Yönetim Bilimleri Dergisi/Journal of Administrative Sciences
Cilt/Volume: 22, Sayı/No: 51, ss./pp.: 219-238
DOI: https://doi.org/10.35408/comuybd.1394043

-RESEARCH ARTICLE-

THE RELATIONSHIP BETWEEN GEOGRAPHY AND ECONOMIC GROWTH IN MIDDLE-INCOME COUNTRIES: EVIDENCE FROM PANEL DATA ANALYSIS [*]

Rüya ATAKLI YAVUZ [1]

Abstract

All countries aim to achieve stable economic growth. Geography is recognized as one of the main determinants of economic growth as it covers the advantages and disadvantages arising from the physical location of the country. For this reason, revealing the relationship between geography and economic growth can give an idea about the economic policies that can be implemented in terms of how to utilize the advantages or how to reduce the effects of disadvantages. In addition, analyses on the effects of geographical location, climate, natural resources, and other geographical characteristics on economic growth help to understand the economy from a broad perspective. This study, using panel data analysis methods with data from 2001-2012, aims to empirically test the relationship between geography and economic growth among 79 countries classified at middle income level according to the World Bank income classification. In line with this objective, various empirical tests were carried out using panel data analysis method. The empirical analyses conducted within the scope of the study revealed that geographical factors are effective on economic growth. Therefore, the inclusion of geographical factors, which are generally ignored by neoclassical growth models, will provide an important perspective for economic growth studies.

Keywords: Geography, economic geography, economic growth, middle-income level, panel data analysis.

JEL Codes: C10, F10, O40, 047.

Başvuru: *21.11.2023* **Kabul:** *12.12.2023*

[*] This study is derived from Rüya ATAKLI YAVUZ's PhD dissertation entitled "Geography and Economic Growth Relationship: Panel Data Analysis" which was completed in 2016 under the supervision of Meliha ENER

[1] Asst. Prof. Rüya ATAKLI YAVUZ (Ph. D.), Canakkale Onsekiz Mart University, Biga Faculty of Economics and Administrative Sciences, Department of Economics, Biga, Çanakkale, Türkiye. ruyaatakli@comu.edu.tr, Orcid No: 0000-0003-3147-333X

ORTA GELİR DÜZEYİNDEKİ ÜLKELERDE COĞRAFYA VE EKONOMİK BÜYÜME İLİŞKİSİ: PANEL VERİ ANALİZİNDEN KANITLAR [2]

Öz

Bütün ülkeler istikrarlı bir ekonomik büyüme elde etmeyi amaçlamaktadırlar. Coğrafya, ülkenin fiziki konumundan kaynaklanan avantaj ve dezavantajları kapsadığı için ekonomik büyümenin temel belirleyicilerinden biri olarak kabul edilmektedir. Bu nedenle coğrafya ile ekonomik büyüme arasındaki ilişkilerin ortaya çıkarılması, avantajlardan nasıl yararlanılacağı veya dezavantajların etkilerinin nasıl azaltılacağı açısından uygulanabilecek ekonomi politikalarına dair fikir verebilir. Ayrıca coğrafi konum, iklim, doğal kaynaklar ve diğer coğrafi özelliklerin ekonomik büyüme üzerindeki etkileri konusundaki analizler, ekonominin geniş bir perspektiften anlaşılmasına yardımcı olmaktadır. 2001-2012 yıllarına ait verilerle panel veri analizi yöntemleri kullanılarak yapılan bu çalışma, Dünya Bankası gelir sınıflandırmasına göre orta gelir düzeyinde sınıflandırılan 79 ülke arasında coğrafya ve ekonomik büyüme arasındaki ilişkiyi ampirik olarak test etmeyi amaçlamaktadır. Bu hedef doğrultusunda, panel veri analizi yöntemi kullanılarak çeşitli ampirik testler gerçekleştirilmiştir. Çalışma kapsamında yapılan ampirik analizler coğrafi faktörlerin ekonomik büyüme üzerinde etkili olduğunu ortaya koymuştur. Bu nedenle, genellikle neoklasik büyüme modelleri tarafından göz ardı edilen coğrafi faktörlerin analizlere dahil edilmesi, ekonomik büyüme çalışmaları açısından önemli bir perspektif sunacaktır.

Anahtar Kelimeler: Coğrafya, ekonomik coğrafya, ekonomik büyüme, orta gelir düzeyi, panel veri analizi.

JEL Kodları: C10, F10, O40, 047.

"Bu çalışma Araştırma ve Yayın Etiğine uygun olarak hazırlanmıştır."

1. INTRODUCTION

Economic growth rates vary between countries and between years. Explaining the international and temporal variations in economic growth rates has been one of the fundamental concerns of economists for many years. Therefore, economists extensively examine and discuss the reasons for these variations. In the literature, there are many empirical and non-empirical studies on the factors influencing economic growth, which dynamics shape these factors, and why one country experiences high economic growth while another exhibits a negative growth rate.

The geographical characteristics have non-negligible effects on the form and development of all economic activities over time. Geographical characteristics sometimes offer advantages for economic activities, whereas they emerge as a

[2] Genişletilmiş Türkçe Özet, makalenin sonunda yer almaktadır.

fundamental factor in determining the boundaries of economic activities at other times. Therefore, when examining economic activities and their progression, considering the geographical structure can provide a broader perspective for the analysis of events from an economic theory standpoint. From the aspect of economic growth, geographical characteristics have on economic growth is also evident.

Geographical location and climate affect both income levels and income growth through transportation costs, distribution of natural resources, agricultural productivity, and similar channels. Thus, geographical location and climate significantly affect on growth rate of an economy. Geography also affects policymakers in terms of determining the direction of economic policies. Even though the economic policies implemented by governments and the country's income level do not affect the geographical location and features, these geographical factors do affect the income level. Geographical location and characteristics affect income through foreign trade and mutual relations with other countries. It is known that geographical characteristics play an important role in a country's foreign trade. Having an advantageous geographical location will lead to increased foreign trade and, consequently, an increase in national income. In summary, a country's geographical location and characteristics affect the growth of national income through the foreign trade channel.

This study aims to empirically test the relationships between geography and economic growth by making use of the 2001-2012 data from 79 countries classified as middle-income according to the World Bank income classification. In this context, the introduction section, which includes a literature review, will be followed by the second section, which provides information about the empirical method to be used and introduces the dataset and variables. The third section will present and interpret empirical findings, whereas the fourth section will discuss the results in the context of the literature. The study will be concluded in the final section, which includes policy recommendations.

1.1 Literature Review

When examining the general literature on geography's effect on economic growth, studies can be classified primarily based on the channels through which geography influences economic growth. For instance, the studies carried out by Bloom et al. (1998), Gallup and Sachs (2001), and McArthur and Sachs (2001) emphasized the "disease" channel, through which geography affects economic growth. In these studies, analyses were conducted based on variables such as climate zones, average temperature, latitude, etc. Accordingly, the risk of contracting diseases such as malaria has a geographical dimension. Moreover, a negative relationship would be expected between the risk of these diseases and economic growth.

In studies carried out by Gallup and Sachs (2000), Sachs (2000), and Masters and McMillan (2001), the "agriculture" channel was considered as an instrument, through which geography influences economic growth. In these studies, analyses were conducted based on variables such as climate zones, soil type, the number of days with rainfall in winter, etc. Accordingly, agricultural production is dependent on factors such as soil quality, topography, and climatic conditions. A technology addressing the conditions of temperate climates might not be suitable for the use in

tropical regions. Agricultural production and agricultural technological advancements in agriculture are among the factors influencing economic growth.

Studies carried out by Hall and Jones (1999), Acemoğlu et al. (2001), Rodrik et al. (2002), and Easterly and Levine (2003) aimed to examine the influence of geography on economic growth via the "institutions" channel with a long-term perspective. Variables such as climate zone, ecological diversity, latitude, lack of coastline, natural barriers, and land density were used in those studies. Accordingly, institutions arise from the initial conditions (climatic conditions, location, abundance of natural resources, etc.). it can be stated that institutions have a long-term effect on economic growth.

Some of the studies aiming to investigate the influence of geography on economic growth via the "trade" channel include those carried out by Sachs and Warner (1997), Frankel and Romer (1999), and Redding and Venables (2004). Variables such as coastline presence, distance to coastlines, rivers, natural barriers, and land density were used in these studies. Accordingly, natural openness promotes trade and enables access to foreign technologies. Therefore, economic growth accelerates.

Studies carried out by Barro (1991), Amstrong (1995), Bivand and Brunstad (2002), Baumont et al. (2003), and Roberts (2004) focused on "spatial heterogeneity" and investigated the relationship between geography and economic growth. Variables such as latitude, climate zone, and regional dummies were used in these studies. Accordingly, parameters in growth models vary among economies. Countries and regions converge to different stable equilibrium states.

In their studies, Baumont et al. (2003) and Carrington (2003) focused on the phenomenon of "spatial convergence" and utilized variables such as proximity, geographic distance, and cultural distance. Accordingly, they reported that countries and regions converge within clusters.

In studies carried out by Coe and Helpman (1995), Coe et al. (1997), Keller (2002), and Lopez Bazo et al. (2004), the relationship between geography and economic growth was examined focusing on "technology diffusion". In these studies, variables such as geographic distance, cultural distance, and transportation costs were used as basic variables in the analyses. Accordingly, the rate of technology diffusion varies depending on the distance to technology leaders. It affects the economic growth.

Ades and Chua (1997), Easterly and Levine (1998), Lall and Yılmaz (2001), and Murdoch and Sandler (2002) focused on "spillovers" in their studies and used variables such as proximity, closeness, border length, and geographic distance. Accordingly, political, social, and economic factors in neighboring countries affect the growth.

Empirical analyses carried out by Gallup et al. (1998) and Radelet and Sachs (1998) also concluded that physical geography criteria (e.g., the ratio of land in tropical regions to total land) and transportation costs (including the ratio of land within 100 km of coastal or navigable river areas) are significant variables in explaining inter-country income differences.

In their study (1999), Frankel and Romer defined geography criteria as tools for trade flows and empirically analyzed them. According to the empirical results of their study, a positive relationship was found between per capita income and the share of trade in national income, attributed to external variations arising from geographic criteria.

In their study (Limao and Venables, 2001:451-479), Limao and Venables examined the effect of countries' geographic structure and infrastructure levels on transportation costs. The real costs of trade – transportation expenses and other costs incurred during international activities – are crucial determinants for a country to fully integrate into the global economy. Distance and underdeveloped transportation and communication infrastructure lead countries to isolate themselves from global trade networks. Limao and Venables (2001) stated that road transportation is seven times more costly than maritime transportation. They also noted that countries experience changes in their gross national products and import-export figures based on whether they have access to the sea. Consequently, countries with a coastline have more favorable transportation options, leading to higher import-export volumes. On the other hand, landlocked countries, with less favorable transportation options, have lower shares of import-export in gross national income compared to others.

2. METHOD

In this study, panel data analysis was used as an econometric method. Panel data offers certain advantages in comparison to cross-sectional and time-series data. Firstly, panel data provides the researcher with a greater number of observations, thereby increasing the degrees of freedom in the model. Additionally, panel data reduces the degree of linear correlation between explanatory variables. Consequently, the accuracy of econometric predictions increases (Hsiao, 2007). In panel data analyses, it is essential to test the stationarity of variables. To decide which stationarity tests to use, the homogeneity of variables and whether there is a cross-sectional dependence in the dataset were examined. Stationarity tests appropriate to the results of homogeneity and cross-sectional dependence tests were conducted. Following tests to select the most suitable model, a regression model was formulated. Finally, tests assessing the statistical significance of the model were conducted.

2.1 Homogeneity Test

In this study, since the number of cross-sectional units (N) is more than the number of periods (T), i.e. (N>T), the appropriate test for homogeneity is the Swamy (Delta) test developed by Peseran. This test examines whether the slope coefficients (βi) are different across cross-sectional units (Altıntaş and Mercan, 2015: 364).
Regarding the hypotheses, H0 assumes homogeneity of slope coefficients, whereas H1 assumes non-homogeneity of slope coefficients.
$p<0.05$ indicates that H0 is accepted at a 5% significance level, and it is concluded that the cointegration coefficients are homogeneous (Pesaran and Yamagata, 2008: 57).

2.2 Cross-Sectional Dependency Test

The presence of cross-sectional dependence is examined by using the CD_{LM1} test by Berusch Pagan (1980) when the time dimension (T) is higher than the cross-sectional dimension (N) (T>N), using the CD_{LM2} test by Pesaran (2004) if T=N, and using the CD_{LM} test by Pesaran (2004) if T<N (Erataş et al., 2015: 403). In this study, the Pesaran (2004) CD_{LM} test is employed since 79 countries (N=79) and 12 years (T=12)

were involved. If the probability value obtained from the test is less than 0.05, H0 is rejected at a 5% significance level. This implies the existence of horizontal section dependence between the units forming the panel (Pesaran, 2004).

2.3 Stationarity Test

In this study, a cross-sectional dependence was found between the countries constituting the panel. Therefore, the stationarity of the series was examined by using the Cross-Sectional Augmented Dickey-Fuller (CADF) test developed by Pesaran (2006), focusing on whether the series is stationary or not. In the CADF test, it is assumed that the error term consists of two components, one for all series and one being specific to each series, and that horizontal cross-sectional dependence arises from the presence of an unobservable common element (Göçer, 2013: 5094).
The arithmetic means of CADF statistics calculated for each country is taken to find if there is a unit root across the panel. Then, the CIPS (Cross-sectional Independence Panel Stationarity) statistic is calculated. The CIPS statistic found is then compared to the critical table values in Pesaran (2006). If the CIPS statistic found is lower than the critical value, H0 is rejected (Göçer, 2013: 5095). This situation implies that the relevant data contains a unit root, and shocks are temporary for all countries comprising the panel. On the other hand, if the null hypothesis is not rejected, then it is determined that the data for all countries contains a unit root, and shocks are not temporary.

2.4 Panel Regression Analysis

Panel data methods, as indicated by Baltagi (2005), are used by considering pooled, fixed, and random effects. To enable the selection of the forecasting model, it is necessary to conduct various statistical tests. Since all variables in the models exhibit variation across countries and periods, it is necessary to conclude if the data should be pooled across both dimensions. The Chow test and the Breush-Pagan (BP) test are utilized to determine the joint significance of time-specific and country-specific effects.

2.5 Dataset and Variables

The variables employed in this study for the period 2001-2012 across 79 countries are presented in Table 1.

Variables	Definition of Variable, Measurement Unit, and Period Covered	Data Source
Y	Gross Domestic Product ($), 2001-2012	World Bank, 2015

X1	Openness, Share of trade in GDP (%), 2001-2012	World Bank, 2015
X2	Export volume index (2000=100), 2001-2012	World Bank, 2015
X3	Land area (km^2), 2001-2012	World Bank, 2015
X4	Total population (person), 2001-2012	World Bank, 2015
X5	Share of urban population in total population (%), 2001-2012	World Bank, 2015
X6	Distance: distance of country's capital city to New York, Rotterdam, or Tokyo (km)	http://www.distance.to, 2015
D1	Having a coast: 1 if the country has no coastline (landlock country), 0 if the country has a coastline	nationsonline.org, 2015
D2	Climate: 1 if the country is in a temperate climate, 0 if not	worldclim.org, 2015
D3	Petroleum exporting country: 1 if the country is a petroleum-exporting country, 0 if not	CIA, 2015

Source: Prepared by the author.

3. RESULTS

Delta homogeneity test results are shown in Table 2.

Table 2. Pesaran and Yamagata (2008) Homogeneity Test Results

Test	Test Statistic	Probability
$\tilde{\Delta}$	6.882	0.021*
$\tilde{\Delta}_{adj}$	7.421	0.008*

Source: Author's calculations. *Variable is statistically significant at the level of 5%.

The probability values of the tests shown in Table 2 are less than 0.05, which leads to the rejection of the null hypothesis (H0). It was determined that the slope coefficients

are not homogeneous. The Delta test results suggest that the series are heterogeneous. Cross-sectional dependence must be examined for heterogeneous series. Therefore, it is important to examine if cross-sectional units are dependent on each other, in other words, if a shock to the series will affect all cross-sectional units to the same extent.

The cross-sectional dependence test results are shown in Table 3.

Table 3. CD_{LM} Test Results

Variable	CD_{LM} (t statistic)	Probability
Y	7.013	0.002
X1	5.372	0.001
X2	6.118	0.026
X3	7.246	0.018
X4	5.099	0.000
X5	6.381	0.005
X6	6.593	0.000

Source: Author's calculations.

Given the results provided in Table 3, since the probability values are less than 0.05, there is cross-sectional dependence in both the series and the equation. In this case, a cross-sectional dependence was found between the countries. A shock to one country affects the others. Therefore, when investigating the presence of a unit root, second-generation unit root tests should be employed.

To examine the existence of a unit root, CADF and CIPS statistics were calculated, and the results are presented in Table 4.

Table 4. Second-Generation Unit Root CADF Test Results

Variable	CIPS Statistic*
Y	11.232
X1	8.239
X2	9.022
X3	12.673
X4	8.563
X5	9.556
X6	13.077

Source: Author's calculations. *In Pesaran (2006), the critical value for CIPS is -2.87.

The calculated CIPS statistics indicate that, since the critical value from Pesaran's (2006) table is higher than -2.87, H0 is accepted. Considering this result, it can be seen that there is a unit root in the series constituting the panel. Consequently, it is concluded that the series do not have stationary levels. This implies that the effect of a shock on the economies of the relevant countries does not immediately dissipate. As

the series exhibited non-stationary levels, regression analysis was conducted with the first differences of the variables.

To decide which panel regression model to select, the results of the Chow and Breusch-Pagan (BP) tests applied are presented in Table 5. For the Chow test, where the H0 hypothesis assumes pooled regression and the H1 hypothesis assumes SEM (fixed effects model), and for the BP test, where H0 assumes pooled regression and H1 assumes TEM (random effects model), the results are presented below.

Table 5. Panel Regression Estimation Method Selection Test Results

Test	Probability	Decision
Chow (F test)	0.139	H_0 Accepted
BP (χ^2 test)	0.095	H_0 Accepted

Source: Author's calculations.

In both tests, it was decided that the pooled model would be selected since the H0 hypothesis was accepted. Consequently, there is no need to choose between the TEM and SEM models. The Hausman test, which is the next step, was not applied.

Table 6. Panel Regression Estimation Results

Dependent Variable: DY				
Method: Panel LS				
Period: 2001 2012				
Number of Cross-Sections (Countries): 79				
Number of (Balanced) Observations in the Panel: 948				
Variable	**Coefficient**	**Std. Error**	**t-statistic**	**P-value**
DX1	0.051879	0.060089	0.863371	0.3881
DX2	0.529408	0.052427	10.09792	0.0000
DX3	0.112886	0.021888	5.157515	0.0000
DX4	0.949092	0.022036	43.07035	0.0000
DX5	0.160330	0.041299	3.882138	0.0001
DX6	-0.346681	0.060697	-5.711682	0.0000
D1	-0.142447	0.048267	-2.951233	0.0032
D2	0.196673	0.055158	3.565636	0.0004
D3	1.277713	0.064884	19.69213	0.0000
C	0.823115	0.647271	1.271670	0.2038
R-Squared	0.890482	**Dependent Variable Mean**		23.67256
Corrected R-Kare	0.889513	**Dependent variable standard deviation**		2.101991
S.E. of regression	0.698693	**Akaike information criterion**		2.130479
Sum squared resid	496.4711	**Schwarz criterion**		2.178526
Log likelihood	-1084.001	**Hannan-Quinn criterion**		2.148717
F-statistic	918.7957	**Durbin-Watson statistic**		0.196921
P-value (F-statistic)	0.000000			

Source: Author's calculations.

The independent variables included in the model explain the GDP variable by 89%. In the model, X1 representing trade openness is the only variable that is not statistically significant. All other independent variables are statistically significant and important. Except for X6 and D1, all these variables have a positive effect on economic growth.

Given the results achieved, it can be seen that there is a positive relationship between trade openness (X1) and economic growth. However, since the probability of X1 is higher than 0.05, it is concluded that the variable is not statistically significant in the model.

As seen in the model, X2 representing the export volume index has a positive relationship with economic growth. The probability value of the export volume index variable being lower than 0.05 indicates that the variable is statistically significant.

Included in the model to represent the country size in the model and being represented by X3, land area was found to have a positive relationship with economic growth. The probability value of the land area variable being lower than 0.05 indicates that these variable yields statistically significant results in the model.

Similarly, there is a positive relationship between the variable X4, representing total population as an indicator of country size, and economic growth. The probability value of the total population variable being lower than 0.05 indicates that these variable yields statistically significant results in the model.

Included in the model to represent urban population density and being represented by X5, urban population and economic growth were found to have a positive relationship. Moreover, the probability value of the urban population variable being lower than 0.05 indicates that this variable also provides statistically significant results in the model.

In the model, there is a negative relationship between the distance variable, which was included in the model as an indicator of transportation costs and shown with X6, and economic growth. Additionally, since the probability value of the distance variable is lower than 0.05, this variable also yields statistically significant results in the model.

The estimated results regarding the dummy variables included in the model are as follows:

As a geographic dummy included in the model to affect transportation costs and thus international trade, the coastal dummy indicated by D1 demonstrates a negative relationship with economic growth. Accordingly, if a country does not have a coastline, economic growth is adversely affected. Countries with coastlines are more advantageous in terms of economic growth. The probability value of this dummy variable is lower than 0.05, indicating that the prediction results it provides in the model are statistically significant.

Climate, which is one of the channels through which geography affects economic growth, is also included in the model as a dummy variable. The climate dummy is represented by D2 in the model. Since the probability of this variable is lower than

0.05, it provides statistically significant results. According to the estimated results, there is a positive relationship between the climate dummy and economic growth. Therefore, if a country is in the temperate climate zone, economic growth is positively affected. However, if the country is in other climate zones (tropical, polar, or desert), economic growth is adversely affected by this condition.

Finally, as an indicator of natural resource richness arising from geographical characteristics, the model includes the dummy variable of a country being a petroleum exporter, represented by D3, that has a positive relationship with economic growth. Since the probability of the variable is lower than 0.05, it provides statistically significant results. Given the estimated results, if a country is a petroleum exporter, then economic growth is positively affected.

4. DISCUSSION

Since the probability of the export volume variable was less than 0.05 in the model, it can be stated that this variable is statistically significant and interpretable in the model. This positive relationship has several reasons. First of all, an increase in export volume will increase national income via the foreign trade multiplier. The increase in export volume will enhance the division of labor and collaboration and lead to a higher level of productivity and production. The advancement of foreign trade in a country will increase competition, necessitate production based on advanced technology, and further contribute to increased production. Therefore, an increase in a country's export volume will result in an increase in economic growth.

There was a positive relationship between land area and economic growth. There is no consensus in the literature regarding the direction of the relationship between these two variables. However, as stated by Frankel and Romer, an increase of one percent in a country's area will increase its income by ten percent. Thus, the empirical analysis results support the findings reported by Frankel and Romer. Since the probability of the land area variable is less than 0.05 in the model, it can be said that this variable is also significant and interpretable in the model.

A positive relationship was found between the total population variable and economic growth. The probability of the total population variable in the model being less than 0.05 indicates that the variable is statistically significant and interpretable.

A positive relationship was found between urban population variable and economic growth. This finding supports the results reported by Becker et al. Accordingly, the effect of population density on economic growth is positive in urban areas and negative in rural areas. The probability of the urban population variable being less than 0.05 indicates that this variable is statistically significant and interpretable in the model.

The negative relationship found between the distance variable and economic growth in the present study aligns with the results of the studies conducted by Limao and Venables. The probability value of the distance variable in the model being less than

0.05 indicates that this variable gives statistically significant results and is interpretable.

The negative relationship between the dummy variable for no coastline and economic growth is consistent with the results of the studies carried out by Gallup, Limao, and Venables, Sachs and Mellinger, and Redding and Venables. The probability of this dummy variable being less than 0.05 implies that the predicted results are statistically significant and interpretable.

The positive relationship found between the climate variable dummy and economic growth aligns with the study carried out by Sachs and Warner. The probability of this variable in the model being less than 0.05 means that it yields statistically significant results and is interpretable.

Finally, there is a positive relationship between the dummy variable for being an oil exporter country and economic growth. The probability value of the variable in the model being less than 0.05 implies that it gives statistically significant results and is interpretable.

CONCLUSION

In recent years, economic theorists emphasized the significance of the heterogeneity of economic actors as a vital element in the functioning of market economies. Highlighting the spatial variations among economic actors, economic geography supports this perspective. The economic geography approach examines not only the general characteristics of economic activities but also their local and regional variations. Furthermore, it aims to explain how geographical conditions affect the relationships between various sectors of an economy. Economic geography focused on the potential strength of regional disparities, suggesting that, despite advancements in technology reducing the dominance of distances between countries or regions on societal life, the effect of space on economic and social life cannot be entirely eliminated.

The liberalization of trade, the reduction, or complete elimination of legal barriers to trade will have positive or negative effects on economic growth. Furthermore, it can be argued that various geographic, demographic, and cultural factors, traditionally excluded or assumed to be fixed and homogeneous in previous economic models, might have diverse consequences for economic growth. The effect of geographic location and characteristics on trade flows, production factors, and people's ideas, attitudes, and behaviors can affect growth through per capita income. Fundamentally, there are two significant channels through which geography influences economic growth: climate and foreign trade. Moreover, geography affects economic activities and, consequently, economic growth in various forms.

According to the analysis results, it was determined that geographical factors play a significant role in economic growth. Those factors have been often neglected by neoclassical growth models. Including them in the models would be beneficial for

economic growth studies. In the recent period, there has been a resurgence of interest in geographical factors. This can be attributed to the revitalization of economic geography models under new economic geography models since the 2000s. However, the number of empirical studies in this field is quite inadequate. The effect of the geographical features of the Earth is undeniable in the formation of all economic activities and their development over time. For example, agricultural technology used in countries with a temperate climate zone might not be suitable for agricultural production in other climate zones, leading to insufficient increases in agricultural productivity and national income. Therefore, countries need to prioritize R&D investments in order to develop agricultural technology suitable for their climatic zones. Geographical characteristics sometimes offer advantages for economic activities, while they serve as a fundamental factor in defining the boundaries of economic activities for humanity at other times. Therefore, when examining economic activities and their progression, taking the geographical structure into account would offer a broader view when examining the events from an economic theory standpoint.

ORTA GELİR DÜZEYİNDEKİ ÜLKELERDE COĞRAFYA VE EKONOMİK BÜYÜME İLİŞKİSİ: PANEL VERİ ANALİZİNDEN KANITLAR

1. GİRİŞ

Coğrafi konum, iklim, doğal kaynaklar ve diğer coğrafi özelliklerin ekonomik büyüme üzerindeki etkileri konusundaki analizler, ekonominin geniş bir perspektiften anlaşılmasına yardımcı olmaktadır. Bu faktörler, ülkeler arasındaki gelir eşitsizliklerinin ve ekonomik kalkınma düzeylerinin açıklanmasında da önemli bir rol oynamaktadır. Ayrıca, dış ticaretin coğrafi faktörlere olan duyarlılığı da yüksektir. Ülkeler arası ticaret, coğrafi konumun avantajlarından faydalanarak ekonomik büyümeyi teşvik etmektedir. Bu bağlamda, bir ülkenin coğrafi konumu ve doğal kaynakları, dış ticarette rekabet avantajı sağlayarak ekonomik büyümeye katkıda bulunabilir. Bununla birlikte, bu faktörlerin yanı sıra ekonominin karmaşıklığını ve diğer etkenleri de göz önünde bulundurmak önemlidir. Ekonomik büyümeyi etkileyen çok sayıda faktör bulunmaktadır ve bunlar arasındaki ilişkiler karmaşıktır. Dolayısıyla ekonomik büyümeyi etkileyen faktörleri belirlemeye yönelik olarak literatürde hem ampirik hem de ampirik olmayan pek çok çalışma bulunmaktadır. Bu çalışmada, dünya bankasının gelir sınıflandırması esas alınarak, orta gelirli ülkeler grubunda yer alan 79 ülkenin, 2001-2012 yılları arası verileri kullanılarak, coğrafya ile ekonomik büyüme arasındaki ilişkinin ampirik olarak araştırılması amaçlanmıştır.

2. YÖNTEM

Çalışmanın ekonometrik yöntemi panel veri analizidir. Panel veri analizlerinde, öncelikle değişkenlerin durağanlıklarının test edilmesi gereklidir. Öncelikle kullanılacak durağanlık testlerinin belirlenmesi için değişkenlerin homojenlik/heterojenlik durumları ve veri setinde yatay kesit bağımlılığının var olup olmadığı kontrol edilmektedir. Homojenlik ve yatay kesit bağımlılığı testlerinin

sonuçlarına göre, uygun durağanlık testleri uygulanmaktadır. Alternatifler arasından en uygun modelin seçilmesi için yapılan testlerin bulgularına göre bir regresyon modeli oluşturulmaktadır. Son olarak, kurulan modelin istatistiki olarak anlamlılığına yönelik testlere yer verilmektedir.

3. BULGULAR

Delta homojenlik testi bulguları, serilerin heterojenliğine işaret etmektedir. Heterojen serilerde yatay kesit bağımlılığının var olup olmadığı birim kök testlerinin seçiminde önem taşımaktadır. Bu sebeple yapılan CDLM yatay kesit bağımlılığı testi bulgularına göre; olasılık değerleri 0.05'in altında olduğu için, serilerde ve denklemde yatay kesit bağımlılığının bulunduğu sonucuna varılmıştır. Dolayısıyla bir ülkeye gelen şokun, diğer ülkeleri de etkileyeceği ifade edilebilir. Bu durumda birim kökün varlığının ikinci kuşak birim kök testleri yardımıyla araştırılması gerekmektedir. Birim kökün varlığını araştırmak için CADF ve CIPS istatistikleri hesaplanmıştır. Hesaplanan CIPS istatistikleri, Pesaran (2006) tablo kritik değeri olan -2,87'in üzerinde olduğu için, serilerde birim kökün var olduğuna karar verilmiştir. Bu sonuç, ülke ekonomilerine gelen bir şokun etkisinin hemen ortadan kalkmadığı anlamına gelmektedir. Serilerde birim kök olduğu için regresyon analizi değişkenlerin birinci dereceden farkları ile gerçekleştirilmiştir. Sonrasında ampirik modelin seçimi için uygulanan Chow testi ve Breush-Pagan (BP) testin bulguları, havuzlanmış model kullanılmasının uygun olacağına işaret etmiştir. Kurulan regresyon modelinin bulgularına göre, modele dahil edilen bağımsız değişkenler, GSYH değişkenini %89 oranında açıkladığı ifade edilebilir. Ampirik bulgular modelde yalnızca X1 ile ifade edilen olan ticari açıklık değişkeninin istatistiksel olarak anlamlı olmadığına işaret etmektedir. X1 dışındaki tüm bağımsız değişkenlerin istatistiksel olarak anlamlı ve önemli olduğu söylenebilir. Ayrıca bulgulara göre, X6 (uzaklık) ve D1 (denize kıyısı olmama) dışındaki tüm değişkenlerin ekonomik büyümeyi pozitif yönlü etkilediği sonucuna varılmıştır.

4. TARTIŞMA

Arazi alanı ile ekonomik büyüme arasındaki pozitif yönlü ilişkiye dair ampirik bulgular, literatürde bu iki değişken arasındaki ilişkinin yönü konusunda var olan tartışmaya katkıda bulunmaktadır. Frankel ve Romer'e (1999) göre, bir ülkenin alanının yüzde bir oranında artışı, ülkenin gelirini onda biri oranında artırabilir. Yapılan ampirik analizler, bu tezi destekler niteliktedir. Ayrıca, uzaklık ile ekonomik büyüme arasında negatif yönlü bir ilişkinin varlığı tespit edilmiştir. Bu durum, Limao ve Venables'in (2001) çalışmalarının analiz sonuçlarını destekler nitelikte olup, uzaklık değişkeninin modeldeki olasılık değerinin 0.05'ten küçük olması, bu değişkenin istatistiksel olarak anlamlı ve yorumlanabilir olduğunu göstermektedir. Denize kıyısı olmama kukla değişkeni ile ekonomik büyüme değişkeni arasındaki negatif yönlü ilişkinin tespiti, Gallup, Sachs ile Mellinger'ın (1998) ve Redding ile Venables'ın (2004) çalışmalarının sonuçlarını destekleyen bir bulgu olarak karşımıza çıkmaktadır. Bu kukla değişkenin olasılık değerinin 0.05'ten küçük olması, elde edilen tahmin sonuçlarının istatistiksel olarak anlamlı ve yorumlanabilir olduğunu

göstermektedir. Bu durum, denize kıyısı olmama durumunun ekonomik büyüme üzerindeki etkisinin önemli olduğunu ve bu etkinin literatürdeki önceki çalışmalarla uyumlu olduğunu vurgulamaktadır.

SONUÇ

İktisatçılar, son yıllarda, piyasa ekonomilerinin karmaşıklığında önemli bir faktör olarak iktisadi aktörlerin farklılığına odaklanmaktadır. Bu bağlamda, coğrafi faktörlerin önemi yeniden vurgulanmaktadır. Bu durumun arkasındaki nedenlerden biri, ekonomik coğrafya modellerinin 2000'li yıllarda, özellikle yeni ekonomik coğrafya modelleri çerçevesinde tekrar canlanmış olmalarıdır. Ancak, bu alanda yapılan ampirik çalışmaların sayısı oldukça sınırlıdır. Bu çalışma dünya bankası gelir sınıflandırmasının orta gelirli ülkeler grubunda bulunan 79 ülkenin, 2001-2012 dönemi verilerini kullanarak, coğrafya ile ekonomik büyüme ilişkisinin ampirik olarak test edilmesini amaçlamaktadır. Ampirik testlerden elde edilen bulgular, coğrafi faktörlerin ekonomik büyüme üzerinde etkili olduğuna işaret etmektedir. Bu nedenle, genellikle neoklasik büyüme modelleri tarafından göz ardı edilen coğrafi faktörlerin analizlere dahil edilmesi, ekonomik büyüme çalışmaları açısından önemli bir perspektif sunacaktır. Tüm iktisadi faaliyetlerin şekillenmesi ve zaman içinde gelişmesinde, coğrafi faktörlerin etkisi göz ardı edilemez bir öneme sahiptir. Örneğin, ılıman iklim kuşağında yer alan ülkelerde kullanılan tarımsal teknoloji, diğer iklim kuşaklarında bulunan ülkelerdeki tarımsal üretim için uygun olmayabilir ve bu durum, tarımsal verimliliği ile ülke gelirini yeterince artırmada etkili olmayabilir. Bu nedenle, ülkelerin bulundukları iklim kuşaklarına uygun tarımsal teknolojiyi geliştirebilmek adına araştırma ve geliştirme yatırımlarına ağırlık vermeleri gerekmektedir. Ancak iktisadi faaliyetlerin coğrafi yapıyla ilişkisi, sadece doğal kaynaklar ve iklim koşullarıyla sınırlı değildir. Aynı zamanda coğrafi konum, ulaşım ağları, ticaret yolları gibi unsurlar da ekonominin dinamiklerini etkiler. Bu nedenle, iktisat teorisi açısından, coğrafi faktörleri incelemek, ekonomik olayları daha kapsamlı bir perspektiften anlamamıza yardımcı olacaktır.

REFERENCES

Acemoglu, D., Johnson, S. and Robinson, J. A. (2001). The Colonial Origins of Comparative Development: An Empirical Investigation. *The American Economic Review,* 91(5), 1369-1401.

Ades, A. and Chua, H. B. (1997). Thy Neighbor's Curse: Regional Instability and Economic Growth. *Journal of Economic Growth*, 2(3), 279-304.

Altıntaş, H. and Mercan, M. (2015). AR-GE Harcamaları ve Ekonomik Büyüme İlişkisi: OECD Ülkeleri Üzerine Yatay Kesit Bağımlılığı Altında Panel Eşbütünleşme Analizi. *Ankara Üniversitesi, SBF Dergisi,* 70(2), 345-376.

Armstrong, H.W. (1995). Convergence Among Regions of the European Union, 1950–1990. *Papers in Regional Science*, 74(2), 143-152.

Ataklı Yavuz, R. (2016). Coğrafya ve Ekonomik Büyüme Ilişkisi: Panel Veri Analizi. Doktora Tezi, Çanakkale Onsekiz Mart Üniversitesi.

Baltagi, B. H. (2005). *Econometric Analysis of Panel Data*, 3rd Edition, Wiley, USA.

Barro, R. J. (1991). A Cross-Country Study of Growth, Saving, and Government. *National Saving and Economic Performance.* University of Chicago Press, 1991, 271-304.

Baumont, C. Ertur, C. and Le Gallo, J. (2003). Spatial Convergence Clubs and The European Regional Growth Process, 1980–1995. *European Regional Growth,* Springer Berlin Heidelberg, 131-158.

Bivand, R. and Brunstad, R. (2006). Regional Growth in Western Europe: Detecting Spatial Misspecification Using the R Environment. *Papers in Regional Science,* 85(2), 277-297.

Bloom, D. E., Sachs, J. D., Collier, P. and Udry, C. (1998). Geography, Demography, And Economic Growth in Africa. *Brookings Papers on Economic Activity*, 207-295.

Breusch, T. S. and Pagan, A. R. (1980). The Lagrange Multiplier Test and Its Applications to Model Specification in Econometrics. *Review of Economic Studies,* 47: 239 – 253.

Carrington, A. (2003). A Divided Europe? Regional Convergence and Neighbourhood Spillover Effects. *Kyklos,* 56(3), 381-393.

Coe, D. T. and Helpman, E. (1995). International R & D Spillovers. *European Economic Review,* 5(39), 859-887.

Coe, D. T., Helpman, E. and Hoffmaister, A. W. (1997). North-South R&D Spillovers. *Economic Journal*, 107(440), 134-49.

Easterly, W. and Levine, R. (1998). Troubles with the Neighbours: Africa's Problem, Africa's Opportunity. *Journal of African Economies*, 7(1), 120-142.

Easterly, W. and Levine, R. (2003). Tropics, Germs, and Crops: How Endowments Influence Economic Development. *Journal of Monetary Economics*, 50(1), 3-39.

Erataş, F., Başcı Nur, H. and Çınar, S. (2015). Para Arzının Post Keynesyen Yorumu: Gelişmiş Ülkeler Örneği. *Akademik Sosyal Araştırmalar Dergisi*, 3. (15), 398-409.

Frankel, J. A. and Romer, D. (1999). Does Trade Cause Growth? *American Economic Review,* 89(3), 379-399.

Gallup, J. L. and Sachs, J. D. (2000). Agriculture, Climate, and Technology: Why are The Tropics Falling Behind? *American Journal of Agricultural Economics,* 82(3), 731-737.

Gallup, J. L. and Sachs, J. D. (2001). The Economic Burden of Malaria. *The American Journal of Tropical Medicine and Hygiene*, 64(1), 85-96.

Gallup, J. L., Sachs, J. D. and Mellinger, A. D. (1998). Geography and Economic Development. *National Bureau of Economic Research Working Paper,* No. w6849.

Göçer, İ. (2013). Seçilmiş OECD Ülkelerinde Bütçe Açıklarının Sürdürülebilirliği: Yatay Kesit Bağımlılığı Altında Panel Eş–Bütünleşme Analizi. *Journal of Yaşar University,* 8(30), 5086-5104.

Greene, W. H. (2003). *Econometric Analysis*, Pearson Education Inc., Upper Saddle River, New Jersey, 07458.

Hall, R. E., and Jones, C. I. (1999). Why do Some Countries Produce So Much More Output Per Worker Than Others? *The Quarterly Journal of Economics*, 114(1), 83-116.

Hsiao, C. (2007). Panel data analysis—advantages and challenges. *Test*, 16(1), 1-22.

Keller, W. (2002). Geographic Localization of International Technology Diffusion. *The American Economic Review,* 92(1), 120-142.

Lall, S. V. and Yılmaz, S. (2001). Regional Economic Convergence: Do Policy Instruments Make a Difference? *The Annals of Regional Science*, 35(1), 153-166.

Lımao, N. and Venables, A. J. (2001). "Infrastructure, Geographical Disadvantage, Transport Costs, and Trade", The World Bank Economic Review, 15.3, 451-479.

López-Bazo, E., Vayá, E., Mora, A. J. and Suriñach, J. (1999). Regional Economic Dynamics and Convergence in The European Union. *The Annals of Regional Science,* 33(3), 343-370.

Masters, W. A. and Mcmillan, M. S. (2001). Climate and Scale in Economic Growth. *Journal of Economic Growth,* 6(3), 167-186.

Mcarthur, J. W. and Sachs, J. D. (2000). Institutions and Geography: Comment on Acemoglu, Johnson and Robinson. No. w8114, *National Bureau of Economic Research,* 2001.

Murdoch, J. C. and Sandler, T. (2002). Economic Growth, Civil Wars and Spatial Spillovers. *Journal of Conflict Resolution*, 46(1), 91-110.

Özgen, N. (2010). Bilim Olarak Coğrafya ve Evrimsel Paradigmaları. *Aegean Geographical Journal*, 19(2), 1-25.

Pesaran, M. H. (2004). General Diagnostic Tests for Cross Section Dependence in Panels. No. 1240. Institute for the Study of Labor (IZA).

Pesaran, M. H. (2006). Estimation and Inference in Large Heterogeneous Panels with a Multifactor Error Structure. *Econometrica*, 74(4), 967-1012.

Pesaran, M. H. and Yamagata, T. (2008). Testing Slope Homogeneity in Large Panels. Journal of Econometrics, 1(142), 50-93.

Radelet, S. and Sachs, J. (1998). Shipping Costs, Manufactured Exports, and Economic Growth. Erişim tarihi: 26.08.2015 <<https://scholar.google.com.tr/scholar?cluster=13759457627272990966&hl=tr&as_sdt=0,5>>

Redding, S. and Venables, A. J. (2004). Economic Geography and International Inequality. *Journal of international Economics,* 62(1), 53-82.

Roberts, M. (2004). The Growth Performances of the GB Counties: Some New Empirical Evidence for 1977–1993. *Regional Studies*, 38(2), 149-165.

Rodrik, D. (2003). Institutions, Integration, and Geography: In search of The Deep Determinants of Economic Growth. *In Search of Prosperity: Analytic Country Studies on Growth,* Princeton University Press, Princeton, NJ, 1-30.

Rodrik, D., Subramanian, A. and Trebbi, F. (2002). Institutions Rule: The Primacy of Institutions Over Geography and Integration in Economic Development, *NBER Working Paper,* No: 9305.

Sachs, J. D. (2000). Tropical Underdevelopment. *Prepared for Economic History Association Annual Meeting, CID Working Paper*, No. 57, December 2000. Available at http://www.cid.harvard.edu/cidwp/057.ht

Sachs, J. D. and Warner, A. M. (1997) Fundamental Sources of Long-run Growth. *The American Economic Review*, 87(2), 184-188.

Wooldridge, J. M. (2002). *Econometric Analysis of Cross Section and Panel Data.* Cambridge, MA: MIT Press, UK.

ANNEXES:

Annex 1. Countries included in the empirical analysis

Angola, Argentina, Albania, Azerbaijan, Bangladesh, West Bank and Gaza, Belarus, Belize, Bolivia, Bosnia and Herzegovina, Botswana, Brazil, Bulgaria, Bhutan, Cape Verde, Algeria, People's Republic of China, Dominican Republic, Dominica, Ecuador, El Salvador, Indonesia, Armenia, Morocco, Fiji, Ivory Coast, Philippines, Gabon, Ghana, Grenada, Guatemala, South Africa, Georgia, India, Honduras, Cameroon, Kazakhstan, Kenya, Kyrgyzstan, Costa Rica, Republic of the Congo, Colombia, Lao PDR (Laos), Hungary, North Macedonia, Malaysia, Mauritius, Mexico, Egypt, Mongolia, Mauritania, Namibia, Nigeria, Nicaragua, Uzbekistan, Pakistan, Panama, Paraguay, Peru, Romania, São Tomé and Príncipe, Senegal, Sri Lanka, St. Lucia, St. Vincent and The Grenadines, Sudan, Eswatini (formerly Swaziland), Tajikistan, Thailand, Tonga, Tunisia, Türkiye, Turkmenistan, Ukraine, Jordan, Vanuatu, Venezuela, Vietnam, Zambia.

Source: Prepared by the author.

Annex 2. Wooldridge (2002) Autocorrelation Test Results

F Value	Probability
321.625	0.124

Source: Author's calculations.

Annex 3. Greene (2003) Heteroscedasticity Test Results

Chi-Square = 301.665
Probability Chi-Square = 0.152

Source: Author's calculations.

Annex 4. Independent Variables Correlation Table

	X1	X2	X3	X4	X5	X6
X1	1.000000	0.071876	-0.349414	-0.457968	-0.043708	-0.110499
X2	0.071876	1.000000	0.229802	0.254939	0.049295	-0.064386
X3	-0.349414	0.229802	1.000000	0.428885	0.206548	0.311156
X4	-0.457968	0.254939	0.428885	1.000000	0.091111	0.161242
X5	-0.043708	0.049295	0.206548	0.091111	1.000000	-0.223668
X6	-0.110499	-0.064386	0.311156	0.161242	-0.223668	1.000000

Source: Author's calculations.

KATKI ORANI / *CONTRIBUTION RATE*	**AÇIKLAMA / *EXPLANATION***	**KATKIDA BULUNANLAR / *CONTRIBUTORS***
Fikir veya Kavram / *Idea or Notion*	Araştırma hipotezini veya fikrini oluşturmak / *Form the research hypothesis or idea*	Rüya ATAKLI YAVUZ
Tasarım / *Design*	Yöntemi, ölçeği ve deseni tasarlamak / *Designing method, scale and pattern*	Rüya ATAKLI YAVUZ
Veri Toplama ve İşleme / *Data Collecting and Processing*	Verileri toplamak, düzenlenmek ve raporlamak / *Collecting, organizing and reporting data*	Rüya ATAKLI YAVUZ
Tartışma ve Yorum / *Discussion and Interpretation*	Bulguların değerlendirilmesinde ve sonuçlandırılmasında sorumluluk almak / *Taking responsibility in evaluating and finalizing the findings*	Rüya ATAKLI YAVUZ
Literatür Taraması / *Literature Review*	Çalışma için gerekli literatürü taramak / *Review the literature required for the study*	Rüya ATAKLI YAVUZ