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SOME ASPECTS OF THE INTERNAL MIGRATION OF POPULATION IN HUNGARY SINCE 1957

by

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PREFACE

It is well-known that the internal migration of population in Hungary is rather significant and its regional, demographic and socio-economic characteristics are of very complex nature. Statistical data based on a continuous registration of permanent and temporary changes of residence show that about 10 percent of the population changes its residence annually. While temporary migration tends mostly from villages to the towns, the majority of permanent migrations cover the movements between villages. In the same time migration between towns is also considerable. Nevertheless, net effects of the permanent migration finally result the permanent movement of the population from villages to towns and from peripheral regions to the central regions of the country.

These intensive migration processes represent the most important factor in the large-scale regional redistribution of the population of the country. The gross effects of these movements are analysed in an earlier publication of the Demographic Research Institute[1]. Within the redistribution of the population also the most important problems of the migration component were investigated – from the point of view of demographic theory and home practice – by Hungarian demographers[2], however, these problems have not been studied so far with full particulars.

That is why we have been glad that Dr. Paul A. Compton, lecturer in Geography at the Queen's University of Belfast has been interested in the problems of the Hungarian internal migration. The author spent more than a year in Hungary, from July 1965 till September 1966, in the frame of the British-Hungarian cultural exchange programme, and devoted most of his work to studying the migration problems of the Hungarian population. The Population Statistics Department of the Hungarian Central Statistical Office and the Demographic Research Institute helped his work by making available for him the basic statistical data, by supporting considerable computer capacity, official services and giving expert advices.

[1] BENE, L., TEKSE, K.: Vizsgálatok a népesség területi eloszlásának alakulásáról Magyarországon, 1900–1960, Budapest (1966/1/No. 9.

[2] See: e. g. ACSÁDI, Gy.: A vándorlás és a regionális tervezés néhány kérdése. Demográfia Vol. III./1960/No. 3–4 pp. 390–423. – SZABADY, E.: A társadalmi-foglalkozási rétegződés és demográfiai hatásai. Demográfia Vol. V./1962/No. 4. pp. 494–500.

After his long stay in Hungary, later when paying his summer visits here, he was received as a guest and he continued collecting further data and developing his investigations. Partial results of his research work had been published earlier in Hungarian in the journals Demográfia and Statisztikai Szemle, other results related were published in foreign periodicals. The comprehensive study of his research results has been presented as the doctoral dissertation to the London University in 1969.

Our present publication is a revised version of the doctoral thesis mentioned above. We have a good reason to hope that the material presented and the methodology developed in details as well as the main results of the study will arouse the demographers' interest not only in Hungary but also abroad.

As the author performed by far the greatest part of his investigations in 1966 and finished them in 1969, naturally, the material elaborated in the study cannot include the Hungarian internal migrations of the second half of the 1960's and those of the early 1970's. However, not only the size of the internal population movement has significantly changed but partly its direction as well, during the last few years, e.g. the inflow to the capital has gradually decreased and the attractive effect of other settlements in certain agricultural areas becomes conspicious and so some remigration has started even in the direction of the eastern counties of the country – all these could have not been included in this volume. Neither the regional data of the 1970 Population Census were known for the author. These data present the regional movement of the population between 1960 and 1970 differently in several aspects, further in other perspective, and in more details than earlier – in consequence of using new concepts in defining population (permanent or resident population).

All these do not diminish the scientific and methodological significance of Dr. Paul Compton's work done for exploring the regional mobility of the Hungarian population. In our further work we have to continue the intensive analysis of the recent development. We intend to analyse firstly the general state of the internal migrations of the period between 1960 and 1970 in the frame of the publication programme of the 1970 Population Census.

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CHAPTER 1

INTRODUCTION

The analysis of the internal migration of population in Hungary is facilitated by the existance of comprehensive data. Since 1955 a system has been evolved whereby changes of residence are notifiable in the same manner as vital events. The research worker is not presented therefore with the problem found in many countries of having first to collect the relevant migration data before any further analysis is possible. Indeed, where the latter conditions prevail, the basic task of the researcher may simply be to discover the actual pattern and volume of movements taking place, together with the more fundamental characteristics of migrants, such as age and sex composition and occupational structure. When this information is unavailable from the official data agencies, its collection and description through well designed surveys is considered an admirable research aim in itself. The task of the research worker in the field of Hungarian internal migration must go beyond this, however, as the fundamental characteristics of migrants and the spatial patterns of migration are already known.

Although excellent data are available, comparatively few studies have been undertaken concerning Hungarian migration (a review of which is to be found in Chapter 6.). Consequently, this publication attempts to provide a comprehensive description and analysis of recent population mobility in the country at large, and is therefore to be regarded as only the first step toward a fuller understanding of Hungarian internal migration.

Excluding the introduction, the study falls into three parts. In the first section, the sources of migration data and the spatial patterns of current population migration in Hungary are described. Some emphasis is placed on discussing the methods of data collection and processing owing to the comparative uniqueness of the system of continuous registration of population mobility. The spatial patterns of internal migration are described in considerable detail for two reasons. Firstly, it is an essential preliminary step in any explanation of the spatial patterns of population mobility. Secondly, the literature reveals no comprehensive description of internal migration for the country as a whole. Descriptions that do exist relate either to specific regions within Hungary, or when concerned with the national situation, they are couched in general terms. Consequently, part one of this study is also an attempt to fill this gap.

The second part of the study concerns the explanation of current population migration in Hungary. This problem is approached firstly from the point of view of the individual migrant and is in terms of the reasons given by the individual for migrating.

Secondly, the spatial patterns of mobility are accounted for by relating them to the characteristics of places that may be considered to influence these patterns. The two approaches complement each other and both are essential for any full understanding of the complete migration process.

In part three the relationship between current migration and future population distribution is assessed at various levels of spatial aggregation, the prime aim being to isolate the influence of migration from the other components of population change – namely fertility and mortality. The analysis is designed to demonstrate the future effects of migration not only on undifferentiated population within the country but also on the regional populations decomposed by age and sex. The development of a Markov chain model allows the computation of indices based on migration which are analagous to those derived from stable population theory. The time varying implications of migration are also demonstrated which allows assessment of the migratory response to changes in the directions of national planning.

At present just under ten per cent of the Hungarian population migrates annually – either permanently or temporarily. If local movements within administrative areas are included this figure is considerably higher. The outcome of the complex pattern of place to place migration streams has been a persistent movement of population from rural to urban areas, and from the peripheral regions of the country to the centre. As a consequence, the urban population grew from 36.6 per cent to 44.5 per cent of the total population of the country between 1949 and 1970.[1]. The rural population, on the other hand, fell not only proportionately, but in absolute terms also between 1960 and 1970, from 5.84 to 5.72 million[1]. Concurrently the population has been passing through a period of intense socio-economic restratification[2], which has been intimately linked with spatial mobility. The rapid decline in the percentage of the population gainfully employed in agriculture is an indication of the speed of this process.

The essential background to the current geographical mobility of the Hungarian population is to be found in the political, economic and demographic evolution of the country during the twentieth century. Numerous links can be cited. The rapid industrialisation of the past twenty-five years is considered by many the key to an understanding of the high rate of internal migration at present. The dominance of Budapest in the migration process is derived from the political and historical development of the country since the end of the first world war. Demography and economic development have interacted to generate the highest rates of natural increase in those areas of the country where employment opportunities are least, which, consequently, has stimulated migration. To place current migration in its historical perspective, the demographic, economic and political evolution of the country during this century is therefore traced in the subsequent sections of this introductory chapter.

[1] 1970 Census of Population – Preliminary Report. It should also be noted that the urban population used above is that population administratively defined as urban.

[2] For example, Szabady (1962) and Klinger (1962).

1.1 The Evolution of the Population of Hungary since 1869

The census taken on January 1st, 1960 enumerated a population of 9,961,044 in Hungary. This was 8.2 per cent more than recorded at the preceding census of 1949. Accordingly, population density increased from 98.9 to 107.1 persons per km^2.

Population data adjusted for the present area of Hungary are available from 1840. The earliest reliable population enumeration however, was in 1869 when the first official census was taken and when 5.01 million people were recorded on the present territory of the country. In the subsequent one hundred years the population has doubled and according to the preliminary results of the 1970 census stood at 10,315.597.

Since 1869, which by and large coincides with the beginning of industrialisation, the fastest rate of population growth occurred during the intercensal periods, 1880 to 1910 when growth consistently exceeded 11 per cent. Subsequently the rate of increase declined and a small population loss was recorded between 1941 and 1949 owing to war losses. After 1949 the rate of population growth quickened although since 1960 it has again declined and during the ten years to 1970 was only 3.5 per cent[1].

Factors influencing population change in Hungary since 1869

Since 1869 several factors have been operative in influencing population development in Hungary. According to Szabady (1960– the following elements tended to accelerate population growth:

a) The continual improvement in longevity; whereby life expectancy at birth increased from 29 years in 1869 to 70 years in 1964. Correspondingly, the crude mortality rate fell from around 30 per thousand in the late nineteenth century to between 10 and 11 per thousand in the 1960's.

b) Immigration; the treaties contracted at the conclusion of the first and second world wars generated significant inflows of population, in part a result of border adjustments.

By contrast, the following factors tended to decelerate population growth:

a) A continual decrease in the live birth rate. Whereas in the late nineteenth century, the crude live birth rate surpassed 40 per thousand, by the middle 1960's it had dropped to 13 per thousand.

b) Emigration from Hungary. Before 1914 emigration from Hungary has been estimated at approximately 340,000, the majority of whom were agricultural workers. Only 90,000 are thought to have returned to the country. Additionally, during the Great Depression, a considerable exodus took place, and in 1929 alone over 10,000 people are estimated to have left the country. Since 1945 emigration has been negligible.

c) Epidemics during the late 19th century. The cholera outbreak of 1873 in particular led to large temporary increases in mortality.

[1] Although being a general introduction to demography, the book 'Bevezetés a Demográfiába' ed.by Egon Szabady uses Hungarian examples almost exclusively by way of illustration. It consequently proved to be an invaluable source of information in the preparation of this section.

d) The consequences of two world wars. Between 1914 and 1918 between 230–250,000 lost their lives as a direct result of hostilities. The corresponding figure for the second world war was 420,000. The indirect effects on fertility were even more dramatic and the Demographic Department of the Central Statistical Office has calculated an indirect loss of 0.5 million live births from the 1914–18 hostilities.

Acsádi and Klinger (1965) have identified the evolution of the population of Hungary between 1870 and the first world war as belonging to the second phase of demographic transition. Birth and death rates declined in parallel, but fertility was still substantially greater then mortality. A rate of natural increase of between 10 and 14 per thousand was thus maintained.

The first world war altered this pattern somewhat. Both the rates of mortality and fertility continued to decline, but in contrast to the preceding period, the fall in the live birth rate continued rapidly, whereas the decline in mortality tended to decelerate. This combined process, however, was not entirely uniform, and Acsádi and Klinger have distinguished three distinct periods of population development between 1920 and 1945. These are:

a) The immediate post-war period between 1919 and 1924 when the birth rate temporarily increased, while the rate of mortality maintained the same trend as observed previous to 1914.

b) A period of fluctuation in the rate of reproduction between 1924 and 1935, characterised by an initial sudden fall in birth rate, with subsequent annual fluctuations of between 25 and 28 per thousand up to 1930. A rapid decline in birth rate subsequently set in and lasted until 1936.

c) A period of reproductive stability ensued during the impending war crisis and subsequent war. The live birth rate fluctuated slightly between 19 and 20 per thousand, while the death rate remained practically constant at 14 per thousand. It was only in the later years of the war that hostilities directly effected Hungary and as a consequence of the deportations and fighting, particularly the siege of Budapest, the death rate increased to an estimated 50 per thousand.

The demographic processes operative during the period 1945 to 1948 are difficult to assess accurately. Some exchanges of population took place, particularly with Czechoslovakia, while some people of German origin left the country (Siegel 1958, Kosinski 1964).

The evolution of the Hungarian population 1949–1968

The general development of the population since 1949 is clear. The pre-war decline in birth rate continued up to 1961 with a temporary upsurge between 1953 and 1955. It has, however, recovered somewhat since 1965. By contrast, the death rate has fluctuated around a virtually stable mean (figure 5b). Although natural increase can thus be accurately assessed, annual movements in actual population change before 1960 cannot be reliably estimated, as it is only since 1956 that international migration data have been recorded. Estimated figures however, provide a picture of uneven population growth. The upsurge in birth rate between 1953 and 1955, produced a temporary rate of growth that had only been exceeded before 1914 (Klinger 1958). By contrast, the population at the end of 1956 was 54,000 less than at the beginning of the year, and in 1957 increased by only 31,000, compared with a natural growth increment of 64,000. The loss of population over these two years was due to emigration during and after the counter-revolution of 1956.

Since 1960 the mortality rate has again been practically stable. The decline in the birth rate has not continued, however. From an all time minimum value of 12.9 per thousand in 1962, excluding the war years, it rose to 14.6 in 1967 and to an estimated value of 15.7 per thousand in the first half of 1969[1]. The rate of increase, with only minor variations which reflect the small fluctuations in mortality, has paralleled the rising birth rate.

The evolution of the age composition of the population of Hungary

A sensitive index of the trends in fertility and mortality since the end of the nineteenth century is the changing age and sex composition of the population of the country. In turn, however, the changing composition of the population reacts upon these parameters and amplifies the already evolving trends.

The general fall in fertility generated a steady decline in the proportion of young people in the total population and a corresponding increase in the proportion of population over the age of 60, while the greater reduction in female mortality shifted the sex ratio further in favour of the male population.

The general process of ageing is succintly demonstrated by the rise in the mean age of population of 6.4 years between 1910 and 1960. The corresponding figures for males and females are 5.2 and 7.3 years respectively (table 1).

Table 1
Movements in the mean age of the population of Hungary

Year	1910	1920	1930	1941	1949	1960
Men	27.2	28.5	29.3	31.0	31.5	32.4
Women	27.3	28.9	30.2	32.1	33.3	34.6
Total	27.2	28.7	29.8	31.6	32.4	33.6

Areal variations in the growth and distribution of population in Hungary[2]

A) Regional variations in population growth and distribution.

Although wide variations exist between the major regions of the country, the territorial pattern of vital events has remained practically unchanged since the 1920's. Fertility has been highest in the north-eastern part of the Alföld throughout the present century, and lowest in Southern Hungary, particularly Southern Transdanubia. In addition, the rural areas have consistently sustained higher birth rates than the urban areas. Differentials in the territorial pattern of mortality are not so well developed and

[1] Based on the returns for the first six months of 1969.

[2] To assist the reader, in this and subsequent chapters, the counties and rural and urban districts of Hungary are listed in Appendix 1, and are accompanied by administrative maps of the country.

have tended to be more variable. The important point, however, is that the general decline in fertility and the improvements in mortality have affected all parts of the country equally[1].

Since 1949 the pattern of natural increase has corresponded closely with that of fertility. The north-eastern counties of the Alföld, i.e. Szabolcs-Szatmár and Hajdú-Bihar counties have experienced the highest population increment through natural increase, while Southeast Alföld and Southern Transdanubia have sustained the lowest natural growth rates (figure 1). Other localised areas of high natural increase are to be found scattered throughout Northern Transdanubia. The general territorial pattern is quite clear, however. South of a line drawn from Kőszeg to Biharkeresztes rural district on the Rumanian border, natural increase has averaged less than 5 per thousand annually since 1949. To the north of this line with the exception of Budapest, it has been significantly higher.

The pattern of actual population change is quite divergent and has been so throughout the present century. Whereas the north-eastern counties of the Alföld sustained the highest rates of natural increase, the growth in their actual population numbers between 1949 and 1960 was exceedingly low and has since turned into an absolute loss. The area of most rapid gain has been the Central Industrial Region around and including Budapest where natural increase is lowest, while large areas of Southern Alföld and Southern Transdanubia experienced population losses of up to 10 per cent between 1949 and 1960 which have intensified. Exceptions to the general population decline in these latter areas are the urban centres and the southern shore of Lake Balaton (figure 2). Thus to a large extent the map of actual population change since 1949 reflects the net migratory behaviour of the population.

Variations in population density are a direct consequence of differential territorial population growth over considerable time intervals. Variations in density, however, depart considerably from the pattern of actual population change since 1949. In 1960 the areas of highest density (figure 3) were: i/the region surrounding Budapest, reflecting the continuous inflow of population to that area during the present century, ii/the north-eastern part of Hungary as a result of continuously high fertility, and iii/points scattered throughout the country marking the urban settlements (Bene and Tekse, 1966). Additionally, two axes of moderately high density pivot upon Budapest. The first reaches out in a north-east direction towards Szabolcs-Szatmár county, while the second extends towards Szeged and Békéscsaba, in the south-east. Generally speaking the density of population in Transdanubia, averaging 40--69 persons per km^2 in 1960, is less than in the areas lying east of the River Danube and in part results from the long tradition of one child families.

The population potential maps of Bene and Tekse (1966) supplement this discussion (figure 4). They succinctly demonstrate that the broad spatial evolution of the Hungarian population this century has been for an ever increasing concentration of population in the central area. The potential around Budapest has greatly intensified, while the localised maxima apparent in the eastern part of Hungary in 1910 had completely disappeared by

[1] In addition to Acsádi and Klinger (op.cit.) Szél (1931 and 1941) and Thirring (1938) are important sources on the pre-war pattern of vital events in Hungary.

960. Indeed, the areas adjacent to the international borders of the country have xperienced a continual weakening of population potential since 1930.

3) The growth of population in Hungary by settlement types

The movement from village to town has been indentified as the most important single henomenon in the spatial development of the population of Hungary since 1869 Lettrich 1962, Mendöl 1963). The earlier phases in this process cannot be termed rbanisation, however, because much of the movement was to places, which although dministratively classed as towns, possessed few urban functions. The large Alföld ettlements, many with populations in excess of 20,000 but with as much as 60 per cent f their labour force employed in agriculture, are such examples. Hence, up to the 1930's his process of population redistribution is termed agglomeration rather than urbanisation Mendöl).

The growth of population in Hungary between 1869 and 1963 by settlement classes is resented in table 2. The settlements are grouped into those administratively classified as rovincial cities, district towns, villages with populations exceeding 10,000 in 1962, and ther villages. The growth of Budapest because of its unique position in Hungary is shown eparately.

A feature of note is the consistent gradation in growth rates between the groups from 869 to 1941. During each inter-censal period, the population of Budapest expanded nost rapidly, and with but one exception – 1920 to 1930 – the growth rate of the illage population was slowest. Moreover, the provincial centres grew more rapidly than the istrict towns. Since the grouping of settlements broadly defines settlements size, it is pparent that up to 1941 there was a direct and strong association between the rate of ettlement growth and settlement size. Indeed, further subdivision of the district towns y size does not alter the gradient.

This type of process has been termed allometric growth (Beckman 1958 and Simon 955), and as defined for settlements, states that population growth is directly related to ne settlement's place in the urban settlement hierarchy. Although, allometric growth is nly postulated for an urban hierarchy in the literature, the agricultural towns and illages of Hungary conform to the pattern as well. Empirical studies have indicated that ne allometric raltionship generally describes urban population growth in countries assing through the early stages of industrialisation, when large scale rural-urban nigration prevails. Since industrialisation began in Hungary in the latter half of the ineteenth century, the early phases of which had been completed by 1941, the lungarian case provides positive evidence for this contention.

Since 1949 the growth pattern of settlements has changed and no longer is it a simple unction of population size. The new socialist towns and provincial cities have expanded apidly, but although their growth rates are now considerably in excess of that of udapest, the capital in 1968 still housed 20 per cent of the total inhabitants of the ountry, 45 per cent of the urban population and was ten times larger than the next city iskolc[1]. In addition, a new feature has been the rapid fall in rural population numbers nce 1959 which to date has approximated 500,000.

[1]The demographic problems resulting from this excessive concentration of population in the apital has been discussed by Pápai (1961 and 1967).

Table 2. Rural and Urban Population Growth by Intercensal Periods

Year	Budapest		Provincial Cities		Type A[1] District Towns		Type B[1] District Towns		Type C[1] District Towns	
	Number (in'00's)	Per Cent Increase	Number (in'00's)	Per Cent Increase	Number (in'00's)	Per Cent Increase	Number (in'00's)	Per Cent Increase	Number (in'00's)	Per Cent Increase
1869	302 1		149 5		247 6		422 9		105 8	
1880	402 7	33.30	166 3	11.23	272 4	10.01	457 2	8.11	111 5	5.39
1890	560 1	39.07	195 0	17.27	303 0	11.23	508,6	11.23	123 3	10.53
1900	861 4	53.80	253 4	29.93	370 8	22.38	564 3	11.15	138 6	11.58
1910	1 110 5	29.81	302 7	19.48	432 6	16.68	613 7	8.76	149 4	7.82
1920	1 232 0	10.90	325 8	7.61	472 8	9.50	642 8	4.73	154 1	3.16
1930	1 442 9	17.11	370 5	13.66	512 9	8.27	671 2	4.42	159 3	3.37
1941	1 712 8	18.71	414 8	11.96	562 6	9.69	718 0	6.98	169 8	6.59
1949	1 590 3	− 7.15	395 0	4.76	518 5	− 9.63	699 3	− 2.60	168 1	− 1.03
1960	1 804 6	13.47	487 3	23.37	629 3	21.38	834 9	19.38	210 6	24.71

Table 2. continued

Year	Type A[2] Villages		Type B[2] Villages	
	Number (in'00's)	Per Cent Increase	Number (in'00's)	Per Cent Increase
1869	376 2	–	3 407 1	–
1880	398 0	5.78	3 521 1	3.34
1890	448 9	12.79	3 870 6	9.93
1900	499 0	11.16	4 167 0	8.17
1910	553 7	10.97	4 449 5	6.78
1920	592 2	6.95	4 566 2	2.62
1930	640 8	8.20	4 887 6	7.04
1941	681 2	6.30	5 056 9	3.46
1949	680 9	0.00	5 152 7	1.89
1960	728 2	6.95	5 266 1	2.01

[1] Type A district towns: populations exceeded 50,000 in 1960. Type B district towns: populations between 20 and 50,000 in 1960. Type C district towns: populations less than 20,000 in 1960.

[2] Type A villages: populations exceeded 20,000 in 1960. Type B villages: populations less than 20,000 in 1960.

1.2 The Economic and Political Evolution of Hungary during the Twentieth Century

A significant event in the political and economic evolution of Hungary during this century was the partition of the Austro–Hungarian Empire in 1918 which was carried out along broad ethnic lines to give self-determination to minority groups[1]. As a consequence the population of Hungary fell from 18.3 million to just under 8 million, and the area of the country reduced from 325 thousand km^2 to 93 thousand km^2.

The partition stimulated the migration of Hungarians from the territories ceded to the successor states (Thirring 1963), although once the new borders had become hardened, such movement stopped. One aspect of the partition, however, still very much influences the current pattern of internal migration in the country, and that is the unbalancing of the urban hierarchy caused by the lack of middle sized cities. Thus at the time of the 1920 census, the population of Budapest stood at 1.2 million, whereas the next largest city in that year was Debrecen with a population of only 98,000. There is still no population concentration in Hungary to counterbalance the attraction of Budapest, which consequently absorbs more migrants annually than the sum of other urban centres combined, even though migration to the capital is discouraged.

Economic development between the two world wars was uneven and in general extremely slow. Agriculture remained the dominant sector and in 1939 still employed over 50 per cent of the labour force and supplied 36.5 per cent of the national income. Its growth and rationalisation was retarded by the feudalistic nature of the system of landholding while the lack of mechanisation and modernisation made it highly labour intensive. Industrial development fared little better and between 1919 and 1939 output from industry grew by only 20 per cent. Foreign investment was particularly active in this sphere and as argued by Rado (1963), may well have been a significant factor in the retardation of industry owing to the export of capital in the form of dividends. Regional economic specialisation was virtually unknown. The industry that did exist was overwhelmingly located in Budapest and it was only in the Miskolc region of north-east Hungary that any other significant centre of industrialisation and specialisation was created.

This general state of economic retardation discouraged the widespread redistribution of population through migration after the initial reaction to the partition of the country. Although continuing urbanisation was a feature of the period, its rate was retarted as the unemployed and underemployed within the agricultural labour force could not be absorbed owing to the lack of employment opportunities in the urban centres. Yet temporary migration in agriculture remained a significant feature owing to the operation of a large seasonal labour force. It would be wrong, however, to create an impression of population stability in the spatial sense. Intervillage, interurban and rural-urban migrations were considerable (Thirring 1963), but compared with the present patterns of population movement, were largely self-compensating.

Since 1945 the economic and political system in Hungary has been transformed. A People's Republic was declared in 1949 and measures nationalising banks, industrial

[1]The area population comprising historical Hungary was divided between seven states: successor Hungary, Austria, Czechoslovakia, Italy, Poland, Rumania and Yugoslavia

establishments, transport, wholesale trade and the majority of retail trade followed. The economy of the country was reorganised, and since 1947 has been developed according to national plans.

The regional pattern of investment up to 1961 did much to reinforce the limited pre-war concentrations of industry. During the period Budapest received one third of all investments while the majority of the remainder was apportioned to Borsod-Abaúj-Zemplén, Fejér, Komárom and Veszprém counties and the cities of Miskolc and Pécs. With the exception of Komló, the new socialist towns constructed up to 1961 are located in these counties also. By comparison, little was invested in the urban and rural settlements of the Alföld.

Yet rather than discourage internal migration these developments actually stimulated it. The large scale public works associated with the construction of new factories and the socialist towns, as well as the spatial concentration of the newly created employment opportunities stimulated both temporary and permanent migration. In agriculture modernisation which increased agricultural productivity and the desirability for a smaller agricultural labour force, encouraged the rapid urbanisation of the rural population, which, contrary to the pre-war situation, could now readily find employment outside the agricultural sector.

Since 1961 the stress placed on transforming the economy of Hungary has been changed to one of creating balanced economic development within the regions of the country and economic decentralisation was proposed. No new industry was recommended for Budapest, investments being restricted to the modernisation and reconstruction of old plants. By comparison, accelerated growth was recommended for seven provincial centres – Debrecen, Miskolc, Pécs, Szeged, Győr, Székesfehérvár and Veszprém. Smaller urban settlements of favourable structure, such as raw material base (e.g. food processing in certain settlements of the Alföld) and satisfactory or skilled labour supply were also earmarked for growth. It may only be coincidental but since 1961, the rate of population inflow to Budapest has fallen rapidly, while that to the large provincial centres has increased. At the same time a decline in the rate of net out-migration from the Alföld has been apparent.

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PART ONE

THE SPATIAL PATTERNS OF POPULATION MIGRATION IN HUNGARY

CHAPTER 2

MIGRATION DATA IN HUNGARY

2.1 Definitions

Persons are classified as internal migrants in Hungary if they cross an administrative boundary in the course of changing residence. A distinction is made between permanent and temporary migrations and the official definitions (Central Statistical Office) are as follows. "A permanent migrant is a person who gives up his dwelling and designates another residence as permanent in some other settlement. A person can only have one permanent residence at any time." "A temporary migrant is a person who, while retaining his permanent dwelling changes residence and designates a dwelling in another settlement as a temporary residence. A person can only have one permanent and one temporary residence at any time." In practice it cannot be assumed that all temporary migrants will return to their permanent residence, which necessitates the tabulation of a further category, that of temporary return migrant, defined as ". . . a migrant who gives up his temporary residence and returns to his permanent dwelling". A move from one temporary residence to another, however, is always related to the migrant's permanent dwelling, which may tend to exaggerate the number of temporary return migrations.

2.2 Sources of Migration Data

Since 1957 the primary source of migration data in Hungary has been the continuous registration of population change of residence. A secondary source is the 1960 census which only covers part of the period under study but which is useful for summary purposes.

The census

Migration data from the 1960 census is based on the place of residence of the population in 1949 and in 1960. As such, estimates of both gross and net migration between the two dates are possible. The record cannot be complete, however, owing to the omission of multiple moves during the intercensal period, which is a common fault of all migration tabulations from census data. Specifically, migrations of the following nature were not recorded:

i) Permanent changes of residence within a village or urban settlement.
ii) Permanent changes of residence during the intercensal period that did not terminate in the permanent place of residence on January Ist, 1960.
iii) Changes of residence of individuals born after December Ist, 1948.
iv) Temporary changes of residence.

Within these limitations, the tabulations concerning migration between 1949 and 1960 are useful in that they provide information on the basic patterns of population movement between the two dates. These data are published in the 1960 census volume „A népesség 1949 és 1960 évi lakóhelye"

Registration of change of residence[1]

The continuous registration of population change of residence inside Hungary is controlled by the police. All individuals over the age of 16 changing their residence either permanently or temporarily must complete a prescribed exit paper – 'kijelentőlap' – on leaving their old residence, and an entry paper – 'bejelentőlap' on moving to their new residence. Separate 'bejelentő- and kijelentőlap's are prescribed for permanent and temporary changes of residence and one section of each document is forwarded to the Central Statistical Office for processing.

Individuals, whether changing their place of residence permanently or temporarily, are required by law to provide the following information for the Central Statistical Office:

1. The exact address of the new residence
2. Family name and forenames
3. Place of birth – for those chaging their place of residence permanently
4. Year of birth
5. Family status – i.e. single man, spinster, married, widow or widower
6. Title of job and occupation
7. Description of occupation conforming most closely to the categories: manual worker, white collar worker, member of a cooperative, selfemployed farmer, other self-employed occupation, student and dependent.
8. Name and address of place of work
9. Reason for changing residence conforming most closely to the categories: change of occupation, change of place of occupation, educational, marriage, moving closer to place of work and dependent.
10. Exact date of moving into new residence – year, month and day.
11. Exact address of former residence. In the case of a temporary move, exact address of permanent residence.
12. Name and year of birth of all persons under the age of 16 moving with the individual.

[1] Some amendments to the system have been introduced since the preparation of this work.

To ensure complete coverage of population redistribution inside Hungary, individuals are also required to complete an exit paper for statistical purposes when returning from a temporary to a permanent residence. The exit paper for temporary return movers[1] is shorter and requires the completion of the following questions:

1. Exact address of temporary residence
2. Family and forenames
3. Date of moving from temporary residence – year, month and day
4. Exact address of permanent residence. If not returning to permanent residence, address of new temporary residence.
5. Year of birth
6. Name and year of birth of all persons under the age of 16 moving with the individual.

The regulations concerning changes of residence are strict and clearly stated (Hungarian Gazette, 1954). The following is a summary of the most important points:

1. An entry and an exit paper must be completed by all individuals moving to a new permanent or temporary residence.

2. The information given on the entry and exit papers must conform to the data contained in the individual's personal identity card.

3. The section concerning occupation must be completed in every case. If the person registering is incapable of working and has no occupation, for example elderly persons, the word dependent must be inserted. If the person registering has no job or occupation temporarily and has been unemployed for less than three months, then the previously held job must be named. If the individual has been unemployed for more than three months, then the word jobless must be inserted. The job or occupation has to be defined exactly. General descriptions, such as white collar worker or industrial worker are not suitable.

4. The person registering is obliged to sign the entry and exit paper. He must also obtain the signatures of the person supplying him with accommodation and the person charged with keeping the official list of residents in his district.

5. The entry and exit papers duly completed must be presented in person, together with personal indentity card to the nearest police station or nearest council office within twenty-four hours of changing residence.[2]

[1] The preliminary results of the 1970 census have brought to light a fairly serious underregistration of temporary return migrants over the last intercensal period. Consequently the net in-flow of population to Budapest and the net out-flow from the Alföld during the period 1960 to 1969 were overestimated. The permanent migration balance, rather than the balance from total movements gives consequently a better picture of population redistribution during the period. It is the permanent migration balance which is generally discussed in this study.

[2] Initially a temporary migration was for a maximum period of 3 months, but was amended to 6 months in 1963. A further amendment in 1962 was designed to restrict permanent migration to Budapest. According to this, five years residence in the Capital is necessary before permission can be granted to either rent or build a flat or a family house there.

Within the limits of the system, these strict regulations, particularly the need for two signatures on the exit and entry papers beside the individual's own ensure the provision of correct information. A further control is the cross-checking of the information given on the exit and entry papers against the data contained in the individual's personal identity card. There is consequently little possibility of providing either deliberately or inadvertently false information about occupation, age, family status, birth place, number of dependents under the age of 16, or place of residence.

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CHAPTER 3

POPULATION MIGRATION IN HUNGARY - A SUMMARY OF THE 1960 CENSUS RETURNS

Of the population of Hungary 11 years of age and older in 1960, 18 per cent had resided in different settlements in 1949. Almost three quarters of these were wage earners. Men were shown as being more mobile than females, while the young productive population between the ages of 15 and 39 comprised the most mobile age group.

3.1 Out-Migration

Well defined differentials in mobility were displayed by the major settlement classes, Budapest, provincial cities, district towns and villages, table 3. One fifth of the village population, compared with only 9 per cent of the population of Budapest moved to another settlement between 1949 and 1960. The proportions for the district towns and provincial cities were 18 and 16 per cent respectively. Of total outmigrants, 73 per cent originated in rural areas, but over half of these settled in other villages. The majority of those migrating from the towns settled in other towns or in Budapest. Geographically, the Alföld was the region of highest out-migration, and over 20 per cent of their 1949 populations were recorded as leaving the counties of Bács-Kiskun, Szabolcs-Szatmár, Békés and Szolnok.[1]

Although considerable population mobility is indicated by these figures, the average migration distances travelled were rather limited and 60 per cent of movers settled in the same county or in neighbouring counties. Of the remainder, almost as many migrated to Budapest as to more distant counties. Indeed as a centre of attraction, Budapest was paramount, for besides attracting the majority of migrants from neighbouring Pest County, the capital also drew to itself over one third of out-migrants from the counties of the Alföld.

The geographical characteristics of out-migrating wage earners were similar to those of all movers, in so far as the mojority originated in villages and moved to otheer settlements within the same county or to neighbouring counties. Their employment structure is of interest, however. One third of migrating wage earners held agricultural occupations, while just under a half were employed in manufacturing industry. Yet employees in the construction industry comprised the most mobile occupational group, as 23 per cent of labour force in this sector migrated between 1949 and 1960. By comparison, those with agricultural occupations were least mobile – 10 per cent changing residence between 1949 and 1960.

[1] Maps of the administrative areas of Hungary are to be found in Appendix 1.

3.2 In-Migration

In 1960, 17 per cent of the population of Budapest was composed of migrants who had moved to the capital during the period 1949 to 1960. The populations of the provincial cities and district towns contained even higher proportions of in-migrants. For each settlement class, approximately three quarters of all in-migrants were from rural areas. It is interesting to note, however, that movers from Budapest were of greater relative significance amongst migrants to rural areas than to the provincial cities (table 4). Whereas out-migration was at a maximum from the counties of the Alföld, in-migration was directed towards Pest county and the counties of Transdanubia. As a result, in 1960 over 25 per cent of the populations of Baranya, Fejér and Komárom counties were composed of migrants who had moved there after 1949. The age composition of in-migrants was such that almost 50 per cent of the urban population between the ages of 20 and 29 in 1960 was composed of those who had resided in different settlements in 1949. Over a quarter of the village population of the same age was so comprised.

In-migrating wage earners made up one fifth of the active population of Budapest in 1960 and over a quarter of the labour force of the provincial cities and district towns. Of the counties, the largest influx of wage earners relative to the total labour force was experienced by Fejér, Komárom and Veszprém counties of Northern Transdanubia.

3.3 Net Migration

The balance of in- and out-migration between 1949 and 1960 generated a considerable increase in urban population. In absolute terms, Budapest received the largest influx, although relatively speaking, growth attributable to migration was higher for the provincial cities. Of the other urban centres of the country, the new socialist towns sustained extremely high growth rates through net population inflow. The first 22 towns ranked in order of net migration gain are presented in table 5. The substantial net outflow of population from rural areas meant that most counties lost population during the period. The agricultural counties of the Alföld were particularly affected. Szabolcs-Szatmár and Hajdú-Bihar counties lost over 10 per cent of their 1949 populations through migration, while the population wastage from Bács-Kiskun, Szolnok, Békés and Csongrád counties exceeded 6 per cent. Small net inflows were sustained by the industrialised counties of Fejér, Komárom, Veszprém and Győr-Sopron in Northern Transdanubia, by Pest county which encircles Budapest and acts as a dormitory region for the capital and by the county of Heves.

Relative gains and losses of wage earners followed a similar course, although the net gain of active population by the urban centres at the expense of the rural areas was somewhat more pronounced, relative to net gain in total population. In this respect Budapest whose net migration surplus was composed predominantly of wage earners, was most favoured. By county, the largest net inflows of wage earners were to Pest, Fejér, Komárom and Veszprém. Highest net outflows were sustained by the Alföld counties of Szabolcs-Szatmár, Hajdú-Bihar, Békés and Bács-Kiskun.

The spatial pattern of population mobility in Hungary between 1949 and 1960 was thus composed of a number of components. Firstly, the flow of population from rural to urban areas was pronounced, but was partly offset by a counter stream in the reverse direction. Secondly, considerable inter-urban and inter-village movements occurred. The effect on the areal distribution of population was to increase the concentration of population in the Central Region and in the eastern part of Northern Transdanubia. By contrast a significant depopulation of the Alföld occurred.

Table 3. Major Out-Migration Flows 1949–60 (per cent)

From	To Budapest	To Urban Centres	To Villages	Per Cent Composition of All Out-Migrants by Place of Origin
Budapest	–	40.1	59.9	8.3
Provincial Cities	31.3	30.7	38.0	3.9
District Towns	25.7	32.6	41.7	15.0
Villages	18.0	29.4	52.6	72.8
Total	18.2	30.8	51.0	100.0

Table 4. Major In-Migration Flows 1949–60 (per cent)

To	From Budapest	From Urban Centres	From Villages	Per Cent Composition of All In-Migrants by Place of Destination
Budapest	–	28.0	72.0	18.2
Provincial Cities	9.3	20.0	70.7	7.1
District Towns	11.3	19.6	69.1	23.7
Villages	9.7	15.2	75.1	51.0
Total	8.3	18.9	72.8	100.0

Table 5. First[1] 22 Urban Centres in Rank Order of Net Population Inflow 1949–60

	Number[1]	Per Cent of 1960 Population		Number[1]	Per Cent of 1960 Population
Budapest	267.7	17.4	Sopron	11.0	32.7
Pécs	30.6	32.3	Szolnok	11.0	29.4
Miskolc	30.5	26.1	Kecskemét	10.6	19.7
Debrecen	23.2	22.0	Szombathely	10.0	22.6
Dunaújváros	20.7	87.3	Zalaegerszeg	8.0	42.1
Szeged	20.4	24.4	Gyöngyös	7.7	32.8
Győr	14.9	25.5	Várpalota	7.6	47.4
Székesfehérvár	13.4	29.3	Veszprém	7.0	34.8
Komló	13.0	70.0	Kazincbarcika	7.0	12.9
Kaposvár	12.4	34.6	Oroszlány	6.7	69.0
Tatabánya	11.1	26.8	Ajka	5.9	48.4

[1] (in 000's)

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CHAPTER 4

POPULATION MIGRATION IN HUNGARY SINCE 1957 - AN ANALYSIS OF DATA FROM THE CONTINUOUS REGISTRATION OF CHANGE OF RESIDENCE

Internal migration in Hungary since 1957 is open to fuller analysis than that of any preceding period owing to the continuous enumeration of population change of residence. Every individual movement is known, and the spatial aspects of both permanent and temporary migration can therefore be surveyed in detail.

4.1 General Trends in Migration since 1957

Temporal trends

Since 1957 the number of internal migrations in Hungary has averaged between 800 thousand and one million annually, i.e. approximately one tenth of the total population number. Two thirds of these have involved temporary movements. A general decline in population mobility is a well established trend, however.

Regarding permanent migration, the decline in mobility was rapid between 1957 and 1959, when the total number changing residence permanently dropped by almost one quarter, and subsequently continued at a more leisurely rate until 1961 (fig. 5c). Since 1961 the trend has fluctuated, although the overall decline has persisted. This general pattern of declining mobility has been virtually duplicated by out-migration from the villages. By comparison, in-migration to the villages has been characterised by the same initial decline, but since 1959 the falling trend has been practically imperceptible. Out-migration from the urban centres and from Budapest has followed a similar course. By contrast, the incidence of migration to Budapest has fallen rapidly since 1962, while that to other urban centres has tended to increase.

The effect of these differing trends in gross population mobility on the migration balance of rural and urban areas is of interest (fig. 5a). Net population outflow from the villages dropped considerably between 1957 and 1958 – indeed 1958 marked the point of minimum rural outflow in the last twelve years – only to rise again to a maximum in 1960. Since then, with minor fluctuations, the net rural outflow of population has followed a declining trend. The longitudinal pattern of net inflow to Budapest has been virtually identical to that of village out-flow, although the fall in net in-migration to the capital has be n more persistent throughout the period. The net gain in the population of other urban centres, by comparison, has shown a distinct tendency to increase. It should be noted, however, that this characteristic was more a feature of the district towns than the provincial cities. The overall movement in temporary migration since 1960 has been downwards but fluctuations in the annual totals have been pronounced. The trend previous to that year is unknown owing to the absence of temporary return migration data.

Spatial trends

Temporal vatiations are but one aspect of general trends in Hungarian migration since 1957. The general evolution of the spatial pattern of migration is a further and important aspect of the same question, but more difficult to demonstrate simply and concisely. The techniques of centrographic analysis, however, supply a partial solution to the problem in that the magnitude and direction of movement over time of the various means of a given spatial distribution provide accurate statistics of changes in that distribution. For the present purpose movements in the migration centres of gravity would appear the most useful measure to depict the general trends in the spatial pattern of population mobility largely because of the simplicity of its computation.

Centres of gravity are but the mean centres of a geographical distribution – the point from which the sum of the squares of the deviations of the distribution are at a minimum – and thus possess the same advantages and disadvantages as the mean of linear statistics. The centre of gravity therefore although providing a concise measure of an areal distribution, which can be utilised for depicting general or average change, does not give us any information concerning the distribution around the mean centre (Bene 1962, Porter 1963).

The position of the various migration centres of gravity in 1958 and 1964 are given in figure 6. With the exception of the centre of gravity of net out-migration, all centres lie immediately to the south and south-east of Budapest and are within 50 km of the city. Additionally, they are generally within 30 km of the 1960 centre of population gravity, thus indicating a clear relationship between migration and population distribution (Bene and Tekse 1966).

The pattern of movement of the various mean centres of migration between 1958 and 1964 is rather complex. The gravity centre of village out-migration moved 1.5 km in an east-south-easterly direction, which suggests that, relative to other parts of the country, central and southern Alföld took on additional significance in the outflow of population from rural areas in 1964 compared with 1958. The centre of gravity of urban out-migration by comparison, moved over 2 km to the west and may be similarly interpreted in terms of a relative increase in migration from the urban centres in the west of the country.

The movement of both the rural and urban in-migration centres of gravity contained northward components but whereas the rural centre also possessed a strong easterly component, the urban centre moved dominantly to the west. Thus relative to other parts of the country in-migration has become increasingly directed towards the northern parts of the country. Rural in-migration, however, intensified in the northeast, i.e. Northeast Alföld and the Miskolc region, whereas urban in-migration strengthened in the northwest.

Thus between, 1958 and 1964, we see movements in the centres of gravity of in- and out-migration of the order of 2 to 4 km. The centres of gravity of migration standardised for population size displayed negligible movement, however. This would suggest either relative stability in the distribution of migration frequency, or that changes in frequency throughout the country were self-compensating in the sense of leaving the centre of gravity unaffected.

The effect of these general movements in gross in- and gross out-migration on the gravity centres of net migration are of interest. The centre of net out-migration, which is overwhelmingly representative of rural net migration, is found well to the east of Budapest in both years. The heavy net outflow of population from the Alföld is obviously reflected here. It did, however, move westwards the considerable distance of 8 km between 1958 and 1964, which does suggest a comparative fall in the net outflow of population from the Alföld. Moreover, the centres of gravity of net in-migration moved east, again pointing to a relative improvement in the migration characteristics of the Alföld.

4.2 Dominant Migration Flows

That on average 55 per cent of moves since 1957 involving permanent changes of residence have occurred within the same county reflects the comparatively short distances over which permanent migrations occur in Hungary. This is, however, a somewhat higher value than specified by the 1960 census results. By comparison, temporary migrants are willing to travel considerably greater distances. Only 15 per cent of temporary moves occur within the same county while over one fifth involve migrations to or from Budapest – less than 10 per cent of permanent moves are so directed.

Concerning the general directions of permanent migration, intervillage, inter-urban and rural to urban movements comprise the dominant flows (table 6). Inter-village and inter-urban movements combined make up about 55 per cent of permanent migration activity. The structure of temporary flows is somewhat different and inter-village and inter-urban moves involving temporary changes of residence account for less than 30 per cent of all temporary moves. By contrast rural-urban and urban-rural movements comprise the dominant temporary flows, the latter stream being largely made up of temporary return migrants (table 7).

Table 6. Intersettlement Class Permanent Migration Flow Matrix-Average Annual Rates 1960–1964[1]

To	From	a	b	c	d
Budapest	a		3.42 (0.6)	4.31 (2.4)	5.48 (10.0)
Provincial Cities	b	0.69 (0.4)	0.57 (0.1)	1.99 (1.0)	2.69 (4.7)
District Towns	c	2.58 (1.5)	4.57 (0.7)	5.40 (2.8)	8.00 (14.0)
Villages	d	8.81 (5.0)	13.90 (2.1)	15.04 (8.0)	26.01 (46.7)

[1]Figures in brackets show migrations comprising each flow as a percentage of all migrations. Figures outside brackets represent migrants per 1000 population place of origin.

Table 7. Intersettlement Class Temporary Migration Flow Matrix-Average Annual Rates 1960–1964[1]

From / To		a	b	c	d
Budapest	a		11.31 (1.)	15.53 (4.0)	18.10 (17.7)
Provincial Cities	b	2.42 (0.8)	2.66 (0.2)	4.66 (1.4)	4.58 (4.5)
District Towns	c	12.08 (3.8)	14.61 (1.3)	12.49 (3.7)	12.48 (12.2)
Villages	d	52.04 (15.5)	43.85 (3.9)	23.76 (11.1)	18.27 (17.9)

Complex patterns of geographical mobility underlie this summary of the dominant directions of population movement in Hungary since 1957. Inter-regional migration may be considered representative of long distance movements (table 8). At this scale, the only area to have sustained substantial in-flows of population has been the Central Region. Its strongest in-migration connections are with the Alföld from which it has attracted population at a rate approaching 10 per thousand annually. Although the rate of out-migration from the Central Region has been low, the pattern of regional connections is little changed for although maximum outflow has been to Northern Transdanubia, the Alföld has still attracted substantial flows of population from the Central Region. Northern Transdanubia has been the other region possessing strong migration connections with the Alföld regions.

Of other connections, the most vigorous migration activity is between neighbouring regions. For instance Northeast Alföld has displayed considerable migration activity with the Northern Region and Southeast Alföld, but less with Southern Transdanubia. Southern Transdanubia by comparison, has strong links with Northern Transdanubia and Southeast Alföld, but poor connections with Northeast Alföld and the Northern Region. Two general points can thus be made. Firstly, that migration links are usually stronger between neighbouring regions, and secondly that a significant interregional migration stream in one direction is generally countered by a strong flow in the reverse direction.

These patterns are reinforced when the regional connections of total migration (i.e. permanent, temporary and temporary return migration combined) are considered, except that the flows attributable to total migration are approximately four times larger than those involving interregional migration of a permanent nature. One significant departure, however, concerns total out-migration from the Central Region where the flows are between 5 and 8 times greater than the permanent migration equivalent. These large outflows are almost entirely attributable to temporary return migration.

[1] Figures in brackets show migrations comprising each flow as a percentage of all migrations. Figures outside brackets represent migrants per 1000 population place of origin.

Table 8. Interregional Permanent Migration Flow Matrix-Average Annual Rates 1960–64

To	From a	b	c	d	e	f
a	–	5.45	8.00	9.85	5.96	5.33
b	1.36	–	0.86	3.74	0.53	0.68
c	2.00	0.74	–	1.88	1.88	0.96
d	2.27	2.64	1.82	–	0.78	0.91
e	1.09	0.44	0.18	0.81	–	1.58
f	2.28	1.17	2.11	2.09	3.28	–

a – Central Industrial Region
b – Northern Industrial Region
c – Southeast Alföld
d – Northeast Alföld
e – Southern Transdanubia
f – Northern Transdanubia

The general features of intercounty permanent migration are similar to those already described at the regional scale. (table 9) In the case of every county, while the majority of moves occur within that county, there is a steady decline in the incidence of migration as the distance separating counties increases. The most notable exception to this general rule is Budapest for although flows to and from the capital are largest in relation to neighbouring Pest county, Szabolcs-Szatmár 200 km distant is the second county in order of contribution to the in-migration total of the capital. Indeed, Budapest experiences much larger inflows of population from the whole of the Alföld than would be expected solely on the basis of distance. Other points that must be made are that no two counties are separated by so great a distance that no migration is generated between them. Additionally, there are no two counties where the dominant migration stream is not partially counterbalanced by a stream in the reverse direction. This applies equally to counties of both similar and dissimilar socio-economic disparities between areas cannot, therefore, provide a satisfactory explanation of inter-territorial migration flows.

At all scales most of these general points concerning migration streams are found to be true. As the units of observation become very small however, a five year or even longer time interval may be necessary to complete the flow matrix at that scale. For example, it was found that a five year period was not sufficiently long for non-zero values to be completely eliminated from a 63X63 urban flow matrix. The decline in migration with increasing distance was a consistent characteristic, however.[1]

4.3 Net Migration

At the regional level, only the Central Industrial Region has consistently experienced net in-flows of population since 1957 and thus continues a long established trend whereby the population of Hungary has become increasingly concentrated in the environs of Budapest. By comparison, the Alföld has sustained the heaviest net population outflow.

[1] The fitting of a Pareto function to urban migration distances partitioned by geographical location is reported in Chapter 8.

Table 9. Intercounty Migration Flow Matrix 1964 (Permanent Migration)

Budapest	–	2	2	1	2	1	8	6	4	2	7	2	4	4	4	2	4	4	8	6	3	2	5	3
Debrecen	35	–	6	4	2	1	3	5	13	2	3	1	131	5	5	3	11	1	26	10	1	0	3	2
Miskolc	27	4	–	1	1	1	3	1	110	1	2	2	6	8	2	2	5	1	16	4	0	0	2	0
Pécs	25	2	1	–	2	85	11	3	2	3	3	2	1	1	2	1	7	16	2	2	11	2	3	3
Szeged	28	1	2	4	–	1	15	17	3	82	4	2	1	3	3	2	7	2	2	6	2	1	3	1
Baranya	15	0	0	103	1	–	14	3	2	5	5	2	3	1	2	1	9	26	3	2	26	1	3	3
Bács-Kiskun	47	1	1	4	6	12	–	3	2	14	13	2	2	2	9	1	33	3	2	7	10	1	5	1
Békés	41	3	1	5	11	3	7	–	3	19	7	2	7	4	11	4	30	3	4	14	2	1	5	2
Borsod-A.-Z.	22	3	55	0	1	1	2	2	–	1	3	1	7	13	3	2	9	1	16	3	1	0	2	0
Csongrád	24	1	1	2	63	3	21	26	2	–	6	2	3	2	6	1	11	4	2	8	2	1	3	2
Fejér	47	1	1	1	1	3	8	3	4	3	–	4	4	3	16	2	22	10	4	3	14	2	21	2
Győr-Sopron	20	1	1	1	1	1	2	1	3	1	3	–	2	1	13	1	7	2	2	1	1	9	13	2
Hajdú-Bihar	43	96	5	2	1	4	5	15	19	2	7	3	–	8	15	2	40	2	16	11	3	1	5	1
Heves	41	2	7	1	1	2	3	2	23	1	5	1	3	–	11	14	23	2	4	14	1	1	4	1
Komárom	29	1	1	1	1	2	8	8	3	3	16	14	6	4	–	2	19	3	6	6	2	2	8	2
Nógrád	32	3	1	1	1	1	4	2	5	1	3	2	3	19	5	–	41	1	5	3	1	1	2	1
Pest	107	1	1	1	1	2	14	6	4	2	9	2	8	5	7	6	–	3	10	14	3	1	4	2
Somogy	36	1	0	17	1	22	3	1	2	2	13	2	2	1	4	1	12	–	2	3	14	2	15	12
Szabolcs-Szatmár	55	14	11	1	1	2	3	4	28	1	6	2	14	5	9	4	34	2	–	6	2	1	4	1
Szolnok	56	4	2	1	2	2	10	14	6	6	7	1	8	16	7	3	44	4	4	–	2	1	4	2
Tolna	42	1	1	12	1	32	20	4	2	3	35	1	2	1	5	5	25	21	3	3	–	1	8	2
Vas	25	1	1	2	1	1	2	2	1	1	6	13	1	1	6	1	7	3	2	1	0	–	22	13
Veszprém	33	1	1	2	1	2	4	3	3	2	21	15	2	2	9	1	11	9	2	3	3	9	–	9
Zala	35	1	0	5	1	4	3	2	2	1	7	5	1	1	8	1	11	15	2	1	3	12	22	–

(Rates per 10,000 population place of destination)
Row values represent out-migration.
Coulumn values represent in-migration

At the more detailed county scale, the picture is little changed, (table 10), and Fejér, Komárom and Pest are the only counties to have regularly sustained an in-migration surplus since 1957. All three may be considered part of the Central Industrial Region complex. Győr-Sopron and Veszprém have been in approximate balance. The two northeast counties of Szabolcs-Szatmár and Hajdú-Bihar have sustained the heaviest net outflows, at annual rates consistently in excess of one per cent of their population.

County and regional variations aside, the most significant direction of net movement has been from the rural areas to the towns, and places which have regularly had annual migration balances in excess of 100 persons are shown on figure 7. With few exceptions, the settlements with positive balances are urban centres. They are spread fairly evenly throughout the country and as a generality, the larger the size of the urban settlement, the larger has been the net inflow of population. Thus, following on Budapest and the provincial cities, we find such places as Győr, Szombathely, Nyíregyháza, and Tatabánya, the most significant settlements of net inflow. The only clear spatial concentration of places with positive migration balances embraces the towns and villages within a thirty mile radius of Budapest. Practically all settlements within this belt have experienced considerable inflows of population since 1949. Settlements sustaining annual net outflows of population greater than 100 persons generally comprise villages. They considerably outnumber the places of net inflow, a natural consequence of the small size of the settlements losing population. Again, there is a reasonably even spread of these places throughout the country, although i) places losing between 500 and 1000 of their population annually are markedly concentrated in Northeast Alföld – noticeably Szabolcs-Szatmár county and ii) places with losses of between 100 and 250 per annum are scattered through the general area of the Alföld. Without exception urban centres sustaining large negative migration balances are also located in the Alföld.

This average picture of net migration is supplemented by figure 8 on which all settlements are presented experiencing a positive migration balance in 1965. The concentration of such places in the general environs of Budapest is strikingly demonstrated. The map also locates the large number of places in Southern Transdanubia and in the Northern Industrial Region that supported small surpluses in that year. Yet these settlements could just as readily have had negative balances in previous years without any corresponding change in their socio-economic character. They are centres of small population size and the movement of a single family can often determine the sign of their migration balance.

The general factors determining these patterns of net migration are well known. Northeast Alföld, the region of greatest net outflow, experiences the highest rate of natural population increase. It is also the most backward area of the country. Although intensely rural, the soils are poor and industry is slow in moving to the region. As a consequence, insufficient employment opportunities exist to absorb those entering the active labour force. The result is a net outflow of population to settlements, usually urban centres, offering more and better opportunities. The concentration around Budapest of settlements with large positive migration balances relates to the growth of these places as dormitories for the capital. The inhabitants generally work in Budapest, but owing to the difficulty of acquiring accomodation in the capital, live outside the city boundary. Migration to these small peripheral settlements is thus one step in the eventul movement of such migrants to Budapest.

Table 10. Annual Movements in the Migration Balance of the Cities and Counties of Hungary – Numbers and Rates

Numbers (000's)

Year	1957	1958	1959	1960	1961	1962	1963	1964	1965	1966	1967	1968
Budapest	32.0	19.0	20.1	25.7	20.2	23.9	18.4	12.9	12.8	10.7	11.5	9.5
Debrecen	0.4	1.3	1.8	2.3	1.8	1.9	1.8	1.9	1.5	1.5	1.6	1.5
Miskolc	2.7	1.5	1.9	2.6	2.3	2.9	2.3	2.0	2.0	1.7	1.5	1.3
Pécs	2.6	2.8	3.4	3.7	2.9	3.2	3.2	3.0	3.6	2.7	2.4	1.8
Szeged	0.2	0.7	1.4	2.1	1.9	2.0	1.9	1.7	1.4	1.4	1.4	1.5
Baranya	1.0	0.9	– 0.6	– 2.1	– 1.8	– 1.7	– 1.5	– 1.5	– 2.0	– 1.5	– 1.2	– 1.5
Bács-Kiskun	– 5.1	– 3.3	– 3.7	– 4.5	– 4.1	– 5.0	– 4.0	– 3.2	– 2.9	– 2.0	– 1.8	– 1.7
Békés	– 4.3	– 4.7	– 4.5	– 5.6	– 4.1	– 4.2	– 3.7	– 3.0	– 3.1	– 2.5	– 2.5	– 1.9
Borsod-A.-Z.	– 1.3	0.5	– 0.5	– 1.2	– 1.7	– 2.2	– 1.2	– 1.3	– 2.0	– 1.6	– 3.0	– 2.4
Csongrád	– 2.4	– 2.6	– 2.4	– 3.2	– 2.9	– 2.7	– 1.7	– 1.8	– 1.3	– 1.0	– 0.7	– 0.8
Fejér	1.3	0.7	1.2	1.1	1.5	1.2	1.0	1.4	2.3	1.0	0.8	1.0
Győr-Sopron	0.9	– 0.0	0.0	– 0.4	0.0	0.1	– 0.1	– 0.3	– 0.1	0.1	0.4	0.3
Hajdú-Bihar	– 4.6	– 5.7	– 5.5	– 6.6	– 5.7	– 6.2	– 5.7	– 5.2	– 4.6	– 4.0	– 4.2	– 3.5
Heves	– 1.1	– 0.4	– 4.6	– 1.7	– 1.1	– 1.1	– 1.4	– 0.9	– 0.7	– 0.2	– 0.7	0.2
Komárom	2.1	3.2	2.4	2.4	2.1	2.2	2.1	2.6	2.3	1.3	1.1	0.9
Nógrád	– 0.6	– 0.2	– 0.3	– 0.8	– 0.7	– 0.7	– 0.5	– 0.5	– 0.2	– 0.6	– 0.4	– 0.6
Pest	– 2.6	3.9	3.8	5.1	5.8	5.3	4.6	5.0	5.6	4.5	4.8	3.0
Somogy	– 1.4	– 1.7	– 2.3	– 2.5	– 2.0	– 2.0	– 1.6	– 1.3	– 1.3	– 0.5	– 0.1	0.0
Szabolcs-Szatmár	– 7.9	– 7.0	– 6.6	– 7.9	– 6.2	– 7.0	– 6.2	– 5.4	– 6.1	– 5.5	– 5.5	– 4.0
Szolnok	– 4.5	– 4.2	– 4.1	– 4.1	– 3.2	– 4.2	– 4.1	– 2.9	– 3.6	– 2.6	– 2.2	– 1.5
Tolna	– 2.7	– 2.1	– 2.2	– 2.2	– 2.2	– 2.3	– 1.6	– 1.7	– 1.6	– 0.7	– 1.0	– 1.1
Vas	– 0.9	– 1.3	– 1.5	– 1.3	– 1.2	– 1.1	– 1.3	– 0.9	– 1.0	– 0.7	– 0.9	– 0.5
Veszprém	– 0.9	0.3	0.4	0.4	– 0.0	– 0.5	0.4	0.4	– 0.2	– 0.3	– 0.3	– 0.5
Zala	– 2.2	– 1.7	– 1.6	– 1.9	– 1.7	– 1.7	– 1.0	– 1.0	– 1.4	– 1.1	– 0.9	– 0.8

Year	1957	1958	1959
Budapest	18.1	10.7	11.2
Debrecen	3.0	10.5	13.9
Miskolc	20.2	10.8	13.4
Pécs	24.5	25.0	29.9
Szeged	2.2	6.6	13.9
Baranya	3.6	3.3	– 7.5
Bács-Kiskun	– 8.7	– 5.7	– 6.2
Békés	– 9.2	– 9.9	– 9.6
Borsod-A.-Z.	– 2.3	0.8	– 0.9
Csongrád	– 7.2	– 7.7	– 7.0
Fejér	3.7	2.1	3.2
Győr-Sopron	2.2	– 0.1	0.0
Hajdú-Bihar	–11.7	–14.5	–14.0
Heves	– 3.1	– 1.1	1.7
Komárom	8.0	12.1	9.0
Nógrád	– 2.5	– 0.7	– 1.0
Pest	– 3.4	5.0	4.9
Somogy	– 4.9	– 4.5	– 6.2
Szabolcs-Szatmár	–13.7	–12.0	–11.2
Szolnok	– 9.5	– 8.9	– 8.9
Tolna	–10.1	– 7.7	– 8.2
Vas	– 3.3	– 4.5	– 5.2
Veszprém	– 2.2	0.7	1.0
Zala	– 8.1	– 6.1	– 5.7

Table 10 continued

Rates per 1000 population

1960	1961	1962	1963	1964	1965	1966	1967	1968
14.1	10.9	12.6	9.6	6.7	6.6	5.5	5.8	4.8
17.5	13.0	13.9	12.7	12.9	10.5	9.7	10.3	9.5
17.5	15.3	18.2	13.5	12.0	11.7	10.0	8.5	7.3
31.3	23.9	25.7	24.6	22.4	27.2	19.5	17.1	13.2
21.3	18.3	18.4	17.5	15.3	12.3	11.9	11.6	12.3
– 6.4	– 6.0	– 5.3	– 5.3	– 5.3	– 7.0	– 5.4	– 4.4	– 5.3
– 7.7	– 7.2	– 8.6	– 7.0	– 5.6	– 5.2	– 3.6	– 3.2	– 3.7
–12.0	– 8.9	– 9.3	– 8.3	– 6.7	– 7.0	– 5.7	– 5.7	– 4.3
– 2.1	– 3.0	– 3.8	– 2.0	– 2.2	– 3.3	– 2.8	– 5.0	– 3.9
– 9.7	– 8.7	– 8.2	– 5.1	– 5.5	– 3.9	– 3.2	– 2.2	– 2.6
2.9	4.2	3.3	2.7	3.6	6.0	2.6	2.0	2.6
– 0.1	0.1	0.3	– 0.3	– 0.7	– 0.1	0.2	1.0	0.7
–15.8	–14.7	–16.2	–15.2	–13.9	–12.4	–11.1	–11.7	– 9.8
– 4.8	– 3.2	– 3.0	– 4.1	– 2.6	– 2.0	– 0.4	– 2.0	– 0.6
8.8	7.6	7.8	7.2	8.8	7.6	4.3	3.8	3.0
– 3.6	– 3.0	– 3.2	– 2.3	– 2.0	– 1.0	– 2.5	– 1.8	– 2.4
6.5	7.3	6.5	5.6	6.1	6.6	5.2	5.5	3.5
– 6.6	– 5.4	– 5.4	– 4.5	– 3.6	– 3.7	– 1.4	– 0.3	– 0.0
–13.6	–10.9	–12.4	–11.0	– 9.6	–11.0	10.1	–10.0	– 7.3
– 9.9	– 7.1	– 9.2	– 9.0	– 9.6	– 8.0	– 5.9	– 4.9	– 3.5
– 8.5	– 8.3	– 8.7	– 6.0	– 6.4	– 6.1	– 2.6	– 4.1	– 4.3
– 4.7	– 4.3	– 4.1	– 4.6	– 3.4	– 3.7	– 2.4	– 3.1	– 1.8
1.1	– 0.0	– 1.3	– 1.0	1.0	0.4	– 0.7	– 0.8	– 1.1
– 7.0	– 6.3	– 6.5	– 3.7	– 3.8	– 5.3	– 4.2	– 3.3	– 3.1

4.4 The migration Fields of Budapest and the Provincial Cities of Debrecen, Miskolc, Pécs and Szeged

As Budapest and the provincial cities control a large component of migration in Hungary, the spatial features of permanent migration to and from these places is surveyed here in greater detail.

For each city, the origins and destinations of permanent migrants were summed over the period 1958 to 1962 and aggregated by rural and urban districts. From this data average migration rates were computed for the five year period and the mean in- and out-migration fields constructed for each city[1] (figures 9 to 11). Such constructions succinctly establish the spatial connections of migration through the simultaneous consideration of both the directional and distance bias in population flows (Hagerstrand 1957).[2]

A general feature of the migration fields of the provincial cities is their symmetry and restricted spatial extent. Both features indicate strong migration connections with an immediate hinterland which are regular in a directional sense. Moreover, the in- and out-migrants of each city are derived from the same general region. The migration field of Budapest, by comparison, demonstrates the nationwide migration connections of the capital. Yet the spatial pattern of these connections is highly irregular and shows prominant directional bias.

The shape and extent of a migration field relate to the distribution of migration distances. For instance, the symmetrical and resticted migration fields of the provincial cities imply regular and fairly steep falls in migration with distance. The highly assymmetrical but extensive field of Budapest, by comparison, implies a slow but directional biased rate of decline in migration with increasing distance from Budapest. But having identified fields which, on subjective judgement, represent either slow or rapid falls in migration with distance, the question arises of the precise relationship between the two variables. The migration fields that have been constructed here, and the results of other workers, indicate emphatically that the relationship is nonlinear (e. g. Morrill 1963, Cavalli-Sforza 1962). Although complex functions have been tested,[3] the log. normal, exponential and Pareto distributions have most frequently been fitted to migration distances and have been found to provide satisfactory statistical descriptions (Brownlee 1911, Kuldorf 1955, Nelson 1959).

These functions are of the following general form when fitted to migration distances:

$$\text{Log Normal} - Pm = ke^{-\frac{b}{\log d^2}}$$

$$\text{Exponential} - Pm = ke^{-bd}$$

$$\text{Pareto} - Pm = ke^{-b \log d} \text{ or } \log Pm = c\text{-}b\log d$$

[1] Standardisation of the migration data is necessary to allow for a) the uneven distribution of population and b) the unequal size of rural and urban districts.

[2] No map transformations of the migration fields were undertaken. The design was to demonstrate actual spatial relationships rather than test hypotheses (e.g. Wolpert 1967).

[3] For example Johnsson (1962) used the function describing the absorption of light by a medium as analogous to the 'absorption' of migration by space with increasing distance from a centre.

Where:

Pm is the probability of migrating between areas d distance apart, k and b are constants.

All three functions are quite straightforward to fit to a set of migration distances but which is to be preferred is not clear from the literature. Indeed, all three distributions can be made to correspond closely over the majority of distance values (Morrill)[1]. The Pareto function, however, tends to infinity for small values which means that migration cannot be given an upper limit, while values are grossly overestimated over short distances. Yet the Pareto function possesses several features to recommend it. Firstly, it states concisely the barrier effect of distance on migrants. Secondly, as our analysis treats migrants en masse, its deterministic assumptions become a distinct advantage in comparison with the exponential and log normal functions, which by allowing for individual and random movements are better adapted for the mathematical statement of the process of diffusion (Morrill). Thirdly, the log linear property of the Pareto function permits the fitting of a set of migration distances by simple regression techniques. In view of these considerations the Pareto distribution was selected and fitted to the migration distances observed in relation to Budapest and the provincial cities.[2]

The results derived from the application of the Pareto function to the distribution of migration distances around Budapest and the provincial cities are presented in table 11, where the exponent of distance is used to characterise the friction confronting migrants due to distance. In addition, the correlation coefficient which is obtained from the regression fitting of the migration distances can be used as an index of migration field regularity. If the decline in migration with distance follows the Pareto function in all directions then a circular migration field will obtain and the statistical correlation between migration and distance will be unity. The degree to which the correlation coefficient departs from unity is then an index of the regularity of a migration field, i. e. a coefficient of regularity.

Table 11. Pareto Function Statistics of the Migration Fields of Budapest and the Provincial Cities

City	Exponent of distance (d^b)		Coefficient of regularity:	
	In-migration	Out-migration	In-migration	Out-migration
Budapest	−0.452	−0.799	0.48	0.67
Debrecen	−1.496	−1.162	0.82	0.70
Miskolc	−1.554	−1.407	0.79	0.74
Pécs	−1.624	−1.606	0.84	0.82
Szeged	−1.765	−1.398	0.78	0.66

[1] Indeed, a single preferred function cannot exist because migration distances vary from area to area according to the factors indicative of their generation.

[2] Since areas rather than points provide the constructional framework of the migration fields here, migration over very short distances is not represented. One of the disadvantages in using the Pareto function is thus at least partially removed.

Budapest Migration to and from Budapest is least affected by distance (table 11). As demonstrated by figure 9 and quantified by the coefficients of regularity its migration fields are also the least regular. The rate of in-migration drops symmetrically in all directions up to the 1000 isoline[1], but at distances further from the city the field becomes highly distorted. Thus, the rate of inmigration continues to fall fairly regularly towards the northwest and south but in an east-west zone reaching across the middle of the country the isolines become very stretched, within which the decline in migration with increasing distance from Budapest is virtually halted. Additionally, in the extreme north-east the rate of migration to the capital shows a tendency to rise. Budapest, therefore attracts greater inflows of population from this zone which includes much of the Alföld than would be expected on the grounds of simple distance. By comparison, it is apparent that migration to the capital is lower than expected from the three provincial industrial regions namely the Pécs area of Southern Transdanubia, Fejér, Komárom and Győr-Sopron counties of Northern Transdanubia and the region surrounding Miskolc.

The pattern of out-migration from Budapest is similar although the east west distortions in the out-migration field are not so prominant. It is also interesting to note that distance acts more as a barrier to migrants leaving than moving to Budapest. This is consonant with the general attitude of the population of the capital concerning the country areas of Hungary. They prefer not to leave Budapest, but if a move is necessary to migrate as short a distance from the capital as possible.

Debrecen and Miskolc The 25 isoline was chosen to define the outer limit of the migration field of each provincial city. Within this limit the fall in migration with distance is consistent although not necessarily regular, while at greater distances from each centre, little further decline in migration occurs.

The migration fields of Miskolc and Debrecen overlap quite extensively, (figures 9 and 10). This, plus the spatial constraints of the respective fields of Budapest to the west and Szeged to the south, has dictated a symmetrical and rather restricted migration field for each city. The fall in migration with increasing distance from each centre is thus rapid, (table 11). The rates of in-migration decline more rapidly than those of out-migration while the coefficients of regu:arity demonstrate that the in-migration fields are also the more regular – these features are reversed for Budapest. We are thus confronted with a situation in which the friction due to distance exerts a stronger influence on the in-migrants to these settlements. Assuming that migration fields are functions of the respective information fields of migrations, we may conclude that the information fields of movers to Debrecen and Miskolc – the majority of whom are from rural areas – are narrower in range than those of urban migrants leaving the two cities. On a priori grounds one may expect the lower general level of education, culture, etc. of the rural population of Hungary to instil a narrower vision of opportunities at distant places compared with the urban population. We may tentatively conclude that our findings concerning the migration fields of these two provincial cities are a reflection of this feature.

Pécs and Szeged The migration fields of Pécs and Szeged also overlap each other spatially. The degree of superimposition is not as great as in the case of Miskolc and Debrecen, however, because the Danube acts as a strong natural divide. Indeed, the

[1] The units used throughout are migrants per 100 thousand population.

western boundaries of both the in- and out-migration fields of Szeged are defined by the river, while the out-migration field of Pécs only just manages to cross the Danube into Baja and Kalocsa rural districts. (figures 10 and 11).

Besides being restricted by their mutual competition, the migration fields of Pécs and Szeged are further confined by the influence of Budapest, Debrecen and Miskolc.

This interaction of mutually conflicting centres is most pronounced in the case of Pécs and is reflected in a high degree of field symmetry and in the rapid fall in migration with increasing distance from the city. Indeed, the friction of distance on movers leaving Pécs is greater than for any of the other centres. Yet rather than relate this to a restricted information field, it is perhaps more logical, in view of the high educational standard of the population of the city, to treat it as reflecting strong factors within Pécs and in Southern Transdanubia in general leading to comparative population immobility. The high incidence of short distance moves in the region as a whole must also be taken into account.

The in-migration field of Szeged displays similar features with the distance exponent being the maximum recorded. By comparison, the friction of distance on out-migrants is considerably less. Although the western boundary of the out-migration field is defined by the Danube, several outliers of reasonably high migration outflow exist beyond the main field, i.e. Sásd and Komló districts in Baranya, Dunaújváros and Budapest, which account for this characteristic. An additional consequence is that the out-migration field of the city is the least regular of the five centres (table 11).

4.5 The Stability of the Spatial Patterns of Internal Migration

So far our consideration of the spatial features of migration in Hungary has been limited to the description of average patterns of population movement since 1957. We have seen, however, that 1961 marks a watershed in the temporal trends in internal migration for, whereas previous to that year, the decline in population mobility had been sharp it subsequently slackened in speed. It is therefore logical to enquire whether broad trends in the spatial patterns of internal migration are discernable.

Although radical changes have occurred in migration intensity, it does not necessarily follow that the spatial patterns of migration have altered. Thus if variations in migration intensity have been uniform throughout the country, the spatial patterns of migration will have remained stable. Indeed, the very small movements in the centres of migration gravity suggest this. On the contrary the extent to which different parts of the country have departed from the average change in migration intensity per unit time reflects the degree of instability in the spatial patterns of migration.

It is possible to examine this question from a number of different view points, i.e. migration flows, the gross migration characteristics of particular places and net migration. This analysis, however, is restricted to the evaluation of the stability of the patterns of gross in-, gross out- and net migration regardless of place of origin and destination[1]. The analysis is at the level of the rural and urban districts which offers a detailed coverage of the country with reasonably homogeneous areal units. It must be stressed, however, that the results derived from this scale need not necessarily apply at any other scale.

[1] The implications of inter-county and inter-regional migration streams for population redistribution which provide an indirect assessment of place to place migration stability are considered in Part 3.

Techniques of analysis

We are given the migration frequencies of a system of sub-areas for the years t and t+1, and we wish to measure the change in the spatial patterns and average intensity of the observed frequencies over that time interval. A simple linear correlation and regression model can be adopted for these purposes of the form:

$$Y = a + bX$$

where, Y represents the migration frequences of the sub-areas at year t+1 and X the migration frequencies for the same sub-areas at year t. (Migration frequency of a given area is defined as the number of migrations per thousand person years lived by the population of the given area per unit time). On the assumption of a linear relationship between X and Y the correlation coefficient of the two sets of frequencies is computed, and used to characterise the degree of pattern stability. A value of unity indicates perfect association and thus absolute pattern stability. The value r^2 may thus be termed the coefficient of correspondence, i.e. the variation in Y explained by X.

The regression equation stating the average relationship between migration frequencies Y and X provides the following additional information. Firstly, the regression coefficient – b –, defining the slope of the regression line is a measure of average in-migration intensity. Only if this coefficient is unity is the migration intensity of the two frequencies identical. If greater or less than unity increased or decreased intensity respectively is indicated. Secondly, if absolute pattern stability is not indicated, then the degree of departure of each individual sub-area from the stable state is of interest. The expected migration frequencies derived from the regression equation are the values that Y would take if the frequency pattern were to remain stable, after allowing for average change in intensity. The difference between the expected and the actual observed Y, the residuals from the regression, thus provides us with information about the migration frequency "tendencies" of the various sub-areas, i.e. the extent and direction of their departure from average change in migration intensity.

The dual character of the intensity of Hungarian migration has already been noted. On the assumption of constant secular changes during each time period, the degree of stability between 1957 and 1961 is evaluated by the comparison of the migration frequency patterns of 1957 and 1961. Similarly, stability between 1961 and 1965 is assessed from the frequencies of 1961 and 1965.

Permanent migration frequency patterns

Throughout the period 1957 to 1965 the general pattern of migration frequency remained unchanged. The north-western counties of Hungary, namely Győr-Sopron, Vas, Zala and parts of Veszprém consistently had in-migration frequencies within the lower sextile ranges (figure 12)[1]. By comparison, the other counties of Transdanubia generally had higher than average rates of population inflow and indeed counties Baranya and Somogy have been the areas of maximum in-migration intensity since 1957. The pattern in the area east of the Danube was more complex and less regular. The northern section

[1] Maps of the frequency patterns of 1961 are presented as being most representative of the period 1957 to 1965. Sextile groupings of the frequency values were adopted to emphasise pattern rather than changing intensity. Maps locating the administrative areas of Hungary are presented in appendix 1.

comprising eastern Pest county, the northern districts of Szolnok and the counties Nógrád, Heves, Hajdú-Bihar, Szabolcs-Szatmár and Borsod-Abaúj-Zemplén, excluding industrialised districts, had in-migration frequencies below average.

In contrast, high rates of in-migration were characteristic of the rural districts ringing Budapest.

The pattern of out-migration frequencies was in many respects similar, (figure 13). Lowest frequencies occurred in northern and western Transdanubia and maximum frequencies in the counties of Baranya, Somogy and Fejér. Low frequencies were also associated with the counties of Nógrád and Heves. By comparison with the pattern of in-migration, the Alföld counties of Szabolcs-Szatmár and Hajdú-Bihar exhibited frequencies well above average. With the exception of the Alföld towns the urban centres and the rural districts ringing Budapest sustained rates of out-migration below average values.

Permanent migration frequency tendencies

On the basis of the respective coefficients of correspondence, the stability of rural in-migration frequency distributions throughout the period was high (table 12). Variations in the patterns of rural out-migration frequency were more apparent, however. Urban migration frequencies on the other hand were considerably less stable, while in contrast to the other patterns, urban in-migration rates exhibited greater variability between 1961 and 1965 than between 1957 and 1961.

Using the b slope coefficients to characterise average changes in migration intensity (table 12), in-migration intensity fell continuously throughout the period 1957 to 1965, the drop being greater for urban than for rural areas. The intensity of urban out-migration similarly fell but in the case of the rural districts the rapid decrease between 1957 and 1961 was partially offset by a small increase in intensity between 1961 and 1965.

Of more interest than the summary indices of pattern stability and changing intensity are the differentials exhibited by each individual sub-area, i.e. migration frequency tendencies. The spatial distribution of in-migration frequency tendencies (figures 14 and 15) is in many respects similar to the frequency pattern previously discussed. Between 1957 and 1961 negative in-migration tendencies (i.e. the decline in the rate of in-migration was greater than expected) were sustained by the rural districts and towns of northwestern Transdanubia. The districts surrounding Budapest including the industrialised areas of Komárom county and parts of Baranya and Somogy, by comparison, exhibited positive in-migration tendencies. Virtually the whole of the country east of the river Danube sustained negative tendencies, the exceptions comprising the larger urban centres and the industrialised districts of Borsod-Abaúj-Zemplén county.

Many of the elements of this spatial distribution were carried over to the period of 1961–1965. The districts east of the river Danube maintained their negative in-migration tendencies with the two notable exceptions of Szabolcs-Szatmár and the southern parts of Bács-Kiskun county. Moreover, those parts of Borsod-Abaúj-Zemplén which had had positive tendencies during the preceding period exhibited a reversal of that trend. The positive tendencies of the districts around Budapest were still present but not so pronounced in either extent or magnitude, while those of Southern Transdanubia expanded in a northwesterly direction to embrace parts of Zala county. In like manner

Table 12. Permanent Migration Frequency Tendencies
Regression Equations and Correlation Coefficients

	In-Migration 1957 – X and 1961 – Y			In-Migration 1961 – X and 1965 – Y		
	Urban Areas	Rural Districts	Urban & Rural Districts Combined	Urban Areas	Rural Districts	Urban & Rural Districts Combined
r	0.86	0.92	0.84	0.81	0.94	0.88
r^2	0.74	0.85	0.71	0.65	0.89	0.78
b	0.25	0.50	0.31	0.72	0.80	0.76
a	21.70	10.13	18.90	9.03	7.03	9.52
	Y = 21.70 + 0.250X	Y = 10.13 + 0.502X	Y = 18.90 + 0.308X	Y = 9.03 + 0.725X	Y = 7.03 + 0.801X	Y = 9.52 + 0.765X

	Out-Migration 1957 – X and 1961 – Y			Out-Migration 1961 – X and 1965 – Y		
	Urban Areas	Rural Districts	Urban & Rural Districts Combined	Urban Areas	Rural Districts	Urban & Rural Districts Combined
r	0.55	0.79	0.68	0.73	0.90	0.92
r^2	0.31	0.62	0.46	0.54	0.82	0.84
b	0.21	0.58	0.32	0.80	1.02	1.04
a	18.32	9.30	16.04	3.47	–1.01	0.90
	Y = 18.32 + 0.213X	Y = 9.30 + 0.581X	Y = 16.04 + 324X	Y = 3.47 + 0.802X	Y = –1.01 + 1.023X	Y = 0.90 + 1.047X

the negative tendencies ot Northwestern Transdanubia spread to cover most of Northern Transdanubia, including the industrialised county of Komárom. With the exception of the large Alföld settlements, the majority of towns, even in areas of general negative tendency, exhibited frequencies greater than excepted.

Out-migration tendencies were less variable spatially during the two periods (figures 16 & 17). Between 1957 and 1961 the districts around Budapest sustained lower than expected frequencies which also held for much of Northern Transdanubia and the border areas of Southern Transdanubia. The greater part of Tiszántúl, the southern area of the Danube-Tisza Interfluve and the central districts of Southern Transdanubia by comparison, exhibited positive out-migration tendencies. During the subsequent period, the negative out-migration tendencies of much of Northern Transdanubia were maintained. The tendencies of the districts around Budapest, however, reversed and a number demonstrated out-migration frequencies markedly larger than excepted.

Of interest is the degree to which the tendencies of both in- and out-migration coincided territorially. To this end, four categories of migration behaviour were derived and mapped as follows (figures 18 & 19):

(i) Areas where both in- and out-migration frequencies were greater than expected.

(ii) Areas where in-migration frequencies were greater and out-migration frequencies less than expected.

(iii) Areas where in-migration frequencies were less and out-migration frequencies greater than expected.

(iv) Areas where both in- and out-migration frequencies were less than expected.

It should be noted that this combination of in- and out-migration tendencies tells nothing of the magnitude of the migration balance. Category (ii) however, can be regarded as favourable in that the tendency is for more people to move into and fewer away from the given area than expected, although the migration balance could be negative. By contrast, category (iii) is unfavourable although here the migration balance could be positive. No value statements of this nature can be made concerning categories (i) and (iv).

Few areas exhibited both positive in- and positive out-migration tendencies between 1957 and 1961, but the majority of those districts that did were located in Central Southern Transdanubia. Rural rather than urban areas fell into this category. Districts belonging to category (ii) were also concentrated spatially, being confined to the surrounding of Budapest and stretching into Northern Transdanubia to include the industrialised county of Komárom and districts along the north shore of Lake Balaton. The developed rural districts of Borsod-Abaúj-Zemplén and many of the urban settlements also fell into this category. Most of the area comprising the Great Hungarian Plain showed negative in- and positive out-migration tendencies, while the western parts of Transdanubia generally fell into category (iv).

The spatial distribution of these migration classes accords well with variations in the socio-economic character of the country. The areas of positive in- and negative out-migration tendency all display characteristics likely to attract rather than repel population, whether it be easy commuting distance to the capital, the availability of employment opportunities in the non-agricultural sectors or developments concerned with tourism. Districts of negative in- and positive out-migration tendency were largely confined to the agricultural region east of the river Danube. Areas of both negative in- and out-migration tendency were also confined to agricultural regions, but were more common in the north and east and in Transdanubia where farming is more efficient and prosperous (Enyedi 1961) and where the isolated tanya dwelling is not a significant landscape feature. The districts of positive in- and positive out-migration tendency were most common in Central Southern Transdanubia where, ceteris paribus, the dense settlement network inevitably increases the probability of migrating.

The 1961 to 1965 pattern of combined tendencies is more complex and not so readily interpretable. Compared with the preceding period, the number of districts of both positive in- and positive out-migration tendencies increased in number, but were not confined to any particular region of the country. The southern border areas of the Danube-Tisza Interfluve region and Southern Transdanubia exhibited this characteristic, as well as the districts immediately to the east of Budapest and in Szabolcs-Szatmár county. Northern Transdanubia and the south-eastern parts of the Alföld were the important areas of negative in- and out-migration tendencies.

The most notable feature, however, of the tendencies of this later period was the increasing ability of the Alföld to either gain or retain population through migration. Thus although the out-migration tendencies of Northeast Alföld were still positive, in-migration tendencies were also positive. By comparison, out-migration tendencies were negative in Southeast Alföld, suggesting a better retention of population. These findings are a reflection of the great attempts that have been made by the Hungarian Government in recent years to stop the depopulation of Eastern Hungary. These efforts have taken various forms, from the resettlement of the tanya population (Lettrich 1968) and general economic development to the active discouragement of migration to Budapest (Magyar Közlöny).

Temporary migration frequency patterns[1]

The broad features of the pattern of temporary in-migration frequency remained unchanged between 1961 and 1965[2]. Areas of above median frequency in both years comprised the rural districts and towns of the Lake Balaton region, the rural districts ringing Budapest and reaching south along the Danube into Tolna county and the Danube-Tisza Interfluve, the rural districts of Southern Transdanubia adjacent to the Yugoslav border, the rural districts immediately south of the Northern Mountain range and the rural districts of Szabolcs-Szatmár and Hajdú-Bihar counties (figure 20). In general, the urban areas including the Alföld towns had frequencies above average. The lowest frequencies again occurred in northwest Transdanubia, while other areas of below median frequency were located in Central Southern Transdanubia, the northern part of the Danube-Tisza Interfluve, in Southeast Alföld and in the Northern Mountain Region.

[1] Temporary migration here is composed of both temporary migration per se and temporary return (back) migration. Thus temporary in-migration comprises those taking up a new temporary residence, plus those formerly residing elsewhere, returning to their permanent residence in a given area: similarly with temporary out-migration.

[2] Temporary migration frequencies are examined for the period 1961 to 1965 only, owing to the unavailability of temporary return migration data before 1961.

Owing to the nature of gross temporary migration, the pattern of temporary out-migration frequencies is virtually identical with that just described (figure 21) and does not warrant separate description[1]

As temporary moves are largely motivated by economic circumstances (Acsádi 1960, Thirring 1965), the great majority of those moving to temporary dwellings originate in the rural areas and small towns (Hungarian Central Statistical Office): hence the high rates of temporary out-migration from the Alföld counties. They move to Budapest, to the rural districts within easy commuting distance of the capital, to the large provincial cities and towns, (e.g. Debrecen, Miskolc, Pécs, Szeged, Székesfehérvár and Győr-Sopron), to the new and growing socialist towns, and to the developed counties of Komárom and Borsod-Abaúj-Zemplén. Hence the high temporary in-migration frequencies sustained by these places. The return movement of these individuals to their permanent residences accounts for the high temporary in-migration frequencies of such counties as Szabolcs-Szatmár and Hajdú-Bihar. The high incidence of temporary migration to and from the Balaton region is associated with the tourist function of that area.

Temporary migration frequency tendencies

Temporary migration frequency patterns were less stable between 1961 and 1965 than the corresponding patterns of permanent migration (table 13). Additionally, spatial variability in temporary migration was greater for urban than for rural areas while the b coefficients indicate a sharp decline in the intensity of temporary migration over the period.

Positive in-migration tendencies were generated in: i) the northern and central parts of the Alföld; ii) the districts surrounding Budapest and extending as two broad bands westwards, the one along the north shore of Lake Balaton, the other in a south westerly direction into Central Southern Transdanubia; and iii) the border districts adjacent to Yugoslavia. Of these three major regions the highest positive tendencies were sustained by the central districts of the Alföld and the districts immediately to the west of Budapest. By contrast, in-migration frequencies were significantly lower than expected in the Northern Industrial Region, Northern Transdanubia and Southeast Alföld. Since all large urban centres sustained higher than expected observed frequencies, it is apparent that the volume of temporary return moves accounted for the strong positive tendency of migrating temporarily to the Alföld (fig. 22).

The pattern of temporary out-migration tendencies was virtually identical with that of in-migration (figure 23). The districts around Budapest and much of the Alföld supported positive out-migration tendencies as did the districts along the north shore of the Balaton. The clear general correspondence of the patterns of temporary in- and out-migration tendency is apparent from figure 24. Of the 180 rural and urban districts only twenty two possessed opposed signs.

[1] Temporary moves by and large involve short term movements only of up to six months duration. The temporary and associated temporary return move are thus made within less than a year. Since all moves are recorded twice in terms of place of origin and place of destination, the aggregation of temporary and temporary return migration invariably leads to correspondence in the annual patterns of temporary in- and gross temporary out-migration.

Table 13. Net Migration Frequency Tendencies
Regression and Correlation Coefficients

	Net Migration 1957 – X and 1961 – Y			Net Migration 1961 – X and 1965 – Y		
	Urban Areas	Rural Districts	Urban & Rural Districts Combined	Urban Areas	Rural Districts	Urban & Rural Districts Combined
r	0.78	0.63	0.67	0.86	0.84	0.81
r^2	0.61	0.40	0.45	0.74	0.70	0.66
b	0.21	0.79	0.34	0.89	0.77	0.80
a	5.62	−2.07	0.34	2.04	−2.08	−0.64
	$Y = 5.62 + 0.211X$	$Y = -2.07 + 0.786X$	$Y = 0.84 + 0.342X$	$Y = 2.04 + 0.886X$	$Y = 2.08 + 0.770X$	$Y = 0.64 + 0.801X$

Temporary Migration Frequency Tendencies
Regression and Correlation Coefficients

	In-Migration X – 1961 Y – 1965			Out-Migration X – 1961 Y – 1965		
	Urban Areas	Rural Districts	Urban & Rural Districts Combined	Urban Areas	Rural Districts	Urban & Rural Districts Combined
r	0.63	0.80	0.59	0.67	0.76	0.69
r^2	0.40	0.64	0.34	0.45	0.58	0.48
b	0.2356	0.5808	0.2239	0.2760	0.5837	0.3389
a	39.36	16.76	37.02	36.08	15.87	30.15
	$Y = 39.4 + 0.236X$	$Y = 16.76 + 0.581X$	$Y = 37.02 + 0.224X$	$Y = 36.08 + 0.276X$	$Y = 15.87 + 0.584X$	$Y = 30.45 + 0.339X$

Net migration frequencies[1]

The basic features of the spatial pattern of net migration frequencies remained constant throughout the period 1957 to 1965 and our description is based on the pattern of 1965 (figure 25). The majority of rural districts sustained net out-flows of population. The greatest losses were sustained by the districts adjacent to Austria, Yugoslavia and Rumania and by the Alföld. The losses from the rural districts of Northern Transdanubia and the Northern Industrial Region were more moderate. Only those areas within commuting distance of Budapest and at the eastern end of Lake Balaton Rat exhibited net population inflows. Urban areas, by contrast, generally sustained net inflows of population, the exceptions being certain of the agricultural towns of the Alföld, for instance, Gyula, Szentes, Karcag, Kisújszállás and Túrkeve. Yet stability in the patterns of rural and urban net migration was rather low between 1957 and 1961 although greater correspondence is indicated for the later period (table 13).

In the discussion of net migration tendencies the terms positive and negative tendency are used regardless of the sign of the migration balance. The convention adopted is as follows: an area of net population outflow is regarded as having a positive tendency when the observed is less than the expected frequency: an area of net population inflow has a positive tendency when the observed frequency is greater than the expected. Negative tendencies are derived similarly.

For the period of 1957 to 1961 (figure 26), positive tendencies were sustained by the rural districts of Northeast Transdanubia. This area extended eastwards to encompass the districts surrounding Budapest, and the northern part of the Danube-Tisza Interfluve – and southwards, to include Central Southern Transdanubia. Positive tendencies were also apparent for the industrialised districts of Borsod-Abaúj-Zemplén and the eastern parts of Szabolcs-Szatmár county. Negative tendencies embraced the border areas of Northern and Southern Transdanubia and much of Southeast Alföld.

The 1961 to 1965 tendencies were markedly different (figure 27). Many of the districts of Northern Transdanubia now had negative tendencies. Although, with the exception of Ráckeve, the districts surrounding Budapest maintained their positive tendencies, the zone had expanded eastwards to embrace much of Southeast Alföld. In addition, positive tendencies were sustained by much of Southern Transdanubia where previously negative tendencies were characteristic. Of the urban areas, only the Alföld settlements had had pronounced negative tendencies during the earlier period. After 1961, however, some of the new socialist towns reverted to negative tendencies also.

With the exception of Szabolcs-Szatmár the districts sustaining positive tendencies for the years 1957 to 1961 possess a priori features of population attraction. Thus the heavy industry of Borsod-Abaúj-Zemplén was still undergoing rapid expansion at that time, while the districts surrounding Budapest are part of the commuter belt of the capital. After 1961 the pattern becomes more random in nature and is consequently more difficult to interpret. With the introduction in 1961 of the Second Five Year Plan, however, Hungary entered a period of decentralisation when active measures were taken

[1] Net migration frequencies were considered for permanent migration only on the assumption that all temporary migrants will return eventually to their permanent residence and in the long term play no part in population redistribution.

to discourage the over-concentration of population in the Central Region. It may be suggested, therefore, that the more random distribution of net migration tendencies after 1961 reflects this change in economic course. Indeed, a notable feature of the post 1961 period was the increased ability of the rural districts of the Alföld to retain their population.

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CHAPTER 5

THE AGE AND SEX COMPOSITION OF HUNGARIAN MIGRANTS

Migration differentials by age and sex have been widely recognised and where data of sufficient quality is available are well documented, (e.g. Thomas 1938). It has been found that females are generally more mobile than males, while the majority of migrants are concentrated in the young adult age groups. Moreover, it has been shown that both age and sex differentials remain stable over fairly long periods of time, and analyses of migration have been based on this assumption (e.g. Friedlander and Roshier 1966). Most work on these differentials has been based on either five year age groups or on the major age groups corresponding to the socio-economic structure of the population. The Hungarian data, however, allows the analysis of these differentials by single years of age, which permits the accurate calculation of indices such as the avarage and median age of migrants. Moreover, the annual tabulation of age and sex differentials since 1957 enables the evaluation of the stability of these parameters over a nine year time period.

In general, age differentials among Hungarian migrants correspond to those documented in other countries (Census of England and Wales 1931, Thomas op.cit.). For Hungary, as a whole, the age distribution of both male and female migrants is in the shape of a stretched capital S. Maxima in migration incidence occur at the youngest ages and amongst the young adult age groups. Minima present themselves at age 15, the last year of compulsory schooling and amongst the oldest population, (figure 28). The age distribution of both permanent and termporary migrants is similar although in the case of the latter, the young adult age group maximum is more pronounced. The age specific rates of migration follow a similar distribution although a further minimum occurs amongst migrants in their middle sixties, whereafter the propensity to move steadily rises with increasing age. This feature is more pronounced amongst females than males and for moves involving permanent in contrast to temporary changes of residence.

The age distribution of migrants is readily interpretable. The high incidence of moves among infants and young children is related to corespondingly high rates amongst young adults. By comparison, the proportion of temporary migration involving young dependents is substantially less either because temporary migrants in the young adult age groups are generally childless, although the data cannot confirm this, or because the children of temporary migrants remain at the permanent residence. The steady fall in the propensity of minors to migrate up to the age of 15 relates to a similar decline in the disposition of adults to move after their early twenties. The factors accounting for the concentration of migrants in the young adult age group are well understood. Firstly, these individuals have yet to find their economic and social position in society which stimulates migration. Secondly, their traditional family ties are in the process of being loosened, while new ties leading to spatial stability such as marriage, have not yet been contracted. Indeed, entering the actual state of marriage generally leads to a move by one if not both of the partners. Thirdly, these individuals are very mobile occupationally.

An important sex-differential common to both permanent and temporary migrants is that the age of maximum female mobility occurs on average 2 to 4 years earlier than that of males. Some association exists here with the age distribution of marriage, for whereas 70 per cent of females marry at ages younger than 24, the modal age being 21, 70 per cent of males marry between the ages of 20 and 29, the highest incidence occurring at the age of 24. The sex specific ages of maximum marriage incidence are thus virtually identical with those of maximum spatial mobility (Demographic Yearbooks 1960–1965).

The age distribution of Hungarian migrants has been fairly stable since data first became available. The modal and median ages of both temporary and permanent migrants have fluctuated somewhat but no explicit trend has emerged (table 14). By contrast, a definite falling trend has been observable in the movement of the mean age of temporary migrants since 1961, it being more pronounced for females than for males. Figure 29 suggests cyclic movements in the mean age of permanent migrants superimposed upon a slightly upward trend. The small increase in mean age of permanent migrants, however, is not significant as far as the intrinsic stability of the age distribution of permanent migrants is concerned. It is a function of the continuous ageing of the Hungarian population, a consistent feature of the present century (Szabady 1960). The steep decline in the mean age of temporary migrants cannot be explained in the same manner, however. Examination of the data by single years of age suggests that it has resulted from a fall in the incidence of temporary moves amongst the older adult population. This associates well with what is known of the relationship between migration and occupational change amongst agricultural population. As argued by Sárfalvi (1964) and shown by data collected by the Central Statistical Office (1965), it is apparent that the rate of absorption of the agricultural population into industrial occupations declined markedly after 1960. The virtual stability of the agricultural population in Hungary since 1960 confirms this contention. On the assumptions that, firstly, the age structure of the agricultural population of the country is older than that of the total population, and that, secondly, agricultural workers seeking occupations in other sectors of the economy tend initially to embark on explorative moves before committing themselves to a permanent change of residence (Sárfalvi), one would expect the mean age of temporary migrants to decrease, as this source of temporary migration slowly declines in importance. If follows from this that temporary moves increasingly involve the urban population of non-agricultural occupations.

Table 14. Summary Indices of the Age Distribution of Hungarian Migrants 1956–1967

Permanent Migration

Year	1956		1957		1958		1959		1960		1961		1962	
	a	b	a	b	a	b	a	b	a	b	a	b	a	b
Mean Age	–	–	24.1	24.8	24.4	25.2	24.7	25.1	25.2	25.6	25.2	25.5	25.1	25.2
Median Age	25.5	22.5	24.0	22.0	24.5	22.0	24.0	22.0	24.0	22.0	25.0	22.5	24.5	22.5
Modal Age	25.0	22.0	24.0	22.0	25.0	21.0	24.0	21.0	23.0	20.0	23.0	19.0	23.0	20.0

Permanent Migration Continued

Year	1963		1964		1965		1966		1967	
	a	b	a	b	a	b	a	b	a	b
Mean Age	25.2	25.3	25.3	25.6	25.3	25.6	25.6	25.8	25.5	25.6
Median Age	24.5	22.5	24.5	22.5	24.5	22.5	24.5	22.5	24.5	22.5
Modal Age	23.0	21.0	23.0	20.0	23.0	21.0	24.0	19.0	23.0	19.0

Temporary and Temporary Return Migration

Year	1961		1962		1963		1964		1965		1966		1967	
	a	b	a	b	a	b	a	b	a	b	a	b	a	b
Mean Age	29.1	28.6	28.7	28.3	28.5	27.9	28.5	27.2	28.0	26.8	28.0	26.9	27.7	26.2
Median Age	23.5	21.5	23.5	21.5	24.0	21.5	23.5	21.5	23.0	21.0	23.5	21.5	23.0	21.5
Modal Age	19.0	19.0	18.0	19.0	19.0	19.0	20.0	20.0	18.0	18.0	18.0	19.0	18.0	18.0

a. – male values
b. – female values

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PART TWO

THE DETERMINANTS OF INTERNAL MIGRATION IN HUNGARY

CHAPTER 6

THE DETERMINANTS OF RURAL-URBAN MIGRATION IN HUNGARY-A REVIEW OF THE LITERATURE

Part one of this study has involved the description of the general features of internal migration in Hungary. Emphasis has been placed on the portrayal on the spatial pattern of population mobility and on the characteristic age and sex composition of migrants. Only general points were made by way of explanation. In the subsequent chapters we therefore endeavour the more specific evaluation of the determinants of internal migration in Hungary.

A disproportionate part of the literature regarding the current determinanats of population mobility in Hungary has been written from the point of view of the agricultural population of the country. It has been concerned primarily with the drift of agrarian population to the towns and as such has only analysed the migration balance of one particular type of population movement in Hungary. The emphasis placed upon agrarian migration may be explained in terms of the post war evolution of the economy of the country. The pace of industrial development has been rapid and its most obvious effects have been on the agricultural population. Initially, surplus agricultural labour was absorbed into industry, but the intensification of this process left some sectors of agriculture undermanned by the late 1950's. Thus from the practical point of view, there was a pressing need to evaluate the determinants of the drift from the land. Additionally, the opinion took root that an accurate picture of the whole internal migration process could be gained by analysing the movements of the agrarian population.

From the position of numbers and spatial patterns of migration one cannot, however, agree with this latter opinion. Large scale interurban movements take place annually, while there are considerable migrations between villages and from urban settlements to villages. Rural-urban movements are thus but one component of internal migration. Yet owing to the emphasis placed on the drift of rural population to the towns, these other important aspects of migration have received scant attention. Moreover, the very fundamental analysis of migration flows has been ignored. In the following chapters, therefore, emphasis is placed on the analysis of the determinants of these additional aspects of migration. Our consideration of the factors influencing rural-urban migration will be restricted to a review of the relevant Hungarian literature.

Rural-urban migration in Hungary can be understood in terms of general variations in the volume and types of employment opportunities between rural and urban areas (Acsádi 1956). The result of the disparities between urban industrial and rural agricultural opportunities has been a rapid decrease in the agricultural population both relatively and absolutely. Throughout the last two decades, rural out-migration has been most intense from the Alföld, where the possibilities of non-agrarian employment are least. Migration of rural population from this region and from other areas has been primarily directed to the larger urban centres. Movements to Budapest have been common from all rural areas, but other large centres have tended to retain their own more local cathment areas. For instance, aside from Budapsest, the townward drift of agrarian population in Southern Transdanubia has been primarily towards Pécs, Komló and Kaposvár, that in the Northern Region towards Miskolc, Ózd, Salgótarján and Eger. All such centres act as magnets to the surrounding agricultural population – both to those displaced from agricultural employment and to those, who of choice, are leaving the land for urban employment and amenities. In the context of regional planning, this process has been detailed for Borsod-Abaúj-Zemplén county by Acsádi (1960).

The complexities of the rural-urban migration process in Hungary between 1949 and 1960 have been analysed in detail by Sárfalvi (1956, 1964, 1965 and 1969) and his findings are presented here in some detail. He analyses the out-migration from rural areas in the context of the socio-economic restratification of the agricultural population and views this process as fundamental to an understanding of Hungarian internal migration. Within this setting, he classifies the forces repelling agrarian population from their rural residences as economic, psychological and demographic. He identifies the major economic forces of repulsion as an unfavourable agricultural wage structure compared with that in industry, changes in agricultural production leading to smaller agricultural manpower requirements, and a low level of investment in agricultural areas. The low rate of investment not only affects the agricultural economy directly but also the level of services and amenities provided in rural areas. It should be noted, however, that Dányi (1962) found no significant correlation between migration and the level of investment during the period 1949 to 1960 at the county level. Although there is no direct evidence to confirm it, one may envisage the retrospective rather than the simultaneous generation migration by disparities in levels of investment and the delay may be considerable.

Sárfalvi envisages the demographic factor acting through the balance of new workers entering the labour force and the level of job opportunities. In Northeast Alföld, particularly in Szabolcs-Szatmár county, the traditionally high birth rate has meant a large surplus of manpower for the available job opportunities in agriculture. Out-migration has consequently been intense. The psychological factor is little expanded upon owing, no doubt, to a lack of concrete information.

According to Sárfalvi the factors attracting agricultural population to urban centres relate to their industrialisation. Firstly, industrialisation was primarily instrumental in widening the gap between agricultural and industrial wage structures thus generating voluntary population movement from rural areas. Secondly, it brought about a rapid expansion in industrial employment opportunities owing to its labour intensiveness which could only be filled through the redeployment of agricultural manpower in industry. Thirdly, the rapid development of industry was initially at the expense of agriculture.

Pálfai (1963) dealing specifically with the problem of agricultural manpower, sheds further light on the mass exodus from rural areas. He accounts for the 500,000 who between 1949 and 1960 left agricultural jobs in favour of other types of employment in terms of mistakes in agricultural planning and the effects of the 1956 counter revolution.

Rural migration from the extremely agricultural counties of Szabolcs-Szatmár and Hajdú-Bihar has received the attention of Nozdroviczky (1959), Csernák (1964) and Molnár (1964). Nozdroviczky was especially concerned with the effect of migration from Szabolcs-Szatmár on the population growth of that county. Of rural migrants changing residence permanently, however, only one third left the county to work elsewhere, which emphasises the volume of rural population movement within the county. Additionally, 50 per cent of permanent migrants were dependents. Nozdroviczky also produces the rather astonishing fact that approximately three quarters of the population of Szabolcs-Szatmár had been involved in temporary migrations between 1949 and 1960. By way of explanation of the high rate of out-migration from the county, she posits the combined influences of repulsion due to the high rate of natural increase in Szabolcs-Szatmár and the attraction of industrial employment in neighbouring Borsod-Abaúj-Zemplén county and in Budapest.

Molnár studied essentially the same problem in relation to Hajdú-Bihar county. Between 1949 and 1963, over 65,000 moved away from the county, or approximately three quarters of the natural population increment during that period. Moreover, the number of agricultural workers decreased from 62 per cent of those gainfully employed in 1930 to 40 per cent in 1963. Molnár names industrialisation elsewhere, mechanisation of agriculture, ineffective industrial and agricultural investment in Hajdú-Bihar county, the low level of agricultural wages and the forced collectivisation of the early 1950's as the reasons for this exodus. Csernák's contribution is restricted to an analysis of that section of the rural population of Hajdú-Bihar county which migrated to the central city of Debrecen. In the generation of these local movements he points essentially to the same factors of repulsion as Molnár, while the attraction is the possibility of non-agricultural employment in Debrecen.

We thus have a number of different authors viewing agrarian migration as the fundamental process of population mobility in Hungary. Their explanations of this phenomena vary little and are in terms of the industrialisation of limited areas of the country and the lack of opportunities in agricultural areas. Aside from Acsádi (op.cit.) wno has stressed the volume of interurban movements, Valkovics (1964) presents the only other dissenting view from this simplistic explanation of Hungarian internal migration. He objects strongly to the contention that the current high rate of internal population mobility is attributable to rapid industrialisation. As confirmation of this, he points to the even higher rates of internal migration in the developed countries, for instance in the United States. In a more specific treatment of the decrease of the agricultural labour force and rural out-migration he envisages the continuation of this process even after the "construction of socialism", i.e. the industrialisation of the country, has been completed. In evidence he draws an analogy with the continuing urbanisation of the rural populations of developed industrial countries. Sárfalvi's explanation of rural-urban movements,by comparison,implies a halt to the process after socialist construction has been achieved. Valkovics also objects to the following explanations of Hungarian rural-urban migration: firstly, that the urban way of life attracts agrarian population, because similar enticements before 1949 did not lead to mass out-migration from rural areas; secondly, that the increase in industrial employment opportunities and production leads to mass out-migration from agricultural regions, because assuming the stability of the balance of internal demand from the various sections of the national economy, the number of active wage earners in agriculture should also increase; and thirdly that rural migration can be attributed to a change from extensive to intensive cultivation, because the intensification of land cultivation in the first decade of the current century did not induce a decline in the agricultural population.

Valkovics's explanation of rural out-migration and the falling agricultural labour force number is in terms of increased agricultural productivity and changing demand patterns within the economy of Hungary. He rejects the proposition that a straight forward increase in agricultural productivity is the cause because even though industrial productivity is also increasing, its manpower requirements are rising simultaneously. By analogy the same should happen to the agricultural labour force. Rather, Valkovics argues that the number of agricultural workers will decrease and out-migration from rural areas continue while the increase in agricultural productivity exceeds the rate of increase in the total demand for agricultural goods. It is the combined action of these two factors that is the determinant of current rural depopulation in Hungary. Only when the elasticity of demand for agricultural goods approximates zero, will change in agricultural productivity become the sole determinant of the number and proportion of active wage earners in agriculture.

Valkovics thus provides the most sophisticated and logical economic argument to explain rural out-migration and the decline in the agricultural population of the country. Yet although his reasons for rejecting the influence of employment opportunities in industry are persuasive on the ceteris paribus assumption, vacant opportunities in industry had to exist for the agrarian population displaced by the changing demand patterns in the towns in order to prevent a build up of surplus manpower on the land and the undermining of the improvements in agricultural productivity. Indeed, one has to suggest that the changes in demand patterns which are at the core of the Valkovics explanation are the result of the increasingly industrial orientation of the Hungarian economy. It is therefore difficult to see how Valkovics's arguments differ basically from those of other authors. This aside, we must wholeheartedly agree with his contention that internal migration in Hungary is not a simple and uncomplicated movement of population from the land to the towns under the influence of industrialisation. If viewed in this manner, no explanation exists for the other types of internal movement which are manifestly taking place.

Other contributors to the literature of rural-urban migration have viewed the process as one of urbanisation. In such studies, therefore, the emphasis is upon those features of urban areas that attract rural population. Lettrich (1964 and 1965) has been to the fore in the analysis of the general characteristics of the urbanisation process. Others have examined the relationship between rural outmigration and the growth of specific urban centres, such as the new socialist towns where the influx of population was primarily from rural areas in search of industrial employment (Ruisz 1959). Schandl (1962) identifies migration as causing the growth of the Budapest agglomeration, where the inflow of population has again been generated by employment opportunities in the non-agricultural sectors of the economy. Bertalan and Viszket (1966) emphasise the undesirability of large concentrations of industry and population in and around Budapest, but point out that the ageing of the population of the capital and the labour force requirements of industry already located in the area mean a continuation of population in-migration. These authors therefore also identify industrial employment opportunities as the dominant factor generating rural-urban migration.

Sárfalvi writing in 1965 forecasts the continuation of rural outmigration because of the persistence of disparities between town and country and a consequential general shortage of manpower in agriculture by the 1970's. Similar conclusions were reached by Berettyán and Timár (1963) and Fekete, Hegedűs and Timár (1964). The latter authors also point out that the young rural wage earner prefers to seek his first job outside agriculture and is unlikely to return to the rural way of life subsequently. In the light of recent economic reforms, however, these forecasts are likely to prove unduly gloomy. These reforms have been designed to redress the balance between agricultural and industrial wages. The price modifications of 1966 and those accompanying the introduction of the new economic mechanism at the beginning of 1968 (Friss 1969) have started the process. Although one does not envisage a sudden halt in the rural-urban flow of population, these measures may help check out-migration from the villages.

By way of summary, two points can be made concerning the literature on rural-urban migration. Firstly, the rapid reduction in the agricultural labour force in the past two decades has led some authors to stress net rural-urban movements as the basic component of Hungarian internal migration. This, however, ignores inter-urban and inter-village migration as well as the gross movements between rural and urban settlements. Secondly, the net effect of rural-urban migration is generally interpreted in terms of the rapid industrialisation of urban centres and the declining need for agricultural manpower. Yet, as Valkovics points out, industrialisation may be irrelevant to this process because urbanisation is also a feature of developed industrial societies. Moreover, current research in the historical demography of Hungary in the eighteenth century indicates that rural-urban movements were considerable even at that time (Dányi personal conversation). Although the single factor explanation advanced up to now is a foundation on which to build, it is apparent that any satisfactory explanation of rural-urban migration must be multivariate in character. A complete understanding of the process, however, will depend on the analysis of gross rather than net flows. At present data concerning the socio-economic features of rural areas is inadequate for this task, but it is hoped that the publication of the 1970 census results will fill this gap.

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CHAPTER 7

WHY PEOPLE MIGRATE

The investigation of the determinants of internal migration can be approached from two sides. One can view the question from the aspect of the individual migrant, in terms of his reasons for moving and the decisions lying behind the event. Alternatively, the characteristics of places that decide the spatial pattern of migration can be analysed. It is not necessary to stress, however, that these two approaches complement each other and a full understanding of the migration process depends upon the adequate comprehension of both.

Our investigation of the determinants of internal migration in Hungary begins from the point of view of the individual migrant: but as reliance is placed on official questionnaires certain aspects of this problem cannot be discussed owing to data deficiencies. Thus, the absence of individual migratory histories makes it impossible to relate moves to the family life cycle (e.g. Lansing and Kish 1957). The migration decision process and the goals of migrants, both important facets of the reasons for migrating, require interviews in depth but no such data is available (e.g. Lansing and Mueller 1967). Yet with the data which is at hand, the reasons behind individual migrations can be related to the age, sex, occupation and family status of movers. Moreover, spatial variations in the reasons for migrating can be examined at the level of the settlement classes used previously, the counties and the economic regions of the country. Indeed, this information provided valuable pointers in the construction of the multivariate model of urban migration presented in chapter 8.

7.1 Aggregate Reason Structure

The reason structures of permanent and temporary migrations for the years 1958 to 1965 are presented in table 15. In each year approximately 40 per cent of the migrations involving permanent changes of residence were made by dependents – wives, children, etc. These moves may be regarded as "passive" in contrast to the "active" moves attributable to decisions made by the heads of households. Of the latter, between 29 and 31 per cent were associated with changes of employment. When moves made for the purpose of being closer to place of work are added to these it becomes apparent that between 45 and 50 per cent of all active migrations involving permanent changes of residence were motivated by "economic" factors. The social reasons of education, marriage and the desire for a new residence per se accounted for a further 25–35 per cent of all permanent moves during each of the seven years. Less than one per cent were attributable to medical reasons.

Table 15. Permanent and Temporary Migration Reason Structures – 1958 to 1968

	Change of employment	Closer to place of work	Education	Change of dwelling	At marriage	Medical purposes & visiting	Dependent	Other and unknown
Permanent Migration								
1968	16.2	11.2	1.1	8.9	13.6	0.4	36.8	11.8
1967	16.2	11.2	1.2	8.6	12.9	0.4	37.8	11.7
1966	16.4	10.8	1.3	8.7	12.6	0.4	38.5	11.3
1965	16.6	11.1	1.3	8.2	12.1	0.4	39.4	11.0
1964	17.5	11.1	1.4	7.8	11.2	0.4	39.5	11.1
1963	19.0	10.7	1.6	7.5	10.7	0.4	39.0	11.1
1962	19.4	10.2	1.7	7.2	10.1	0.4	38.1	12.9
1961	17.5	9.8	1.6	7.1	10.2	0.5	40.0	13.3
1960	17.8	9.7	1.6	6.6	9.3	0.5	40.6	13.9
1959	18.2	9.2	1.5	6,0	9.1	0.5	42.8	12.7
1958	19.0	8.7	1.4	6.6	8.5	0.5	44.9	10.4
Temporary Migration								
1968	46.9	13.6	15.2	1.9	3.4	5.3	8.9	4.8
1967	43.9	13.6	16.5	2.0	3.3	6.1	9.2	5.4
1966	43.0	13.3	17.3	2.2	3.0	6.7	9.6	4.9
1965	43.0	13.3	16.4	2.2	3.0	6.7	10.0	5.4
1964	44.9	13.4	15.5	1.9	2.6	7.2	9.8	4.7
1963	44.5	12.8	15.6	1.8	2.3	8.9	9.7	4.4
1962	45.3	12.1	14.0	1.9	2.0	9.7	10.1	4.9
1961	45.4	11.1	13.3	1.9	1.9	10.4	10.1	5.9
1960	47.8	10.4	12.2	1.8	1.7	9.8	10.5	5.8
1959	49.3	9.6	10.4	1.5	1.6	10.4	11.8	5.4
1958	50.1	9.7	9.2	1.8	1.6	10.1	12.8	4.7

Although general stability in the reason structure of permanent migrants is indicated, temporal trends are apparent for certain of the categories. For instance, moves undertaken for the purpose of residing closer to work place and those made on marriage consistently accounted for a higher proportion of permanent movers year by year. The proportion of migrating dependents by comparison shifted in the opposite direction as did moves involving change of employment.

The relative significance of these factors as generators of temporary migration diverged considerably from this pattern. In each year over 60 per cent of temporary moves were undertaken for "economic" reasons, i.e. 45 to 50 per cent involved change of employment and between 10 and 14 per cent were moves to be closer to work place. The social motives of marriage and the desire for a new residence were less significant and combined accounted for somewhat less than 5 per cent of all temporary moves. The proportion of dependents migrating temporarily was also considerably smaller. Medical and educational factors by comparison figured more strongly.

Age and sex differentials in the reason structures

Age and sex differentials in the reasons for migrating permanently can be assessed for the year 1958 only. The majority of male moves attributable to each reason – up to 80 per cent – occurred before the age of 40 (table 16). Only migrations generated by medical reasons and by the desire for a new residence per se occurred in significant proportions at older ages. Age concentration was most pronounced for moves taking place at marriage (85 per cent between the ages of 20 and 30), and those involving educational reasons (95 per cent between the ages of 16 and 29) and dependents (94 per cent before the age of 15).

At corresponding ages, change of employment was the most significant factor generating male migration, and accounted for a higher proportion of moves amongst males aged 30 to 59 than aged 16 to 29. When migration for the purposes of being closer to place of work is combined with this factor, the "economic" determinant is seen to be the motivating force for 40 per cent of male migrants aged 16 to 19 – the minimum, and 71 per cent of male migrants in the 30 to 39 age group – the maximum. Concerning the other factors, as expected on a priori grounds, the proportion of male migrations generated by marriage and education steadily fell with increasing age. The significance of migration attributable to medical reasons and change of residence per se, by comparison, rose with increasing age.

Temporal age variations in the factors inducing female migration are similar to those described for males (table 16). At corresponding ages, however, the relative significance of the reasons generating male and female migration differed considerably, as the 'passive' mobility of female dependents within the family group comprised the most important single category of female migration. The economic factors associated with migration were consequently less significant, although they still accounted for over 20 per cent of migration amongst females aged 16 to 49.

Table 16. Age and Sex Differentials in the 1958 Permanent Migration Reason Structure

Men

Age Group	0–15	16–19	20–29	30–39	40–49	50–59	60+	Unknown	Total
Change of employment		9.7	41.5	26.6	11.7	7.0	2.8	0.7	100
Closer to place of work		5.6	46.8	28.1	10.3	6.2	2.4	0.6	100
Education		68.4	27.7	2.3	0.5	0.3	–	0.8	100
Change of dwelling		6.0	26.8	23.3	12.6	12.4	18.3	0.6	100
At marriage		3.9	72.6	13.9	4.5	2.8	1.7	0.6	100
Medical purposes		2.5	15.0	17.1	13.0	18.4	33.4	0.6	100
Visiting		36.7	23.1	9.5	5.5	8.5	15.6	1.1	100
Dependent	93.9	2.3	0.6	0.2	0.1	0.3	2.6	0.0	100
Other		21.1	27.8	15.0	7.5	7.2	20.6	0.8	100
Unknown		12.4	38.4	19.0	8.3	7.7	11.9	1.4	100
Change of employment		33.2	38.9	46.0	47.4	40,0	14.8		
Closer to place of work		9.9	22.8	25.2	21.6	18.4	6.7		
Education		16.9	1.9	0.3	0.1	0.1	–		
Change of dwelling		3.5	7.0	11.2	14.0	19.4	26.8		
At marriage		5.7	17.9	6.3	4.8	4.2	2.3		
Medical purposes		0.1	0.2	0.3	0.6	1.2	2.0		
Visiting		0.5	0.1	0.1	0.1	0.2	0.3		
Dependent	100.0	10.0	0.7	0.5	0.4	1.9	16.8		
Other		13.3	4.8	4.8	5.6	7.5	20.1		
Unknown		6.9	5.7	5.4	5.3	7.1	10.2		
Total		100.0	100.0	100.0	100.0	100.0	100.0		

Table 16. continued
Women

Age Group	0–15	16–19	20–29	30–39	40-49	50–59	60+	Unknown	Total
Change of employment		20.7	44.5	18.6	8.7	4.8	2.1	0.6	100.0
Closer to place of work		14.8	52.6	19.2	7.2	4.0	1.5	0.7	100.0
Education		69.5	26.4	2.5	0.3	0.2	0.1	1.0	100.0
Change of dwelling		6.6	27.6	18.4	10.9	11.9	23.8	0.8	100.0
At marriage		24.6	59.2	9.4	3.2	2.0	0.8	0.8	100.0
Medical purposes		4.2	15.4	15.1	9.4	17.4	37.8	0.8	100.0
Visiting		22.6	27.0	8.1	6.5	11.3	24.5	0.0	100.0
Dependent	48.8	5.0	20.6	11.2	4.4	4.0	5.7	0.3	100.0
Other		16.7	25.7	11.7	5.8	10.4	29.1	0.6	100.0
Unknown		15.9	39.7	17.2	7.7	6.7	11.8	1.0	100.0
Change of employment		21.6	17.0	16.6	18.2	11.4	3.3		
Closer to place of work		5.0	6.6	5.6	4.9	3.1	0.8		
Education		5.9	.8	0.2	0.1	0.0	–		
Change of dwelling		3.4	5.3	8.2	11.4	14.1	18.9		
At marriage		21.7	19.2	7.2	5.6	4.1	1.2		
Medicial purposes		0.2	0.3	0.6	,0.4	1.9	2.7		
Visiting		0.3	0.1	0.1	0.1	0.3	0.4		
Dependent	100.0	25.1	37.8	48.2	44.4	45.7	43.2		
Other		6.9	3.9	4.1	4.8	9.8	18.3		
Unknown		9.9	9.0	9.2	9.6	9.6	11.2		
Total		100.0	100.0	100.0	100.0	100.0	100.0		

Occupational differentials in the factors inducing migration

Variations in the reason structures of male and female migrants by the class and type of occupation are presented in tables 17 and 18. Data are again available for 1958 only.

With the exception of retired persons, students and dependents, moves associated with change of employment predominate in all male occupational classes. Wide variations exist, however, in its comparative significance. For example, change of employment generated a higher proportion of moves amongst white collar than amongst manual workers, and amongst those with agricultural compared with other occupations. The latter differential is linked with the rapid reduction of the agricultural labour force during the late 1950's. Unfortunately, data is not available from the continuous enumeration of population movements that permits an accurate assessment of the association between migration and change of occupation, for whereas the number of migrations induced by change of employment are known, the types of employment previous to and after the migration event are not. Consequently, the proportion of those engaged in agriculture who actually left the agricultural sector on moving cannot be measured. Suffice it to say that, on the basis of the 1960 census results[1], migration has been identified as the most important mechanism of the socio-economic restratification of the agricultural population of Hungary (Klinger 1962, Mód 1964, Sárfalvi 1964 and 1969).

The aggregation of moves stimulated by change of employment and the desire to be closer to place of work suggest that, in 1958, 67 per cent of manual workers and 85 per cent of skilled workers on state farms and 80 per cent of agricultural cooperative members moved for economic reasons. By comparison, "economic" motivation generated just over 60 and 70 per cent respectively of migration amongst manual and white collar workers engaged in the mining, manufacturing and construction industries. However, a significantly higher proportion of these moves were generated by the desire to be closer to place of work compared with migrants of agricultural occupation. Thus in summary, the "economic" motive for migrating is much stronger amongst white collar than amongst manual workers. Additionally, a significantly higher proportion of migrants with agricultural occupations are so influenced compared with migrants engaged in other sectors of the economy.

Amongst migrants of active age, marriage and change of residence per se were the only other factors to generate considerable numbers of moves. Both accounted for a higher proportion of migrations amongst manual than amonst white collar workers and amongst those engaged in manufacturing, mining and construction industry compared with those in agricultural and service occupations. The relatively low proportion of moves amongst agricultural workers generated by marriage, however, is not attributable to a low incidence of marriage in rural areas, but to the agricultural population generally seeking marriage partners nearer at hand than the remainder of the population.

[1] A retabulation of the 1960 census data was recently undertaken by the Demographic Research Group to assess the degree of socio-economic restratification amongst the Hungarian population between 1949 and 1960. Restratification was found to be considerable amongst all occupational groups (Demographic Research Group 1965).

Table 17. Male Occupational Differentials in the 1958 Permanent Migration Reason Structure

	Change of employment	Closer to place of work	Education	Change of dwelling	At marriage	Medical purposes	Visiting	Dependent	Other	Unknown	Total
Manual Workers											
Mining	34.1	35.1	0.4	11.3	12.5	0.1	0.0	0.1	4.5	4.9	100.0
Manufacturing	34.4	26.6	0.6	9.8	15.8	0.4	0.1	0.3	6.8	5.2	100.0
Constr. Indust.	30.2	23.6	0.3	11.7	17.9	0.2	0.1	0.3	8.8	6.9	100.0
Agriculture	51.6	15.0	0.2	9.2	8.0	0.2	0.1	0.6	6.3	8.8	100.0
Service Indust.	46.4	28.5	0.6	5.7	8.6	0.1	0.1	0.1	3.5	6.4	100.0
Other & Unknown	40.0	21.0	0.5	10.3	12.8	0.3	0.1	0.3	7.3	7.4	100.0
Total	40.1	23.2	0.4	9.9	12.4	0.3	0.1	0.3	6.5	6.8	100.0
White Collar Workers											
Mining, Manufact. & Constr. Indust.	40.4	32.5	0.8	7.8	11.5	0.4	0.1	0.1	4.9	1.5	100.0
Agriculture	59.5	24.5	0.5	3.7	6.7	0.3	0.1	0.1	3.2	1.4	100.0
Service Indust.	62.9	21.8	0.5	3.3	6.9	0.3	0.2	0.1	3.0	1.0	100.0
Other & Unknown	48.3	24.6	1.0	6.0	12.2	0.5	0.1	0.1	5.8	1.4	100.0
Total	55.5	24.8	0.5	4.7	8.7	0.4	0.1	0.1	3.9	1.3	100.0
Independent											
Agriculture	25.2	20.0	0.1	23.1	13.1	0.4	0.1	0.1	9.8	7.2	100.0
Other & Unknown	43.5	17.6	0.3	18.0	6.2	0.5	0.2	0.3	6.5	6.9	100.0
Miscellaneous											
Agric.Co-op Member	63.9	16.2	0.1	6.9	3.6	0.1	–	0.3	3.2	5.7	100.0
Indust.Co-op Member	37.4	25.9	0.8	10.8	13.1	1.1	0.1	0.2	6.9	3.7	100.0
Student	7.8	4.2	60.1	2.9	2.0	0.1	1.0	9.6	9.2	3.1	100.0
Old age pensioner	4.9	0.5	0.1	25.6	4.1	4.8	0.9	15.8	27.5	15.8	100.0
Dependent	0.5	–	1.9	2.5	0.1	0.1	0.1	92.8	1.4	0.6	100.0
Unknown	46.8	2.2	0.7	7.9	6.5	1.2	0.2	2.8	11.2	20.5	100.0

The remaining reasons for male migration were uniformly low with all occupations, although the special categories of retired persons, students and dependents formed natural exceptions. The proportion of dependents migrating to take up employment and further their education was, however, surprisingly small.

Occupational variations in the reasons for female migration are essentially the same as those outlined for males, (table 18). A significant departure, however, was that female migrations generated by marriage were invariably more important for each occupational type. The effect of this was to lower somewhat the significance of the other reasons for migrating.

7.2 Differentials in the Reasons Generating Migration by Settlement Class

The discussion of differentials in migration reason structure by settlement class[1] falls under three separate headings:

i) cross sectional variations in the factors generating permanent migration ii) temporal variations in the factors generating permanent migration iii) variations in the relative significance of the factors inducing permanent and temporary migration[2].

Cross-sectional variations in the factors generating permanent migration by settlement class

The mean reason structures of in- and out-migration for the period 1958 to 1965 are distinctive, (table 19). Not only was the number of migrants moving to Budapest to find new employment and to be closer to their already existing place of employment greater than the number leaving the capital for the same reasons, but the relative importance of these two factors varied similarly. Thus by aggregating the two, we may conclude that 44.5 per cent of all migrants moving to Budapest over the seven year period were motivated by "economic" factors. Only 25.7 per cent of migrants leaving the capital were so influenced. Concerning village migration, 15.9 per cent of in-migrants were motivated by "economic" considerations compared with 17.5 per cent of those who moved away. This differential again becomes more accentuated when absolute numbers are considered. Variations of similar nature were also apparent for moves involving marriage, change of residence per se, students and dependents.

Intersettlement gradients in the reason structure are well developed. Economic inducements were most significant in generating migration to Budapest and least significant in the case of village in-migration. The proportion of in-migrants prompted by the desire to change residence, by comparison, was lowest for Budapest and highest for the villages. Similarly, dependents composed a higher proportion of migrants to the villages than to the capital.

Many of the intersettlement gradients exhibited in table 19 are as expected on a priori grounds. The predominance of Budapest in the economic life of the country and its attractiveness to migrants has already been noted. It would, therefore, be surprising if

[1] The settlement classes used here are: Budapest, provincial cities, district towns and villages.

[2] The available data does not allow the discussion of these points according to age, sex and occupational differentials of migrants.

Table 18. Occupational Differentials in the Female 1958 Permanent Migration Reason Structure

	Change of employment	Closer to place of work	Education	Change of dwelling	At marriage	Medical purposes	Visiting	Dependent	Other	Unknown	Total
Manual Workers											
Mining	22.6	29.3	0.4	13.3	18.8	0.4	0.2	7.2	3.8	4.0	100.0
Manufacturings	31.0	23.0	0.4	7.9	18.4	0.6	0.1	6.0	5.8	6.8	100.0
Construction industry	28.7	23.0	–	8.9	20.5	0.7	0.2	7.4	5.1	5.5	100.0
Agriculture	46.5	11.5	0.1	5.6	11.3	0.3	0.2	10.9	5.0	8.6	100.0
Service industry	44.3	20.9	0.8	7.1	10.1	0.5	0.1	5.0	5.0	6.2	100.0
Other & Unknown	50.7	13.3	0.3	6.5	10.6	0.6	0.1	6.9	5.0	6.0	100.0
Total	40.5	17.9	0.4	7.2	14.3	0.6	0.1	7.1	5.3	6.6	100.0
White Collar Workers											
Mining, Manufact. & Constr. Indust.	29.7	22.7	0.7	6.5	23.7	0.8	–	7.4	6.1	2.4	100.0
Agriculture	40.0	18.1	0.3	5.4	19.5	0.1	–	10.1	3.7	2.8	100.0
Service Industry	52.0	15.8	0.8	4.1	16.1	0.4	0.2	4.7	3.5	2.4	100.0
Other & Unknown	38.7	17.7	0.6	4.6	22.0	0.5	0.1	7.4	5.8	2.6	100.0
Total	45.4	17.3	0.8	4.6	18.6	0.4	0.2	5.9	4.4	2.4	100.0
Independent											
Agriculture	13.1	14.3	0.1	15.7	25.2	0.5	0.1	16.9	6.3	7.8	100.0
Other & Unknown	23.7	13.7	0.8	18.4	11.6	1.0	–	11.6	9.6	9.6	100.0
Miscellaneous											
Agric. Co-op. Member	53.7	14.6	–	4.3	4.0	0.3	0.2	13.4	3.0	6.5	100.0
Industr. Co-op. Member	30.2	23.2	0.4	10.6	13.4	1.9	–	8.1	7.5	4.7	100.0
Student	10.1	3.7	55.6	1.5	8.4	0.2	0.5	11.2	6.1	2.7	100.0
Old age pensioner	2.1	0.2	–	17.1	2.3	8.0	0.9	27.5	27.9	14.0	100.0
Dependent	3.5	0.1	0.7	5.4	8.3	0.4	0.1	70.4	4.1	7.0	100.0

Table 19. The Mean Permanent Migration Reason Structure by Settlement Class – 1957 to 1965

In-migration

	Change of employment	Closer to place of work	Education	Change of dwelling	At marriage	Medical purposes & visiting	Dependent	Other & Unknown	Total
Budapest	29.2	15.3	4.1	4.5	9.8	0.9	24.5	11.7	100.0
Provincial Cities	20.3	13.4	4.5	6.1	8.0	0.5	36.5	10.7	100.0
District Towns	18.4	12.3	1.8	6.7	8.3	0.5	42.2	9.8	100.0
Villages	15.9	7.7	0.7	7.6	10.5	0.3	44.0	13.3	100.0
Budapest	22.2	18.6	36.5	6.4	12.7	33.3	6.6	12.1	12.3
Provincial Cities	7.1	8.6	15.4	6.4	5.3	6.4	5.8	5.2	6.8
District Towns	19.1	24.5	19.2	19.2	16.7	19.1	21.1	15.2	19.5
Villages	51.6	48.3	28.9	68.0	65.3	41.2	66.5	67.5	61.4
Total	100.0	100.0	100.0	100.0	100.0	100.0	100.0	100.0	100.0

Out-Migration

	Change of employment	Closer to place of work	Education	Change of dwelling	At marriage	Medical purposes & visiting	Dependent	Other & Unknown	Total
Budapest	19.7	6.0	1.5	12.3	10.3	1.4	28.5	20.3	100.0
Provincial Cities	23.0	6.8	2.7	7.0	8.6	0.8	35.0	16.1	100.0
District Towns	21.0	8.3	2.3	7.0	8.6	0.6	39.2	12.9	100.0
Villages	17.5	10.7	1.3	6.5	10.1	0.3	42.5	11.1	100.0
Budapest	8.0	4.4	7.9	11.5	6.5	17.9	4.9	12.8	7.2
Provincial Cities	4.7	2.4	7.0	3.8	3.1	5.1	3.1	5.1	3.7
District Towns	16.5	10.2	21.2	14.4	12.9	18.5	14.0	15.5	14.4
Villages	70.8	83.0	63.9	70.3	77.5	58.5	78.0	66.6	14.4
Total	100.0	100.0	100.0	100.0	100.0	100.0	100.0	100.0	100.0
Hungary Total	18.4	9.9	1.5	7.0	9.8	0.5	40.8	12.1	100.0

"economic" motivation were not prominent in the accounting for migrants taking up permanent residence there. By comparison one would expect a smaller proportion of migrants to the villages to be so motivated. Moves generated by the desire to reside closer to place of work form an interesting class of economically induced migration. By implication such movers are already employed at or close to their place of destination before migrating. It is, therefore, apparent that previous to their migration they would have belonged to the large body of medium and long distance commuters in Hungary[1]. Sárfalvi (1969) has highlighted commuting as an intermediate stage in the resettlement of rural population in urban areas when a single and direct rural-urban move is not feasible. Assuming that migration induced by the desire to reside closer to place of work is proportional to the intensity of commuting, one would expect centres of mass commuting to be also those places receiving considerable influxes of population for this reason. Since it has been demonstrated by data collected by the Central Statistical Office that the intensity and magnitude of commuting is proportional to the size and importance of the urban centres involved in the process, the inter-settlement gradient in the relative significance of moving closer to place of work as a factor generating in-migration is thus as expected: being highest for Budapest and lowest for the villages. The converse naturally applies to out-migrants and is borne out by the observed figures.

The proportions of migrating dependents similarly exhibited well defined gradients by settlement class, being least prominent in the motivation structure of Budapest and most significant in that of the villages. The proportions of migrants below the age of 15 vary identically. Aside from differential age structure, however, a close association exists between the comparative significance of dependents amongst in-migrants and the availability of new accommodation at the place of destination. On a priori grounds one may assume that families, in contrast to individuals, are more likely to move to settlements where accommodation is both adequate and guaranteed than otherwise. Of all urban centres in Hungary the housing problem is greatest in Budapest, for although the net stock of dwelling units in the capital increased by over 64 thousand between 1960 and 1966 (Central Statistical Office 1968), this has been inadequate to meet the combined needs of the population long resident in Budapest and migrants from elsewhere. A reflection of the comparative shortage of housing in the capital is the regulation of 1962 restricting the purchase and renting of apartments and houses to those who have resided or worked permanently in Budapest for a minimum period of five years (Magyar Közlöny op. cit.). In such circumstances, the small proportion of dependents migrating to the capital is explicable. Although no direct confirmation is available, indirect evidence such as this and the low proportion of under 15 year old amongst in-migrants suggests that the ratio of single people and childless families moving to Budapest is greater than in the case of the other settlement classes. Thus, the predominance of the "economic" motive amongst movers to the capital reflects not only the number and magnitude of available economic opportunities, but also housing problems which deter families with dependents from moving to Budapest. Accommodation is virtually as difficult in the provincial cities. These and the new socialist towns are

[1] As a working definition, medium and long distance commuters are regarded as those living outside the administrative area of their place of work.

the post-war growth centres of Hungary and indeed, the contribution of migration to their population growth has been greater than for Budapest. Their housing problems are consequently also acute which must account, to a large extent, for the lower proportion of dependents in their in-migration structures compared with the villages and district towns.

The intersettlement gradient in the proportion of dependent out-migrants can be related to the population age structures of the settlement classes. In addition, however, it may be recalled that the majority of individuals moving from villages and district towns move to other villages and district towns, which inevitably leads to similar percentages of dependents in both their in- and out-migration reason structures. Even so, the somewhat smaller proportion of dependents amongst migrants leaving the villages and district towns may be related to the accommodation problems in Budapest and the provincial cities.

The intersettlement gradient in the proportion of migrants motivated by the desire to change accommodation per se may be accounted for by similar reasoning. Where housing tends to be inadequate, as in Budapest, a higher proportion of people may be expected to move away to obtain better accomodation, compared with places of more adequate housing conditions, and indeed, the proportion of migrants leaving Budapest for this reason is almost double that for any of the other settlement categories. It is also tempting to detect here the beginnings of the suburbanisation of the population of Budapest under the influence of the spread of the motor car and the growth of fast suburban railways and bus routes.

Temporal variations in the reason structure of permanent migration

Our discussion of the mean reason structures for the years 1958 to 1965 masks temporal variations in the relative significance of the factors generating migration. Yet it is apparent from figure 30 that certain trends were well established throughout the period. For example, the proportion of migrations occurring at marriage steadily increased for each settlement type and indeed, the actual number of migrations so generated also rose, although the total number of migrations fell throughout the period. But while the incidence of marriage has increased amongst the population as a whole since 1962, in the years previous to that the trend was downwards (Central Statistical Office). The consistent rise therefore since 1958 in both the proportion and incidence of migrations occurring on marriage cannot be attributed to a similar rise in the number of marriages amongst the total population. Although no independent studies are available to confirm it, it may be suggested that here we have evidence that the current high degree of both social and physical mobility in Hungary is stimulating the search for marriage partners further afield than previously. The setting up of new homes has consequently involved a steady increase over time in both the incidence and the proportion ot migrations ocurring on marriage. The similar trend established in the proportion of moves motivated by the desire for new residences may also be related to this.

Trends in the relative propensity of migrations stimulated by the other factors were more uneven and tended to vary with settlement class. In general, the proportion of dependents amongst both in- and out-migrants declined throughout the period, although there was a tendency for the significance of dependents migrating to provincial cities and to Budapest to rise somewhat after 1963. The general decline, however, reflects the decreasing proportion of population below the age of 15, a consequence of the falling birth rate and the increasing ratio of married females in the labour force.

The precipitous drop in the proportion of dependents entering Budapest in 1962, by contrast, is a reflection of the legislation of that year restricting house purchase and rental in the capital (Magyar Közlöny). Indeed, this new legislation may well have had a dampening effect on the mobility of dependents in general as suggested by the prominant dips in the proportion of dependents leaving the villages and district towns in that year also. It may be suggested that the subsequent recovery in the proportion of dependents migrating to and from the provincial cities and Budapest was in part compensation for an initial overreaction to the 1962 legislation.

Of temporal variations in the economic motives for migrating, those exhibited for net migration display the most interesting trends. For each settlement class, moves for the purpose of residing closer to place of work took on added significance yearly, and apart from migrating dependents was the most significant factor accounting for the positive migration balance of the provincial cities and district towns and the negative balance of the villages. Moreover, it is the most biased in a directional sense of all the positive reasons for migrating in so far as it accounted for between 20 and 40 per cent of net migration but only 10 to 20 per cent of gross migration. The similar but less pronounced increases in the proportion of in-migrations generated by this factor is consonant with the growing body of commuters in the country.

Change of employment was the most significant "active" factor stimulating gross migration and in trend was either cyclic or showed a declining tendency. However, although accounting for over half of the net inflow of population to Budapest, it was of much lesser significance in accounting for the net migration of other settlements. Indeed in 1965 it was of no greater importance than marriage in the reason sturtures of the provincial cities and district towns.

The only reason inducing net outflows of population from Budapest was change of residence per se. It grew in significance over the seven years and is further evidence of the tendency for the suburbanisation of the population of the capital mentioned in the previous section.

Variations in the relative significance of the factors inducing temporary and permanent migration

With but two exceptions, change of employment was the most significant factor inducing temporary migration. The exceptions were; firstly, migration to the provincial cities where in 1965 education overtook change of employment as the predominant reason for moving temporarily, and secondly, temporary migration from Budapest where "long term" visiting was the prime reason. Although change of employment was generally the most significant factor generating temporary migration, wide differentials were apparent in its comparative importance by settlement class. For instance 50 per cent of temporary migrants moving to Budapest were so motivated compared with less than 35 per cent of those leaving the provincial cities. A basic contrast with permanent migration also exists here for when migration to Budapest is excluded, we find that in the permanent migration reason structure change of employment, while being the most important 'active' reason for moving, was surpassed by the percentage of migrating dependents. The latter category, however, comprised a very small proportion of those migrating temporarily with the exception of temporary moves to the villages. Indeed this basic contrast between the factors as stimulants of temporary and permanent migration is reinforced when we compare the relative significance of the "economic factor" – i.e. change of employment and moves for being closer to work combined. Thus of temporary moves to Budapest, approximately 65 per cent were so motivated compared with 45 per cent of permanent moves: of temporary migrations from the villages about 60 per cent were thus induced compared with 28 per cent of permanent moves (table 19 and figure 31). Naturally, these differentials would be less if dependents were excluded from the calculation of the ratio but they would not be eliminated.

In importance, education was the second factor inducing temporary migrations being most significant in relation to the provincial cities and district towns. Throughout the period 1958–1965 the proportion of both temporary in- and out-migration so generated increased, the steepest rise again occurring in the case of the provincial cities and district towns. By comparison, education as a reason for migrating permanently comprised an exceedingly small percentage of permanent migrations and was not plotted on figure 31.

Marriage and moves to new accommodation, while forming significant categories in the permanent migration reason structures, accounted for very small proportions of temporary migration. By contrast, long term 'visiting' as a motivation generated a high although sharply declining percentage of temporary moves from Budapest, the provincial cities and the district towns. It was an insignificant reason for migrating permenantly.

Variations in reason structure are of course to be expected between these two inherently different types of migration. Temporary migrations represent a partial break only with the old environment. Temporary moves are by definition ephemeral and indeed many may be highly speculative. In such circumstances, it is natural that dependents will remain at the permanent dwelling. By contrast, the dependents of permanent migrants will under normal circumstances move with the head of the household owing to the finality of the event.

The temporary migration associated with economic factors in present day Hungary is more complex than in the past. The periodic movements of landless agricultural labourers, a feature of the pre-war period, has disappeared from the rural scene. Indeed, on average, less than 7 per cent of those making temporary moves now are engaged in agricultural occupations, considerably less than one would expect on the basis of the 30 per cent of the population of the country depending upon agricultural employment.

By contrast with past eras, temporary moves in Hungary now are generated by the constant evolution of the economy. For example, the staffing of new factories with trained personnel may in the first instance, be on a temporary basis (Balogh 1966). Large scale temporary movements over considerable distances are a feature of the oil and natural gas industry of the country[1]. Additionally many temporary moves are still

[1] A considerable proportion of the workers in the Zala oil fields are from the northeastern part of the Alföld. They reside in Zala temporarily for periods of up to six months, (Forgács 1966 & Nagy 1968).

seasonal in nature being regulated by the annual rhythm of the construction industry and on average one fifth of temporary movers have been employed in this sector during the past decade or so. Additionally, indirect evidence suggests that up to 15 per cent of temporary moves annually are generated by individuals taking their first job[1].

Temporary moves, therefore, are towards those places offering temporary employment opportunities in the non-agricultural sectors of the economy. The movement is thus predominantly from the rural areas to the towns and over three quarters of temporary out-migration is from the villages. As a consequence, the proportion of temporary in-migrants motivated by economic factors is highest in the case of moves to Budapest where a shortage of manpower exists and lowest to the villages. The temporary out-migrant gradient by contrast is reversed.

Turning finally to the gradients and trends exhibited by education as a factor inducing temporary migration, it is apparent that the continuously rising proportion of moves so generated is associated with the rapid expansion of higher education in the country. Budapest is the main university and college centre and the incidence of temporary moves to the capital for educational reasons is higher than for the provincial cities and district towns combined. In absolute terms, however, this figure is swamped by the magnitude of those moving to Budapest for economic reasons: hence its low relative significance in the temporary in-migration reason structure of the capital. By comparison, higher education facilities in the provincial cities are proportionally greater. Szeged is an ancient and expanding university centre and the same applies to Debrecen. Miskolc has a growing technical university. Other types of higher educational facilities available in these provincial centres as well as in the district towns are similarly expanding. The high proportion of temporary moves to these places attributable to education is thus understable.

7.3 Differentials in the Factors Generating Migration by Economic Regions and Counties

Little spatial variation occurs in the relative significance of the factors generating regional and county migration (table 20 and figures 32 and 33). For every region, migrating dependents comprise the largest single component of both permanent in- and out-migration. Of the active reasons for migrating permanently the economic motives of change of employment and residing closer to place of work are the most significant, followed by the social reasons of marriage and change of residence per se. In the generation of temporary migration, the economic factors take on additional prominance and are followed in importance by moves induced by educational reasons. The proportion of migrating dependents by contrast is small.

Regional and county differentials in the relative significance of the economic factor are most worthy of comment (table 20). On a priori grounds, one might expect economic motivation to vary directly with the level of development of the various regions and counties in generating in-migration, and to vary indirectly with the level of development

[1] Data collected by the Central Statistical Office indicates that approximately one quarter of temporary movers record dependent as their occupation. By contrast only 10 per cent give dependent as their reason for moving. The 15 per cent difference is made up of those taking their first job, moving because of marriage, etc.

in generating out-migration. In general the regional and county differentials that do exist in this factor confirm this proposition. Thus the rate and relative significance of both permanent and temporary out-migration induced by the economic factor is highest in the case of Northeast Alföld and the counties of Szabolcs-Szatmár and Hajdú-Bihar, and lowest in the case of the Central Region. By comparison, economic motivation is most significant in generating in-migration to the Central and Northern Industrial Regions and to the counties of Borsod-Abaúj-Zemplén, Komárom and Fejér. It is least significant in the case of the Alföld regions. The degree of interregional population redistribution attributable to the economic factor emphasises the inition proposition (table 20).

County and regional differentials in the proportion of migrating dependents are small with the exception of the Central Region where the proportion of dependents amongst permanent migrants is considerably lower than for the other regions. Yet there is still a considerable net inflow of dependents to the region annually which, however, is almost entirely to Pest County. By comparison, the relative significance of dependents migrating away from the Central Industrial Region temporarily is substantial.

Small differentials also exist in the proportions of permanent migration generated by marriage and change of residence per se, although they are difficult to interpret. However, the population accruing to the Central Region from moves induced by marriage is sizeable, and is predominantly at the expense of Northeast Alföld.

7.4 Summary

Although dependents comprise the most important single category of permanent migrants, the economic motives of change of employment and moving closer to place of work are the most significant 'active' factors in generating permanent migration. In the generation of temporary migration these motives take on added importance. Significant differentials exist in this economic 'factor', however, according to the age, sex and occupation of migrants. Male moves are more likely to be so generated than female moves; migrants with agricultural occupations are more so influenced than those employed in other sectors of the economy. In addition, the relative significance of this factor in generating migration varies by settlement class, economic region and county. It accounts for more than half the net population movement between the economic regions, and apart from migrating dependents, is the most significant factor in the drift of population from the rural areas to the towns.

The social reasons of marriage and change of residence per se have accounted for an increasing proportion of permanent moves annually since 1957. Marked age differentials occur in the proportions of migrations induced by marriage as is to be expected on a priori grounds. Change of residence as a motive for migrating rises with increasing age. Variations by settlement class in both reasons are well developed while marriage also accounts for a sizeable part of net rural-urban movements. Both factors generate a considerably smaller proportion of temporary migration.

Whereas movements associated with education comprise a small part of permanent migration, considerable numbers of temporary movements are thus generated. The proportion has risen annually and variations are apparent by settlement class. Yet

Table 20. Mean Annual Migration Reason Structure by Economic Regions

Permanent In-migration

Region	Change of employment	Closer to place of work	Education	Change of dwelling	At marriage	Medical purposes & visiting	Dependent	Other & Unknown	Total
Permanent In-migration									
Central Industrial	21.1	14.3	2.4	7.2	12.2	0.7	28.5	13.6	100.0
Northern Industrial	15.8	11.4	1.0	6.4	12.8	0.3	43.4	9.0	100.0
Northeast Alföld	18.2	8.7	1.7	7.4	10.0	0.3	42.5	11.2	100.0
Southeast Alföld	16.4	10.3	0.9	9.8	10.0	0.3	42.4	9.9	100.0
Southern Transdanubia	16.5	9.0	0.9	8.6	9.0	0.2	44.0	11.8	100.0
Northern Transdanubia	15.9	11.4	1.0	7.5	12.4	0.3	41.3	10.2	100.0
Permanent Out-migration									
Central Industrial	15.4	12.5	1.6	10.4	11.7	0.7	30.7	16.0	100.0
Northern Industrial	17.3	11.2	1.4	6.3	12.1	0.3	42.0	9.4	100.0
Northeast Alföld	19.6	10.6	1.7	6.2	10.9	0.3	41.3	9.4	100.0
Southeast Alföld	17.0	11.5	1.2	8.6	10.6	0.3	41.2	9.6	100.0
Southern Transdanubia	17.2	9.6	1.1	8.1	8.9	0.3	43.2	11.6	100.0
Northern Transdanubia	17.3	11.3	1.4	7.2	12.7	0.3	39.1	10.7	100.0
Net Migration (rates per 1000 population)									
Central Industrial	2.30	1.30	0.34	−0.13	0.91	0.04	1.49	0.44	6.67
Northern Industrial	−0.51	0.01	−0.14	0.01	0.13	−0.01	0.18	0.20	−0.52
Northeast Alföld	−1.94	−1.39	−0.12	−0.08	−1.07	−0.01	2.73	−0.17	−7.51
Southeast Alföld	−0.92	−0.91	−0.15	0.03	−0.64	−0.00	1.36	−0.32	−4.28
Southern Transdanubia	−0.59	−0.38	−0.11	0.12	−0.07	−0.01	−0.28	−0.10	−1.42
Northern Transdanubia	−0.27	0.18	−0.10	0.15	0.02	−0.02	1.14	−0.04	1.05

Table 20. (continued)

Region	Change of employment	Closer to place of work	Education	Change of dwelling	At marriage	Medical purposes & visiting	Dependent	Other & Unknown	Total
				Temporary In-migration					
Central Industrial	49.9	14.4	13.4	2.2	2.5	6.7	5.5	5.4	100.0
Northern Industrial	49.3	15.4	12.5	1.5	2.5	3.3	11.8	3.7	100.0
Northeast Alföld	36.0	11.0	22.5	1.3	2.8	8.3	14.5	3.6	100.0
Southeast Alföld	29.7	12.9	33.5	1.3	2.5	4.5	12.0	3.6	100.0
Southern Transdanubia	40.7	11.4	11.1	2.7	2.6	10.8	15.6	5.1	100.0
Northern Transdanubia	43.8	12.4	13.2	1.7	2.9	8.9	12.6	4.5	100.0
				Temporary Out-migration					
Central Industrial	30.6	11.2	10.1	2.2	4.5	20.0	14.2	7.2	100.0
Northern Industrial	49.1	13.5	15.6	1.6	1.9	4.2	10.1	4.0	100.0
Northeast Alföld	57.2	13.6	11.3	1.8	1.8	2.7	7.9	3.7	100.0
Southeast Alföld	45.1	15.2	18.8	2.0	2.4	4.5	8.1	3.9	100.0
Southern Transdanubia	41.3	13.6	17.7	2.4	2.6	6.3	11.0	5.1	100.0
Northern Transdanubia	38.9	13.3	21.3	1.8	2.6	7.5	9.5	5.1	100.0

although inducing an insignificant proportion of gross permanent out-migration from the villages, it must not be ignored as a factor accounting for the net drift of population to urban areas.

This analysis of the behavioural aspects of why people migrate in Hungary has been constrained by the necessity of using data collected through a questionnaire designed by the Central Statistical Office. Important aspects of the problem such as the educational attainment of migrants, their individual migration histories and their decision making process could not therefore be discussed. It is clear, however, that significant variations in the reasons generating migration occur at the rural-urban level. Territorial differentials are not great. In addition we are able to conclude that the determinants of spatial mobility in Hungary are more complex than suggested by Sárfalvi (1965), who strongly emphasised as the dominant factor, the economic motive of migrating when leaving an agricultural occupation for one in industry; for although the net drift of population from rural to urban areas is stimulated by economic forces, the movement of dependents, in this process, is even more significant, while marriage accounts for a sizeable part of the net flow. In addition, net rural-urban migration is but a small component of total population movement in Hungary.

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CHAPTER 8

THE DETERMINANTS OF URBAN MIGRATION IN HUNGARY

Chapter 7 was designed to account for migration in Hungary from the view point of the individual migrant. Although a degree of variability in the relative significance of particular reasons for migrating by settlement class, county and region was indicated, the balance of motivating factors was similar and showed a large degree of stability over time. The economic inducements for migrating, namely change of employment and residing closer to place of work were dominant although the social factors of marriage and education also generated significant numbers of migrations. Yet while one is able to infer from the proportions of migration attributable to particular reasons the general determinants of spatial mobility, this type of analysis provides little insight into the characteristics of particular places and areas that generate internal migration in Hungary and specify the directions and patterns of movement.

The analyses by Hungarian workers of one aspect of this question, namely the net flow of population from rural to urban areas have been reported in chapter 6 but as was argued there, net rural-urban flows form but a small component of the internal migration process in Hungary. Firstly, they disguise far larger gross population movements generated between rural and urban areas. Secondly, the large scale intervillage and interurban movements are ignored. Although general pointers are available an adequate comprehension of these gross flows requires a precise understanding of the functional relations between such movements and the socio-economic characteristics of the places involved in the migration process. Unfortunately gross movements between urban and rural areas and intervillage movement cannot be thus analysed at present owing to deficiencies in the socio-economic data of rural areas. The analysis of the migratory characteristics of urban places and interurban migration flows is more favourably placed, however, owing to the wealth of data concerning their socio-economic features. In the subsequent analyses we consequently concentrate on this aspect of migration.

In this chapter linear multiple regression models[1] are developed, to explain and describe in a statistical sense the rates of net migration, in-migration, and out-migration of

[1] Although a well tried and proved technique, there are certain assumptions that have to be fulfilled before one can justifiably employ linear multiple regression. The choice of data measurement scales is critical as the regression equations are calculated on the assumption of the linear relationships of the data. In the present analysis as there is no reason to believe that the relationships between the variables are other than linear, this assumption is not tested. Normality of the input data is a further important assumption as it is on this basis that the standard deviation, variance and significance and confidence tests – 't' statistic, confidence intervals, etc. – are calculated. If any of the input data is not normal

the towns of Hungary excluding Budapest between 1960 and 1964.[2]. On the assumption that the relationships listed are constant over time the mathematical formalisation of the models also allows the prediction of the various migration parameters provided that the values of the independent variables utilised in the analysis are known. It is suggested that the differing migration characteristics of the urban settlements investigated are a function of their distinctive demographic, economic and social features as well as of the interrelationships between these features. This proposition is not new to migration analysis and has been tested, generally for net migration with fair success by workers in the United States of America (Anderson 1956, Kariel 1963, Tarver et al 1961) and in Europe (Lovgren 1956, Olsson 1965, Blanco 1964).

Since place of origin and destination are ignored in this analysis, we obtain a statistical explanation of all internal migration that involves urban areas. The explanation of in-migration is approached through the factors that attract migrants to specific urban centres. Out-migration, by comparison, is conceived from the view point of the factors that repel from urban places. Inter-urban and rural-urban migration is thus explained in terms of the socio-economic features of the urban centres involved in the process. Consequently, intervillage movements are the only component of migration not specifically treated here.

8.1 Conceptual Framework

The current analysis, as well as the other studies mentioned, utilises the fundamental migration concept of "push-pull" (Goodrich 1936). All places possess demographic, social and economic features that both repel and attract population, but which operate on potential migrants in different ways depending on their socio-economic status, age, sex, etc. The volumes and rates of movement between places may be expressed in terms of the interrelationships among the respective characteristics of repulsion and attraction, while the sign and magnitude of net migration of a given place reflects the delicate balance between these features. A more formal statement of the "push-pull" concept for Hungarian migration can be expressed in terms of three propositions.

Firstly, it is assumed that differentials exist in the demographic, social and economic characteristics of the towns of Hungary which, for example, are reflected not only in variations in population size and employment opportunities, but also in the structure of such parameters. These may be regarded as "in-built" disparities which are the result of

then transformations are necessary. There are few perfectly normal distributions among socio-economic data (Ferber and Verdoorn 1962) but a compromise must be struck between rigorously satisfying the normality assumption and the interpretation of the regression results. The latter becomes difficult when the transformations are mathematically complex. In the social sciences approximately normal distributions are generally obtained with quite simple transformations, although in such instances the significance levels in tests of correlation and regression coefficients should also be regarded as approximate. Therefore, where necessary the input data in this analysis has been approximately normalised. A further assumption is the independence of the explanatory variables in the regression equation. This is a major problem as covariance can arise through multi-collinearity and auto correlation. If such interrelationships are not understood, spurious interpretations of regression results can be made. Intercorrelation between the independent variables are partly eliminated through principal component analysis prior to the regression analysis.

[2]The location of the urban settlements of Hungary is shown on map 37, appendix 1.

unequal rates of change over long time intervals. It is these that generate the majority of population movements, e. g. routine changes of employment, marriage, etc.

Secondly, Hungary has been passing through a period of economic transformation during which industry has rapidly spread outside its traditional areas of location. This has created new employment opportunities in many settlements which cannot always be filled by the population residing there. Indeed, a simple correlation analysis suggests a negative relationship between the level and pace of economic development in an urban centre, and its crude birth rate and the rate of natural increase[1]. Consequently, the physical movement of population from less developed towns and from rural areas must restore the manpower disparities so created.

The third proposition in closely related to the second. Although the concentration of industrial activity in the traditional areas of the country is being broken down and a more even spatial spread of employment opportunities in the non-agricultural sectors of the economy being created, this is a long term process and one requiring enormous investment. The modernisation of agriculture has gone ahead rapidly, however, and is therefore releasing manpower from the agricultural sector which is not always able to find local employment, owing to the still uneven spread of non-agricultural opportunities. The population employment disparities thus created are in the short term again solved by a redistribution of population through physical movement rather than by the relocation of factories, offices, etc.

8.2 Index Variables of the Demographic, Social and Economic Characteristics of the Towns of Hungary

Since it is posited that it is the unique combination of demographic, social and economic features of each urban centre that determines its migratory characteritics, a set of variables must be established to measure these distinctive traits.

The general factors associated with the movement of individual migrants provides some assistance here (chapter 7) in that we know the balance of demographic, social and economic factors in the generation of migration. But at the same time we are unaware of the interrelationships between these general factors and the socio-economic features of the urban centres that ultimately determine the pattern of spatial mobility. It therefore cannot be assumed that particular features of the urban environments more characteristically induce migration than others. This necessitates the establishment of a comprehensive set of socio-economic measures of urban conditions and forty-six variables were consequently selected to characterise the demographic, social and economic environments of the chosen towns. These variables are presented in table 21[2].

The demographic and economic variables fall into two categories, namely those measuring magnitude and volume on the one hand, and those concerned with structure

[1] Three instances only are quoted here. Negative correlations exist between the live birth rate and percent of the population employed in the service industries ($r = -.46$), change in employment in heavy industry between 1960 and 1964 ($r = -.07$), and change in employment in light industry ($r = -.41$).

[2] The 46 variables were selected from data published in the 1960 Hungarian Census, the Demographic Yearbooks (1960 to 1964) and the volume Magyar Városok (1966, ed. Egon Szabady).

on the other. The social variables are divided into five main categories comprising educational attainment, educational availability, housing conditions, medical facilities and cultural level[1]. Since it is posited that recent change in the demographic, economic and social characteristics is of particular importance in influencing recent movement patterns, indices of change are calculated for the period 1960 to 1964[2].

Table 21. Index Variables of the Socio-Economic Characteristics of the Towns of Hungary

I. DEMOGRAPHIC VARIABLES

1. *Volume and magnitude of demographic characteristics*
   - X_1 Population size (1960)
   - X_2 Population size (1964)
   - X_3 Natural increase 1960 to 1964
   - X_4 Actual increase 1960 to 1964

2. *Demographic structure*
   - X_5 Per cent population change 1960 to 1964
   - X_6 Sex ratio (1962)
   - X_7 Live birth rate per thousand (1962)
   - X_8 Crude death rate per thousand (1962)
   - X_9 Per cent population under the age of 14 (1962)
   - X_{10} Per cent of population aged 15 to 59 (1962)
   - X_{11} Per cent of population over 60 (1962)

II. ECONOMIC VARIABLES

1. *Volume and magnitude of economic activity*
   - X_{12} Labour force number (1962)
   - X_{13} Labour force employed in heavy industry (1962)
   - X_{14} Labour force employed in the machines industry (1962)
   - X_{15} Labour force employed in light industry (1962)
   - X_{16} Total number of industrial establishments (1962)
   - X_{17} Number of ministry industrial establishments (1962)
   - X_{18} Total retail trade sales (millions of forint) (1962)
   - X_{19} Retail food sales (millions of forint) (1962)
   - X_{20} Durable consumer goods sales (millions of forint (1962)
   - X_{21} MÁV ticket sales 1962

[1] Cultural level is measured rather imperfectly by number of television licenses and cinema places.

[2] This is a possible weakness in experimental design since population movements between 1960 and 1964 may also reflect changes occurring in the years immediately preceding 1960, owing to delayed migratory response. The problem here, however, is one of data availability, and data for many of the variables are not available for the second half of the 1950's. Although the 1949 census does allow the computation of indices of change for some of the variables, the rapid pace of evolution renders average values relating to the eleven year interval 1949 to 1960 irrelevant for an understanding of migration during the first five years of the 1960's.

2. *The structure of economic activity*

X_{22} Per cent employed in agriculture in 1960
X_{23} Per cent employed in industry and construction in 1960
X_{24} Per cent employed in service industry in 1960
X_{25} Per cent change in heavy industry labour force 1960–64
X_{26} Per cent change in light industry labour force 1960–64
X_{27} Per cent change in per capita retail sales 1960–64.
X_{28} Dependents per 100 workers (1962)
X_{29} Workers per 100 families (1962)

III. SOCIAL VARIABLES

1. *Educational attainment*

X_{30} Per cent finishing general school (1960)
X_{31} Per cent with high school matriculation and university diploma (1960)

2. *Educational opportunities*

X_{32} Number of middle school pupils (1962)
X_{33} Number of gymnasium pupils (1962)
X_{34} Number of nursery school places (1962)
X_{35} Number of general school teachers (1962)

3. *Housing conditions*

X_{36} Total dwelling stock (1962)
X_{37} Increase in dwellings stock 1960 to 1964 (per cent)
X_{38} Annual rate of dwelling construction 1960–64
X_{39} Number of dwellings with bath (1962)
X_{40} Rooms per hundred dwellings (1962)
X_{41} Population per hundred dwellings (1962)
X_{42} Dwelling density (1962)
X_{43} Suburban (tanya) population (1960)

4. *Medical facilities*

X_{44} Doctors per 100 inhabitants (1962)

5. *Entertainment*

X_{45} Number of T. V. licences (1962)
X_{46} Number of cinema places (1962)

A regression model utilising all 46 variables, however, is an illogicality and uneconomical because many of the independent variables are inter-correlated and are measuring similar socio-economic features. Moreover, the use of such a large set of independent variables with the resulting high degree of inter-correlation makes any regression result difficult to interpret. To partially resolve these problems, in particular to eliminate redundancies from the battery of independent variables, a principal components analysis was performed on the 46X46 data matrix. Independent variables were then selected for inclusion in the regression models on the basis of the principle components analysis and their a priori relationship to the reason structure of migration discussed in chapter 7.

8.3 Selected Variables

Dependent variables

Six separate regression models have been computed to describe the various migration aspects of the 62 cities and towns of Hungary. The dependent variables Y are as follows:

i) Y_n is the average annual net migration rate for the years 1960 to 1964. ii) Y_{pi} refers to the average rate of in-migration involving permanent changes of residence over the same five years[1]. iii) Y_{po} represents the average annual rate of out-migration involving permanent changes of residence over the same period[2]. iv) Y_{tt} is the sum of Y_{pi} and Y_{po} and is the average annual rate of total permanent migration activity over the same five years. v) Y^1_{ti} and vi Y^2_{to} are the average annual rates of temporary in- and out-migration respectively over the five years 1960 to 1964. The values of each of the dependent variables are approximately normally distributed and no transformations were undertaken.

Independent variables

Prior knowledge of the reasons why people migrated dictated a compromise between strict adherence to statistical principles and more subjective judgement in the selection of independent variables. Adherence to strict statistical principles would have demanded the adoption of five variables to characterise each of the five significant components derived from the principal components analysis whether or not they were significant in the context of migration theory. The independent variables, therefore, were selected on the basis of either a high loading on a particular component or a strong a priori relationship with the reasons for moving, or both. A degree of intercorrelation amongst the independent variables was therefore unavoidable.

[1] The in-migration rates are computed from the population sizes of the urban settlements of destination.

[2] The out-migration rates are computed from the population sizes of the urban centres of origin.

General opportunities and migrant availability
Operational difinition – population size in 1960 – (X_1)

The relationship between migration and population size has been discussed by a number of writers. Firstly, population numbers determine the volume of individuals available to move (Anderson 1956). Secondly, information about places and the flows of information between places, which naturally determine whether the relative attractiveness of a centre to potential migrants is broadly disseminated, may be considered proportional to population size (Heide 1963). Thirdly, it is a reasonable assumption that the larger an urban centre, the greater is the number of available opportunities which are likely to attract potential migrants, whether they be social opportunities – (e. g. quality of housing), economic opportunities (e. g. the availability of jobs), or demographic opportunities (e. g. the number of marriage eligibles).

For the prupose of the analysis the population size of the 62 urban centres in 1960 was selected as the operational definition of general opportunities and migrant availability. It loads most highly on principal component 1 and is superior to either the mid- or terminal population of the period of analysis by facilitating migration prediction by the regression models. The distribution of population sizes is lognormal and the logarithms of the observed values have been taken to approximate normality. The hypothesised relationships between population size and the dependent variables are presented in table 22.

Table 22. Hypothesised Relationships between the Independent and Dependent Variables

	X_1	X_2	X_3	X_4	X_5	X_6	X_7	X_8	X_9
Y_n	Positive	Positive	Positive	Positive	Negative	Negative	Positive	Positive	Positive
Y_{pi}	Negative	Positive	Positive	Positive	Negative	Negative	Positive	Positive	Positive
Y_{ti}	Negative	Positive	Positive	Positive	Negative	Negative	Positive	Positive	Positive
Y_{tt}	Negative	Positive	Positive	Positive	Negative	Negative	Positive	Positive	Positive
Y_{po}	Negative	Negative	Negative	Negative	Positive	Positive	Negative	Negative	Negative
Y_{to}	Negative	Negative	Negative	Negative	Positive	Positive	Negative	Negative	Negative

Economic variables

As change of job is invariably the most important "active" reason given by both males and females for migrating, three independent variables were selected to measure the economic features of the 62 towns likely to influence the areal choise of jobs by migrants.

Spatial variations in income
Operational definition: industrial earnings index (X_2)

Spatial variations in the per capita income have been recognised by a number of workers as being an important determinant of migration (Goodrich, op.cit., Anderson op.cit., Lowry 1966). Unfortunately, no per capita income data are available for the areal units demanded by this investigation. However, the publication of the 1966 wage bill for selected industrial types by urban centres (Területi Zsebkönyv 1968) made it possible to compute a per capita industrial earnings index for those employed in State and Socialist Industry which is included here as variable X_2. It is recognised that the earnings index is an imperfect measure of per capita income, yet it is the best available. Moreover, in view of the fact that many migrants in Hungary are moving from agricultural to industrial employment, for whom it is reasonable to assume that an important determinant in the choice of urban centre is the relative level of industrial wages, the industrial earnings index becomes an important factor in its own right in influencing migration.

X_2 was not available for inclusion in the principal components analysis, but a later correlation analysis demonstrated its high association with the percentage of the population employed in manufacturing industry and in construction ($r = 0.82$). It is therefore considered a good measure of component 2.

The relationship hypothesised between the dependent variables and X_2 are presented in table 22.

Type of industrial employment opportunity
Operational definition: number of industrial establishments under ministerial control – (X_3)

It can be argued that, in part, the net outflow of population from the rural areas of Hungary is caused by the lack of employment opportunities in manufacturing industry in such regions[1]. The corollary to this is that the net population inflow to the towns is partially consequent upon the opportunities for industrial employment that they provide. This argument can be taken further in that it may be supposed that the relative attractiveness of urban centres depends on the proportion and number of opportunities offered in industry.

It has already been assumed that the number of opportunities is a function of population size – variable X_1. But a further important factor is the type of industrial opportunity available. In this respect it may be assumed that urban centres in which

[1] Sárfalvi (1964) has identified lack of industrial employment in rural areas as the primary reason for the drift of population to the towns.

modern growth industries[1] are located are likely to be more attractive to potential migrants than other centres. As the operational definition of this variable, industrial establishments under ministerial direction, which comprise the large factories of the country in such branches as chemicals, engineering, steel, mining, etc. has been selected. It effectively separates the sectors contributing highly to the economy from those of lesser importance. The distribution of this variable is log-normal and a logarithmic transformation is therefore undertaken to approximate normality. The hypothesised relationships between X_3 and the dependent variables are as for X_2 (table 22).

Change in urban living standards
Operational definitions: percentage change in per capita retail sales 1960–1964 – (X_4)

Differences in urban economic growth rates have been posited as a factor inducing migration in Hungary, recent change being of particular significance. In addition it can also be argued that interurban variations in the quality of economic life may well be a significant determinant of migratory patterns. Places with high levels of living can be expected to attract population and contrarywise for the places where levels of living are comparatively low. Percentage change in per capita retail sales between 1960 and 1964 is designed to combine both factors, on the assumption that increase in retail sales, other things being equal, is directly related to general economic growth rates and rise in living standards.

The hypothesised relationships between X_4 and the dependent variables are as for X_2 (table 22).

Demographic variables

We have already seen that dependents comprise a considerable body of permanent migrants, and the two variables which follow are designed to draw this fact into the regression analysis. The incidence of marriage as a demographic factor inducing migration may be considered a function of population size and is thus included within variable X_1.

Population pressure
Operational definition: natural increase 1960–1964 – (X_5)

It has already been demonstrated that an inverse relationship holds between the rate of natural increase and population size, and between the birth rate and change in the numbers employed in manufacturing industry. By contrast, a direct relationship holds between the rate of natural increase and the number employed in agriculture. In other words, those areas with the fastest rate of economic growth appear to experience the lowest rates of natural population increase. We might thus expect people to move from areas of high natural increase, which tend to be poorly developed economically and

[1] Growth industries in the planned socialist economy of Hungary comprise a somewhat different spectrum from those in the developed capitalist world. Emphasis is not placed, to the same extent, on production for the consumer market, but rather on the production of the more basic goods, such as chemicals, engineering products, scientific and precision instruments, etc.

socially, to more advanced regions of slower natural growth. To express it in another way, we might well expect people to move away from areas of relative population pressure – where opportunities are low – to areas of relative underpopulation (Hamilton 1951). Naturally one expects this process to be most significant in the case of contrasting urban and rural environments but equally one may expect it to operate between dissimilar urban centres and to influence the choice of urban settlement of former rural dwellers and of interurban movers. The variable natural increase between 1960 and 1964 is thus introduced as a measure of population pressure.

The relationship hypothesised between natural increase and the dependent variables are presented in table 22.

Dependents per 100 wage earners – (X_6)

Pressure of population, however, need not reflect current variations in the rates of natural increase, but may well be the result of high rates of growth and migration in the past. This is the likely case in Hungary where the crude birth rate has generally declined during the last years to a minimum in 1962. Consequently, the additional variable ratio of dependents to gainfully employed population in 1962, has been added to characterise population pressure resulting from past patterns of natural increase and population movements. The ratio of dependents to earners reflects fertility over the last decade and has the additional advantage of incorporating elderly dependents, who, in rural areas, may be of particular significance in depressing family living standards and thus inducing younger dependents to migrate. Moreover X_6 loads highly on component 5. The hypothesised relationships between X_6 and the dependent variables are as for X_5 (table 22).

Social variables

Educational attainment
Operational definition: percentage of the population with higher education qualifications in 1960 – (X_7)

The migratory reason structure indicates that a considerable percentage of temporary moves are generated by the process of higher education. No data were available on the spatial distribution of students in institutions of higher education and consequently this direct measure could not be included here as an independent variable. Moves thus motivated are therefore measured indirectly by the introduction of the variable – percentage of the population with higher education diplomas – on the assumption that many ex-students will continue to reside in the places where they received their higher education.

Moreover, general educational attainment is a useful general measure of the relative attractiveness of places to potential migrants. It reflects economic attractiveness to the extent that many jobs requiring higher educational qualifications are restricted to the larger and more important urban centres. Additionally, many qualified people are unwilling to move to minor provincial centres, even when employment opportunities are available, because of their relative lack of social and cultural amenities. In this respect then the proportion of population in a place with university and other higher education qualifications is also an index of social and cultural amenities.

The relationships hypothesised between educational attainment and the dependent variables are presented in table 22.

Quality of Housing
Operational definition: rooms per 100 dwellings – (X_8)

It was suggested in chapter 7 that intersettlement class gradients in the proportion of migrating dependents relate to the availability and quality of housing at the places of destination. Variable X_8 – the average number of rooms per 100 dwellings – is specifically designed to measure the quality of available housing and, other things being equal, may be regarded as an index of relative overcrowding. The attractiveness of urban centress to potential migrants is, therefore, a direct function of this variable. X_8 loads highly on components 4 and 13.

The hypothesised relationships between X_8 and the dependent variables are as for X_7 (table 22).

Housing availability
Operational definition: increase in the stock of dwellings between 1960 and 1964 – (X_9)

Whereas variable X_8 measures the quality of housing, X_9 is designed to assess housing availability, an important consideration for all migrants but especially for those with families. The large influx of population from the rural areas to the towns since the second world war has tended to aggravate the shortage of urban housing in Hungary and housing availability in urban centres is consequently closely related to the difference between the number of new houses constructed and the number of old dwellings demolished over a given time period. The relationship, however, between increase in the stock of dwellings and migration is a two way process. The construction of new dwellings may well stem from past heavy in-migration to an area as well as high and sustained rates of natural increase but such a case is unikely to increase the stock of dwellings available to new migrants. On the other hand, new dwellings can be constructed specifically to attract migrants to a place, for example, in the case of the new socialist towns and other places designed as growth centres. With the latter particularly in view, it is suggested that places, where the number of dwellings is increasing, are likely to attract migrants. Moreover, the construction of new dwellings also reflects the general level of urban economic activity and fairly high correlations may be expected between X_9 and the industrial earnings index (X_2). X_9 loads most highly on component 2.

The hypothesised relationships between X_9 and the dependent variables are presented in table 22.

8.4 Statistical Analysis

Stepwise multiple regression analysis was used to test the hypotheses and to formulate models of the relationship between the dependent and independent variables[1]. In this technique, a series of regression equations are computed such that, at each step, that independent variable is introduced into the regression set which accounts for the largest portion of unexplained variance in the dependent variable. Thus at the first iteration a simple linear regression equation is computed with that independent variable having the highest correlation with Y. At the second iteration the independent variable that accounts for the largest proportion of the remaining variance in the dependent variable is brought into the regression set and so on. The routine is completed when no independent variable can be introduced into the regression set that reduces the unexplained variance in the dependent variable by a statistically significant amount[2]. The analysis thus computes the optimum subset of independent variables for explaining the dependent variable in a statistical sense. The regression model has the form:

$$Y = b_o X_o + b_1 X_1 + \ldots + b_n X_n + E$$

where

X_o is an artificial variable which has the constant value $X_o = 1, X_1, X_2 \ldots X_n$ are the independent variable 1,2 . . .n, E is an error term.

By the stepwise procedure, the independent variables are ranked in accordance with their ability to reduce the unexplained variance in Y at each regression step. It is here that the problem of intercorrelation presents itself for when two or more independent variables are highly related, the introduction into the regression analysis of a variable from this subset reduces the significance of those variables with which it highly correlates at later steps. Hence the use of principal components analysis as a preliminary to the regression analysis[3].

The independent variables, however, were selected to both minimise intercorrelation and to conform to the reason structure for individual migrations. Therefore since strict statistical principles were being compromised some degreee of association between the independent variables was unavoidable as demonstrated by the zero order correlation matrix (table 23).

Thus X_9 (increase in dwelling stock) is fairly highly correlated with X_2 (industrial earnings index) – $r = 0{,}57$. X_3 (number of industrial establishments under ministerial control) correlates strongly with X_1 (polulation size in 1960) – $r = 0.71$, while X_6 (dependents per 100 wage earners) is related to X_7 (percentage of population with higher education) – $r = 0.65$.

[1] The standard ICL package program XDS2 was adopted for this problem.

[2] The whole universe rather than a sample of Hungarian towns is analysed here. All independent variables are therefore logically significant. For the convenience of establishing certain critical limits, however, a sample from an infinite population is assumed.

[3] A stepwise regression analysis was undertaken with net migration as the dependent variable and the first ten principal components from the 46 x 46 data matrix as independent variables. The level of explanation was surprisingly low being only 46 per cent.

Table 23. Zero Order Correlation Matrix of Variables Included in the Investigation

	Y_n	Y_{po}	Y_{pi}	Y_{tt}	Y_{ti}	Y_{to}	X_1	X_2	X_3	X_4	X_5	X_6	X_7	X_8
Y_{po}	− 0.24													
Y_{pi}	0.89	0.16												
Y_{tt}	0.69	0.50	0.93											
Y_{ti}	0.61	− 0.02	0.61	0.53										
Y_{to}	− 0.60	0.52	− 0.35	− 0.12	− 0.30									
X_1	0.11	− 0.48	− 0.13	− 0.29	− 0.05	− 0.23								
X_2	0.65	− 0.17	0.55	0.43	0.57	− 0.58	0.16							
X_3	0.50	− 0.54	0.22	− 0.01	0.19	− 0.58	0.72	0.47						
X_4	0.48	− 0.04	0.51	0.43	0.48	− 0.25	− 0.15	0.28	− 0.01					
X_5	0.53	0.18	0.60	0.59	0.55	− 0.24	− 0.18	0.60	− 0.07	0.43				
X_6	− 0.37	0.57	− 0.11	0.11	0.01	0.46	− 0.34	− 0.07	− 0.55	0.04	0.35			
X_7	0.50	− 0.55	0.22	− 0.01	0.15	− 0.54	0.40	0.21	0.70	0.40	− 0.11	− 0.65		
X_8	0.64	− 0.11	0.58	0.47	0.48	− 0.48	− 0.17	0.56	0.29	0.20	0.38	− 0.18	0.41	
X_9	0.86	− 0.22	0.76	0.58	0.54	− 0.50	0.07	0.57	0.37	0.44	0.60	− 0.23	0.39	0.44

With few exceptions the correlations between the independent and dependent variables are significant at the 0.1 per cent level. The major exception is the dependent variable Y_{po}4 (the rate of permanent out-migration) which has statistically significant correlations with five of the independent variables only, namely X_1 (population size), X_6 (dependents per 100 workers), X_4 (change in retail sales), X_7 (per cent with higher education) and X_3 (number of industrial establishments under ministerial control). The net migration rate is significantly correlated with all independent variables.

Intercorrelations between the dependent variables are of interest. Y_n (net migration rate) correlated most highly with Y_{pi} (the rate of permanent in-migration) – $r = 0.89$ which in turn is strongly correlated with Y_{tt} (total permanent migratory activity ($r = 0.93$). In contrast, the correlation between Y_n and Y_{po} – the rate of permanent out-migration, is negative but is not significant at the 0.1 level. Fairly high correlations exist between Y_n and Y_{tt}, Y_n and Y_{ti} – the temporary in-migration rate, and Y_n and Y_{to} the temporary out-migration rate. Low negative correlations are found between the permanent and temporary in-migration rates and their respective out-migration rates, but fairly strong positive relationships occur between the permanent and temporary in-migration rates ($r = 0.61$) and the permanent and temporary out-migration rates ($r = 0.52$).

The regression models

The results from the regression analyses are summarised in table 24. With Y_n as dependent variable, X_9 (increase in dwelling stock), X_8 (rooms per 100 dwellings), X_4 (increase in retail sales) and X_6 (dependents per 100 workers) account for a statistically significant portion of the explained variance in the dependent variable at the 99 per cent confidence level. X_2 (the industrial earnings index) is significant at the 95 per cent level. Combined, these five independent variables account for 86.9 per cent of urban variations in the rate of net migration, an encouraging level of explanation. The five variable regression model has the following equation[1].

$$Y_n = -38.5304 + 1.8933X_9 + 0.2656X_8 + 0.4256X_4 - 0.1792X_6 + 0.0058X_2$$
$$(9.3614) \quad (0.2205) \quad (0.0629) \quad (0.1686) \quad (0.04835) \quad (0.0028) \quad \ldots \text{eq. 1}$$

The second model treats the permanent out-migration rate – Y_{po} – as dependent variable. X_6 (dependents per 100 workers) and X_1 (population size in 1960) are significant at the 99 per cent confidence level. The percentage of population in the various urban centres with higher education qualifications in 1960 (X_7) is significant at the 95 per cent level. Combined, however, these three variables account for only 43.4 per cent of the variation in the rate of permanent out-migration. The regression model has the following equation:

$$Y_{po} = 50.0144 + 0.1459X_6 - 2.9714X_1 - 0.2780X_7$$
$$(13.6746) \quad (0.0595) \quad (1.1481) \quad (0.1696) \quad \ldots \text{eq. 2}$$

[1] Figures in brackets are the standard errors of regression coefficients.

Table 24. Summary Table of the Regression Models

Step	Variable added to Regression Set	R^2	Increase in R^2	„t" Statistic
	DEPENDENT VARIABLE – Y_n			
1	Increase in dwelling stock – X_9	.734	.734	12.89[1]
2	Rooms per 100 dwellings – X_8	.817	.083	5.19[1]
3	Dependents per 100 wage earners – X_6	.843	.026	3.06[1]
4	Increase in per capita retail sales – X_4	.859	.016	2.52[1]
5	Industrial earnings index – X_2	.869	.010	2.04[2]
	Standard error of estimate S_{yc} = 5.15 migrants $^0/_{00}$			
	DEPENDENT VARIABLE – Y_{pi}			
1	Increase in dwelling stock – X_9	.569	.569	8.89[1]
2	Rooms per 100 dwellings – X_8	.638	.069	3.39[1]
3	Increase in per capits retail sales – X_4	.676	.038	2.58[1]
4	Per cent with higher education – X_7	.694	.018	1.86[2]
	Standard error of estimate S_{yc} = 8.86 migrants $^0/_{00}$			
	DEPENDENT VARIABLE – Y_{po}			
1	Dependents per 100 wage earners – X_6	.314	.314	5.23[1]
2	Population size in 1960 – X_1	.408	.094	3.07[1]
3	Per cent with higher education – X_7	.434	.026	1.68[2]
	Standard error of estimate S_{yc} = 4.98 migrants $^0/_{00}$			
	DEPENDENT VARIABLE – Y_{ii}			
1	Industrial earnings index – X_2	.323	.323	5.35[1]
2	Increase in per capita retail sales – X_4	.444	.121	3.58[1]
3	Rooms per 100 dwellings – X_8	.477	.033	1.92[2]
	Standard error of estimate S_{yc} = 38.02 migrants $^0/_{00}$			
	DEPENDENT VARIABLE – Y_{io}			
1	Industrial earnings index – X_2	.476	.476	7.38[1]
2	Ministerial industrial establishments – X_3	.613	.137	4.57[1]
3	Increase in dwelling stock – X_9	.640	.027	2.09[1]
4	Dependents per 100 wage earners – X_6	.659	.019	1.79[2]
	Standard error of estimate S_{yc} = 5.82 migrants $^0/_{00}$			
	DEPENDENT VARIABLE – Y_{ti}			
1	Natural increase 1960–64 – X_5	.354	.354	5.73[1]
2	Increase in dwelling stock – X_9	.430	.076	2.80[1]
3	Population size 1960 – X_1	.496	.066	2.76[1]
4	Rooms per 100 dwellings – X_8	.513	.017	1.68[2]
	Standard error of estimate S_{yc} = 12.06 migrants $^0/_{00}$			

[1] Significant at the 99 per cent level of confidence
[2] Significant at the 95 per cent level of confidence

With the rate of temporary out-migration as dependent variable, three independent variables are significant at the 99 per cent confidence level – X_2 (industrial earnings index), X_3 (number of ministerial industrial establishments) and X_9 (increase in the dwelling stock). X_6 (dependents per 100 workers) is significant at the 95 per cent level. The resulting regression equation is:

$$Y_{to} = \underset{(7.5379)}{38.7090} - \underset{(0.0650)}{0.2534X_2} - \underset{(1.2350)}{3.7074X_3}\ \underset{(0.2277)}{0.4710X_9} + \underset{(0.0624)}{0.1116X_6} \quad \ldots \text{eq. 3}$$

Combined, these four variables account for 65.9 per cent of the variation in the rate of temporary out-migration.

The fourth and fifth regression models treat the rates of permanent in-migration – Y_{pi} – and temporary in-migration – Y_{ti} – as dependent variables. 69.4 per cent of the variance in Y_{pi} is accounted for by the four variables X_9 (increase in dwelling stock), X_8 (rooms per 100 dwellings), X_4 (increase in retail sales) and X_7 (percentage of the population with higher education qualifications). X_9, X_8 and X_4 are significant at the 99 per cent level, X_7 at the 95 per cent confidence level. The regression equation is of the form:

$$Y_{pi} = \underset{(13.3471)}{-34.1263} + \underset{(0.3515)}{2.1821X_9} + \underset{(0.1007)}{0.4029X_8} + \underset{(0.2896)}{0.6604X_4} - \underset{(0.2513)}{0.4664X_7} \quad \ldots \text{eq. 4}$$

Treating the rate of temporary in-migration (Y_{ti}) as the dependent variable, the three variables X_4 (change in per capita retail sales), X_2 (industrial earnings index) and X_8 (rooms per 100 dwellings) accounted for 47.7 per cent of the variance in Y_{ti}. X_4 and X_2 are significant at the 99 per cent level. The degree of statistical explanation, however, is disappointingly low. The three variable regression equation is:

$$Y_{ti} = \underset{(58.0280)}{-267.9924} + \underset{(1.1554)}{4.0707X_4} + \underset{(1.4018)}{4.3487X_2} + \underset{(0.4492)}{0.8621X_8} \quad \ldots \text{eq. 5}$$

A four variable regression model explains 51.3 per cent of the variance of Y_{tt} (total permanent migration activity), the independent variables being X_9 (increase in dwelling stock), X_1 (population size), X_5 (natural increase) and X_8 (rooms per 100 dwellings). X_8 is significant at the 95 per cent confidence level, the remainder at the 99 per cent level. The regression model has the following equation:

$$Y_{tt} = \underset{(37.6643)}{93.3230} + \underset{(0.5405)}{1.5564X_9} + \underset{(2.8225)}{6.9965X_1} + \underset{(0.1187)}{0.2751X_5} + \underset{(0.1433)}{0.2013X_8} \quad \ldots \text{eq. 6}$$

Interpretation of the multiple regression models

The regression models provide a statistical description of the functional relationship between migration and a set of variables characterising the socio-economic status of the towns of Hungary. Although statistical associations do not necessarily imply casual relationships, the degree of statistical fit of the various models together with satisfactory a priori explanations of the relationships between the dependent and independent variables makes it possible to interpret the results with some confidence.

Net migration – (Y_n) and the rate of permanent in-migration – (Y_{pi})

The associations between Y_n and Y_{pi}, and the independent variables are very similar and it is reasonable to assume that the same factors are generating both types of migration. Of the independent variables, the increase in the stock of dwelling units between 1960 and 1964 (X_9) is most strongly related to both Y_n and Y_{pi}. It is introduced at the first regression steps and accounts for 73 per cent of the variation in the rate of net migration and 57 per cent of the variation in the rate of permanent in-migration. Its partial correlation coefficients are never less than 0.75 and 0.61 with Y_n and Y_{pi} respectively. The ratio of rooms to dwellings – X_8 – is brought into the regression sets at the second step and increases the portions of explained variance in net migration to 81.7 per cent and in the rate of permanent in-migration to 63.8 per cent. Its partial correlation coefficients increase at later steps in both models stressing its importance as an explanatory variable.

At subsequent steps in the regression analysis the two models diverge. With Y_n as dependent variable per 100 workers (X_6), change in the volume of retail sales (X_4), and the industrial earnings index (X_2) are introduced at the third, fourth and fifth steps respectively and combined increase the explained variance in the net migration rate to 86.9 per cent. This is, however, an improvement of only 5 per cent over the first two independent variables. Treating the rate of permanent in-migration as the dependent variable, by comparison, the order of introduction at the third and fourth steps is change in per capita retail sales (X_4) and percentage of the population with higher education qualifications (X_7). Together these account for a further 5.7 per cent of the variation in Y_{pi}.

A direct interpretation of these results could be misleading. The increase in dwelling units, which accounts for such a high proportion of the variation in both dependent variables

$$r_{Y_n 9.3468} = (0.80) \text{ and } r_{Y_{pi} 9.478} = (0.64)$$

influences the destinations of migrants both directly and indirectly, through its composite character. Of its direct associations, the availability of dwellings may well prompt moves amongst those desiring to improve their existing standard of accommodation and indeed change of residence per se as a reason for migrating has accounted for a rising proportion of moves in the country since 1958.

Yet the high correlation between X_9 and the dependent variables must also be considered in the light of its strong associations with the general level of economic activity in the 62 urban centres[1]. X_9 is strongly correlated with X_2 (industrial earnings

[1] X_9 is also positively related to the size of the industrial labour force ($r = 0.58$), change in employment in heavy industry ($r = 0.67$) and in the machine industry between 1960 and 1964 ($r = 0.68$).

index $r = 0.571$) which in turn is highly associated with Y_n and Y_{pi} ($r = 0.651$ and 0.554 respectively). Yet X_2 never enters the regession set of Y_{pi} and only enters that of Y_n at the fifth step, as the prior introduction of X_9 in both models drastically reduces the proportion of unexplained variance in the dependent variables that is accounted for by X_2.

We cannot therefore conclude without qualification that housing availability is a prime determinant of net and in-migration, for, granted that economic opportunities are less effective in attracting migrants where accommodation is not readily available, other evidence suggests that it is still economic opportunities rather than the availability of dwellings that is crucial. Thus it has already been demonstrated that change of employment is a prime reason for migrating. In addition we find that people are willing to commute long distances to work, even after changing their permanent places of residence for employment reasons. The influx of population to the small settlements ringing Budapest, who then commute to work in the capital provides one example. We conclude, therefore, that while increase in dwelling stock, as a general measure of housing availability, is significant in its own right as a determinant of migration, its high correlation with Y_n and Y_{pi} is in large part due to its association with the level of economic activity. Indeed, the association of Y_n and Y_{pi} with the general level of economic activity is further substantiated by their statistically significant and positive correlations with X_4 (change in the volume of retail sales) and, in the case of Y_n only, with X_2 (industrial earnings index).

Quality of housing, as measured by X_8 (the ratio of rooms to dwellings) is more unique as reflected by the increase in its partial correlation coefficients with the introduction of additional variables into the regession models. It accounts for a fair proportion of the variance in both Y_n ($r_{Y_n 8.469} = 0.59$) and Y_{pi} ($r_{Y_{pi} 8.479} = 0.47$) and is positively related to them. Its association with both dependent variables therefore verifies the hypothesis of a strong and positive relationship between room space per dwelling and the ability of the urban centres to attract migrants.

The demographic variable X_6 (dependents per 100 workers) was introduced as a measure of population "pressure" on the level of family living, economic opportunities and social services. It is significantly and negatively related to Y_n only, ($r_{Y_n 6.98} = -0.37$) although if X_6 were to have entered the regression set of Y_{pi} the relationship would also have been negative. These findings tend to confirm the hypothesis that population "pressure" repels rather than attracts migrants.

X_7 (percentage of the population with higher education) is only related significantly to Y_{pi} and reduces the unexplained variance at the fourth regession step by 2 per cent. X_7 was included in the investigation partly as a measure of the socio-cultural environments of the towns but after controlling for X_4 and X_9 and thus removing the economic associations from this variable, the partial correlation coefficient indicates a negative relationship with the rate of permanent in-migration ($r_{Y_{pi} 7.49} = -0.25$). The hypothesis that the rate of in-migration and the proportion of the population with higher education are positively related is not therefore substantiated. Indeed, places experiencing the highest rates of in-migration, for example, the new socialist towns, are generally not culturally developed but neither are places with extremely low in-migration rates, for instance the Alföld towns.

Thus, although three variables, ostensibly measuring the social characteristics of the towns, explain a significant proportion of the variation in Y_n and Y_{pi}, it is concluded that urban differentials in the net migration rate and in the rate of permanent in-migration are more importantly related to the level of economic activity. This finding parallels the structure of migration reasons as recorded elsewhere (chapter 7).

The rate of permanent out-migration Y_{po}

The statistical explanation of variations in the urban rate of permanent out-migration is not particularly satisfactory, only 43.4 per cent of the variance being accounted for. The associations that are brought out, however, are satisfactory on a priori grounds and may thus be interpreted with some confidence. Although the level of economic activity, as measured directly by variables X_2, X_3, X_4 and indirectly by X_8 and X_9, is not significant, they are all negatively related to Y_{po}. This does suggest that a low level of economic activity and poor quality housing repels migrants as hypothesised earlier. X_6 (dependents per 100 workers) and X_1 (population size) accounted for 41.6 per cent of the variation in Y_{po}. Each is of equal importance as an explanatory variable as demonstrated by the partial correlation coefficients ($r_{Y_{po}1.67} = -0.32$, $r_{Y_{po}6.71} = 0.32$). We have argued already that X_6 as a measure of relative population pressure in the towns is likely to repel rather than attract population. Its positive association with Y_{po} confirms this hypothesis. By contrast, X_1 is negatively related to Y_{po} but accepting that population size is proportional to the general level of urban opportunities, the negative relationship is understandable. Planners in Hungary might well find it disturbing, however, that the smaller the population of a town, the faster is the rate of population exodus.

The percentage of the population with higher education (X_7) is also negatively related to Y_{po}. Places lacking in economic opportunities are not likely to attract professional and trained people: nor are such places likely to possess the social and cultural amenities that are likely to induce such individuals to remain. Indeed, it is apparent that X_7 partly accounts for the unattractiveness of places with high ratios of dependents to wage earners, for its introduction into the regression set considerably reduces the partial correlation of X_6 with Y_{po}, ($r_{Y_{po}6.1} = 0.49$ and $r_{Y_{po}6.17} = 0.32$). The postulated inverse relationship between general educational standard and the rate of out-migration is thus substantiated.

The rather low statistical explanation of permanent out-migration contrasts with the more successful in- and net migration models. Out-migrants are at the same time in-migrants and it can be argued that if place of origin and place of destination are of equal importance to the migrant (i.e. repulsion from the place of origin and attraction to the place of destination) then the same level of statistical explanation should be achieved for both. Thus the rather large divergences between the explanatory power of the respective models suggest that place of origin and destination are not of equal importance in the permanent migratory process. In view of the greater success of the in-migration model, it is, therefore, tentatively suggested that attraction to the place of destination rather than repulsion from the place of origin is the active force behind permanent migration. Consequently, the place of origin is relatively passive in this schema. Other evidence exists to substantiate this contention. The range of variation in the rate of permanent out-migration from urban centres is small (17 to 41 per thousand with over half the values occuring within the range 20 and 30 per thousand – average values 1960 to 1964) compared with the rate of in-migration (18 to 91 per thousand – average values 1960 to 1964). The general similarity of the rates of out-migration even from places of highly contrasted socio-economic character suggests that settlements of origin act as 'passive reservoirs' of potential migrants whose rates of outflow are governed by the spatial distribution and characteritics of the places of destination. Within fairly narrow limits, the sum influence of all places is constant for each place of origin, thus inducing a fairly even rate of out-migration from all settlements within the spatial system.

Rate of temporary in-migration – (Y_{ti})

The statistical explanation of temporary in-migration is considerably less successful than for permanent in-migration (table 24). With Y_{ti} as dependent variable, X_2 (industrial earnings index) is introduced at the first step in the regression model and accounts for 32 per cent of the variance. It is followed by X_4 (increase in the volume of retail sales) and X_8 (rooms per 100 dwellings) at the second and third steps respectively, which increases the variance accounted for to 47.7 per cent. All three independent variables are positively related to Y_{ti}.

Temporary migrants thus move to places of favourable industrial wage structure and rising living standards as measured by X_4. Of the two factors, the industrial wage index is the more significant as shown by the comparison of the respective partial correlation coefficients ($r_{Y_{ti}2.4} = 0.52$ and $r_{Y_{ti}4.2} = 0.40$). Additionally, temporary migrants are not attracted to towns where the average size of dwelling units is small. The introduction of X_8 into the regression set, however, causes a reduction in the partial correlation between, X_2 and Y_{ti} ($r_{Y_{ti}2.48} = 0.37$) owing to a degree of intercorrelation between X_2 and X_8. The ratio of rooms to dwellings thus reflects in some degree, the level of industrial wages, as may be expected on a priori grounds. The general economic motivation of temporary moves is thus emphasised by these findings and conforms with the reason structure of temporary movers, for whom change of job and moving closer to place of work are of overriding importance.

The level of statistical explanation is disappointing. It may be posited, however, that the decisions behind temporary moves do not generate the same degree of prior arrangement and rational choice that precedes permanent changes of residence because the move is not final. Moreover, the predominance of temporary migrants in their late teens and early twenties, when individuals are least settled socio-economically, is more pronounced than among permanent movers. In view of these considerations, a probabilistic rather than a deterministic model might well provide a more satisfactory statistical description.

Rate of temporary out-migration – Y_{to}

Unlike permanent out-migration for which it has been suggested place of origin plays a generally passive role, temporary out-migration would appear, from the considerably better fit of the model, (66 per cent of the variance explained) to be more directly influenced by the character of the place of origin. Y_{to} is negatively related to X_2 (industrial earnings index), X_3 (number of ministerial establishments) and X_9 (increase in dwelling stock). By contrast, it is positively related to X_6 (dependents per 100 workers), a measure of population pressure. Temporary out-migration is thus shown to be highest from urban centres with a comparatively low level of economic development (X_2 and X_9). Pressure on economic opportunities and family life (X_6), by comparison, promotes temporary outflows of population.

The variations in the explanatory power of the temporary migration models deserves further consideration. The low statistical fit of the temporary in-migration model does not result from the place of destination acting in a passive role in the migration process as wittnessed by the wide range of observed temporary in-migration rates (5 to 75 per thousand). Many of the preferences of temporary residence may however be purely speculative in nature, and a substantial random element is thus introduced. Additionally, many temporary moves are stimulated by rather ephemeral manpower demands (e.g. large construction projects), the influences of which are lost in a multivariate investigation. In contrast, the repulsion of the place of origin may be considered constant over fairly long time intervals. It may be suggested that it is the unfavourable characteristics of the place of permanent residence rather than the consistent pulls of other urban centres which prompt temporary moves; hence the better statistical fit of temporary out-migration model.

The rate of total permanent migration activity – Y_{tt}

Total permanent migration activity is highly correlated with permanent in-migration (r=0.93). This and the rather low correlation of Y_{tt} with permanent out-migration (r=0.50) suggests that total permanent migration activity is predominantly associated with those urban features that attract migrants. To the extent that Y_{tt} is positively correlated with X_2 (industrial earnings index) and X (increase in per capita retail sales) in the zero order correlation matrix, this assumption is confirmed.

The stepwise regression model, however, suggests a somewhat more complex relationship. At the first regression step, X_5 (the rate of natural increase) is the most significant variable and accounts for 36 per cent of the variation in Y_{tt}. X_9 (increase in dwelling stock) and X_1 (population size) are introduced at the second and third steps respectively and increase the explained variance to 50 per cent. X_9 and X_5 are positively related to Y_{tt}; X_1 by contrast is negatively related to it. Yet it is apparent that the fairly high zero order correlation of Y_{tt} and the rate of natural increase reflects the multicollinear relationship of X_5, X_9, X_1 and Y_{tt}. Consequently, at the third step in the multiple regression analysis, increase in dwelling stock (X_9) accounts for the highest proportion of explained variance in Y_{tt} ($r_{Ytt9.15}$ O 0.42) followed by X_1 ($r_{Ytt\,1.95} = -0.34$. The introduction of X_8 (rooms per 100 dwellings) further reduces the partial correlation between Y_{tt} and X_1. The statistical explanation of Y_{tt} therefore lies in the combined influence of that variable which best characterises the attractiveness of urban centres to potential migrants, i.e. X_9 (increase in dwelling stock) and a factor expressing the general level of opportunities. Y_{tt} is negatively related to the latter, however.

Table 25. The Observed Relationships between the Independent and Dependent Variables

	X_1	X_2	X_3	X_4	X_5	X_6	X_7	X_8	X_9
Y_{ii}	P	Positive	P	Positive	P	Negative	P	Positive	Positive
Y_{pi}	N	P	N	Positive	P	P	Negative	Positive	Positive
Y_{ti}	N	Positive	P	Positive	P	P	P	Positive	P
Y_{tt}	Negative	P	P	P	Positive	P	N	Positive	Positive
Y_{po}	Negative	N	N	N	N	Positive	Negative	N	N
Y_{to}	N	Negative	Negative	N	P	Positive	N	N	Negative

Positive – positive relationship significant at 99 per cent level
Negative – negative relationship significant at 99 per cent level
P – positive relationship not significant at 95 per cent level
N – negative relationship not significant at 95 per cent level
Elements underlined indicate relationship opposite to that hypothesised

This is acceptable on a priori grounds in so far as permanent in- and out-migration are the components of Y_{tt}. Indeed by evaluating separately the factors associated with Y_{po} and Y_{pi}, Y_{tt} has already been explained, although indirectly. We may thus conclude that total permanent migration activity is highest for a) urban centres where general opportunities are few and which consequently generate considerable migration activity because of high out flows of population and for b) urban centres attractive to migrants, which generate significant migration activity through high rates of in-migration. There is the further suggestion that the rate of total permanent migration activity is an inverse function of population size.

Finally, the observed relationships between the various dependent and independent variables are summarised in table 25.

8.5 The Distribution of Residuals

The regression equations presented on pages 114–116 are a generalised description of the spatial structure of urban migration in Hungary. The appropriate values of the independent variables may be inserted into the equations and a solution of the various Y's obtained for each of the urban settlements. The accuracy with which the regression models describe the actual patterns of urban migration is dependent upon the degree to which the regression planes approximate the actual distribution of migration values. Measures of the goodness of fit of the regression models to the observed distribution have already been presented in the previous section, i.e. the total variance in the distribution of the various Y's explained by the regression models and the standard error of estimate. Yet although important, these measures do not indicate the difference between the observed – Y – and computed – Yc – migration values of individual urban centres, namely the residuals, where specific to this analysis, a residual is defined as that part of the magnitude of a given migration rate of an individual urban centre which is independent of the general association between migration and the independent factors included in the investigation.

Some towns can be expected to have residuals considerably larger than average, while others will have computed values close to the observed. This raises the question of whether any recognisable patterns are to be found in the distribution of residual values, for example, the clustering of urban centres with large residuals in particular areas of the country, or their restriction to urban centres of a particular type. Such patterns if present may well prove useful in the formation of additional hypotheses to improve the fit of the regression models and may in addition assist in their interpretation (Thomas 1968, Wong 1963).

Residuals are measured by subtracting the expected or computed value of Y from the actual observed migration value, i.e. (Y–Yc). The value of the residual consequently has a negative sign where the regression equation overestimates the value of Y. In the ensuing discussion the standarised residual $(Y-Yc)/S_{Yc}$ is generally used. Its distribution is identical with that of the Yc–Y values, but it has the advantage of allowing an objective definition of large and small residuals. When the error terms are normally distributed, an esential assumption of regression analysis, S_{Yc} has statistical properties similar to the standard deviation of a normal frequency distribution and approximately 32 per cent of standardised residuals thus have values greater or less than one standard error.

Additionally, only rarely will residuals of the $(Y-Yc)S_{Yc}$ type have values greater than $2S_{Yc}$. Using these properties, standardised residual values greater than plus or minus one standard error may be defined as large residuals.

Although, for interpretation, emphasis is placed upon those urban centres at the extremes of over and under estimation, i.e. places with large residual values, one complete set of residuals, that for net migration (equation 1) is presented in table 26. Besides Y, Yc and the standardised residual of each place, two further residual measures are presented here: namely, the basic residual (Y–Yc) and the relative residual Y–Yc/Y, the latter measuring the magnitude of the difference between the estimated and observed values, for whereas the distribution of the Y–Yc and $Y-Yc/S_{Yc}$ residuals are identical, the distribution of the Y–Yc/Y residuals diverges considerably in sign and rank.

Table 26. Residuals after Regression on Y_n – the Migration Balance

	Y	Yc	Y–Yc	$\frac{Y-Yc}{S_{Yc}}$	$\frac{Y-Yc}{Y}$
Kazincbarcika	60.32	50.47	9.85	1.93	0.16
Oroszlány	43.49	34.07	9.42	1.84	0.22
Kiskunhalas	8.22	0.10	8.32	1.63	1.01
Baja	14.10	5.84	8.26	1.62	0.59
Kaposvár	22.29	14.53	7.76	1.52	0.35
Esztergom	12.94	5.52	7.42	1.45	0.57
Szentendre	13.94	7.87	6.06	1.19	0.44
Debrecen	14.14	8.17	5.96	1.17	0.42
Nyíregyháza	9.39	3.79	5.60	1.10	0.60
Dunaújváros	45.85	40.66	5.19	1.02	0.11
Orosháza	2.24	2.53	4.78	0.94	2.13
Sátoraljaújhely	3.26	1.26	4.52	0.88	1.39
Nagykőrös	0.35	3.97	4.31	0.84	12.31
Gyula	6.40	2.20	4.20	0.82	0.66
Keszthely	12.08	8.01	4.08	0.80	0.34
Szentes	2.84	– 1.03	3.87	0.76	1.36
Pécs	25.88	22.06	3.82	0.75	0.15
Cegléd	1.19	4.53	3.34	0.65	2.81
Kiskunfélegyháza	– 2.18	– 4.41	2.21	0.43	1.02
Tata	13.37	11.49	1.88	0.37	0.14
Kisújszállás	7.98	9.46	1.47	0.29	0.18
Szeged	18.34	17.06	1.28	0.25	0.07
Makó	0.40	1.55	1.14	0.22	– 2.85
Várpalota	15.51	14.46	1.04	0.20	0.07
Pápa	11.59	10.71	0.89	0.17	0.08
Csongrád	– 4.51	– 5.19	0.67	0.13	– 0.15
Tatabánya	15.99	15.68	0.31	0.06	0.02
Szekszárd	15.54	15.41	0.13	0.02	0.01
Túrkeve	– 17.72	– 17.85	0.13	0.02	– 0.01
Mohács	4.17	4.20	– 0.03	– 0.00	– 0.01
Zalaegerszeg	26.25	26.39	– 0.15	– 0.03	0.01
Kecskemét	9.22	9.39	– 0.17	–0.03	0.02
Mezőtúr	– 10.87	– 10.69	– 0.18	– 0.04	0.02
Ajka	30.26	30.61	– 0.37	– 0.07	– 0.01
Mosonmagyaróvár	13.28	13.88	– 0.60	– 0.11	– 0.05
Gyöngyös	9.02	9.77	– 0.75	–0.15	– 0.08

	Y	Yc	Y–Yc	$\frac{Y-c}{S_{Yc}}$	$\frac{Y-Yc}{Y}$
Szombathely	13.31	14.11	– 0.80	– 0.16	– 0.06
Karcag	– 9.67	– 8.33	– 1.34	– 0.26	0.14
Hódmezővásárhely	– 2.83	– 1.39	– 1.44	– 0.28	0.51
Szolnok	18.71	20.67	– 1.96	– 0.38	– 0.10
Székesfehérvár	19.12	21.10	– 1.98	– 0.39	– 0.10
Balassagyarmat	2.00	3.86	– 1.85	– 0.36	– 0.93
Kőszeg	2.63	4.53	–1.90	– 0.37	– 0.72
Hajdúszoboszló	– 1.97	0.88	– 2.85	– 0.56	1.45
Jászberény	– 2.83	0.14	– 2.98	– 0.58	1.06
Eger	10.71	13.77	– 3.06	– 0.60	– 0.29
Ózd	13.80	17.04	– 3.24	– 0.63	– 0.23
Békéscsaba	6.98	10.30	– 3.32	– 0.65	– 0.48
Hajdúböszörmény	– 9.92	– 6.43	– 3.48	– 0.68	0.38
Vác	15.44	19.26	– 3.82	– 0.75	– 0.25
Miskolc	15.47	19.69	– 4.22	– 0.83	– 0.27
Kalocsa	11.57	16.17	– 4.60	– 0.90	– 0.40
Hatvan	6.41	11.91	– 5.50	– 1.08	– 0.86
Győr	13.50	19.00	– 5.50	– 1.08	– 0.41
Salgótarján	8.92	15.17	– 6.25	– 1.22	– 0.70
Nagykanizsa	7.56	14.08	– 6.51	– 1.27	– 0.86
Hajdúnánás	– 14.59	– 7.65	– 6.94	– 1.36	0.48
Törökszentmiklós	16.30	– 0.68	– 6.98	– 1.37	0.43
Veszprém	17.33	25.66	– 7.33	– 1.43	– 0.42
Sopron	5.08	13.97	– 8.89	– 1.74	– 1.75
Komárom	12.52	21.94	– 9.42	– 1.84	– 0.75
Komló	8.66	18.25	– 9.59	– 1.88	– 1.11

Interpretation of the residual distributions

The distribution of net migration residuals is difficult to interpret. They cluster neither by the geographical location of the urban centres nor by urban type. For example, the computed values of three of the new socialist towns, Kazincbarcika, Oroszlány and Duanujváros are strongly underestimated: the values for the other new socialist towns are overestimated. The provincial cities similarly do not cluster according to residual value, while the residuals of the urban centres of the Alföld, which are alike in socio-economic structure, also lack uniformity: the values for Orosháza, Nagykőrös, Gyula, Kiskunhalas, Nyíregyháza are underestimated, while those for Törökszentmiklós, Hajdúnánás, Kalocsa, etc. are overestimated. This random rather than ordered distribution of net migration residuals suggest therefore that no one additional factor may be introduced to improve the fit of the net migration regression model. Consequently the residual patterns are to be understood in terms of, firstly, the unique features of each urban centre likely to influence migrants, and secondly, by the chance element which derives from the apparently 'irrational' choice of new residence made by some migrants.

Ordered arangements of those urban centres with large residuals are not apparent by either spatial location of settlement type (table 27). A pattern does appear, however, to the extent that the majority of settlements for which net migration is grossly underestimated are, as might be expected, also those for which both in-migration and total permanent migration activity are similarly underestimated, and vice versa.

Table 27. Distribution of Large Residuals – ± S_{Y_c}

Y_n – Net migration		Y_{pi} – Permanent migration	
Kazincbarcika	1.93	Oroszlány	2.91
Oroszlány	1.84	Szentendre	2.35
Kiskunhalas	1.63	Dunaújváros	2.33
Baja	1.62	Kaposvár	1.63
Kaposvár	1.52	Esztergom	1.55
Esztergom	1.45	Debrecen	1.41
Szentendre	1.19	Kiskunhalas	1.27
Debrecen	1.17	Tata	1.22
Nyíregyháza	1.10	Mezőtúr	1.13
Dunaújváros	1.02	Orosháza	1.02
Komló	– 1.88	Sopron	2.09
Komárom	– 1.84	Nagykanizsa	1.66
Sopron	– 1.74	Kőszeg	1.59
Veszprém	– 1.43	Hajdúszoboszló	1.37
Törökszentmiklós	– 1.37	Jászberény	1.28
Hajdúnánás	– 1.36	Győr	1.14
Nagykanizsa	– 1.27	Hatvan	1.11
Salgótarján	– 1.22	Komló	1.04
Győr	– 1.08	Szombathely	1.01
Hatvan	– 1.08		

Y_{po} – Permanent out-migration		Y_{tt} – Total migratory activity	
Szentendre	2.59	Szentendre	2.18
Kalocsa	2.29	Oroszlány	1.93
Túrkeve	1.83	Kaposvár	1.74
Kaposvár	1.81	Dunaújváros	1.68
Mezőtúr	1.52	Mezőtúr	1.38
Pápa	1.52	Debrecen	1.37
Komló	1.40	Kiskunhalas	1.20
Veszprém	1.33	Túrkeve	1.12
Kiskunhalas	1.12	Esztergom	1.00
Szolnok	1.01	Kőszeg	– 2.41
Kőszeg	– 2.69	Sopron	– 1.84
Szombathely	– 1.87	Szombathely	– 1.40
Ajka	– 1.66	Ajka	– 1.29
Nagykőrös	– 1.50	Nagykanizsa	– 1.28
Mosonmagyaróvár	– 1.41	Mosonmagyaróvár	– 1.16
Balassagyarmat	– 1.20	Hajdúszoboszló	– 1.16
Sopron	– 1.11	Győr	– 1.12
Jászberény	– 1.07	Jászberény	– 1.07
Hajdúszoboszló	– 1.01		

For example, we find all three of these rates underestimated for Oroszlány and Dunaújváros and it is apparent that the rapid increase in economic opportunities in these places is not fully represented by the regression models[1] In addition to the rates of in-, net- and total migration, the rate of out-migration is also grossly underestimated for Szentendre and here closeness to Budapest, a variable not included in the analysis, is seen to operate. Szentendre is within commuting distance of the capital and, consequently, its own socio-economic characteristics do not fully reflect its attractiveness to migrants. At the same time, the underestimation of out-migration would suggest that Budapest has an inordinate pull on the population of Szentendre, many of whom may use Szentendre as one step in their eventual migration to Budapest. A similar relationship exists between Esztergom, for which net, in- and total migration are underestimated and Dorog, the neighbouring industrial agglomeration. Dorog provides the place of employment, Esztergom the residential centre (Lettrich 1956). Consequently, the socio-economic status of the latter place will again provide an underestimation of its attractiveness to migrants. Other places lying at the extremes of underestimation of net, in- and out-migration are Debrecen, Kaposvár and Kiskunhalas.

Similar regularities exist at the extremes of overestimation. Northwest Transdanubia is a general area of low population mobility for reasons not fully understood and the migration values for the towns of this region – Sopron, Kőszeg and Győr – are overestimated. Compared with the remainder of the country, the socio-economic features of these places would consequently suggest a greater than observed migratory response. A spatial pattern of residual values would thus appear to be emerging in this region.

The town of Komló forms an interesting example in that it is the only centre for which different migration values are at the extremes of over- and underestimation. Komló is a new socialist settlement and the underestimation of out-migration and the overestimation of in-migration are quite atypical of such a centre. Komló is a coal mining centre, however, which although providing above average per capita income, has poor conditions for work. Komló also lies within 20 km of Pécs, which must act as a strong magnet on its population. The interrelations of these two factors may provide a partial explanation of the anomalous residual values.

8.6 Summary

In the previous chapter the general problem of why people migrate was approached by way of the motivations and reasons behind individual migrations. Here, by contrast, the specific problem of urban migration is tackled through multiple regression and correlation analysis in terms of the socio-economic characteristics of urban places that may be considered to influence the spatial patterns of migration.

Although the level of statistical explanation varied according to the measure of migration used as dependent variable, the analysis suggests that economic determinants are of prime importance. The model using net migration as dependent variable was the

[1] This factor obviously relates to their status of being new socialist towns, where the rapidity of socio-economic change is great. Variables to assess this parameter were not included in the analysis.

most successful and over 80 per cent of the variance was explained. While the explanation of permanent in-migration was satisfactory, that for permanent out-migration was disappointing. It is therefore suggested that attraction to the place of destination rather than repulsion from the place of origin is the dominant factor in accounting for permanent migration in Hungary. The analysis of temporary migration presented the reverse situation, the statistical explanation being considerably higher for temporary out-migration. Although the deterministic explanation is low, the great variability in the rates of temporary in-migration suggests that attraction to place of origin is still a dominant feature in the temporary migration process. However, temporary moves may be purely speculative in nature while many are influenced by ephemeral job opportunities such as new industrial construction. The spatial aspects of such migrations are therefore likely to be better occounted for by a stochastic model.

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CHAPTER 9

INTER-URBAN MIGRATION FLOWS

The previous chapter was concerned with the migration characteristics of individual urban settlements. The multiple regression models developed were most successful in explaining statistically net migration. Their performance in accounting for variations in in-migration and out-migration, whether involving permanent or temporary changes of residence was not so satisfactory. But whereas net migration is a parameter which, per se, relates to particular and individual places and is to be accounted for in terms of the socio-economic features of those places, in- and out-migration imply relationships between places. Thus an in-migrant is at the same time an out-migrant, dependent on the reference point of the event. We have already argued that "push" and "pull" factors are acting on all migrants, but the previous analysis was so designed that the simultaneous action of both factors could not be considered. Thus out-migration was accounted for in terms of the characteristics of the place of origin and no account was taken of the characteristics of the place of destination. In this chapter, therefore, it is our intention to develop a model that complies with the dualistic nature of the migration process. We wish to examine in the same model the complete migratory event in relation to both places of origin and destination with the specific aim of accounting for interurban migration in Hungary.

Place to place migration streams are therefore analysed for the 63 urban centres of the country. Owing to the small annual flows occurring between a) the less significant and b) the more distant towns, the streams are determined for the five year period 1960 to 1964 to minimise small values and short period fluctuations in volume. Streams involving permanent changes of residence only are analysed. The migration data was aggregated from unpublished work tables[1].

9.1 Conceptual Framework

The conceptual framework adopted in the previous chapter is also apposite here. Yet although socio-economic disparities are factors inducing migration flows, additional propositions must be formulated. It is an observable fact that a migration flow from a place i to a place j is always countered by a stream in the opposite direction. In this

[1] The unpublished work tables were made available by the kind permission of Dr. Egon Szabady.

instance, we may posit that one component of the dominant stream derives from the general socio-economic disparities between the two places – the dominant flow being towards the place of greater socio-economic attraction. We may also assume, however, that other components of this dominant flow would still be active, even if socio-economic disparities between i and j did not exist, for even in a country of complete social and economic equilibrium it is difficult to envisage a complete halt to all migration. One may consider the movements attributable to these other components as being induced by normal socio-economic intercourse between places, partly to maintain an already established equilibrium. Examples of such movements are migrations induced by family ties.

We may also posit that it is movements such as these that comprise the flow of population contrary to the dominant migraiton streams, although an additional factor determining these counter flows must derive from the fact that the general socio-economic disparities between places do not affect all migrants identically. Thus moves contrary to the dominant stream may be actively generated by the distribution of specialised opportunities. In Hungary the flow of engineers and technicians from Budapest to development projects in the countryside provides one such example.

Wolpert (1969) in an attempt to quantify a similar concept, suggests that migration will inevitably occur between places, directly proportional to their population size and inversely proportional to their distance apart. We may regard this component of population flows as "natural migration", a concept analagous to natural fertility. He further suggests that it is only the deviations from the flows induced by this function that are conditioned by the differential socio-economic characteristics of places i and j.

We may, therefore, posit that place to place migration streams are in the first instance induced by normal socio-economic intercourse. Superimposed on this component of "natural" migration, however, are movements resulting from the socio-economic disparities between places. These may augment or decrease the "natural" flows and may have variable effects on different migrant groups.

A second characteristic feature of place to place migration streams is the rapid fall off in migration volume with distance. The rate of decline is not uniform for all places, however, and is inversely related to the importance of the centres involved in the migration process. For example, it has already been shown that the decline in the volume of migration to and from Budapest with increasing distance from the capital is considerably less rapid than in the case of the provincial cities (Chapter 4., part 4). This characteristic of migration has been aptly described as the friction" due to distance. Hagestrand (1956) related it to the size and shape of the information field perceived by individuals as a group. It is implied, therefore, that distance is functionally related to the information field and provided a satisfactory measure of distance can be derived, it may be used as a substitute for Hagestrand's very meaningful concept. Thus a further proposition is that the magnitude of place to place flows in Hungary is inversely related to some function of the distance separating places, which, however, varies with the types of settlement involved in the process.

9.2 Models of Place to Place Migration Streams

The point of departure of all deterministic models of place to place migration flows is the gravity function, first noted by Ravenstein (1885 and 1889) and subsequently formalised by Zipf (1944) and Stewart (1948). Basically the gravity model states that the total interaction between two places is directly proportional to the product of their respective population sizes and inversely proportional to the distance separating them. Stouffer's (1940) "intervening opportunities" model, formalised as a mathematical function, is identical with the gravity model (Anderson 1955). Expressed in terms of opportunities, it is, on a priori grounds, conceptually more satisfactory, although the quantification of "intervening opporunities" as proposed by Stouffer, presents problems of autocorrelation for which no satisfactory solution has yet been found.

Somermeijer (1961) was the first worker to successfully append direction to the gravity model for the explanation of migration streams. He also derived a measure of social distance based on religion and successfully tested his composite model on migration data from the Netherlands. More recent developments are due to Lowry (1964 and 1966). He has hypothesised that migration flows between the Standard Metropolitan Areas of the United States are a function of spatial variations in economic opportunities as reflected by disparities in wages and unemployment in industry, i.e. an economic "push-pull" hypothesis. His model has the following form:

$$M_{i\to j} = k\,\frac{U_i}{U_j} \cdot \frac{W_j}{W_i} \cdot \frac{L_i\,L_j}{D_{ij}} \qquad \ldots (1)$$

where

$M_{i\to j}$	is the number of migrants from i to j
L_i, L_j	is the size of non-agricultural labour force at i and j respectively.
U_i, U_j	is the number employed at i and j expressed as a percentage of their respective non-agricultural labour forces.
W_i, W_j	is the hourly wage in manufacturing industry at i and j respectively.
D_{ij}	is the airline distance between i and j
The term $\frac{L_i\,L_j}{D_{ij}}$	is the gravity function modified by the replacement of population size with labour force number.

Rogers (1967) taking the Lowry model as that "conceptually most satisfactory" for the explanation and prediction of migration flows, has further refined it and tested it on interregional migration flows in California with impressive results. The model, as modified by Rogers, retains the same mathematical form but some of its component parts have been either changed, or given other operational definitions. Thus Rogers takes as the best measure of the friction of distance the road mileage separating i and j. Further, because the regression and partial correlation coefficients of the unemployment variables at i and j had signs opposite to those expected on a priori grounds, Rogers removed them from the model. An additional change is the substitution of the labour force number at i and j with a variable Rogers terms 'labour force eligables', to facilitate the prediction of migration by the model. The latter he defined as the number of population between the ages of 15 and 64. This variable is easily obtained for future dates by the cohort survivorship method of population forecasting. Rogers' modifications lead to little loss of explanatory power compared with the Lowry model.

That the basic gravity model can be so successfully modified and extended indicates its great flexibility. Variables can be added or subtracted according to the characteristics of the area being analysed and the availability of data. Moreover, the model as refined by Lowry is log-linear and multiple regression analysis can be used to fit flow matrices and test hypotheses.

9.3 Modified Gravity Model of Interurban Migration in Hungary

Interurban migration in Hungary during 1960 to 1964 is peculiar to that country. Thus while accepting Lowry's refinement of the gravity model as being conceptually satisfactory to account for interurban migration in Hungary, further refinements and additions must be made to suit the Hungarian case.

The gravity model as modified by Lowry and Rogers hypothesises that the flows between places are a sole function of economic push-pull factors over equal distances. This would appear an oversimplification for reasons previously stated in chapter 7. While the dominance of economic factors in generating migration in Hungary cannot be denied, the social reasons of marriage, the desire for a new residence per se, must not be ignored. In addition, and this must be stressed, an average of 40 per cent of migrations involving permanent changes of residence are made by dependents. Although one may argue that the economic factor is dominant here through the direct ties linking dependents and heads of households, who, we must assume, make the active decision to migrate, it appears preferable logically to include in the model some measure of the total availability of migrants rather than the availability of those solely economically active. For this purpose it is assumed that migrant availability is proportional to the population size of the place of origin – place i in the notation of the model, and our operational definition of migrant availability is therefore the population size of centres – i – in 1960.

Migrant availability, however, is a passive factor, as the volume of movements from this "pool" will be determined by the attractiveness of the place of destination – place j – relative to place i and the intervening distance. A first approximation of the attractiveness of place j is the determination of the volume of available opportunities there, and since economic motivation, as an 'active' factor, dominates internal migration in Hungary, labour force number at j in 1960 is used as the operational definition of general opportunities at j[1].

Combined, migrant availability at i, opportunities at j and the distance separating i and j comprise the basic gravity function of our model which is:

$$\frac{P_i L_j}{D_{ij}} \qquad \ldots (2)$$

where

[1] The 1960, i.e. initial values of population size and labour force number were adopted, rather than average values for the period 1960 to 1964 because a) accurate data was avalilable from the 1960 census and b) to assist forecasting.

P_i is the population number at i – operational definition of migrant availability
L_j is the labour force size at j – operational definition of general opportunities at j
D_{ij} is the shortest motor road distance separating i and j – operational definition of the "friction" due to distance[1]

It is to be noted that the introduction of the concept migrant availability at i and general opportunities at j, gives a directional bias to the basic gravity function, i.e. unlike previous formulations the predicted flow from i to j will differ from the predicted flow from j to i. If we adopt Wolpert's suggestion that the gravity function provides an estimate of natural migration, then this latter formulation is conceptually preferable to previous attempts, because the component 'natural migration' is similarly unlikely to produce identical flows from i to j and from j to i. Moreover, this modification of the gravity function provides a significantly better fit to the flow matrices in Hungary migration than either the Lowry or Zipf variants.

The basic gravity function is modified by the inclusion of three additional variables to appraise the quality of opportunities at i and j and thus to assess further their relative attractiveness to migrants. For this purpose, Lowry included the variables, ratio of unemployment in i compared with j and ratio of wages in manufacturing industry at j relative to i. Comparative unemployment may thus be regarded as a push" factor and comparative wage level a "pull" factor. In Hungary, however, no easily identifiable "push" factor exists owing to the non-existance of unemployment. Underemployment may well be a factor but is not quantifiable. The general wage level and opportunities in industry, by comparison, may be considered highly significant for the reasons argued in chapter 8. However, since per capita income data is unavailable, the industrial earnings index utilised previously is included as an approximation of the general wage level. Concerning opportunities in industry, the operational definition adopted for this variable is the percentage of the labour force employed in manufacturing and construction in 1960. In addition, variations in the spatial distribution of ammenities and services may be considered an important inducement to migrate. On a priori grounds this variable can be assumed directly proportional to the level of services provided at places i and j and, consequently, is operationally defined as the percentage of those gainfully occupied in service functions in 1960[2].

The complete model used to explain interurban migration flows in Hungary is as follows:

$$M_{i \to j} = k \frac{S_j}{S_i} \cdot \frac{W_j}{W_i} \cdot \frac{IE_j}{IE_i} \cdot \frac{P_i L_j}{D_{ij}} \qquad \ldots (3)$$

where

P_i is the population number at i

[1] Concerning the variable D_{ij}, the use of straight line, road or rail distances are equally good. Trial runs of the model utilising each distance measure did not significantly alter the explanatory power of the model.

[2] Although proving a highly significant independent variable in the explanation of the migration characteristics of individual urban centres (chapter 8), increase in dwelling stock was not included here owing to its high association with the industrial earnings index.

L_j is the labour force number at j

D_{ij} is the road distance separating i and j

IE_i, IE_j is the percentage employed in manufacturing and construction industry at i and j respectively in 1960.

W_i, W_j is the industrial earnings index at i and j respectively.

S_i, S_j is the percentage involved in service functions at i and j respectively in 1960.

$M_{i\to j}$ is the number of permanent migrants moving from i to j during the years 1960 to 1964.

The mechanism of the model is thus the continuous adjusment of the modified gravity function, $\frac{P_i L_j}{D_{ij}}$, by the ratios of variables designed to assess the comparative socio-economic structures of places i and j. Taking the number of moves derived from the gravity function as "natural" migration, a more favourable wage structure in j compared with i generates a relatively greater flow from i to j than otherwise expected. The reverse occurs when the wage structure is more favourable at i: similarly with the other structural variables.

The model is log linear and it is in this form that it is employed in the subsequent analysis. The log transformation is:

$$\log M_{i\to j} = \log k + \log S_j - \log S_i + \log W_j - \log W_i + \log IE_j - \log IE_i + \log P_i + \log L_j - \log D_{ij} \quad \ldots (4)$$

In terms of the log transformation, the following relationships are hypothesised between flows from all places i to all places j and the independent variables:

i) positive relationships with variables $\log P_i$, $\log L_j$, $\log W_j$, $\log S_j$ and $\log IE_j$.

ii) negative relationships with $\log D_{ij}$, $\log S_i$, $\log W_i$ and $\log IE_i$.

While providing a statistical explanation of migration flows, the model also has predictive qualities. The operational definition of the independent variables implies that flows between 1960 and 1964 are generated by the characteristics of the urban centres comprising the flow matrix at the beginning of the time interval. In prediction, it is more convenient to use current values of variables to generate future migration than say average values over the forecast periods. In the operational form adopted, therefore, we are also able to test the predictive qualities of the model.

9.4 Interurban Migration Streams – the Regression Analysis

Interurban migration streams were fitted to the log transformation of the model by stepwise multiple regression. The regression model of the log transformation is:

$$\log M_{i\to j} = b_o + b_1 \log S_j + b_2 \log S_i + b_3 \log W_j + b_4 \log W_i + b_5 \log IE_j + b_6 \log IE_i + b_7 \log P_i + b_8 \log L_j + b_9 \log D_{ij} + E \quad \ldots (5)$$

where $b_0, \ldots, b_9$ are the regression coefficients and E is the error term. Only those variables with regression coefficients significantly different from zero at the 5 per cent level of significance are included in the regression model.

Between the 63 urban centres of Hungary, there are a possible 3906 migration streams – a number too large to handle as a group. The urban centres were thus aggregated into a number of smaller classes and separate regression models were computed for the various flow matrices so derived. The urban classes selected were:

a) Aggregations of urban centres by geographical location, comprising the following flow matrices:

i) Migration flow matrix for the centres of the Alföld – 702 streams
ii) Migration flow matrix for the urban centres of Transdanubia – 600 streams
iii) Migration flow matrix for the urban centres of the Northern Region – 90 streams

b) Aggregations of urban centres by type of settlement comprising the following flow matrices:

i) Migration flow matrix for Budapest and the provincial cities – 20 streams
ii) Migration flow matrix for the new socialist towns including Tatabánya – 42 streams
iii) Migration flow matrix for the provincial cities and all other towns – 464 streams, which was disaggregated into:
  a) migration streams to the provincial cities from all other urban destinations – – 232 streams
  b) migration streams from the provincial cities to all urban destinations – 232 streams

9.5 Regression Models of Migration Streams Generated between Urban Centres and Aggregated According to Geographical Location

The aggregation of urban centres by geographical location was designed as far as possible to maximise homogeneity of urban type within each region but at the same time to minimise regional fragmentation. Selection of many regions results in small flow matrices which do not give a representative picture of interurban flows within the country. Moreover, the possibly highly significant factor of distance would be represented over a small range of values only in this case. With these two conditions in mind a regional grouping of urban centres into Alföld towns, Transdanubian towns and towns in the Northern Region was therefore preferred to an aggregation based on the six economic regions.

Reasonable homogeneity of urban type is thus retained. The urban centres of the Alföld are particularly distinct. With the exception of the provincial cities of Debrecen and Szeged and the medium sized centres of Békéscsaba, Kecskemét and Szolnok, they all lack modern industrial development, while here are located the large settlements of agricultural character but of urban status. The urban centres of the Northern Region and Transdanubia differ considerably from those of the Alföld. Transdanubia contains six of the seven new socialist towns that had been created by 1964. All are newly and heavily industrialised and are composed of highly trained and technically oriented populations. Important industrial locations are found in Komárom county and around Győr and Pécs. By comparison, the Northern Region, to a much greater extent, comprises urban settlements that are of long standing industrial character, and here are located the traditional centres of iron and steel manufacture at Miskolc and Ózd. This is not meant to imply, however, that modern developments are not taking place in the Northern Region, but a broad distinction between the urban centres of the Northern Region and Transdanubia on these grounds would appear to be valid.

In view of these contrasts, one might expect the selected variables to differ in significance in accounting for interurban migration within the three regions. Thus in addition to the general propositions established so far, one may further hypothesise that the level of wages in industry and general industrial employment are more significant in explaining interurban migration in the Northern Region and in Transdanubia where industry is important, than in the Alföld. Moreover, it is reasonable to assume that with the traditionally backward population of the Alföld whose information field is consequently more limited, the importance of distance is a more significant factor is accounting for migration than in the other regions. This analysis of regional variations in interurban migration streams is therefore designed to test these additional hypotheses as well as the general propositions set out in a previous section.

The regression models are summarised in table 28. It is apparent that the gravity function $\frac{P_i L_j}{D_{ij}}$ is the most significant factor accounting for interurban migration in each region. The variance in interurban migration explained by this function is 67.7 per cent, 65.0 per cent, 64.6 per cent for the Alföld, Transdanubia and the Northern Industrial Region respectively. Of the three variables comprising the gravity function, distance is the most important factor. In each instance it is negatively related to the volume of migration flow and confirms the relationship hypothesised previously. As indicated by the regression coefficients, the fall in migration with distance is highest in the Alföld – the functional relationship being ($D{-1.67}$) – and considerably less in Transdanubia ($D{-1.43}$) and in the Northern Region ($D{-1.49}$). In accounting for interurban migration, distance is again most significant for flows generated in the Alföld. These findings therefore tend to confirm the hypothesis that distance is more important in accounting for the variability of interurban migration streams in the Alföld than in the other regions. Additionally, as the friction due to distance is also greater, this confirms the further proposition that the information field of the Alföld population is the most restricted of the three.

Of the other variables comprising the gravity function, migrant availability at the place of origin is more significant than the general level of economic opportunities at the place of destination in explaining interurban flows in both Transdanubia and the Northern Region. We may tentatively conclude, therefore, that migrant availability rather than the general level of economic opportunities at the destination is more likely to induce interurban migration in these two regions.

The Alföld urban flows are again at variance where a stronger relationship exists between migration and the level of opportunities at the place of destination than with

Table 28. Regression Statistics for Flows between the Urban Centres of the Alföld – (27 x 27 flow matrix)

Variables Added to Regression Set	R^2	Increase in R^2	At Last Regression Step			
			Coefficient	Standard Error	„t" Statistic	Partial Correlation
Constant			2.029	2.044	0.99	
log D_{ij}	0.394	0.394	– 1.669	0.051	32.83	– 0.78
log L_j	0.585	0.191	0.964	0.064	15.07	0.50
log P_i	0.677	0.192	0.769	0.079	9.68	0.34
log S_j	0.701	0.024	0.945	0.123	7.69	0.28
log S_i	0.709	0.008	– 0.629	0.125	5.03	– 0.19
log W_i	0.711	0.002	– 0.662	0.315	2.10	– 0.08

Regression Statistics for Flows between the Urban Centres of Transdanubia – (25 x 25 flow matrix)

Variables Added to Regression Set	R^2	Increase in R^2	At Last Regression Step			
			Coefficient	Standard Error	„t" Statistic	Partial Correlation
Constant			– 16.884	2.981	5.66	
log D_{ij}	0.338	0.338	– 1.429	0.057	24.90	– 0.72
log L_j	0.497	0.159	0.928	0.059	15.77	0.54
log P_i	0.650	0.153	0.872	0.045	16.47	0.56
log W_j	0.669	0.019	1.554	0.291	5.35	0.22
log IE_j	0.674	0.005	– 0.550	0.119	4.62	– 0.19
log W_i	0.680	0.006	0.893	0.256	3.49	0.14
log S_j	0.682	0.002	0.306	0.171	1.79	0.07

Regression Statistics for Flows between the Urban Centres of the Northern Region – (10 x 10 flow matrix)

Variables Added to Regression Set	R^2	Increase in R^2	At Last Regression Step			
			Coefficient	Standard Error	„t" Statistic	Partial Correlation
Constant			– 21.075	8.976	2.35	
log D_{oj}	0.394	0.394	– 1.492	0.176	8.49	– 0.68
log P_i	0.510	0.116	0.943	0.150	6.27	0.57
log L_j	0.646	0.135	0.734	0.172	4.27	0.42
log W_j	0.676	0.017	2.359	1.113	2.09	0.22
log S_j	0.659	0.013	1.160	0.404	2.87	0.30
log S_i	0.689	0.013	0.591	0.310	1.91	0.20

migrant availability. The "pull" rather than the "push" factor is thus of greater significance in this region. This finding again confirms the fundamental disparity between the determinants of interurban migration in the Alföld compared with other regions of the country.

The significance of the remaining variables differs considerably region by region. Of those designed to measure the specific attraction of the place of destination, the general level of wages in idustry and the provision of service functions are significant in generating interurban flows in Transdanubia and in the Northern Region. They are positively related to migration and thus confirm the hypotheses established previously on a priori grounds. By comparison, the level of industrial employment at points of origin is negatively related to the volume of migration from i to j, in Transdanubia. Of the other factors designed to assess repulsion from places i, the general level of wages in industry and the level of service functions in the urban centres of Transdanubia and the Northern Region respectively, both account for a significant part of the variance in interurban migration. They are, however, positively related to the volume of migrant flow which is contrary to the hypotheses established on a priori grounds.

In the case of the Alföld, the level of services at places of destination is positively and strongly correlated with interurban flows, while the provision of services and wage levels at the places of origin are negatively related to the migration streams there. These findings conform to the hypotheses established on a priori grounds.

Thus again, different factors are seen to be generating interurban migration in the Alföld. The level of service functions is a strong determining factor there, in contrast to industrial earnings in Transdanubia and in the Northern Region. This finding verifies, therefore, the hypothesis that spatial variation in industrial development in the latter two regions is a more significant determinant of interurban migration than in the Alföld: for although the level of service functions is a significant determinant of flows in the Northern Region, it does not correlate as strongly with migration as the industrial wages level.

Concerning the total variance explained, the regression model for the Alföld is the most successful and accounts for 71.1 per cent of the variance in interurban migration between 1960 and 1964. The performances of the models for Transdanubia and the Northern Region are similar, the variance accounted for being 68.2 and 68.9 per cent respectively. These results compare favourably with those obtained by Lowry (op.cit.).

9.6 Regression Models of Migration Streams between Urban Centres Aggregated by Urban Type

There is evidence to suggest that the determinants of migration flows vary with the character of the places of origin and destination. Empirical support for this proposition comes from the United States (Bogue, Shyroch and Hoermann 1957, and Lansing and Mueller 1967) as well as from Hungary. With regard to the latter, the reason structure of migrants (chapter 7) shows distinct variations by settlement class, which are consistent over time. Moreover, the findings in the previous section suggest that the determinants of interurban migration within the Alföld, which to a large extent is between places of gricultural character, differ from the factors generating interurban flows in Transdanubia nd in the Northern Industrial Region. In addition, one may suppose that migration flows etween places, which are socio-economically homogeneous, comprise a significantly arger component of what has been termed "natural migration", i.e. moves determined by narriage, family ties, routine occupational changes, etc. than the component reflecting ocio-economic disparity. The latter, by comparison, will bear a stronger influence on noves between unlike places. Thus one may posit that the variables comprising the ravity function, which relate to migrant availability and general opportunities, should ccount for a larger proportion of the variation in moves between alike than unlike urban entres.

With a view to testing these general propositions for interurban migration in Hungary, he regression models were fitted to migration streams between Budapest and the rovincial cities and to flows between the new socialist towns. Both flow matrices omprise urban centres of distinctive character. Budapest and provincial cities are the argest urban centres in the country and are the main seats of economy, culture and ducation. The new socialist towns, by comparison, have been constructed since 1948. Typically, they are centres of heavy industry, mining, iron and steel, chemicals, for nstance, while the general level of earnings amongst their population tends to be well bove the national average owing to their skilled and technically oriented labour force.

The regression statistics fitted to the two set of migration streams are summarised in able 29. It is immediately apparent that the respective findings are divergent. Firstly, the nodel clearly provides a good explanation of migration between Budapest and the rovincial cities. The explained variance in migration flows between the new socialist owns is disappointingly low by contrast. Secondly, while distance is the most significant actor accounting for the flows between the new socialist towns, it is of lesser importance han migrant availability (P_i) and the general level of opportunities (L_j) in explaining the treams between Budapest and the provincial cities. It is also interesting to note that the riction of distances is less with migration between the new socialist towns. Thirdly, the evel of services and the proportion of employment in manufacturing and construction ndustry at points of destination are significant in accounting for streams between the ew socialist towns. By comparison, the industrial wage level at place of destination and he level of industrial employment at the point of origin are significant in explaining lows between Budapest and the provincial cities. Fourthly, the general level of pportunities at the place of destination (L_j) is not significant in the case of the new ocialist towns. These findings therefore, tend to confirm the hypothesis that the leterminants of migration vary with the socio-economic attributes of the points of origin nd destination.

The empirical support for the proposition that the gravity function as a measure of "natural" migration, rather than those variables indicative of socio-economic disparity, ccounts overwhelmingly for flows between alike places is inconclusive. This thesis is ertainly confirmed by the findings for Budapest and the provincial cities, where the ravity function accounts for 97.4 per cent of the migration between these places. Additionally, the variables comprising the gravity function all have partial correlation oefficients with $M_{i \to j}$ greater than 0.90. Yet with streams between the new socialist

Table 29. Regression Statistics for Flows between Budapest and the Provincial Cities – (5 x 5 flow matrix)

Variables Added to Regression Set	R^2	Increase in R^2	At Last Regression Step			
			Coefficient	Standard Error	„t" Statistic	Partial Correlation
Constant			– 21.165	6.702	3.16	
log L_j	0.412	0.412	0.939	6.702	3.16	0.98
log P_i	0.906	0.494	0.891	0.051	17.37	0.98
log D_{ij}	0.974	0.068	– 1.176	0.139	8.47	0.68
log W_j	0.978	0.004	1.644	0.518	3.18	0.68
log S_j	0.980	0.002	1.305	0.663	1.97	0.49
log IE_i	0.982	0.002	– 1.117	0.442	2.52	– 0.59
log W_i	0.988	0.006	1.110	0.529	2.10	0.52

Regression Statistics for Flows between the New Socialist Towns Including Tatabánya – (7 x 7 flow matrix)

Variables Added to Regression Set	R^2	Increase in R^2	At Last Regression Step			
			Coefficient	Standard Error	„t" Statistic	Partial Correlation
Constant			– 23.884	14.698	1.62	
log D_{ij}	0.266	0.266	– 0.952	0.251	3.79	0.25
log P_i	0.304	0.078	0.612	0.383	1.60	0.25
log S_j	0.346	0.042	2.380	1.217	1.96	0.31
log IE_j	0.381	0.035	5.950	3.127	1.90	0.30

towns, by comparison, the variable- L_j-of the gravity function is not significant, while the variables of economic disparity – S_j and IE_j, have higher partial correlations with $M_{i \to j}$ than migrant availability (P_i).

To clarify further the influence of different types of origin and destination on the determinants of migration flows, the model was fitted, firstly, to a matrix of migration streams between the provincial cities and all other urban centres, excluding Budapest, and secondly, to this matrix partitioned according to provincial city and non-provincial city, points of origin and destination. A summary of the regression statistics of this analysis is presented in table 30.

Regarding the non-partitioned flow matrix, distance is again the most significant factor. Although the industrial earnings index at j entered the regression set at the second iteration, its significance fell at later steps with the introduction of migrant availability (P_i) and general level of opportunities (L_j). The level of service functions at both points of origin and destination and industrial employment at the point of destination are also

Table 30. Regression Statistics for Flows between the Provincial Cities and All Urban Centres

Variables Added to Regression Set	R^2	Increase in R^2	At Last Regression Step			
			Coefficient	Standard Error	„t" Statistic	Partial Correlation
Constant			– 11.376	1.922	5.92	
log D_{ij}	0.452	0.452	– 1.436	0.049	29.47	– 0.81
log W_j	0.533	0.081	1.174	0.277	4.24	0.19
log L_j	0.567	0.034	0.900	0.059	15.34	0.58
log P_i	0.719	0.152	0.836	0.056	14.82	0.57
log S_j	0.726	0.007	0.418	0.108	3.26	0.15
log S_i	0.731	0.005	– 0.419	0.126	3.33	– 0.15
log IE_j	0.736	0.005	0.338	0.118	2.87	0.13

Regression Statistics for Flows from All Other Urban Centres to the Provincial Cities

Variables Added to Regression Set	R^2	Increase in R^2	At Last Regression Step			
			Coefficient	Standard Error	„t" Statistic	Partial Correlation
Constant			– 5.753	2.734	2.10	
log D_{ij}	0.578	0.578	– 1.481	0.064	23.08	– 0.84
log P_i	0.728	0.150	0.792	0.076	10.46	0.57
log W_j	0.741	0.013	1.062	0.297	3.58	0.23
log S_i	0.746	0.005	0.347	0.125	2.78	0.18
log W_i	0.755	0.009	0.556	0.217	2.56	0.17

Regression Statistics for Flows from the Provincial Cities to All Other Urban Centres

Variables Added to Regression Set	R^2	Increase in R^2	At Last Regression Step			
			Coefficient	Standard Error	„t" Statistic	Partial Correlation
Constant			3.087	0.612	5.05	
log D_{ij}	0.406	0.406	– 1.397	0.077	18.12	– 0.77
log L_j	0.605	0.199	0.981	0.088	11.16	0.59
log IE_j	0.682	0.077	0.716	0.095	7.51	0.45
log W_j	0.696	0.014	1.279	0.528	3.14	0.20

significant factors. The signs of the regression coefficients of all three variables are as expected on a priori grounds. The model accounts for 73.6 per cent of the variance in the flow matrix.

Migration to non-provincial city destinations from provincial city origins is strongly correlated with the level of industrial wages and industrial employment at the places of destination. By comparison, migration to the provincial cities from non-provincial city origins is not only influenced by the level of industrial wages at the provincial city destinations, but also by the level of industrial wages and service functions at the non-provincial city origins. The latter variables are, however, positively related to migration, i.e. high levels of industrial wages and service functions in non-provincial city origins induce migration to the provincial cities[1]. This is contrary to the relationship hypothesised on a priori grounds. By way of partial explanation, it is suggested that individuals with skills who can command good wages, comprise a large component of the migrants to the provincial cities from other urban centres. Before moving, such individuals are more likely to reside in settlements with favourable rather than unfavourable wage structures, which in turn will reflect the level of service functions in such places. Evidence to support this contention can be derived from the shortage of skilled workers in the provincial cities which leads to the active attraction of such individuals by enterprises. Additionally, within the context of the system of registration, the skilled worker migrating permanently will find his move more facilitated than the unskilled worker. The general findings, however, tend to confirm further the hypothesis that the determinants of migration flows vary according to the characteristics of the places of origin and destination.

9.7 Distribution of Residuals and the Prediction on Interurban Migration Streams

The observed and expected flow matrices of migration between Budapest and the provincial cities, between the new socialist towns and between the urban centres of the Northern Region are presented in tables 31 to 33 . A feature of all flow matrices is the consistent underestimation by the model of the volume of migration between places separated by small distances, the critical value being of the order of 40 km. For larger distance values. the fit is encouragingly good.

The observed sizes of both dominant and counter streams between neighbouring places are inordinantly large when compared with the values of places further apart. Since the observed and expected values of net migration are not so disproportionate, this would suggest that the underestimation by the model of flows between neighbouring places is caused by the underevaluation of the component "natural" migration rather than an

[1] It is interesting to note that the friction of distance is less for flows from provincial city origins to non-provincial city destinations. This suggests that the provincial city population has the more extensive information field. At the same time the lower partial correlation coefficient between distance and migration from provincial city destinations implies that the aggregate information field of the provincial cities is less regular spatially than that of non-provincial city population.

Table 31. Observed and Expected Flow Matrices – Budapest and the Provincial Cities[1]

From \ To	Budapest	Debrecen	Miskolc	Pécs	Szeged	Total
Budapest		1345 (1064)	1306 (1464)	1454 (1660)	1196 (1197)	5301 (5387)
Debrecen	2437 (1187)	–	364 (341)	93 (93)	75 (96)	2969 (2308)
Miskolc	1960 (1965)	271 (273)	–	66 (75)	81 (68)	2378 (2381)
Pécs	1625 (1932)	65 (65)	70 (65)	–	1360 (1283)	3120 (3345)
Szeged	1529 (1785)	68 (86)	73 (75)	1631 (1256)	–	3301 (3202)
Total	7551 (7460)	1749 (1488)	1813 (1946)	3224 (3084)	2712 (2644)	17,069 (16,623)
Migration Balance	+2250 (+2073)	–1220 (– 820)	– 565 (– 435)	+124 (– 261)	– 589 (– 558)	0 (– 1)

[1]Expected values are shown in brackets

Table 32. Observed and Expected Flow Matrices – New Socialist Towns and Tatabánya[1]

From \ To	Ajka	Duna-újváros	Kazinc-barcika	Komló	Oroszlány	Tatabánya	Várpalota	Total
Ajka	–	10 (7)	4 (4)	4 (10)	11 (10)	18 (12)	15 (24)	62 (67)
Dunaújváros	7 (7)	–	18 (9)	29 (19)	1 (21)	23 (24)	8 (12)	86 (92)
Kazincbarcika	1 (2)	6 (3)	–	8 (4)	53 (5)	4 (6)	5 (5)	77 (25)
Komló	1 (4)	29 (7)	33 (5)	–	2 (6)	23 (10)	12 (12)	100 (44)
Oroszlány	7 (4)	1 (8)	10 (5)	1 (8)	–	255 (82)	4 (17)	278 (127)
Tatabánya	9 (8)	14 (15)	9 (12)	16 (17)	573 (155)	–	40 (34)	661 (241)
Várpalota	39 (10)	10 (14)	3 (6)	19 (14)	65 (21)	33 (22)	–	169 (87)
Total	64 (35)	70 (54)	77 (41)	77 (72)	705 (218)	356 (156)	84 (104)	1433 (680)
Migration Balance	+ 2 (– 32)	– 16 (– 38)	0 (+ 16)	– 23 (+ 28)	+ 427 (+ 98)	– 305 (+ 85)	– 85 (+ 17)	0 0

[1] Expected values are shown in brackets

Table 33. Observed and Expected Flow Matrices – Urban Centres of the Northern Region[1]

From \ To	Miskolc	Balassa-gyarmat	Eger	Gyöngyös	Hatvan	Kazinc-barcika	Ózd	Salgó-tarján	Sátoralja-újhely	Vác	Total
Miskolc	–	12 (16)	135 (210)	59 (94)	14 (17)	658 (408)	194 (170)	41 (58)	140 (52)	57 (19)	1310 (1044)
Balassagyarmat	17 (15)	4	18 (6)	10 (17)	1 (4)	1 (2)	1 (7)	69 (28)	1 (1)	37 (17)	155 (97)
Eger	172 (202)	7 (7)	–	128 (97)	52 (13)	33 (19)	64 (33)	44 (24)	7 (7)	8 (21)	515 (423)
Gyöngyös	56 (81)	7 (15)	134 (87)	–	65 (55)	4 (8)	6 (15)	31 (48)	2 (4)	4 (18)	309 (331)
Hatvan	24 (18)	3 (5)	47 (15)	84 (70)	–	15 (2)	3 (3)	12 (17)	1 (1)	1 (9)	190 (140)
Kazincbarcika	279 (320)	1 (1)	11 (42)	6 (8)	7 (1)	–	28 (38)	6 (8)	23 (4)	1 (1)	362 (423)
Ózd	282 (150)	4 (6)	99 (31)	7 (15)	8 (2)	89 (43)	–	27 (29)	13 (5)	6 (5)	535 (286)
Salgótarján	44 (51)	82 (27)	43 (22)	23 (49)	23 (14)	1 (9)	23 (29)	–	8 (3)	10 (13)	257 (217)
Sátoraljaújhely	242 (51)	1 (1)	17 (8)	8 (5)	1 (1)	53 (51)	32 (6)	1 (3)	–	1 (1)	356 (81)
Vác	9 (20)	12 (19)	11 (12)	10 (22)	1 (8)	3 (2)	8 (6)	4 (15)	3 (1)	– (105)	61 (105)
Total	1125 (908)	129 (97)	515 (433)	335 (377)	172 (115)	857 (498)	359 (307)	235 (230)	198 (78)	125 (104)	4050 (3147)
Migration	– 185	– 26	0	+ 26	– 18	+ 495	– 176	– 22	– 158	+ 64	0
Balance	(–136)	(0)	(+10)	(+46)	(–25)	(+ 75)	(+ 21)	(+13)	(– 3)	(– 1)	(0)

[1] Expected values are shown in brackets

underestimation of the component reflecting socio-economic disparity. It is difficult to justify the inclusion of additional variables to estimate the natural component of migration flows. Rather, the weighting of variables (P_i) – the assessment of migrant availability – and (L_j) – the measure of general opportunities at the place of destination – for all places separated by a distance of less than 40 km by a factor greater than one, is suggested as a solution[1]. Alternatively, the distance variable can be adjusted. This discrepancy therefore, would not appear to arise from a conceptual defect in the model, such as the exclusion of important independent variables.

Inspection of tables 31 to 33 demonstrates that the use of the model for the prediction of interurban migration streams is not unduly affected by the underestimation of flows between neighbouring places. The fit of the expected migration flow matrix for Budapest and the provincial cities is impressive. That for the new socialist towns is acceptable apart from the gross underestimation of flows between the nearby towns of Tatabánya and Oroszlány. A similar judgment can be made for the expected flow matrix of the Northern Region.

Gross in-, gross out- and net migration for the towns can also be predicted by summing the various row and column values of the flow matrices. Here, however, the underevaluation of flows between nearby places plays a considerable influence. Its effect is greatest on the prediction of total movement between the various groups of urban centres. Thus, the expected total movement between the new socialist towns is less than half the observed figure: between the urban centres of the Northern Region the short fall is one quarter of the observed value. Gross, in- and gross out- values for certain of the places are similarly distorted. Expected and observed net migration values for Budapest and the provincial cities correspond closely. Greater discrepancies, however, occur for the other urban centres. Yet the expected sign of the value for net migration usually corresponds with the observed.

Assuming that the functional relationships between migration and the independent variables in the model hold constant, the utility of the model for the forecasting of future interurban migration flows thus appears promising. Current values of the independent variables can be used to forecast interurban migration five years hence. The reliability of more long range predictions, however, will depend on the accuracy with which the independent variables can be estimated.

9.8 Summary

In this chapter a modified gravity model has been developed to explain and predict interurban migration in Hungary. It is postulated that migration streams comprise two components – namely 'natural' migration, and moves attributable to interurban socio-economic disparities. The gravity function is considered to assess natural migration while three additional variables are added to the model to measure socio-economic disparity.

The model has been fitted with promising results to a series of urban flow matrices aggregated according to geographical location. The gravity function was found to account

[1] The precise value of the weighting factor must await further empirical research

for the greater portion of the variance explained, from which it was concluded that 'natural' migration comprises a large proportion of interurban flows. The fitting of the model to a second set of flow matrices aggregated by urban type suggests that the determinants of interurban migration vary according to the types of origin and destination involved in the migration process.

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PART THREE

CURRENT MIGRATION AND POTENTIAL POPULATION CHANGE

CHAPTER 10

MIGRATION AND AGGREGATE POPULATION CHANGE

In the two preceeding chapters we have been concerned with the explanation and prediction of migration associated with the urban centres of Hungary. The models utilised have been deterministic in character and their facility for prediction depends above all upon the availability of reliable data for assessing the independent variables. Even for short term prediction, however, these are likely to prove just as elusive as the value of migration whose prediction is the object of the analysis.

Besides prediction and explanation, however, a third major aspect of migration must be examined, namely the implications of known and observed migratory flows for population change in Hungary. Here, on the assumption that migration flows remain unchanged, we can investigate the important questions of the potential effect of current migration flows on the population size of individual sub-areas and the consequential implications for the future distribution of population.

Such analyses must in no way be construed as excercises in migration or population forecasting because the unrealistic assumption of unchanging migration rates is necessarily adopted. We may, therefore, term this type of analysis as "analytical" projection. However, the following valuable information is forthcoming. Firstly, although forecasting is not the aim, indicators of the future size of territorial populations resulting from a given migration system are obtained. In the short term these could well provide reasonably accurate forecasts since temporal variations in the magnitude and directions of migration change only slowly in the majority of instances. Secondly, a comparison of the differing effects of a chronological sequence of migration flow matrices on population distribution is indicative of the changing quantitative significance of migration over time. The corrollary to this is that such projected distributions could well show the most effective direction for intervention to provide a population distribution within a province or a country considered desirable by such bodies as governmental planning authorities. Thirdly, depending on the method by wich the exercise is performed, an insight into the spatial mechanism of migration is provided.

The analysis can be approached in two ways. The first is to project future population on the assumption of unchanging fertility, mortality and migration. From this result is subtracted the values of a similar projection based solely on natural increase, the difference providing a measure of the part that migration could be expected to play in population change. The second approach is to ignore births and deaths and simply examine the effect of migration on a "closed" population. Although divorced from reality, it possesses the great advantage of enabling the other components of population change to be held constant while the implications of migration are measured directly. With this approach, one is in effect conducting a demographic experiment, the method of the pure and natural sciences. Which approach is selected will vary according to the detailed objectives of the analysis and data availability.

The analysis can be performed for aggregate populations or for populations differentiated by age and sex. Moreover, any number and combination of sub-areas can be adopted, the choice again depending on the objectives of the analysis and data availability.

In the following cpapters the relationship between migration and population change is assessed at various spatial scales for aggregate populations and for populations differentiated by age and sex. The differing implications of permanent and total migration are assessed seprately.

In seeking possible models to evaluate the relationship between migration and aggregate population change, stable population theory provides a useful analogy. Dublin and Lotka (1925) have shown that any population subject to constant age specific fertility and survivorship ratios eventually develops a stable age structure. Linked with the stable age structure is a constant rate of natural increase which is termed the true or intrinsic rate of natural increase. To illustrate more specifically what is meant, the following paragraph is quoted from Dublin and Lotka (op.cit.) and refers to the United Stated population in the decades immediately preceeding and following the year 1900. Through past decades the birth rate has been falling. This means that persons 30 years old today are survivors out of a relatively larger batch of births than persons 10 years old, for example, who were born at a time of more recent and therefore lower birth rate. In this way the older age groups are today weighted with the fruits of a relatively higher birth rate in the more remote past. So long as the birth rate continues falling, this situation of a swollen age distribution at adult ages may not give any outward signs of its inherent weakness. But the birth rate cannot continue to fall indefinitely. Sooner or later it must become stationary or nearly so. The second source of our relatively high proportion of persons in the reproductive age groups, (the first being immigration) ,will then also be cut off and then, with precisely the same mortality as today, and precisely the same fecundity of our women, we should have a birthrate very different from that now observed. That is to say, if the present schedule of frequency of maternity for women at each age remained permanently established; and if similarly the present schedule of mortality at different ages continued permanent, then after the age distribution had had time to adjust itself to these constant biological conditions, we should have instead of the present birth of 23.4 thousand per annum, a birthrate of only 20.9; at the same time the deathrate would rise from the present (1920) figure 12.41 to 15.43. Each of these changes alone is significant enough; but when we consider the effect upon the natural rate of increase, that is, upon the excess of the birthrate over the deathrate, we find that this has changed from 11 per thousand to 5.5 per thousand per annum; it has been cut down to just one half."

Lotka was in effect describing the interaction of a given schedule or age specific fertility and mortality rates and population age structure in the context of population hange, whereby he demonstrated the underlying trends of constant fertility and ıortality rates, or to put it in another way, the true growth potential of a given opulation. Our problem is very similar which is to calculate the potential for population hange of a given schedule of migration rates. Yet whereas Lotka examined the effect of onstant age specific fertility and mortality rates on the age structure of a given opulation, we are interested in the relationship between constant migration rates and the opulation numbers of a given set of sub-areas. Thus by analogy with stable population ıeory, our sub-areas are equivalent to Lotka's age groups.

Both stable population theory and the proposed migration model pertain therefore to losed populations: but whereas the population of stable population theory is closed in ıe spatial sense – i. e. migration is excluded, the sum of the populations of our sub-areas closed in a demographic sense by constraining fertility and mortality. It follows from ıis, that no measure equivalent to the intrinsic rate of natural increase can be derived om the migration model since the sum total population of the sub-areas remains onstant, i. e. the rate of natural increase is unity. However, by applying an unchanging chedule of migration rates to the populations of the various sub-areas, we can derive an quilibrium population distribution equivalent to Lotka's stable age stucture, which onstitutes the potential of our given schedule of migration rates for affecting population hange.

For clarity, we can restate our model in systems terminology. In stable population ıeory the components of the systems are female population age groups and the ınctional relationships or connections between these age groups are the associated age pecific fertility and survivorship ratios. The system evolves through firstly, the ageing of ıe population, secondly, the abstraction of individuals from the system by death and ıirdly, by the addition of individuals to the system through births. Although closed in a patial sense, the system is "open" in that individuals are crossing its boundaries and ecause it is an open system it tends to a steady state – i. e. a constant rate of population hange relating to a stable age structure.[1]

Our migration system is somewhat different. The components are the population sizes f the given set of sub-areas and the connections between these sub-areas are the ıter-sub-area migratory flows represented by a migration flow matrix. The system volves by the redistribution of population between the sub-areas through migration. ıdividuals neither enter nor leave the system and it is therefore closed. It, therefore,

[1] It is irrelevant to the current problem to describe in detail the various computational procedures ıssociated with the calculation of the stable age structure and intrinsic rate of natural increase (see Lotka 1935 and Coale 1957). However, the most recent computational methods are formalised in erms of matrix algebra and are of direct utility in the operational definition of our model (Lopez 1960 and Keyfitz 1965). Keyfitz has shown that if a projection operator matrix containing the elevant age specific fertility rates and survivorship ratios for a female population is raised to a ufficiently high power, the ratio of any element from the n th power of the matrix to the orresponding element from the n-1 th power of the matrix approximates the intrinsic rate of natural ncrease. The product of the n th power of this matrix and a column vector containing the size of each nitial female age group gives the stable female age structure. If instead of a matrix of age specific ertility rates and survivorship ratios relating to various age groups, we write a similar projection perator matrix containing the rates or probabilities of migrating between the given set of sub-areas, he associated equilibrium population distribution can be similarly calculated.

tends towards minimum entropy which is represented by a migration flow matrix of unchanging migration probabilities from which the equilibrium population distribution is derived.

10.1 An Ergodic Markov Chain Model of the Relationship Between Migration Streams and Population Change

We are now in a position to state our problem in more formal terms and to develop an operational model. Let us assume that we have a region consisting of n sub-areas. The population size of each sub-area and of the whole region is given, as well as the migration streams between the sub-areas for a specific time interval t to t + 1. The problem is to compute the population size of each sub-area at time t + 1, t + 2, . . . , t + n, on the assumption that the system of migration streams is unchanging through time. The population within the whole region is therefore closed in the sense that it does not vary in size since we are excluding fertility and mortality from our system by assuming natural increase to be unity.

Since natural increase is unity, we can assume that population change within the sub-areas, brought about by migration, is an ergodic Markov chain process. We can construct and define a Markov chain by referring to the specific problem. Let us denote the sub-areas within our region $a_1, a_2, \ldots, a_n$ and examine the migratory behaviour of one individual. The probabilities of the individual being in any sub-area at the initial time t are given, as well as the probabilities of the individual moving between sub-areas during the time interval t to t + 1, denoted in general terms p_{ij}, where p_{ij} is the probability of the individual moving from sub-area i to sub-area j. In Markov chain terminology the sub-areas are called states, the probabilities of moving between sub-areas are called transitional probabilities, and the time intervals over which movements take place are called steps. With this information we are able to calculate the probabilities of all possible movement sequences of the individual as well as the probabilities of the individual being in any particular sub-area at time t + , t + 2, . . . , t + n. For example, suppose the individual starts in sub-area a_i with probability $p_i^{(0)}$ then the probability of that individual moving to sub-area a_j after one step or after one time interval is p_{ij}, and the probability of him being in sub-area a_j is given by $p_i^{(0)} \cdot p_{ij}$. Similarly the probability of him moving to sub-area a_j after n steps or after time t + n is given by $p_{ij}^{(n)}$. A process of this type which allows one to calculate all possible sequences of movements between any of the sub-areas as well as the probabilities of being in any particular sub-area after a given period of time can be called a Markov chain process[1].

The process can be formalised in terms of matrix algebra[2]. Let us demonstrate for a region consisting of three sub-areas, $a_1, a_2\ a_3$. The probabilities of the individual being in any sub-area at the beginning of the process can be represented by a row vector:

$$p^0 = (p_1^{(0)} \quad p_2^{(0)} \quad p_3^{(0)}$$

[1] The mathematics of Markov chain process are detailed in Kemeny et al (1960) and Faddeev and Faddeeva (1960).

[2] Bernadell (1941) was the first to demonstrate the use of matrix algebra in population analysis.

and the transitional probabilities by a matrix P:

$$p = \begin{matrix} & a_1 & a_2 & a_3 \\ a_1 & p_{11} & p_{12} & p_{13} \\ a_2 & p_{21} & p_{22} & p_{23} \\ a_3 & p_{32} & p_{32} & p_{33} \end{matrix}$$

where p_{11} is the probability of moving from a_1 to a_1, i. e. of remaining in the sub-area a_1, p_{12} is the probability of moving from a_1 to a_2 and so on. The elements in rows of the matrix represent all possible outmovements from a given sub-area, and the numerical values of the elements of each row thus sum to one. The columns of the matrix give the in-movements to a given sub-area. A matrix of this type is called a stochastic matrix, this being defined as a square matrix whose row elements sum to one.

What is involved can be made clearer by reference to an actual numerical example and for simplicity let us consider a region containing two sub-areas, a_1 and a_2. Let us assume that the process begins in the following manner, with the probability of an individual starting in sub-area a_1 being $\frac{3}{4}$ and the probability of him starting in a_2 being $\frac{1}{4}$. This can be written as the row probability vector, $p^{(0)}$,

$$p^{(0)} = \left(\frac{3}{4}\ \frac{1}{4}\right)$$

The matrix of transitional probabilities describing all possible movement sequence between the sub-areas is,

$$P = \begin{pmatrix} \frac{1}{2} & \frac{1}{2} \\ \frac{1}{3} & \frac{2}{3} \end{pmatrix}$$

where the elements in the matrix are to be interpreted as above. Now suppose we wish to calculate the probabilities of the individual being in sub-area a_1 after one step, i. e. at time $t + 1$, we must take account of all possible ways of the individual moving to sub-area a_1. This can be done quite simply by pre-multiplying the matrix P of transitional probabilities by the row vector $p^{(0)}$, i. e.

$$p^{(1)} = p^{(0)} \cdot P \quad \text{or}$$

$$(3/4 \quad 1/4) \begin{pmatrix} 1/2 & 1/2 \\ 1/3 & 2/3 \end{pmatrix} = (11/24 \quad 13/24)$$

i. e. by following the row by column method of matrix multiplication, the probability of being in sub-area a_1 after one step is given by $3/4 \cdot 1/2 + 1/4 \cdot 1/3 = \frac{11}{24}$ and of being in a_2 is given by $3/4 \cdot 1/2 + 1/4 \cdot 2/3 = \frac{13}{24}$

Similarly $p^{(2)} = p^{(1)} \cdot P$, $p^{(3)} = p^{(2)} \cdot P, \ldots, p^{(n)} = p^{(n-1)} \cdot P$ and by substitution,

$$p^{(2)} = p^{(0)} \cdot P^{(2)},\ p^{(3)} = p^{(0)} \cdot P^{(3)}, \ldots, p^{(n)} = p^{(0)} \cdot P^{(n)}.$$

Thus by squaring the matrix and pre-multiplying it by the initial probability vector we obtain the probability of the individual being in a particular sub-area at time $t + 2$, by cubing the matrix at time $t + 3$, and in general, after time $t + n$, by raising the matrix to its n th power. The elements within the powers of the initial matrix P give the probabilities of moving from one sub-area to another after the time period corresponding to the matrix exponent has elapsed. In the case where we are concerned with more than one individual, the probabilities of being in particular sub-areas allow us to calculate the actual number of individuals within any sub-area, if the total population within all sub-areas is known. In this manner the ergodic Markov chain model allows one to compute the time changing implications of a particular migration system with regard to population change, without having to unravel what are, in this instance, the distorting effects of fertility and mortality.

If the stochastic matrix P is regular, where a regular matrix is defined as a matrix whose powers contain only positive elements, then the matrix P, if raised to a sufficiently high power, approaches an 'equilibrium' matrix T, where $T = T \cdot P = T \cdot T$. A unique probability vector t is associated with matrix T such that $t = p^{(0)} \cdot T = t \cdot T$, and where t is identical with each row probability vector forming the matrix T. The equilibrium matrix T can be calculated quite rapidly by matrix iteration, by squaring matrix P, squaring the result and so on. So for example, after eight iterations P^{256} is obtained.

In the context of the relationship between migration and population change, this is the most useful characteristic of a Markov chain and relates directly to our problem. It demonstrates that no matter what initial migration probabilities are assigned to population movements between sub-areas and no matter what the probabilities are of being in any sub-area at the start of the process, then, provided the matrix P of transitional probabilities is regular, it will approach an equilibrium matrix T describing a state of statistical equilibrium when the probabilities of migrating between any sub-area and any other will not change with additional time. Associated with this matrix T is a unique probability vector t containing the probabilities of being in each sub-area, and which is also an equlibrium state. In other words, we have obtained what we can term the end product implications or underlying migration tendencies of a particular migration system as a determinant of population change. The equilibrium population distribution as given by vector t is an index of migration that is directly analogous to the stable age structure of stable population theory.

The Markov chain model thus proves itself a powerful analytical tool in the study of migration. Although pioneered in the field of genetics and in the study of epidemics, Markovian processes are being increasingly applied to the analysis of 'movement' problems in the social sciences. Both the ergodic chain, which has been outlined above and in which it is possible to go from any state to any other state, and the absorbing chain are relevant to such problems, where an absorbing chain has one or more states that it is impossible to leave. The latter has apparent utility in the field of population forecasting, where one is concerned not only with migration but also with fertility and mortality. In this context, an example of an absorbing state would be death.

I. Blumen, M. Kogan and P. J. McCarthy (1955) used a "mover-stayer" model to describe employment mobility between different types of industry. In this model it was assumed that a "stayer" remained within the same industry while a "mover" changed industries over time. L. A. Goodman (1961) has outlined modifications to the model which facilitates the computation of the relevant probabilities. A. Rogers (1966), has suggested how Markov chain processes can be applied to the problem of calculating the magnitude of inter-territorial migration streams necessary to attain a desired distribution of population between the sub-areas of a region. He makes use of both "an ergodic policy model" in which natural increase within the population is disregarded and an "absorbing policy model" which includes natural increase. He does not, however, stress the considerable time that can elapse before the desired distributions are attained, which can make the results of academic rather than of practical interest. In his judgment, the absorbing model is of greater practical value. Although theoretically correct, this is a rather misleading, since his statement of the model makes no allowance for the age and sex structure of the populations being projected. It also utilises crude fertility, mortality and migration rates instead of age specific rates. Since the absorbing model is by implication a forecast, crude measures of the components of population change are insufficiently precise.

10.2 Spatial Framework

Analyses of the relationship between current migration and potential population change are made at three levels of spatial aggregation, as no single areal framework proved entirely satisfactory. The basic areal units adopted for the tabulation of migration data in Hungary are the rural and urban districts and an analysis utilising this system as the spatial framework is theoretically quite satisfactory, since it largely corresponds to the functional division of the country. With few exceptions the rural districts are of an agricultural nature, while the settlements administratively classed as towns are urban in function, with the exception of some of the large centres of the Alföld which are accorded urban status primarily because of their size. Two practical drawbacks exist, however, in the adoption of this framework. Firstly, it has been continually modified since 1957 and the 128 rural districts in existence in that year had been reduced through amalgamation to 117 by 1965. The results of a time series comparision of migration implications are therefore invalidated at the district scale unless the annual migration statistics are retabulated according to a specific and unchanging number of areal units of district order. Secondly, an avarage of approximately 185 rural and urban districts have been recognised since 1957, giving a possible 32,220 separate migration streame. This would make for lengthy computational work even with the modern machine techniques at one's disposal.

The county and county boroughs provide a second level of spatial aggregation, however, which is more suitable as an analytical framework. It produces a 24 × 24 migration flow matrix which is easily processed and this scale has consequently been chosen as framework for analysis. Moreover, the boundaries of these sub-areas have remained unchanged since 1949 and a time series analysis of the varying effects of each annual migration system does not therefore require data retabulation. However, the counties are neither homogeneous in character nor functional units. An analysis of the relationship between migration and potential population change is consequently only meaningful at that particular scale and must therefore be supplemented by analyses at different levels of spatial aggregation to demonstrate fully the implications of current migration.

With this end in view, the analysis at the county scale is supplemented, firstly by a study of the relationship between migration and population change at the level of the different settlement classes of the country to depict rural-urban differentials. The four classes recognised and extensively utilised by the Central Statistical Office are adopted, namely, Budapest, the county boroughs the district towns and the villages[1]. The second supplementary analysis is performed at the level of the six economic regions of the country. These are functional long term planning areas and therefore constitute an important framework within which to examine the relationship between migration and potential population change (e. g. Horányi 1965). Although there is no general agreement in Hungary as to the boundaries of these economic areas, the division used by the Central Planning and Central Statistical Offices has been accepted here.

In addition to assessing the implications of migration at these various levels of spatial aggregation, temporal variations in equilibrium population distributions can be used to classify areas according to their migration characteristics. They can also be employed to demonstrate underlying trends in migration and thus to test the response of migration to socio-economic change. In the following chapters, therefore, as an addition to the straightforward reporting of the implications of migration, these other applications of equilibrium population distribution analysis are demonstrated. To this end, the economic regions are selected to assess the contrasting implications for population distribution of permanent and total migration. Secondly, on the basis of a time series comparison of the equilibrium population distributions of the economic regions and settlement classes, the response of migration to socio-economic changes associated with the second five year plan is evaluated. Thirdly, the counties and county boroughs of Hungary are classified according to the magnitude and trend pattern of their equilibrium populations as derived from annual migration systems between 1959 and 1965.

10.3 Migration and Population Change for the Economic Regions of Hungary

In this section we are concerned with the relationship between current migration and potential population redistribution between the economic regions of Hungary. The differing implications of permanent migration and total migration are demonstrated, where total migration is defined as the sum of permanent, temporary and temporary return moves (Compton 1966). The effect of total migration is analysed separately for although opposed temporary migration streams by and large balance each other, thus playing little part in population change, when taken over an extended period the greatly

[1] The adoption of a more detailed settlement class system was precluded by the necessity to retabulate the basic migration data.

increased intensity of total as compared to permanent mobility leads to a more rapid convergence to equilibrium.

The first step in the analysis is the construction of two data matrices, D_p and D_t, cross tabulating permanent and total migration respectively between the six economic regions during the five year period January lst 1960 to December 31st 1964. The elements on the principle diagonals of these matrices represent the non-mobile population during this period. The data matrices are given in table 34, where the column and row elements represent in- and out-migration respectively.

The data matrices are converted into the probability matrices M_p and M_t, representative of the permanent and total migration system respectively. Matrices M_p and M_t are given in table 35.

Table 34. The Permanent Migration – D_p – and Total Migration D_t – Data Matrices for the Economic Regions – 1960–1964

Out-Migration	In-Migration a	b	c	d	e	f	
a	2 551 027	18 127	26 739	30 364	14 604	30 427	
b	35 638	1 240 330	4 832	17 298	2 855	7 683	
c	59 517	6 416	1 379 410	13 572	13 948	15 733	$=M_p$
d	77 419	29 442	14 771	1 426 935	6 367	16 452	
e	30 967	2 731	9 767	4 037	973 070	17 003	
f	50 174	6 393	9 087	8 585	14 874	1 794 255	

	a	b	c	d	e	f	
a	1 873 517	114 261	180 206	238 556	100 463	164 280	
b	142 130	1 030 647	17 329	82 742	8 864	27 124	
c	223 877	18 603	1 122 550	35 431	35 954	52 181	$=D_t$
d	311 700	100 486	36 397	1 048 295	14 590	59 918	
e	121 284	8 449	32 056	12 042	804 552	59 192	
f	190 552	24 819	41 768	46 610	55 850	1 523 769	

Where:

a is the Central Industrial Region
b. is the Northern Industrial Region
c is Southeast Alföld
d is Northeast Alföld
e is Southern Transdanubia
f is Northern Transdanubia

Table 35. The Transitional Probability Matrices M_p and M_t

	a	b	c	d	e	f
a	0,954982	0,006786	0,010010	0,011366	0,005467	0,011389
b	0,027229	0,947808	0,003696	0,013216	0,002181	0,005870
c	0,039982	0,004310	0,0926652	0,009117	0,009370	0,010569
d	0,049268	0,018736	0,0009400	0,908074	0,004052	0,010470
e	0,029846	0,002632	0,0009413	0,003891	0,937831	0,016387
f	0,026641	0,003394	0,0004825	0,004558	0,007898	0,952948

$= M_p$

	a	b	c	d	e	f
a	0,701355	0,042774	0,067460	0,089304	0,037608	0,061499
b	0,108593	0,787590	0,013240	0,63218	0,006635	0,020740
c	0,150395	0,012497	0,754100	0,023801	0,024153	0,035054
d	0,198360	0,063947	0,023162	0,667115	0,009285	0,038131
e	0,116892	0,008143	0,030895	0,011606	0,775416	0,029655
f	0,101176	0,013178	0,022177	0,024748	0,057048	0,809066

$= M_t$

Where:

a is the Central Industrial Region
b is the Northern Industrial Region
c is Southeast Alföld
d is Northeast Alföld
e is Southern Transdanubia
f is Northern Transdanubia

Given the migration systems M_p and M_t, we can project the populations of the economic regions to equlibrium on the assumptions that firstly, the sum total population of the six regions remains constant and secondly, that the migration probabilities remain unchanged through time. Since our model is an ergodic Markov chain, we know that the equilibrium population distributions associated with each system are independent of any initial starting distribution, the equilibrium distributions being the respective row probability vectors of high powers of matrices M_p and M_t. Consequently, in this respect there is no need to define the initial population probability distributions. Our interest, however, is not solely in the equilibrium matrices and associated vectors but also in the changing regional distribution of population as each system tends to equilibrium. Since these intermediate distributions are not indentical with the row vectors of corresponding probability matrices, but are dependent upon the starting probabilities, we must define an initial population distribution $d^{(0)}$ which has been taken as the distribution of population between the economic regions on January lst, 1960, where $d^{(0)}$ is the row vector:

a	b	c	d	e	f[1]
(0,268173	0,131396	0,149442	0,157753	0,104163	0,189073)

In addition to the projected population distributions derived from the interaction of $d^{(0)}$ and M_p and M_t, the regional population numbers associated with each iterative stage of

[1] a . . . f represent the economic regions as defined in table 35.

the probability matrices can also be calculated. In order to facilitate this, we have adopted the actual population sizes of each economic region at the beginning of 1960 as an additional initial population vector $k^{(0)}$, where $k^{(0)}$ is the row vector:

a	b	c	d	e	f[1]
(2 671 238	1 308 836	1 488 596	1 571 386	1 037 575	1 883 368)

Since interregional migration streams have been summed over a five year period in the construction of the initial probability matrices, the resulting projections are in five year steps. For example the product of the matrix M_p and the row vector $d^{(0)}$ gives the regional population distribution at the beginning of 1965 derived from permanent changes of residence and so on. The computation of the equilibrium matrices and population vectors by single steps is, however, an extremely lengthy process, and although providing detailed information, the evolution of each population migration system can be adequately demonstrated by the computation of a fewer number of selected intermediate matrices and vectors. For these reasons an iterative squaring procedure has been adopted and intermediate probability matrices and population vectors are thus available for the 1st, 2nd, 4th, 8th, . . . , and 256th powers of the matrices M_p and M_t. In terms of actual dates, these powers are equivalent to the years 1965, 1970, 1980, 2000, . . . , and 3240 respectively. It must be stressed that the projected population vectors associated with these dates are in no way meant to approximate the future populations of the economic regions and the results in the accompanying tables are not to be regarded as population forecasts. The vectors demonstrate solely the expected distribution of population derived from a given schedule of migration probabilities assuming a constant regional population total and an unchanging schedule of migration probabilities.

Tables 36 & 37 represent the evolution of each system in terms of the population vectors derived from the powers of the matrices M_p and M_t. The permanent migration system attains equilibrium at the 256th power of matrix M_p, i. e. in the year 3240. In contrast, the total migration system converges more rapidly, and equilibrium is attained at the 64th iteration of M_t or in the year 2280. It should be noted, however, that equilibrium is closely approximated quite early on in the iterative process of each migration system; thus the population sizes of the economic regions sustain little additional change after the 16th iteration of the matrix M_t and the 64th iteration of the matrix M_p. The approach to equilibrium is thus asymptotic in form.

Equilibrium is achieved when the complex interactions of the interregional migration flows result in zero net movement between the economic regions, and is a measure of the initial imbalance within each migration system. The greater the magnitude of these flows, the more rapidly is equilibrium achieved. Consequently, the rate of convergence to equilibrium characterises the average intensity of movements within a migration system and provides a useful summary index of mobility. The utility of this index is not readily apparent in the current example, however, because the intra-system variations in intensity

[1]a . . . f represent the economic regions as defined in table 35.

are immediately apparent from the inspection of matrices M_p and M_t. However, if one were characterising variations in overall mobility in a time series of migration systems for which the differences were neither as great nor as obvious as in the current example, contrasting rates of convergence to equilibrium could provide a satisfactory and accurate method of characterising variations in intra-system mobility.

The equilibrium matrices $M_p^{(256)}$ and $M_t^{(64)}$ and the associated eigen vectors $d_p^{(256)}$ and $d_t^{(64)}$ supply further contrasts between the two migration systems. Although initially interregional migratory flows are greater in the M_t than in the M_p matrix, the total migration system ultimately leads to a more even distribution of population between the economic regions of the country. Thus, whereas at equilibrium, the permanent migration system predicts an expected 42.3 per cent of the population of the country residing in the Central Region, the equivalent figure generated by the total migration system is 30.9 per cent and similarly with the other regions (table 37). This result is perhaps contrary to what would be expected on a priori grounds since current regional population balances derived from total migration are in every case larger than those resulting solely from permanent changes of residence. For example, over the five years 1960 to 1964, the Central Industrial Region experienced a net inflow of 192 thousand inhabitants as a result of all movements combined, compared with 133 thousand from migration involving permanent changes of residence only. In contrast, Northeast Alföld lost 37 thousand more individuals over the same period from total moves than from moves of a permanent nature. Although in the "short" term therefore total migration must lead to the greater concentration of population in the central areas of the country and consequently to the greater depopulation of the Alföld and other peripheral areas, the long term implications are for permanent migration to produce the larger regional population disparities.

To illustrate the process whereby the long and short term implications of the two systems differ, let us consider the two place example of Northeast Alföld and the Central Industrial Region, net population movement being in the direction of the latter. Of the two systems, the higher probabilities associated with total migration lead initially to a smaller population in Northeast Alföld and a larger concentration in the Central Industrial Region for the reasons just given. But counteracting a rapid and continuous widening of this gap are two factors. Firstly, as the population of Northeast Alföld falls, the number of migrants moving to the Central Industrial Region declines in sympathy consequent upon the out-migration probabilities remaining constant over time. Secondly, as the population of the Central Industrial Region rises in number, migration to Northeast Alföld increases for the same reason. Eventually, equilibrium is attained when the two flows are in balance and net movements are zero. Yet the greater the migratory flows, the more rapidly is equilibrium achieved, as we have already seen. Consequently, the accretion of population to the Central Industrial Region and the corresponding drain from Northeast Alföld continues over a longer time interval in the case of permanent migration and is sufficient to surpass the greater initial disparity in population size resulting from the total migration system. Naturally a similar argument can be applied to the six region system which we have here.

We can now examine the population vectors derived from the two systems in the light of this discussion. Thus, it is only in the early stages of the evolution of each system that

Table 36. Expected Population Distributions for the Economic Regions of Hungary Derived from the Iteration of Matrix M_p

Region	1960		1965		1970		
	Initial Population Vector $k_p^{(0)}$	Initial Population Distribution Vector $d_p^{(0)}$	Population Vector $k_p^{(1)}$	Population Distribution Vector $d_p^{(1)}$	Population Vector $k_p^{(2)}$	Population Distribution Vector $\bar{d}_p^{(2)}$	$k_p^{(2)}/k_p^{(1)}$
Central Industrial	2 671 3	0,2682	2 804 7	0,2816	2 926 4	0,2938	1,0434
Northern Industrial	1 308 8	0,1314	1 303 6	0,1309	1 298 1	0,1303	0,9958
Southeast Alföld	1 488 6	0,1494	1 444 6	0,1450	1 404 4	0,1410	0,9722
Northeast Alföld	1 571 4	0,1577	1 500 8	0,1507	1 437 7	0,1443	0,9580
Southern Transdanubia	1 037 6	0,1042	1 025 7	0,1029	1 014 6	0,1019	0,9892
Northern Transdanubia	1 883 4	0,1891	1 881 6	0,1889	1 879 9	0,1887	0,9991
Total	9 961 1	1,0000	–	1,0000	9 961 0	1,0000	–

Region	1980			2000		
	Population Vector $k_p^{(4)}$	Population Distribution Vector $d_p^{(4)}$	$k_p^{(4)}/k_p^{(2)}$	Population Vector $k_p^{(8)}$	Population Distribution Vector $d_p^{(8)}$	$k_p^{(8)}/k_p^{(4)}$
Central Industrial	3 138 6	0,3151	1,0725	3 462 2	0,3476	1,1031
Northern Industrial	1 286 2	0,1291	0,9908	1 261 4	0,1266	0,9807
Southeast Alföld	1 334 0	0,1339	0,9499	1 226 0	0,1231	0,9190
Northeast Alföld	1 330 8	0,1336	0,9257	1 177 3	0,1182	0,8846
Southern Transdanubia	994 4	0,0988	0,9801	961 2	0,0965	0,9666
Northern Transdanubia	1 877 1	0,1885	0,9985	1 873 0	0,1880	0,9978
Total	9 961 0	1.0000	–	9 961 1	1,0000	–

Table 36 continued

Region	2040			2120		
	Population Vector $k_p^{(16)}$	Population Distribution Vector $d_p^{(16)}$	$k_p^{(16)}/k_p^{(8)}$	Population Vector $k_p^{(32)}$	Population Distribution Vector $d_p^{(32)}$	$k_p^{(32)}/k_p^{(16)}$
Central Industrial	3 844 1	0,3859	1,1103	4 124 1	0,4140	1,0729
Northern Industrial	1 216 4	0,1221	0,9643	1 160 1	0,1165	0,9537
Southeast Alföld	1 098 2	0,1103	0,8958	1 007 [illegible]	0,1011	0,9172
Northeast Alföld	1 017 1	0 1021	0,8640	926 6	0,0930	0,9910
Southern Transdanubia	916 2	0,0920	0,9531	8 748 0	0,0878	0,9549
Northern Transdanubia	1 869 0	0,1876	0,9979	1 868 2	0,1876	0,9996
Total	9 961 0	1,0000	–	9 961 1	1,0000	–

Region	2280			2600		
	Population Vector $k_p^{(64)}$	Population Distribution Vector $d_p^{(64)}$	$k_p^{(64)}/k_p^{(32)}$	Population Vector $k_p^{(128)}$	Population Distribution Vector $d_p^{(128)}$	$k_p^{(128)}/k_p^{(64)}$
Central Industrial	4 213 5	0,4230	1,0217	4 220 7	0,4237	1,0017
Northern Industrial	1 126 9	0,1131	0,9714	1 121 4	0,1126	0,9951
Southeast Alföld	982 8	0,0987	0,9757	982 0	0,0986	0,9992
Northeast Alföld	910 0	0,0913	0,9831	909 5	0,0913	0,9995
Southern Transdanubia	857 2	0,0861	0,9799	855 6	0,0859	0,9981
Northern Transdanubia	1 870 6	0,1878	1,0013	1 871 9	0,1879	1,0007
Total	9 961 0	1,0000	–	9 961 0	1,0000	–

Table 36 continued

Region	3220			3221	
	Population Vector $k_p^{(256)}$	Population Distribution Vector $d_p^{(256)}$	$k_p^{(256)}/k_p^{(128)}$	Population Vector $k_p^{(257)}$	$k_p^{(257)}/k_p^{(256)}$
Central Industrial	4 220 7	0,4237	1,00001	4 220 7	1,00000
Northern Industrial	1 121 2	0,1126	0,99988	1 121 2	1,00000
Southeast Alföld	982 0	0,0986	1,00001	982 0	1,00000
Northeast Alföld	909 5	0,0913	0,99999	909 5	1,00000
Southern Transdanubia	855 6	0,0859	1,00001	855 6	1,00000
Northern Transdanubia	1 872 0	0,1879	1,00004	1 872 0	1,00000
Total	9 961 0	1,0000	–	9 961 0	–

Table 37. Expected Population Distributions for the Economic Regions of Hungary Derived from the Iteration of Matrix M_t

Region	1960		1965		1970		
	Initial Population Vector $k_t(0)$	Initial Population Distribution Vector $d_t(0)$	Population Vector $k_t(1)$	Population Distribution Vector $d_t(1)$	Population Vector $k_t(2)$	Population Distribution Vector $d_t(2)$	$k_t(2)/k_t(1)$
Central Industrial	2 671 3	0,2682	2 863 1	0,2874	2 964 5	0,2976	1,0354
Northern Industrial	1 308 8	0,1314	1 297 4	0,1303	1 289 0	0,1283	0,9935
Southeast Alföld	1 488 6	0,1494	1 430 3	0,1436	1 396 2	0,9762	0,9762
Northeast Alföld	1 571 4	0,1577	1 463 7	0,1469	1 406 7	0,1412	0,9611
Southern Transdanubia	1 037 6	0,1042	1 020 1	0,1024	1 011 4	0,1015	0,9915
Northern Transdanubia	1 883 4	0,1891	1 886 5	0,1894	1 893 4	0,1901	1,0004
Total	9 961 1	1,0000	9 961 2	1,0000	9 961 2	1,0000	

Region	1980			2000		
	Population Vector $k_t(4)$	Population Distribution Vector $d_t(4)$	$k_t(4)/k_t(2)$	Population Vector $k_t(8)$	Population Distribution Vector $d_t(8)$	$k_t(8)/k_t(4)$
Central Industrial	3 045 9	0,3058	1,0275	3 073 5	0,3085	1,0091
Northern Industrial	1 277 7	0,1283	0,9913	1 267 0	0,1272	0,9916
Southeast Alföld	1 363 2	0,1368	0,9764	1 344 5	0,1350	0,9863
Northeast Alföld	1 360 4	0,1366	0,9761	1 342 6	0,1348	0,9869
Southern Transdanubia	1 005 4	0,1009	0,9941	1 005 3	0,1009	0,9999
Northern Transdanubia	1 908 5	1,1916	1,0080	1 929 2	0,1936	1,0103
Total	9 961 1	1,0000	–	9 961 0	1,0000	–

Table 37 continued

Region	2040			2120		
	Population Vector $k_t^{(16)}$	Population Distribution Vector $d_t^{(16)}$	$k_t^{(16)}/k_t^{(8)}$	Population Vector $k_t^{(32)}$	Population Distribution Vector $d_t^{(32)}$	$k_p^{(256)}/k_p^{(128)}$
Central Industrial	3 074 3	0,3086	1,0003	3 074 0	0,3086	0,9999
Northern Industrial	1 261 2	0,1266	0,9954	1 260 1	0,1265	0,9991
Southeast Alföld	1 339 4	0,1345	0,9962	1 339 0	0,1344	0,9997
Northeast Alföld	1 339 6	0,1345	0,9978	1 339 2	0,1344	0,9997
Southern Transdanubia	1 007 1	0,1011	1,0018	1 007 7	0,1012	1,0005
Northern Transdanubia	1 939 4	0,1947	1,0058	1 941 2	0,1949	1,0009
Total	9 961 0	1,0000	–	9 961 2	1,0000	–

Region	2280			2281	
	Population Vector $k_t^{(64)}$	Population Distribution Vector $d_t^{(64)}$	$k_t^{(64)}/k_t^{(32)}$	Population Vector $k_t^{(65)}$	$k_t^{(65)}/k_t^{(64)}$
Central Industrial	3 074 0	0,3086	1,00000	3 074 0	1,00000
Northern Industrial	1 260 0	0,1265	0,99997	1 260 0	1,00000
Southeast Alföld	1 339 0	0,1344	1,00000	1 339 0	1,00000
Northeast Alföld	1 339 2	0,1344	0,99999	1 339 2	1,00000
Southern Transdanubia	1 007 7	0,1012	1,00000	1 007 7	1,00000
Northern Transdanubia	1 941 2	0,1949	1,00002	1 941 2	1,00000
Total	9 961 1	1,0000	–	9 961 2	–

total migration generates the more pronounced changes in regional population numbers. For instance, vector $k_t^{(2)}$ shows the larger population in the Central Industrial Region after which the vectors k_p always produce the higher figure. By comparison, population loss form Northeast Alföld through total migration is higher up to vector $k_t^{(2)}$, but the permanent migration system subsequently indicates net outflows of greater magnitude. The corresponding values for the other regions are shown in tables 36 and 37.

A further characteristic of the evolution of each system is that the equilibrium vectors do not necessarily comprise either the minimum population size of regions consistently losing population through migration or the maximum sizes for regions experiencing net population inflow. Thus, according to the permanent migration system, the population of Northern Transdanubia can be expected to reach a minimum at vector $k_p^{(32)}$ and subsequently increase in size. The population of Southern Transdanubia projected from the total migration system is at a minimum at vector $k_t^{(8)}$, while that of the Central Industrial Region attains its maximum value at that particular step.

At this point it must again be stressed that the vectors derived from the iterations of matrices M_p and M_t demonstrate solely the manner in which a given schedule of migration probabilities can be expected to redistribute population between the six economic regions on the basis of the assumptions adopted in the model. They are therefore not population forecasts. The powers of the initial matrices M_p and M_t, however, are more amenable to direct interpretation since they are independent of any population vector or of the factors of fertility and mortality. They provide a wealth of information concerning not only the probabilities of interregional migration but also the population ratios that can be expected to migrate between the regions up to given stages in the projection process. To demonstrate this facility the example of matrix ${M_p}^{(2)}$ is discussed (table 38). By inspection we can see that during the twenty years 1960 to 1970 the completed probability of moving from the Northern Industrial Region to the Central Industrial Region is 0.053 and similarly the probability of moving in the reverse direction is 0.013. In other words, we can expect 5.3 per cent of the population residing in the Northern Region during the 10 years of the projection to move to the Central Industrial Region by 1970, and similarly, 1.3 per cent of the population of the Central Industrial Region can be expected to move to the Northern Region, during the same period. The elements of the other transitional matrices of M_p and M_t can be interpreted in the same manner.

Table 38. The Transitional Probability Matrix M_p^2

	a	b	c	d	e	f
a	0,913602	0,013221	0,019073	0,021430	0,010593	0,022018
b	0,052831	0,898814	0,007374	0,024906	0,004396	0,011679
c	0,076359	0,008582	0,859325	0,017323	0,017819	0,020592
d	0,093075	0,035193	0,017898	0,825555	0,007960	0,020319
e	0,057569	0,005335	0,017975	0,007717	0,879929	0,031375
f	0,051568	0,006758	0,009464	0,008904	0,015148	0,908158

$= M^2\ p$

Completed population change resulting from the two systems suggests the following pattern of evolution. Moves involving permanent changes of residence between 1960 and 1964 could be expected to increase the proportion of the population of Hungary residing in the Central Industrial Region from 26.8 per cent in 1960 to 42.2 per cent of the total Hungarian population. By contrast, the percentage of population in Northeast and Southeast Alföld could be expected to decrease from 15.1 per cent to 8.6 per cent and 14.5 per cent to 9.1 per cent respectively. Smaller percentage decreases than above are indicated from Northeast and Southeast Alföld while stability in the proportions of population residing in the Northern Region and in Southern Transdanubia is suggested.

In summary, the Markov chain models suggest that if current rates of migration are maintained, the total migration system – M_t – will produce neither an excessive concentration of population within the Central Region, nor excessive depopulation from the Alföld. The permanent migration system, on the other hand, generates large disparities in regional population sizes. Which system more closely approximates future reality is difficult to judge at this stage. The methodology of the analysis, however, leads one to suggest that the permanent migration system may well possess the greater veracity, since the assumption of out-migration being proportional to the population size of the region of origin is highly questionable in the case of temporary return migration, an important component of total movement. In this context it may be suggested with justification that migrants returning from temporary to permanent residences are more logically related to the population number of their place of permanent rather than temporary origin as has been assumed in the preceeding analysis.

10.4 The Migration Response to the Economic Decentralisation Policy of the Second Five Year Plan

Owing to the territorial concentration of economic activity and population in the environs of Budapest, the second five year plan outlined a programme of economic decentralisation. The essential feature of the policy was the continued expansion of seven large provincial towns, namely Debrecen, Miskolc, Pécs, Szeged, Győr, Székesfehérvár and Veszprém together with the new socialist towns, to counterbalance the attractiveness of Budapest and to prevent an excessive concentration of population in the Central Region of the country. Moreover, expansion was to be encouraged in other towns possessing a suitable economic profile. Territorially this policy was designed to generate further development in Northern Transdanubia, in the Northern Industrial Region and in the Pécs area of Southern Transdanubia as well as create new industrial centres in the Alföld (Radó 1963).

On the basis of the hypothesis that population redistribution through migration is largely the result of differential economic development, a migratory response is consequently to be expected to the changes introduced during the course of the second five year plan. One might expect migration to the Central Industrial Region and population movement away from the Alföld, particularly Southeast Alföld, to fall. Migration to Northern Transdanubia and to the Northern Industrial Region by comparison might be expected to increase.

The expected implications of the plan for the various settlement types might be suggested as a reduction in migration to Budapest but increased population flows to the provincial cities and some district towns. Owing to the continued decline of the agricultural labour force, the depopulation of the villages might be expected to continue at the same pace or even to accelerate.

Although perhaps not a conscious aim the measures taken in the second five year plan therefore sought to induce changes in the direction of population redistribution by influencing the spatial pattern of socio-economic factors generating migration. Any assessment of the outcome of this policy can, therefore, come through the analysis of the migration response to these changes, and the implications of this response for future population distribution within the country.

The most direct and simple method of assessing the migration response to any change in socio-economic conditions, is to examine movements in the migration balance of individual areas. For instance, if a relative fall occurred in the net in-flow of population to Budapest during the course of the plan, one might attribute it to the decentralisation programme. The migration balance, however, of any particular place is the result of the inter-action of a multitude of population flows within a migration system. Consequently, it is through the assessment of the implications for population change of a migration system that the most logical and reliable basis for measuring the migration response to socio-economic change is to be found. The Markov chain model provides one with an operational definition of this migration population system, for here migration is treated as a set of migration flows which are used to project the temporal relationship between spatial mobility and population change. The migration response to any set of socio-economic factors can thus be assessed in terms of its expected influence on population size.

In this section the migration response to the measures introduced in the second five year plan is assessed for the four settlement classes previously recognised and for the economic regions. Since the second five year plan was in operation from 1960 to 1964, the migration response to the new economic course is measured by comparing the implications of migration for population distribution during the period 1957 and 1960 with those for the period 1961 and 1964. The time changing implications of permanent migration only are considered owing to the unavailability of temporary return migration data previous to 1961.

The first part of the analysis is concerned with inter-settlement class migration. The transitional probability matrices S_{1957} and S_{1961} (table 39) containing the average probabilities of migrating between the settlement classes for the period 1957 to 1960 and 1961 to 1964 respectively, were calculated as previously. The vectors corresponding to each stage of matrix iteration are given in table 40 and comprise firstly the probability vectors, written as the percentage distribution of population between the settlement classes, and secondly, the actual population number within each settlement class. The average rates of population change between successive iterations are also given. The number of population and the distribution of population between the settlement classes at the beginning of 1961 were adopted as the initial vectors – $k_s^{(0)}$ and $d_s^{(0)}$ respectively. The comparability of the two vector systems was thus ensured.

Table 39. The Transitional Probability Matrices S_{1957} and S_{1961}

	a	b	c	d	
a	0,940362	0,003724	0,013868	0,042046	
b	0,021042	0,889925	0,021042	0,063811	$= S_{1957}$
c	0,024008	0,009171	0,890092	0,076729	
d	0,025571	0,010237	0,033125	0,930977	

	a	b	c	d	
a	0,951631	0,002768	0,010345	0,035256	
b	0,013706	0,912402	0,018261	0,055631	$= S_{1961}$
c	0,017241	0,007988	0,914604	0,060167	
d	0,021929	0,010784	0,032293	0,934994	

Where:

a represents Budapest
b represents the provincial cities
c represents the district towns
d represents the villages

The rows and columns of the matrices represent out- and in-migration probabilities respectively.

Both systems generate a constant inflow of population to Budapest. The vectors derived from the powers of matrix S_{1957}, however, consistently give the higher population number for the capital. By comparison, each system generates a constant outflow of population from the villages, the vectors from matrix S_{1957} again producing the higher population figure. The population of the provincial cities attains a maximum value at the 32nd power of each matrix and subsequently declines in number. Here, however, the vectors from matrix S_{1961} indicate the larger population size. A similar cyclic development is suggested for the district towns with their population rising to a maximum value at the 16th iteration of each matrix: the vectors from the powers of matrix S_{1961} again giving the larger population number.

The avarage rates of population change between successive iterative steps are instructive. During the early stages in the evolution of each system, the provincial cities show the fastest rate of growth although in the later phases of both processes a slight decline in population size occurs. The latter characteristic would appear to be closely related to the fact that most migration to the provincial cities is from the villages. The rapid decline in the village population, however, eventually generates such small inflows of population to the provincial cities that this value is exceeded by the volume of outmigration.

The changes in the directions of migration and their effect on intersettlement population redistribution suggest that the migratory response to the second five year plan is consistent with the expected effects of the policy of decentralisation. A lower rate of population growth in Budapest is generated from the migration system operative during the years 1961 to 1964 than during the preceeding period. It is consistent with the decision not to locate new industry in the capital, which has reduced the attractiveness of

Budapest to potential migrants[1]. The accelerated growth rate through migration of both the provincial cities and the district towns during the later period also accords with the economic changes. In addition, the more exaggerated decline in the population of the villages shown by the 1960 to 1964 migration system is consonant with an increased rate of urban development and the continued reduction in the agricultural labour force number.

We are able similarly to derive indices of the inter-regional migration response to the economic changes associated with the second five year plan. As before, moves involving permanent changes of residence only are considered owing to the unavailibility of temporary return migration data before 1961. The regional division of the country utilised here is identical with that adopted in the previous section.

Matrices containing the transitional probabilities of interregional migration were constructed as before and are denoted R_{1957} and R_{1961}, corresponding respectively to the time intervals 1957 to 1960 and 1961 to 1964. Both were iterated to equilibrium and the population vectors were calculated for selected powers of each matrix (table 41). The regional population numbers and distributions – $k^{(0)}$ and $d^{(0)}$ respectively – were adopted as the initial vectors[2].

The general features of the population vectors derived from each migration system are similar. Both generate uninterrupted population growth in the Central Industrial Region and a continuous fall in population numbers in the Northern Industrial Region, Northeast Alföld, Southeast Alföld and Southern Transdanubia. The population of Northern Transdanubia evolves somewhat differently in that at first it sustains a declining population to a minimum value at the 16th iteration of R_{1957} and the 64th iteration of R_{1961} which subsequently increases in size. Although similar in general characteristics, however, the system R_{1961} generates the greater regional disparities in population size at equilibrium which is somewhat contrary to what might be expected on the grounds of the economic changes associated with the second five year plan.

Yet while R_{1961} is the less favourable of the two systems in the sense of a greater concentration of population in the Central Region at the expense of every other region at equilibrium, a full assessment of the migration response to the second five year plan must also depend on the evaluation of the complete evolution of the two systems; and here a more complex pattern of response is indicated. Up to vector $k^{(8)}_{r_{1957}}$ the 1957 system suggests the greater net inflow of population to the Central Industrial Region and it is thus only at later phases in the evolution of each process that the 1961 system generates the larger population in this region. By comparison, Northeast Alföld is shown as having the larger population up to vector $k^{(16)}_{r_{1961}}$, Southeast Alföld to $k^{(32)}_{r_{1961}}$ and Northern Transdanubia to $k^{(64)}_{r_{1961}}$. The 1961 system, however always generates smaller populations in the Northern Industrial Region and in Southern Transdanubia.

The second five year plan proposed the establishment of new industry in the Alföld, the further development of the Northern Industrial Region, Northern Transdanubia and the Pécs–Komló complex of Southern Transdanubia. Factory expansion was not

[1] It should be noted that the restrictive legislation of 1962 is an additional factor here (page 90).

[2] The initial vectors relate to the regional population numbers and distribution on January 1st, 1961.

Table 40. The Population Vectors k_{s1957} and k_{s1961} Computed from the Iterations of Matrices S_{p1957} and S_{p1961}

Settlement Groups	Initial Population Vector $k_{s\text{-}57}^{(0)}$	Initial Population Distribution Vector $d_{s.57}^{(0)}$	Population Vector $k_{s.57}^{(2)}$	Population Distribution Vector $d_{s.57}^{(2)}$	Mean Annual Change (%)
Budapest	1 843 9	18,43	2 023 3	20,22	1.17
Provincial Cities	507 7	5.07	559 7	5.59	1.22
District Towns	1 713 0	17.12	1 798 1	17.97	0.62
Villages	5 941 4	59.38	5 624 9	56.22	– 0.69
Total	10 006 0	100.00	10 006 0	100.00	

Settlement Groups	Initial Population Vector $k_{s.61}^{(0)}$	Initial Population Distribution Vector $d_{s.61}^{(0)}$	Population Vector $k_{s.61}^{(2)}$	Population Distribution Vector $d_{s.61}^{(0)}$	Mean Annual Change (%)
Budapest	1 843 9	18.43	1 993 0	19.92	0.99
Provincial Cities	507 7	5.07	579 9	5.79	1.68
District Towns	1 713 0	17.12	1 849 9	18.49	0.95
Villages	5 941 4	59.38	5 583 2	55.80	– 0.71
Total	10 006 0	100.00	10 006 0	100.00	

Table 40 continued

Settlement Groups	Population Vector $k_{s.57}^{(4)}$	Population Distribution Vector $d_{s.57}^{(4)}$	Mean Annual Change (%)	Population Vector $k_{s.57}^{(8)}$	Population Distribution Vector $d_{s.57}^{(8)}$	Mean Annual Change (%)
Budapest	2 172 7	21.71	0.89	2 401 3	24.00	0.63
	597 8	5.97	0.79	645 0	6.45	0.48
District Towns	1 853 7	18.53	0.36	1 910 3	19.09	0.19
Villages	5 381 8	53.79	– 0.55	5 049 4	50.46	– 0.40
Total	10 006 0	100.00		10 006 0	100.00	

Settlement Groups	Population Vector $k_{s.61}^{(4)}$	Population Distribution Vector $d_{s.61}^{(4)}$	Mean Annual Change (%)	Population Vector $k_{s.61}^{(8)}$	Population Distribution Vector $d_{s.61}^{(8)}$	Mean Annual Change (%)
Budapest	2 119 6	21.18	0.77	2 319 4	23.18	0.57
Provincial Cities	635 7	6.35	1.16	711 8	7.11	0.38
District Towns	1 948 8	19.48	0.67	2 069 0	20.68	0.49
Villages	5 301 9	52.99	– 0.66	4 905 8	49.03	– 0.72
Total	10 006 0	100.00		10 006 0	100.00	

Settlement Groups	Population Vector $k_{s.57}^{(16)}$	Population Distribution Vector $d_{s.57}^{(16)}$	Mean Annual Change (%)	Population Vector $k_{s.57}^{(32)}$	Population Distribution Vector $d_{s.57}^{(32)}$	Mean Annual Change (%)
Budapest	2 671 8	26.70	0.33	2 868 9	28.67	0.11
Provincial Cities	679 9	6.80	0.18	684 7	6.84	0.01
District Towns	1 928 1	19.27	0.04	1 901 9	19.01	– 0.01
Villages	4 726 2	47.23	– 0.21	4 550 5	45.48	– 0.07
Total	10 006 0	100.00		10 006 0	100.00	

Settlement Group	Population Vector $k_{s.61}^{(16)}$	Population Distribution Vector $d_{s.61}^{(16)}$	Mean Annual Change (%)	Population Vector $k_{s.61}^{(32)}$	Population Distribution Vector $d_{s.61}^{(32)}$	Mean Annual Change (%)
Budapest	2 572 4	25.71	0.32	2 787 0	27.85	0.43
Provincial Cities	781 8	7.81	0.12	807 8	8.08	0.01
District Towns	2 149 5	21.48	0.33	2 142 5	21.41	– 0.08
Villages	4 502 3	45.00	– 0.28	4 268 7	42.66	– 0.05
Total	10 006 0	100.00		10 006 0	100.00	

Table 40. continued

Settlement Group	Population Vector $k_{s.57}(64)$	Population Distribution Vector $d_{s.57}(64)$	Mean Annual Change (%)	Population Vector $k_{s.57}(128)$	Population Distribution Vector $d_{s.57}(128)$	Mean Annual Change (%)
Budapest	2 928 3	29.27	0.01	2 932 1	29.30	0.00
Provincial Cities	679 9	6.79	– 0.00	679 3	6.79	– 0.00
District Towns	1 886 2	18.85	– 0.01	1 885 0	18.84	– 0.00
Villages	4 511 6	45.09	– 0.01	4 509 6	45.07	– 0.00
Total	10 006 0	100.00		10 006 0	100.00	

Settlement Groups	Population Vector $k_{s.61}(64)$	Population Distribution Vector $d_{s.61}(64)$	Mean Annual Change (%)	Population Vector $k_{s.61}(128)$	Population Distribution Vector $d_{s.61}(128)$	Mean Annual Change (%)
Budapest	2 876 1	23.74	0.04	2 886 6	28.85	0.00
Provincial Cities	803 4	8.03	– 0.01	801 6	8.01	– 0.00
District Towns	2 115 7	21.15	– 0.01	2 111 7	21.10	– 0.00
Villages	4 210 8	42.08	– 0.01	4 206 1	42.04	– 0.00
Total	10 006 0	100.00		10 006 0	100.00	

Table 41. The Population Vectors k_{r1957} and k_{r1961} computed from the iterations of matrices R_{1957} and R_{1961}

Regions	Initial Population Vector $k_{r.57}^{(0)}$	Initial Population Distribution Vector $d_{r.57}^{(0)}$	Population Vector $k_{r.57}^{(2)}$	Population Distribution Vector $d_{r.57}^{(2)}$	Mean Annual Change (%)
Central Industrial	2 729 8	27.28	2 942 3	29.41	0.95
Northern Industrial	1 317 6	13.17	1 316 9	13.16	– 0.02
Southeast Alföld	1 472 0	14.71	1 395 7	13.95	– 0.65
Northeast Alföld	1 555 6	15.55	1 440 3	14.39	– 0.98
Southern Transdanubia	1 036 3	10.35	1 025 5	10.25	– 0.13
Northern Transdanubia	1 894 7	18.94	1 885 3	18.84	– 0.05
Total	10 006 0	100.00	10 006 0	100.00	

Regions	Initial Population Vector $k_{r.61}^{(0)}$	Initial Population Distribution Vector $d_{r.61}^{(0)}$	Population Vector $k_{r.61}^{(2)}$	Population Distribution Vector $d_{r.61}^{(2)}$	Mean Annual (Change (%)
Central Industrial	2 729 8	27.28	2 935 9	29.34	0.92
Northern Industrial	1 317 6	13.17	1 310 3	13.10	– 0.08
Southeast Alföld	1 472 0	14.71	1 404 5	14.04	– 0.59
Northeast Alföld	1 555 6	15.55	1 444 8	14.44	– 0.96
Southern Transdanubia	1 036 5	10.35	1 018 1	10.17	– 0.24
Northern Transdanubia	1 894 7	18.94	1 892 4	18.91	– 0.02
Total	10 006 0	100.00	10 006 0	100.00	

Table 41 continued

Regions	Population Vector $k_{r.57}^{(4)}$	Population Distribution Vector $d_{r.57}^{(4)}$	Mean Annual Change (%)	Population Vector $k_{r.57}^{(8)}$	Population Distribution Vector $d_{r.57}^{(8)}$	Mean Annual Change (%)
Central Industrial	3 122 1	31.20	0.68	3 402 8	34.01	0.56
Northern Industrial	1 314 2	13.13	– 0.02	1 305 3	13.04	– 0.03
Southeast Alföld	1 330 9	13.30	– 0.60	1 229 3	12.29	– 0.49
Northeast Alföld	1 345 2	13.44	– 0.88	1 201 7	12.01	– 0.71
Southern Transdanubia	1 015 7	10.16	– 0.11	998 8	9.98	– 0.11
Northern Transdanubia	1 877 9	18.77	– 0.04	1 868 1	18.67	– 0.03
Total	10 006 0	100.00		10 006 0	100.00	

Regions	Population Vector $k_{r.61}^{(4)}$	Population Distribution Vector $d_{r.61}^{(4)}$	Mean Annual Change (%)	Population Vector $k_{r.61}^{(8)}$	Population Distribution Vector $d_{r.61}^{(8)}$	Mean Annual Change (%)
Central Industrial	3 114 3	31,12	0.73	3 402,9	34.01	0.57
Northern Industrial	1 301 9	13.02	– 0.08	1 283 5	12.83	– 0.09
Southeast Alföld	1 345 8	13.45	– 0.53	1 250 3	12.50	– 0.48
Northeast Alföld	1 352 2	13.51	– 0.84	1 210 2	12.09	– 0.70
Southern Transdanubia	1 001 5	10.01	– 0.20	972 7	9.72	– 0.19
Northern Transdanubia	1 890 2	18.89	– 0.01	1 886 5	18.85	– 0.01
Total	10 006 1	100.00		10 005 9	100.00	

Table 41 contined

Regions	Population Vector $k_{r.57}^{(16)}$	Population Distribution Vector $d_{r.57}^{(16)}$	Mean Annual Change (%)	Population Vector $k_{r.57}^{(32)}$	Population Distribution Vector $d_{r.57}^{(32)}$	Mean Annual Change (%)
Central Industrial	3 748 6	37.46	0.30	4 020 9	40.19	0.11
Northern Industrial	1 281 8	12.81	– 0.05	1 241 9	12.41	– 0.05
Southeast Alföld	1 103 8	11.03	– 0.33	1 006 1	10.06	– 0.15
Northeast Alföld	1 037 3	10.37	– 0.46	925 0	9.24	– 0.17
Southern Transdanubia	974 3	9.74	– 0.08	949 6	9.49	– 0.01
Northern Transdanubia	1 860 2	18.59	– 0.01	1 862 5	18.61	– 0.00
Total	10 006 0	100.00		10 006 0	100.00	

Regions	Population Vector $k_{r.61}^{(16)}$	Population Distribution Vector $d_{r.61}^{(16)}$	Mean Annual Change (%)	Population Vector $k_{r.61}^{(32)}$	Population Distribution Vector $d_{r.61}^{(32)}$	Mean Annual Change (%)
Central Industrial	3 783 9	37.82	0.34	4 128 2	41.26	0.15
Northern Industrial	1 246 2	12.45	– 0.09	1 189 8	11.89	– 0.08
Southeast Alföld	1 123 8	11.23	– 0.42	1 011 9	10.11	– 0.17
Northeast Alföld	1 042 2	10.48	– 0.48	921 4	9.21	– 0.19
Southern Transdanubia	929 0	9.28	– 0.15	879 8	8.79	– 0.09
Northern Transdanubia	1 880 8	18.80	– 0.01	1 874 8	18.74	– 0.00
Total	10 005 9	100.00		10 005 9	100.00	

Table 41 contined

Regions	Population Vector $k_{r.57}^{(64)}$	Population Distribution Vector $d_{r.57}^{(64)}$	Mean Annual Change (%)	Population Vector $k_{r.57}^{(128)}$	Population Distribution Vector $d_{r.57}^{(128)}$	Mean Annual Change (%)
Central Industrial	4 117 4	41.14	0.01	4 126 4	41.24	0.00
Northern Industrial	1 209 7	12.09	– 0.01	1 201 7	12.01	– 0.00
Southeast Alföld	974 5	9.74	– 0.01	972 7	9.72	– 0.00
Northeast Alföld	894 7	8.94	– 0.02	892 7	8.92	– 0.00
Southern Transdanubia	938 2	9.38	– 0.00	937 4	9.37	– 0.00
Northern Transdanubia	1 871 5	18.70	0.00	1 875 1	18.74	0.00
Total	10 006 0	100.00		10 006 0	100.00	

Regions	Population Vector $k_{r.61}^{(64)}$	Population Distribution Vector $d_{r.61}^{(64)}$	Mean Annual Change (%)	Population Vector $k_{r.61}^{(128)}$	Population Distribution Vector $d_{r.61}^{(128)}$	Mean Annual Change (%)
Central Industrial	4 287 1	42.84	0.04	4 311 0	43.09	0.00
Northern Industrial	1 144 0	11.43	– 0.03	1 131 5	11.31	– 0.00
Southeast Alföld	966 4	9.66	– 0.03	962 4	9.62	– 0.00
Northeast Alföid	887 6	8.87	– 0.03	886 0	8.85	– 0.00
Southern Transdanubia	849 0	8.49	– 0.02	843 0	8.42	– 0.00
Northern Transdanubia	1 871 9	18.71	– 0.00	1 872 0	18.71	– 0.00
Total	10 006 0	100.00		10 005 9	100.00	

projected for Budapest. Consequently, on a priori grounds, a decline in the attractiveness of the Central Industrial Region to potential migrants is expected while the ability of the other regions to retain their populations might be expected to increase. But the equilibrium population distributions from the contrasted migration systems in no way accord with the expected migration response to these measures. Additionally the earlier phases of the evolution of each system conform only in the case of the Central Industrial Region, Southeast and Northeast Alföld and Northern Transdanubia. Although further development is projected, the population numbers generated by the 1961 system in the Northern Industrial Region and in Southern Transdanubia are at every stage smaller than indicated by the earlier system. By way of explanation it may be suggested that the migration response to the measures of the second five year plan has been delayed in the Northern Industrial Region and Southern Transdanubia and was consequently not apparent during the period 1961 to 1964. A contributory factor in the case of the Northern Industrial Region may well be its past and current high birth rate particularly in Borsod-Abaúj-Zemplén county. It can be argued that insufficient opportunities were being created in the region as a whole during the years 1961–1964 to absorb completely the annual increase in the regional labour force, a considerable part of which consequently migrated. The above result therefore could indicate that between 1957 and 1964 the gap between population numbers and available opportunities widened in that region.

10.5 The Impact of Time Consecutive Migration Systems on the Potential Population Numbers of the Counties and County Boroughs of Hungary

The counties and county boroughs of Hungary provide the third level of spatial aggregation at which the implications of place to place migration flows for population change are evaluated. The analysis is more detailed than in previous sections in that the aerial framework consists of 24 sub-areas generating a 576 element migration system. In addition, this spatial framework is utilised to compute separately the implications of the seven annual migration systems between 1959 and 1965. The objectives of the analysis are firstly, the classification of the counties and county boroughs on the basis of the magnitude and trend pattern of their respective equilibrium population distributions derived from the seven time consecutive migration systems. Since the equilibrium distributions are indicative of the population change potential of a particular migration system, this classification may be regarded as representing the migration potential of each county and county borough. Secondly, an assesment is made of variations in the rates of population concentration in the central areas of the country, particularly in Budapest and the depopulation of the peripheral areas of the country during the seven years 1959 to 1965. Parts of the ensuing discussion, therefore, supplement the analysis presented in section 10.4.

Firstly, the several data matrices representing the permanent migration flows between the 24 sub-areas for each year from 1959 to 1965 were constructed. The probability matrices denoted $P_{1959}, P_{1969}, \ldots, P_{1965}$ were then calculated, using the population number of each sub-area at mid-year as an approximation of person years lived. Each

Table 42. Selected Population Vectors for the Counties and County Boroughs of Hungary Demonstrating the Future Effects of the 1965 Migration System (in '000's)

	$V_n^{(0)}$	$V_n^{(2)}$	$V_n^{(4)}$	$V_n^{(8)}$	$V_n^{(16)}$	$V_n^{(32)}$	$V_n^{(64)}$	$V_n^{(128)}$	$V_n^{(256)}$	$V_n^{(512)}$	$V_n^{(1024)}$
Budapest	1952	1977	2002	2049	2136	282	2490	2702	2821	2847	2849
Debrecen	148	151	154	158	163	167	161	147	138	137	137
Miskolc	171	174	178	185	196	212	226	229	220	215	214
Pécs	136	142	149	161	182	210	238	251	253	252	252
Szeged	116	119	121	126	134	145	156	160	157	155	155
Baranya	278	274	271	265	255	243	234	230	228	228	228
Bács-Kiskun	563	558	552	542	524	495	460	432	423	423	424
Békés	443	437	431	420	400	369	328	294	282	281	281
Borsod-A.-Z.	593	590	586	579	565	543	511	476	448	439	438
Csongrád	320	318	316	311	303	291	274	259	249	247	247
Fejér	385	389	393	401	415	437	463	484	492	494	494
Győr-Sopron	400	400	400	400	400	399	398	398	398	397	397
Hajdú-Bihar	367	358	350	335	310	275	239	213	204	203	203
Heves	342	341	340	337	332	323	309	292	282	279	279
Komárom	299	303	307	315	330	353	384	412	425	427	427
Nógrád	236	236	235	235	233	230	226	221	218	217	217
Pest	849	860	870	889	921	969	1023	1065	1086	1092	1092
Somogy	362	359	356	352	343	329	311	295	288	288	288
Szabolcs-Sz.	552	540	529	507	471	416	354	311	298	297	297
Szolnok	443	436	429	416	394	360	319	287	278	277	277
Tolna	256	253	250	244	235	220	203	192	189	189	189
Vas	276	274	272	269	261	249	230	208	192	188	187
Veszprém	410	411	411	412	413	414	414	413	410	409	409
Zala	263	261	258	253	244	229	209	190	181	179	179
Total[1]	10,160	10,161	10,160	10,161	10,160	10,160	10,160	10,160	10,160	10,160	10,160

[1] Rounding errors are responsible for variations in the totals

system was iterated to equilibrium and selected population vectors describing their evolution in terms of population size and distribution were computed. The population number of each of the 24 counties and county boroughs on January 1st, 1966 and the associated population distribution were adopted as initial vectors, $v_n^{(0)}$ and $v_d^{(0)}$ respectively, to ensure the strict comparability of the results.

For the sake of clarity, the two distinct sets of information provided by the ergodic Markov chain analysis can be restated as follows. Firstly, we can trace the manner in which each migration system could be expected to affect the population sizes of the county and county borough sub-areas through time. These data are contained in the vectors derived from each iteration of the transitional probability matrices. Secondly, instead of viewing each system dynamically and separately, a cross section of corredponding results from the systems, which relate to a given iterative or time stage, can be compared. For example, we can compare the different sizes of the equilibrium populations for every sub-area derived from each migration system, or the populations from any significant intermediate stage. Trends in the population sizes of every sub-area derived from a given stage of matrix iteration can thus be graphed. Although migration for each year between 1959 and 1965 has been projected on the unreal assumption of unchanging probabilities, we obtain indices that succinctly demonstrate any change in the relationship between migration and population change over that period as measured by the differing effects that each annual migration system could be expected to have on the given initial population distribution.

When the relationship between the 1965[1] migration system and population change is examined for each sub-area (table 42), three district patterns of development emerge:

a) Places where the population continuously increases in size from the initial to the equilibrium situations, namely the populations of Budapest, Pécs, Fejér, Komárom and Pest.
b) Places where the population initially increases but later decreases in size, namely the populations of Debrecen, Miskolc, Szeged and Veszprém. Three out of the four provincial cities fall into this category. They are each surrounded by counties of rapid population decline, and since the majority of their in-migrants come from these counties, the sizes of their projected populations are directly influenced by the declining population tendencies of their immediate surroundings. Further, in the case of Debrecen and Veszprém, the influence of the surrounding districts is such that their equilibrium populations are smaller in size than their initial populations.
c) Counties where the population continuously decreases in size, namely for Győr-Sopron, Nógrád, Baranya, Heves, Somogy, Csongrád, Bács-Kiskun, Tolna, Borsod-Abaúj-Zemplén, Zala, Vas, Békés, Szolnok, Hajdú-Bihar and Szabolcs-Szatmár.

On the basis of the size of the equilibrium populations, we can divide the cities and counties of Hungary into two groups:

[1] The general pattern of evolution of the other systems is similar to that outlined for 1965.

a) Those where the equilibrium populations are larger than the initial populations, namely for Budapest, Pécs, Miskolc, Szeged, Fejér, Komárom and Pest.
b) Those where the equilibrium populations are smaller than the initial population, namely for Debrecen, Baranya, Bács-Kiskun, Békés, Borsod-Abaúj-Zemplén, Csongrád, Győr-Sopron, Hajdú-Bihar, Heves, Nógrád, Somogy Szabolcs-Szatmár, Szolnok, Tolna, Vas, Veszprém and Zala. When a similar division of the places was made on the basis of the average migration balance between 1959 and 1965, a somewhat different division was obtained with Debrecen, Győr-Sopron, and Veszprém being grouped with those counties likely to experience population increase. The variations arise, first of all, because the Markovian model allows for the interactions that exist within the migration and population systems and secondly, because gross migration is used in the computations.

The equilibrium populations calculated for each annual migration system are given in table 43 and in graphical form in figure 34 where the ratios of the equilibrium populations to the initial population are plotted as two year running means for each area. Figure 34 clearly demonstrates the changing implications of migration throughout the seven year period of the analysis. The areas can be grouped into four separate categories on the basis of the trend pattern of their equilibrium populations. These are as follows:
a) Places whose equilibrium populations are initially stable but later increase in size, namely Debrecen, Fejér, Hajdú-Bihar and Komárom.
b) Places whose equilibrium populations at first decrease but later increase in size, namely Baranya, Bács-Kiskun, Csongrád, Nógrád, Pécs, Somogy, Tolna, Vas, Veszprém and Zala.
c) Places whose equilibrium populations initially increase but subsequently decrease in size, namely Budapest, Békés, Miskolc, Szeged, Szabolcs-Szatmár and Győr-Sopron.
d) Places whose equilibrium populations fluctuate in size but which are generally stable, namely Borsod-Abaúj-Zemplén, Heves, Pest and Szolnok.

The counties in group 'b'are contiguous geographically, with the exception of Nógrád and occur in Transdanubia and in Southeast Alföld. The same is true for counties in group 'd'which are confined to the northeast and centre of the country. Group 'a' is split into two geographical areas, namely the contiguous counties of Komárom and Fejér, and the city of Debrecen and the surrounding county of Hajdú-Bihar. Areas in group 'c' completely scattered and include such unlike places as Budapest and Szabolcs-Szatmár.

A classification based on both the magnitude and trend pattern of the equilibrium populations is more difficult to make and six groupings are recognised.

a) Counties where the equilibrium populations lie between 45 and 75 per cent of the initial population and where the general trend is for the equilibrium populations to increase in size, namely Békés, Csongrád, Hajdú-Bihar and Szabolcs-Szatmár.
b) Counties where the equilibrium populations are between 60 and 90 per cent of the size of the initial population and where the trend pattern is for the equilibrium populations to initially decrease but later increase in size, namely, Baranya, Bács-Kiskun, Borsod-Abaúj-Zemplén, Heves, Nógrád, Somogy, Szolnok, Tolna, Vas and Zala.

Table 43. The Size of the Equilibrium Populations for the Counties and Cities of Hungary Calculated from the Annual Migration Systems 1959 to 1965 (in 000s)

	1959	1960	1961	1962	1963	1964	1965
Budapest	3061	3387	3187	3351	3026	2823	2849
Debrecen	126	134	130	129	133	142	137
Miskolc	210	223	218	240	229	222	214
Pécs	235	234	199	223	242	244	252
Szeged	123	141	144	144	165	163	155
Baranya	266	209	206	216	228	228	228
Bács-Kiskun	413	377	381	360	394	415	424
Békés	246	215	256	252	283	287	281
Borsod-A.-Z.	499	448	447	442	499	491	438
Csongrád	205	182	197	202	246	232	247
Fejér	418	407	434	410	426	448	494
Győr-Sopron	405	414	409	400	385	479	397
Hajdú-Bihar	186	177	185	176	189	202	203
Heves	309	241	275	269	254	273	279
Komárom	379	379	382	279	385	426	427
Nógrád	226	173	196	186	198	203	217
Pest	1058	1103	1148	1094	1029	1062	1092
Somogy	269	250	258	254	275	288	288
Szabolcs-Sz.	277	250	295	288	317	323	297
Szolnok	290	285	315	278	282	311	277
Tolna	183	175	168	167	186	184	189
Vas	192	191	187	187	180	200	187
Veszprém	408	406	382	355	410	420	409
Zala	177	160	160	158	200	195	179
Total[1]	10,161	10,161	10,160	10,160	10,161	10,161	10,160

[1] Rounding errors are responsible for variations in the totals

c) Places whose equilibrium populations fluctuate in size around the initial population, namely, Győr-Sopron, Veszprém and Debrecen.

d) Counties where the equilibrium populations are always larger than the initial population, being stable between 1959 and 1963 but subsequently rapidly increasing in size, namely Fejér and Komárom.

e) Places where the equilibrium populations are between 5 and 45 per cent larger than the initial population and where the trends are either fluctuating stable, or at first show an increase in size and subsequently decrease, namely Miskolc, Pest and Szeged.

f) Cities where the equilibrium populations are never less than 45 per cent larger than the initial population, namely Budapest and Pécs.

Counties in categories 'a' and 'b' are contiguous. Those in group 'a' are confined to the extreme east and southeast of the country and are agricultural in character, which accounts for the equilibrium populations being so small in size. These counties are still very little industrialised and so cannot be expected to retain all their population.

A promising aspect for the planners, however, is that the results of the present analysis indicate that this area as a whole is increasingly able to retain its population.

Group 'b' contains by far the largest number of counties. With the exception of Baranya, Borsod-Abaúj-Zemplén and Nógrád, they are mainly agricultural in character although not so underdeveloped industrially as the counties in group 'a'. Most of the counties in this group showed a sharp drop in the size of their equilibrium populations between 1959 and 1960 or 1961. There is no apparent economic or social reason why this should have been so and it cannot be linked to any other of the factors that are thought to influence population movement. This period, however, did mark an increase in the tendency of the population of the capital to grow through migration. Since 1960 or 1961 most of these counties have shown a slow but continual growth in the size of their equilibrium populations which in most cases would appear to reflect the declining tendency to migrate to Budapest. In some instances, however, the later increase in the size of the equilibrium populations can be attributed to more tangible factors. For example, the continuous increase in the equilibrium population number of Somogy county can be related to the development of the Balaton region of the county as tourist centres thus increasing its attractiveness to migrants. Some anomalous patterns still remain. Baranya is one of the more industrialised counties of the country yet the size of its equilibrium population in 1965 was lower than that of 1959. This can be attributed in part to the rapid decline in the rate of migration to the new socialist town of Komló. Borsod-Abaúj-Zemplén, on the other hand, has had an equilibrium population which has fluctuated in size from year to year and although it has an economic structure closely resembling that of Komárom and Fejér counties, the trend patterns and the magnitude of its equilibrium populations form a complete contrast. Fejér and Komárom counties are close to Budapest, however, and although Miskolc is the second city in the country in terms of population number, this contrast may have some explanatory power in accounting for the differences.

The last four groups contain fewer places and their geographical locations can thus be regarded as less significant. Somolarities in this respect and also in economic structure do occur within these groups, however; Győr-Sopron and Veszprém counties are both located in Northern Transdanubia and although still largely agricultural in character have important growth centres within their boundaries, the aluminium industry and Balaton tourism in particular, providing their rationale. Debrecen is the other place grouped with these counties and for a provincial city would appear to have atypical equilibrium populations and migration tendencies. It is, however, surrounded by an area which is rapidly losing population, and at the same time from which it attracts many of its in-migrants. The Markovian process assesses this interrelationship by showing that if present migration flows continue between these two places, a stage will be reached when in-migrants to Debrecen are exceeded by out-migrants, although the current net migration balance is positive.

Komárom and Fejér have parallel economic and social structures which are borne by the similarity of their equilibrium populations. The migration tendencies for Komárom are slightly more favourable than those for Fejér, but the former is more industrially developed. It is again not unnatural that Pest county and the provincial towns of Miskolc and Szeged should fall into the same category. Pest county, large areas of which are dormitory regions for Budapest, is in economic and social structure not unlike the cities of Hungary. The apparent slowing down of potential population growth through migration in Miskolc and Szeged can be linked with the greater ability of counties in groups 'a' and 'b' to retain their population. Budapest and Pécs have been grouped together solely on the basis of the magnitude of the size of their equilibrium populations, and not on their trend patterns. In the latter respect they are very dissimilar. With the physical restrictions that exist on migration to Budapest and with the rapid development of the countryside, it is not unexpected that the size of the equilibrium populations of Budapest should decline. This is in line with government policy and the analysis does show that the decline in migration to the capital is an underlying tendency that has been maintained since 1960. A radical change in the directional flows of migration would be required to reverse it.

Why the city of Pécs should have a growth tendency so much larger than the other provencial towns is not readily apparent. The interaction as regards migration between Southern Transdanubia and the rest of the country is not so marked, however, as that between the other major regions. Yet high population mobility exists within Southern Transdanubia and the population growth potential of Pécs through migration can be viewed as something peculiar to that region, in that its population is becoming increasingly concentrated in the provencial centre. Moreover, the declining rate of development in the new socialist town of Komló (25 km from Pécs) which formerly attracted many migrants from Southern Transdanubia has assisted this process.

In summary, it may be suggested that the equilibrium population distributions derived from the Markovian model furnish a meaningful basis for the classification of the migration characteristics of the counties and county boroughs of Hungary. The classification is built on the analysis of migration interrelationships rather than the migration features of individual places. Temporal trends in the inter-county distribution of equilibrium populations may be considered encouraging in the light of declared regional demographic policy of Hungary. The implications of migration are changing in such a manner that the outflow of population from the rural areas and its concurrent concentration in the central areas of the country, in particular in Budapest, is slowing down. The Alföld is increasingly able to retain its population, while the growing tendency for population agglomeration in Komárom and Fejér counties and in Pécs should tend increasingly to counter the attraction of the capital.

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CHAPTER 11

MIGRATION AND THE AGE AND SEX COMPOSITION OF THE POPULATIONS OF THE REGIONS OF HUNGARY

Differential fertility and migration are the prime determinants of the short term modification of population age and sex composition (Coale and Hoover 1958). An increase in life expectancy at birth evantually augments the relative number of persons in the older age groups, but change in mortality is generally a slow process and is not subject to the sharp and rapid fluctustions characteristic of fertility and migration (Spengler 1956).

Population age composition has important economic and social implications. It ultimately determines the proportion of population in the labour force and, ceteris paribus, its per capita income, while the proportion of dependents greatly influences the required level of social investment (e.g. Coulson 1968). The reproductive capacity of a population is similarly influenced. A positive crude rate of natural increase at a given time can provide a very false impression of potential population increase if age structure is ignored. For instance Hungary's crude growth rate in 1965 was2.24 per thousand which, after standardising for the age composition of the female population, translated into an intrinsic rate of natural increase of -7.08 per thousand (Keyfitz 1968)[1].

The significance of population age structure is fully recognised by Hungarian demographers and has been extensively studied as an integral part of economic demography. "In Hungary research on economic demography has been going on since the foundation of the Research Group for Population Studies of the Central Statistical Office (in September 1962) . . . In a later stage of the research work the so-called economic biography of the avarage man representing the total population of the country was established, i.e. it was calculated how the duration of the economically active and economically inactive life, the working time and the non-working time (leisure time), the production and consumption, the values of all these factors compared with each other, etc. would develop in the course of life of the avarage man with his advancing age." (Szabady 1967) Pursuing this line of research Valkovics (1967) has constructed economic age pyramids of the population of Hungary depicting the balance between production and consumption which provide a succinct picture of the economic significance of the various age groups.

In view of the important implications of population age composition, of which migration is one of the significant determinants, this chapter considers the potential of

[1] Female population only

internal migration in Hungary during the period 1960 to 1964 for generating change in the age and sex structures of the populations of the economic regions of the country. Two models are presented for assessing this relationship. The one assumes a closed population in which the process of ageing is ignored. The other, through an open system, compares the age structures of populations derived from projected natural increase with those obtained from projected natural increase and migration combined.

11.1 A Closed System Model

Given a territory divided into n sub-areas, the problem is to measure the effect of a schedule of age specific migration flows on the age and sex composition of the populations of the n sub-areas over time. As in the previous chapter a constant total population within the whole territory and unchanging migration probabilities or rates are assumed.

We are given the age distributions of the populations of the n sub-areas for each sex in five year age groups at time t. The migration streams between the sub-areas are similarly differentiated. Owing to our initial assumption of a constant total population within the territory, mortality and fertility being excluded, the 0–4 age group will have disappeared from our sub-areas at time t + 5 through the process of ageing. Similarly at t + 10 our sub-areas will lack population between the ages of 0 and 9 and so on. To overcome this problem inherent in a closed system model, we must make the further assumption that each age group is closed, i. e. the sum total population in identical five year age groups in all the n sub-areas is also assumed constant over time. Migration is, however, allowed between the identical age groups of the various sub-areas.

The implications of age specific migration flows for the population age compositions of the sub-areas can be demonstrated from the associated "equilibrium" age structures. Although the ergodic Markov chain model developed in the previous chapter can be adapted to calculate the age compositions at equilibrium, the problem is approached here in a different manner because of data inadequacies.

The equilibrium age distributions of the populations of the n sub-areas for either sex can be defined as those age distributions producing a zero migration balance for each age group from a given schedule of age specific migration rates. For age group x in the ith sub-area this can be written as:

$$\sum_{j=1}^{n-1} {}_x m_{j,i} \cdot {}_x a_j - \sum_{j=1}^{n-1} {}_x m_{i,j} \cdot {}_x a_i = 0 \qquad \ldots (1)$$

where

${}_x m_{i,j}$ are the age specific migration rates from sub-area i to sub-areas j for age group x,
${}_x m_{j,i}$ are the age specific migration rates from sub-areas j to sub-area i for age group x,
${}_x a_j$ is the population size of age group x at equilibrium in sub-area j,
${}_x a_i$ is the population size of age group x at equilibrium in sub-area i.

Once the condition defined by equation 1 is satisfied, the population numbers of each age group will not change.

We also know, by definition that the sum of the equilibrium populations of every age group x in all sub-areas is equal to the initial total population of age group x and is therefore constant. This relationship can be written as:

$$\sum_{j=1}^{n} {}_x a_j = {}_x t \qquad \ldots (2)$$

where

${}_x a_j$ is the equilibrium population size of age group x in the j th sub-area.

${}_x t$ is the sum of the initial populations in every age group x and is constant.

By solving equations 1 and 2 in all combinations we obtain the equilibrium population numbers of every age group x in every sub-area i.

The equilibrium population structures by five year age groups were computed for the six economic regions of Hungary. The model as outlined, however, had to be modified when applied to the actual places since cross tabulations of migration origins and destination decomposed by migrants' age are not available. Only the gross in- and out-migration totals are available for the regions and counties by age of migrants. While simplifying the calculation of the equilibrium age compositions of the economic regions, the coarseness of the migration data detracts from the numerical precision of the computed values, as the analysis can be performed only in terms of the number of migrants entering or leaving the various age groups of a given region in relation to the rest of Hungary. The implications for population age composition of a complete interregional system of age specific migration flows cannot be assessed. By introducing this modification equation 1 simplifies as:[1]

$${}_x m_i \cdot {}_x a_i - {}_x m_j \cdot {}_x b_j = 0 \qquad \ldots (3)$$

and equation 2 as:

$${}_x a_i + {}_x b_j = {}_x t \qquad \ldots (4)$$

where,

${}_x a_i$ is the equilibrium population size of age group x in region i

${}_x b_j$ is the sum total population of age group x in every region j at equilibrium, excluding region i.

[1] A difficulty associated with the computation of the equilibrium age compositions of the populations of the economic regions is the derivation of the relevant age specific migration rates from data at the county level. The first step was the aggregation of the annual totals of gross in- and gross out-migration by single years of age at the county level for the period 1960 to 1964. Secondly, this data was aggregated into five year age groups by economic regions. The third step was the exclusion of intra-county and intra-regional migrations. Only then could the age specific migration rates for each sex be calculated.

Age specific migration rates were based on the adjusted migration values and the mid-period population size of the area of origin. For example, the age specific out-migration rates for the Central Industrial Region were calculated from the population residing in the Central Industrial Region in June 1962, while the age-specific in-migration rates were written in terms of the population in the rest of the country in June 1962. Age specific migration rates were computed separately for males and females.

$_x m_i$ is the age specific out-migration rate from age group x in region i to age group x in all regions j.

$_x m_j$ is the age specific in-migration rate to age group x in region i from age group x in all regions j.

$_x t$ is the total initial population of age group x.

By solving equation 3 and 4 simultaneously for every age group in all sub-areas, we obtain the equilibrium age composition of the population of the economic regions. Since the method of computing the equilibrium age and sex composition of the populations of the economic regions relies on the solving of simultaneous equations rather than matrix iteration, the speed of convergence on equilibrium cannot be evaluated. There is no reason to believe, however, that it differs fundamentally in magnitude from the results rep rted in the previous chapter. But, since individual age groups form separate systems in this model, there is also no reason to assume that in a given region, the equilibrium population sizes of each age group will be attained at the same time. As a rough guide, the greater the mobility within an age group, the more rapidly will convergance occur. We may, thus, suppose that the 15 to 35 age groups invariably attain stability before the others.

The equilibrium age and sex composition of the populations of the economic regions derived from the closed system model

The regionalisation adopted here differs from that previously used in that the rural district and town of Dunaujváros are included in Nothern Transdanubia rather than in the Central Industrial Region. The aggregation of the basic migration data was greatly facilitated by this minor adjustment to the regional boundaries. The other regions remain unchanged. The initial regional age distributions adopted for the projection were those on 1st January 1960. Only permanent migration is considered and the equilibrium age distributions calculated from equations 3 and 4 are presented in tables 44 to 46.

A comparison of the total equilibrium population sizes of each region derived from the method presented here with corresponding figures from the Markov chain projection (chapter 10.3) affords some control over the two models. Although the total sizes for each region are not identical, the level of agreement is encouraging. Yet identical values for the same region are not to be expected because firstly, one is comparing the results of a projection based on aggregate migration rates, with one utilising age-specific migration rates, and secondly the regionalisation used in the two models varies.

In general terms, the expected evolution of the age and sex composition of the regional populations generated by the closed model is as follows. Firstly, owing to the inclusion of the town and rural district of Dunaújváros, the population of Northern Transdanubia can be expected to increase in size as can that of the Central Region. All other regions lose population. Secondly, the model demonstrates that the greatest structural change can be expected in the young adult age groups of both sexes.

Table 44 refers to the equilibrium age and sex composition of the population of the Central Industrial Region. Given the assumptions adopted in the model, it is apparent that the characteristics of migration between 1960 and 1964 were such that every male and female age group can be expected to gain in population numbers. The greatest

Table 44. Initial and Equilibrium Age Distributions-Central Industrial Region

Age Group	Males				Females			
	Initial Population		Equilibrium Population		Initial Population		Equilibrium Population	
	Number (in 00s)	Per Cent	Number (in 00s)	Per Cent	Number (in 00s)	Per Cent	Number (in 00s)	Per Cent
0 – 4	80 5	6.6	97 3	4.9	76 2	5.5	92 2	4.1
5 – 9	107 9	8.9	152 8	7.7	103 1	7.5	146 9	6.5
10 – 14	94 5	7.8	163 2	8.3	91 4	6.7	153 8	6.8
15 – 19	95 0	7.8	197 4	10.8	93 8	6.8	200 9	8.9
20 – 24	80 3	6.6	164 2	8.3	86 8	6.3	154 4	6.9
25 – 29	88 9	7.3	137 0	6.9	96 0	7.0	141 8	6.3
30 – 34	96 4	7.9	136 3	6.9	106 9	7.8	155 2	6.9
35 – 39	95 5	7.9	143 8	7.3	113 3	8.3	187 7	8.4
40 – 44	64 3	5.3	97 8	4.9	74 8	5.5	122 0	5.4
45 – 49	99 9	8.2	166 6	8.4	112 1	8.2	207 9	9.3
50 – 54	86 4	7.1	152 2	7.7	99 1	7.2	183 0	8.2
55 – 59	75 2	6.2	132 0	6.7	89 0	6.5	148 2	6.6
60 – 64	58 9	4.8	86 7	4.4	80 0	5.8	124 6	5.6
65 – 69	38 8	3.2	63 5	3.2	59 8	4.4	94 4	4.2
70 – 74	26 9	2.2	45 9	2.3	44 1	3.2	65 6	2.9
75 +	25 2	2.2	42 4	2.1	44 8	3.3	66 8	3.0
Total	1 214 6	100.0	1 979 1	100.0	1 371 2	100.0	2 245 4	100.0
Dependency Ratio	0.56		0.49		0.57		0.50	

Table 44. Initial and Equilibrium Age Distributions
Southern Transdanubia

Age Group	Males				Females			
	Initial Population		Equilibrium Population		Initial Population		Equilibrium Population	
	Number (in 00s)	Per (in 00s)	Number (in 00s)	Per Cent	Number (in 00s)	Per Cent	Number (in 00s)	Per Cent
0 – 4	45 7	9.2	44 6	11.4	43 4	8.1	42 6	10.5
5 – 9	47 2	9.5	43 4	11.1	45 5	8.5	40 5	10.0
10 – 14	39 6	7.9	34 1	8.7	38 9	7.2	32 2	7.9
15 – 19	36 2	7.3	24 4	6.2	36 6	6.8	24 7	6.1
20 – 24	35 1	7.0	24 0	6.1	35 5	6.6	24 9	6.1
25 – 29	36 8	7.4	29 5	7.6	37 8	7.0	30 3	7.5
30 – 34	38 6	7.7	32 5	8.3	40 2	7.5	32 8	8.1
35 – 39	36 8	7.4	29 0	7.4	41 1	7.6	31 1	7.6
40 – 44	20 5	4.1	15 8	4.0	23 3	4.3	16 9	4.2
45 – 49	33 4	6.7	23 7	6.0	38 6	7.2	25 5	6.3
50 – 54	32 6	6.5	19 2	4.9	36 8	6.8	22 7	5.6
55 – 59	30 7	6.2	23 6	6.0	33 8	6.3	24 4	6.0
60 – 64	23 8	4.8	19 8	5.1	28 7	5.3	21 3	5.2
65 – 69	16 2	3.2	11 9	3.0	22 2	4.1	14 9	3.7
70 – 74	12 1	2.4	6 2	1.6	17 2	3.2	11 2	2.7
75 +	13 7	2.7	9 9	2.6	19 1	3.5	10 3	2.5
Total	499 0	100.0	391 6	100.0	538 7	100.0	406 3	100.0
Dependency Ratio	0.66		0.78		0.66		0.75	

Table 45. Initial and Equilibrium Age Distributions

Northeast Alföld

Age Group	Males				Females			
	Initial Population		Equilibrium Population		Initial Population		Equilibrium Population	
	Number (in 00s)	Per Cent	Number (in 00s)	Per Cent	Number (in 00s)	Per Cent	Number (in 00s)	Per Cent
0 – 4	81 8	10.7	59 2	14.5	78 4	9.7	54 5	12.6
5 – 9	84 1	11.1	50 4	12.3	80 7	10.0	46 7	10.9
10 – 14	71 4	9.4	33 0	8.1	69 0	8.5	33 0	7.7
15 – 19	63 3	8.3	29 5	7.2	63 2	7.8	27 1	6.3
20 – 24	46 8	6.2	15 7	3.8	57 5	7.1	28 0	6.5
25 – 29	54 9	7.2	26 7	6.5	58.1	7.1	33 3	7.7
30 – 34	55 7	7.3	32 3	7.9	58 6	7.2	32 7	7.6
35 – 39	53 5	7.0	29 9	7.3	58 1	7.2	27 8	6.4
40 – 44	29 1	3.8	15 1	3.7	32 9	4.1	14 1	3.3
45 – 49	47 0	6.2	19 8	4.8	54 0	6.7	20 9	4.9
50 – 54	43 8	5.8	20 3	5.0	48 2	6.0	21 2	4.9
55 – 59	39 1	5.1	19 0	4.6	42 1	5.2	21 8	5.1
60 – 64	32 1	4.2	20 5	5.0	36 5	4.5	21 5	5.0
65 – 69	23 0	3.0	14 5	3.5	28 5	3.5	18 4	4.3
70 – 74	18 0	2.4	11 8	2.9	21 9	2.7	14 8	3.4
75 +	17 9	2.3	11 8	2.9	21 9	2.7	14 8	3.4
Total	761 5	100.0	409 5	100.0	809 6	100.0	430 6	100.0
Dependency Ratio	0.76		0.96		0.73		0.88	

Table 45. Initial and Equilibrium Age Distributions

Southeast Alföld

Age Group	Males				Females			
	Initial Population		Equilibrium Population		Initial Population		Equilibrium Population	
	Number (in 00s)	Per Cent	Number (in 00s)	Per Cent	Number (in 00s)	Per Cent	Number (in 00s)	Per Cent
0 – 4	62 3	8.7	50 0	11.3	59 6	7.7	45 1	9.7
5 – 9	66 7	9.3	46 4	10.5	64 3	8.4	44 2	9.5
10 – 14	59 7	8.3	31 7	7.2	58 4	7.6	31 8	6.9
15 – 19	55 8	7.7	28 1	6.4	56 6	7.4	28 8	6.2
20 – 24	47 2	6.6	19 9	4.5	41 3	6.7	28 8	6.2
25 – 29	49 7	6.9	27 4	6.2	53 3	6.7	33 5	7.2
30 – 34	52 9	7.4	34 5	7.8	55 9	7.3	34 7	7.5
35 – 39	51 9	7.2	33 3	7.5	56 6	7.4	31 2	6.8
40 – 44	30 2	4.2	17 7	4.0	33 4	4.3	17 9	3.9
45 – 49	52 3	7.3	28 7	6.5	58 9	7.6	29 6	6.4
50 – 54	49 1	6.8	27 5	6.2	52 8	6.9	26 6	5.8
55 – 59	44 2	6.2	25 2	5.7	46 7	6.1	27 2	5.9
60 – 64	34 4	4.8	26 9	6.1	40 3	5.2	24 0	5.2
65 – 69	23 7	3.3	15 8	3.5	30 9	4.0	20 3	4.4
70 – 74	18 3	2.4	13 8	3.1	24 3	3.1	17 3	3.7
75 +	21 0	2.9	15 4	3.5	25 6	3.6	21 7	4.7
Total	719 4	100.0	442 3	100.0	768 9	100.0	462 4	100.0
Dependency Ratio	0.66		0.82		0.66		0.79	

Table 46. Initial and Equilibrium Age Distributions-Northern Industrial Region

Age Group	Males				Females			
	Initial Population		Equilibrium Population		Initial Population		Equilibrium Population	
	Number (in 00s)	Per Cent	Number (in 00s)	Per Cent	Number (in 00s)	Per Cent	Number (in 00s)	Per Cent
0 – 4	61 6	9.7	63 3	11.2	58 6	8.7	65 5	11.1
5 – 9	63 5	10.0	62 0	10.9	60 9	9.1	61 4	10.4
10 – 14	52 7	8.3	45 7	8.1	50 7	7.6	46 7	7.9
15 – 19	51 5	8.1	40 3	7.1	50 7	7.6	39 3	6.7
20 – 24	46 8	7.3	39 3	6.9	49 7	7.4	47 4	8.1
25 – 29	52 0	8.2	53 2	9.4	51 6	7.7	50 6	8.6
30 – 34	50 2	7.9	49 6	8.7	50 7	7.5	47 4	8.0
35 – 39	48 2	7.5	44 8	7.9	51 5	7.7	41 5	7.0
40 – 44	28 2	4.4	23 0	4.1	31 5	4.7	25 2	4.3
45 – 49	41 5	6.5	34 1	6.0	46 7	7.0	32 7	5.6
50 – 54	37 3	5.8	30 7	5.4	41 0	6.1	29 2	5.0
55 – 59	32 7	5.1	25 1	4.4	35 9	5.3	27 1	4.6
60 – 64	25 7	4.0	18 8	3.3	30 6	4.5	24 2	4.1
65 – 69	18 2	2.9	14 5	2.6	23 7	3.5	17 5	3.0
70 – 74	13 5	2.1	10 9	1.9	18 1	2.7	16 1	2.7
75 +	14 0	2.2	12 1	2.1	19 3	2.9	16 9	2.9
Total	637 6	100.0	567 3	100.0	671 2	100.0	588 8	100.0
Dependency Ratio	0.64		0.64		0.64		0.73	

Table 46. Initial and Equilibrium Age Distributions
Northern Transdanubia

Age Group	Males				Females			
	Initial Population		Equilibrium Population		Initial Population		Equilibrium Population	
	Number (in 00s)	Per Cent	Number (in 00s)	Per Cent	Number (in 00s)	Per Cent	Number (in 00s)	Per Cent
0 – 4	92 0	9.5	109 5	10.8	87 6	8.8	103 9	10.3
5 – 9	97 9	10.1	112 2	11.1	93 3	9.4	108 1	10.6
10 – 14	81 7	8.4	92 0	9.1	78 4	7.7	89 4	8.7
15 – 19	76 7	7.9	58 7	5.8	74 0	7.4	54 6	5.3
20 – 24	73 4	7.6	66 0	6.5	68 7	6.9	65 7	6.3
25 – 29	72 4	7.4	80 8	8.0	72 9	7.3	78 3	7.6
30 – 34	73 7	7.6	82 2	8.1	74 0	7.4	83 6	8.2
35 – 39	72 0	7.4	77 1	7.6	75 3	7.5	76 7	7.5
40 – 44	40 1	4.1	43 0	4.2	43 4	4.4	43 0	4.2
45 – 49	63 4	6.5	64 7	6.4	67 2	6.7	60 9	6.0
50 – 54	59 5	6.1	59 0	5.8	62 6	6.3	57 7	5.6
55 – 59	54 2	5.6	51 2	5.1	57 1	5.7	55 8	5.5
60 – 64	42 5	4.4	44 7	4.4	48 8	4.9	49 4	4.8
65 – 69	28 2	2.9	28 1	2.8	35 8	3.6	35 4	3.5
70 – 74	21 0	2.2	21 4	2.1	27 9	2.8	28 6	2.8
75 +	22 6	2.3	22 6	2.2	30 2	3.0	32 3	2.2
Total	971 3	100.0	1 013 6	100.0	997 2	100.0	1 023 3	100.00
Dependency Ratio	0.66		0.75		0.67		0.79	

increase is indicated for the 10–24 and the 45–59 age groups. On the basis of the equilibrium age structure, the population of the Central Region can be divided into five groups, the age limits of which are virtually identical for both sexes. Compared with 1960, the closed system model produces an equilibrium distribution in which lower percentages of population can be expected in the 0–9, the 25–44 (excluding females aged 35–44) and the 60 plus age groups. In contrast, higher percentages are indicated for the 10–24 and 45–59 age groups.

Northeast and Southeast Alföld can be grouped together for discussion. Their equilibrium age distributions show drastic population losses (table 45) from every age group, affecting both sexes equally. The equilibrium age structures are particularly interesting in that they are characteristic of areas that are experiencing or have recently experienced accelerating rates of out-migration. The present model duplicates this effect with closed age groups and constant age specific rates of in- and out-migration. For instance, compared with the 1960 structure, a pronounced ageing of the population over the age of 10 is suggested, characterised by a marked decline in the proportion of the population comprising the adolescent and young adult age groups of both sexes, i.e. males between the ages of 10 and 29 and females between 10 and 24. Similarly, a relative deficit is suggested for the 40–59 age group. In contrast, the 30–39 age group for men, the 25–34 for women and the 0–9 and over 60 groups for both sexes are proportionately larger than in 1960. Under the assumptions of the model, the dependency ratios of both regions can therefore be expected to rise; those of Northeast Alföld from 0.76 to 0.96 and 0.73 to 0.88 for the males and females respectively; those of Southeast Alföld from 0.66 to 0.82 and 0.66 to 0.79.

Although an overall increase in population size is generated in Northern Transdanubia and a net loss in the Northern Industrial Region, the structure of their equilibrium age distributions is similar, table 46. Further, although sustaining an overall net increase in population, not every age group in Northern Transdanubia experiences a net population inflow at equilibrium as is the case in the Central Industrial Region. Similarly, although sustaining a net loss of population, not every age group of the Northern Industrial Region is smaller at equilibrium than in 1960. In this respect its evoulution differs from that of Northeast and Southeast Alföld. The strong resemblance between the two equilibrium distributions is not surprising, however, in view of the similarity of the current socio-economic structures of the Northern Industrial Region and Northern Transdanubia. For instance, compared with the initial age compositions, the model generates both a relative and absolute increase in the populations aged 0–14. A relative increase in the male populations between the ages of 25 and 39 and in females aged 20–34 is also indicated for both regions and similarly with the population over the age of 40.

Although a net loss of population from every age group can be expected the equilibrium age composition of the population of Southern Transdanubia resembles that of neighbouring Northern Transdanubia in so far as the 0–14 and 25–39 age groups comprise higher percentages at equilibrium compared with the initial population. Similarly the 15–24 age group at equilibrium falls in relative significance as does population over the age of 40. The movement in the dependency ratios is also similar.

In summary, assuming closed age groups, the characteristics of migration between 1960 and 1964 were such as to suggest the development of younger populations in the

Northern Industrial Region and in Northern and Southern Transdanubia. By comparison, an older population is indicated for the Central Industrial Region, where the small decline in the percentage of the population over the age of 60 in outweighed by the rise in population between the ages of 45 and 59 and the fall in the relative size of the 0–9 age group. The equilibrium age compositions of Northeast and Southeast Alföld conform to neither of these categories. Each can be expected to experience a large relative increase in population under the age of 15. At the same time, the comparative significance of the older age groups also rises. In general, the greatest structural changes are suggested for the 15 to 24 and 45 to 54 age groups and apply equally to males and females. Rather large variations are also indicated for the youngest age groups. Least change occurs in the populations between 25 and 44.

Value judgments in the socio-economic context, as to whether the age and sex structures are more or less favourable at equilibrium than in 1960 cannot be ventured owing to the theoretical nature of the computed age distributions. Every population must in reality age and the effects of migration described above are consequently disseminated through the complete populations of the regions by virtue of this process. Yet the equilibrium age structures computed from the closed system model comprise an additional migration index that characterises inter-regional migration. Because of its nature, it reflects the magnitude and pattern of the age specific migration rates of the period chosen for analysis and expresses them in terms of equilibrium population sizes.

11.2 An Open System Model

In the previous section the effect of a given schedule of age specific migration rates on the population age structure of the economic regions of Hungary was projected on the assumption of closed age groups. We shall now develop an open system model which allows for natural increase and the process of ageing and from which the effect of migration on regional population age and sex structures can still be assessed. The analysis consists of two steps. Firstly the regional population numbers are projected in five year age groups on the basis of a given schedule of age specific fertility and survivorship ratios. Secondly, a further projection is made utilising the same age specific fertility and survivorship ratios but with the addition of migration. It is the difference between the two projections that provides us with a measure of the effect of migration on regional population age and sex structures.

Projection A – on the ground of fertility and mortality

We are given an initial population in five year age groups and we wish to compute the population number of the same age groups five years later. Let us denote the initial population in five year age groups as ${}_0a, {}_1a, \ldots, {}_xa$ equivalent to the age groups 0–4, 5–9, . . . , $5x–(5x + 4)$ and let ${}_0b, \ldots, {}_xb$ be the same age groups after five years. In this scheme, after five years ${}_0a$ becomes ${}_1b$, ${}_1a$ becomes ${}_2b$ and in general ${}_{x-1}a$ becomes ${}_xb$. On the assumption of no migration the relationship between the a's and the b's depends solely on the number of persons who survive at the end of five years and can be expressed as,

$$_1b = {_0a} \cdot {_0S}, \quad _2b = {_1a} \cdot {_1S}, \ldots, \quad _xb = {_{x-1}a} \cdot {_{x-1}S} \qquad \ldots (1)$$

where $_0S, {_1S}, \ldots, {_xS}$, are five year survivorship ratios for the age groups 0–4, 5–9, . . . , 5x–(5x + 4). The survivorship ratios are easily computed from the L_x column of an appropriate life table. The population of any given area differentiated by age and sex can be projected in this manner, over as many five year intervals as the analysis requires.

However, we still have to compute the size of the youngest age group after five years, namely $_0b$. The size of this group is a function of the number of females of reproductive age during the five years of the projection. The standard method of projecting the size of $_0b$ is to multiply the mean female population between 15 and 49, decomposed into five year age groups by the appropriate age specific fertility rates adjusted for the five year period of the projection. The mean female population of a given age group is defined as,

$$\frac{1}{2}(f_x^a + f_x^b) \qquad \ldots (2)$$

where f_x^a is the initial female population of age group x and f_x^b is the female population of the same age group five years later.

If we denote the age specific fertility rate for age group x as $_xu$, the total number of live births to females of reproductive age over the five years of the projection is given by the expression:

$$_0b = \sum_{x=3}^{9} \frac{1}{2} {_xu} (f_x^a + f_x^b) \qquad \ldots (3)$$

Not all the live born, however, will survive to form age group $_0b$ at the end of the five years and equation 3 must therefore be weighted by the survivorship factor – $_bS$ –, i.e.

$$_0b = {_bS} \cdot \sum_{x=3}^{9} \frac{1}{2} \cdot {_xu} (f_x^a + f_x^b) \qquad \ldots (4)$$

where $_bS$ expresses the ratio of those born alive who survive to form age group 0–4 at the end of five years. The number born alive can be disaggregated into males and females by weighting the value by the appropriate sex ratio at birth. As before, given the schedule of age specific fertility rates, the value of $_0b$ can be projected over as many five year periods as is required by the analysis.

The projection as set out in this table is rather inconvenient to work with, since $_0b$ must be calculated from the mean female population of reproductive age over five years. Keyfitz (1965), however, has demonstrated that the number of new births can be expressed entirely in terms of the initial female age groups, the a's, by modifying the age specific fertility rates. The projection can then be formalised in terms of matrix algebra.

The standard expression for calculating the number born alive surving to form the age group 0–4 at the end of five years is,

$$ {}_0b = \frac{1}{2}\cdot b^S[{}_3u(f_3{}^a + f_2{}^a \cdot f_2{}^S) + {}_4u(f_4{}^a + f_3{}^a \cdot f_3{}^S) + ,\ldots, + {}_9u(f_9{}^a + f_a{}^a \cdot f_8{}^S)] $$

But this can also be written as,

$$ {}_0b = \frac{1}{2}\cdot {}_bS[f_2{}^a \cdot f_2{}^S \cdot {}_3u + f_3{}^a({}_3u + f_3{}^S \cdot {}_4u) + ,\ldots, + f_8{}^a({}_8u + f_8{}^S \cdot {}_9u) + f_9{}^a{}_9u] \qquad \ldots(5) $$

and generally as,

$$ {}_0b = \sum_{x=2}^{9} f_x{}^a \cdot {}_xU \text{ where } {}_2U = \frac{1}{2}\cdot {}_bS \cdot (f_2{}^S \cdot {}_3u) \qquad \ldots(6) $$

$$ \text{and } {}_xU = \frac{1}{2}\cdot {}_bS \cdot f_x{}^a({}_xu + f_x{}^S \cdot {}_{x+1}u) $$

The modified age specific fertility rates – ${}_xU$ – are thus computed from the expression $\frac{1}{2}\cdot {}_bS({}_xu + f_x{}^S \cdot {}_{x+1}u)$. Its further modification by the sex ratio at birth can provide fertility rates for computing separately the male and female components of ${}_0b$.

The complete projection in five year age groups of the female population of a given area 'i' can now be performed in terms of the initial age groups and can be written in matrix form as,

$$ {}_fv_i^{(1)} = {}_fN_i \cdot {}_fv_i^{(0)} \qquad \ldots(7) $$

where

${}_fN_i$ is a square matrix containing the modified age specific fertility rates and survivorship ratios of the female population in given area i.

${}_fv_i^{(0)}$ is the initial female population of area 'i' in five year age groups.

${}_fv_i^{(1)}$ is the female population of area 'i' in five year age groups at the end of five years.

For a projection up to a maximum age of 50, the matrix ${}_fN_i$ has the following form[1]

$$ {}_fN_i = \begin{pmatrix} 0 & 0 & {}_2U & {}_3U & {}_4U & {}_5U & {}_6U & {}_7U & {}_8U & {}_9U \\ {}_0S & 0 & 0 & 0 & 0 & 0 & 0 & 0 & 0 & 0 \\ 0 & {}_1S & 0 & 0 & 0 & 0 & 0 & 0 & 0 & 0 \\ 0 & 0 & {}_2S & 0 & 0 & 0 & 0 & 0 & 0 & 0 \\ 0 & 0 & 0 & {}_3S & 0 & 0 & 0 & 0 & 0 & 0 \\ 0 & 0 & 0 & 0 & {}_4S & 0 & 0 & 0 & 0 & 0 \\ 0 & 0 & 0 & 0 & 0 & {}_5S & 0 & 0 & 0 & 0 \\ 0 & 0 & 0 & 0 & 0 & 0 & {}_6S & 0 & 0 & 0 \\ 0 & 0 & 0 & 0 & 0 & 0 & 0 & {}_7S & 0 & 0 \\ 0 & 0 & 0 & 0 & 0 & 0 & 0 & 0 & {}_8S & 0 \\ 0 & 0 & 0 & 0 & 0 & 0 & 0 & 0 & 0 & {}_9S \end{pmatrix} $$

[1] The male population of area i is similarly projected.

Projection B – on the ground of fertility, mortality and migration

As previously we are given an initial population in five year age groups and we wish to compute the population of each age group after five years. The initial and terminal populations are denoted as before. Let us consider the terminal age group $_xb_i$ of sub-area i, the population of which comprises those who survive from the initial age group $_{x-1}a$, plus in addition, the balance of in- and out-migrants over the five years of the projection. Age group $_xb_i$ is thus given by:

$$_xb_i = {}_{x-1}a_i \cdot {}_{x-1}S_i + {}_{x-1}M_i - ({}_{x-1}D_i - {}_{x-1}M_0) \qquad \ldots (8)$$

Where

$_{x-1}M_0$ is out-migration from the age group initially $_{x-1}a$ of sub-area i over the five year period of the projection.

$_{x-1}M_i$ is in-migration to the age group initially $_{x-1}a$ of sub-area i over the five years of the projection.

$_xD_i$ is the number of deaths amongst in-migrants to age group initially over the five years.

The flows M_i and M_0 can naturally be disaggregated into the various origins and destinations of migrants[1]

The problem is to derive accurate migration rates or probabilities for the projection of the above migration paramters. Here two procedures exist. The first is to compute age specific migration rates which are a function of the initial and terminal populations of a given age group, for the five years of the projection. The second procedure is to calculate cohort migration rates which are derived from the number of migrants entering and leaving the same population over the five years. For instance, the number of out-migrants from the population initially aged 15 to 19 and which at the end of five completed years forms the 20 to 24 age group is the sum of migrants from the 15 to 19 age group in the first year, the 16–20 age group in the second year and so on to the 19 to 23 age group in the fifth year. The computation of cohort migration rates requires annual migration data decomposed by single years of age. They are the more accurate migration rates, however, as they relate to the actual population exposed to the migration event over the five years of the projection.

Projection utilising age specific migration rates

Let us consider a projection utilising age specific migration rates. As with the derivation of new births from age specific fertility rates, the number of out-migrants from a given age group x can be approximated by multiplying the mean population of age group x over the five years of the projection by the appropriate age specific migration

[1] Since complete spatial cross tabulations of migration flows by the age of migrants do not exist, the problem is greatly simplified. Thus for any sub-area within a given migration system we are in practical terms dealing with two migration flows only, namely the flow away from the given sub-area to all other sub-areas combined, and the flow to the given sub-area form all other sub-areas combined (page 199).

rate. Thus the number of migrants leaving the age group initially ${}_xa$ of sub-area i for all other sub-areas collectively termed j is given by,

$$ {}_xm_{ij}\frac{1}{2}({}_xa_i + {}_xb_i) \qquad \ldots(9)$$

where

${}_xm_{ij}$ is the age specific out-migration rate for age group x of sub-area i.

In like manner the number of migrants entering age group x of sub-area i can be written in terms of the mean populations in age group x of all sub-areas j, thus:

$$ {}_xS_i \cdot {}_xm_{ji}\frac{1}{2}({}_xA_j + {}_xB_j) \qquad \ldots(10)$$

where

${}_xm_{ji}$ is the age specific in-migration rate to age group x of sub-area i.
${}_xA_j$ is the initial population size of age group x in all sub-areas j.
${}_xB_j$ is the population of age group x in all sub-areas j at the end of five years.
${}_xS_i$ is a survivorship factor to compute the number of in-migrants to age group x of sub-area i who survive at the end of five years.

Equation 8 can now be written in terms of the initial and terminal populations and the age specific migration rates as:

$$ {}_xb_i = {}_{x-1}a_i \cdot {}_{x-1}S_i - \frac{1}{2}\,{}_xm_{ij}\,({}_xa_i + {}_xb_i) + \frac{1}{2}\,{}_xS_j \cdot {}_xm_{ji}\,({}_xA_{ji} + {}_xB_j)$$

which simplifies to:

$$ {}_xb_i = \frac{{}_{x-1}a_i \cdot {}_{x-1}S_i - \frac{1}{2}\,{}_xm_{ij} \cdot {}_xa_i + {}_xS_j \cdot {}_xm_{ji} \cdot \frac{1}{2}({}_xA_j + {}_xB_j)}{1 + \frac{1}{2}\,{}_xm_{ij}} \qquad \ldots(11)$$

The solution of equation 11 depends upon the removal of ${}_xB_j$ from the right hand side of the equation. This equation must therefore be rewritten in terms of the initial population – the A's – and the corresponding survivorship ratios and age specific migration rates. Consider the population ${}_xB_j$: this is made up of the survivors from the initial age group ${}_{x-1}A_j$, i.e. ${}_{x-1}A_j \quad {}_{x-1}S_j$, plus the balance of in- and out-migrants over the five years of the projection. The number of out-migrants from the population initially ${}_{x-1}A_j$ and after five years ${}_xB$ in all sub-areas j can be approximated by multiplying the mean of the population – $\frac{1}{2}\,({}_{x-1}A_j + {}_{x-1}A_j \cdot {}_{x-1}S_j)$ – by an appropriate age specific migration rate, i.e.

$$ {}_{x-(1+0.5)}m_{ji}\,\frac{1}{2}\,({}_{x-1}A_j + {}_{x-1}A_j \;\; {}_{x-1}S_j) \qquad \ldots(12)$$

Similarly, migration to the population in all sub-areas j which at the end of five years is ${}_xB$ is derived from the equation:

$$ {}_{x-(1+0.5)}S_j \cdot {}_{x-(1+0.5)}m_{ij}\,\frac{1}{2}\,({}_{x-1}a_i + {}_{x-1}a_i \cdot {}_{x-1}S_i) \qquad \ldots(13)$$

Equation 11 thus becomes:

$$_xb_i = \frac{_{x-1}a_i \cdot {}_{x-1}S_i - \frac{1}{2}\,{}_xm_{ij} \cdot {}_xa_i + {}_xS_j \cdot {}_xm_{ji}\,\frac{1}{2}\,[{}_xA_j + {}_{x-1}A_j \cdot {}_{x-1}S_j + {}_{x-(1+0.5)}S_i \cdot {}_{x-(1+0.5)}m_{ij}\,\frac{1}{2}\,({}_{a-1}a_i + {}_{x-1}a_i \cdot {}_{x-1}S_i) - {}_{x-(1+0.5)}m_{ji}\,\frac{1}{2}\,({}_{x-1}A_j + {}_{x-1}A_j \cdot {}_{x-1}S_j)]}{1 + \frac{1}{2}\,{}_xm_{ij}} \qquad \ldots (14)$$

Equation 14 thus provides a model for calculating the size of age group $_xb_i$ utilising age specific migration rates. Unfortunately, it is extremely clumsy and does not simplify.

Projection utilising cohort migration rates

As previously, let us denote the initial population in five year age groups as $_0a$, $_1a$, $\ldots$, $_{x-1}a$ and the same population after five years as $_1b$, $_2b$, $\ldots$, $_xb$. The new born surviving to the end of five years form the age group $_0b$.

Cohort migration rates express the probability of migration occurring within the same population or generation over time, in this instance the five years of the projection. Therefore, while the age of the cohort varies through time, the members of the cohort remain identical. Here the projection of any age group $_xb$ at the end of five years is straightforward and can be simply expressed in terms of the initial age composition. Thus $_xb$ is made up of firstly, the survivors from $_{x-1}a$, i.e. $_{x-1}a \cdot {}_{x-1}S$. Out-migrants from the age group initially $_{x-1}a$ and at the end of five years $_xb$ can be obtained by applying the appropriate cohort out-migration rate to $_{x-1}a$. For sub-area i this can be expressed as:

$$_{x-1}cm_{ij} \cdot {}_{x-1}a_i \qquad \ldots (15)$$

where $_{x-1}cm_{ij}$ is the cohort out-migration for the age group initially $_{x-1}a_i$ in sub-area i.

In-migration to the age group initually $_{x-1}a$ in sub-area i is similarly expressed in terms of the initial age group $_{x-1}A_j$ in all sub-areas j, i.e.,

$$_{x-1}cS_i \cdot {}_{x-1}cm_{ji} \cdot {}_{x-1}A_j \qquad \ldots (16)$$

where $_{x-1}cm_{ji}$ is the cohort in-migration rate to the initial age group $_{x-1}a_i$ of sub-area i from all sub-areas j and $_{x-1}c\tilde{S}_i$ is a survivorship factor. The age group $_xb_i$ after five years is therefore given by the expression:

$$_xb_i = {}_{x-1}a_i \cdot {}_{x-1}S_i - {}_{x-1}a_i \cdot {}_{(x-1)}cm_{ij} + {}_{(x-1)}cS_j \cdot {}_{(x-1)}cm_{ji} \cdot {}_{(x-1)}A_j \qquad \ldots (17)$$

Where the age composition of migration data is not sufficiently detailed to allow the computation of cohort migration rates, the procedure can still be adopted by weighting the appropriate age specific migration rates according to the avarage period a cohort spends within a given age group. Equation 17 then becomes:

$$ {}_{x}b_i = {}_{x-1}a_i \cdot {}_{x-1}S_i - (0.6\,{}_{x-1}m_{ij} + 0.4\,{}_{x}m_{ij})\,{}_{x-1}a_i + (0.6\,{}_{x-1}S_i + 0.4\,{}_{x}S_i) $$
$$ (0.6\,{}_{x-1}m_{ji} + 0.4\,{}_{x}m_{ji})\,{}_{x-1}A_j \qquad \ldots (18) $$

Undoubtedly the preferred projection is that utilising cohort migration rates. Compared with the age specific model, it gives the more accurate values of migration while its steps are easier of execution. In the following analysis the relationship between migration and the age compositions of the economic regions of Hungary is therefore assessed with the assistance of the cohort projection.

The analysis

The standard economic regions of the country are again used as the spatial framework of the analysis. The years 1960 to 1964 were chosen as the base period of the projection. Separate prognoses have been made for males and females in five year steps from 1970 to 1990. The age composition implications of permanent migration only are analysed, total migration again being excluded, because of the unavailability of temporary return migration data previous to the year 1961.

Step 1

The first step in the analysis is to project the populations of the economic regions generated by natural increase between 1960 and 1964. Life tables have not been constructed for the economic regions and the appropriate survivorship ratios were computed from the unpublished county life tables of 1959–60[1]. Modified age specific feitility rates for the regions were computed by the method described on page 210.

Separate matrices for projecting natural increase – projection operators – were constructed for the male and female populations of the regions, denoted ${}_{m}N_i$ and ${}_{f}N_i$ respectively. Naturally the age specific fertility rates were included in matrix ${}_{f}N_i$ only. The male projection operator ${}_{m}N_i$ thus consisted solely of survivorship ratios and male live births generated by ${}_{f}N_i$ were entered into the projection at the end of each projection step. The initial population vectors were the male and female populations of the regions on January lst 1965 decomposed into five year age groups, denoted ${}_{m}v_i^{(0)}$ and ${}_{f}v_i^{(0)}$ respectively.

Consider the female projection operator ${}_{f}N_i$ of region i. Post multiplication of ${}_{f}N_i$ by the column vector ${}_{f}v_i^{(0)}$ gives the vector ${}_{f}v_i^{(1)}$, i.e. the female population of region i in five year age groups in 1970. Similarly the product of ${}_{f}N_i$ and ${}_{f}v_i$ generates the female population of the same region in 1975. In general terms, the projection for n steps can be written as:

[1] More recent life table data is only available for the population of Hungary as a whole. The survivorship ratios are consequently not representative of the average mortality characteristics of the populations of the regions during the projection base period. A significant error is not introduced, however, owing to the stable nature of current mortality in Hungary. More serious errors may well have arisen during the computation of the survivorship ratios by assuming them to be weighted averages of the survivorship ratios of the counties comprising the economic regions. Great care was taken, however, in the weighting procedure and the error involved is not considered to be large. The unpublished county life tables were made available to the author by Dr. Egon Szabady.

$$_f v_i^{(n)} = {_f}N_i \cdot {_f}v_i^{(n-1)} \qquad \text{or} \qquad {_f}v_i^{(n)} = {_f}N_i^{(n)} \cdot {_f}v_i^{(0)} \qquad \ldots (19)$$

The male population of each region is similarly projected.

Step II

The projection generated by natural increase and migration is identical in respect of the treatment of births and deaths and the matrices ${_f}N_i$ and ${_m}N_i$ are consequently central to it. But in addition, matrices containing the cohort migration rates must now be appended and here a choice of procedure is available.

With the first procedure migration is included in the projection by the addition of the matrices cM_{ji} and cM_{ij} containing the in- and out-migration rates respectively for the cohorts of region i differentiated for males and females. These rates are entered along the diagonal immediately below the principal diagonal of the respective matrices, all other elements being zero. Post multiplication of the matrices by the column vector $v_i^{(0)}$ generates the number of out-migrants from each cohort of region i excluding out-migration from the population newly born, during the five years of the projection. Similarly, post multiplication of the matrix cM_{ji} by the vector $v_j^{(0)}$ weighted by the survivorship factor S_i gives the number of in-migrants to each cohort of region i during the five years of the projection, excluding migration to the cohort newly born. The male and female populations are again treated separately. Migration to and from the cohort newly born over the five years can be included by either further modification of the age specific fertility rates of matrix ${_f}N_i$ or by computing cohort migration rates applicable to the newly born.

In matrix form the complete projection for the female population of region i, excluding the adjustment for the newly born is:

$$_f v_i^{(n)} = {_f}N_i \cdot {_f}v_i^{(n-1)} + {_f}cM_{ji} \cdot {_f}S_i \cdot {_f}v_j^{(n-1)} - {_f}cM_{ij} \cdot {_f}v_i^{(n-1)} \qquad \ldots (20)$$

and similarly for the male population.

The second procedure is more refined in matrix terms. Out-migration from the cohorts of region i is treated as population loss through death and a combined out-migration-survivorship ratio is computed. Equation 20 thus reduces to:

$$_f v_i^{(n)} = {_f}N_i \cdot v_i^{(n-1)} + {_f}cM_{ji} \cdot {_f}v_j^{(n-1)}$$

which can be expressed as the supermatrix operation,

$$\begin{pmatrix} {_f}N_i & cM_{ji} \\ 0 & 0 \end{pmatrix} \begin{pmatrix} v_i^{(n-1)} \\ v_j^{(n-1)} \end{pmatrix} = {_f}v_i^{(n)} \qquad \ldots (21)$$

where the matrix ${_f}N_i$ contains the combined out-migration – survivorship ratio. The supermatrix procedure although more elegant was not adopted here, owing to the necessity of weighting the newly born by a migration factor after each projection step.

The handling of supermatrices, however, is identical with normal matrix operations and offers a rapid method of calculating the equilibrium age distributions of each region i, provided the problem of migration amongst the newly born can be resolved. It also offers the possibility as Rogers (1966) has demonstrated of performing the projection for an 'n' sub-area spatial system on the basis of all interconnecting migration streams decomposed by age and sex.

Step III

By subtracting the result of projection A from B for each projection step, we can calculate the precise contribution of migration to the expected population number of each age group in region i. This contribution is made up of the direct migration of population during each projection step plus the cumulative effect of migration on the number of live births. In this respect the open system model is a more accurate measure of the relationship between a given schedule of migration rates and projected population age structure than the closed system model. It is also more realistic conceptually in that the natural process of ageing is included.

The implications of migration for the age and sex composition of the economic regions of Hungary as demonstrated by the open system model

The male and female populations of the economic regions between the ages of 0–74 have been projected in five year steps to the year 1990. At each projection step, two sets of data are given; firstly the projection on the ground of natural increase and secondly, the projection based on natural increase and migration combined. For each given region, any difference in the two projected population values of identical age groups at corresponding steps provides an assessment of the likely effect of current migration on the age structure of the given region, assuming unchanging age specific migration rates. In the following discussion, the projections generated by natural increase and by natural increase and migration combined are referred to as projections A and B respectively.

Whereas projection A generates a steady fall, the inclusion of migration prompts a continual and rapid increase in the population size of the Central Industrial Region. Initially, migration induces the most intense change in the population aged 15 to 29, and least variation in the size of the youngest and oldest age groups. Thus in 1970, the effect of migration is to generate 10.7 per cent more males and 15.1 per cent more females in the 20 to 24 age group than otherwise expected. By comparison, the average difference in the male and female population over the age of 50 is of the order of 2 per cent only. With each additional step in the projection, however, the large inflow of migrants to the 25 to 29 age group is steadily diffused throughout the whole population by the process of ageing, and by the rapid increase in new births due to the expansion in the number of females of reproductive age (figure 35.& table 47).

The effect of migration is greater on the female than on the male population, and by 1990 projection B generates a female population 30 per cent larger and a male population 28 per cent larger than projection A. These average figures, however, do not indicate the full extent of the effect of migration on the population of the Central Region. The number of new births is dramatically increased and by 1990 the direct and indirect effects of migration can be expected to induce 43.7 per cent more male births and 43.9 per cent more female births than otherwise. The young adult age groups are greatly modified also and by 1990 the number of males and females aged 25 to 34 is over 50 per cent larger than that generated by the projection of constant fertility and mortality schedules.

The likely effect of migration on the age composition of the region is succinctly summarised by the comparison of the dependency ratios derived from projections A and B (table 48). Both generate decreases in the ratio of dependents to population of active age. The ratios derived from projection B, however, are smaller at each projection step. Thus, although the gap in male dependents derived from the two projections narrows after 1980, the implications of migration between 1960 and 1964 may be considered favourable for both the population age composition and economic health of the Central Industrial Region.

By comparison with the Central Industrial Region, projection A generates a steady increase in the populations of Northeast Alföld, Northern Transdanubia and the Northern Industrial Region. However, only in the case of the male population of Northern Transdanubia does the inclusion of migration lead to a larger increase in population size and at that only up to 1985 (tables 49, 50 and 52). The female population generated in this region by projection B is smaller at each projection step and after 1985 actually starts to decrease in absolute number. The male and female populations of the Northern Industrial Region follow a similar pattern of evolution. By comparison with these rather moderate implications of migration, projection B induces a rapid fall in both the male and female populations of Northeast Alföld.

The populations of Southern Transdanubia and Southeast Alföld can be expected to develop somewhat differently in that projected natural increase does not generate a consistent rise in the total number of males and females. Thus the size of the male population of Southeast Alföld starts to fall after 1970 and the female population follows a similar course after 1975. The projected fall in the female and male populations of Southerns Transdanubia is delayed until 1980 and 1990 respectively. When migration is included in the projection, a steady decline is suggested in the male and female populations of Southern Transdanubia at each five year step which is translated into a rapid fall in population numbers in Southeast Alföld.

As in the case of the Central Industrial Region, the effect of migration on the specific age groups of these regions, is initially greatest on the populations between the ages of 15 and 29, whether the net effect of migration is positive or negative. There is a tendency, however, for the maximum significance of migration to occur at earlier ages for females than for males. Aside from these similarities, however, the implications of migration vary strongly region by region.

In the case of Northern Transdanubia approximately half the age groups can be expected to gain population through migration in 1970, namely the population of both sexes aged 0–14 and 24–44 and the male population only between the ages of 60 and 64. At other ages, migration either has no effect or generates a small outflow of population. Yet the interesting point demonstrated by projection B is that the age groups experiencing net population growth in 1970 through the direct and indirect effect of migration do not necessarily retain this characteristic at subsequent steps. Thus, by 1990 only the male population aged 10 to 29 and 35 to 49 and the female population aged 45 to 54 can be expected to be larger through the influence of migration. In other words, the age groups gaining population by net in-migration are on the whole older in 1990 than in 1970 and at the same time are reduced in number. The effect of ageing is central to this process. The movement of population from age groups sustaining positive to those with negative migration balances rapidly alters the pattern of relative population gain and loss through the direct and indirect effects of migration. For instance, although the population comprising the first three female age groups is larger in 1970 through the inclusion of migration than otherwise, subsequent ageing rapidly removes the population initially gained owing to the large net population outflow associated with the 15 to 24 age groups. In addition the net population inflow accruing to the 25 to 44 age group is not sufficiently large to counteract this loss. Consequently by 1990 the number of females within the age range 25 to 44 generated by projection B is smaller than that induced by projected natural increase. At the same time, the relative reduction in the number of females of reproductive age adversely effects the size of new births cohorts after 1980 (table 49).

The population of the Northern Industrial Region evolves in a similar manner. Thus in 1970, projection B generates larger populations than projection A in the 0 to 4, 25 to 29 and 30 to 34 male age groups and in the 0 to 4, 5 to 9 and 25 to 29 female age groups. Through the process of ageing just described, however, this initial gain in population is eliminated by 1990. The small positive increases in male and female births first disappear after 1975, as females in the reproductive age groups decline in number, although the influence of the initial gain in the 25 to 34 male age groups is apparent until 1985 (table 50).

Up to 1990, however, the expected age structure of Northern Transdanubia and the Northern Industrial Region are not greatly affected by migration. Projection B generates a total male population in Northern Transdanubia that is only 0.1 per cent smaller than expected from natural increase alone, while the projected sizes of individual age groups never deviate by more than 1.5 per cent. Variations in the female population are more marked, yet even here the maximum deviation is only 7 per cent in the case of the 30 to 34 age group. Deviations of similar magnitude occur in the projected age groups of the Northern Industrial Region. The insignificant effect of migration on the age compositions of these two regions is summarised by their respective dependency ratios. The male ratios derived from the two projections are indentical at each projection step and although small differences are generated in female dependency they may be considered insignificant.

Projection B initially generates the larger population in the 0 to 4 male and female age groups of Southern Transdanubia, yet this small positive gain is entirely eliminated by 1985 by the process of ageing and the reduction in live births. By contrast with other areas, however, the inclusion of migration in the projection has a more pronounced effect on the male than female population of this region, although the variation is small. Concerning individual age groups, the largest deviations generated by projection B are in the population aged 30 to 34 and male and female numbers are respectively 10 and 9 per cent smaller than would otherwise be expected by 1990. Yet although the implications of migration for the age composition of the population of this region are stronger than for Northern Transdanubia and the Northern Industrial Region, they are still comparatively weak as demonstrated by the similarity of the dependency ratios derived from projections A and B. However, in so far as the ratios of dependents to the population of active age given by projection B are higher than those derived from projection A at each step after 1980, it may be concluded that interregional migration between 1960 and 1964 held unfavourable implications for the age composition of Southern Transdanubia and the economic well being of the region.

Northeast and Southeast Alföld can be grouped together for discussion (table 52 and 53). Both regions are characterised by high relative and absolute losses of population from each age group through migration, which initially are most intense for the 20 to 29 age groups. The concentrated population outflow from these age groups is rapidly diffused through the whole age structure of each region by the process of ageing and the reduction in the number of live births. Consequently, by 1990, their age compositions are inverted replicas of that of the Central Industrial Region. The greatest relative effect of migration is on the youngest population and on the young and middle adult age groups. Thus by 1990, the direct and indirect loss of new births is as high as 70 per cent in Northeast Alföld and losses of similar magnitude are suggested for the young and middle adult population. Southeast Alföld is somewhat less affected but the implications of migration are still serious for the age composition of its population.

The changing dependency ratios associated with each projection clearly demonstrate the implications of migration for the age composition of these two regions. Projection A suggests a steady rise in both the proportion and number of population of active age, in both sexes, the improvement in male dependency being particularly pronounced. Projection B by comparison, also generates an increase in the proportion of males of active age; yet in this instance male dependency is considerably higher in each region by 1990 than would be expected from the projection of constant age specific fertility and mortality rates. In addition, the number of males of active age is significantly smaller. For females, an essentially static proportion of dependents is suggested by projection B compared with the steadily improving situation generated by projection A. We may conclude, therefore, that if current rates of interregional migration continue, a comparative worsening of dependency can be expected in Northeast and Southeast Alföld. This, combined with the rapid reduction in population numbers at every age, must inevitably have serious socio-economic consequences for the two regions.

11.3 Summary

The implications of current migration for the population age compositions of the economic regions have been assessed through the application of both closed and open system models. The closed system model is highly theoretical in nature since population ageing is excluded from it. It does serve to demonstrate, however, the magnitude of potential population change generated on specific age groups by current migration and is consequently a valuable indicator of the effects of migration. The open system model, by comparison, is more realistic. The inclusion in the model of live births and the process of ageing permits an evaluation of the direct implications of migration for age composition, while the effect of migration on the reproductive health of a population can be clearly demontrated. Both of these factors are of great socio-economic significance. Age composition determines the proportion of population of active age, while an understanding of the relationship between migration and reproduction is essential for the formulation of correct regional demographic policies, (Szabady 1965). Naturally, the models used here can only provide general pointers in these directions owing to the large number of constraints that have necessarily been introduced.

Even allowing for these, however, the results obtained from the analyses are instructive. The closed system model clearly demonstrates the great importance of migration on the population of young adult age. In Hungary, only the Central Industrial Region is likely to experience net inflows of population to this economically and demographically very significant age group. The open system model clearly shows that the age concentration of migrants eventually effects an entire population. For instance, although the inflow of population to the youngest age groups of the Central Industrial Region is comparatively small, a large increase in live births eventually accrues in the region from the in-migration of females of reproductive age. Conversely, a rapid decrease in live births is suggested in the two regions of the Alföld owing to the heavy out-migration of females of reproductive age. An additional finding of some significance is that although certain age groups in Northern Transdanubia and in the Northern Industrial Region are currently gaining population from migration, thus generating an overall population increase in these two regions, the loss of live births owing to the out-migration of females in the young reproductive age groups will eventually transform this increase into one of population decline. We therefore find that by 1990 only the Central Indistrial Region is likely to sustain a rising population number, if current rates of fertility, mortality and migration remain unchanged.

Table 47. The Projected Population of The Central Industrial Region

numbers in '00's

Age-Group	Initial Population (1965)	1970			1975			1980			1985			1990		
		A	B	B/A	A	B	B/A	A	B	B/A	A	B	B/A	A	B	B/A
Males																
0 – 4	67 0	73 5	74 7	101 6	71 1	80 6	112.4	65.3	81 7	125.1	55 8	76 5	137.1	49 0	70 4	143.7
5 – 9	82 6	65 9	67 5	102.4	72 4	74 8	103.3	70 7	80 4	113.7	64 3	81 4	126.6	55 0	76 3	138.7
10 – 14	110 4	82 4	86 3	104.7	65 8	70 2	106.7	72 3	77 3	106.9	70 5	83 0	117.7	64 1	84 0	131.1
15 – 19	112 8	110 5	117 4	106.2	82 1	93 5	113.9	65 6	75 6	115.2	72 0	82 6	114.7	70 2	88 3	125.8
20 – 24	118 6	112 1	124 1	110.7	109 4	132 6	121.2	81 7	108 8	133.2	65 2	87 2	133.7	71 6	94 1	131.4
25 – 29	96 8	117 8	128 6	109.2	111 3	134 7	121.0	108 6	147 2	135.5	81 1	125 1	154.3	64 7	98 7	152.6
30 – 34	95 0	96 1	100 4	104.5	116 8	129 7	111.0	110 4	136 0	123.2	107 7	150 1	139.4	80 4	129 0	160.5
35 – 39	100 6	94 0	97 3	103.5	95 0	101 3	106.0	115 6	129 3	111.9	109 2	135 6	124.2	106 6	150 4	141.1
40 – 44	98 8	99 2	102 2	103.0	92 6	98 7	106.6	93 6	101 8	102.6	113 9	128 8	113.1	107 6	135 0	125.5
45 – 49	65 8	96 8	101 4	104.8	97 1	104 6	107.7	90 7	101 0	111.4	91 7	103 1	112.4	111 6	129 1	115.7
50 – 54	100 4	63 6	64 7	101.7	93 5	100 1	107.1	93 8	103 1	109.9	87 6	99 5	113.6	88 6	101 1	114.1
55 – 59	84 5	94 2	95 9	101.8	59 6	61 6	103.4	87 7	95 6	109.0	88 0	98 5	111.9	82 2	95 0	115.6
60 – 64	68 3	75 8	76 8	101.3	84 5	86 8	102.7	53 5	55 7	104.1	78 7	86 7	110.2	78 0	89 5	113.4
65 – 69	50 8	57 7	58 3	101.0	63 9	65 3	102.2	71 3	73 6	103.2	45 1	47 1	104.4	66 4	74 9	111.5
70 – 74	30 5	38 5	38 9	101.0	43 8	44 6	101.8	48 5	49 8	102.7	54 1	56 0	103.5	34 3	35 8	104.0
Total	1 283 1	1 277 6	1 334 4	104.5	1 259 7	1 379 1	109.5	1 229 2	1 416 7	115.3	1 184 9	1 441 0	121.6	1 131 1	1 451 3	128.3

A: Projection based on fertility and mortality
B: Projection based on fertility, mortality and migration

Table 47. The Projected Population of The Central Industrial Region

numbers in '00's

Age-Group	Initial Popula-tion (1965)	1970			1975			1980			1985			1990		
		A	B	B/A	A	B	B/A	A	B	B/A	A	B	B/A	A	B	B/A
Females																
0 – 4	62 8	68 8	69 9	101.6	67 1	75 4	112.4	61 0	76 4	125.3	52 2	71 5	137.0	45 8	65 9	143.9
5 – 9	78 3	61 9	63 5	102.6	67 9	70 1	103.2	66 2	75 4	113.9	60 2	76 4	126.9	51 5	71 6	139.0
10 – 14	105 7	78 2	81 9	104.7	61 8	66 1	107.0	67 7	72 6	107.2	66 1	77 9	117.9	60 1	78 9	131.3
15 – 19	107 4	105 4	119 9	113.8	78 0	96 3	123.5	61 7	76 9	124.6	67 6	83 1	122.9	65 9	88 7	134.6
20 – 24	119 7	107 1	123 3	115.1	105 1	139 1	132.5	77 7	115 9	149.2	61 5	91 6	148.9	67 4	97 5	144.7
25 – 29	96 1	119 2	127 3	106.8	106 6	131 1	123.0	104 6	148 8	142.3	77 4	126 7	163.7	61 2	99 5	162.6
30 – 34	101 4	95 6	100 1	104.7	118 5	128 7	108.6	106 1	132 5	124.9	104 0	150 8	145.0	77 0	129 3	167.9
35 – 39	110 9	100 4	104 2	103.8	94 9	102 8	108.3	117.9	130 0	110.4	105 4	133 8	126.9	103 4	152 0	147.0
40 – 44	116 2	109 8	113 2	103.1	99 4	106 4	107.0	94 0	104 7	111.4	116 6	131 0	112.4	104 3	134 6	129.1
45 – 49	76 0	114 4	119 1	104.1	108 0	115 9	107.3	97 9	109 1	111.4	92 5	106 9	115.6	114 8	132 0	115.0
50 – 54	113 0	74 3	75 6	101.8	111 9	118 8	106.2	105 6	115 5	109.4	95 7	108 8	113.7	90 5	106 6	117.8
55 – 59	98 7	109 2	111 4	102.0	71 7	74 3	103.6	108 0	116 9	108.2	102 0	113 7	111.5	92 4	107 1	115.9
60 – 64	86 5	93 0	94 7	101.8	102 9	106 7	103.7	67 6	70 8	104.7	101 8	111 8	109.8	96 1	108 6	113.0
65 – 69	75 1	78 2	79 8	102.1	84 1	87 3	104.0	96 5	101 1	104.8	61 1	64 9	106.2	92 1	101 6	110.3
70 – 74	52 2	63 3	63 8	100.8	66 0	67 8	102.7	70 9	74 1	104.5	81 3	86 1	105.9	51 5	55 3	107.4
Total	1 399 5	1 378 6	1 447 7	105.0	1 343 9	1 487 0	110.7	1 303 3	1 520 6	116.7	1 245 4	1 531 9	123.3	1 174 0	1 529 2	130.3

A: Projection based on fertility and mortality
B: Projection based on fertility, mortality and migration

Table 48. Projected Dependency Ratios

Year	Central Industrial Region		Northern Industrial Region		Northeast Alföld		Southeast Alföld		Southern Transdanubia		Northern Transdanubia	
	A	B	A	B	A	B	A	B	A	B	A	B
						Males						
1965	0.47	0.47	0.61	0.61	0.75	0.75	0.63	0.63	0.64	0.64	0.58	0.58
1970	0.45	0.43	0.56	0.56	0.67	0.70	0.59	0.60	0.59	0.60	0.56	0.56
1975	0.47	0.44	0.54	0.54	0.63	0.68	0.57	0.59	0.56	0.57	0.53	0.53
1980	0.45	0.42	0.51	0.51	0.59	0.64	0.53	0.55	0.52	0.53	0.50	0.50
1985	0.45	0.43	0.53	0.53	0.62	0.67	0.54	0.57	0.53	0.54	0.53	0.52
1990	0.44	0.42	0.54	0.54	0.62	0.68	0.54	0.57	0.54	0.55	0.54	0.53
						Females						
1965	0.49	0.49	0.60	0.60	0.67	0.67	0.60	0.60	0.61	0.61	0.63	0.63
1970	0.47	0.46	0.57	0.57	0.62	0.64	0.58	0.59	0.59	0.59	0.59	0.59
1975	0.50	0.47	0.56	0.56	0.60	0.64	0.58	0.60	0.57	0.58	0.55	0.57
1980	0.49	0.45	0.53	0.54	0.58	0.62	0.55	0.57	0.53	0.54	0.53	0.54
1985	0.51	0.47	0.56	0.57	0.61	0.66	0.57	0.59	0.56	0.57	0.56	0.57
1990	0.51	0.46	0.57	0.57	0.61	0.67	0.56	0.60	0.56	0.57	0.57	0.57

A: Derived from projection based on fertility and mortality
B: Derived from projection based on fertility, mortality and migration

Table 49. *The Projected Population of Northern Transdanubia*

numbers in '00's

Age Group	Initial Population (1965)	1970			1975			1980			1985			1990		
		A	B	B/A	A	B	B/A	A	B	B/A	A	B	B/A	A	B	B/A
								Males								
0 – 4	72 5	74 4	75 6	101.6	79 9	80 3	100.5	84 6	83 5	98.7	81 8	79 9	97.7	76 0	74 4	97.8
5 – 9	92 8	71 4	72 4	101.4	73 2	75 4	103.0	78 6	79 9	101.7	83 3	82 9	99.5	80 5	79 3	98.5
10 – 14	98 5	92 6	93 1	100.5	71 2	72 6	102.0	73 0	75 7	103.7	78 5	80 1	102.0	83 1	83 1	100.0
15 – 19	82 4	98 1	97 8	99.6	92 2	92 3	100.1	70 9	72 0	101.6	72 7	75 0	103.2	78 2	79 3	100.1
20 – 24	76 1	82 0	80 7	98.4	97 6	95 6	97.9	91 7	89 9	98.0	70 6	70 1	99.3	72 3	73 0	101.0
25 – 29	75 5	75 6	76 7	101.5	81 5	81 3	99.8	97 0	96 1	99.1	91 2	89 9	98.6	70 2	70 1	99.8
30 – 34	73 4	74 8	74 9	100.1	75 0	77 2	102.9	80 9	81 7	101.0	96 2	96 4	100.2	90 5	89 8	99.2
35 – 39	74 1	72 6	72 9	100.4	74 0	74 2	100.3	74 2	76 6	103.2	80 0	81 0	100.3	95 2	95 5	100.3
40 – 44	71 4	73 1	73 3	100.3	71 6	72 0	100.6	73 0	73 2	100.3	273 2	75 7	103.4	78 9	80 0	101.4
45 – 49	39 5	70 0	69 9	99.8	71 7	71 7	100.0	70 2	70 4	100.3	71 6	71 5	99.9	71 7	73 9	103.0
50 – 54	61 5	38 2	38 2	100.0	67 7	67 5	99.7	69 3	69 2	99.9	67 9	67 8	99.9	69 2	68 2	95.5
55 – 59	56 5	58 0	58 0	100.0	36 0	36 0	100.0	63 9	63 5	99.4	65 4	65 1	99.5	64 0	63 8	99.7
60 – 64	49 2	51 1	51 0	100.1	52 6	52 4	99.6	32 6	32 5	99.7	57 8	57 3	99.1	59 2	58 8	99.3
65 – 69	36 5	42 0	41 8	99.6	43 7	43 4	99.3	44 9	44 6	99.3	27 9	27 7	99.3	49 4	48 7	98.5
70 – 74	22 0	28 2	27 9	98.9	32 5	32 0	98.5	33 8	33 2	99.2	34 7	34 2	98.6	21 5	21 8	98.6
Total	981 9	1 002 1	1 004.2	100.2	1 020 3	1 020 3	100.3	1 038 6	1 041 6	100.3	1 052 6	1 054 8	100.2	1 059 8	1 059 0	99.9

A: Projection based on fertility and mortaiity
B: Projection based on fertility, mortality and migration

Table 49. The Projected Population of Northern Transdanubia

numbers in '00's

Age-Group	Initial Population (1965)	1970			1975			1980			1985			1990		
		A	B	B/A	A	B	B/A	A	B	B/A	A	B	B/A	A	B	B/A
								Females								
0 – 4	68 4	69 8	70 9	101.5	75 0	75 3	100.4	79 4	78 3	98.6	76 8	74 9	97.5	71 3	69 8	97.9
5 – 9	88 5	67 4	68 4	101.5	68 8	70 9	103.1	74 0	75 2	101.6	78 3	78 0	99.6	75 7	74 6	98.5
10 – 14	93 9	88 3	88 9	100.6	67 3	68 7	102.8	68 7	71 2	103.6	73 8	75 4	102.2	78 2	78 2	100.0
15 – 19	75 9	93 7	92 0	98.1	89 2	86 7	97.2	67 2	67 0	99.7	68 5	69 4	101.3	73 7	73 6	99.8
20 – 24	71 1	75 7	74 0	97.8	93 5	89 1	95.3	88 9	83 5	93.9	67 0	64 0	96.3	68 4	66 8	97.6
25 – 29	69 4	70 8	71 0	100.2	75 4	73 7	97.7	93 1	88.1	94.6	88 5	82 0	92.7	66 7	63 4	95.1
30 – 34	73 2	69 0	69 6	100.8	70 4	71 4	101.4	74 9	74 1	98.9	92 5	88 3	95.5	88 0	81 9	93.0
35 – 39	74 0	72 7	72 9	100.3	68 5	69 3	101.2	69 8	71 3	102.1	74 4	73 9	99.3	91 8	87 2	94.9
40 – 44	74 6	73 1	73 2	100.1	71 8	72 0	100.3	67 7	68 4	101.0	69 0	70 4	102.0	73 5	72 9	99.2
45 – 49	42 7	73 4	73 2	99.7	71 9	71 9	100.0	70 6	70 5	99.9	66 5	66 9	100.6	67 8	68 8	101.5
50 – 54	65 7	41 7	41 6	99.8	71 6	71 2	99.4	70 1	69 8	99.6	68 9	68 6	99.6	65 0	65 1	100.1
55 – 59	60 3	63 3	63 2	99.8	40 2	40 1	99.8	69 0	68 5	99.3	67 6	67 1	99.3	66 4	65 9	99.2
60 – 64	53 7	56 9	56 8	99.8	59 7	59 6	99.8	37 9	37 8	99.7	65 1	64 5	99.1	63 8	63 1	98.9
65 – 69	50 6	48 2	48 1	99.8	51 0	50 9	99.8	53 6	53 5	99.8	34 0	33 9	94.7	57 3	57 7	100.8
70 – 74	29 8	41 9	41 3	98.6	39 9	39 4	98.7	42 2	41 5	98.3	44 3	43 8	98.9	28 1	27 2	96.7
Total	991 9	1005 8	1005 1	99.9	1014 0	1009 8	99.6	1027 0	1018 4	99.2	1035 3	1021 6	98.7	1035 6	1016 1	98.1

A: Projection based on fertility and mortality
B: Projection based on fertility, mortality and migration

Table 50. The Projected Population of the Northern Industrial Region

numbers in '00's

Age Group	Initial Popula-tion (1965)	1970			1975			1980			1985			1990		
		A	B	B/A	A	B	B/A	A	B	B/A	A	B	B/A	A	B	B/A
								Males								
0 – 4	49 9	50 8	50 9	100.1	53 5	53 2	99.4	55 6	54 6	98.2	52 3	51 3	98.0	51 0	49 1	96.2
5 – 9	61 2	49 0	49 0	100.1	49 8	50 0	100.4	52 5	52 2	99.4	54 6	53 5	90	51 3	51 2	99.8
10 – 14	63 1	61 0	60 8	99.6	48 9	48 6	99.4	49 7	49 7	100.0	52 3	51 8	99.0	54 5	53 2	97.7
15 – 19	51 2	62 8	62 2	99.0	60.7	59 7	98.4	48 7	47 7	97.0	49 5	48 9	98.8	52 1	50 9	97.7
20 – 24	49 7	50 7	50 3	99.2	62 2	60 9	97.9	60 1	58 2	96.8	48 2	46 4	96.3	49 0	47 5	96.9
25 – 29	46 2	59 5	49 6	100.1	50 3	50 4	100.2	61 7	60 8	98.5	59 7	57 6	96.5	47 9	45 6	95.1
30 – 34	51 7	45 5	45 7	100.1	48 7	49 3	101.2	49 5	50 3	101.6	60 7	60 4	99.5	58 7	57 0	97.1
35 – 39	49 5	51 1	50 7	99.2	44 9	44 9	100.0	48 1	48 6	101.0	48 9	49 7	101.6	60 0	59 6	99.3
40 – 44	47 1	48 7	48 5	99.6	50 3	49 6	98.6	44 2	44 0	99.5	47 3	47 7	100.8	48 1	48 9	101.7
45 – 49	27 4	46 0	45 5	98.9	47 5	46 8	98.5	49 1	47 7	97.1	43 1	42 4	98.4	46 2	46 1	99.8
50 – 54	29 6	26 4	26 3	99.7	44 3	43 6	98.4	45 8	44 8	97.8	47 3	45 7	96.6	41 6	40 6	97.5
55 – 59	34 9	37 3	37 1	99.4	24 9	24 6	98.8	41 7	40 8	97.8	43 1	41 9	97.2	44 5	42 7	95.9
60 – 64	29 7	31 7	31 5	99.4	33 9	33 5	98.8	22 6	22 1	97.8	37 9	36 8	97.1	39 2	37 8	96.5
65 – 69	22 0	25 3	25 1	99.2	27 0	26 5	98.1	28 9	28 2	97.6	19 3	18 6	96.4	32 3	31 0	95.9
70 – 74	14 5	17 3	17 1	98.8	19 9	19 4	97.5	21 2	20 6	97.2	22 7	21 9	96.5	15 1	14 4	95.3
Total	627 7	653 0	650 0	99.5	666 8	661 1	99.1	679 3	670 4	98.7	686 8	674 6	98.2	691 3	675 6	97.7

A: Projection based on fertility and mortality
B: Projection based on fertility, mortality and migration

Table 50. The Projected Population of the Northern Industrial Region numbers in '00's

Age-Group	Initial Population (1965)	1970			1975			1980			1985			1990		
		A	B	B/A	A	B	B/A	A	B	B/A	A	B	B/A	A	B	B/A
Females																
0 – 4	47 9	47 8	48 4	101.3	50 4	50 5	100.2	52 4	51 9	99.0	50 8	49 7	97.8	48 0	46 7	97.2
5 – 9	58 6	47 1	47 2	100.2	47 0	47 7	101.5	49 5	49 9	100.8	51 5	51 1	99.2	49 9	48 9	97.9
10 – 14	60 8	58 4	58 3	99.8	47 0	46 9	99.8	46 9	47 5	101.3	49 4	49 6	100.4	51 4	50 9	99.0
15 – 19	48 6	60 7	59 4	97.9	58 3	56 7	97.3	46 9	45 5	97.0	46 8	46 1	98.5	49 3	48 2	97.7
20 – 24	49 1	48 4	47 9	98.9	60 5	58 2	96.2	58 1	55 2	95.0	46 7	44 1	94.4	46 7	44 8	95.9
25 – 29	49 4	48 9	59 2	100.6	48 2	48 5	100.6	60 2	58 4	97.0	57 9	54 9	94.8	46 5	43 7	94.0
30 – 34	51 0	49 2	49 0	99.6	48 6	49 1	101.0	48 3	48 5	101.0	59 9	58 2	97.2	57 6	54 5	94.6
35 – 39	49 9	50 6	50 3	99.4	48 8	48 2	98.8	48 3	48 4	100.2	47 6	48 0	100.8	59 4	57 1	96.1
40 – 44	50 6	49 4	49 1	99.3	50 1	49 3	98.4	48 3	47 3	97.0	47 7	47 6	99.8	47 0	47 0	100.1
45 – 49	30 7	49 8	49 4	99.2	48 6	47 9	98.6	49 2	48 1	97.8	47 4	46 1	97.3	46.9	46 3	98.7
50 – 54	45 3	30 0	29 8	99.3	48 7	48 0	98.6	47 5	46 6	98.0	48 1	46 7	97.1	46 4	44 8	96.5
55 – 59	39 3	43 7	43 4	99.3	29 0	28 6	98.6	47 0	46 1	98.1	45 8	44 6	97.4	46 5	44 8	96.3
60 – 64	33 7	37 1	36 9	99.5	41 3	40 7	98.5	27 4	26 8	97.8	44 4	43 2	97.3	43 4	41 8	96.5
65 –69	27 6	30 6	30 4	99.3	33 7	33 1	98.2	37 5	36 8	98.1	24 9	24 2	97.2	40 3	38 9	96.5
70 – 74	19 9	23 1	22 8	98.7	25 6	25 1	98.0	28 2	27 3	96.8	31 4	30 4	96.8	20 8	19 9	95.6
Total	662 2	674 7	671 5	99.5	685 6	678 6	99.0	695 3	684 1	98.4	700 5	684 4	97.7	700 2	678 2	96.8

A: Projection based on fertility and mortality
B: Projection based on fertility, mortality and migration

Table 51. The Projected Population of Southern Transdanubia

numbers in '00's

Age Group	Initial Population (1965)	1970			1975			1980			1985			1990		
		A	B	B/A	A	B	B/A	A	B	B/A	A	B	B/A	A	B	B/A
								Males								
0 – 4	35 0	35 6	35 7	100.3	38 1	37 3	97.9	39 2	37 8	9.4	37 0	35 2	95.1	34 2	32 4	94.7
5 – 9	45 5	34 4	34 3	99.7	35 0	35 1	100.3	37 3	36 7	98.4	38 5	37 1	96.4	36 3	34 6	95.3
10 – 14	47 2	45 2	44 9	99.3	34 2	34 0	99.4	34 9	34 8	99.7	37 2	36 4	96.9	38 4	36 8	95.8
15 – 19	37 5	46 9	46 2	98.5	45 0	43 9	97.6	34 1	33 3	97.7	34 7	34 1	98.3	37 1	35 6	96.0
20 – 24	33 8	37 2	36 0	96.8	46 6	44 2	94.9	44 7	41 8	93.5	33 8	31 8	94.1	34 4	32 6	94.8
25 – 29	33 2	33.5	33 1	98.8	36 9	35 1	95.1	4 2	42 9	92.9	44 3	40 3	91.0	33 5	30 8	91.9
30 – 34	35 7	32 9	32 3	98.2	33 2	32 7	98.5	36 5	34 7	95.1	45 7	42 1	92.1	43 8	39 4	90.0
35 – 39	37 3	35 3	35 0	99.2	32 5	31 7	97.5	32 9	32 3	98.2	36 1	34 3	95.0	45 2	41 5	91.8
40 – 44	35 3	36 9	36 4	98.6	34 9	34 1	97.7	32 1	31 0	96.6	32 5	31 8	97.9	35 7	33 7	94.4
45 – 49	19 7	34 7	33 9	98.0	36 1	35 2	97.5	34 1	32 8	96.2	31 4	29 8	94.9	31 8	30 7	96.5
50 – 54	31 6	18 9	18 7	98.9	33 3	32 3	97.0	34 8	33 6	96.6	32 9	31 2	94.8	30 3	28 4	93.7
55 – 59	30 2	29 7	29 4	99.0	17 8	17 4	97.8	31 3	30 0	95.9	32 7	31 2	95.4	30 9	29 0	93.9
60 – 64	27 6	27 3	27 1	99.3	26 9	26 4	98.1	16 1	15 7	97.5	28 4	27 0	95.1	29 6	28 0	94.6
65 – 69	20 1	23 7	23 4	98.7	23 5	23 0	97.9	23 1	22 5	97.4	13 9	13 4	96.4	24 4	23 0	94.3
70 – 74	12 4	15 6	15 3	98.1	18 4	17 7	96.2	18 2	17 4	95 6	18 0	17 1	95.0	10 8	10 2	94.4
Total	482 0	487 8	481 7	98.8	492 3	480 3	97.6	495 5	477 1	96.3	496 9	472 5	95.1	496 3	466 4	94.0

A: Projection based on fertility and mortality
B: Projection based on fertility, mortality and migration

Table 51. The Projected Population of Southern Transdanubia

numbers in '00's

Age-Group	Initial Population (1965)	1970			1975			1980			1985			1990		
		A	B	B/A	A	B	B/A	A	B	B/A	A	B	B/A	A	B	B/A
								Females								
0–4	33.0	33.7	33.8	100.3	36.0	35.4	98.3	37.1	35.8	96.5	35.0	33.3	95.1	32.4	30.7	94.8
5–9	43.1	32.5	32.5	100.0	33.2	33.3	100.3	35.4	34.8	98.3	36.5	35.2	96.4	34.4	32.8	95.4
10–14	45.4	43.0	42.6	99.1	32.4	32.2	99.4	33.1	33.0	99.7	35.4	34.5	97.5	36.4	34.9	95.9
15–19	37.7	45.3	44.2	97.6	42.9	41.4	96.5	32.5	31.3	96.6	33.1	32.1	97.0	35.3	33.6	95.2
20–24	35.5	37.5	36.5	97.3	45.2	42.8	94.7	42.8	39.8	93.0	32.3	30.2	93.5	32.9	31.0	94.0
25–29	34.9	35.4	35.1	99.2	37.4	36.1	96.5	45.0	42.2	93.8	42.6	39.1	91.8	32.1	29.7	92.5
30–34	37.2	34.7	34.4	99.1	35.2	34.7	98.6	37.2	35.7	96.0	44.8	41.7	93.1	42.4	38.5	90.8
35–39	39.4	36.9	36.5	98.9	34.5	33.8	98.0	37.2	35.7	96.0	36.9	35.2	95.4	44.4	40.8	91.9
40–44	40.2	39.1	38.7	99.0	36.6	35.9	98.1	34.1	33.2	97.4	34.6	33.7	97.4	36.6	34.6	94.5
45–49	22.7	39.7	38.9	98.0	38.5	37.5	97.4	36.1	34.8	96.4	33.7	32.2	95.6	34.1	32.7	95.9
50–54	37.2	22.1	21.9	99.1	38.7	37.7	97.3	37.6	36.2	96.3	35.2	33.7	95.7	32.9	31.2	94.8
55–59	35.1	35.9	35.6	99.2	21.3	21.0	98.6	37.4	36.0	96.3	36.3	34.6	95.3	34.0	32.2	94.7
60–64	31.6	32.9	32.6	99.1	33.7	33.1	98.2	20.0	19.6	98.0	35.1	33.5	95.4	34.1	32.0	93.8
65–69	25.4	28.2	27.8	98.6	29.4	28.7	97.6	30.2	29.3	97.0	17.8	17.3	97.2	31.4	29.6	94.3
70–74	18.1	21.2	20.7	97.6	23.5	22.5	95.7	24.5	23.3	95.1	25.1	23.8	94.8	14.8	14.1	95.3
Total	516.5	518.1	511.8	98.8	518.6	509.9	97.6	517.7	499.0	96.4	514.3	490.0	95.3	508.3	478.2	94.1

A: Projection based on fertility and mortality
B: Projection based on fertility, mortality and migration

Table 52. The Projected Population of Northeast Alföld

numbers in '00's

Age Group	Initial Population (1965)	1970			1975			1980			1985			1990		
		A	B	B/A	A	B	B/A	A	B	B/A	A	B	B/A	A	B	B/A
								Males								
0–4	63.7	64.7	62.8	97.1	72.9	63.9	87.7	79.5	63.9	80.4	78.8	59.2	75.1	75.2	54.0	71.8
5–9	78.8	62.5	60.4	96.6	63.5	59.9	94.3	71.5	61.0	85.3	78.1	61.1	78.2	77.3	56.6	73.2
10–14	81.8	78.5	75.9	96.7	62.3	58.3	93.6	63.3	57.9	91.5	71.3	59.0	82.8	77.8	59.1	76.0
15–19	59.8	81.5	77.8	95.5	78.2	72.0	92.1	62.0	55.3	89.2	63.0	55.1	87.5	71.0	56.2	79.2
20–24	49.0	59.3	53.4	90.1	80.7	68.7	85.1	77.5	63.5	81.9	61.5	48.8	79.4	62.5	48.8	78.1
25–29	33.9	48.6	39.6	81.5	58.7	42.9	73.1	80.0	54.5	68.0	76.8	50.1	65.2	60.9	38.6	63.4
30–34	48.9	33.6	32.2	95.8	48.2	37.4	77.6	58.2	40.3	69.2	79.3	50.4	63.6	76.1	46.3	60.8
35–39	51.2	48.3	46.4	96.1	33.3	31.5	94.6	47.8	36.5	76.7	57.6	39.3	68.2	78.5	48.8	62.2
40–44	50.0	50.4	48.8	96.8	47.6	44.4	93.3	32.8	29.5	89.9	46.9	35.4	75.5	56.7	38.1	67.2
45–49	31.7	49.0	46.7	95.3	49.4	45.7	92.5	46.6	41.6	89.3	32.1	27.5	85.7	45.9	33.7	73.4
50–54	43.6	26.0	25.5	98.1	47.3	44.1	93.2	47.7	43.1	90.4	45.0	39.3	87.3	31.0	25.5	82.3
55–59	40.1	41.5	40.6	97.8	24.7	23.7	96.0	44.9	41.0	91.3	45.3	40.1	88.5	42.7	36.6	85.7
60–64	35.5	36.7	36.1	98.4	37.9	36.5	96.3	22.6	21.3	94.3	41.1	36.9	89.8	41.5	36.2	87.2
65–69	27.7	30.9	30.4	98.4	31.9	30.9	96.9	33.0	31.3	94.9	19.7	18.3	92.9	35.8	31.6	88.3
70–74	18.2	22.4	21.9	97.8	25.0	24.0	96.0	25.8	24.4	94.6	26.7	24.8	92.9	15.9	14.5	91.2
Total	714.1	733.9	698.4	95.2	761.6	673.7	89.8	793.1	665.0	83.9	823.0	645.2	78.4	848.3	624.7	73.6

A: Projection based on fertility and mortality
B: Projection based on fertility, mortality and migration

Table 52. The Projected Population of Northeast Alföld

numbers in '00's

Age-Group	Initial Population (1965)	1970			1975			1980			1985			1990		
		A	B	B/A	A	B	B/A	A	B	B/A	A	B	B/A	A	B	B/A
								Females								
0 – 4	59 7	60 8	58 8	96.7	68 5	59 7	87.2	74 7	59 8	80.1	74 0	55 4	74.9	70 7	50 6	71.6
5 – 9	75 2	58 8	56 8	96.6	59 9	56 1	93.7	67 4	57 2	84.9	73 6	57 2	77.7	72 9	53 1	72.8
10 – 14	78 4	75 1	72 5	96.5	58 7	54 8	93.4	59 8	54 3	90.8	67 3	55 3	82.2	73 4	55 5	75.6
15 – 19	61 4	78 2	71 2	91.1	64 9	65 9	88.0	58 5	49 9	85.3	59 6	49 5	83.1	67 1	50 6	75.4
20 – 24	49 9	61 2	52 4	85.6	77 9	60 8	78.1	74 6	56 0	75.1	58 3	42 5	72.9	59 4	42 5	71.6
25 – 29	50 9	49 6	44 4	89.5	60 9	46 5	76.4	77 6	53 8	69.3	74 3	49 4	66.5	58 0	37 6	64.8
30 – 34	54 5	50 6	47 9	94.7	49 4	42 6	86.2	60 6	44 5	73.4	77 2	51 6	66.8	73 9	47 2	63.9
35 – 39	55 7	54 1	51 9	95.9	50 3	45 8	91.0	49 0	41 2	84.1	60 2	43 0	71.4	76 6	49 3	64.4
40 – 44	55 5	55 1	53 4	96.9	53 5	49 8	93.1	49 8	44 0	88.4	48 5	39 8	82.1	59 6	41 5	69.6
45 – 49	31 4	54 7	52 4	95.8	54 2	50 4	93.0	52 7	47 0	89.2	49 0	41 7	85.1	47 7	37 8	79.3
50 – 54	51 5	30 7	30 1	98.1	53 4	50 2	94.0	52 9	48 2	91.1	51 3	45 0	87.7	47 8	40 0	83.7
55 – 59	45 6	49 7	48 7	98.0	29 6	28 5	96.3	51 5	47 5	92.2	51 1	45 7	89.4	49 6	42 7	86.1
60 – 64	39 1	43 0	42 2	98.1	46 9	45 1	96.2	28 0	26 4	94.3	48 6	44 0	90.5	48 2	42 3	87.8
65 – 69	32 4	35 3	34 8	98.6	38 8	37 5	96.7	42 3	40 1	94.8	25 3	23 5	92.9	43 9	39 2	89.3
70 – 74	20 2	26 8	26 1	97.4	29 2	28 0	95.9	32 1	30 0	93.5	35 0	32 6	93.1	20 9	19 0	90.9
Total	761 4	783 7	743 5	94.9	806 0	721 5	89.5	831 5	700 3	84.2	853 1	676 3	79.3	869 6	648 7	74.6

A: Projection based on fertility and mortality
B: Projection based on fertility, mortality and migration

Table 53. The Projected Population of Southeast Alföld

numbers in '00's

Age Group	Initial Population (1965)	1970			1975			1980			1985			1990		
		A	B	B/A	A	B	B/A	A	B	B/A	A	B	B/A	A	B	B/A
								Males								
0 – 4	46.3	47.0	46.4	98.7	50.4	46.7	92.7	51.9	45.8	88.2	48.6	41.6	85.6	44.4	37.4	84.2
5 – 9	60.8	45.5	44.9	98.6	46.2	45.1	97.6	49.6	45.5	91.7	51.0	44.8	87.8	47.8	40.8	85.3
10 – 14	65.1	60.7	59.2	97.5	45.4	43.8	96.5	46.1	44.1	95.7	49.5	44.6	90.1	50.8	44.0	86.6
15 – 19	54.5	64.8	62.8	96.9	60.4	57.1	94.5	45.2	42.3	93.6	45.9	42.7	93.0	49.2	43.2	87.8
20 – 24	48.6	54.0	50.6	93.7	64.3	58.3	90.7	59.9	53.0	88.5	44.8	39.5	88.2	45.5	39.9	87.6
25 – 29	41.4	48.2	43.8	90.9	53.6	45.7	85.3	63.8	52.8	82.8	59.4	48.0	80.8	44.5	35.9	80.6
30 – 34	47.0	41.0	39.0	95.1	47.8	41.7	87.2	53.1	43.4	81.7	63.2	50.2	79.4	58.9	45.6	77.4
35 – 39	50.6	46.5	45.3	97.4	40.6	37.9	93.3	47.3	40.7	86.0	52.6	42.4	80.6	62.6	49.1	78.4
40 – 44	49.9	49.8	48.7	97.8	45.8	43.8	95.6	40.0	36.8	92.0	46.6	39.6	85.0	51.8	41.4	79.9
45 – 49	28.7	48.8	47.3	96.9	48.7	46.3	95.1	44.8	41.7	93.1	39.1	35.2	90.0	45.6	38.0	83.3
50 – 54	49.6	27.7	27.4	98.9	47.1	45.0	95.5	47.0	44.1	93.8	43.2	39.8	92.1	37.7	33.7	89.3
55 – 59	45.6	46.7	46.0	98.5	26.1	25.4	97.3	44.4	41.9	94.4	44.3	41.0	92.6	40.7	37.0	90.9
60 – 64	40.3	41.4	40.9	98.7	42.4	41.3	97.4	23.7	22.9	96.6	40.3	37.7	93.5	40.3	36.9	91.5
65 – 69	29.5	34.5	34.0	98.6	35.5	34.5	97.2	36.3	34.9	96.1	20.3	19.4	95.6	34.5	31.9	92.4
70 – 74	18.7	23.3	22.8	97.8	27.3	25.8	94.5	28.1	26.3	93.6	28.7	26.6	92.7	16.1	14.8	91.9
Total	676.4	680.0	659.0	96.9	681.5	638.3	93.7	681.0	616.1	90.5	677.4	592.9	87.5	669.9	569.5	85.0

A: Projection based on fertility and mortality
B: Projection based on fertility, mortality and migration

Table 53. *The Projected Population of Southeast Alföld*

numbers in '00's

Age-Group	Initial Population (1965)	1970			1975			1980			1985			1990		
		A	B	B/A	A	B	B/A	A	B	B/A	A	B	B/A	A	B	B/A
								Females								
0 – 4	43 9	44 7	43 8	97.9	47 9	44 1	92.1	49 3	43 2	87.6	46 2	39 2	84.8	42 2	35 3	83.6
5 – 9	58 2	43 3	42 5	98.1	44 0	42 5	96.6	47 3	42 9	90.7	48 6	42 2	86.8	45 5	38 4	84.3
10 – 14	62 9	58 1	56 7	97.5	43 3	41 6	96.1	44 0	41 6	94.5	47 2	42 1	89.2	48 5	41 5	85.5
15 – 19	55 1	62 8	59 4	94.5	58 0	53 5	92.2	43 2	39 4	91.2	43 9	39 5	89.9	47 1	40 1	85.1
20 – 24	48 6	54 9	50 0	91.0	62 6	54 5	87.1	57 8	49 0	84.8	43 0	36 3	84.4	43 7	36 6	83.7
25 – 29	47 3	48 4	44 8	92.5	54 7	46 1	84.3	62 3	50 6	81.2	57 6	45 6	79.2	42 9	34 0	79.2
30 – 34	49 1	47 1	45 2	95.9	48 2	43 3	89.8	54 4	44 5	81.8	62 0	49 1	79.2	57 3	44 2	77.1
35 – 39	53 7	48 8	47 6	97.5	46 8	43 9	93.8	47 9	42 2	88.1	54 0	43 5	80.6	61 6	47 7	77.4
40 – 44	54 7	53 1	51 8	97.5	48 2	46 0	95.4	46 2	42 5	92.0	47 3	41 0	86.8	53 4	42 2	79.0
45 – 49	32 1	53 8	52 3	97.2	52 2	49 6	95.0	47 4	44 1	93.0	45 4	40 8	89.9	46 5	39 4	84.7
50 – 54	56 4	31 4	31 0	98.7	52 5	50 4	96.0	51 0	47 9	93.9	46 3	42 6	92.0	44 4	39 4	88.7
55 – 59	49 9	54 4	53 4	98	30 2	29 4	97.4	50 6	47 9	94.7	49 1	45 4	92.5	44 5	40 5	91.0
60 – 64	43 2	46 9	46 2	98.5	51 1	49 4	96.6	28 4	27 3	96.1	47 5	44 3	93.3	46 1	42 1	91.3
65 – 69	35 8	39 0	38 4	98.5	42 4	41 1	96.9	46 2	43 9	95.0	25 7	24 3	94.5	42 9	39 6	92.3
70 – 74	25 5	30 2	29 5	97.6	32 9	31 6	96.0	35 8	33 7	94.1	38 9	36 2	93.1	21 7	20 1	92.6
Total	716 4	716 6	692 4	96.9	714 8	666 6	93.3	711 4	640 6	90.0	702 5	612 2	87.1	688 2	580 9	84.4

A: Projection based on fertility and mortality
B: Projection based on fertility, mortality and migration

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CHAPTER 12

SUMMARY AND CONCLUSIONS

12.1 The Geographical Mobility of the Hungarian Population

The continuous registration of change of residence within Hungary shows that approximately ten per cent of the population migrates annually. Expressed in another way this means that the average Hungarian can be expected to make just over eight migratory moves between the age of one and death and this figure would be considerably higher if residential mobility were to be included. Two thirds of these moves involve temporary changes of residence and consequently play little part in the redistribution of population within the country. The remaining one third are permanent migrations which on balance have generated a steady drift of population from the rural areas to the towns and from the peripheral areas to the centre of the country.

The net effect of migration, however, does not reflect the great complexity of population mobility within Hungary. The majority of permanent migrations occur between villages while interurban mobility is also considerable. Moreover, the substantial streams from rural to urban areas are countered by sizeable population flows in the reverse direction. The territorial pattern of mobility is equally complex. Although net outflows are generated from those areas least developed in a socio-economic sense, for instance the Alföld, the dominant migration streams are always countered by flows in the reverse direction. Temporary migration is predominantly interurban and rural-urban in character.

The spatial pattern of migration intensity reflects the complexity of the place to place migration streams. The frequency of both permanent in- and out-migration is highest in Southern Transdanubia, where the settlement net work is most dense. By comparison, the lowest frequencies are generated within the nortwest portion of Transdanubia and in the mountainous area of north central Hungary, comprising the Börzsöny, Mátra and Bükk ranges. The frequency of in-migration to the rural and urban districts ringing Budapest is also high while out-migration is considerable from most areas of the Alföld. Although the spatial pattern has remained reasonably stable, the overall intensity of migration has declined substantially since 1957. Certain tendencies are apparent, however, in that the Alföld is increasingly able to hold its population, while a comparative decline in migration to the central areas of the country is apparent.

The majority of permanent migrations occur over short distances. More than half are generated within the same county, and an additional quarter involve moves between neighbouring counties. The friction generated by distance is thus considerable. The selected urban centres for which migration fields have been constructed further demonstrate the localised nature of most migration activity in Hungary. It is only Budapest that exerts a sufficiently strong attraction to influence migration within the whole of the country. Individuals making temporary moves on the other hand, are willing to travel longer distances and only rarely does the proportion of temporary moves within the same county exceed one quarter of the total.

Internal migration is the dominant component of population redistribution within the country. The rural areas currently possess the highest rates of natural increase, yet since 1959 the population residing in the villages has fallen by over a quarter of a million. By comparison, natural increase is insufficient for the reproduction of the population of Budapest, yet the capital in the last decade has had an annual growth rate approaching one per cent. Territorial variations are equally marked. The excess of births over deaths is most pronounced in the counties of Szabolcs-Szatmár and Hajdú-Bihar in the northeastern region of the Alföld, yet their populations are falling in number. A low rate of natural increase in the Central Industrial Region, by comparison, is greatly augmented by net inflows of population through migration.

The geographical pattern of population mobility thus revolves around two factors. The first is the dominance of the capital, Budapest in the country. On average, since 1957, it has experienced net inflows of population equal to the combined total of all other urban centres, although its dominance in the migration process is now declining. The second factor is the depopulation of the Alföld, from which the majority of migrants to Budapest and the other major urban centres have been derived. Although out-migration intensity is lower than is Southern Transdanubia, a far higher proportion of moves from this region are of a long distance nature. Thus whereas out-migration from places in Southern Transdanubia has been predominantly to other centres within the same region, a high percentage of out-migrants from settlements in the Alföld have traditionally left the area altogether.

A distinctive feature of migrants within Hungary, as elsewhere, is their age structure. Approximately 60 per cent of males and females involved in migrating permanently are between the ages of 15 and 39. This age concentration is even more pronounced amongst temporary migrants, up to 75 per cent of whom belong to this age group. Females on average migrate at younger ages than males as demonstrated by a differential of between two and three years in their mean, median and modal ages. Although the age structure of permanent migrants has been remarkably stable since 1957, the small differences being accounted for by variations in the age composition of the population as a whole, the average age of temporary migrants has declined continously since 1961. This latter feature is related to a fall in the incidence of temporary moves amongst the older population. The Hungarian data is unhelpful concerning other differentials in population mobility. Unfortunately, the educational standard of migrants is not recorded, although on the basis of findings in other countries it may be supposed that marked variations occur between the propensity to migrate and educational attainment. Statistics on differential mobility by occupation suggest that white collar workers are more mobile than those in manual occupations which would also suggest the existance of differentials according to educational attainment.

12.2 The Determinants of Geographical Mobility in Hungary

The explanation of the geographical mobility of population within Hungary has been approached from two sides. Firstly, the reasons and motives behind individual migrations have been investigated, the behavioural approach, and secondly, the socio-economic characteristics of regions and places that determine the geographical pattern of population movement have been evaluated. Both aspects must be fully appreciated before the internal migration process can be fully understood.

Of the individual reasons for migrating, the economic motives of change of employment and residing closer to current place of work are most significant and account for 30 per cent of permanent and 60 per cent of temporary changes of residence. A highly significant, although passive reason for migrating permanently, is that of being a dependent and indeed dependents comprise over 40 per cent of permanent movers annually.

The social motives of marriage and the desire for a new residence per se generate an additional 15 to 20 per cent of permanent moves, although as reasons for migrating temporarily, they are insignificant. With the latter, educational and medical reasons are of considerable importance, as is the visiting of relatives and friends for extended periods of time. The proportion of dependents among temporary movers is very small.

Although the comparative significance of the reasons for moving pemanently varies little territorially, pronounced differentials exist by settlement class. Thus economic motivation is highest amongst inmigrants to Budapest and lowest amongst those moving to the villages. On the other hand, the proportion of dependents moving to Budapest is lower than for the other settlement types. These differentials are even more pronounced with temporary movements. In addition temporal trends are apparent in certain of the motives for migrating. For instance, in every year since 1957, the proportion of permanent migrations occurring on marriage has risen. By comparison the proportion of migrating dependents has tended to decrease. Of the trends in the economic reasons for migrating, those exhibited for net migration are the most interesting. Thus for each settlement class, moves for the purpose of residing closer to place of work have taken on added significance annually since 1957. Apart from migrating dependents such moves have been the most important factor accounting for the positive migration balance of the provincial cities and district towns and the negative balance of the villages.

Although the relative composition of the reasons generating migration provides general pointers, any explanation of the geographical patterns of population mobility must be concerned with spatial variations in the socio-economic characteristics of the places involved in the migration process. The net flow of population from rural to urban areas has been the prime concern of Hungarian research workers. The consensus has explained this process in terms of the modernisation of agriculture and the industrialisation of certain limited localities within the country, which have heightened regional socio-economic disparities. Two forces are thus at work in generating the rural-urban flow of population. Firstly, there has been a shrinkage in employment opportunities in agriculture, consequent upon the improvement in agricultural productivity which has stimulated the movement of the rural population to the towns. Secondly, the rapid pace of industrial development has created many new employment opportunities in that sector of the economy which have been largely filled by population from rural areas, who have either been displaced from agricultural occupations or attracted by the comparatively more favourable wage structure in industry. The process is therefore primarily one of population restratification, but the limited spatial extent of industrial development has resulted in migration being an important mechanism in this process.

Although satisfactorily interpreting the net movement of population from rural to urban areas, this explanation still leaves unaccounted the majority of internal migrations. For instance, neither the intervillage nor the interurban movements of population can be viewed in this light, while the substantial migration from urban to rural areas is left completely unexplained. With a view to resolving the determinants of these additional types of migration, multivariate analysis has been employed.

Firstly, on the assumption that migration is generated by spatial socio-economic disparities, step wise multiple regression analysis has been utilised to explain in a statistical sense the migratory features of individual urban centres. Here not only was net migration employed as a dependent variable, but also gross in- and gross out-migration of both a permanent and temporary nature. Initially a battery of 46 independent variables was chosen to characterise the socio-economic features of the urban centres. Nine independent variables were then selected on the basis of firstly, a principal components analysis which removed redundancies from the variable set and, secondly, on the a priori relationships between the variables and the motives generating individual migration. The model with net migration as dependent variable was most successful, 87 per cent of its variation being accounted for. Housing quality and housing availability were the most significant independent variables, followed by indices of population dependency, living standards and per capita income. Economic disparities are thus envisaged as being the prime determinants of urban net migration.

Although in-migrants are at the same time out-migrants, the statistical explanation of permanent in-migration was considerably higher than for permanent out-migration. On the basis of this finding and the similarity of the rates of out-migration from all urban centres, it was concluded that firstly, the socio-economic characteristics of the places of destination are active determinants of migration and secondly, that the places of origin are essentially passive elements in the process, serving solely as reservoirs of potential migrants. In other words, the pull rather than the push factors are more significant in accounting for gross population movements involving permanent changes of residence in Hungary. By contrast, gross temporary out-migration was more satisfactorily explained than gross temporary in-migration. Using the same reasoning as previously it is therefore concluded that factors repelling migrants from their permanent place of residence are considerably more significant than the features attracting them to their temporary destination. The strong positive correlation between the rate of temporary out-migration and the degree of dependency within a population bears out this contenion. Yet temporary destinations are not passive in their influence as witnessed by the wide range of temporary in-migration rates. Many of the preferences of temporary place of residence are, however, purely speculative in nature and a substantial random element is thus introduced. Moreover, many temporary moves are generated by ephemeral manpower demands, such as large construction projects, the influences of which are lost in a multivariate analysis. In view of such considerations it is suggested that temporary in-migration is more of a stochastic than a deterministic process. Yet as demonstrated by the introduction of a variable assessing income at the first regression step in both models, economic disparities are of prime importance in interpreting the spatial pattern of temporary migration.

The analysis of the migration characteristics of individual urban centres was performed without regard to the origins and destinations of migrants and in an attempt to explain statistically place to place migration streams, a modified gravity model was fitted to a series of interurban flow matrices. This design allowed the introduction of the variable distance, which other workers have found to be of great significance in accounting for migration flows. In the development of this model the concept of "natural migration", which forms an integral part of normal socio-economic intercourse between places, was added to the proposition that migration relates to socio-economic disparities between places. Natural migration is regarded as a function of the distance separating places, migrant availability at the places of origin and the level of general opportunities at the place of destination. Urban socio-econimic disparities were measured by the inclusion of the variables, assessing income, industrial employment and the level of services.

The model was fitted to migration flow matrices for the urban centres of the Alföld, Transdanubia and the Northern Region. Distance was the most significant factor accounting for interurban movements in each instance, the relationship being negative. Migrant availability and the general level of opportunities at places of destination accounted for the bulk of additional variance explained. The contribution of the variables measuring socio-economic disparity was thus small. However, whereas disparities in the level of services were more significant in generating interurban migration in the Alföld, economic disparities were more important in the other two regions. These findings would tend to suggest that the determinants of migration flows vary with the types of origin and destination, and that natural migration is the more sizeable of the two components of interurban migration in Hungary.

With a view to clarifying further these relationships, the model was fitted to migration flow matrices for Budapest and the provincial cities, and for the new socialist towns.

Whereas the fit of the model to migration flows between Budapest and the provincial cities was impressive, the level of explanation for population movements between the new socialist towns was disappointing. In addition, whereas the gravity component, as an assessment of natural migration, accounted overwhelmingly for the variance in migration between Budapest and the provincial cities, migrant availability was not even significant as a factor generating movements between the new socialist towns. The comparative significance of the variables measuring socio-economic disparity also differed. These findings add further credence to the proposition that the determinants of interurban population flows vary according to the types of migration origins destinations. Although on a priori grounds one might expect natural migration to be of greater significance in accounting for migration between alike places, the findings were inconclusive. This propositon is amply borne out by the flows between Budapest and the provincial cities. The results for the new socialist towns, however, cannot be regarded as lending any confirmation to it.

12.3 Migration and Population Change in Hungary

Part three of the study has considered the implications for population distribution of current migration. An ergodic Markov chain model has been developed to assess the potential impact of aggregate migration flows on the distribution of population between the economic regions, the various settlement classes and places of county status. It was demonstrated that the implications of permanent, in contrast to total migration, are for a more uneven regional distribution of population in the long term. However, a time series comparison of equilibrium population distributions demonstrated that the implications of migration have changed over the last decade. Currently Budapest can no longer be expected to grow as rapidly through migration as in the latter half of the 1950's. By comparison, the district towns and provincial cities have increased their potential for growth through migration. In addition, the analysis established that the Alföld is now better able to retain its population, although large outflows are still indicated for the future.

Two further models have been developed to establish the likely effect of current migration on the age and sex composition of the populations of the economic regions. The "closed" model in which the effects of ageing were constrained, demonstrated that migration carries the greatest significance for the young adult age groups. With the exception of the Central Industrial Region, all regions lost population in these age groups, the outflow being greatest from the Alföld. As shown by the "open" system model, however, the pronounced effect of migration on the young adult age groups is eventually spread throughout the whole populations of the regions by the process of ageing and its influence on reproduction. The open system model thus serves to depict both the direct and indirect consequences of current migration for population age and sex composition.

Although not intended as population forecasting, all three models clearly demonstrate the serious demographic consequences of current migration for the population of the Alföld. Not only is the direct outflow of population of active age likely to be considerable, but this also has the indirect consequence of reducing the number of potential live births. Although the measures that have recently been taken to improve the Hungarian birth rate have met with some success, the current pattern of migration, by generating net population movement away from the villages and Northeast Alföld, the places traditionally of highest fertility, may render the long term success of this policy uncertain.

As to the future, one may confidently expect the current patterns of gross migration to remain little changed. They comprise a large component of what has been termed "natural" migration whose continuance will in no way be lessened by economic policies designed to reduce current regional socio-economic disparities. It can be ventured, however, that a reduction in these regional disparities may eventually diminish the net outflow of population from such backward areas as the Alföld and stem the population concentration in the central areas of the country. Indeed, trends in this direction are already apparent in the environs of Budapest. Yet whether the current patterns of net movement will entirely disappear is doubtful. Great difficulties beset the development of the Alföld. A new infrastructure must be created while the location of manufacturing and food processing industries in the area is faced with a grave water supply problem which may be difficult to overcome. Although socially and culturally it makes good sense to restrict the growth of Budapest, economic pressures may make this impracticable. Even were manufacturing industry to be decentralised the attraction of employment in the tertiary sector in the capital would still remain, while a policy restraining its development would run counter to the aims of the new economic mechanism. Clearly, however, cities must be created of sufficient size to counterbalance the inordinate prominance of Budapest in the socio-economic life of Hungary. In this respect, the planned expansion of the seven provincial centres, Debrecen, Miskolc, Pécs, Szeged, Győr, Székesfehérvár and Veszprém is welcome. Yet although wage differentials are being lessened between industry and agriculture, the growth of the provincial centres must stimulate further outflows of population from rural areas. The more even distribution of employment opportunities outside the agricultural sector may, however, diminish the incidence of temporary migration.

APPENDIX 1

THE ADMINISTRATIVE DIVISIONS OF HUNGARY

Rural districts (járások) and towns of rural district status (járási jogú városok) are listed in conjunction with their respective counties.

BUDAPEST – subdivided into 22 districts – kerület

Cities of County Status – megyei jogú városok (provincial cities)

DEBRECEN
MISKOLC
PÉCS
SZEGED

Counties – megye

BARANYA

Rural districts:

Mohács
Pécs
Pécsvárad[1]
Sásd
Sellye
Siklós
Szigetvár

Urban districts:

Komló
Mohács

BÁCS-KISKUN

Rural districts:

Baja
Bácsalmás
Dunavecse
Kalocsa
Kecskemét
Kiskőrös
Kiskunfélegyháza
Kiskunhalas

Urban districts:

Baja
Kalocsa
Kecskemét
Kiskunfélegyháza
Kiskunhalas

[1] These rural districts have been amalgamated with surrounding districts since 1960.

BÉKÉS

Rural districts:

- Békés
- Gyoma[1]
- Gyula
- Mezőkovácsháza
- Orosháza
- Sarkad[1]
- Szarvas
- Szeghalom

Urban districts:

- Békéscsaba
- Gyula
- Orosháza

BORSOD-ABAUJ-ZEMPLÉN

Rural districts:

- Abaújszántó[1]
- Edelény
- Encs
- Mezőcsát
- Mezőkövesd
- Miskolc
- Ózd
- Putnok[1]
- Sátoraljaújhely
- Szerencs
- Szikszó[1]

Urban districts:

- Kazincbarcika
- Ózd
- Sátoraljaújhely

CSONGRÁD

Rural districts:

- Makó
- Szeged
- Szentes

Urban districts:

- Csongrád
- Hódmezővásárhely
- Makó
- Szentes

FEJÉR

Rural districts:

- Bicske
- Dunaújváros
- Enying[1]
- Mór
- Sárbogárd
- Székesfehérvár

Urban districts

- Dunaújváros
- Székesfehérvár

GYŐR-SOPRON

Rural districts:

- Csorna
- Győr
- Kapuvár
- Mosonmagyaróvár
- Sopron

HAJU-BIHAR

Rural districts:

- Berettyóújfalu
- Biharkeresztes
- Debrecen
- Derecske
- Polgár
- Püspökladány

[1] These rural districts have been amalgamated with surrounding districts since 1960.

Urban districts:

- Győr
- Mosonmagyaróvár
- Sopron

HEVES

Rural districts:

- Eger
- Füzesabony
- Gyöngyös
- Hatvan
- Heves
- Pétervásár[1]

Urban districts:

- Eger
- Gyöngyös
- Hatvan

NÓGRÁD

Rural districts:

- Balassagyarmat
- Pásztó
- Rétság
- Salgótarján
- Szécsény

Urban districts:

- Balassagyarmat
- Salgótarján

Urban districts:

- Hajdúböszörmény
- Hajdúnánás
- Hajdúszoboszló

KOMÁROM

Rural districts:

- Dorog
- Komárom
- Tata

Urban districts:

- Esztergom
- Komárom
- Oroszlány
- Tata
- Tatabánya

PEST

Rural districts:

- Aszód[1]
- Buda
- Cegléd
- Dabas
- Gödöllő
- Monor
- Nagykáta
- Ráckeve
- Szentendre
- Szob
- Vác

Urban districts:

- Cegléd
- Nagykőrös
- Szentendre
- Vác

[1] These rural districts have been amalgamated with surrounding districts since 1960.

SOMOGY

Rural districts:
- Barcs
- Csurgó
- Fonyód
- Kaposvár
- Marcal
- Nagyatád
- Siófok
- Tab

Urban district:
- Kaposvár

SZOLNOK

Rural districts:
- Jászapáti[1]
- Jászberény
- Kúnhegyes[1]
- Kúnszentmárton
- Szolnok
- Tiszafüred
- Törökszentmiklós

Urban districts:
- Jászberény
- Karcag
- Kisújszállás
- Mezőtúr
- Szolnok
- Törökszentmiklós
- Túrkeve

VAS

Rural districts:
- Celldömölk
- Körmend
- Sárvár
- Szentgotthárd
- Szombathely
- Vasvár

SZABOLCS-SZATMÁR

Rural districts:
- Baktalórántháza
- Csenger
- Fehérgyarmat
- Kisvárda
- Mátészalka
- Nagykálló
- Nyírbátor
- Nyíregyháza
- Tiszalök
- Vásárnamény

Urban district:
- Nyíregyháza

TOLNA

Rural districts:
- Bonyhád
- Dombóvár
- Gyönk
- Paks
- Szekszárd
- Tamás

Urban district:
- Szekszárd

VESZPRÉM

Rural districts:
- Devecser
- Keszthely
- Pápa
- Sümeg[1]
- Tapolca
- Veszprém
- Zirc

[1] These rural districts have been amalgamated with surrounding districts since 1960.

Urban districts:
Kőszeg
Szombathely

Urban districts:
Ajka
Keszthely
Pápa
Várpalota
Veszprém

ZALA

Rural districts:
Lent
Letenye
Nagykanizsa
Zalaegerszeg
Zalaszentgrót

Urban districts:
Nagykanizsa
Zalaegerszeg

Key to Figure 36

1. Mohács
2. Pécs
3. Pécsvárad
4. Sásd
5. Sellye
6. Siklós
7. Szigetvár
8. Bácsalmás
9. Baja
10. Dunavecse
11. Kalocsa
12. Kecskemét
13. Kiskőrös
14. Kiskunfélegyháza
15. Kiskunhalas
16. Békés
17. Gyoma
18. Gyula
19. Mezőkovácsháza
20. Orosháza
21. Sarkad
22. Szarvas
23. Szeghalom
24. Abaújszántó
25. Edelény
26. Encs
27. Mezőcsát
28. Mezőkövesd
29. Miskolc
30. Ózd
31. Putnok
32. Sátoraljaújhely
33. Szerencs
34. Szikszó
35. Makó
36. Szeged
37. Szentes
38. Bicske
39. Dunaújváros
40. Enying
41. Mór
42. Sárbogárd
43. Székesfehérvár
44. Csorna
45. Győr
46. Kapuvár
47. Mosonmagyaróvár
48. Sopron
49. Berettyóújfalu
50. Biharkeresztes
51. Debrecen
52. Derecske
53. Polgár
54. Püspökladány
55. Eger
56. Füzesabony
57. Gyöngyös
58. Hatvan
59. Heves
60. Pétervására
61. Dorog
62. Komárom
63. Tata
64. Balassagyarmat
65. Pásztó
66. Rétság
67. Salgótarján
68. Szécsény
69. Aszód

70. Buda
71. Cegléd
72. Dabas
73. Gödöllő
74. Monor
75. Nagykáta
76. Ráckeve
77. Szentendre
78. Vác
79. Szob
80. Barcs
81. Csurgó
82. Fonyód
83. Kaposvár
84. Marcal
85. Nagyatád
86. Siófok
87. Tab
88. Baktalórántháza
89. Csenger
90. Fehérgyarmat
91. Kisvárda
92. Mátészalka
93. Nagykálló
94. Nyírbátor
95. Nyiregyháza
96. Tiszalök
97. Vásárosnamény
98. Jászapát
99. Jászberény

N. B. The following urban districts are included on fig.

100. Karcag
101. Kisújszállás
102. Kunhegyes
103. Kunszentmárton
104. Mezőtúr
105. Szolnok
106. Tiszafüred
107. Törökszentmiklós
108. Túrkeve
109. Bonyhád
110. Dombovár
111. Gyönk
112. Paks
113. Szekszárd
114. Tamás
115. Celldömölk
116. Körmend
117. Sárvár
118. Szentgotthárd
119. Szombathely
120. Vasvár
121. Devecser
122. Keszthely
123. Pápa
124. Sümeg
125. Tapolca
126. Veszprém
127. Zirc
128. Lent
129. Letenye
130. Nagykanizsa
131. Zalaegerszeg
132. Zalaszentgrót

Key to Figure 37

1. Budapest
2. Debrecen
3. Miskolc
4. Pécs
5. Szeged
6. Ajka
7. Baja
8. Balassagyarmat
9. Békéscsaba
10. Cegléd
11. Csongrád
12. Dunaújváros
13. Eger
14. Esztergom
15. Gyöngyös
16. Győr
17. Gyula
18. Hajdúböszörmény
10. Hajdúnánás
20. Hajdúszoboszló
21. Hatvan
22. Hódmezővásárhely
23. Jászberény
24. Kalocsa
25. Kaposvár
26. Karcag
27. Kazincbarcika
28. Kecskemét
29. Keszthely
30. Kiskunfélegyháza
31. Kiskunhalas
32. Kisújszállás
33. Komárom
34. Komló
35. Kőszeg
36. Makó
37. Mezőtúr
38. Mohács
39. Mosonmagyaróvár
40. Nagykanizsa
41. Nagykőrös
42. Nyíregyháza
43. Orosháza
44. Oroszlány
45. Ózd
46. Pápa
47. Salgótarján
48. sátoraljaújhely
49. Sopron
50. Szekszárd
51. Szentendre
52. Szentes
53. Székesfehérvár
54. Szolnok

55. Szombathely
56. Tata
57. Tatabánya
58. Törökszentmiklós
59. Túrkeve
60. Vác
61. Várpalota
62. Veszprém
63. Zalaegerszeg

The Economic Regions

Central Industrial Region comprising the counties of Pest and Budapest and the town and rural district of Dunaújváros in Fejér county.
Northern Industrial Region comprising the counties of Borsod-A.-Z., Heves and Nógrád and Miskolc.
Northeast Alföld comprising the counties of Hajdú-Bihar, Szabolcs-Szatmár and Szolnok and Debrecen.
Southeast Alföld comprising the counties of Bács-Kiskun, Békés and Csongrád and Szeged.
Southern Transdanubia comprising the counties of Baranya, Somogy and Tolna and Pécs.
Northern Transdanubia comprising the counties of Győr-Sopron, Komárom, Vas, Veszprém, Zala and Fejér excluding the town and rural district of Dunaújváros.

FIGURES

NATURAL POPULATION INCREASE 1949-1960
by rural and urban districts

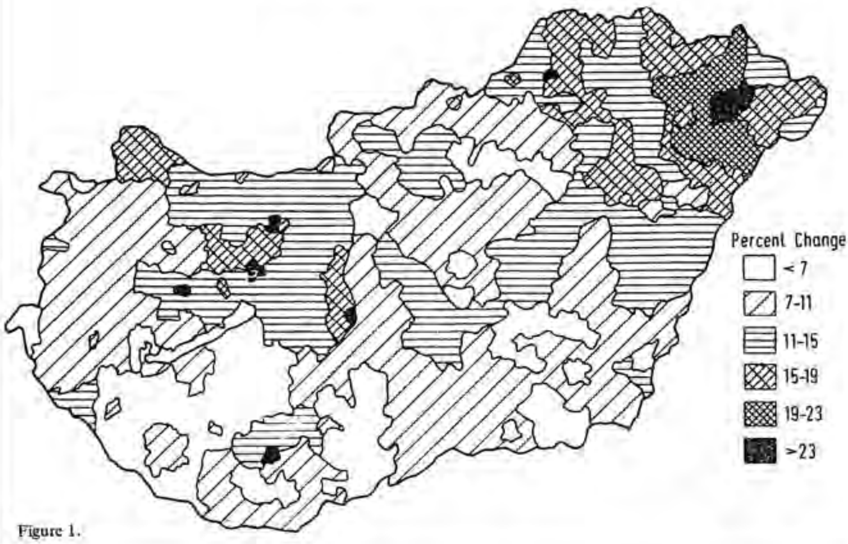


Figure 1.

ACTUAL POPULATION CHANGE 1949-1960
by rural and urban districts

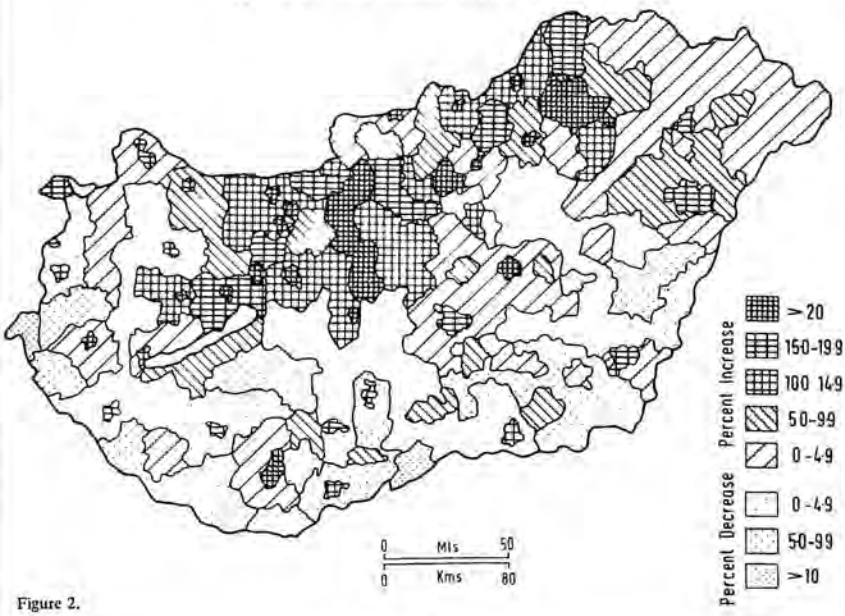


Figure 2.

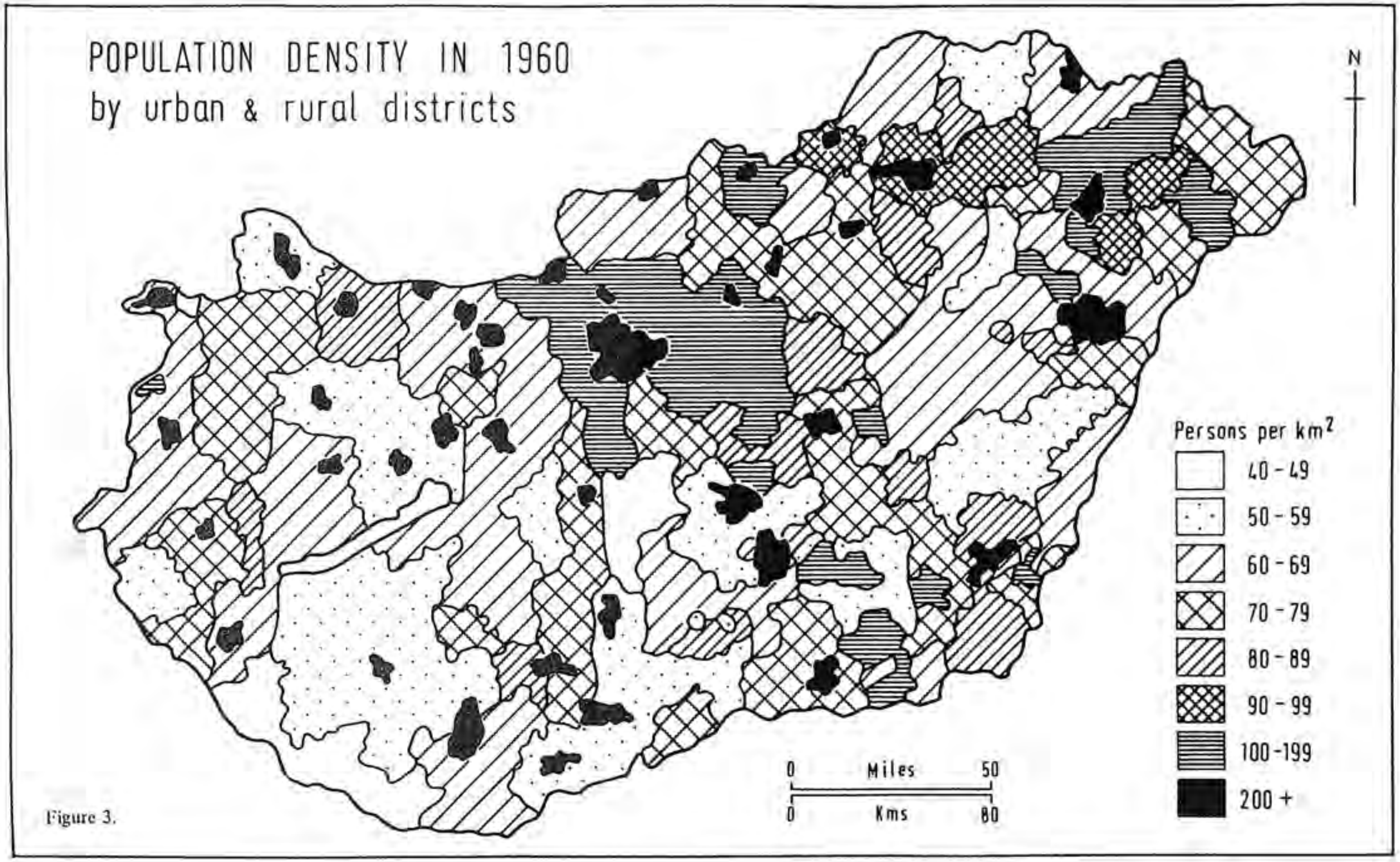

POPULATION DENSITY IN 1960
by urban & rural districts
N
Persons per km²
40 - 49
50 - 59
60 - 69
70 - 79
80 - 89
90 - 99
100 - 199
200 +
0 Miles 50
0 Kms 80

Figure 3.

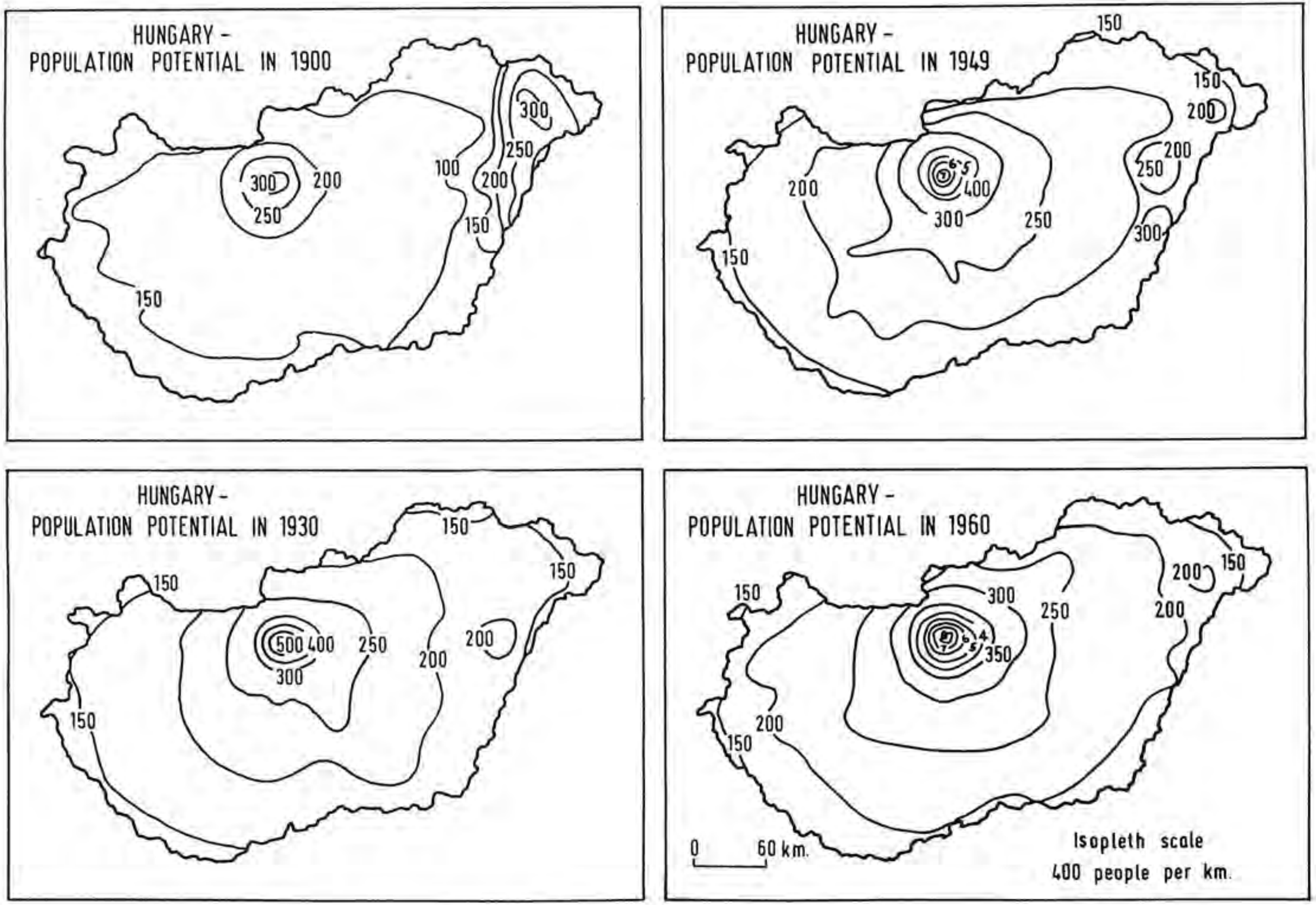
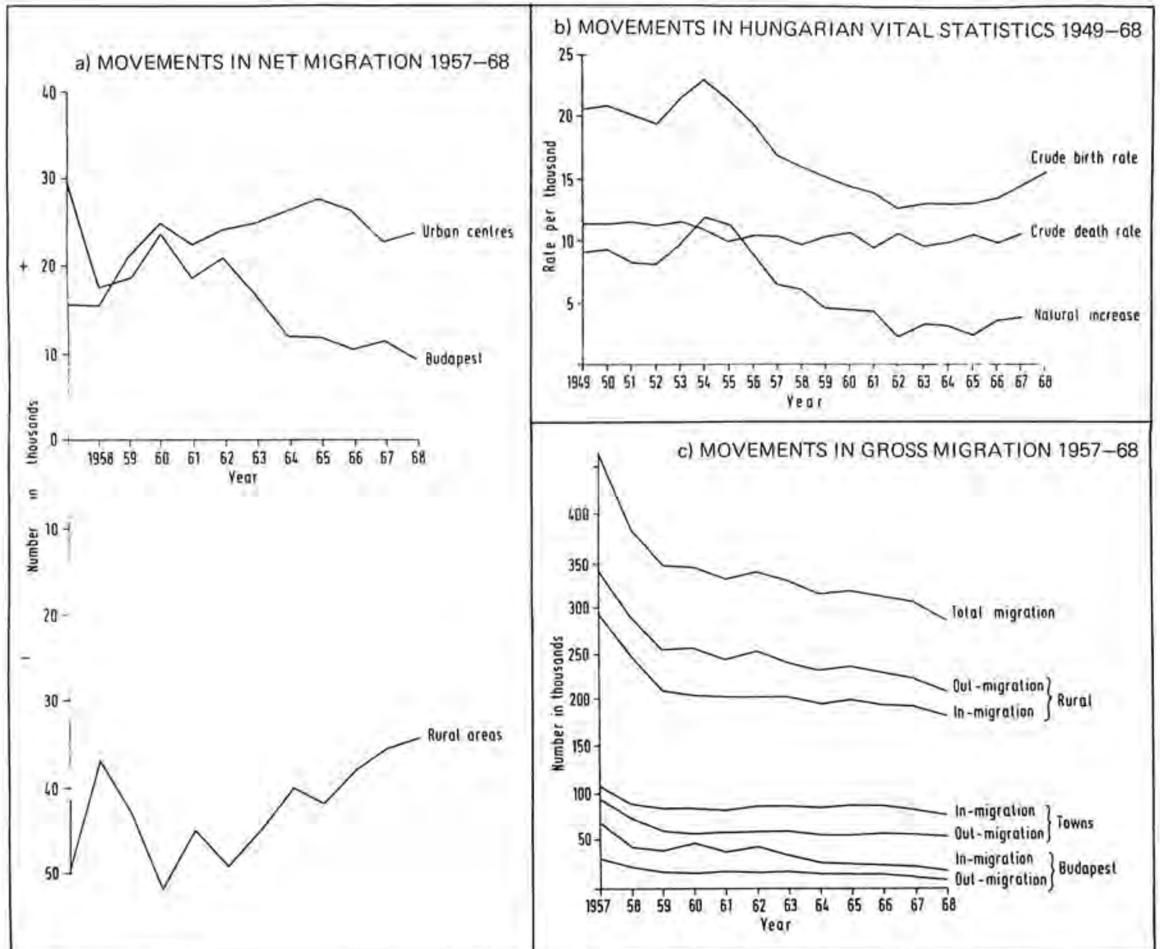


Figure 4. Hungary – Population Potential 1900 to 1960 (after Bene and Tekse 1966)


a) MOVEMENTS IN NET MIGRATION 1957–68
Number in thousands
+
–
Urban centres
Budapest
Rural areas
1958 59 60 61 62 63 64 65 66 67 68
Year
b) MOVEMENTS IN HUNGARIAN VITAL STATISTICS 1949–68
Rate per thousand
Crude birth rate
Crude death rate
Natural increase
1949 50 51 52 53 54 55 56 57 58 59 60 61 62 63 64 65 66 67 68
Year
c) MOVEMENTS IN GROSS MIGRATION 1957–68
Number in thousands
Total migration
Out-migration
In-migration
Rural
In-migration
Out-migration
Towns
In-migration
Out-migration
Budapest
1957 58 59 60 61 62 63 64 65 66 67 68
Year

MOVEMENTS IN THE CENTRES OF GRAVITY OF MIGRATION BETWEEN 1958 & 1964

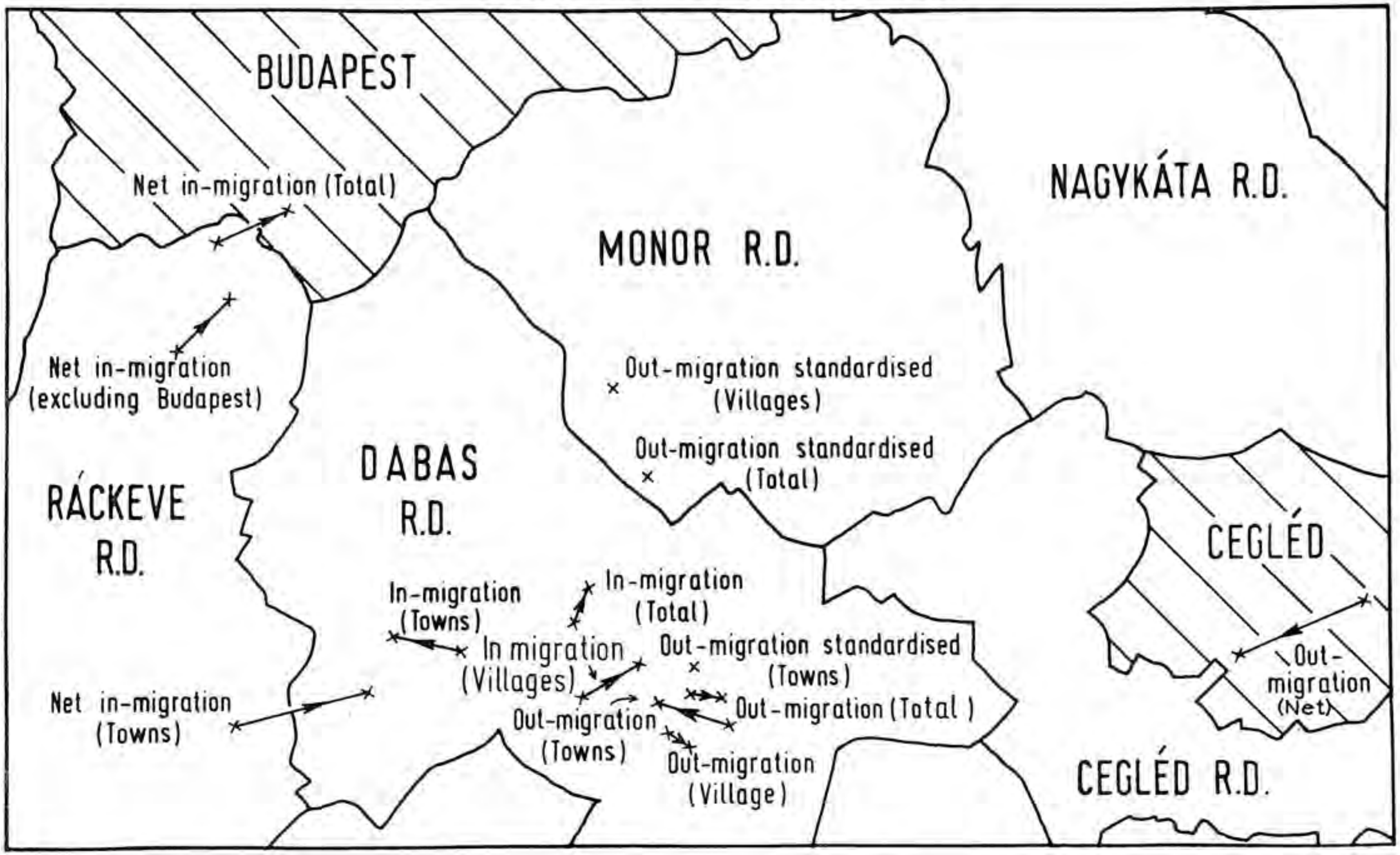


Figure 6.

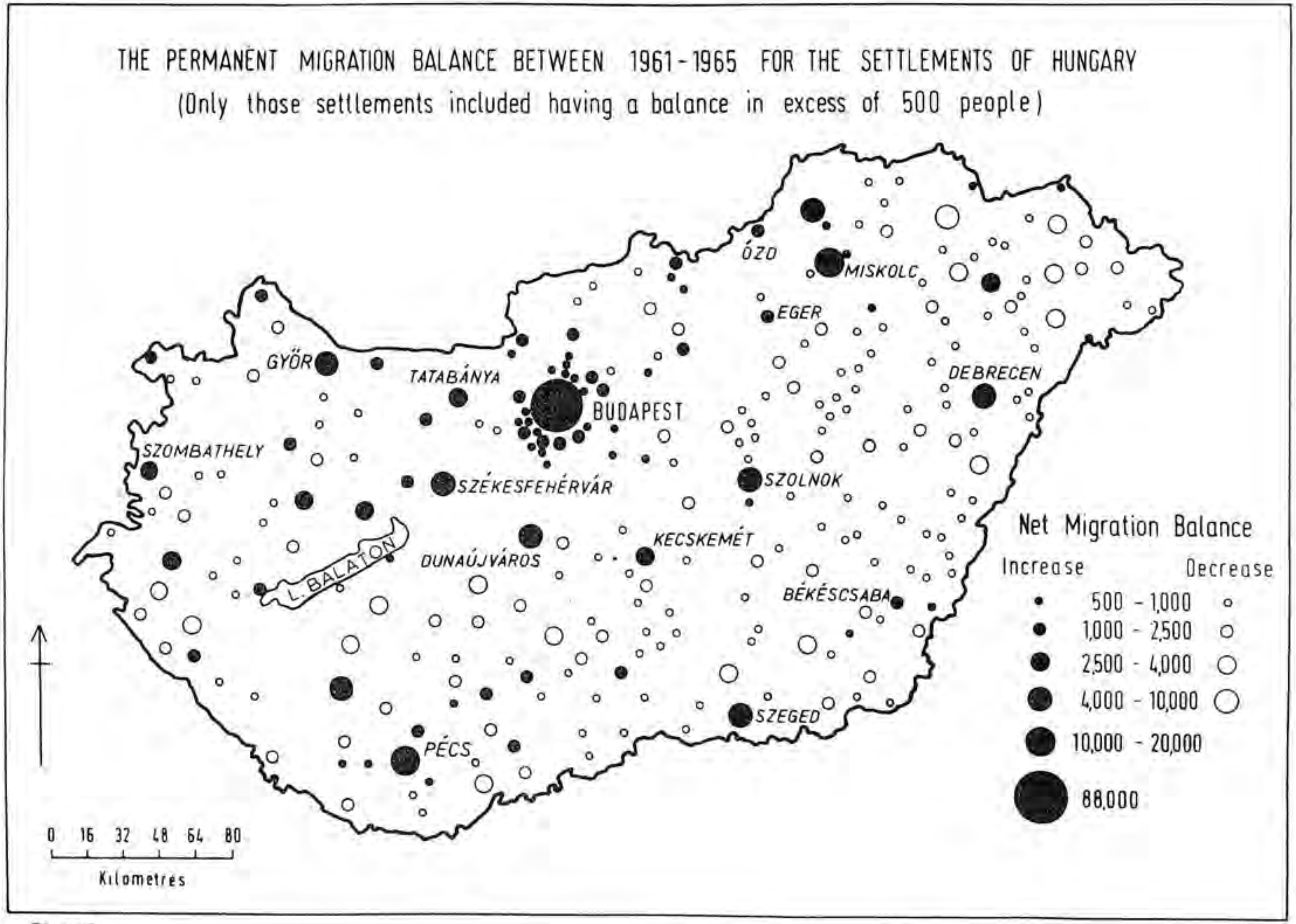

THE PERMANENT MIGRATION BALANCE BETWEEN 1961-1965 FOR THE SETTLEMENTS OF HUNGARY
(Only those settlements included having a balance in excess of 500 people)
ÓZD
MISKOLC
EGER
GYŐR
TATABÁNYA
BUDAPEST
DEBRECEN
SZOMBATHELY
SZÉKESFEHÉRVÁR
SZOLNOK
KECSKEMÉT
L. BALATON
DUNAÚJVÁROS
BÉKÉSCSABA
SZEGED
PÉCS
Net Migration Balance
Increase
Decrease
500 - 1,000
1,000 - 2,500
2,500 - 4,000
4,000 - 10,000
10,000 - 20,000
88,000
0 16 32 48 64 80
Kilometres

Figure 7

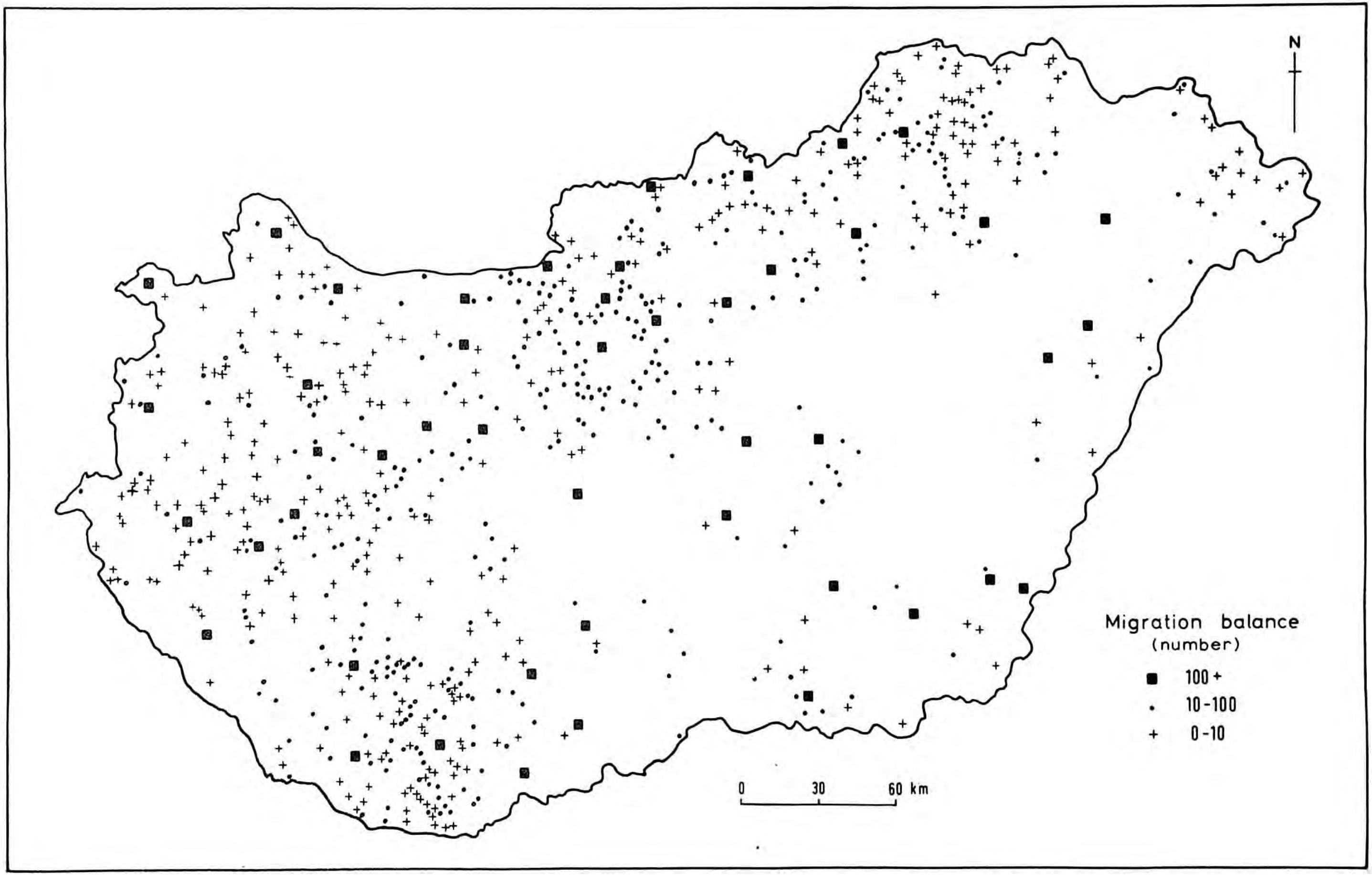
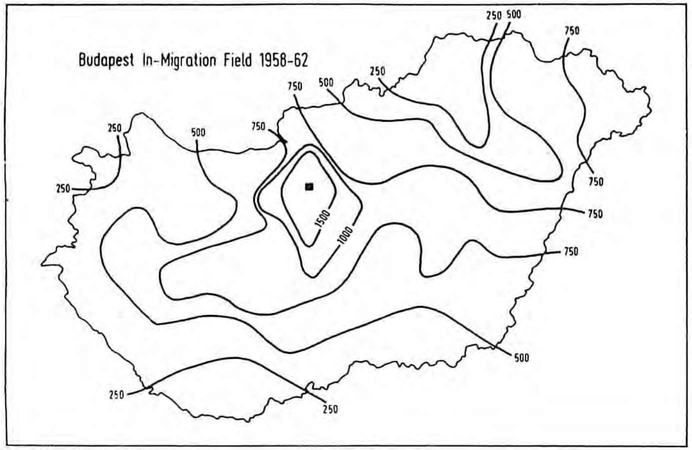
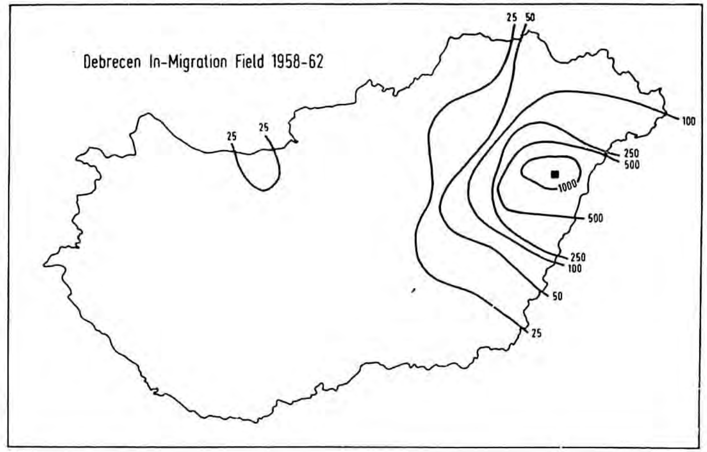
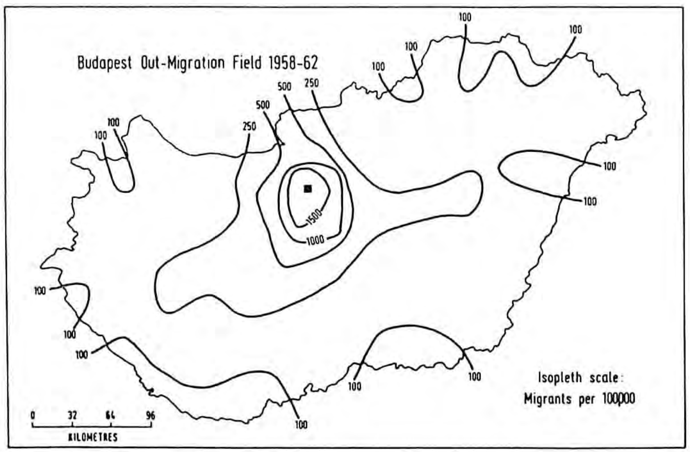
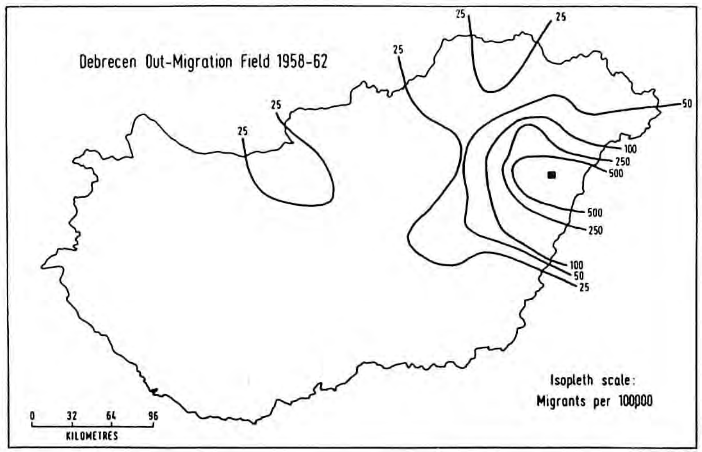


Figure 8. Places with a Positive Migration Balance in 1965


Budapest In-Migration Field 1958-62
250 500
750
250
750 500
250 500 750
250
1500
1000
750
750
750
750
500
250
250


Debrecen In-Migration Field 1958-62
25 50
25 25
100
250
500
1000
500
250
100
50
25


Budapest Out-Migration Field 1958-62
100
100
100
100
500 250
500
250
100
100
1500
1000
100
100
100
100
100
100
100
100
Isopleth scale:
Migrants per 100,000
0 32 64 96
KILOMETRES


Debrecen Out-Migration Field 1958-62
25
25
25
25
25
50
100
250
500
500
250
100
50
25
Isopleth scale:
Migrants per 100,000
0 32 64 96
KILOMETRES

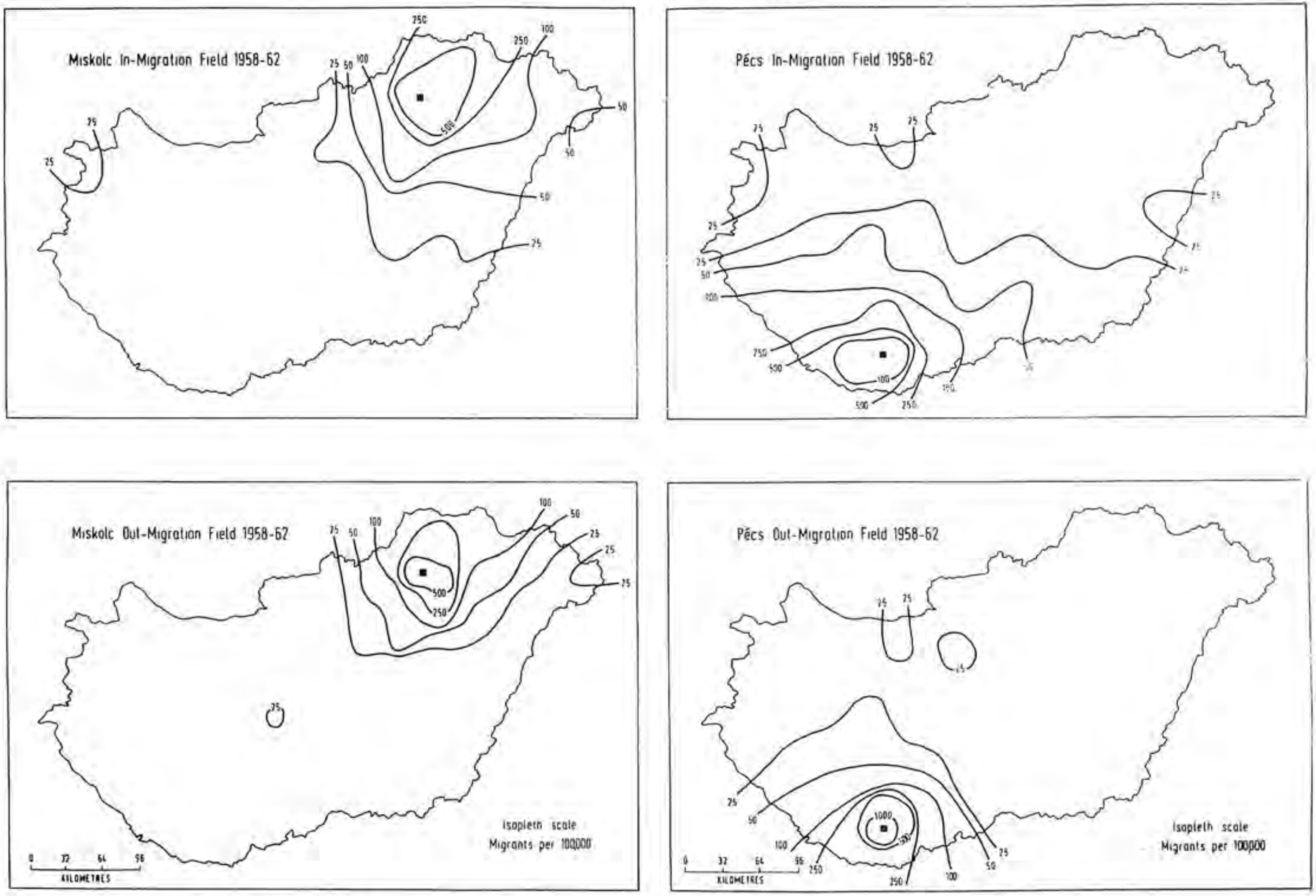
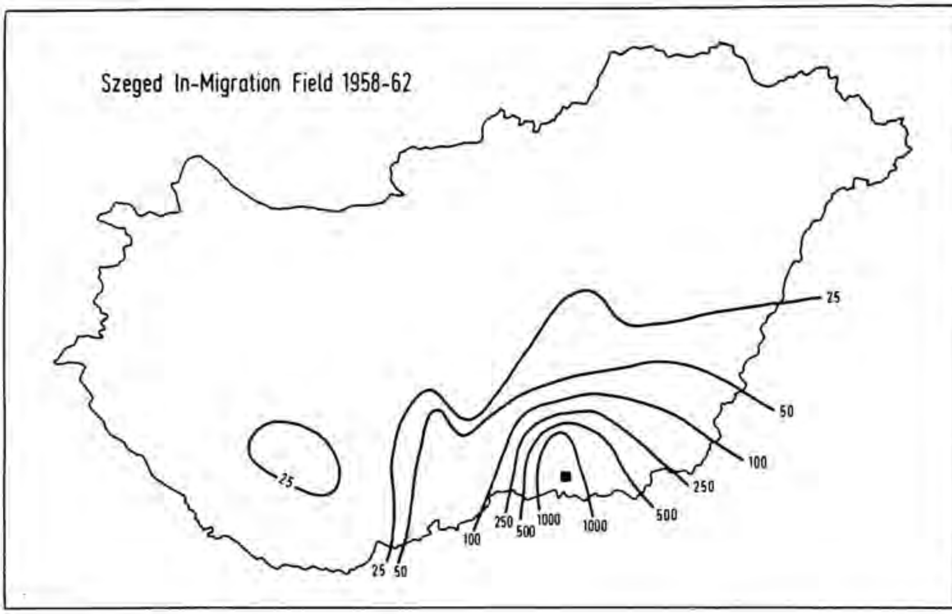


Figure 10. The Mean Annual Migration Fields of Miskolc and Pécs 1958 – 1962



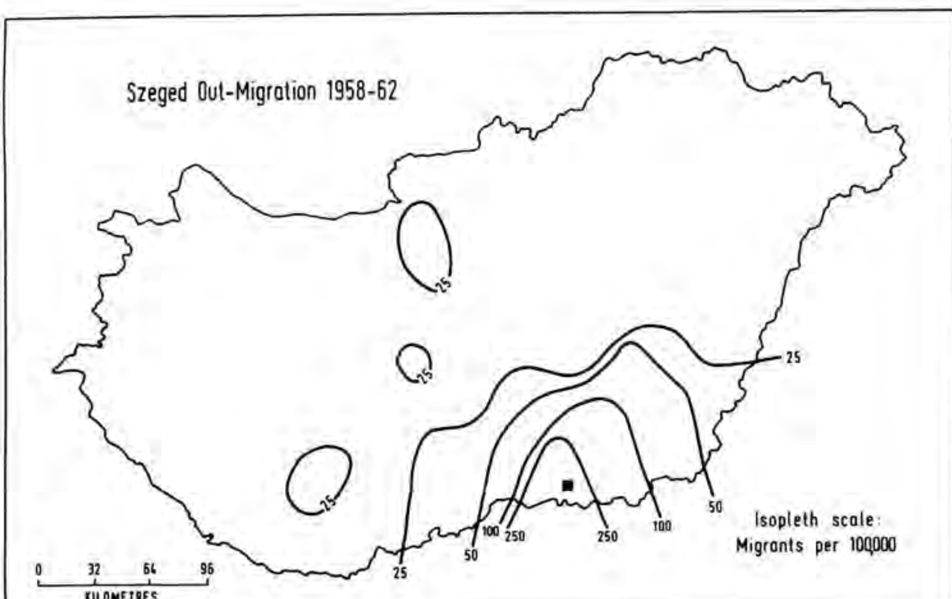


Figure 11. The Mean Annual Migration Fields of Szeged – 1958 to 1962

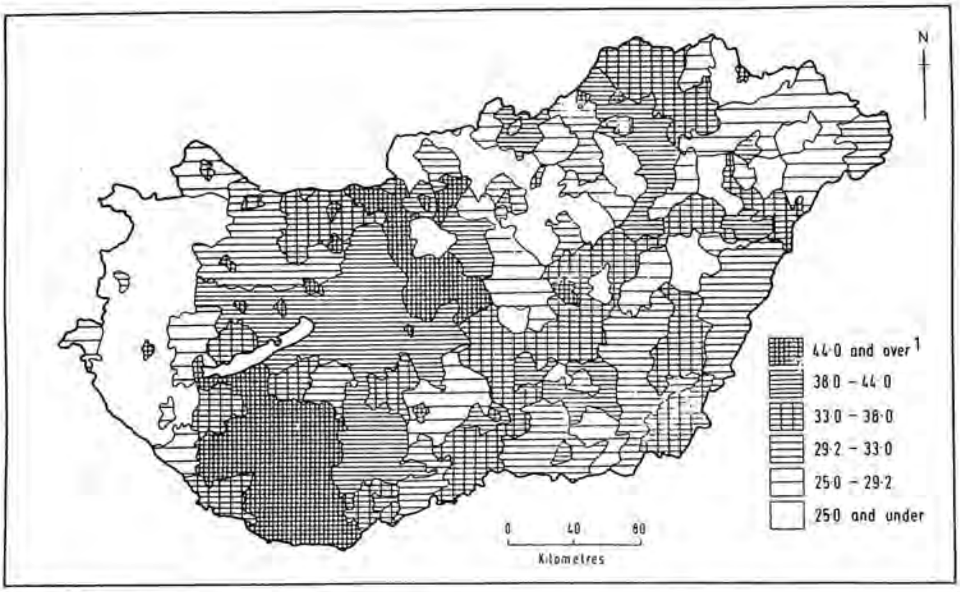


Figure 12.

PERMANENT IN-MIGRATION FREQUENCIES – 1961

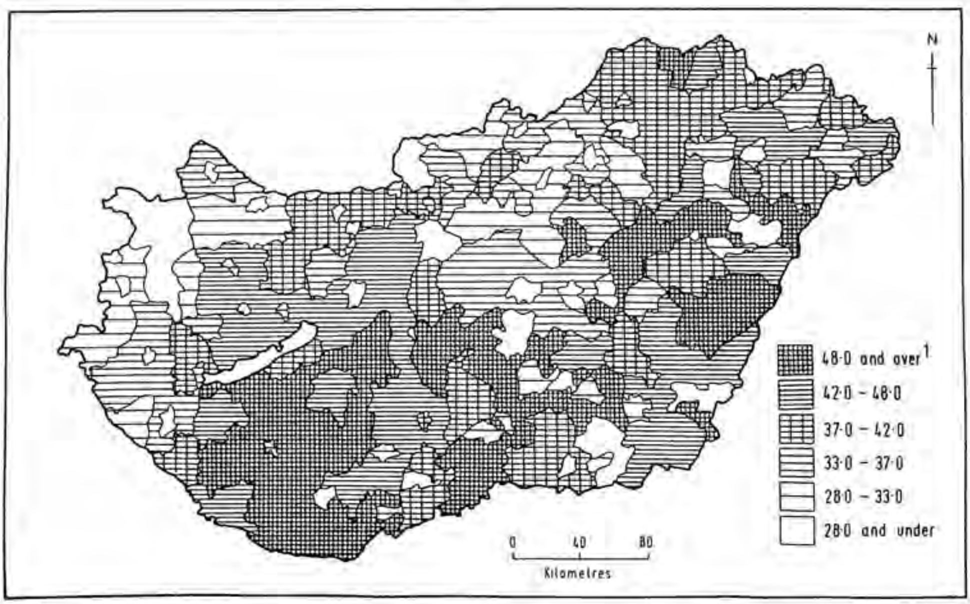


Figure 13.

PERMANENT OUT-MIGRATION FREQUENCIES – 1961

[1] Migrants per 1000 Population

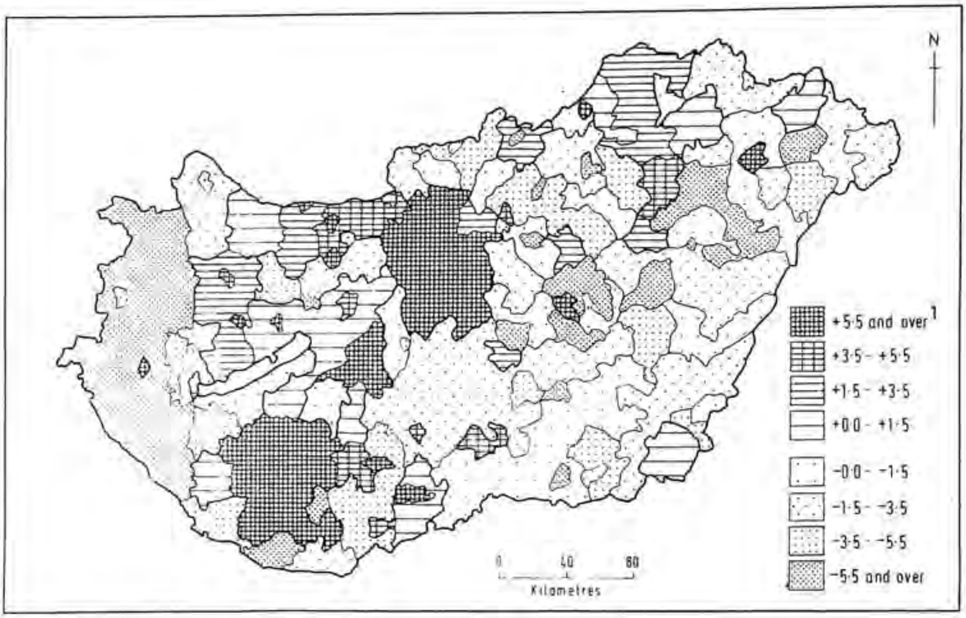


Figure 14.

PERMANENT IN-MIGRATION FREQUENCY TENDENCIES — 1957 TO 1961

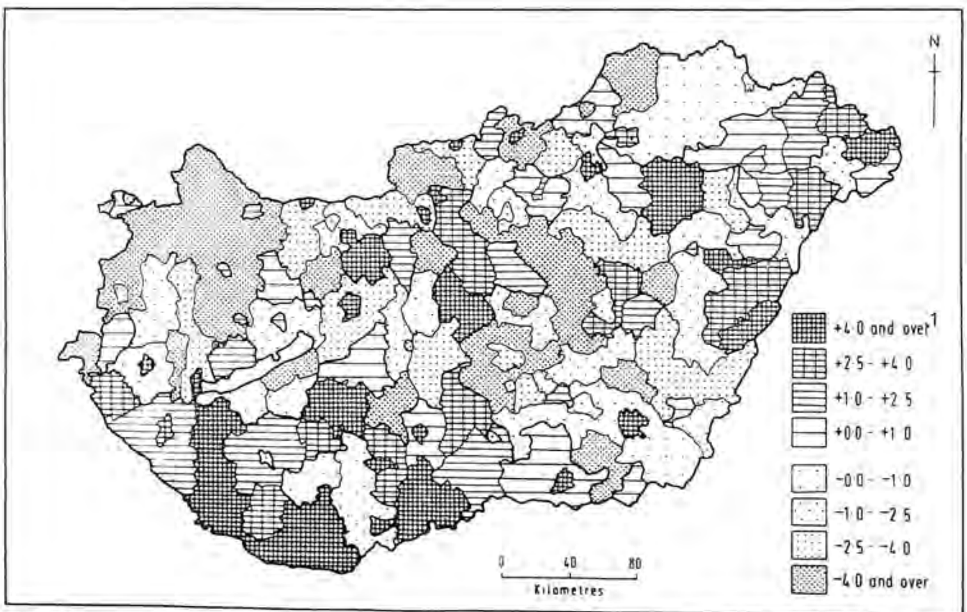


Figure 15.

PERMANENT IN-MIGRATION FREQUENCY TENDENCIES — 1961 TO 1965

[1] Migrants per 1000 Population

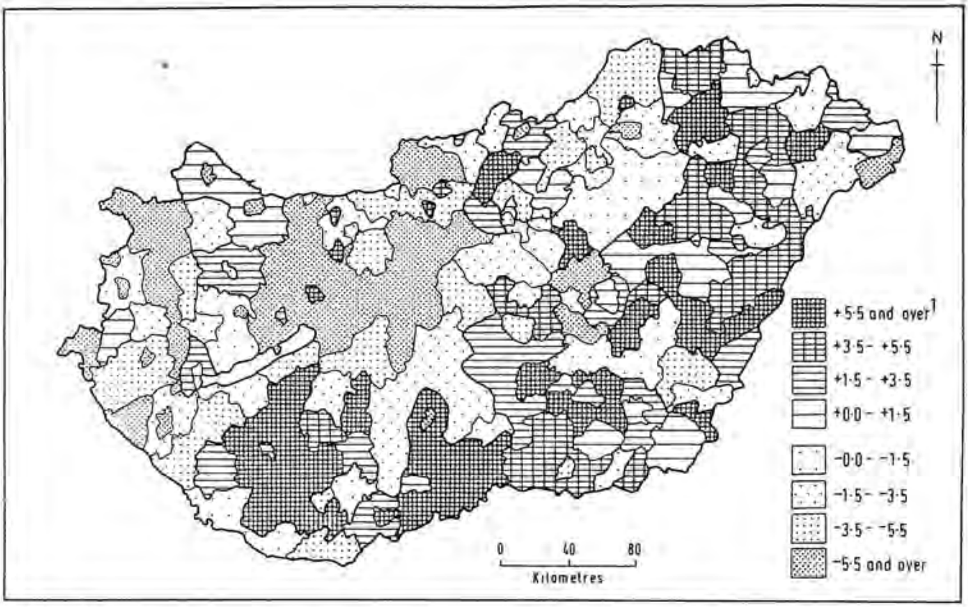


Figure 16.

PERMANENT OUT-MIGRATION FREQUENCY TENDENCIES – 1957 TO 1961

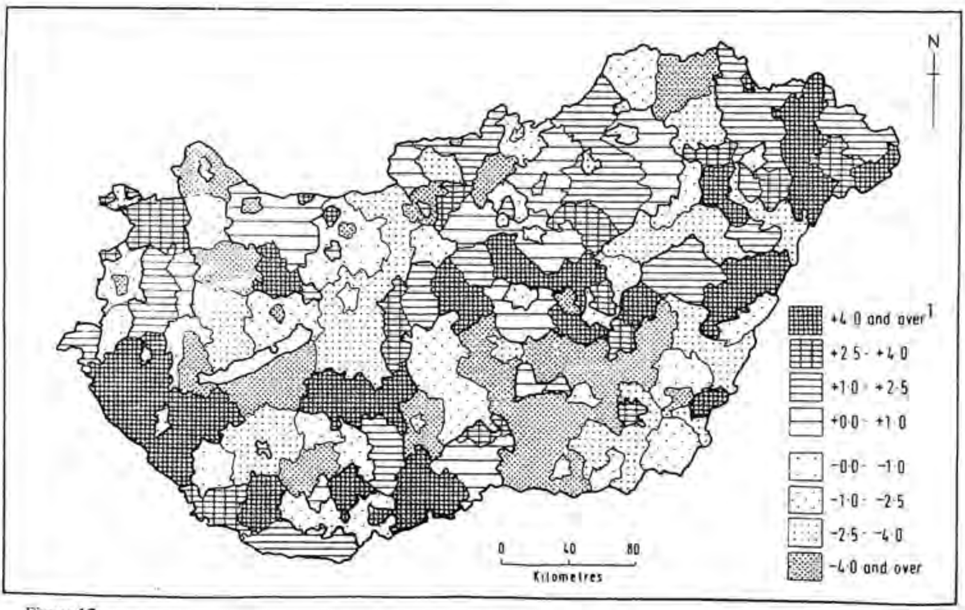


Figure 17.

PERMANENT OUT-MIGRATION FREQUENCY TENDENCIES – 1961 TO 1965

[1] Migrants per 1000 Population.

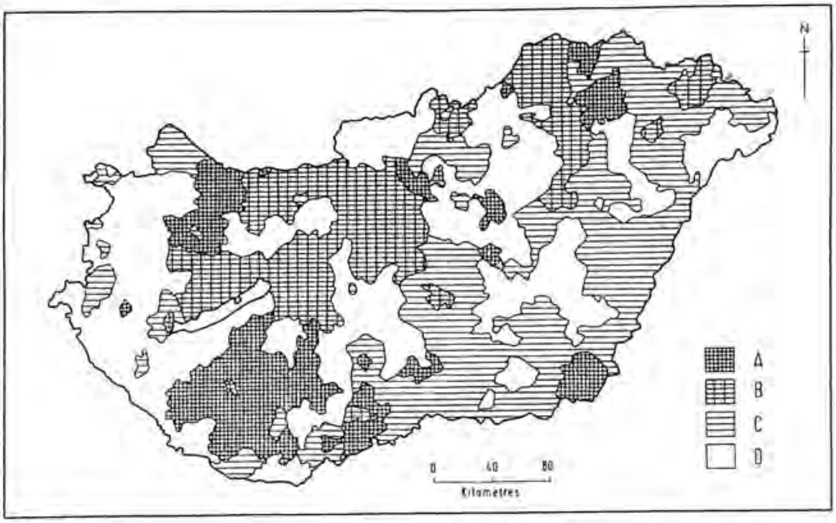


Figure 18.

CLASSIFICATION OF PERMANENT MIGRATION FREQUENCY TENDENCIES – 1957 TO 1961

A. In-and out-migration frequencies greater than expected.

B. In-migration frequencies greater, out-migration frequencies less than expected.

C. In-migration frequencies less, out-migration frequencies greater than expected.

D. In-and out-migration frequencies less than expected.

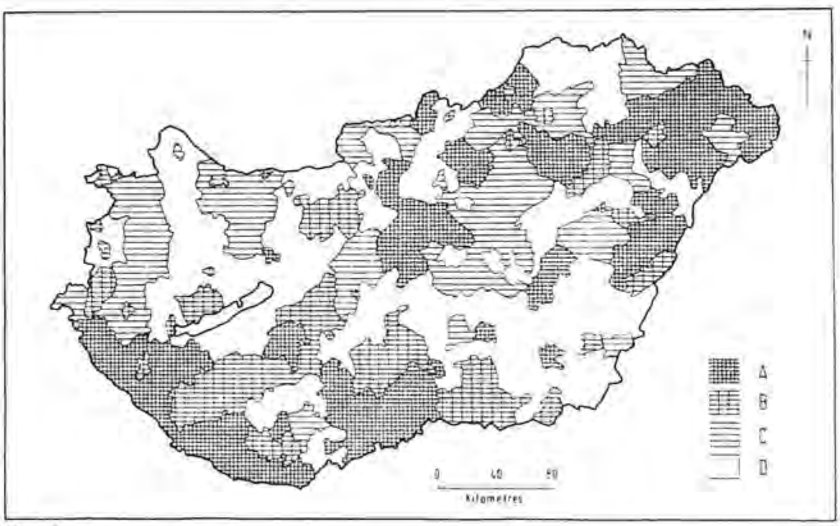


Figure 19.

CLASSIFICATION OF PERMANENT MIGRATION FREQUENCY TENDENCIES – 1961 TO 1965

A. In-and out-migration frequencies greater than expected.

B. In-migration frequencies greater, out-migration frequencies less than expected.

C. In-migration frequencies less, out-migration frequencies greater than expected.

D. In-and out-migration frequencies less than expected.

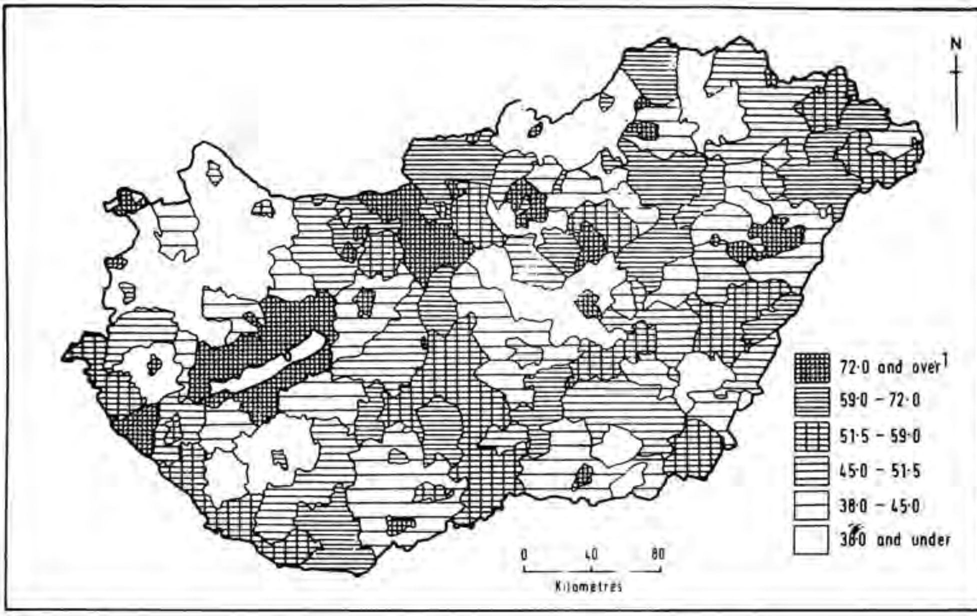


Figure 20.

TEMPORARY IN-MIGRATION FREQUENCIES – 1961

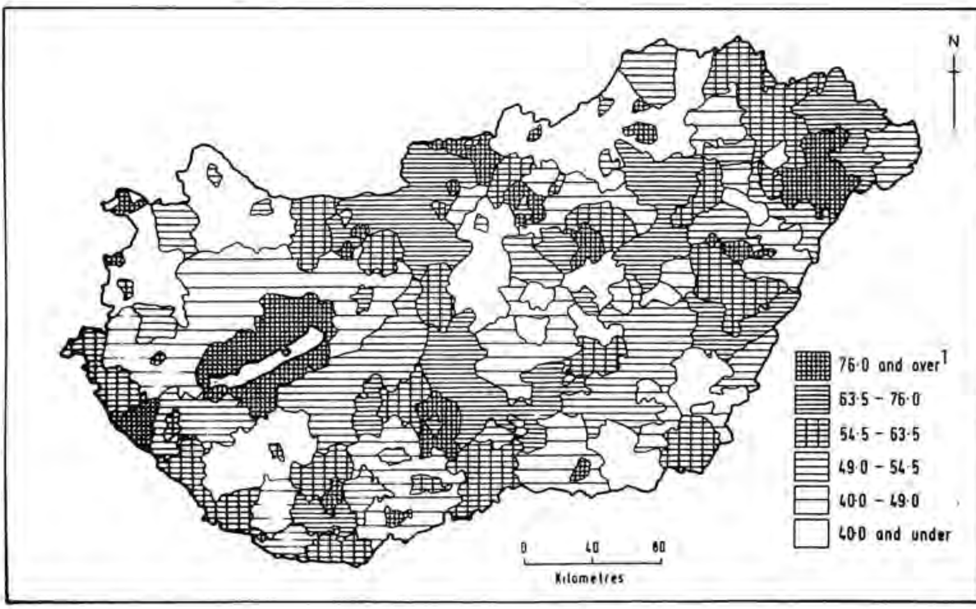


Figure 21.

TEMPORARY OUT-MIGRATION FREQUENCIES – 1961

[1] Migrants per 1000 Population

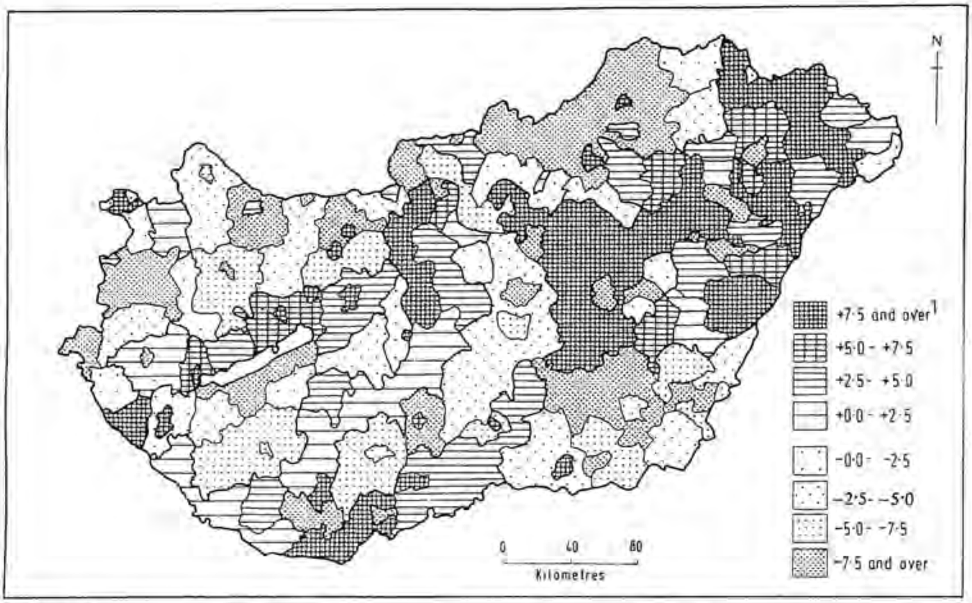


Figure 22.

TEMPORARY IN-MIGRATION FREQUENCY TENDENCIES —1961 TO 1965

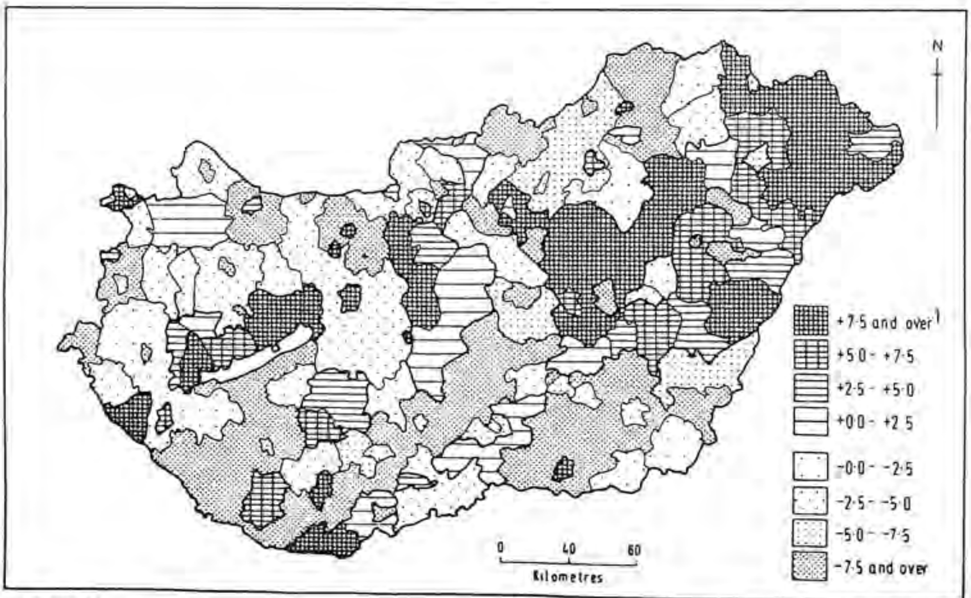


Figure 23.

TEMPORARY OUT-MIGRATION FREQUENCY TENDENCIES —1961 TO 1965

[1] Migrants per 1000 Population

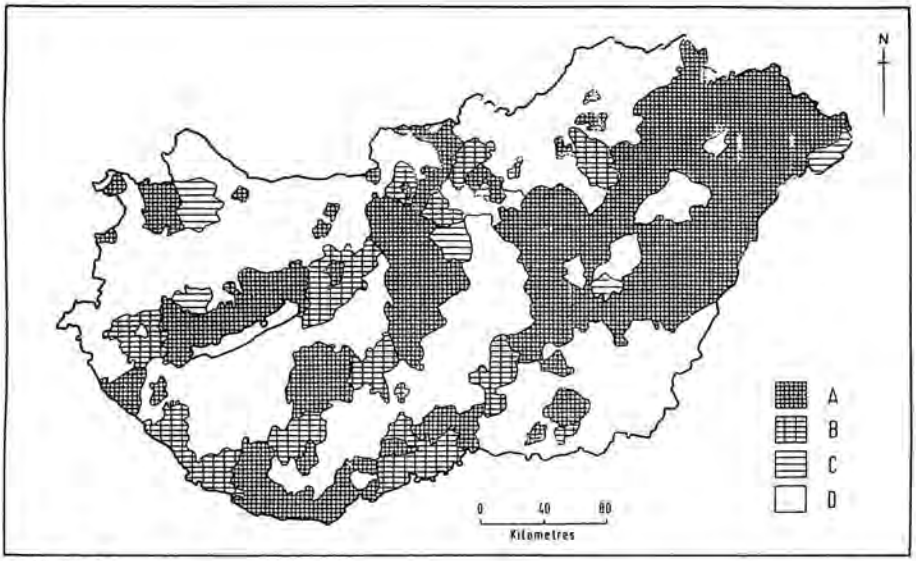


Figure 24.

CLASSIFICATION OF TEMPORARY MIGRATION FREQUENCY TENDENCIES – 1961 TO 1965

A. In-and out-migration frequencies greater than expected.
B. In-migration frequencies greater, out-migration frequencies less than expected.
C. In-migration frequencies less, out-migration frequencies greater than expected.
D. In-and out-migration frequencies less than expected.

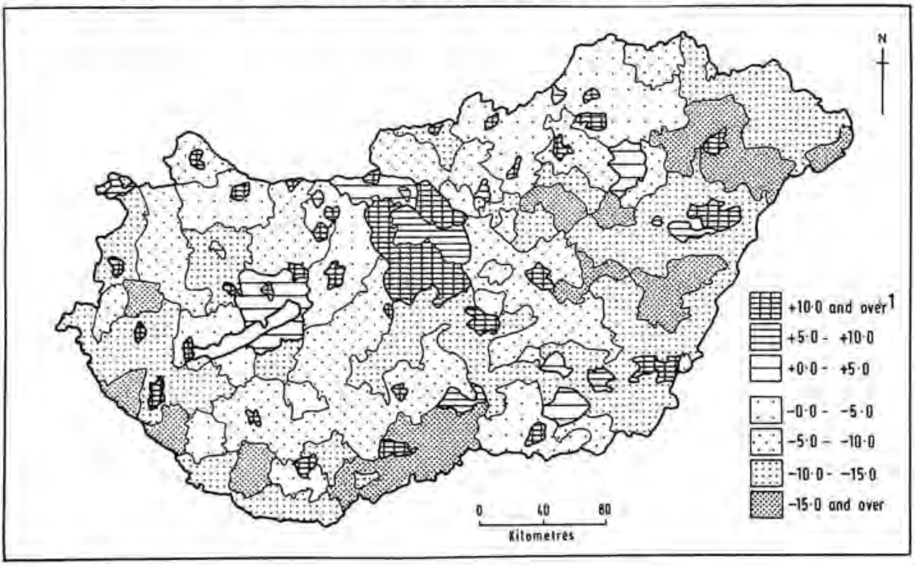


Figure 25.

PERMANENT NET MIGRATION FREQUENCIES – 1965

[1] Migrants per 1000 Population

35

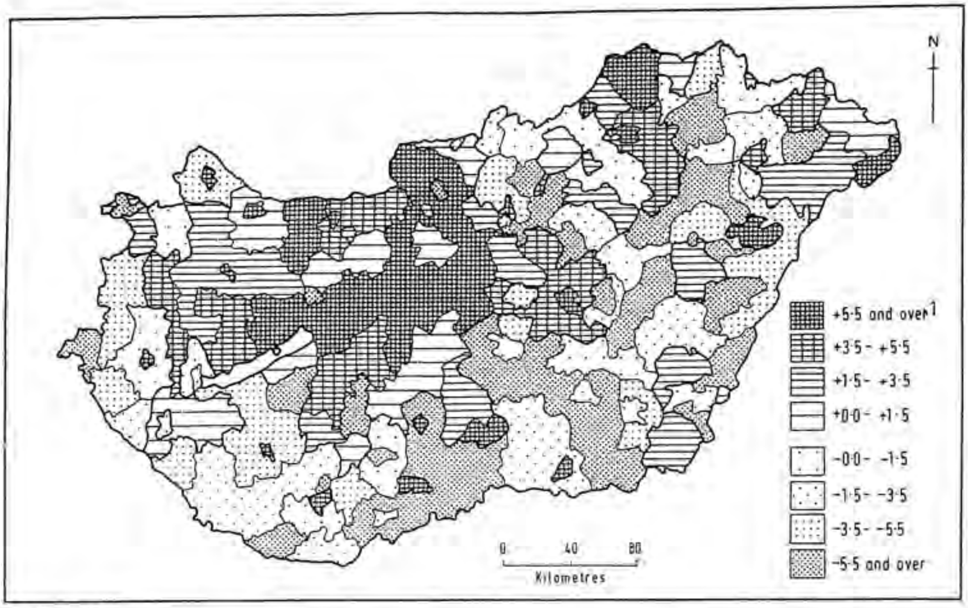


Figure 26.

PERMANENT NET MIGRATION FREQUENCY TENDENCIES – 1957 TO 1960

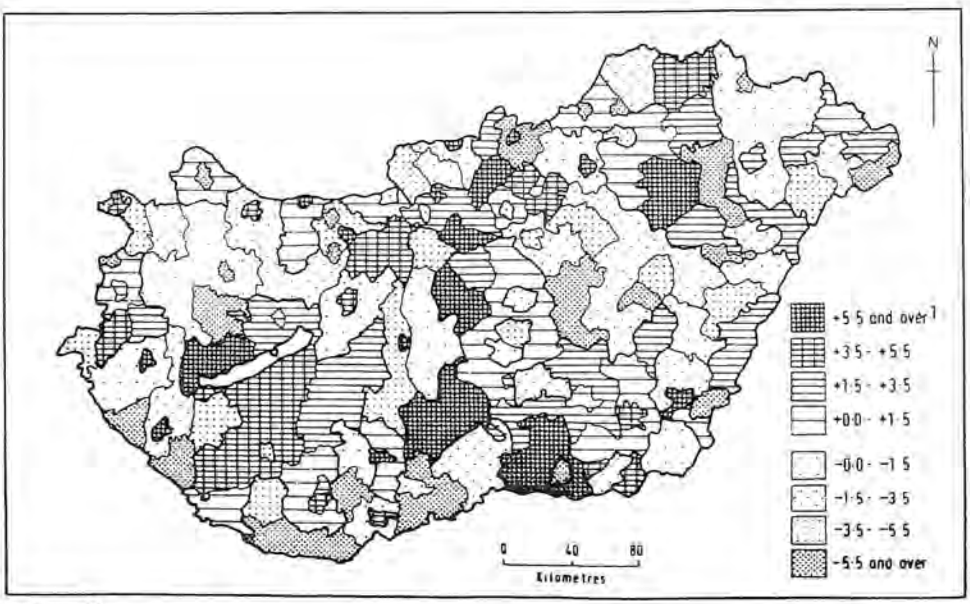


Figure 27.

PERMANENT NET MIGRATION FREQUENCY TENDENCIES – 1961 TO 1965

[1] Migrants per 1000 Population

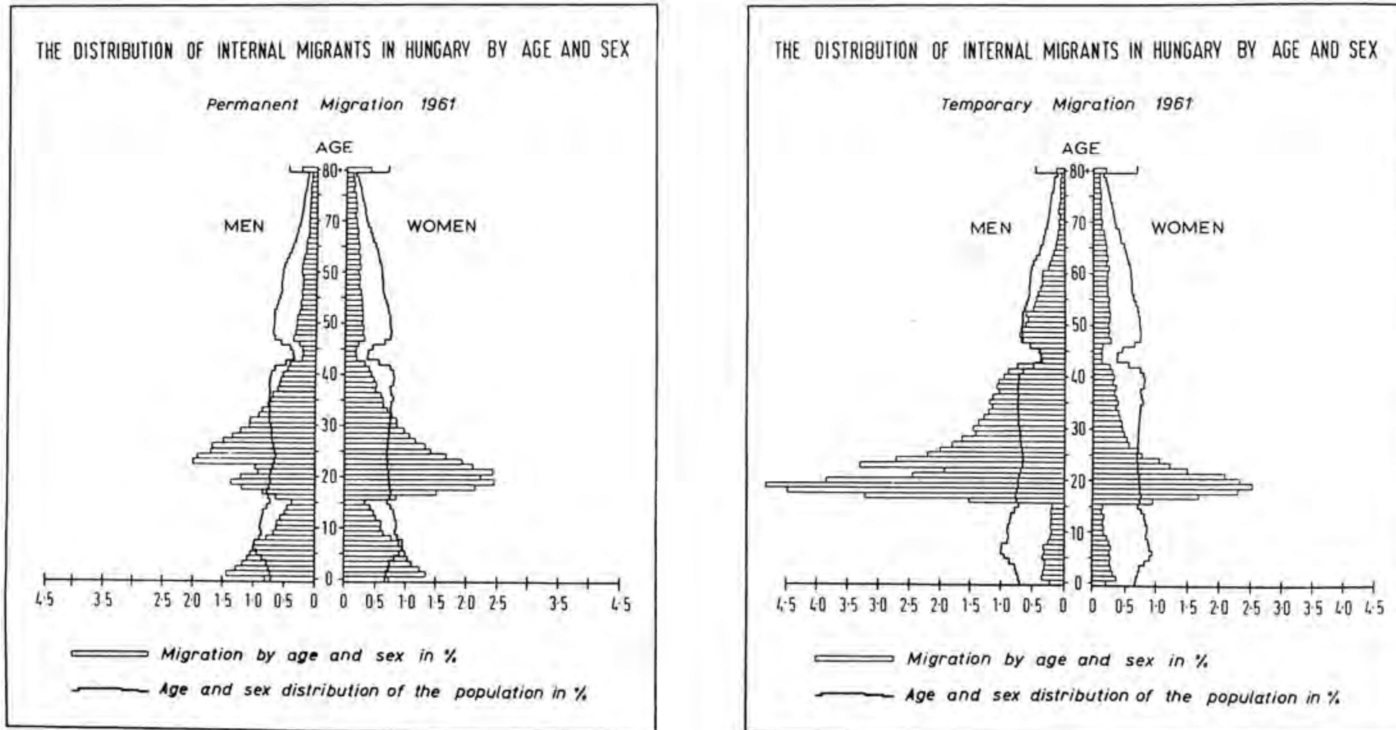
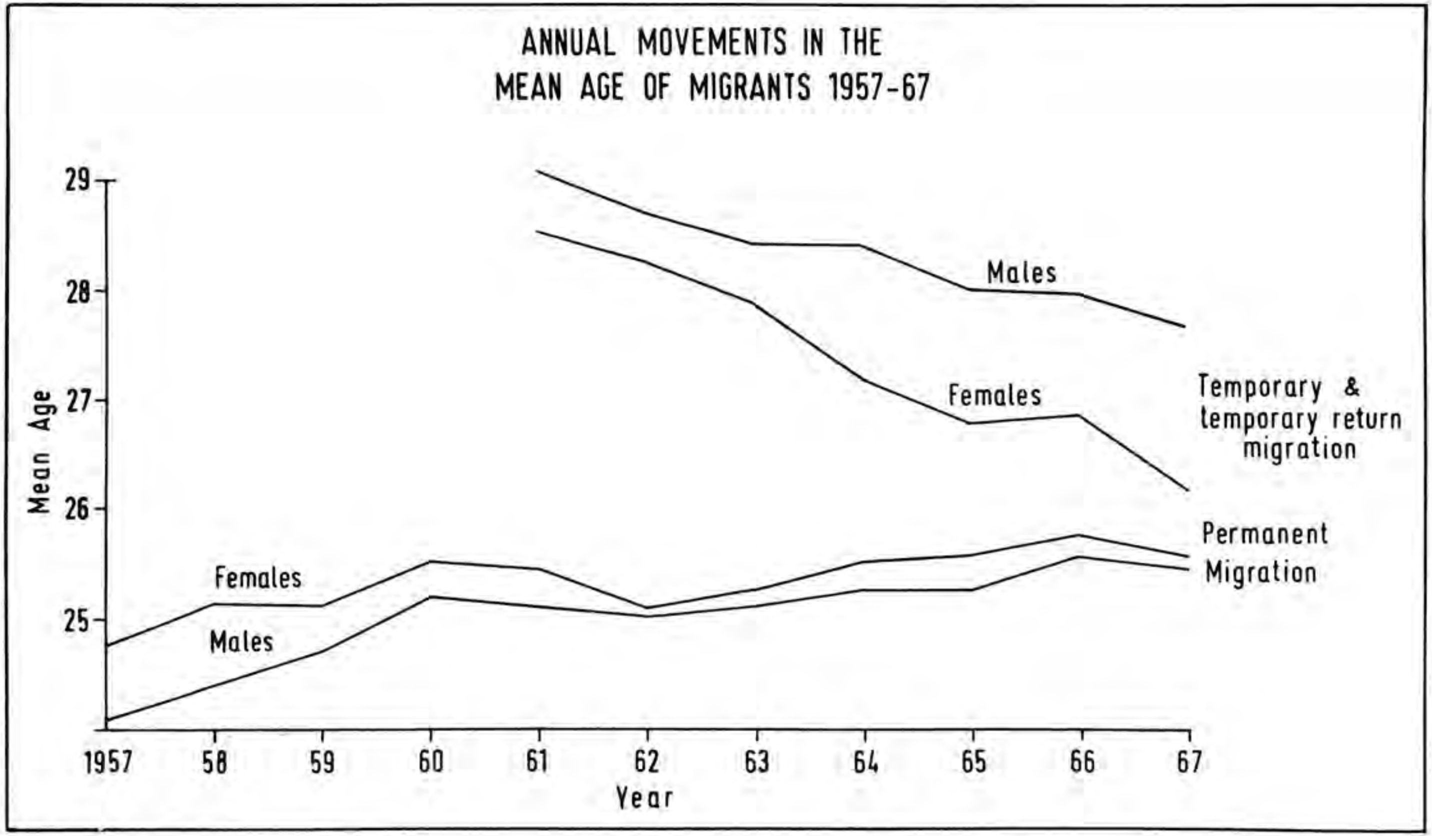


Figure 28. (after Hungarian Central Statistical Office 1961)



ANNUAL MOVEMENTS IN THE
MEAN AGE OF MIGRANTS 1957-67
Mean Age
29
28
27
26
25
Males
Females
Temporary &
temporary return
migration
Permanent
Migration
Females
Males
1957
58
59
60
61
62
63
64
65
66
67
Year

Figure 29.

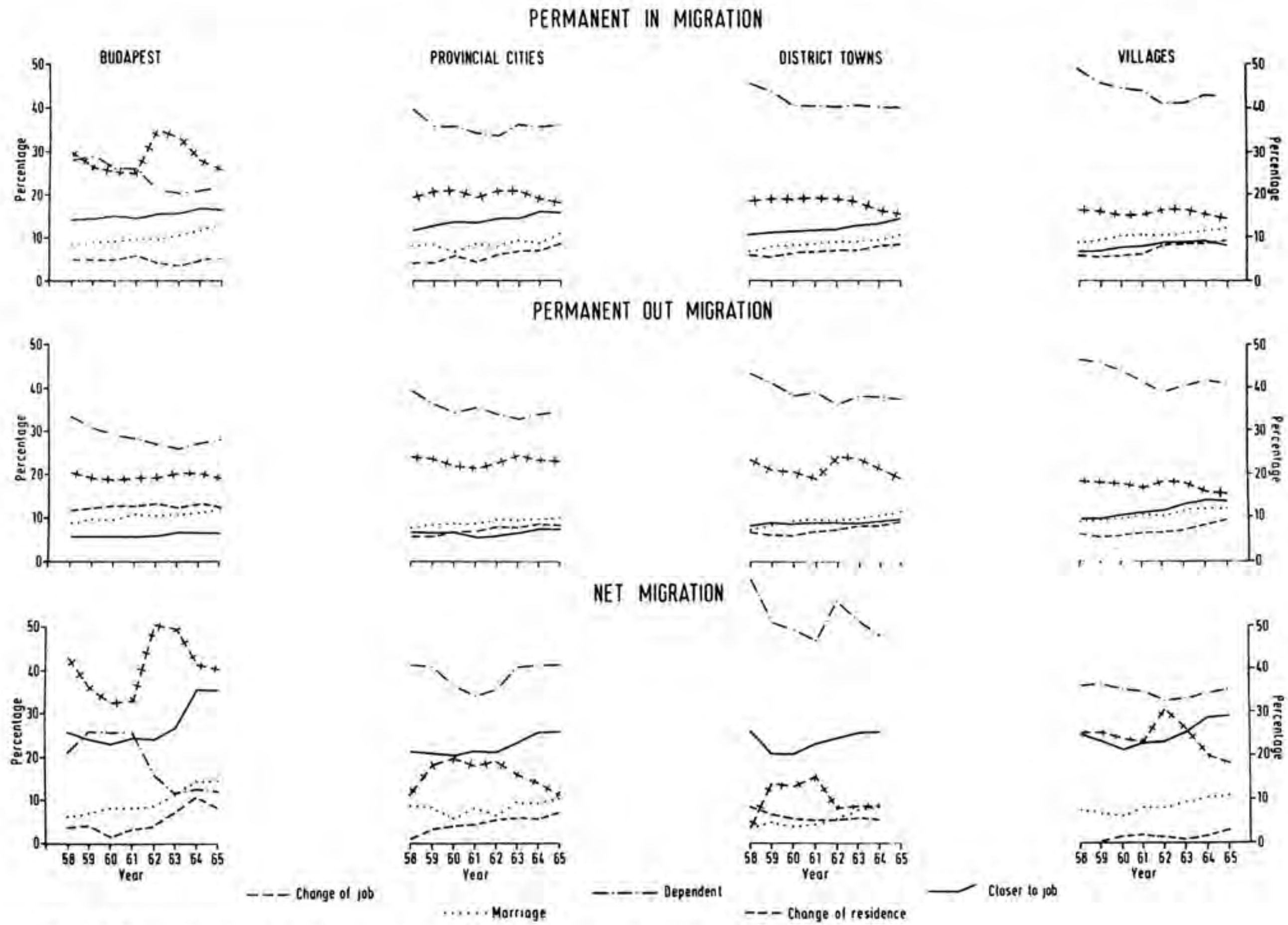


Figure 30. Temporal Variations in the Permanent Migration Reason Structure by Settlement Class

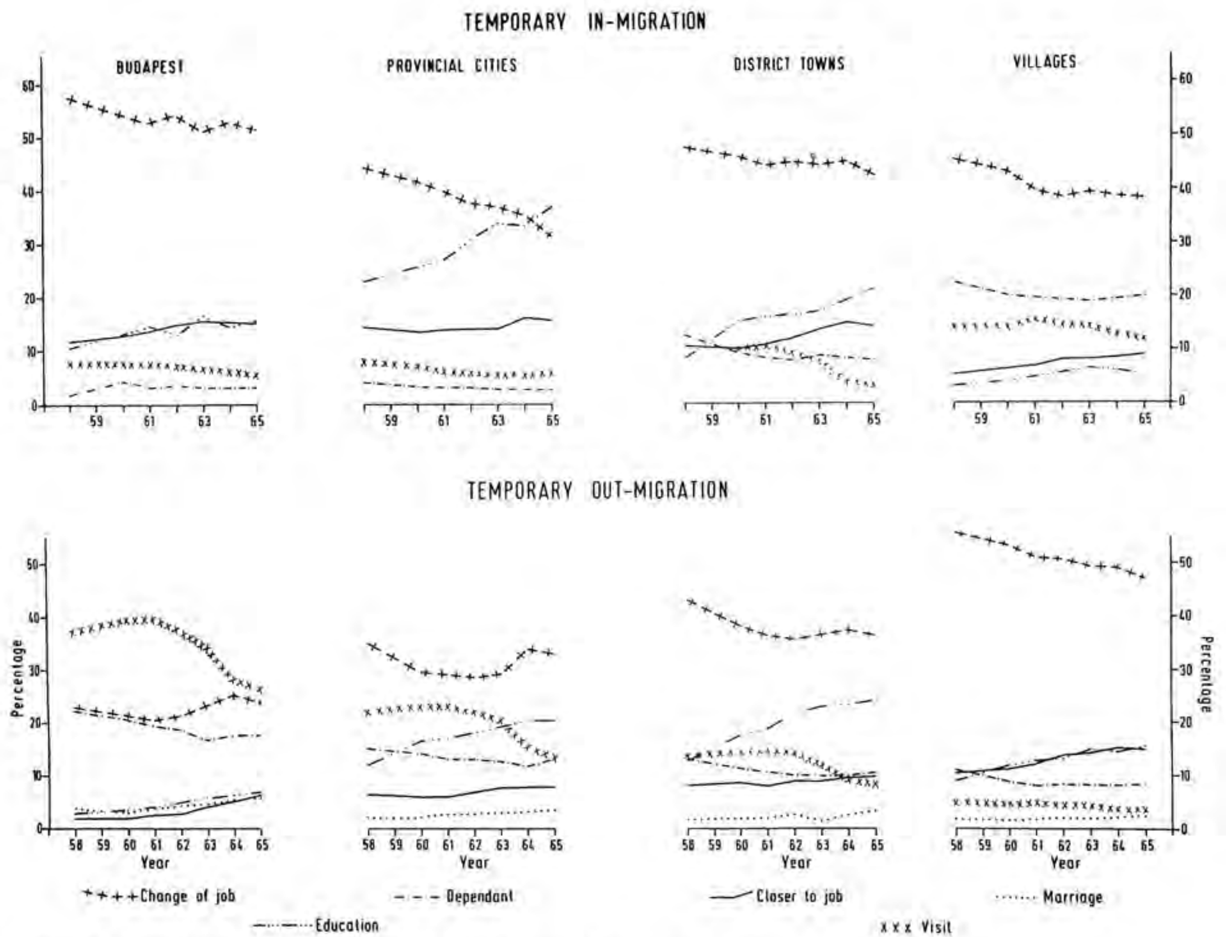


Figure 31. Temporal Variations in the Temporary Migration Reason Structure by Settlement Class

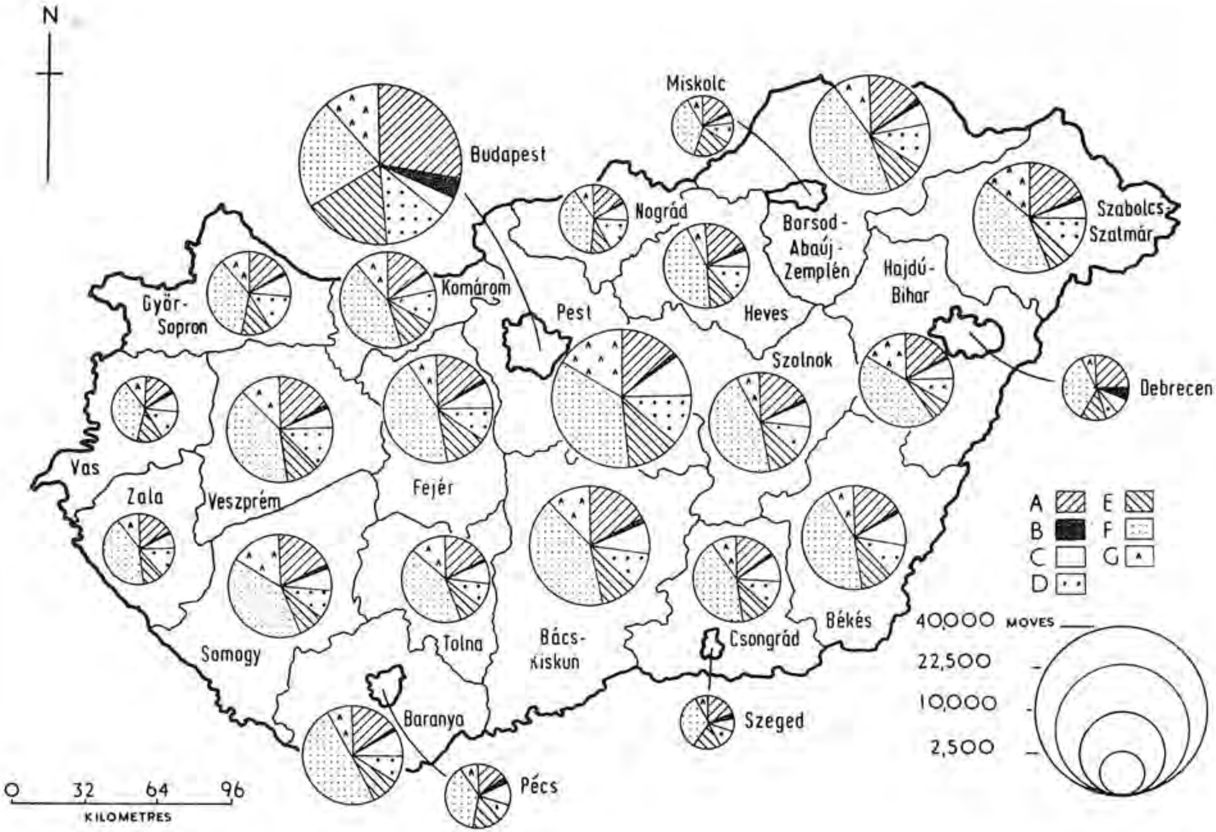


Figure 32. Permanent In-migration Reason Structure by Counties

A. Change of employment B. Education C. Change of dwelling D. Marriage E. Closer to place of work F. Dependent G. Other and unknown

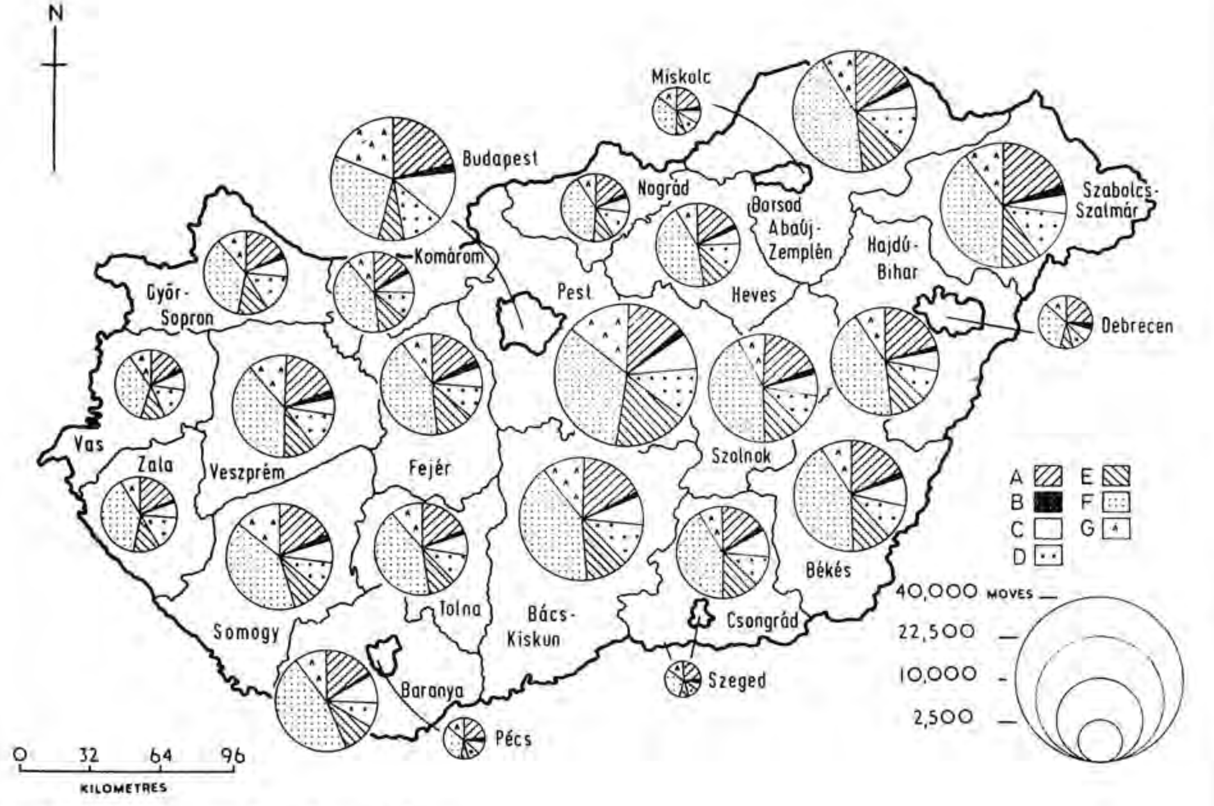


Figure. 33. Permanent Out-migration Reason Structure by Counties

A. Change of employment B. Education C. Change of dwelling D. Marriage E. Closer to place of work F. Dependent G. Other and unknown

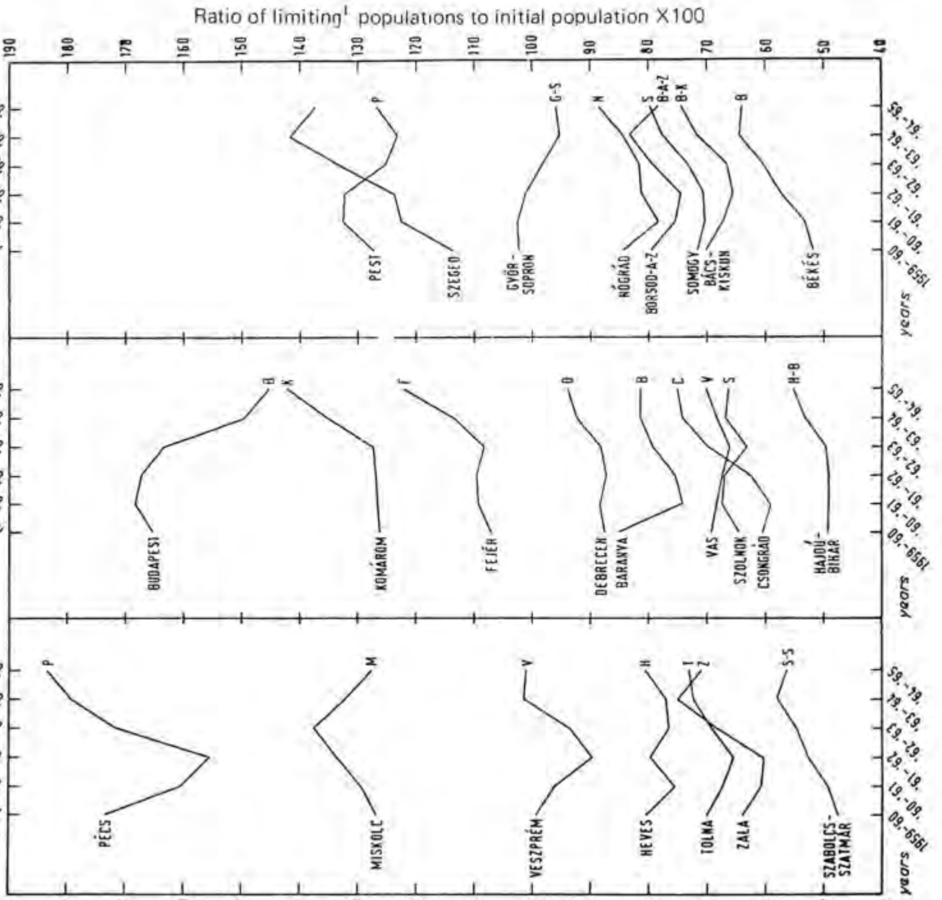


Figure 34.

The Size of the Equilibrium Population for the Counties and Cities of Hungary Calculated from the Annual Migration Systems 1959 to 1965 (in 000's)

[1] For 'limiting' read 'equilibrium'

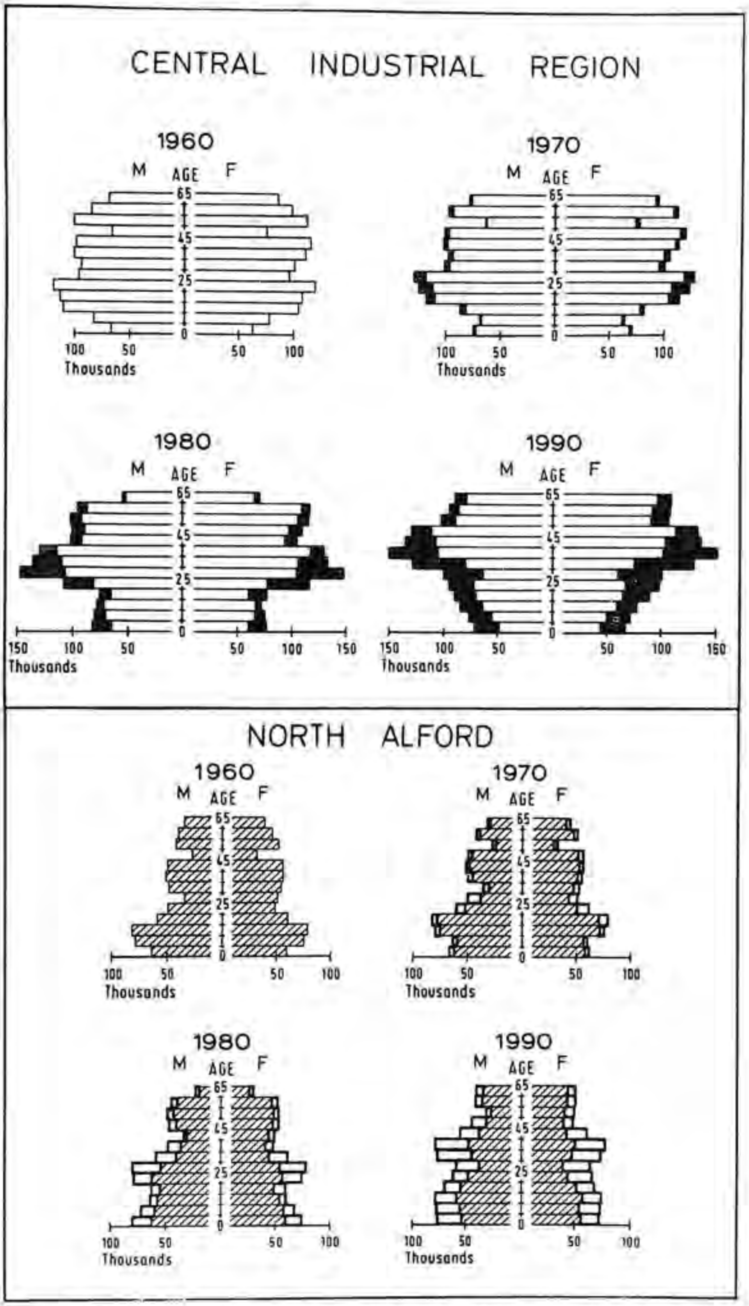


Figure 35. The Open System Projection for the Central Industrial Region and Northeast Alföld
Central Industrial Region: black shading represents migration surplus
Northeast Alföld: white area represents migration deficit
Please note: 'North Alford' should read 'Northeast Alföld'

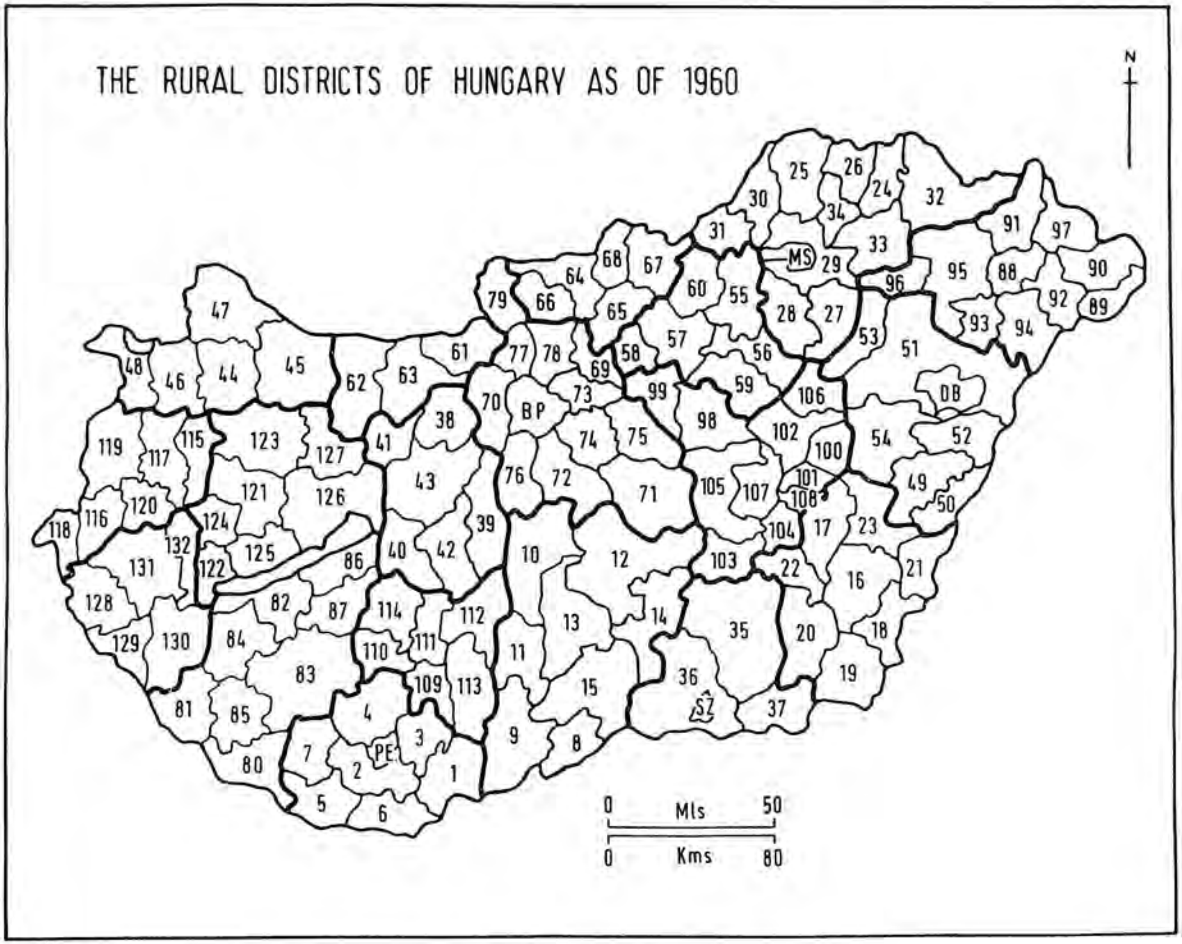

THE RURAL DISTRICTS OF HUNGARY AS OF 1960
N
BP
MS
DB
PE
SZ
0 Mls 50
0 Kms 80

Figure 36.

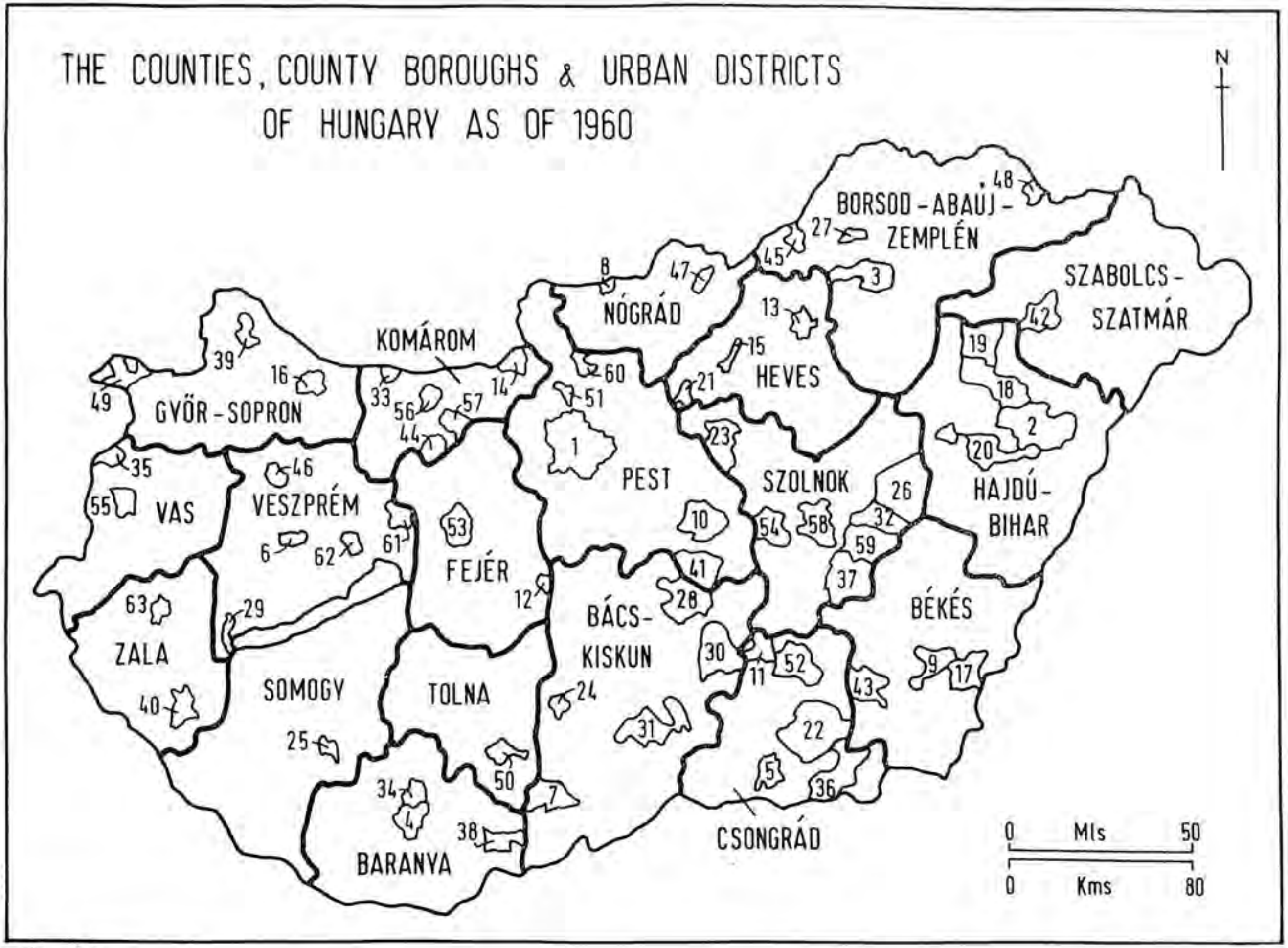

THE COUNTIES, COUNTY BOROUGHS & URBAN DISTRICTS
OF HUNGARY AS OF 1960
N
BORSOD - ABAÚJ -
ZEMPLÉN
SZABOLCS -
SZATMÁR
NÓGRÁD
HEVES
KOMÁROM
GYÖR - SOPRON
PEST
SZOLNOK
HAJDÚ -
BIHAR
VAS
VESZPRÉM
FEJÉR
BÉKÉS
BÁCS -
KISKUN
ZALA
SOMOGY
TOLNA
BARANYA
CSONGRÁD
0 Mls 50
0 Kms 80
1 2 3 4 5 6 7 8 9 10 11 12 13 14 15 16 17 18 19 20 21 22 23 24 25 26 27 28 29 30 31 32 33 34 35 36 37 38 39 40 41 42 43 44 45 46 47 48 49 50 51 52 53 54 55 56 57 58 59 60 61 62 63

Figure 37.

PUBLICATIONS OF THE DEMOGRAPHIC RESEARCH INSTITUTE. In the series of the Publications of the Demographic Research Institute the following volumes have been published:

1. Population Projections for Hungary by Counties between January 1, 1960, and January 1, 1980. 1963/1
2. The Situation of Pensioners. 1963/2
3. Investigation on the Reliablity of Age-Admissions in the Population Census of 1960. 1964/1
4. Demographic Characteristics of the Population in Hungary by Regions. 1965/1
5. Causes of Divorces. 1965/2
6. Situation and Problems of the Pensioners of Budapest. 1965/3
7. Social Mobility and its Demographic Effects in Budapest and in the Towns. I. 1965/4
8. Change in Occupation of the Population between 1960 and 1963. 1965/5
9. A Study on the Regional Distribution of Hungary's Population 1900–1960. 1966/1
10. Housing-Demographic Data. 1966/2
11. Situation of Social Institutes and Their Dependants. 1966/3
12. Regional Projections of the Population of Hungary. 1966/4
13. The Development of the Hungarian Descriptive Statistics. 1966/5
14. Fertility Data. 1966/6
15. The Impact of Demographic Factors on Culture. 1967/1
16. School Qualification and Professional Training. 1967/2
17. The Economic Age-pyramids of Hungary's Population. 1967/3
18. The Demographic Characteristics of the Nationalities of the County of Baranya. 1968/1
19. Population Projection for Hungary, 1966–2001. 1968/2
20. Hungarian Historical Demography after World War II. 1968/3 *(In English)*
21. Colloquium on Historical Demography. Budapest, 1965. 1968/4 *(In French, English and German)*
22. Demographic Characteristics by Size of Settlements, 1900–1960. 1968/5
23. Annals of the Demographic Research Institute of the Central Statistical Office, 1963–1968. 1968/6 *(In Hungarian and English)*
24. Alcoholism. 1968/7
25. Allowance for Child's Care. 1969/1
26. Survey Techniques in Fertility and Family Planning Research: Experience in Hungary. 1969/2 *(In English)*
27. Family Planning in Hungary. Main Results of the TCS-66 Study. 1970/1
28. Allowance for Child's Care. 1970/2
29. Demographic and Phisical-Developmental Study of Those Who Applied for Admission to Universities (Higher Schools) in 1966. 1970/3
30. Social Mobility and its Demographic Effects in Hungary II. 1970/4
31. Family Planning in Hungary. Main Results of the 1966 Fertility and Family Planning (TCS) Study. 1970/5 *(In English)*
32. Abstracts of the Lectures Delivered at the 9th Hungarian Congress of Biology. Budapest, 6–7–8 May, 1970. 1970/6 *(In English)*
33. Some Aspects of the Internal Migration of Population in Hungary Since 1957. 1970/7 *(In English)*

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Formátum: B/5 Terjedelem: 26 (A/5-ös) ív
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Felelős vezető: Kecskés József igazgató