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ABSTRACT

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Antalya and Muğla provinces located in southwestern Turkey have emerged as the new magnets for internal migration in the country. Characteristics of immigration from other provinces to these two are described, and analyzed in the context of the gravity model. The factors that affect the migration to Antalya and Muğla seem to be the same and their effects on the flows to each destination differ only slightly. Better job opportunities, especially in the hotel and restaurant services sector, appear as the main attraction fueling this migration. Surprisingly, the pleasant climates of the two provinces do not seem to matter.

JEL Classification: J61, R23

Keywords: internal migration, gravity model, Turkey, Antalya, Muğla

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1. Introduction

Since 1975, every five years, 7-8 percent of the Turkish population has moved from one province to another. This rate was probably even higher during 1950-1975 for which no detailed migration statistics are available. This movement was essentially from the east, southeast and north towards the northwest, west and south, and from the less urbanized, less industrialized, and poorer regions of the country, to the more urbanized, more industrialized and richer regions. However, there are indications that in recent years new major migration paths have emerged.

During 1975-1980 and 1980-1985 periods, the provinces with the highest net migration rates (between 4 and 11 percent per five years) were Kocaeli, İstanbul and Bursa provinces in the northwest, surrounding the eastern half of the Marmara Sea, İzmir in the west, on the central Aegean coast, and İçel in the south, along the eastern shores of the Mediterranean. These, together with Ankara, in central Anatolia, and Adana, in the south, on the eastern Mediterranean coast, had the highest in-migration also in absolute numbers. These seven provinces received almost half of all of the inter-provincial migration. In 1990, the urbanization rates of these provinces ranged between 61 to 91 percent, the share of industry in total employment, between 9 and 34 percent, and the part of real GDP attributable to industry, between 28 to 57 percent.

After 1985, Antalya and Tekirdağ, and after 1995, Muğla and Bilecik joined the list of provinces with net migration rates exceeding 4 percent per five years. In fact, for the period 1995-2000, Tekirdağ, Muğla, Antalya and Bilecik ranked first through fourth, ahead of İstanbul, Bursa, and İzmir, which remained on the list, and Kocaeli, and İçel, which dropped out of it.[1] Antalya ranked 5th, Tekirdağ 10th, Muğla 11th, and Bilecik 52nd among 81 provinces, in migrants received in absolute value. Their corresponding ranks were 15th, 23rd, 47th, and 50th respectively, among 67 provinces in the period 1975-1980. The net migration rates of the eleven provinces mentioned are contrasted for various periods in Figure 1 and listed in Table 1 for 1995-2000.

The jump in the net migration rates of Tekirdağ and Bilecik can be considered continuation of the old pattern, as both of these provinces are in the northwestern section of the country which has been a major magnet for those who leave their provinces. Both are heavily industrialized and urbanized. In 2000, about one fifth to one-fourth of their employment and about half of their real GDP originated in their industrial sectors. In the same year, almost two-thirds of their population was classified as urbanized. Migration flows to Antalya and Muğla on the other hand, constitute new paths. These provinces are located in the southwest, outside the traditional migration destinations. They have relatively high per capita income levels but are not urbanized and their economies rely mostly on agriculture and services (especially hotel and restaurant services). In 2000, the urbanization rates of the two provinces were 54 and 38 percent, and ranked 42nd and 77th among the 81 provinces, respectively. The share of industrial sector in total employment was 5.5 percent for

[1] The net migration rate of İçel dropped to 1 percent during 1995-2000, from 7 percent during 1985-1990. In the case of Kocaeli , the corresponding drop was even more dramatic, from almost 11 percent to zero. The latter is caused mainly by the two earthquakes which hit the province in 1999, and is likely to be a temporary phenomenon.

Antalya, and 6.0 percent for Muğla. These ranked 51st and 47th among the 81 provinces. In contrast, the shares of agriculture and services in total employment were 49.8 and 39.4 percent for Antalya, and 55.1 and 34.0 percent for Muğla. The proportion of real GDP attributable to agriculture, industry and services for the two provinces were 19.1, 8.4 and 64.0 for the former, and 18.5, 28.4 and 45.9 for the latter. What distinguishes these two provinces from the rest is the unusually large size of their tourism sectors and the phenomenal growth it has exhibited. The share of hotel and restaurant services in 2000 real GDP was 22.3 and 19.5 percent for Antalya and Muğla, respectively. Corresponding figures for all other provinces were in the single digits, except for Nevşehir, which barely made it to a double digit level. Antalya and Muğla ranked very high (second and third in the nation) also in absolute value of this sector's output, surpassed only by İstanbul. During 1990-2000, the average annual growth rate of the sector's output was 6.5 percent in Antalya and 9.0 percent in Muğla, which was far more than the growth rates of other sectors and far more than the corresponding growth in other provinces. More detailed information is provided in Tables 1 through 4 about the economic and social characteristics of the eleven provinces mentioned above, so that the reader can make his or her own comparisons.

It should be noted also that, although the majority of immigrants arriving at Antalya and Muğla were from traditional, poor, agricultural and rural eastern provinces, about a third of them came from the seven provinces mentioned above which get the lion's share of internal migration. Thus it appears that these two provinces have emerged as new migrant destinations and exhibit characteristics quite different than the other major migrant-drawing provinces. The urbanized, industrialized and wealthier regions of Turkey are now not only sharing immigrants leaving the less-urbanized, agricultural, and poorer regions of the country with these two provinces, they in fact have begun to lose a part of their own populations to them. The growth of the tourism sector rather than industry appears to be fueling this.

The aim of this study is to analyze immigration to Antalya and Muğla from the other provinces. For this purpose, we will utilize a variant of the so called gravity model. This model is very popular with researchers of migration in other countries, as it fits their data remarkably well. Major studies which discuss and/or apply the gravity model include Dhar (1984), Muesser (1989), Greenwood (1997), Lucas (1997), Adrienko and Guriev (2004), Fan (2005), Phan and Coxhead (2010), and Etzo (2011). Although there are many studies on internal migration in Turkey, for example, Munro (1974), Gedik (1996), Tunalı (1996), Pazarlıoğlu (1997), Gündüz and Yetim (1997), İçduygu and Ünalan (1998), Gezici and Keskin (2005), Kocaman (2008), and Filiztekin and Gökhan (2008), only the last one employed the gravity model. None of them focused specifically on the migration flows to Antalya and Muğla, and they all treated migration flows between any two locations as if they are similar. We hope to gain more insight by studying the flows to the two provinces in question separately.

In the next section, we will present our version of the gravity model, and in the section following that, the empirical results from fitting it to the Turkish data. In the last section, conclusions based on our estimation results will be listed. In view of a number of surveys on the migration literature and the gravity model (for example, by Anderson, 2011, Etzo, 2008, and Greenwood and Hunt, 2003), we will refrain from providing yet another survey here.

2. The Model

According to the basic gravity model, the flow of migrants between two locations is a function of the population of the sending location, its unemployment (or wage) rate relative to that of the receiving location and, the distance and previous migration between the two locations. It is assumed that the number of people moving away from a location is likely to be higher if its population is larger. Immigration is seen as an economic activity with its costs and benefits over time. Benefits are assumed to be higher for those moving from a high unemployment (low wage) area to a low unemployment (high wage) area. The current unemployment rate or earnings are taken as proxies for future employment possibilities and earnings. The distance between the origin and the destination is treated as a proxy for the cost of the move. The latter includes psychic costs of removal from loved ones, a familiar culture and environment, and costs of information acquisition, besides transportation costs. The presence of friends, family and other contacts already at the destination, as a result of past migration, tends to lower such costs and increase the probability of finding a job at the destination. These are often referred to as "kinship" or "network" effects on migration.

In the basic gravity model, it is assumed that the influences of population, distance, past immigration and unemployment differentials would be the same for all migration flows. We will include in our model all of these variables but we will fit separate equations for Antalya and Muğla and allow the parameter values to differ between the two equations. Typically, in empirical applications, in addition to the variables mentioned, other pull and push factors are also considered. We did as well. However, all of the additional variables tried, except one, provided unsatisfactory results. These will be discussed in the next section. Here we should mention that the exceptional variable was the one representing the intensity of the damage caused by the two earthquakes which devastated nine provinces in 1999.[2] Loss of their businesses and/or homes may have hastened the decisions of those contemplating migrating, and may have triggered a desire to relocate among those who became fearful of similar disasters in the future. We have added a variable to the basic model to capture the quake factor. We measured all variables in logarithms, as it is typically done in applications of the gravity model. Thus our model is as follows:

$$\ln M_{ij} = a_j + b_j \ln P_j + c_j \ln D_{ij} + f_j \ln (U_i/U_j) + g_j \ln H_{ij} + n_j \ln Q_i + e_{ij} \qquad \begin{matrix} i = 1, 2, 3, \ldots, 79 \\ j = 80 \text{ and } 81 \end{matrix}$$

where

M_{ij} : number of people who migrated from province i to province j, between 1995 and 2000,

P_i : resident population of province i in 1995,

D_{ij}: highway distance (in kilometers) between the capital cities of provinces i and j,

U_i : unemployment rate in province i,

[2] The nine provinces are the following: Bolu, Bursa, Düzce, Eskişehir, İstanbul, Kocaeli, Sakarya, Zonguldak and Yalova.

H_{ij} : number of people residing in province j in 1995 who were born in province i,

Q_i : number of residences and businesses in province i which suffered heavy damage in 1999 earthquakes,

e_{ij} : the disturbance term for province i in the equation for j,

and a_j , b_j , c_j , f_j , g_j , and n_j (j = 80, 81) are parameters to be estimated. j is equal to 80 for Antalya and 81 for Muğla.

3. Empirical results

The migration equations presented in the previous section are estimated using both Ordinary Least Squares (OLS) and Robust Regression methods. The data on the Q_j variable is obtained from the General Directorate of Disaster Affairs (Ministry of Public Works and Settlement, the Republic of Turkey). The D_{ij} values are taken from the General Directorate of Highways (Ministry of Transport and Communication, the Republic of Turkey). The source of data for all other variables is the Turkish Statistical Institute (Prime Ministry, the Republic of Turkey).

P_i and H_{ij} figures are not readily available but their counterparts for the year 2000 are. So P_i values are obtained by deducting from the resident population of province i in 2000, the total in-migration into the province and adding total out-migration from the province during 1995-2000. To get the H_{ij} figures, the product of M_{ij} and the proportion of native born in province i is deducted from the number of people living in province j in 2000 who were born in province i. In a few cases where the resulting figure turned out to be negative, it is taken as 0.000001 instead. The latter is not given the value of zero, so that logarithms can be taken. For the same reason, for those provinces not affected by the 1999 earthquakes, Q_j is taken as 0.000001 rather than zero.

The OLS estimates of the equations given in the previous section are presented in the first two columns of Table 5. All of the parameters are statistically significant and the R-square values for the two equations are 0.93 and 0.87. So the gravity model fits the data relatively well. Nevertheless we have tried other pull and push factors mentioned in the literature as well, such as the age distribution (median age), level of education (mean years of schooling), rate of urbanization, climate (average temperatures prevailing during the coldest and warmest months) at the origin, all relative to that at the destination, and the size of the originating province (its radius computed under the assumption that the province has a circular shape). However, as we have indicated in the previous section, none of these made a statistically significant contribution. The median age was considered because young migrants can expect a longer stream of wage differentials and stand to gain more from a move. The information acquisition and adjustment to a new environment should be easier and cheaper for the educated people and consequently would lead to higher emigration from provinces with higher mean years of schooling. That was the motivation behind trying the latter variable. Unfortunately, with macro data it was not possible to measure effects of these

variables separately because they are correlated with each other and with the unemployment variable already in the equations. Where unemployment rate is high, usually the median age and the education level are low. Urbanization level was considered because the extra urban amenities, such as health care and educational opportunities, gained by people moving from less urbanized areas are likely to be more. The idea behind the use of radius is that smaller localities are likely to have larger out-migration because it takes a shorter move to get out of the province than in larger provinces. Antalya and Muğla have very pleasant weather conditions, which attract many tourists, domestic and foreign. The temperature variables were considered to check whether some of the permanent moves to this area are motivated by favorable climactic conditions.

In addition to the variables that are considered, there may be factors specific to particular origins which can easily be missed. To make sure that such outliers did not contaminate our results, we estimated our equations also with robust regression procedures. Large differences observed across the two equations in case of some OLS parameter estimates, which were hard to explain, was another reason why we felt that the need to check their robustness. The last two columns of table 5 present the robust regressions. Indeed, the procedure identifies nine outliers for Antalya equation and two for Muğla, which are listed in the notes of the table. When these are taken into account, cross-equation differences between the parameter values narrows to sensible levels. We will base our analysis on the robust regressions which are more reliable, given the circumstances.

According to the estimation results, a percentage increase in the population of a province is expected to result in 0.52 percent more migration to Antalya and 0.60 percent more to Muğla. One percent increase in the distance of a province to the two provinces in question, on the other hand, causes 0.63 and 0.41 percent drop, respectively, in the number of migrants. A percent increase in the unemployment rate of a province (relative to that prevailing at the destination), leads to a 0.45 and 0.33 percent increase in the migration flows, respectively. Migration from one location to another leads to more migration in the future. Existence of expats from a particular province in Antalya and Muğla appear to have the same effect on the migration from that province. One percent increase in the number of people from an origin living in southwestern Turkey stimulates migration from that province by 0.38 - 0.39 percent. Likewise, it appears that the 1999 earthquakes have increased the migration from the provinces impacted to Antalya and Muğla about the same amount. Each percentage increase in the number of residences and businesses which suffered heavy quake damage in a province, translated into a little less than 0.02 percent increase in migration to Antalya and Muğla.

4. Conclusions

Lately Antalya and Muğla provinces located on the southwestern shores of Turkey have emerged as new migrant magnets in the country. We studied the immigration these receive from the remaining 79 provinces, and found that the gravity model explains it quite well. In some respects migration to these two provinces is similar to the migration to the traditional destinations. For example, Erjem (2009) reports that in a survey of migrants to İçel, a province on the Mediterranean coast bordering Antalya, only two percent indicated the more favorable climate of the province as a

motivating factor behind their move. More than 55 percent cited better job opportunities and about 30 percent their relatives who migrated earlier. We too found the desire to find a job or a better job, to be the main motivation behind the move to Antalya and Muğla and the immigrants living in these provinces as encouraging further migration. Also, the milder climates and natural beauties the two provinces offer attract many tourists to them, but not those who would like to settle there permanently. That can change soon though and Antalya and Muğla can become Turkish versions of Florida and Arizona in the U.S. People who spend their vacations there now may decide to move permanently later when they retire which is already occurring with foreign tourists. That distance is a hindrance to migration and that migration from a location is related to its population are also among our findings. The two major earthquakes in 1999 boosted migration to Antalya and Muğla from the northwestern provinces affected by them, but that is likely to be a temporary spurt.

In some other respects however migration to Antalya and Muğla differ from the migration to traditional destinations. It is fueled mainly by the increase in economic activity in tourism related businesses, such as restaurants and hotels, rather than industry. Also, the availability of urban amenities does not play a role in it. Our findings show that special pull and push factors play a role as well in the migration from certain provinces (listed in notes of Table 5 as outliers), which need to be studied further.

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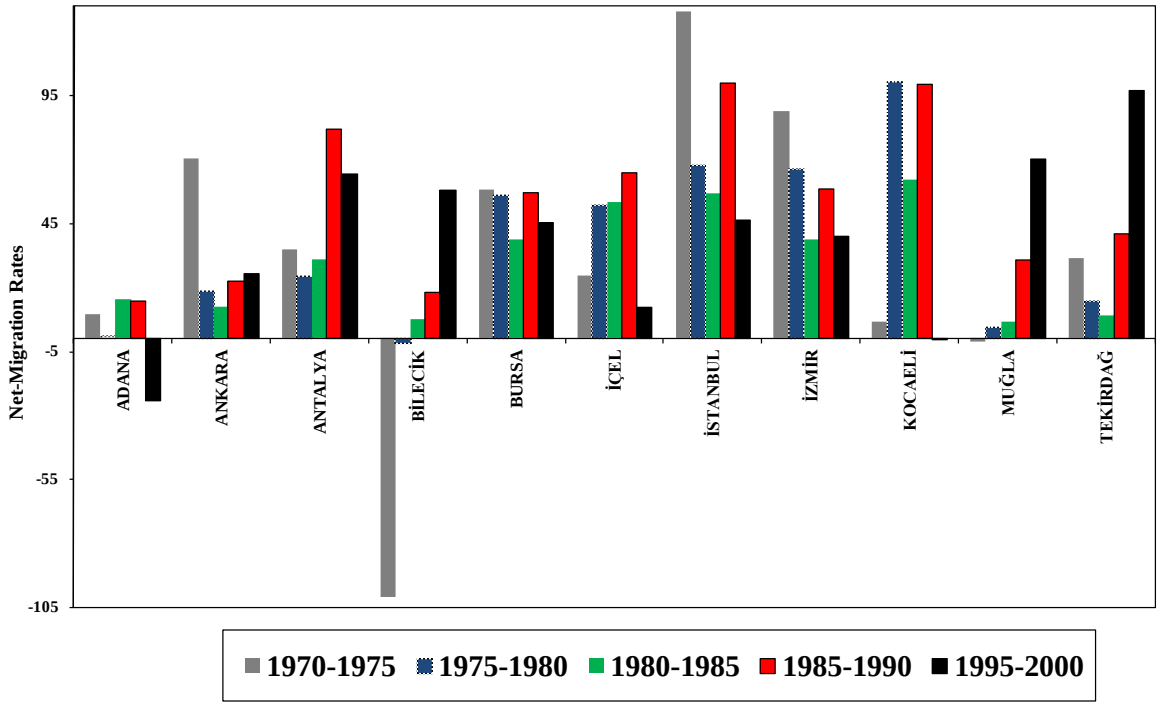
Figure 1
Net Migration Rates for Selected Provinces (per thousand)



Source:
Turkish Statistical Institute (Prime Ministry, the Republic of Turkey).

Table 1
Socio-Economic Characteristics of Selected Provinces in 2000

	Urbanization Rate (%)	Median Age (years)	Mean Years of Schooling	Net Migration Rate (%)	Per Capita Real GDP ('000 TL)	Unemployment Rate (%)
Turkey	64.9	24.8	5.4	-	1760.9	8.9
Adana	75.6	23.5	5.3	-2.4	1933.4	14.3
Ankara	88.3	26.8	6.8	2.6	2397.5	11.0
Antalya	54.5	28.1	6.1	6.4	1723.4	7.9
Bilecik	64.0	28.9	5.7	5.8	2959.5	4.7
Bursa	76.8	28.0	5.7	4.5	2401.1	9.3
İçel	60.5	24.6	5.4	1.2	1861.9	10.2
İstanbul	90.7	26.3	6.2	4.6	2645.3	12.7
İzmir	81.1	28.8	6.1	4.0	2680.1	10.8
Kocaeli	59.9	25.7	5.8	0.0	4376.8	8.3
Muğla	37.5	30.0	6.0	7.0	2663.2	4.3
Tekirdağ	63.4	28.6	5.8	9.7	2535.9	6.3

Notes:
In the computation of mean years of schooling for each province, 15, 11, 8, and 5 years of schooling are attributed, respectively, to university, high school, middle school, and primary school graduates in the province. Two years worth of schooling is attributed to those who are literate but not a graduate of any school. Children under age six are omitted in computing the mean. The net migration rates are for the 1995-2000 period. Per capita real GDP is in 1987 TL.

Source:
Authors' computations using data obtained from the Turkish Statistical Institute (Prime Ministry, the Republic of Turkey).

Table 2
Employment in Selected Provinces: Sectoral Breakdown and Annual Growth Rates

	Share (%)								Growth Rate (%)				
	Agriculture		Industry		Construction		All Services		Agriculture	Industry	Construction	All Services	Total
	1990	2000	1990	2000	1990	2000	1990	2000	1990-2000	1990-2000	1990-2000	1990-2000	1990-2000
Turkey	54.0	48.4	12.9	13.4	5.1	4.6	28.0	33.6	0.0	1.5	0.1	3.0	1.1
Adana	49.8	43.1	14.8	14.4	5.3	4.9	30.0	37.6	-3.0	-1.9	-2.6	0.6	-1.6
Ankara	18.2	16.3	14.3	13.4	7.2	6.4	60.2	63.9	1.1	1.6	1.0	2.9	2.3
Antalya	57.4	49.8	6.4	5.5	7.1	5.3	29.1	39.4	1.8	1.7	0.3	6.4	3.2
Bilecik	55.9	46.7	16.1	19.4	3.5	3.4	24.5	30.5	-1.7	1.9	-0.2	2.2	0.0
Bursa	40.5	33.6	25.8	28.2	6.2	5.0	27.6	33.3	0.4	3.2	0.0	4.3	2.3
İçel	55.4	57.7	8.9	7.9	6.6	4.5	29.1	29.9	2.5	0.9	-1.9	2.3	2.1
İstanbul	5.2	8.1	34.2	32.2	9.0	6.2	51.6	53.4	8.0	2.7	-0.4	3.7	3.3
İzmir	32.6	28.6	20.5	20.6	6.4	5.3	40.4	45.5	0.5	1.9	-0.1	3.0	1.8
Kocaeli	33.0	39.1	24.1	20.3	8.5	8.3	34.4	32.3	5.7	2.1	3.7	3.2	3.9
Muğla	61.1	55.1	7.8	6.0	7.3	4.9	23.9	34.0	1.5	-0.1	-1.5	6.2	2.5
Tekirdağ	47.5	38.8	16.9	26.2	6.6	4.1	29.0	30.9	0.4	7.0	-2.4	3.0	2.4

Source:
Authors' computations using data provided by the Turkish Statistical Institute (Prime Ministry, the Republic of Turkey).

Table 3
Real GDP in Selected Provinces: Sectoral Breakdown (%)

	Agriculture			Industry			Construction			All Services			Hotel and Restaurant Services		
	1990	1995	2000	1990	1995	2000	1990	1995	2000	1990	1995	2000	1990	1995	2000
Turkey	**25.7**	**25.8**	**24.9**	**17.2**	**18.9**	**20.6**	**5.3**	**5.4**	**5.0**	**37.5**	**41.7**	**46.6**	**2.0**	**2.3**	**2.6**
Adana	18.9	20.2	14.8	28.5	31.1	32.4	4.8	4.1	2.8	43.9	41.3	44.1	1.6	1.5	1.7
Ankara	5.3	4.2	4.1	16.6	16.6	16.2	13.4	12.4	10.8	61.9	62.5	60.8	1.8	1.9	1.9
Antalya	21.3	21.8	19.1	8.9	8.4	8.4	10.1	8.9	7.2	58.9	60.0	64.0	18.2	19.1	22.3
Bilecik	18.2	14.0	13.6	45.2	52.8	51.4	3.8	3.6	4.1	28.0	25.8	26.4	0.7	0.5	0.6
Bursa	17.3	13.4	9.7	36.0	40.0	42.1	6.4	6.2	4.2	34.2	35.5	36.9	2.2	2.4	2.4
İçel	20.1	15.8	20.9	27.8	27.9	23.6	6.2	5.7	2.8	40.1	44.2	45.7	3.1	3.4	3.5
İstanbul	1.1	0.8	0.5	34.5	37.3	37.5	4.9	4.3	4.3	52.9	53.6	52.4	4.3	3.6	3.8
İzmir	10.4	9.2	7.5	29.8	31.7	29.5	5.6	5.2	3.7	48.1	46.5	47.9	2.7	2.8	3.0
Kocaeli	3.0	2.8	2.3	56.7	55.6	50.9	4.3	3.7	3.3	22.7	23.2	24.6	0.7	0.6	0.7
Muğla	25.2	27.0	18.5	21.3	18.7	28.4	7.7	5.5	4.4	43.9	46.0	45.9	14.1	17.3	19.5
Tekirdağ	20.2	14.6	12.3	30.9	37.6	46.7	13.0	11.7	6.9	31.5	31.4	29.4	1.4	1.5	1.3

Source:
Authors' computations using data provided by the Turkish Statistical Institute (Prime Ministry, the Republic of Turkey).

Table 4
Real GDP in Selected Provinces: Sectoral Annual Growth Rates (%)

	Agriculture		Industry		Construction		All Services		Hotel and Restaurant Services		Total Real GDP	
	1990-1995	1995-2000	1990-1995	1995-2000	1990-1995	1995-2000	1990-1995	1995-2000	1990-1995	1995-2000	1990-1995	1995-2000
Turkey	0.6	1.7	4.5	4.0	1.6	0.5	3.7	4.3	4.4	5.3	3.2	3.9
Adana	2.9	-4.3	3.3	2.7	-1.9	-5.7	0.3	3.2	0.4	3.9	1.5	1.9
Ankara	-1.1	3.4	3.4	3.6	1.7	1.5	3.5	3.7	4.4	4.5	3.3	4.3
Antalya	6.5	0.2	4.9	2.7	3.3	-1.4	6.4	4.3	6.9	6.2	6.0	2.9
Bilecik	2.3	0.3	11.1	0.4	6.7	3.5	6.0	1.4	2.0	3.4	7.7	0.9
Bursa	-1.7	-1.6	5.6	6.0	2.6	-3.1	4.2	5.7	5.6	4.6	3.5	4.9
İçel	-2.1	8.6	2.9	-0.7	0.9	-10.5	4.8	3.4	4.7	3.3	2.8	2.7
İstanbul	-0.6	-8.0	5.9	4.4	1.3	4.3	4.5	3.8	0.8	5.1	4.2	4.3
İzmir	1.9	-1.5	5.8	1.3	2.6	-3.6	3.7	3.4	4.5	4.7	4.4	2.8
Kocaeli	2.7	-0.4	4.0	1.1	1.1	0.8	5.0	4.1	3.7	4.1	4.4	2.9
Muğla	5.9	-1.3	1.8	15.6	-2.2	2.0	5.5	6.4	8.9	9.0	4.5	6.4
Tekirdağ	-2.4	4.0	8.2	12.4	1.9	-3.3	3.9	6.3	5.2	4.6	4.0	7.7

Source:
Authors' computations using data provided by the Turkish Statistical Institute (Prime Ministry, the Republic of Turkey).

Table 5
Estimated Regression Equations

Variables	OLS Regressions		Robust Regressions	
	ANTALYA	**MUĞLA**	**ANTALYA**	**MUĞLA**
CONSTANT	1.730 (0.057)	- 2.236 (0.073)	1.454 (0.03)	- 1.508 (0.149)
RESIDENT POPULATION	0.486 (0.000)	0.883 (0.000)	0.521 (0.000)	0.605 (0.000)
DISTANCE	- 0.610 (0.000)	- 0.493 (0.000)	- 0.626 (0.000)	- 0.408 (0.000)
RELATIVE UNEMPLOYMENT	0.454 (0.000)	0.281 (0.065)	0.448 (0.000)	0.326 (0.010)
PAST MIGRATION	0.420 (0.000)	0.037 (0.064)	0.392 (0.000)	0.378 (0.000)
EARTHQUAKE	0.026 (0.000)	0.013 (0.045)	0.018 (0.000)	0.017 (0.003)

Notes:
All variables are in logarithms. For the definitions of variables, see Section 2. OLS (Ordinary Least Squares) regressions are estimated utilizing the REG procedure of SAS (2008) statistical package. **R-square** values for the two equations are **0.93 and 0.87**, respectively. The numbers in parantheses in each cell are the probabilities relevant to the t-test to decide whether the coefficient in the cell is equal to zero or not. Robust regressions are estimated using the same statistical package's ROBUSTREG procedure. More specifically, the least trimmed squares (LTS) method developed by Rousseeuw (1984), Rousseeuw and Van Driessen (2000) and Zaman et al. (2001) is selected. The following observations are picked by the algorithm as outliers: Ankara, Bolu, Giresun, Hatay, Kahraman Maraş, Tunceli, Van and Yalova, in theAntalya equation, and Hakkari and Kocaeli in the Muğla equation. The parameter values reported in the last two columns of the table are the final weighted least squares (FWLS) estimates. The numbers in parantheses in those columns are the probabilities relevant to the Chi-square test to decide whether the associated coefficient is equal to zero.

Source:
Author's computations using data described in section 3.