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CALCULATION OF INTERREGIONAL MIGRATION MULTIPLIERS IN TURKEY WITH INPUT-OUTPUT ANALYSIS

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Abstract

Migration, simply defined as the displacement of population between geographical regions, is a very important concept due to its consequences affecting social, economic, cultural, psychological, political etc. structure of the society. It is important to predict the whole effects of the migration to a region for the protection of living standards of both immigrants and for the region itself. To do this, it is necessary to know not only initial migration but also the indirect migration created by those immigrants. This study aims to calculate total migration multipliers of internal migration experienced in Turkey. To accomplish this, an input-output table about internal migration is prepared. Using this input-output model, the migration multiplier coefficients and the forward and backward linkage indexes are calculated and categorized the regions as ones with high level of attraction, ones with high level of repulsion and ones with minimum impact on migration. Istanbul, Ankara, İzmir, Bursa, Kocaeli, Adana and Antalya sub-regions, with high level of attraction, impels internal migration in Turkey. The high levels of repulsion metropolitan areas are Kastamonu, Erzurum, Kırıkkale, Trabzon and Ağrı sub-regions. The sub-regions which minimally impact internal migration in Turkey are Aydın, Manisa, Şanlıurfa, Hatay, Konya, Tekirdağ, Gaziantep and Balıkesir.

Keywords: Migration, Internal Migration, Input - Output Analysis, Migration Multipliers, Turkey

INTRODUCTION

Migration is an existing phenomenon since the beginning of human history and it affects both the location and emigrant either directly or indirectly. It is possible to define the concept of migration in different ways. Migration, as a process of changing the geographical location, is the population movement that alters economic, cultural, is changing the social and political aspects of society (Özer, 2004: 11). Migration can be explained as resettlement of people leaving their native land either permanently or temporarily. Migration may seem like displacement of the population at first glance but it is not just changing the place, rather it is a significant population movement containing many elements such as economic, social, cultural, psychological, environmental, political aspects and affects the social structure of all these aspects (Sağlam, 2006: 34).

One of the most prominent factor that causes migration is the wills of individuals to eliminate the negative effects of inequality of opportunities in their localities because of several reasons. Migration from a region with inadequate opportunities to a region which offers better opportunities is also called push-pull theory (Lee, 1966: 50). While the factors that lead people to migrate such as low income, low standards of living, lack of economic opportunities and political pressure are called push factors, factors such as higher income, job opportunities, economic opportunities and political freedom are called pull factors (Castles and Miller, 1998, 20-21).

Whatever the reason is, migration between regions will create significant economic and social results for both migration-receiving regions and migration sending regions. These can be basically divided into nine sub-topics:

1. Imbalance in population distribution,
2. Imbalance in income distribution,
3. Lack of education and health services,
4. Housing shortage and unplanned urbanization
5. Environmental problems caused by lack of infrastructure and superstructure in urban areas,
6. Increase in the amount of unemployment,
7. Increase in labor exploitation as a result of rising unskilled labor force
8. Increase in crime rates as a result of cultural and economic conflicts,
9. Destruction of green spaces in urban areas in spite of rural agricultural areas remain idle.

Minimizing the negative effects caused by all of these problems will be possible with sufficient additional investments and measures to be held in the region. When these measures are taken, it will not be adequate to make planning only by taking the number of immigrants into consideration. This is because migration from one region to another is not just limited to the number of immigrants; it also creates a new wave of migration.

Regardless of the reason, the population displaced from one region to another is defined as immigrants. The concept of immigrant is analyzed under selective approach (selectivity of migration) in the literature (Çelik, 2002: 276). This approach specifies some of the immigrants as more intrepid and advantageous than others regarding to their age, gender, marital status, physical and mental health, intelligence, profession and so forth. These people are called pioneer immigrants and execute the first migration movement (Çağlayan, 2006: 76-85). Migration of these people to an area can be described as the first impact or direct impact of the migration. In addition to this, there are indirect impacts of immigrants on the population of migration-receiving areas. The first one of these indirect impacts is the number of children whom immigrants will have in migration areas. When immigrants migrate to a new region, they bring the experiences and habits gained in the region they leave. One of them is the fertility rate. The immigrants will have children at the same fertility rate where they migrate. The number of newborn will affect the population rate of migration-receiving and the migration-sending region equally. Because it takes a long time for a newborn to grow up and have children, birth cannot affect the population of a region permanently. The second indirect effect has longer impacts on the population of migration-receiving region. This indirect impact is the guidance of pioneering immigrants to the people left behind to migrate and therefore causing new people to come to migration areas (Massey, 1990: 8).Migration of these people to an area can be described as the first impact or direct impact of the migration. This impact is also the beginning of new migration wave. This time the immigrants who came to the region by the guidance of pioneering immigrants will become pioneering immigrants themselves and they will guide new people including their relatives and circle of friends to migrate (Yu, 2006: 9)

Therefore, the total migration amount created by a pioneer immigrant is not limited to him/her, it also comprises indirect migration. The sum of direct and indirect migration is defined as the migration multiplier.

While potential effects of migration on a region is analyzed, it will provide more sound results to take into consideration not only the number of pioneering immigrants but also the results of indirect migration wave created by them. This can be done by calculating the multiplying factors of migration.

The concept of multiplier was used by R.F. Kahn for the first time and has been made an important tool case of Macroeconomic Model by J.M. Keynes (Archer, 1977: 3). In general, there is a wide range of applications of multiplier concept which shows total effects of exogenous variables on endogenous variables in a model. The input-output model is a method for calculating the multiplier coefficients. Coefficients of the inverse matrix of Leontief input-output model provide multiplier coefficients.

The migration multipliers for Turkey are calculated in this study using the input-output model. In order to do this, firstly an input-output table about internal migration is prepared and Leontief inverse matrix is calculated by using this table, then multiplier coefficients are calculated. There are many studies comprising both theoretical and mathematical models conducted by various institutions and researchers working in different fields on the phenomenon of migration in Turkey. Nevertheless, all of these studies have directly addressed the direct effects of migration and ignored the indirect effects. In that regard, this study is the first in Turkey.

LITERATURE STUDY

Munro (1974), in a research on internal migration within the period of 1960 and 1965, set up a model to determine the factors that influence internal migration. While the first hypothesis adopted in the study asserts that the initial driving force affecting migration arises from the agricultural regions and the other is that migration occurs incrementally. According to this study, the immigrant population move primarily to the nearest attractive area of their region and then they move to an attractive area of another region.

Doh (1984), in his study on the reasons of internal migration in Turkey between 1970 and 1975, specifies that the main cause of migration is the inefficient production in the agricultural sector in Turkey. Furthermore, Doh also argues that broader job opportunities in metropolitan areas are also another factor of internal migration in this period.

Tobler (1995), in his study, questions the validity of the immigration laws written by Ravenstein in 1880's. By questioning the other studies based on Ravenstein's work, Tobler also concludes that both Ravenstein's migration laws and additional contributions to these laws are not sufficient.

Gedik (1998) has conducted a research focusing on census and the permanent residence address records. Demirci and Sunar (1998), have evaluated internal migration issue employing the data obtained from the Republican Period census at the same year.

Yamak and Yamak (1999) have analyzed the effect of income factor on migration by studying income levels of Turkey's provinces and migration phenomenon together for 1980–1990 period and concluded that income differences between provinces is the most important factor on the migration.

Ucdogruk (2002) has studied the movement of internal migration to the province of Izmir with an econometric model. The first hypothesis of the study is that immigrants are educated young while the second claims that distance has an impact on migration. Both hypotheses with regard to age and education are important factors affecting migration, the effect of reducing migration because of the developments in the transport sector concluded that eliminates reached.

By using push and pull factors, Gür and Ural (2004) have examined the reasons of internal migration in Turkey. The main findings of the study reveals that, in the basis of province, the internal migration in Turkey is related to the average income level of a province and unemployment rate, level of industrialization, health and educational services quality and most important of all female labor force employment opportunities in the expected direction and degree.

Estimation of the number of the immigrants, their socio-economic characteristics before and after migration, difficulties experienced during and after migration, the numbers and the reasons of returning immigrants or those who intend to return have been analyzed at the research conducted by Hacettepe University Institute of Population Studies (2006).

By analyzing it in the historical aspect, the effects on urbanization and direction of migration fact in Turkey have been studied at Sağlam's research (2006).

Koçak and Terzi (2012) examined the phenomenon of migration in Turkey, reasons of migration, adaptation of immigrants to the cities and positive and negative effects of migration to the cities as well as the possible solutions to minimize migration.

Pazarlıoğlu (2001) built econometric models for internal migration of Turkey by using panel data and he made two scenario analysis as well as predictions on internal migration by utilizing appropriate models.

Ceritli, Sunar and Demirci (2005) analyzed the change of internal migration aspects over time and its effects on population structure. The main cause of migration was determined to be the need of finding a job. On the other hand, it was found that appointments and assignments, education possibilities and effects of Marmara and Duzce earthquakes caused interprovincial migration and migration among different provinces.

Polat (2007) defined the causes and consequences of migration to the provinces at Ağrı sub-region (Ağrı, Ardahan, Iğdır and Kars) by Correlation Analysis and ANOVA analysis. According to the findings; the most important causes of migration were explained as insufficient health and educational services, lack of social activities, tough climate conditions and better job opportunities.

Soltyszewski et al (2008) evaluated the genetic relationships between homogeneity of Poland's population and neighboring countries with variance analysis and multidimensional scaling. Analysis indicated that Poland has a homogeneous population and there isno similarity between Poland's and Russia's populations while the population of Germany is similar to the population of Russia. It was stated that the historical events that cause these findings were migration of Gotha, the impact of the Vikings, settlement of Germans (or forced to being settled) near the river Volga and other conditions associated with World War II.

Esteban Fernández Vázquez et al. (2011) conducted a research on migration in Spain and calculated the internal and external migration among Spanish regions with input-output model. Yu (2006) used Keynesian approach and figured out migration multipliers by taking into consideration not only immigrants but also indirect effects created by them.

INTERNAL MIGRATION IN TURKEY

Internal migration is the displacement of the population inside the country. This has no impact on total population of the country but has a significant impact on the population of regions. Therefore, migration will change the proportion of regional populations. These proportional changes in regional population density intensify the existing economic and social disparities between regions. Various internal migration incidents have occurred at different times since the establishment year of Turkish Republic. These internal migration incidents and their effects which Turkey has experienced can be analyzed in three periods.

The first internal migration incident happened in the 1950s. At this period, population movements occurred from villages to urban areas in consequence of low productivity in the Turkish agricultural sector, rural unemployment and insufficient income. Thus, the population of rural areas decreased while population in urban areas increased in a short time. The negative effect of these population movements has primarily shown itself in unplanned urbanization arising from housing shortages in urban areas.

The second migration movement was observed between 1960 and 1980.Since cities had become more attractive in terms of economic and social conditions and urban areas attained a certain level of saturation, population movement occurred from city to city rather than from rural to city during this period (İçduygu ve Ünalan, 1997: 44).Major provinces including Ankara, Izmir, Bursa, Gaziantep and particularly Istanbul have become migration-receiving provinces despite Gaziantep, Sivas, Kars, Trabzon, Kastamonu, Rize and Giresun have become migration-sending provinces (İçduygu and Sirkeci, 1999b: 252).

Post-1980 period comprises the last wave of migration movement in Turkey. In this period, Turkey has experienced significant economic, political and social changes and this period has been defined by globalization concept. Migration to metropolitan cities has accelerated and security became an important factor during this period. Migration movement to safer places has intensified especially in East and Southeast regions of Turkey because of security problems (Dinç, 2007). This security related migration movement initially headed to surrounding provinces considered safer and later to West and Central Anatolian Region provinces such as Istanbul, Izmir, Adana, Bursa and Mersin (İçduygu and Ünal, 1997: 43). In general, whatever the reason is, the immigration movements in 1980's tend to happen from cities to metropolitan provinces.

Although there are differences in internal migration movements in Turkey the path for all periods is shown in Figure 1.

Figure 1: The Path of Migration in Turkey

Location where immigrants reside ⇒ *Center of region where immigrants reside* ⇒ *Another region*

Considering all historical migration movements in Turkey, constantly migration-receiving regions are the Mediterranean, Marmara and West Anatolia regions while constantly migration-sending regions are the Northeast Anatolia, Southeast Anatolia and Black Sea regions.

INPUT-OUTPUT MODEL

Input-output model, generated by Leontief, emphasizes how much each sector at the economy should produce in order to meet the total demand for final goods. It emphasizes the interdependence among the different sectors in an economy. Thus, an output from one industrial sector may become an input to another industrial sector. The input–output model, considering the interdependencies among the different sectors of an economy, is a general equilibrium model that analyzes the economy with a quantitative and multi-sectoral technique. Along with the development in data collection and processing techniques, input-output models are being widely used in many areas.

Input-output table is the starting point for calculation of input-output models. It is a tool to describe the flow of goods and services produced among different sectors of the economy in a determined period. All industry sectors that comprise the national economy are displayed both in the column and the row, in an input-output table (Aydoğuş, 1999: 15).Input-output tables show that outputs from each sector of the economy are used as inputs by the other sectors. Every column in an input-output table shows flow of production of one economic sector to other sectors in a stated period while every row shows inputs needed for production of one economic sector from other sectors in a stated period.

In an input-output model with N sectors, (X_i) distribution of any output of the (i) sector between demand factors is shown as;

$$X_i = \sum_{j=1}^{N} X_{ij} + Y_i \qquad (i = 1,2, \dots \dots \dots ., N) \tag{1}$$

Where; X_i = total gross output of sector i (supply), X_{ij} = the amount of product of sector i absorbed as an input by sector j, andY_i = the autonomous final demand for the products of sector i.

Sectoral production for any economic sector is defined as a linear function of intermediate inputs.

$$X_{ij} = a_{ij} X_j \tag{2}$$

In this context, a_{ij} represents the amount of intermediate input i used to produce per unit of output by sector j and called called a input-output coefficient.

When equality (2) is substituted into equality (1)

$$X_i = \sum_{j=1}^{N} a_{ij} X_j + Y_i \tag{3}$$

If equality (3) is solved for X's with matrix notation then;

$$X = (I - A)^{-1} Y \tag{4}$$

Where:

$\boldsymbol{X}_{(\boldsymbol{Nx1})}$: production output vector,

$\boldsymbol{A}_{(\boldsymbol{NxN})}$: input coefficient matrix,

$\boldsymbol{Y}_{(\boldsymbol{Nx1})}$: final demand vector,

$(\boldsymbol{I} - \boldsymbol{A})^{-\boldsymbol{1}}$: Leontief inverse matrix.

Leontief inverse matrix has a significant position at input-output analysis. The elements of this matrix, defined as the multiplying coefficients, show the relationship between the production and final demand.

It is not possible for one sector in an economy to act independently from other sectors. This mutual dependence is defined as sectoral interdependence. Sectoral interdependence has two components. The first one is backward linkage effect. It shows the amount of intermediate inputs used by a sector itself and from other sectors for production. The second one is forward linkage effect. It shows the amount of intermediate inputs given by a sector itself and to other sectors. Leontief inverse matrix is used to calculate the level of these two interdependence effects in the context of input-output model. The sum of columns of this matrix indicates the backward linkage effect when the sum of rows indicates the forward linkage effect.

Linkage indices based on the average linkage effects provide more practical results to measure and interpret the level of dependence between sectors in the input-output model.

The backward and forward linkage effects calculated from Leontief inverse matrix is as:

$$TFI_i = \sum_{j=1}^{N} r_{ij} \Bigg/ \left[\left(\sum_{i=1}^{N} \sum_{j=1}^{N} r_{ij} \right) / \mathrm{N} \right] (i = 1,2, \ldots \ldots \ldots, N)(5)$$

$$TBI_j = \sum_{i=1}^{N} r_{ij} \Bigg/ \left[\left(\sum_{j=1}^{N} \sum_{i=1}^{N} r_{ij} \right) / \mathrm{N} \right] (j = 1,2, \ldots \ldots \ldots, N)(6)$$

Where, TFI is forward linkage effect and TBI is backward linkage effect.

If the index value of the linkage effect is higher than 1 it means the sector has high link effect. On the contrary, if it is lower than 1, it means the sector has low link effect (Resosudarmo ve Nurdianto, 2007: 7-9). Based on these linkage effects, Hirschman has classified sectors in four categories. The classification regarding to the backward and forward linkage effects of the sectors are as follows (Hirschman, 1958: 98 - 116).

The most important sectors: Both forward and backward linkage effects are high (High TBI-High TFI)

The second most important sectors: Backward linkage effect is high, forward linkage effect is low (High TBI-Low TFI)

The third most important sectors: Forward linkage effect is high, backward linkage effect is low (High TFI-Low TBI)

The fourth most important sectors: Both backward and forward linkage effects are low (Low TBI-Low TFI)

INTERNAL MIGRATION TABLE AND MODEL STRUCTURE FOR INPUT-OUTPUT ANALYSIS

An input-output table about internal migration is prepared at first to calculate migration multipliers. Table 1 has an overview of this table. The input-output table is composed of two parts. The geographical regions of Turkey are listed at the first section. These regions are written twice, both in the column and in the row of this section. The values in the row show the number of immigrants moved from a region to other regions and the values in the column show the number of immigrants came to a region from other regions. These regional migration amounts also constitute internal variables of the model.

The net resident population amounts of each region are recorded at the second section. When calculating the net resident population, the amount of population born in the region is added to the population of the region and the amount of dead people is subtracted. Immigration and migration values of a region are not the same. Therefore, the value of the columns and the rows of the table are not equal. The difference between immigration and migration values of the regions are calculated and added to this section as “net migration amount” in order to obtain the equivalence of columns and rows. The sum of all these variables constitute the net population which is the exogenous variable of the model. The input-output table is given in Table 1.

Table 1: Migration Input-Output Table

Regions	1	2 …n	…j		Total Migration Sent (TVG)	Net Population (NN)= NYN+NG		Total Population N=TVG+NN
						Net Resided Population (NYN)	Net Migration (NG)	
1	0	G_{12}	G_{1j}	G_{1N}	$\sum_{j=1}^{N} G_{1j}$	nyn_1	ng_1	N_1
2	G_{21}	0	G_{2i}	G_{2N}	$\sum_{j=1}^{N} G_{2j}$	nyn_2	ng_2	N_2
..	..	..	..	..				
İ	G_{i1}	G_{i2}	G_{ij}	G_{iN}	$\sum_{j=1}^{N} G_{ij}$	nyn_i	ng_i	N_i
..	..	..	..	..				
N	G_{N1}	G_{N2}	G_{Nj}	0	$\sum_{j=1}^{N} G_{NN}$	nyn_n	ng_n	N_n
Total Migration Received (TAG)	$\sum_{i=1}^{N} G_{i1}$	$\sum_{i=1}^{N} G_{i2}$	$\sum_{i=1}^{N} G_{ij}$	$\sum_{i=1}^{N} G_{NN}$				
Net Resident Population (NYN)	nyn_1	nyn_2	nyn_j	nyn_n				
Total Population(N)	N_1	N_2	N_j	N_n				

Where;

G_{ij} ;Number of immigrants moved from region i to region j in rows, amount of arriving immigrants to region j from region i in columns,

NYN_i ;Resided population for the region i (population before migration + (birth and death)),

NG_i ; The net number of immigrants for region i (immigrants came-emigrants left),

NN_i ;The net population for the region i [population before migration + (birth - death)]+ [immigrants came-emigrants left].

In order to ensure consistency of input-output table, it is possible to write the equality (7) for the rows and equality (8) for the columns in matrix notation format.

$$N_i = TVG_i + NN_i \quad (7)$$

$$N_j = TAG_j + NYN_j \quad (8)$$

Where, N_i is total population, TVG_i is sum of rows which is the sum of immigrants that came, TAG_j is the sum of columns which is sum of received migration and NN_i is net population amount which is net resided population + net migration amount.

The amount of internal migration can be written in matrix form as below.

$$G = \begin{bmatrix} 0 & g_{12} & \cdots & g_{1n} \\ g_{21} & 0 & & g_{2n} \\ \vdots & & \ddots & \vdots \\ g_{n1} & g_{n2} & \cdots & 0 \end{bmatrix} \quad (9)$$

Unit migration coefficients are matrix elements and can be calculated as follows.

$$g_{ij} = \frac{G_{ij}}{N_j} \quad (10)$$

As N_i is the total population of region i, the equality (3) and equality (7) can be written in the form of population equality as below.

$$N_i = \sum_{j=1}^{N} g_{ij} N_j + NN_i \quad (11)$$

When matrix is applied, the following equality is found.

$$N - GN = NN \quad (12)$$

$$N = (I - G)^{-1} NN \quad (13)$$

Here, the elements of $(I - G)^{-1}$ matrix gives migration multipliers. These elements, as seen in columns, show the effect of one unit increase in the region i to the increase at direct and indirect migration in region j.

THE SOLUTION OF INTERNAL MIGRATION IN TURKEY BY INPUT-OUTPUT MODEL

Preparation of Input-Output Table Data Source

Address Based Population Registration System (ABPRS) was established to keep up to date information of the population registers in Turkey in 2007. This system is utilized to monitor the information of individuals settled in Turkey via ID numbers and to register them where they reside. Additionally, the people temporarily residing at institutions such as military barracks, prisons and universities are also registered to the places where the institution is located.A person is defined as “immigrant” if his/her residence place is different on two reference dates according to ABPRS. Furthermore, information about entire population on the regional and provincial basis is published annually.

Turkish Statistical Institute’s (TurkStat) has classified the regions of Turkey into three categories based on their economic, social and geographical similarities. Twelve regions have been identified at Level 1 and twenty-six sub-regions has been identified at Level 2. The Level 3 is designed in the basis of provinces. The Level 2 category is used in this study. The sub-regions at Level 2 are shown in Figure 2.

Figure 2: Level 2 Sub-regions

Source: TurkStat

The rows and columns of the input-output table that is used for internal migration are comprised of these 26 sub-regions. The provinces included in statistical sub-regional unit are given at Table 2. The sub-regions of Level 2 statistical regional unit and the provinces covered by these sub-regions are shown at Table 2.

Table 2: Level 2 Statistical Regional Units and the Provinces Covered

No.	Sub-regions	Provinces Covered	No.	Sub-regions	Provinces Covered
1	İstanbul	İstanbul	14	Zonguldak	Zonguldak, Karabük, Bartın
2	Ankara	Ankara	15	Kastamonu	Kastamonu, Çankırı, Sinop,
3	Konya	Konya, Karaman	16	Samsun	Samsun, Tokat, Çorum, Amasya
4	Bursa	Bursa, Eskişehir, Bilecik	17	Kırıkkale	Kırıkkale, Aksaray, Niğde, Nevşehir, Kırşehir

Table 2...

5	Kocaeli	Kocaeli, Sakarya, Düzce, Bolu, Yalova	18	Kayseri	Kayseri, Sivas, Yozgat
6	İzmir	İzmir	19	Trabzon	Trabzon, Ordu, Giresun, Rize, Artvin, Gümüşhane
7	Aydın	Aydın, Denizli, Muğla	20	Gaziantep	Gaziantep, Adıyaman, Kilis
8	Manisa	Manisa, Afyonkarahisar, Kütahya, Uşak	21	Şanlıurfa	Şanlıurfa, Diyarbakır
9	Tekirdağ	Tekirdağ, Edirne, Kırklareli	22	Mardin	Mardin, Batman, Şırnak, Siirt,
10	Balıkesir	Balıkesir, Çanakkale	23	Malatya	Malatya, Elazığ, Bingöl, Tunceli,
11	Antalya	Antalya, Isparta, Burdur	24	Van	Van, Muş, Bitlis, Hakkari
12	Adana	Adana, Mersin	25	Erzurum	Erzurum, Erzincan, Bayburt
13	Hatay	Hatay, Kahramanmaraş, Osmaniye	26	Ağrı	Ağrı, Kars, Iğdır, Ardahan

Source: TurkStat

Based on records at ABPRS, to calculate the regional population, TurkStat adds the number of newborns and arriving immigrants to the population registered in that region in a year. In addition to that, the number of emigrants left and the number of deaths in the same year is subtracted from registered population of the same year to find out the number of population at the end of the year. The values obtained are published in the first quarter (January, February, March) of next year. Thus, in order to prepare input-output table to be used in this study, following data are applied based upon TurkStat calculation method.

- As declared by TurkStat in 2013, the number of emigrants left and came among Level 2 sub-regions.
- Population of each sub-region for 2013,
- Number of newborns and deaths of each sub-region for 2013,
- Total population of each sub-region for 2014.

Calculation of Internal Migration Multipliers By Input-Output Model

Regarding to the internal migration in Turkey, Leontief inverse matrix is calculated using migration input-output table at Table 1 and forward and backward linkage indexes are obtained with the help of equality (5) and equality (6).

When backward linkage index indicates the regions where the largest amount of migration received, forward linkage index indicates the regions where the largest amount of migration sent. Regional index values were calculated considering the classification made by the Hirschman and the results are given in Table 3.

Table 3: Results of the Index

No.	Regions	Linkage Effects		No.	Regions	Linkage Effects	
		Backward	**Forward**			**Backward**	**Forward**
1	İstanbul	1.178673	0.992391	14	Kırıkkale	0.984307	1.01442
2	Tekirdağ	0.986469	0.997375	15	Kayseri	0.990914	1.001673
3	Balıkesir	0.98418	0.996402	16	Zonguldak	0.976859	1.003282
4	İzmir	1.011291	0.992704	17	Kastamonu	0.976893	1.02424
5	Aydın	0.99439	0.992799	18	Samsun	0.992398	1.009237
6	Manisa	0.991855	0.994944	19	Trabzon	0.993186	1.012449
7	Bursa	1.009818	0.990903	20	Erzurum	0.980736	1.014639
8	Kocaeli	1.007307	0.99516	21	Ağrı	0.978844	1.012062
9	Ankara	1.054361	0.994908	22	Malatya	0.982977	1.003118
10	Konya	0.98654	0.994389	23	Van	0.982575	1.000505
11	Antalya	1.002898	0.99519	24	Gaziantep	0.985306	0.989447
12	Adana	1.003275	0.993392	25	Şanlıurfa	0.990198	0.991727
13	Hatay	0.988872	0.991144	26	Mardin	0.984879	1.001498

Regions of Turkey can be classified into three categories by using the data in Table 3:

- Migration-receiving regions (high backward linkage effect, low forward linkage effect)
- Migration-sending regions (high forward linkage effect, low backward linkage effect)
- Regions with stable population (low forward and backward linkage effects)

According to this classification, among the 26 sub-regions, 7 are migration-receiving regions, 11 are migration-sending regions and 8 are the regions with stable population. All the results are given in Table 4.

Table 4: Level 2 Classification of Sub-regional Migration

Regions with high level of attraction	Regions with high level of repulsion	Regions with Stable population
1. İstanbul,	1. Kastamonu,	1. Aydın,
2. Ankara,	2. Erzurum,	2. Manisa,
3. İzmir,	3. Kırıkkale,	3. Şanlıurfa,
4. Bursa,	4.Trabzon,	4. Hatay,
5. Kocaeli,	5. Ağrı,	5. Konya,
6. Adana,	6. Samsun,	6. Tekirdağ,
7. Antalya	7. Zonguldak,	7. Gaziantep,
	8. Malatya,	8. Balıkesir
	9. Kayseri,	
	10. Mardin,	
	11. Van	

According to Table 4, these sub-regions are categorized as having high level of attraction power. The common feature of these sub-regions is that these regions are the metropolitan areas of Turkey. The sub-regions that cause internal migration in Turkey at most are categorized as having high level of repulsion. Kastamonu is at the top of this category followed by Erzurum and Kırıkkale. In general, considering this categorization, Black Sea and East Anatolian Regions are the most efficient regions on internal migration in Turkey. On the contrary, Aydın, Manisa and Şanlıurfa have minimum impact on internal migration. Based on this categorization, it may be claimed that East Anatolian Region and Thracian region have minimum impact on internal migration in Turkey.

The Leontief Inverse Matrix calculated on internal migration in Turkey is given in Appendix 1. Inferences made by considering the matrix data are discussed in detail only for Istanbul. All the definitions referred to in Istanbul can be generalized to other regions. Although Elements of Leontief Inverse Matrix are the direct multiplier coefficients, the row and column elements provide different information. Multiplier coefficients for Istanbul in the column of Leontief Inverse Matrix are given in Table 5.

Table 5: The Most and the Least Effective Regions on Migration To Istanbul Sub-region

	The most effective			**The least effective**	
No.	**Sub-regions**	**Multiplier Coefficents**	**No.**	**Sub-regions**	**Multiplier Coefficents**
1	Kastamonu	0.022716	1	Manisa	0.003210
2	Trabzon	0.021083	2	Aydın	0.003536
3	Samsun	0.015744	3	Hatay	0.003551
4	Ağrı	0.014312	4	Konya	0.003626
5	Erzurum	0.013106	5	Adana	0.003836
6	Zonguldak	0.012908	6	İzmir	0.003994
7	Tekirdağ	0.012536	7	Ankara	0.004067
8	Mardin	0.010134	8	Antalya	0.004246
9	Kocaeli	0.010097	9	Gaziantep	0.004266
10	Van	0.009821	10	Bursa	0.004420
11	Malatya	0.009778	11	Şanlıurfa	0.004565
12	Kayseri	0.008408	12	Balıkesir	0.006461
13	Kırıkkale	0.007430			
Sum of multiplier coefficients		**1.218112**			

As seen in Table 5, 1 person increase at the population in Istanbul sub-region creates the amount of 1.218112 person migration in Turkey. This means that indirect migration amount created by one person increase in the population of Istanbul caused by birth or migration is 0.21 people. Kastamonu with0.022716, Trabzon with 0.021083 and Samsun with 0.015744 are the most responsible for the increase of 1.218112 people created by Istanbul. Manisa with 0.003210, Aydın with 0.003536 and Hatay with 0.003551 are the least responsible ones. Multiplier coefficients for Istanbul in the row of Leontief Inverse Matrix are given in Table 6.

Table 6: The Impacts of Sub-regions on the Migration Istanbul Received

No.	**Sub-regions**	**Multiplier Coefficients**	**No.**	**Sub-regions**	**Multiplier Coefficients**
1	Trabzon	0.002884	14	Antalya	0.00082
2	Kocaeli	0.002463	15	Şanlıurfa	0.000778
3	Samsun	0.001957	16	Erzurum	0.000707
4	Tekirdağ	0.001747	17	Aydın	0.000667
5	Ankara	0.001215	18	Adana	0.000655
6	Mardin	0.001188	19	Zonguldak	0.000641
7	Kastamonu	0.001086	20	Ağrı	0.000625
8	Kayseri	0.001066	21	Hatay	0.000583
9	Bursa	0.001063	22	Gaziantep	0.000511
10	Van	0.000883	23	Kırıkkale	0.000446
11	İzmir	0.000859	24	Manisa	0.000428
12	Malatya	0.000842	25	Konya	0.0004
13	Balıkesir	0.00082			
Sum of multiplier coefficients			**1.025598**		

According to the Leontief inverse matrix, 1 person increase in the population in Turkey creates the amount of 1.025598 person migrations in İstanbul. Trabzon sub-region with 0.002884 and Kocaeli sub-region with 0.002463 have the biggest impact for this situation. Samsun sub-region with 0.001957, Tekirdağ sub-region with 0.001747 and Ankara sub-region with 0.001215 follow them. Konya sub-region with 0.0004 has the minimum impact on the migration increase experienced in İstanbul. Manisa sub-region with 0.000428, Kırıkkale sub-region with 0.000446 and Gaziantep sub-region with 0.000511 follow Konya.

Considering historical trends in migration in Turkey, internal migration primarily directs to the developed center of a region, and after reaching saturation point, it directs to the developed center of the nearest sub-region. Analyzing all the multiplier values calculated for Istanbul region, it is seen that this region remains outside this trend. Istanbul receives migration from all regions of Turkey, particularly Black Sea Region. This situation can be explained that Istanbul is the center of attraction in terms of migration in Turkey.

CONCLUSIONS

The economic and social disparities between geographic regions of a country differentiate the regions in terms of development. Geographical advantages and disadvantages may increase this differentiation. Today, regional development disparities are one of the problems almost each country experienced. The most important result of this problem is the movement of population from the regions with insufficient conditions to better regions, namely migration. Although migration may seem simply the movement of population among geographical regions, it is an important phenomenon affecting social, economic, cultural, psychological, political etc. structure of the society because of its impacts. It is important to predict the whole effects of the migration or emigration to a region for the protection of living standards of both immigrants and the region itself. To do this, it is necessary to know not only initial migration but also the indirect migration created by those immigrants. Indirect impacts of migration are defined as the number of children born to immigrants in emigrated region and the pioneering of immigrants to the people left behind for coming and joining them. The migration multiplier is a broader concept that encompasses both the initial migrants and the migration indirectly caused by them.

It is aimed in this study to calculate total migration multipliers of internal migration experienced in Turkey. In order to accomplish this, input-output model is used and internal migration multiplier values for 26 regions are calculated by applying TurkStat's statistical data for regional units Level 2. An input-output table about internal migration is prepared to do this. This table contains information on migration movements among regions in Turkey, the population at the beginning of a period i.e. the initial population of the regions before migration has occurred, the amount of births and deaths during a period as well as the amount of migration. With the help of Leontief Inverse Matrix calculated by using Input-Output Model, the forward and backward linkage indexes are figured out. Hirschman's sectoral classification is used to categorize the regions as regions with high level of attraction, regions with high level of repulsion and regions with minimum impact on migration.

Istanbul, Ankara and Izmir sub-regions impel internal migration in Turkey at the highest level with respect to that classification. These are followed by Bursa, Kocaeli, Adana and Antalya sub-regions respectively. The common feature of all these sub-regions is that they are metropolitan areas. These metropolitan areas trigger mostly Kastamonu, Erzurum, Kırıkkale and then other sub-regions such as Trabzon, Ağrı, Samsun, Zonguldak, Malatya, Kayseri, Mardin and Van to create internal migration. There are seven sub-regions that have the minimum impact on internal migration in Turkey respectively Aydın, Manisa, Şanlıurfa, Hatay, Konya, Tekirdağ, Gaziantep and Balıkesir.

The multiplier coefficient is calculated as 1.21 for Istanbul that has the highest level of attraction. This means that 1 person increase at the population in Istanbul creates the amount of 1.21 person migration in Turkey. Kastamonu with 0.022716 has the highest impact on migration increase created by Istanbul while Trabzon with 0.021083 and Samsun with 0.015744 follow it. Besides, Kastamonu and Kayseri with 0.0011 have the highest impact on migration that Istanbul has received. Ankara and Mardin follow Kastamonu with 0.0012.

The results obtained from the study are not only coincide very closely with the actual results shared by TurkStat about internal migration in Turkey but also provide more detailed information. Whatever the reason is, in order to prevent all negative effects of a migration experienced among different regions, it will be insufficient to take precautions by taking into account the number of immigrants solely. Instead of this, it will provide more reliable results to use multiplier coefficients when producing migration policies because of considering the indirect effects of migration alongside with the direct effects.

The results obtained from the study do not only coincide very closely with the actual results shared by TurkStat about internal migration in Turkey but also provide more detailed information. For whatever reason, in order to prevent all negative effects of a migration experienced among different regions, it will be insufficient to take policy measures by taking into account the number of immigrants solely. The first effect of this insufficiency will be the irregular urbanization on regions with high level of attraction. In addition to deficiency of housing, schools and hospitals, insufficiencies in social and economic fields will appear after a while. Using migration multiplier coefficients in the projection of investments that will be made to protect the economic and social structure of a migration-receiving region; we can make more reliable predictions. As an alternative method, population predictions can be made for every region by using multiplier coefficients. Based on these predictions, along with every required infrastructure investment on that region, the social effects of this population change such as the crime rate can be calculated.

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APPENDIX 1

Leontief Inverse Matrix

Regions	İstanbul	Tekirdağ	Balıkesir	İzmir	Aydın	Manisa	Bursa	Kocaeli	Ankara
İstanbul	1,0003	0,0017	0,0008	0,0009	0,0007	0,0004	0,0011	0,0025	0,0012
Tekirdağ	0,0125	1,0000	0,0014	0,0011	0,0006	0,0006	0,0015	0,0016	0,0014
Balıkesir	0,0065	0,0015	1,0000	0,0035	0,0012	0,0022	0,0035	0,0016	0,0019
İzmir	0,0040	0,0004	0,0012	1,0001	0,0030	0,0031	0,0013	0,0007	0,0018
Aydın	0,0035	0,0004	0,0007	0,0044	1,0000	0,0023	0,0012	0,0009	0,0017
Manisa	0,0032	0,0004	0,0013	0,0055	0,0027	1,0000	0,0029	0,0010	0,0016
Bursa	0,0044	0,0006	0,0013	0,0013	0,0008	0,0016	1,0000	0,0018	0,0021
Kocaeli	0,0101	0,0007	0,0007	0,0009	0,0008	0,0006	0,0022	1,0001	0,0022
Ankara	0,0041	0,0004	0,0006	0,0015	0,0011	0,0007	0,0015	0,0014	1,0001
Konya	0,0036	0,0004	0,0004	0,0018	0,0010	0,0011	0,0013	0,0008	0,0032
Antalya	0,0042	0,0003	0,0005	0,0016	0,0023	0,0019	0,0012	0,0008	0,0024
Adana	0,0038	0,0003	0,0003	0,0009	0,0007	0,0004	0,0007	0,0007	0,0018
Hatay	0,0036	0,0004	0,0003	0,0007	0,0007	0,0004	0,0007	0,0006	0,0014
Kırıkkale	0,0074	0,0008	0,0005	0,0016	0,0010	0,0007	0,0015	0,0015	0,0138
Kayseri	0,0084	0,0005	0,0005	0,0015	0,0008	0,0005	0,0014	0,0011	0,0071
Zonguldak	0,0129	0,0013	0,0006	0,0009	0,0009	0,0008	0,0021	0,0047	0,0037
Kastamonu	0,0227	0,0011	0,0006	0,0009	0,0008	0,0006	0,0013	0,0026	0,0138
Samsun	0,0157	0,0013	0,0005	0,0013	0,0008	0,0005	0,0021	0,0019	0,0070
Trabzon	0,0211	0,0010	0,0006	0,0012	0,0007	0,0006	0,0025	0,0039	0,0031
Erzurum	0,0131	0,0015	0,0009	0,0030	0,0012	0,0011	0,0038	0,0032	0,0038
Ağrı	0,0143	0,0018	0,0008	0,0031	0,0014	0,0012	0,0030	0,0033	0,0039
Malatya	0,0098	0,0006	0,0006	0,0017	0,0010	0,0008	0,0015	0,0012	0,0030
Van	0,0098	0,0009	0,0007	0,0017	0,0014	0,0009	0,0026	0,0013	0,0024
Gaziantep	0,0043	0,0003	0,0002	0,0006	0,0005	0,0004	0,0005	0,0005	0,0011
Şanlıurfa	0,0046	0,0003	0,0004	0,0014	0,0005	0,0004	0,0010	0,0005	0,0018
Mardin	0,0101	0,0006	0,0005	0,0022	0,0009	0,0009	0,0011	0,0009	0,0020
Backward Linkage	**1,2181**	**1,0195**	**1,0171**	**1,0451**	**1,0277**	**1,0250**	**1,0436**	**1,0410**	**1,0896**

Leontief Inverse Matrix (Contunie 1)

Regions	Konya	Antalya	Adana	Hatay	Kırıkkale	Kayseri	Zonguldak	Kastamonu	Samsun
İstanbul	0,0004	0,0008	0,0007	0,0006	0,0004	0,0011	0,0006	0,0011	0,0020
Tekirdağ	0,0004	0,0007	0,0006	0,0006	0,0005	0,0005	0,0005	0,0003	0,0011
Balıkesir	0,0004	0,0009	0,0006	0,0004	0,0003	0,0005	0,0003	0,0002	0,0006
İzmir	0,0008	0,0013	0,0007	0,0004	0,0005	0,0006	0,0002	0,0001	0,0008
Aydın	0,0008	0,0027	0,0008	0,0007	0,0004	0,0005	0,0002	0,0002	0,0006
Manisa	0,0009	0,0025	0,0006	0,0004	0,0004	0,0004	0,0002	0,0002	0,0004
Bursa	0,0006	0,0010	0,0006	0,0004	0,0004	0,0006	0,0004	0,0002	0,0009
Kocaeli	0,0004	0,0008	0,0006	0,0005	0,0004	0,0005	0,0010	0,0004	0,0009
Ankara	0,0010	0,0015	0,0010	0,0006	0,0021	0,0017	0,0006	0,0012	0,0017
Konya	1,0000	0,0041	0,0018	0,0007	0,0018	0,0009	0,0002	0,0002	0,0006
Antalya	0,0023	1,0000	0,0017	0,0015	0,0007	0,0010	0,0003	0,0002	0,0007
Adana	0,0011	0,0017	1,0001	0,0030	0,0012	0,0011	0,0001	0,0002	0,0004
Hatay	0,0006	0,0018	0,0041	1,0000	0,0005	0,0012	0,0002	0,0002	0,0003
Kırıkkale	0,0026	0,0020	0,0032	0,0010	1,0001	0,0045	0,0003	0,0004	0,0012
Kayseri	0,0008	0,0016	0,0014	0,0009	0,0022	1,0000	0,0002	0,0003	0,0015
Zonguldak	0,0004	0,0010	0,0005	0,0006	0,0004	0,0005	1,0000	0,0013	0,0008
Kastamonu	0,0007	0,0010	0,0007	0,0006	0,0008	0,0009	0,0018	1,0001	0,0030
Samsun	0,0005	0,0011	0,0006	0,0004	0,0006	0,0014	0,0004	0,0009	1,0001
Trabzon	0,0004	0,0009	0,0006	0,0004	0,0004	0,0007	0,0006	0,0004	0,0035
Erzurum	0,0009	0,0014	0,0011	0,0009	0,0007	0,0014	0,0003	0,0003	0,0013
Ağrı	0,0008	0,0011	0,0009	0,0007	0,0005	0,0011	0,0003	0,0003	0,0009
Malatya	0,0006	0,0013	0,0027	0,0015	0,0006	0,0012	0,0002	0,0003	0,0007
Van	0,0007	0,0013	0,0023	0,0007	0,0004	0,0005	0,0002	0,0002	0,0005
Gaziantep	0,0003	0,0013	0,0026	0,0026	0,0003	0,0006	0,0001	0,0001	0,0003
Şanlıurfa	0,0004	0,0013	0,0028	0,0010	0,0003	0,0004	0,0001	0,0001	0,0003
Mardin	0,0007	0,0013	0,0039	0,0010	0,0005	0,0005	0,0002	0,0002	0,0005
Backward Linkage	**1,0196**	**1,0365**	**1,0368**	**1,0220**	**1,0172**	**1,0241**	**1,0095**	**1,0096**	**1,0256**

Leontief Inverse Matrix (Continue 2)

Regions	Trabzon	Erzurum	Ağrı	Malatya	Van	Gaziantep	Şanlıurfa	Mardin	**Forward Linkage**
İstanbul	0,0029	0,0007	0,0006	0,0008	0,0009	0,0005	0,0008	0,0012	**1,025598**
Tekirdağ	0,0010	0,0005	0,0008	0,0005	0,0006	0,0003	0,0005	0,0006	**1,030748**
Balıkesir	0,0007	0,0004	0,0004	0,0004	0,0005	0,0003	0,0006	0,0005	**1,029743**
İzmir	0,0006	0,0006	0,0005	0,0005	0,0006	0,0003	0,0009	0,0009	**1,025921**
Aydın	0,0006	0,0004	0,0004	0,0004	0,0006	0,0004	0,0006	0,0006	**1,026019**
Manisa	0,0005	0,0004	0,0004	0,0003	0,0005	0,0003	0,0005	0,0006	**1,028235**
Bursa	0,0014	0,0006	0,0004	0,0005	0,0007	0,0003	0,0006	0,0005	**1,02406**
Kocaeli	0,0018	0,0005	0,0005	0,0004	0,0005	0,0003	0,0004	0,0004	**1,028459**
Ankara	0,0012	0,0006	0,0005	0,0007	0,0006	0,0004	0,0008	0,0006	**1,028198**
Konya	0,0005	0,0004	0,0003	0,0005	0,0004	0,0004	0,0007	0,0005	**1,027662**
Antalya	0,0006	0,0003	0,0003	0,0005	0,0005	0,0008	0,0011	0,0008	**1,02849**
Adana	0,0004	0,0003	0,0003	0,0010	0,0009	0,0015	0,0020	0,0016	**1,026632**
Hatay	0,0004	0,0004	0,0002	0,0008	0,0004	0,0026	0,0011	0,0007	**1,024308**
Kırıkkale	0,0008	0,0005	0,0004	0,0005	0,0005	0,0005	0,0006	0,0006	**1,048363**
Kayseri	0,0007	0,0007	0,0004	0,0007	0,0004	0,0005	0,0005	0,0004	**1,03519**
Zonguldak	0,0012	0,0004	0,0002	0,0003	0,0003	0,0002	0,0004	0,0004	**1,036853**
Kastamonu	0,0013	0,0004	0,0004	0,0004	0,0005	0,0003	0,0005	0,0005	**1,058511**
Samsun	0,0032	0,0006	0,0004	0,0004	0,0004	0,0003	0,0004	0,0004	**1,043007**
Trabzon	1,0001	0,0013	0,0005	0,0004	0,0004	0,0003	0,0004	0,0003	**1,046327**
Erzurum	0,0032	1,0000	0,0016	0,0013	0,0007	0,0006	0,0007	0,0005	**1,04859**
Ağrı	0,0012	0,0016	1,0000	0,0006	0,0015	0,0006	0,0007	0,0004	**1,045927**
Malatya	0,0007	0,0008	0,0004	1,0000	0,0008	0,0020	0,0021	0,0007	**1,036683**
Van	0,0006	0,0005	0,0009	0,0008	1,0000	0,0007	0,0010	0,0010	**1,033983**
Gaziantep	0,0003	0,0003	0,0002	0,0014	0,0004	1,0000	0,0025	0,0008	**1,022555**
Şanlıurfa	0,0002	0,0002	0,0002	0,0011	0,0006	0,0026	1,0000	0,0022	**1,024911**
Mardin	0,0004	0,0002	0,0003	0,0006	0,0012	0,0013	0,0029	1,0000	**1,035009**
Backward Linkage	**1,0264**	**1,0136**	**1,0116**	**1,0159**	**1,0155**	**1,0183**	**1,0233**	**1,0178**	