Analysis of Waves of Immigration to Israel, 1989-2001

Abstract

In migration, as in other natural processes, negative feedback may elicit wave-shaped phenomena. This has led to a rationale that considers a migration stream a wave process—a perception of migration that this paper terms the "wave approach." The wave approach views migration within a system of demographic, social, economic, and natural processes in migration-sending and -receiving regions in a broader context of a migration system. The paper calls attention to possible interrelations between migration waves and selectivity of migrants as the wave of migration progresses. Changes in migrant selectivity during the development of migration waves occur in conformity with the wave of the migratory process. The discovery of regularities in these phenomena may be useful not only for theoretical research but also for the practical forecasting of migratory processes.

The Development of a Migration Wave

Migration streams, as a rule, are wavy in nature. Therefore, the term "waves of migration" is commonly used. However, the wave phenomena that are related to the migration wave are insufficiently appreciated. The discovery of regularities in these phenomena may be useful not only in theoretical research but also in the practical forecasting of migratory processes. Existing migration theories do not pay enough attention to these regularities. Demographers have made strenuous efforts to elaborate theories that explain the origin and development of migratory streams. They have paid much less attention to the termination of the stream, even though this process mirrors the initial stage of migration and its study may be useful in explaining the origin of the migratory stream. Disregard of migration waves often results in the belief that migration is a chaotic movement of human masses that never starts, never ends, and has only a general relationship with labor and dwelling markets. This manner of thinking is especially common in the analysis of internal migrations. Even inclusive reviews of existing theories of international migrations, such as that of D. S. Massey (Massey, 1998), divide the theories into two groups: those that explain the onset of migrations and those that explain the perpetuation of migrations.

Some studies do regard migrations as wave-like processes (e.g., Faist, 2000), but they are still few. The cumulative causality approach that D. Massey proposes describes the mechanism with which a migratory wave develops. In the literature, such a process is called an inverted U-curve. Important efforts to investigate migration waves have been made in order to determine wavelike changes in rates of emigration (Locher, 2002). Our paper calls attention to some possible interrelations between migration waves and selectivity of migrants as the migration wave evolves. We refer to such a view of migration as a "wave approach."

The wave approach considers migration within a broader constellation of demographic, social, economic, and natural contexts (Fig. 1). Various connections between regions—political, cultural, historical, etc.—may hinder or promote migration between them. The migratory stream in a given region coexists with in-migration from other regions, out-migration in other directions, and return- and counter-migrations.

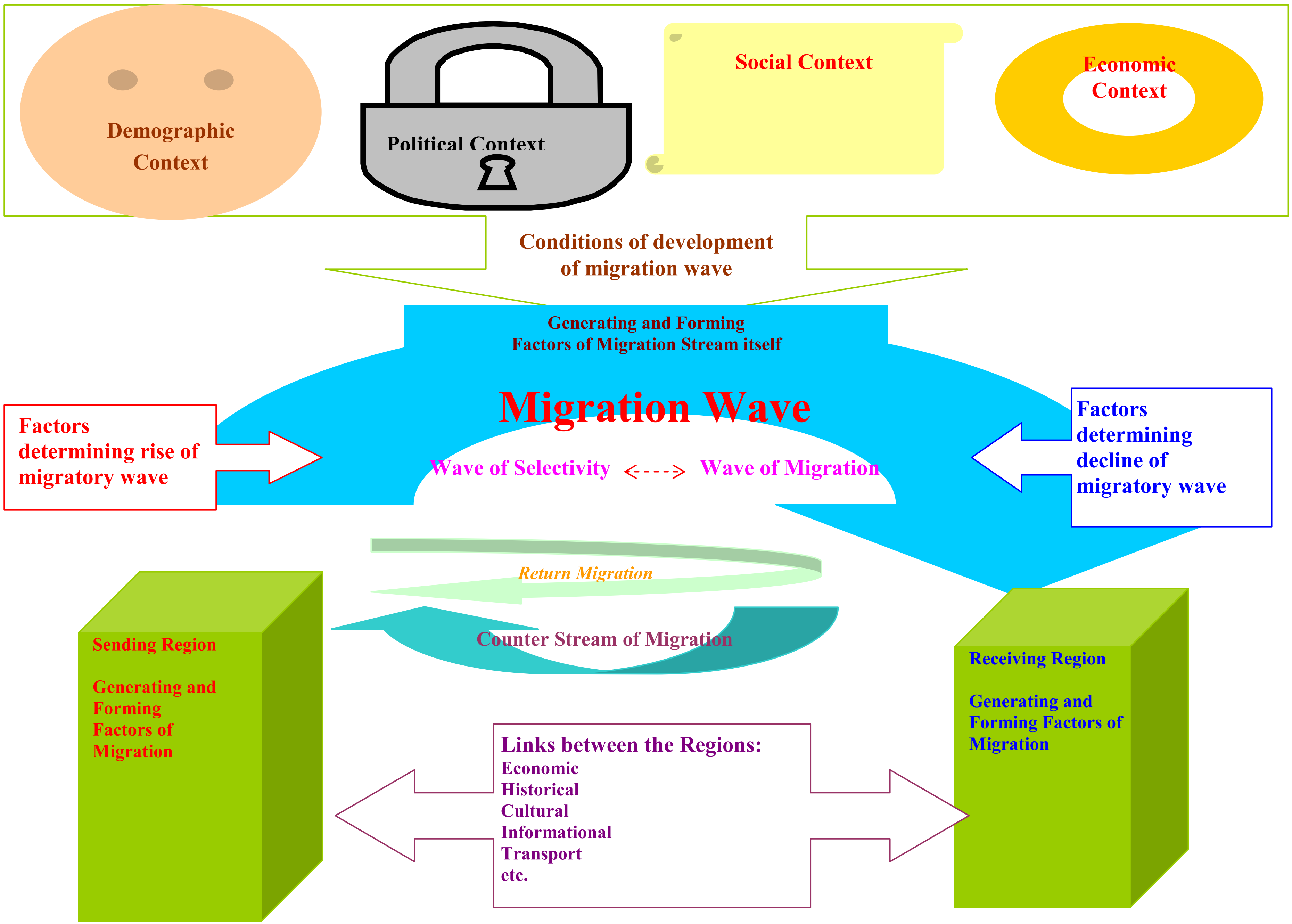


Fig. 1. General scheme of development of migration wave

The influence of migration on sending and receiving regions may be stabilizing, i.e., tending to equilibrium, or destabilizing, in both the areas of arrival and the areas of departure of migrants. The disintegration of power structures in a sending region results in the release of energy that is used for the creation of new social formations (Adams, 1988). Some releases of energy may initiate and support streams of out-migration. Under certain conditions, too, new social formations may arise in the destinations of a migratory stream that ease the migrants' absorption difficulties in new locations.

Generative and formative factors of a migratory stream operate in this environment and are responsible for the volume and the shape of the migration stream. Along with the migration factors in the sending and receiving regions that determine the volume and shape of the migration wave, the migration stream is affected by the causes of the migratory process itself. The migration process may generate positive feedback; in such a case the more migrants reach a given region, the more demand there is for differentially skilled labor to support the functioning of society, resulting in greater demand for additional in-migrants.

Negative feedback in migration process results in wave phenomena. The migratory stream appears in respond to real and/or imagined pull and/or push factors. We call the main factors of the process the leading forces of the migration stream. In accordance with these forces, a selection of migrants evolves in which the migrants' characteristics align themselves with the factors of migration. As the migratory stream gathers strength, the extent of migrants' conformity to the factors rises. One possible reason for this is an increase in available information that affects the selectivity of migrants. The process continues until the region of arrival attains a point of saturation and/or until the pool of prospective out-migrants in the region of departure runs low. As a rule, when this happens, the migration stream gradually ebbs. After the saturation point is reached, migrants' conformity to the initial factors that animated the migratory movement gradually decreases, as the supply and demand of migrants who satisfy the leading force of the stream diminish. This causes the leading force itself to weaken. As a result, two waves are emerging: a wave of migration and a corresponding wave of change in selectivity.

Migrant Selectivity

Migrant selectivity, i.e., the composition of migrants' demographic and social characteristics, changes as the wave of migration develops. These changes present certain regularities. Generally speaking, the regularities may be described as follows: at the initial onset of a migratory stream, several definite types of people migrate—persons weakly connected with their place of residence, people motivated by *Wanderlust,* ideological migrants, and the like. Next, people who receive information about a place of destination that they consider reliable, from previous migrants or from other sources, begin to migrate. They believe that migration will improve their living conditions in important respects. These people conform maximally to the specific type of migratory stream, i.e., to the leading forces that generate the migratory stream. If the leading forces attract qualified professionals, their percent among the migrants will increase; if they attract unskilled workers, this component will increase, and so on. In the final phase of the migratory wave, the migration stream includes, in greater part, people who for various reasons could not migrate earlier, e.g., earlier migrants' children and elderly relatives who do not correspond to the main leading force of the migration stream. Now the migrants' conformity to the leading force of the migration wave becomes low. Thus, the conformity of migrants' characteristics to the leading force of the migration stream is high at the peak of the migration wave and low at its beginning and its end. At each stage, migrants who have properties appropriate to the given stage are selected.

Manifestations of Wave Patterns

The waviness of migrations is often imperceptible because the migratory stream cannot be isolated into its constituent flows. Such imperceptibility may also occur if the migratory stream is subjected to administrative or political restrictions, e.g., entry and/or departure quotas. The use of such restrictions holds the total number of migrants to an approximation of a constant preferred level through the period at issue, and statistical publications show a time series of migration that is practically invariable in size. Controlled migration may achieve the goal of assuring a given quota of migrants, thereby smoothing the wave in the resulting migratory stream. However, it cannot obliterate the wavy nature of the flows that generate the stream, and the migrants' characteristics may vary substantially. Research on the wave character of these flows is needed for correct management of controlled migration processes and for reliable forecasting of spontaneous migrations. An additional problem in the study of migration waves pertains to the availability of data that is gathered only for customary administrative geographical and calendar units. Large regions may include places of arrival and departure that relate to different migratory streams. Migration data amassed on a yearly basis may mask not only seasonal variations but also entire small waves and—much more important—critical stages in the development of migrant streams, such as the beginning, end, trough, or crest of a migratory wave. The scale of the data should be suitable for research of wave processes in time series. An excessively small scale, e.g., daily migration data, may obscure all wave changes if the daily number of migrants is small. Therefore, before one uses a time series for wave analysis, one should determine an aggregation that is appropriate to the analysis.

Migration waves take on various forms. They may be long or short, develop at different speeds, attain different amplitudes, and so on. These differences may trace to various factors. Long waves are related to long-term socioeconomic processes. Short waves of emigration are caused not by long-term processes in the countries of departure or arrival but by specific events in these countries that prompt people to attempt to predict the future development of social and economic conditions in other places of departure and arrival. Examples of such events are violent conflicts, large changes in currency exchange rates, election results and so on. The factors of migration may be differentiated by the intensity of their influence. Long-term factors are based on long-lasting socioeconomic conditions; short-term factors are specific events such as bouts of civil unrest or financial turbulence.

A leading force in migration manifests itself in the pulling or pushing of a specific population group that is composed of "leading migrants"— those whose migration is prompted by the leading forces of the migration stream. Members of the sending population are related to leading migrants in various ways, e.g., kinship, friendship, or economic networks. As a result, any stream of migration involves, to some extent, "driven migrants"—migrants who are not motivated directly by the leading force of the stream. Examples are non-working family members of labor migrants, the service personnel of retired migrants as well as their family members, and so on. They may outnumber the leading migrants in the migration stream. This distinction based on Petersen's distinction between resultant and epiphenomenal migrants (Petersen, 1969).

Correct identification of leading migrants is especially important in the wave analysis of migrations, since the wave characteristics of the formative factors of migration are probably more observable for them than for driven migrants. In the case of labor migration, for example, the occupations of the leading migrants, and not those of family members who accompany them, are the key characteristics of selectivity. The nature of the available data, however, sometimes rules out such identification. Usually, there is a direct dependency between the proportion of leading migrants and the total volume of migration: the larger the share of leading migrants among total migrants, the larger the volume. This is because it is the leading migrants who keep the wave of migration going. If the share of leading migrants is small, the relationship between a migration wave and the wave of its characteristics cannot be shown statistically. To find such a relationship, one must isolate the flow of leading migrants from the migration stream. It is often difficult to observe wave changes of characteristics of a migratory stream until the stream is divided into constituent flows, in our case, separated into leading and driven migrants.

There is also a certain relationship between the phase of a migration wave and phases of waves of change in migrants' characteristics. These waves may coincide in a phase, exist in antiphase, or succeed each other at some lag. The proportion of certain group of migrants in the total may only grow or decrease in the course of a migratory wave. Sometimes the variability may occur because the length of the wave of change in this selective characteristic is much longer than that of the observed wave of migration.

The factors of migration and the characteristic parameters of a migratory stream interrelate in ways that are characterized by certain regularities. Different types of waves have specific regularities of selectivity, depending on their length, frequency, amplitude, and shape. In this study, we demonstrate the wave effects in regard to waves of adequate amplitude, even though obviously the analysis should be expanded to waves of smaller amplitude. Large-scale waves are chosen here because it is a much more complicated task to recognize wave effects of selectivity in weak migration waves.

In this paper, estimation of the degree of conformity between the wave of migration and the characteristics of migrant selectivity is performed by use of a coefficient of wave similarity (Riss, 2002a, 2002b). We introduce it below.

Coefficient of Wave Similarity—CWS

In recent years, as the data-warehouse theory and data-mining methods have been developed, there has been some progress in statistical research of time series. Scholars have developed theories of pattern recognition and pattern comparison in time series, especially in the description of geographical coordinates as a set in data files and the use of cluster-analysis methods to search for similar time series in data warehouses. To compare time series in econometrics, spectral analysis is applied. Development of the cointegration theory, which serves the same purpose, began in the 1970s. According to this theory, two time series are cointegrated if their linear combination is itself a stationary series. These approaches, however, are based on rather complex mathematical methods and, as a rule, require lengthy series of data. Such series rarely exist in the context of migration processes. This may be due to the nature of migration processes, since the lengthiness of these process includes independent or weakly dependent migration streams, each of which has to be examined in isolation from the others.

In cases where one wishes to estimate the similarity of sequences, a coefficient that is analogous to coefficients used for comparison of similarity of binary series is appropriate. In its simple form, such a coefficient calculates the number of coincidences between respective values in two binary sequences. In the following table, two columns with six members per column are presented and the number of concurrences in values is three. Thus, the coefficient of similarity of the sequences is 0.5.

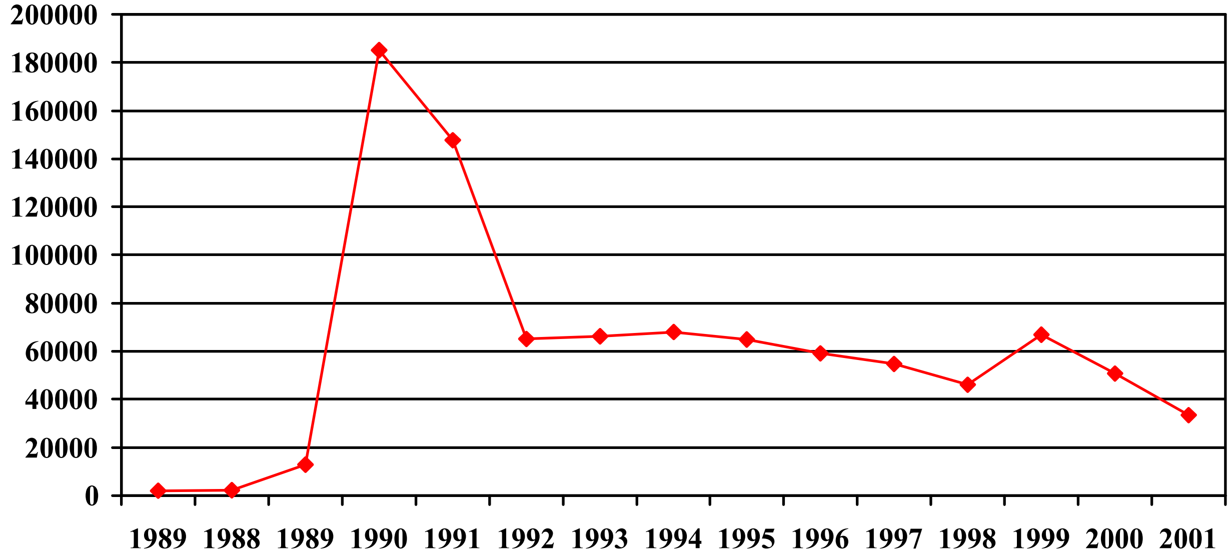
1	1
0	1
0	0
1	1
1	0
0	1

On the basis of this coefficient, we developed several composite coefficients that take into account the nature of the data represented by binary series. For example, they may represent the presence of certain attributes in two compared populations, in which it is important to know how many individuals of each type are present in each population. Then the calculated similarity coefficient is weighted by the number of individuals in each subgroup.

To compare different waves of migration over time and to compare changes in different characteristics of one migration wave, the time aspect is very important. This aspect is lacking in the coefficient described above. Therefore, this study suggests the use of a coefficient of wave similarity (CWS) for time sequences that takes into account the time aspect of the development of a migration wave.

The number of characteristics of a migration process is measured and the values of each characteristic are recorded at the same time. One of the time sequences is assumed to be the main wave; the others are the waves of its characteristics. The wave to be considered is selected in the main time series with the help of the programmed algorithm or by an expert decision. For the same period, a time series for the describing characteristic is selected and the following calculations are made. If the value in two consecutive values of the sequence is larger than the previous value, the calculated parameter is assigned the value of 1. If it is smaller than the previous value, the parameter is assigned the value of 0. Zero change is considered a positive change. If the difference between two consecutive members is very small relative to the size of the members of the sequence, such members of the series may be considered equal and the computed parameter is assigned the value of 1. This elicits two new sequences that are comprised of ones and zeroes. For these sequences, one additional auxiliary parameter is calculated in following way: If the corresponding members of both sequences have identical values, the parameter is assigned the value of 1. If the values are different, then the parameter is assigned the value of –1. The results obtained are added up and the sum is divided by the length of the sequences. The result of this operation is called the coefficient of wave similarity (CWS). The CWS will be equal to 1 in the case of full phase

Fig. 2. Waves of Immigration from the USSR/FSU 1989-2001



coincidence of waves and –1 in the case of total antiphase. Values close to zero signal a lack of coincidence between the main wave and the wave of characteristics change.

The CWS allows us to compare the similarity of waves irrespective of their amplitude. This is both the shortcoming and the advantage of the method. By adding the values of average and dispersion of compared series to the calculated CWS, we obtain a convenient way of comparing two sequences of equal length. The CWS method, however, has several limitations. The CWS value depends on the number of members in the sequences and on parity in the number of members of even and odd sequences. The factor may be zero only in a case where the length of the sequence is expressed by an even number. The factor quickly decreases commensurate with the number of discrepancies between values of series, so that a value close to 0.3 signifies about 60 percent agreement between examined waves. Despite these limitations, CWS may be a convenient tool for the analysis of migration processes. We apply it for analysis of immigration to Israel.

Waves of Jewish Immigration to Israel from the USSR/FSU

About a million emigrants from the Soviet Union and the former Soviet Union (FSU) immigrated to Israel between 1989 and 2001. Since migration streams of such amplitude are rare, this migration process is a very interesting object for research, especially in regard to wave phenomena in migration because strong waves were observed during the period. For examination purposes, the 1989–2001 period was divided into three subperiods that were differentiated mainly by waves of immigration defined by immigration years (Fig. 2). Since the margins of subperiods are always difficult to determine, there is always an element of arbitrariness in their choice. The subperiods chosen (with overlapping margins) were 1990–1992, 1992–1998, and 1998–2001.

More than one wave developed during the relevant years. Furthermore, each wave developed under different conditions and, accordingly, was caused by different factors. The subperiods are distinct in terms of migrants' characteristics. The first subperiod peaked in 1990, when Jewish immigration attained a record level. The next subperiod included 1994, when immigration increased insignificantly relative to 1993. The resulting weak wave was caused, among other things, by the passage of a new emigration law in Russia, war in Chechnya, and a government crisis in Russia in September 1993. The last subperiod witnessed a strong wave of immigration that crested in 1999, as migration decisions made in the previous year were implemented and as Russia, and several post-Soviet countries with strong economic ties to Russia, endured a year of financial crisis. First, we shall calculate the coefficients of wave similarity for the entire 1990–2001 period, for which we have the requisite data. Then we do the same for three subperiods, followed by an analysis of each.

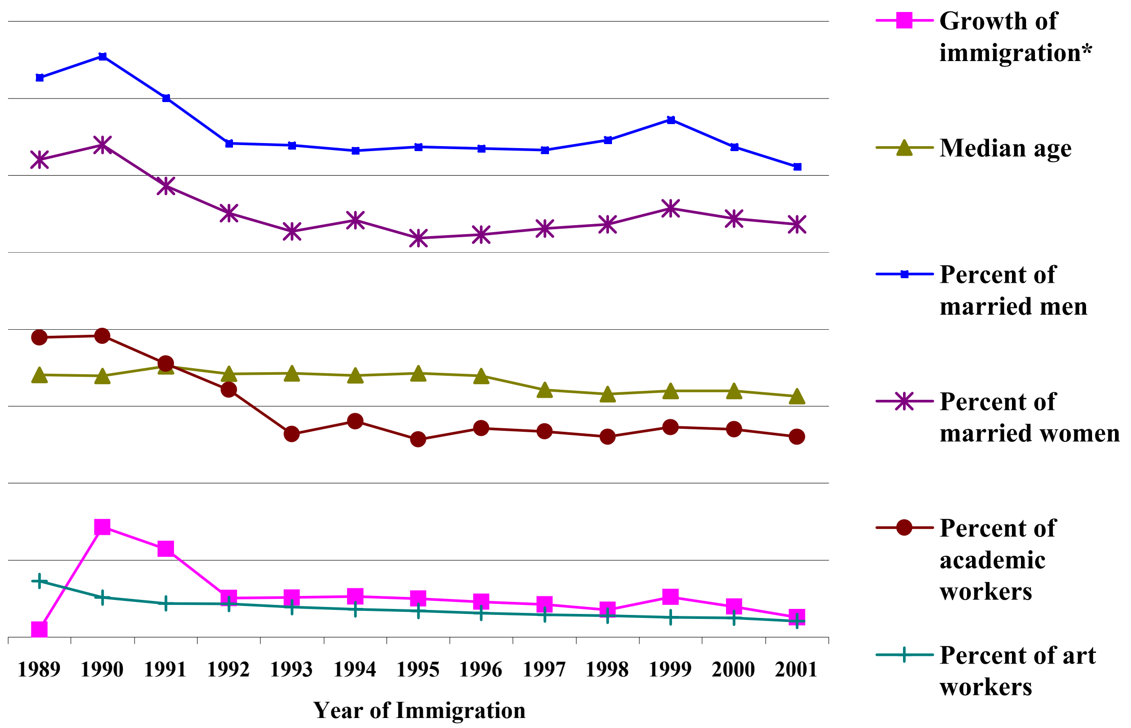
Table 1. Wave Phenomena in Migration Stream from Former USSR to Israel (1989-2001)

Year of Aliyah	*Growth of immigration**	*Median Age*	*Percent of married men*	*Percent of married women*	*Percent of academic workers*	*Percent of art workers*
1989	1.0	34.1	72.7	62.0	38.9	7.3
1990	14.3	33.9	75.5	64.0	39.1	5.1
1991	11.4	35.2	70.1	58.6	35.5	4.4
1992	5.0	34.2	64.2	55.1	32.1	4.3
1993	5.1	34.3	63.9	52.7	26.4	3.9
1994	5.3	34.0	63.2	54.2	28.0	3.6
1995	5.0	34.3	63.7	51.8	25.7	3.4
1996	4.6	33.9	63.5	52.3	27.1	3.1
1997	4.2	32.1	63.3	53.1	26.7	2.9
1998	3.6	31.6	64.6	53.6	26.0	2.8
1999	5.2	32.0	67.2	55.7	27.3	2.6
2000	3.9	32.0	63.7	54.4	27.0	2.5
2001	2.6	31.3	61.1	53.6	26.0	2.1
CWS All the period		0.17	0.33	0.33	0.67	0.33
CWS 1989-1992		-0.33	1.0	1.0	1.0	0.33
CWS 1992-1998		0.33	-0.33	-0.33	0.33	0.33
CWS 1998-2001		0.33	1.0	1.0	1.0	0.33

*** in times to1989**

Coefficients of wave similarity for the entire period and its three subperiods were calculated on the basis of Table 1. Fig. 3 shows relationships between the size of a migratory stream and changes in selectivity of migrants' characteristics. CWS values for the entire period are relatively low, as one would expect, because the period includes multiple waves caused by different leading forces and a middle subperiod that had no salient wave. The CWS value for the percent of academic workers is relatively high (.67) because immigrants' profession was the main immigrant-selectivity factor (Table 1). The leading migrants of this migration stream were well-educated wealthy professionals. Soviet Jewry was noted for its high level of education and elderly age structure. The percent of scientific and academic workers was calculated on the basis of the total number of immigrants who had known occupations and who had worked before they emigrated. Importantly, a large percent of immigrants did not state their pre-immigration occupation. Since we do not know which groups of immigrants did not supply this information, the share of the "occupation unknown" group, which was significant in some years during the period at issue, may create a degree of inaccuracy that is crucial to our analysis. Unfortunately, the effect of this problem on the data cannot be estimated quantitatively.

Fig. 3. Wave Phenomena in Immigration Stream from USSR/FSU to Israel



*** in times to1989**

In the first subperiod, around the peak of immigration from the USSR in 1990, there were expected changes in migrant selectivity (Fig. 3) and high values of coefficient of wave similarity (Table 1). The data show that in the peak immigration year the immigrants' minimum age was lowest and the number of immigrants who arrived alone was smallest. Both characteristics were consequences of the family nature of the immigration during this subperiod. In subsequent years, the share of immigrants who came alone increased, the age selectivity changed, and the coefficient of wave similarity changed sign (Table 1). As immigration accelerated, the immigrants' median age rose because the increase was fueled by the immigration of larger numbers of whole families. These families were less mobile than young, single persons, and by the time they made their move the socioeconomic situation had deteriorated severely. The selectivity waves of other attributes shown in Table 1 coincide fully with a wave of migration.

Since the second of the three subperiods, 1992–1998, contained a weak wave, the conformity of immigration waves to the immigrants' characteristics appeared weak, as expected. The small upturn in immigration around 1994 may have distorted the picture of the wave phenomena because it was so small. One doubts whether it is worthwhile to search for manifestations of wave effects in the case of a wave that is practically indiscernible. The CWS values are also small (Table 1). In regard to this period, it is especially important to distinguish between the migratory stream and the flows that generated it. The decline in the proportion of scientific and academic workers who arrived that year may be explained by the decrease in the percent of immigrants from Russia among immigrants to Israel from the FSU at large in 1995.

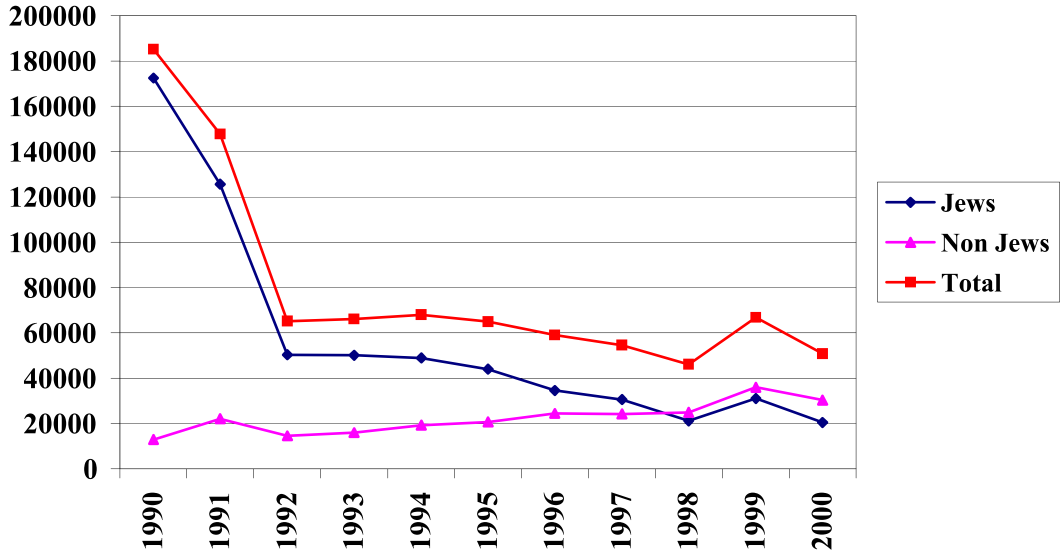
The last subperiod contains a strong splash and presents high CWS values, as one would expect of a strong wave of migration. The expected regularity in the correspondence between the size of immigration and the parameters of the migratory stream was observed at this time. The CWS in this subperiod attained a value of 1 for the characteristics that were defined above as basic for the considered migration stream, i.e., the immigrants' occupational structure and family status (Table 1).

As noted, changes in some characteristics are not expressed in the form of a complete wave; instead, they either fade away or amplify along with the wave of migration. Thus, the CWS values for such characteristics are small. An example of such a characteristic is the proportion of writers and artists among the immigrants. The nature of these occupations is such that their practitioners are more popular than other immigrants and, consequently, may become models for emulation. This may strengthen the amplitude of migration even if this is not the intention of the role-model migrants themselves. A decrease in their share among immigrants, from the high plateau at the initial stages of migration wave, expresses the influence of especially difficult absorption conditions for this occupational group in the host country.

The median age decreased throughout the period, with slight fluctuations. The median age declined at the local peaks of immigration in 1990 and 1994. In 1999, the median climbed slightly because the immigrants were younger during the second half of the 1990s than in the early stages of the migration stream. The reason for this is that even though the sending population in 1999 was a thoroughly expanded Jewish population that was characterized by a younger age structure, the share of immigrants from Russia and the proportion of Jews among all immigrants increased that year.

Percent changes in median age, marital status, and share of academic workers correspond with the nature of this migration stream to Israel, in which the leading migrants during this period originated from the wealthy Jewish families that were well adjusted to the Soviet way of life and had professions that had been appreciated in the USSR. These families, troubled by the deterioration of the ethnic and economic situation amidst the acute social changes that surrounded them, exercised the option of immigrating to Israel. When these immigrants flooded their country of origin with information about the situation in Israel, younger and less educated FSU Jews started to leave. Since their characteristics corresponded more precisely with demand in the Israeli labor market, they had better prospects of successful absorption in Israel. Furthermore, they came from an expanded Jewish population, i.e., one that used a broader definition of Jewishness and even included non-Jews. One may assume that this expanded Jewish population began to generate a new stream of emigration to Israel in 1993 or so (Fig. 4). The waves of Jewish and non-Jewish migrants may give us a rough idea of the actual immigration waves from different sending populations, i.e., the core Jewish and the expanded Jewish populations, which the available data do not allow us to isolate.

Fig. 4. Immigrants by Registered Religion, 1990-2000



Conclusions and Future Considerations

The conclusions of this preliminary study may be summed up as follows: At the peak of a migration wave, migrants' characteristics that stem from the leading factors of the relevant migratory stream achieve their extremes. In certain situations, a lag in phase between waves of migration and waves of selectivity may take place. Wave phenomena may not become apparent if migrants' characteristics in regard to a given migration stream are neutral. Wave phenomena in migratory processes become apparent only in waves of migration that are large enough in amplitude. This parameter depends on the type of migratory stream, and the nature of this dependency should be investigated. In weak fluctuations in the volume of a migration stream, some changes in the wave of a characteristic of migrants may escape notice because other formative forces of the migration flow mask the selectivity in this characteristic. Hence, a migratory stream must attain a given threshold amplitude to make changes in selectivity measurable. This statement is somewhat tautological—if we can observe the wave phenomena in the analyzed migration process, then the amplitude of the wave is large enough, and vice versa. Since minute distinctions in parameters may be masked by errors in the available data, the existence of rules of selectivity for the acceptance of statistically significant results should be checked on large quantities of data. In addition, the size of an error in statistical data may be equal to or even greater than the size of an investigated phenomenon.

The appearance of a wave pattern in the characteristics of a migratory stream depends on the type of interrelations between a migratory stream and its constituent flows. The wave analysis should allow consideration of complex wave phenomena, such as the interaction of waves of different frequencies in one migratory process. For a carrying wave of migration to exist, profound changes in sending and receiving regions must create long-term changes in the number of migrants. Atop the carrying wave, one may observe shorter wavelike changes in the number of migrants due to casual circumstances. Seasonal fluctuations in the number of migrants may affect the possibility of detecting changes in migrant selectivity. Such fluctuations may also have intrinsic selective regularities of their own, which—along with other seasonality effects—must be eliminated in the analysis of statistical time series of migration.

Our study found certain degree of consistency in the observed wavy changes in migrants' characteristics and the waves of migration. This suggests that special approaches may be used to seek such phenomena in the data. Methods of pattern recognition in statistical series may be especially useful. In sum, the development of statistical mathematical methods for the analysis of wave phenomena in migrations is essential.

To use the wave approach for the analysis of migration processes, changes in the collection and presentation of statistical data must be made. The collection and/or publication of time series are often quitted when the magnitudes of observed facts seem to be too small because they fall short of some level arbitrarily regarded as worth of attention. No less frequently, the collection and/or publication of data do not begin until the observed phenomenon attains a level that is considered high enough. This rules out the very possibility of studying the wave character of migrations; hence our insistence that any administrative approach of this type in gathering statistical data should be changed. In our era, when information may be presented on digital media that have immense capacities, such a change is feasible.

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