



Econometric Analysis of Effective Socio-Economic and Educational Variables in Migration*

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ABSTRACT

Purpose: There is a significant educational migration in Turkey, and if life satisfaction is not improved, it is expected that this migration may increase. The aim of this study was to determine the impact effective socio-economic and educational variables in migration using life satisfaction survey data of Turkish Statistical Institute, and to calculate the numerical coefficient values of these variables to be used by policy makers for investments.

Research Methods: Two types of econometric models were used to determine the effective variables in migration. Outlier observations were detected, and their negative effects were corrected with the help of robust regression methods. This paper provides evidence of how outliers changed the statistics and test results. In addition, multicollinearity corrected estimates were calculated.

Findings: The most significant variables in migration were the gross domestic product per capita and education variable. Using life satisfaction index values, educational and related migrations can be reduced. This paper also provides evidence of how outliers in data changed the statistically significant variables, estimates, normality and heteroscedasticity in the test results.

Implications for Research and Practice: Migration can be reduced by increasing life satisfaction and lowering dissatisfaction in essential and non-essential municipality service variables. Using the methods in this paper and using future indices that are going to be published it is possible to take countermeasures for migration using models with higher explanatory power.

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Introduction

Migration can be defined as a short, medium or long-term displacement act that is carried out in order to settle in a place or to return to another place. Education, economic reasons, marriage, job changes, appointment, retirement, relocation of the family are individual reasons; and social differences between the regions, rapid population growth, declining agriculture sector, politics, security, blood feud, custom/honor problems are other reasons for migration in Turkey (Anavatan, 2017; Cetin & Cetin, 2018; Kocak & Terzi, 2012; Ozdemir, 2018; Ozdemir, 2012; Sevinc, Davran, & Sevinc, 2018; Taskin & Erdemli, 2018; Yakar & Saracli, 2010). Educational migration to cities increases in Turkey, because the number of high schools and universities increases there (Isik, 2009). In addition, trained individuals migrate if they cannot utilize the education they receive in their current location (Pazarlioglu, 2007). Especially after 1990, the number of students studying in universities increased and education has become a major cause of migration in Turkey (Isik & Ugras, 2018). The most significant factors which affected the internal migration decision of individuals in Turkey are education and the appealing force of people who migrated before (Ciftci, 2011; Ercilasun, Gencer, & Ersin, 2011). Educational migration is also increasing throughout the world, and it is very important for any economy because it implies several benefits as economic growth, higher labor market participation, extra income, new technologies, and innovation (Hawthorne, 2010). Therefore, this topic has to be analyzed scientifically.

Table 1

Migrating Population and its Ratio by Migration Causes, 2011.

The reason for migration	Migrating population	Migration rate (%)
Migration dependent on the members of the family	916'761	41.50
Education	498'137	22.60
Assignment / business change	295'906	13.40
Job seeking / finding	268'400	12.20
Marriage / Divorce	166'284	7.50
Health	22'649	1.00
Other	39'115	1.80
Unknown	593	0.03
Total	2'207'844	100.00

Source: TURKSTAT (2013a).

Education promises a higher income for future; therefore, indirectly it is an economical migration. In Table 1, migrated population and its rates in 2011 influenced by economic reasons are education (22.6%), seeking/finding a job (12.2%), health (1.0%), and their sum is 35.8%. In addition, migration dependent on one of the members of the family (41.5%) is also the indirect result of previously mentioned economic reasons (Turkish Statistical Institute [TURKSTAT], 2013a). The point to be noted in this table is that migration due to education is high. A similar survey in 2013, carried out by Hacettepe University Institute of Population Studies (HUNEE) and only

applied to women yielded that migration due to education is 10.7% in women population (HUNEE, 2015). Comparing 22.6% (women and men) to 10.7% (of only women) migration due to education it can be estimated that men migration is more than 22.6% of the migrating men population. In Isik (2009) for the 1995-2000 period, only 8.8% of the total immigration received by Istanbul was for education purposes, while this rate was 10% in Izmir and 17% in Ankara. When the distribution of the population who migrated between the provinces in the 1995-2000 period according to the reasons for immigration is examined, 26% depended on a family member, 20% job seeking, 13% appointment, and 12% migrated for school learning purposes. Comparing these numbers with Table 1, educational migration increased 10.6% in eleven years. From these surveys, it can be concluded that educational reasons are important in internal migration, and it is represented by a separate variable in this paper.

The following papers investigate migration with educational variables in the model. Ondes and Kizilgol (2020) examines the effect of push and pull factors of internal migration for the period 2008-2017 with spatial panel data models; and note that underdevelopment, especially in the field of health and education, has been the most important problem of the regions that emigrate. Cetin and Cetin (2018) carry out a panel data analysis for 2008-2013, and find that per capita income and education services affect migration positively while employment rate of the agricultural sector and inflation rate affect migration adversely. Tatoglu (2017) investigates the determinants of net migration using ordered panel logit regression for 2008-2014 period. The results show that with the increase in the number of universities in the region, the region does not let out immigrants in terms of education, but starts to let in immigrants; therefore, this is a factor that reduces the net migration rate. Albayrak and Abdioglu (2017) investigates the main factors that affect migration between provinces in Turkey using principal components regression analysis for the year 2015. According to the results, the rise in the rate of faculty and college graduates increases the amount of migrations the province receives. Ducan (2016) uses a panel regression analysis and finds the coefficient of the education variable to be positive and statistically significant. This reveals that the increase in the schooling rate at the secondary school level increases the migration from the cities. Ercilasun et al. (2011) using ordinary least squares (OLS) for 2010 find that the most important factor influencing internal migration is the attractive power of those who have migrated before. They also state that the decision to migrate depends on the high capacity of the universities in the provinces. Albayrak and Abdioglu (2016), Ciftci (2010), Gullupinar (2012), Dogan and Kabadayi (2015), Sigeze and Balli (2016) also find educational migration to be statistically significant. In addition to these statics for the whole population, there are also papers that find educational migration for provinces to be important.

Literature and statistics presented in previous paragraphs imply that there is a significant educational migration Turkey. In addition, digital age products (machinery, robots, computers, artificial intelligence) and two types of workers exist today. There are qualified workers who have special skills that cannot be replaced by these products, and there are unqualified workers who do not have specific skills that

can easily be replaced on the labour market (Berg, Buffie, & Zanna, 2016). Human labour is increasingly replaced by capital input or robots, and government policymakers should try to prepare their countries for the future and focus on education policy (vocational and professional training, re-training). This implies that good education policies are more important than ever in the digital age as employment and requirements on workers may change rapidly (Becker, 2019). New policies also have to consider educational migration; otherwise, this type of migration may increase even more. This paper identifies the statistically significant socio-economic and education variables with their numerical coefficient values to be used by policy makers. Policymakers will have the choice to decrease educational migration and other types of migration using life satisfaction survey data of TURKSTAT in most cost-effective way.

From a different point of view, the main reason behind migration is the poverty (dissatisfaction) in terms of some socio-economic and educational variables. Lack of satisfaction brings migration movements. Turkey is a developing country and has not reached life satisfaction index values of those in advanced countries. Due to the scarcity of resources, all index values may not be raised to the level of developed countries at the same time. In this case, policy makers have to be provided with the effective variables that need to be invested in and variables that have no influence in order to use the scarce resources available more efficiently. How an increase in satisfaction in educational level, a decrease in differences between regional educational index values, and an improvement in index values of socio-economic variables will affect migration or overall life satisfaction are the subjects of this paper.

The cases of the existence of outliers in data and multi-collinearity between independent variables are not investigated in the previous literature. This study is an example of how the results change in this case, and it calculates more reliable results using robust regression techniques that are not frequently used in the literature. In addition, the number of independent variables used in the models are more than the ones in the previous literature. While multi-collinearity makes statistically significant variables hard to detect, estimates in presence of outliers give biased estimates or result in incorrect significant variables, which is discussed in the following sections of this paper. With the method used in this paper, predictions can be updated with new data in the future; more effective predictions can be made, and new satisfaction indexes with more variables can be prepared by statistical institutions. In this way, best unbiased estimators (BUE) with more power can be obtained and not only hypothesis for education but other hypotheses that are outside of the scope of this paper can be answered. Policies aiming to reduce migration using the results from this paper will be more cost efficient and effective.

Method

Research Design

This study employed quantitative research methods to measure the correlation between migration and independent (socio-economic and education) variables. For this aim, robust regression method by Rousseeuw and Leroy (1987) and

multicollinearity adjusted variables by Gujarati (2004) were used as design to obtain the statistically significant effective variable magnitudes. The results enabled to test hypothesis related to socio-economic and education variables in migration. Using the results, the amount of migration reduction was calculated.

Research Sample

All of the variables used in this paper came from TURKSTAT for 81 provinces in Turkey. The dependent variable was net migration rate (‰) for the years 2012-2013 from TURKSTAT (2016a), the independent variable was GDP per capita (TL) for the year 2014 from TURKSTAT (2016b), and other independent variables were the life satisfaction index values from TURKSTAT (2013b). The index values were between 0 and 100 and thus indicated the possibility of multi-collinearity.

$$Y = \beta_1 X_1 + \beta_2 X_2 + \beta_3 X_3 + \beta_4 X_4 + \beta_5 X_5 + \beta_6 X_6 + \beta_7 X_7 + \beta_8 X_8 + \beta_9 X_9 \quad (1)$$

Table 2

Variables in the model.

X_1 : GDP per capita (TL)
X_2 : GDP per capita (TL) square
X_3 : Health services
X_4 : Educational services
X_5 : Public safety services
X_6 : Transportation services
X_7 : Main water service
X_8 : Public transport service
X_9 : Street sign and outside door numbering services

For the model given in (1), the dependent variable migration rate, Y ; the independent variables GDP per capita and life satisfaction index values, X_i ($i = 1, \dots, 9$) used in the analysis are given in Table 2. The reasons for including these variables were as follows. In literature and statistics presented in the previous part, economic reasons for migration were important; therefore, GDP per capita was included in the model. GDP per capita (X_1 and X_2) was used to measure the nonlinear economic effect with positive expected relation to migration. Turkey has an aging population with steadily declining birth rates (Gonder, 2017). Especially in the provinces with aging population that needs care or in the provinces with inadequate health services (X_3), people will be inclined to migrate. Educational services (X_4) that satisfy people are generally found in big cities and the information in introduction part required this variable to be included in the model. Besides poverty, lack of public safety services (X_5) is a significant variable in eastern or south-eastern part of Turkey, because security topics caused a migration in Turkey (Sigeze & Balli, 2016). Transportation services (X_6) are important for production and people transfer to other places; if people have difficulty of bringing their goods to markets or frequently travel to same places, they will tend

to move to the destination places. Main water service (X_7) is a proxy variable for the development level of the province because water resource activities comprise a large part of infrastructures in the city (Yevjevich, 1992). Public transport service (X_8) and street sign and outside door numbering service (X_9) variables are proxies for quality services in the city, which may not be statistically significant for small cities, where everybody can walk to their destinations or know most of the places in the city. For all the index values used as independent variables, the expected coefficient values were positive.

Data Analysis

There is one paper that uses outlier detection in the literature about migration. Yorulmaz (2009) uses robust regression method for the year 2000 to show estimates of OLS and the least trimmed squares (LTS) regressions using only the gross domestic product (GDP) variable in the model. It illustrates how the outcomes/results change in the presence of outliers. However, the number of independent variables is one; model specification bias can be the subject of question. There are studies that are similar to this paper, but in these studies important variables are not incorporated in the model, multicollinearity is not investigated, or outliers are not analyzed.

Almost all of the previous studies on this subject used a non-robust method to make a scientific inference. This paper also used the ordinary least squares (OLS) to estimate and to identify statistically significant variables. The reason for using OLS method is that under the assumption of normality, OLS values are the best-unbiased estimators and give estimates that are closest to the population parameter values (Gujarati, 2004). Even though a large number of variables were used in this paper, very rarely effective variables not included in the model or missing data might cause outliers. Outlier values adversely affect OLS estimates, and even one observation can cause a substantial deviation from the population parameter values (Kiraci, 2013; Rousseeuw & Leroy, 1987). Robust regression methods are used to correct the negative impact of outlier values. This paper used the least median squares (LMS) method developed by Rousseeuw and Leroy (1987) to identify the outliers. Shortly, first OLS estimators were obtained then using PROGRESS the outliers were detected, and finally OLS estimates without outliers were recalculated.

The existence of a large number of independent variables leads to the problem of multi-collinearity among these variables. If the degree of multi-collinearity increases, then the standard deviation of the coefficient's increases by the variance-inflating factor (VIF) amount. This decreases t -statistic and makes the coefficient of significant variables statistically insignificant. The VIF values can be calculated from the equation (2) with the coefficient of determination, R_{aux}^2 , obtained by auxiliary regression (Gujarati, 2004). In this way, the effect of multi-collinearity is eliminated, and the correct t -statistics are calculated.

$$VIF = \sqrt{1/(1-R_{aux}^2)} \quad (2)$$

Results

The results suggest that GDP per capita is one of the main variables affecting migration, but as explained in the previous parts, other variables are also influential. If these variables are not included in the model, then model specification bias might cause biased estimates (Gujarati, 2004). Therefore, all possible social variables that lead to migration were included in the model to identify all possible factors for net migration and the effect of education on migration. In the following models, all observations were first kept in the data then outlier analysis was performed. After detecting the outliers, the regression was repeated without outliers and multi-collinearity corrected statistics were calculated.

Table 3

Regression with Satisfaction Index Data

R^2	0.4368						
Obs.	81						
ANOVA	<i>df</i>	<i>SS</i>	<i>MS</i>	<i>F</i>			
Regression	9	5130.90	570.100	6.118			
Difference	71	6616.32	93.188				
Total	80	11747.21					
	<i>Coeff.</i>	<i>Std. Err.</i>	<i>t-stat.</i>	<i>p-value</i>	R_{aux}^2	VIF	<i>C. t-stat</i>
Constant	-36.0223	15.2283	-2.3655	0.0207			
X₁	4.9535	1.0365	4.7793	0.0000	0.9731	6.1018	29.1623
X₂	-0.0873	0.0223	-3.9103	0.0002	0.9709	5.8579	-22.9059
X ₃	-0.2455	0.3652	-0.6723	0.5036	0.8371	2.4776	-1.6656
X₄	0.9353	0.3567	2.6220	0.0107	0.8726	2.8020	7.3467
X ₅	-0.2238	0.3857	-0.5804	0.5635	0.8484	2.5687	-1.4908
X₆	-0.7165	0.3722	-1.9251	0.0582	0.8915	3.0354	-5.8435
X₇	0.3271	0.1586	2.0620	0.0429	0.7208	1.8926	3.9025
X ₈	-0.1426	0.1801	-0.7920	0.4310	0.7323	1.9328	-1.5307
X ₉	-0.1601	0.1945	-0.8231	0.4132	0.8055	2.2677	-1.8665

Note: "C. t-stat" is multi-collinearity corrected t-statistics.

Regression results using satisfaction index data, including suspicious observations are given in Table 3. The variables of GDP per capita, educational services, and water services were statistically significant. Multi-collinearity between independent variables can be examined by auxiliary regression. As the index values were between 0 and 100 this increased multi-collinearity, and the values of R^2 were between 0.7208 and 0.9731 (Table 3, R_{aux}^2). This also increased the amount of variance at the VIF rate and reduced the significance of the variables. This variance increase can be corrected

by the corrected *t*-statistics. When the corrections were applied, the transportation services became also statistically significant.

According to Table 3, Jarque-Bera statistics was 74.901 (*p* value 0.0000) and white heteroskedasticity test was 43.64372 (*p* value 0.8167). The presence of one or more outliers causes the test to reject normality (Darne & Charles, 2011; Gel & Gastwirth, 2008). Using the results of this table, hypothesis testing was not possible. Non-normality implied that the regression model might not be correctly identified and there might be outliers in the model.

When the OLS standardized residuals were examined, six observations (Cankiri, Gumushane, Mus, Tokat, Tunceli, and Yozgat out of 81 provinces) were detected as outliers. However, Rousseeuw (1984), Rousseeuw and Leroy (1987) prove that outliers affect the results of regression and hence the estimates in Table 3 were unreliable. For this reason, when outliers were detected using PROGRESS, nine observations (Ardahan, Cankiri, Giresun, Gumushane, Mus, Tokat, Tunceli, Yalova, and Yozgat out of 81 provinces) were identified as outliers. It should be noted that Ardahan, Giresun and Yalova were identified as additional outliers. This is an indication that outliers mask other outlier observations and affect the results.

Table 4

Regression with Satisfaction Index Data without Outliers.

<i>R</i> ²	0.6456						
Obs.	72						
ANOVA	<i>df</i>	<i>SS</i>	<i>MS</i>	<i>F</i>			
Regression	9	3196.768	355.1964	12.55			
Difference	62	1754.609	28.30015				
Total	71	4951.377					
	<i>Coeff.</i>	<i>Std. Err.</i>	<i>t-stat.</i>	<i>p-value</i>	<i>R</i> _{aux} ²	<i>VIF</i>	<i>C. t-stat.</i>
Constant	-28.2759	8.5055	-3.3244	0.0015			
<i>X</i> ₁	3.3747	0.6089	5.5426	0.0000	0.9748	6.3020	34.9297
<i>X</i> ₂	-0.0559	0.0130	-4.2867	0.0001	0.9728	6.0683	-26.0132
<i>X</i> ₃	-0.5612	0.2240	-2.5058	0.0149	0.8445	2.5357	-6.3538
<i>X</i> ₄	0.6137	0.2052	2.9905	0.0040	0.8701	2.7743	8.2964
<i>X</i> ₅	0.0319	0.2235	0.1429	0.8868	0.8532	2.6097	0.3729
<i>X</i> ₆	-0.2161	0.2263	-0.9549	0.3433	0.8998	3.1592	-3.0168
<i>X</i> ₇	0.3821	0.0932	4.1018	0.0001	0.7355	1.9444	7.9753
<i>X</i> ₈	-0.0921	0.1026	-0.8976	0.3729	0.7219	1.8964	-1.7022
<i>X</i> ₉	-0.3110	0.1112	-2.7964	0.0069	0.8016	2.2449	-6.2778

Note: "C. *t-stat*" is multi-collinearity corrected *t*-statistics.

The outliers differed from other observations in the model because they were influenced by other variables, which might not be included in the model. In the analysis, outliers were treated differently in robust regression literature. The outliers were deleted from the data then OLS was reapplied, and the results in Table 4 were obtained. If the problem of multi-collinearity is taken into consideration, seven variables become significant.

According to Table 4, Jarque-Bera statistics was 1.4843 (p value 0.4768) and white heteroskedasticity test was 57.56743 (p value 0.3100). All of these statistics implied that the regression model might correctly be identified, and the estimators were BUE. All the variables except the transportation services, public safety services, and public transportation services were statistically significant. When multi-collinearity was examined between independent variables, transportation services variable became statistically significant. The coefficient of determination was a high value, 64.6%.

Comparing Table 3 including outlier observations with Table 4 without outlier observations, the explanatory power of the model in Table 4 was 20.9% higher. There were changes in the coefficients of estimators. Statistically significant variables in Table 3 were more significant in Table 4. The variables X_3 and X_9 were not significant in Table 3 but had become highly significant in Table 4, because outlier provinces masked the significance of these variables in the results. In addition, the residuals were non-normal in Table 3, which made hypothesis testing impossible; but in Table 4, the residuals were normal, which made the estimates BUE.

The results in Table 4 suggested that a province with 1000 TL higher per capita income would have approximately 0.136% ($=3.3747-2*0.0559*18.056$) higher migration than for the provinces near to average per capita income of 18056TL. For example, the minimum per capita GDP value is 7828TL and the maximum value is 39467TL. If per capita GDP is increased 31639TL for the lowest province, then migration will decrease by 4.3%, which is higher than the maximum migration value of 2.464% for small province. Reducing the income gap decreases migration.

Provinces with high satisfaction for educational services (X_4) pulled migration by 0.06137% for each point of higher satisfaction. For example, the minimum index value was 48 and the maximum value was 88 for education. If satisfaction education services was increased by 40 points for the lowest province, then migration would decrease by 2.4548%, which was very near to the maximum migration value of 2.464% for a small province. Provinces with high satisfaction for main water service services (X_7), which represented essential municipal services for life, for each point of satisfaction pulled migration up by 0.03821%, which was less than educational satisfaction. Satisfaction in essential municipality services would decrease migration.

It was expected that if health services satisfaction (X_3) was high in a province, then migration would be towards this province; however, this coefficient was negative. The reason for this was that in the developed provinces where there was net positive migration, satisfaction of health services was low. This variable represented the perceived health status of people. Therefore, if people felt healthy, they would migrate to other provinces, and hence the coefficient was negative.

Street sign and outside door numbering services (X_9) variable, which is a proxy variable for non-essential municipal services for life, had a negative coefficient. Economic, educational and essential municipal services for life were dominant in migration, which made this variable less significant. Mainly small provinces in the western part of Turkey had a high X_9 value and small provinces in the eastern part of Turkey had a low value. Therefore, on the average, most migration was from the small provinces with high X_9 values to the big provinces with low value. The same conclusion can be applied to transportation services satisfaction (X_6). Public safety services (X_5) and public transport service satisfaction (X_8) were not statistically significant and had no effect on migration. Usually, public safety services are good where crime is high and people would not move to places where crime is high, also migration due security has a low percentage. In addition, people would not leave the places where public safety is good even when crime is high, which makes this variable ineffective.

Discussion, Conclusion and Recommendations

The results of the models suggest that economic, educational and some essential municipality services are very effective in migration. The same conclusion is supported by TURKSTAT (2013a) in Table 1 and HUNEE (2015) studies. According to models with satisfaction data, closing the per capita GDP gap between provinces will decrease migration between 0.136%-0.1516% for each 1000 TL increase in per capita GDP near to average per capita income of 18056TL.

Education is also a highly statistically significant and effective variable in migration. As education satisfaction increases in a region, this pulls (increases) migration to that region. When Table 4 was examined, when the education index increased by 10 points for a province, this increased net migration by 0.61% to that place. The largest education index value was 88.9, and the lowest index value was 48.2. If the index with the lowest of the province was increased to the highest value, this would reduce migration by 2.45% to this province, which was very near to the maximum migration value of 2.46% among small provinces. Only five provinces had a higher migration rate than this number. In this way, net migration from small provinces can greatly be reduced.

If migration is to be reduced in a cost-effective way, investments in education have a direct effect in reducing migration by increasing satisfaction and decreasing dissatisfaction in educational services. Indirectly, these investments will increase per capita income in the provinces, which will decrease migration further. Both of these variables may eliminate the structural migration problem of Turkey; frictional migration may continue. Turkey attaches great importance to the development or opening of universities in each province, and this is an important effort to reduce this migration.

Essential and some non-essential municipality services are also statistically significant variable in migration. However, they are not as effective as economic or

educational factors. Other statistically significant variables in migration are health services, transportation services, network water services, street signs, and external door numbering services. Future indices that are going to be published by TURKSTAT, the variables identified in the literature in this paper and the model introduced in this paper can be used to take measures against migration with models with higher explanatory power.

Life satisfaction index values from TURKSTAT are subjective happiness perception of individuals in Turkey measured using surveys. Problems in results for surveys between regions also apply to the results of this paper. Municipal services' results under general public services cover the services of all municipalities within the provincial borders; therefore, this paper provides results only for regions with municipalities. Although the models used in this paper had high coefficients of determination, the fact that the independent variables that are index data are not of measurable units may have been a hindrance to better results. Index values are in the range between 0-100, which causes multicollinearity and decreases the significance of some coefficients, but in this paper they were corrected using VIF. Using the results from this paper, future survey questions can be modified to decrease multicollinearity among variables. OLS and robust regression results differed slightly, but robust regression results were BUE. Therefore, it should also be stressed that the conclusions of this paper are valid for non-outlier observation provinces, data with outlier provinces need additional independent variables, but this will decrease the degrees of freedom of the model.

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Göç Üzerinde Etkili Sosyo-Ekonomik ve Eğitim Kaynaklı Göç Değişkenlerinin Ekonometrik Analizi

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Özet

Problem Durumu: Türkiye’de eğitim kaynaklı bir göç mevcuttur ve bunun artma olasılığı bulunmaktadır. Göç konusunun arkasında yatan önemli sebepler insanların içinde buldukları ortamda bazı sosyo-ekonomik veya eğitim değişkenleri açısından memnuniyetsizlik içinde olmalarıdır. Göçün nedenleri olarak insanları doğdukları yerden ayrılmaya zorlayan itici faktörler (memnuniyetsizlikler) olduğu gibi onları göç alan mekanlara çeken faktörler (memnuniyetler) de vardır. Göçler sonucu göç kaynağı bölge ve göç edilen bölge sosyo-ekonomik olumsuzluklar yaşamaktadır. Eğitim ya da başka sebeplerden ötürü göçü azaltma çabası durumunda göçü en etkin ve verimli biçimde azaltmak için sayısal göstergelere ihtiyaç duyulmaktadır. Daha önce konu ile yapılmış çalışmalar mevcuttur, fakat hiçbiri aykırı değer (sonucu oluşabilecek sapmalı tahmin) ve çoklu-doğrusallık (sonucu etkili olmayan değişkenler) problemini dikkate almamıştır. Bu çalışma, göç üzerinde etkili değişkenleri tespit etmekte, eğitim kaynaklı göçün istatistiksel olarak anlamlılığını ve etkisini incelemektedir.

Araştırmanın Amacı: Bu çalışmanın amacı, ekonometrik analiz yaparak göç üzerinde etkili sosyo-ekonomik değişkenleri ve büyüklüklerini tespit etmek, özel olarak eğitim değişkenlerinin göç üzerinde istatistiksel olarak anlamlılığını sınamaktır. Bu büyüklükler tespit edildikten sonra göçü verimli bir biçimde azaltmak için öneriler sunmaktır. Bütün bu analizleri aykırı değerleri ve çoklu-doğrusallığı dikkate alarak yapmaktır.

Araştırmanın Yöntemi: Etkili değişkenleri tespit etmek için çeşitli modeller ve yöntemler kullanılmıştır. Bu çalışmada en küçük kareler (EKK) yöntemi tahmin etmek ve bilimsel çıkarımda bulunmak için kullanılmıştır. Normallik varsayımı altında EKK en küçük sapmasız tahmin edici olması sebebi ile anakütle değerlerine en yakın tahminleri verebilmektedir. Çok sayıda değişken kullanılmasına rağmen çok nadiren etkili değişkenlerin modelde olmaması veya veri olmaması sebebi ile konulamaması aykırı değerlere (outlier) sebebiyet vermektedir. Aykırı değerler EKK tahminlerini olumsuz etkilemekte ve anakütle değerlerinden çok büyük sapmalara sebebiyet verebilmektedir. Bu duruma karşı Rousseeuw ve Leroy tarafından geliştirilen en küçük ortanca kareler (EKOK) yöntemi kullanılmaktadır.

Konu ile ilgili yazın taranmakta ve değerlendirilmektedir. Türkiye’de 1950’lerden sonra göçe sebep olan bütün değişkenler bu çalışmada kişi başına GSYH, sağlık,

eđitim, asayiş, ulařtırma, řebeke suyu, toplu tařıma, sokak levhaları ve dıř kapı numaralandırma hizmetleri deęiřkenleri olarak ifade edilmektedir. Analizde kullanılan baęımlı deęiřken olan net g oranı (%) 2012-2013 yılları, baęımsız deęiřken kiři baři GsYH (TL) 2014 yılı ve diđer btn baęımsız deęiřkenler olan yařam memnuniyeti endeksi TK internet sayfalarından elde edilmiřtir. Endeks deęerleri 0 ve 100 arasında bulunmakta, bu durum oklu-doęrusallık olma olasılıęını gstermektedir.

ok sayıda baęımsız deęiřken olması baęımsız deęiřkenler arasında oklu-doęrusallık sorununu ortaya ıkarmaktadır. oklu-doęrusallık mkemmele yaklařıka katsayıların standart sapması varyans Őiřme faktr (VIF) kadar artmaktadır. Bu durum *t*-istatistięini anlamsız yapmakta ve anlamlı olan deęiřkenlerin katsayısını anlamsız ıkmaktadır. Yan regresyon yaparak buradan elde edilen yan regresyon belirlilik katsayısı ile VIF deęerleri hesaplanabilir. Bu sayede sonu tablolarında oklu-doęrusallıęın etkisi elenerek gerek anlamlı *t*-istatistikleri verilebilmektedir.

Mevcut verilerin uygun yıllar iin olanları kullanılarak farklı modeller sunulmaktadır. Karřılařtırma yapabilmek iin alternatif model sonuları da tretilmektedir. Etkili olan deęiřkenler iinden eđitim sebebi ile g edenlerin g üzerindeki etkisi incelenmekte ve elde edilen deęiřkenler sonucunda g azaltmak iin politika onerileri sunulmaktadır. Kaynakların daha verimli kullanılabilmesi ve i g sorununu azaltmak iin kısa vadede etkili deęiřkenler tespit edilerek uzun vadede de bu deęiřkenlerin etkisi kullanılarak i g dřrme iin zm onerileri uygulanabilecektir.

Arařtırmanın Bulguları: Arařtırmada kullanılan birok deęiřken ve eđitim istatistiksel olarak anlamlı ıkmaktadır. Ekonomik, eđitimsel ve belediyelerin sunduęu zaruri ve bazı zaruri olmayan hizmetler g yaratan deęiřkenler olarak tespit edilmiřtir. Aykırı deęerler ve kullanılan baęımsız deęiřkenlerin sayısının ok olmasından tr oklu-doęrusallık tespit edilmiřtir. Bu sorunu ařmak iin alternatif modeller ve deęiřkenler (tretilerek) kullanılarak tahmin yapılmıřtır.

Analiz yntemi aısından literatrde yer alan benzer bir tane alıřma ile karřılařtırıldıęında bu alıřmanın daha fazla deęiřken iermesi sebebi ile model verideki sapmayı daha fazla aıklayabilmekte ve daha sapmasız tahminler yapabilmektedir. G ile ilgili yapılmıř diđer modellerin aıklayabilirlięi incelendięinde; daha yksek aıklayabilirlięe sahip modeller mevcuttur. Bu modeller ok sayıda deęiřkenle modeller kurup bu alıřmadan daha yksek aıklayabilirlięe ulařmıřtır. Fakat aykırı deęer analizi yapılmaması sonuların sapmalı olma ihtimalini doęurmaktadır ve bu makalelerde eđitim deęiřkeni diđer deęiřkenlerin iinde deęerlendirildięi iin eđitimin etkisi tespit edilememektedir. Bu alıřmada kullanılan modeller yksek belirlilik katsayısına sahip olmalarına raęmen kullanılan endeks verileri aynı yılın verileri olmaması sonuların daha iyi olması ynnden engel oluřturmuř olabilmektedir. Elde edilen sapmasız en iyi tahminler sadece aykırı deęer olmayan gzlemler iin geerlidir.

Eđitim gc zerinde etkilidir. Bir blgede eđitim memnuniyeti arttıka oraya gc artmaktadır. Eđitim endeksinin 10 puan artması net gc %0.61 arttırmaktadır. En byk eđitim endeks deęeri 88.9 ve en dřk endeks deęeri 48.2 olduęu dřnldęnde en dřk ilin endeks deęerini en yksek ile ıkarmak o ilin gcn %2.45 azaltacaktır. Kk illerde en byk gc deęeri %2.46 olmakta ve sadece beř ilde bu rakamdan daha yksek bir gc oranı bulunmaktadır. Bu sayede kk illerden kaynaklı net gc byk lde azaltılabilir.

Arařtırmanın Sonuları ve nerileri: Gcte en nemli deęiřkenler ekonomik gsterge olan kiři bařına GSYH ve eđitim olmaktadır. Belediyenin sunduęu zaruri ihtiyaları karřılayan hizmetler de gcde etkilidir. Zaruri ihtiyaların karřılandığı, memnuniyetin yksek olduęu illere gc edilmekte, memnun olunmayan iller gc vermektedir. Eđitim memnuniyetini arttırmak veya memnuniyetsizlięi dřrmek eđitim yatırımları ile mmkn olmaktadır. Eđitim yatırımlarının artması doęrudan gc azaltacaktır. Buna ilaveten, dolaylı olarak yatırım yapılan illere gelir saęlayacaęı iin kiři baři GsYH artacak gc azalacaktır. Bu sebeple, eđitim yatırımları belediye yatırımlarında daha etkili olabilme tahmininde bulunabiliriz. Trkiye'nin her ilinde niversitelerin aılmasına ve geliřtirilmesine nem vermek bu gc azaltmak iin nemli bir abadır. Bu alıřmada belirlenen katsayılarla daha verimli biimde memnuniyetleri arttırmak ve memnuniyetsizlikleri dřrerek gc azaltılabilir. Aynı durum kullanılan dięer deęiřkenler iin de sylenbilir. Bu alıřmada kullanılan yntemler ve gelecekte yayınlanacak endeksler ile daha yksek aıklayabilirlięe sahip modellerle tahmin yapmak mmkn olabilecektir.

Anahtar Kelimeler: Eđitim, dayanıklı baęlanım, oklu-doęrusallık, aykırı deęer, yařam memnuniyeti