Chapter 6

Migration and Economic Growth in USA

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Abstract

The purpose of this study is to analyze the relationship between economic growth, capital, labor and migration in the USA by using the COBB-Douglas production model. In the study, the stationarity of the variables was examined first. A cointegration relationship was found between the variables through the ARDL estimates, based on empirical evidence. In the final stage of the empirical analysis, the causality relationship between the variables was analyzed by the VECM Granger causality test. A two-way causality between capital and economic growth was found. In addition, a unidirectional causality from migration to economic growth and from economic growth to labor was identified. It is concluded that migration is a factor that stimulates the US economy, and the policies that policy makers will implement for migrants will guide the country's economy in the short-term and long-term.

1. Introduction

Migration is usually defined as the temporary or permanent movement of a person or a group from one geographical location to another, along an administrative or political border. Movements within a country are usually defined as internal migration, and accordingly, international cross-border movements are referred to as international migration (Arango, 2017). This study examines international migration. Human migration is an old phenomenon that dates back to the earliest periods of human history. In the modern ages, migration continues to offer many opportunities for states, societies and immigrants. While there were 155 million estimated migrants in 2000 (2.8% of the world population), there were 244 million international migrants in 2015 (3.3% of the world's population) (IOM, 2018).

The movement of the human population has continued throughout history and become a component of the process of structural change.

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Immigration due to political or economic difficulties or people's own desires and aspirations, was accompanied by the transformation of social order. With the emergence of capitalism, particularly in the last 150 years, migration has taken a certain shape. Such migration has a few different characteristics. First of all, it covers certain sectors, not all nations. Secondly, it usually occurs as a result of a personal decision-making process, not through coercion or oppression. Third, immigrants do not come from unknown or hostile states, on the contrary, immigration mainly occurs between units that are part of the same international system. Fourth, migrations are fundamentally economic movements that are sustained over a broad period of time, which are predictable in terms of direction and magnitude. Fifth and most importantly, it is the migration of labor, in other words, the purpose of the movement is the desire of the migrants to sell their working capacities in new areas (Portes, 2016).

Benefits related to migration can be in many ways including higher earnings and better employment opportunities. Migration to a more desirable environment can also have physical advantages. These advantages may include better climatic conditions, low crime rates, low pollution levels, superior medical facilities, etc. Other than these, there are obviously, many forms of costs. First, and perhaps the clearest one is the direct monetary costs of moving. Second, the movement has physical costs. In addition, moving from one region to another can create costs due to loss of seniority, loss of retirement benefits, retraining, etc. (Cebula and Vedder, 1973).

Populations of countries are affected not only by the natural increase (fertility rates being higher than mortality rates), but also by immigration. Determining the size of the population was quite difficult for historians. The prediction of migration, birth, marriage and mortality rates was quite challenging, leading to serious errors in determination. Diligent recording of the statistics since the nineteenth century allowed migration data to be assessed properly. This theme is very important because the economy, military quality and even the survival of a state depend on the structure of its population. Therefore, some economies encouraged migration into their countries (Foreman-Peck, 2016). Countries were able to meet their labor or military requirements in this way. Migration for traditional migration countries is an important component for the early development of society. While the United States permits family migration to a great extent, other traditional immigrant countries follow a mixed strategy for migrants by following a selective policy for labor migrants through quotas. (Bauer et al., 2004).

Studying historical evidence in the USA provides much insight. First, the nature of immigrant selection has changed over time. In the past, immigrant selection patterns were random and immigrants had positive or negative skills, while today, immigrants with positive skills are preferred. Secondly, both in the past and the present, immigrants haven't been able to reach a level of income that is as high as that of the local population. Third, it was observed that immigrants led to a decrease in the wages of the locals, but evidence did not support the view that immigrants had a negative impact on the US economy (Abramitzky and Boustan, 2017). According to the International Migration Report (2017), there are approximately 50 million foreigners living in the United States, which corresponds to roughly 15% of the total population of the United States. The United States, which is the country with the highest number of immigrants in the world, is followed by Saudi Arabia, Germany and the Russian Federation.

The main purpose of this study is to estimate the cointegration relationship between capital, labor and migration, and economic growth, and to establish the causality link between the variables. The study is organized as follows: The second section provides a literature review on the relationship between economic growth, capital, labor and migration. The third section presents the data and the results of the econometric methodology. The final section consists of conclusions and recommendations.

2. Literature Review

Morley (2006) investigated the relationship between migration and economic growth in Australia, Canada and USA for the period of 1930 and 2002. The findings of this study indicated a unidirectional causality from GDP per capita to immigration. Chletsos and Roupakias (2012) investigated the causality relationship between real per capita GDP and unemployment variables, and migration in Greece during the period of 1980 - 2011. The findings of the study revealed that economic growth was the causality of migration and unemployment was the causality of migration. González-Gómez and Giráldez (2011) examined the relationship between economic growth and migration in Germany and Switzerland for the period of 1970 - 2005. The results revealed that economic growth was the causality of migration in Switzerland.

Youngho et al. (2012) aimed to determine the heterogeneous effects of migration on economic growth, covers the period between 1960 and 2010. In the study where the GMM estimator was used, it was found that migration in developed countries had a positive effect on economic growth. Di Maria

and Lazarova (2012) empirically examined 194 countries between 1990 and 2000. As a result of the study examining the effect of the qualified migrants on human capital and economic growth, it concluded that migration rates created positive effects on human capital, thus accelerating economic growth.

Boubtane et al. (2013) analyzed 22 OECD countries over the period of 1987 - 2009. As a result of the analysis, a two-way causality between economic growth and migration was found. Bashier and Siam (2014) analyzed Jordan's period of 1920 - 2012 in their study where the variables of capital, domestic labor and guest workers were used. Their findings led them to conclude that capital and domestic labor had a positive and significant effect on economic growth, while guest workers had a positive but insignificant effect on economic growth. Boubtane et al. (2016) examined 22 OECD countries over the period of 1986 - 2006. In the study where the GMM method was used, it was found that the human capital of migrants increased economic growth. Latif (2015) analyzed Canada for the period of 1983 - 2010. Based on the panel VECM results, the real GDP per capita had positive effects on the flow of migration.

Bove and Elia (2017) researched 135 countries for the period of 1960 - 2010. The findings showed that migration in developing countries played a more significant role on real GDP per capita. In a study based on the question of "What happens in the USA if immigration stops?", Treyz and Evangelakis (2018), forecasted the period of 2018 - 2060. Based on the results, it was estimated that the US employment rate would reach the maximum level in 2019, and the workforce in labor and capital markets would decrease by 20% until 2060. Olarinde (2017), examined the relationship between migration, human capital formation and economic growth in Nigeria for the period of 1980 - 2011. The empirical findings of that study revealed that economic growth showed a positive response to migration and a net gain arising from migration was available in the output. Gómez and Giráldez (2018) empirically analyzed the EU/EFTA member countries. According to the results of the causality analysis, Switzerland, Slovenia and Finland had a unidirectional causality from economic growth to migration.

3. Data, Econometric Methodology And Application

3.1. Data

The purpose of this study is to analyze the relationship between economic growth, capital, labor and migration in the USA. For this purpose, the links between growth, capital, labor and migration was researched by using the COBB-Douglas production function. The reason why the migration variable

is added to the COBB-Douglas production function is because migrants are included in the production function. The general outline of the COBB-Douglas production function is as follows:

$$Y_{it} = AK^{\alpha t}, L^{\alpha t}, M^{\alpha t} \quad (1)$$

The logarithmic form of Equality 1 is as follows:

$$\ln(Y_t) = \alpha_0 + \alpha_{1i} \ln(K_t) + \alpha_{2i} \ln(L_t) + \alpha_{3i} \ln(M_t) + \pi_t \quad (2)$$

where; $\alpha_0 = \ln(A_0)$; $t = 1, \ldots, N$ represents the countries. The variables Y, K, Y and M represent economic growth, capital, labor and migration, respectively. GDP (current US dollars) was used as the economic growth representative, Gross fixed capital formation (current US dollars) was used as the capital variable, and Total Labor Force was used as the labor variable. GDP, K and L data were obtained from the World Bank database and M data were obtained from the OECD Stat.

3.2. Econometric Methodology And Application

3.2.1. Unit Root Test

The ADF unit root test was applied to the variables to test the validity of the condition that the variables in the ARDL bounds test were stationary in the I(0) or I(1) level. ADF unit root test results are given below.

Table 1: ADF unit root test results

	Level		First Difference	
	t-stats	p-value	t-stats	p-value
GDP	-0.827	0.953	-3.788**	0.030
K	-2.094	0.531	-3.663**	0.040
L	-0.301	0.988	-4.407*	0.007
M	-3.180	0.105	-4.613*	0.004

Note: Critical values 1% and 5% are represented by * and **, respectively.

According to the results of Table 1, while economic growth, capital, labor and migration variables are unit rooted at the level, they became stationary at the level. Therefore, the precondition of the ARDL bounds test was provided.

3.2.1. ARDL Bound Test

In this study, the Autoregressive Distributed Lag (ARDL) bounds test developed by Pesaran et al. in 2001 was used to test the cointegration relationship. The precondition for the ARDL bounds test is for variables to be stationary at the I(0) or I(1) level. According to the results of Table 1, the precondition of being able to use the ARDL bounds test in this study is met. An adapted version of the Pesaran et al. (2001) model for the purposes of our study is provided below:

$$\Delta GDP = \alpha_0 + \sum_{i=1}^{m} \alpha_{1i} \Delta GDP_{t-1} + \sum_{i=1}^{m} \alpha_{2i} \Delta K_{t-1} + \sum_{i=1}^{m} \alpha_{3i} \Delta L_{t-1} + \sum_{i=1}^{m} \alpha_{4i} \Delta M_{t-1} + \delta_1 GDP_{t-1} + \delta_2 K_{t-1} + \delta_3 L_{t-1} + \delta_4 M_{t-1} + \varepsilon_t \quad (3)$$

Where Δ represents first-level difference, α represents the parameters to be estimated, and ε_t represents white noise error term. The ARDL approach estimates the optimum duration of delay for each variable. The empty hypotheses which do not display bounds test cointegration are decided based either on F statistics or Wald statistics. The null hypothesis which does not have cointegration between the variable are shown in equation 3 $H_0: \delta_1 = \delta_2 = \delta_3 = \delta_4 = 0$ and as in an alternative hypothesis $H_1: \delta_1 \neq \delta_2 \neq \delta_3 \neq \delta_4 \neq 0$.

Table 2: Bounds test and diagnostic test results

Selected Model	(2, 1, 0, 0)		**R^2**	0.940
k	3		**Adjusted R^2**	0.924
F-Statistic	18.85		**F statistics**	60.619
Critical Values	**I(0)**	**I(1)**	**LM Test**	0.105
%1	4.30	5.23	**ARCH Test**	0.609
%5	3.38	4.23	**RESET Test**	0.950
%10	2.97	3.74	**Normality Test**	0.335

The results of the ARDL boundary test are given in Table 2. The model's F-statistic is 18.85 and as is statistically higher than the critical values above, there is a cointegration relationship in the ARDL model. After the ARDL model was determined as co-integrated, the model's diagnostic test results need to be tested for the model's significance.

Diagnostic test results are also presented in Table 2. According to the findings, there is no autocorrelation problem. In addition, it was determined that there was no heteroscedasticity in the model. Additionally, it was

determined that the model was structured correctly and the error terms were normally distributed.

Table 3: Short-term coefficients

Variables	Coefficients	p-value
$\Delta_{(K)}$	0.376*	0.000
$\Delta_{(L)}$	0.452**	0.032
$\Delta_{(M)}$	0.015*	0.001
CointEq(-1)	-0.267*	0.000

*Note: Critical values 1% and 5% are represented by * and **, respectively.*

The short-term coefficients of the ARDL bounds test are presented in Table 3 According to the findings, the short-term coefficients of the capital, labor and migration variables are positive and statistically significant. The error correction coefficient is negative and statistically significant. 26.7% of the short-term deviation is corrected in the following term.

Table 4. Long-term coefficients

	ARDL Estimate		FMOLS Estimate	
Variables	Coefficients	p-value	Coefficients	p-value
K	0.355*	0.008	0.182*	0.002
L	1.481**	0.015	2.832*	0.000
M	0.061*	0.003	0.031**	0.045
C	0.013*	0.000	0.010*	0.000

*Note: Critical values 1% and 5% are represented by * and **, respectively.*

The ARDL bounds test and the FMOLS long-term coefficient estimates are provided in Table 4. The rationale behind providing the results of the ARDL bounds test and the FMOLS estimators, is to increase the reliability of the cointegration coefficients. An interpretation of the results in Table 3 reveals that the long-term coefficients of the capital, labor and migration variables in the USA were positive and significant.

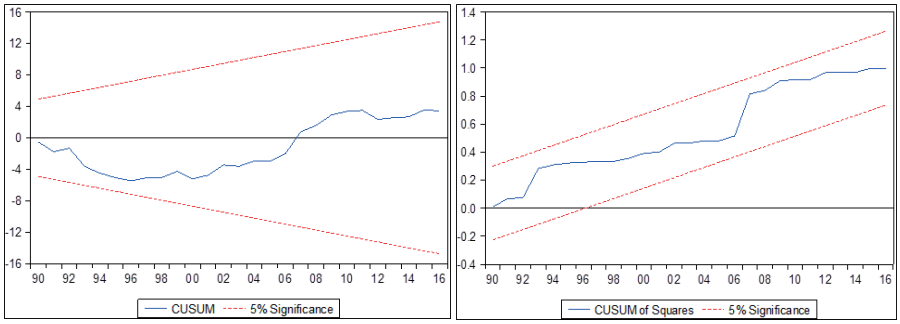

Figure 1: CUSUM and CUSUMQ charts

Figure 1 shows the cumulative sum (CUSUM) and cumulative sum of squares (CUSUMQ) graphs. The estimated parameters remain within the 5% line limits and therefore remain stable.

3.2.3. VECM Granger Causality Test

After the cointegration relationship was determined in the model, vector error correction model (VECM) was used. Short- and long-term causality relationships were estimated with the VECM test and the Granger (1969) test. The VECM test is formulated below.

$$(1-S)\begin{bmatrix} GDP \\ K \\ L \\ M \end{bmatrix} = \begin{bmatrix} a_1 \\ a_2 \\ a_3 \\ a_4 \end{bmatrix} + \sum_{i=1}^{p}(1-L)\begin{bmatrix} b_{11i} & b_{12i} & b_{13i} & b_{14i} \\ b_{21i} & b_{22i} & b_{23i} & b_{24i} \\ b_{31i} & b_{32i} & b_{33i} & b_{34i} \\ b_{41i} & b_{42i} & b_{43i} & b_{44i} \end{bmatrix} X \begin{bmatrix} GDP_{t-1} \\ K_{t-1} \\ L_{t-1} \\ M_{t-1} \end{bmatrix} + \begin{bmatrix} \beta_1 \\ \beta_2 \\ \beta_3 \\ \beta_4 \end{bmatrix} + ECT_{t-1} + \begin{bmatrix} \varepsilon_{1t} \\ \varepsilon_{2t} \\ \varepsilon_{3t} \\ \varepsilon_{4t} \end{bmatrix} \quad (4)$$

Where, 1-S is the lag operator, ECM_{t-1} is the lag error correction term, β_j (j=1,2,3,4) are correction coefficients and ε_{jt} (j=1,2,3,4) are error correction terms. In order to interpret the causality relationship of the variables, the ECT_{t-1} coefficient must be significant and between [-1, 0].

Table 5: VECM Granger causality test results

Dependent Variable	ΔGDP	ΔK	ΔL	ΔM	Long-run (p-value) ECT_{t-1}	Direction of causality
ΔGDP	-	14.630 (0.002)	5.430 (0.143)	6.554 (0.087)	-0.446 [-3.478]	K-GDP; M-GDP
ΔK	10.984 (0.011)	-	15.802 (0.001)	7.192 (0.066)	-0.913 [-2.847]	GDP-K; L-K; M -K
ΔL	7.492 (0.057)	7.607 (0.054)	-	4.355 (0.226)	-0.081 [-2.532]	GDP-L; K-L
ΔM	2.735 (0.434)	5.060 (0.167)	7.866 (0.049)	-	4.334 [2.325]	L- M

Notes: p-values are presented in parentheses, while t-statistics are shown in bracket.

Table 5 presents the results of the VECM Granger causality test. According to the short-term causality results, there is a bidirectional causality between capital and economic growth. In addition, a unidirectional causality from migration to economic growth and from economic growth to labor was identified.

In the long-term VECM Granger causality test, the coefficients of ECTs should be negative and statistically significant. Accordingly, the ECT coefficients of economic growth, capital and labor were found to be -0.446, -0.913 and -0.081, respectively. This indicates that the convergence rates are 44.6%, 91.3% and 8.1%, respectively. If the coefficient of the error correction term is less than 1, the system is balanced by fluctuation. This fluctuation decreases in each period before the transition to equilibrium is achieved (Narayan and Smith, 2005; Agency, 2016). Accordingly, the rate of equilibrium for economic growth, capital and labor are 2.2 years, 1.1 years and 12.3 years respectively.

4. Conclusion

Migration in the United States, which has one of the highest rates of immigrants among all other countries in the world, is an important phenomenon for sustainable growth. The main purpose of this study is to examine the role of migration in the growth of the USA. For this purpose, economic growth, capital, labor and migration variables were used in this study for the USA. Firstly, the stationarity of the variables was examined and

it was determined that the variables were stationary at the I(1) level. In the model that was used, short-term and long-term elasticity coefficients were estimated by the ARDL test. The findings showed that the variables were positive and significant. The elasticity coefficient of migration was found to be inelastic and it was estimated that it had a positive effect on economic growth.

Based on the results of the VECM causality analysis, a unidirectional causality relationship from migration to economic growth was detected. Obviously, these findings suggest that migration to the US is a major factor driving economic growth, indicating that migration to the US needs to be greater promoted by policy makers. Empirical analyses show that there is also a unidirectional causality from economic growth to labor. In addition, a bidirectional causality between capital and economic growth is also identified.

The findings of this study indicate that migrants not only create benefits for the US economy, but may also have positive effects in other areas. For example, specially trained migrants may have higher output levels than the local population. In this way, productivity can be increased and an extra contribution can be made to the economy. In addition, educated migrants come to the country ready for production without requiring any costs. Thus, the total education cost of the countries would also decrease.

Migrants can change the average age of the country, helping the population to become more effective. Especially for countries with a rising average age, migrants are important in the labor market. The selection of immigrants from a particular income group can play an active role in increasing welfare by providing an inflow of money for the country. It is recommended that US policy makers assess these factors and the contribution of migration to the economy is more thoroughly researched.

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