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DETERMINANTS OF ECONOMIC GROWTH: AN APPLICATION WITH UNBALANCED PANEL ANALYSIS IN OECD COUNTRIES

EKONOMİK BÜYÜMENİN BELİRLEYİCİLERİ: OECD ÜLKELERİNDE DENGESİZ PANEL ANALİZİYLE BİR UYGULAMA

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ABSTRACT

One of the most important indicators of the increase in economic and social welfare in a country is the economic growth phenomenon. There are several studies in the literature that aimed to identify the components of economic growth and their contribution to growth. In the present study, economic growth indicators were selected as investments, population, human capital, employment, public investments and the size of logistics industry. To determine economic growth indicators in 34 OECD countries, unbalanced panel analysis is conducted in the present study. As a result, it was determined that study variables of logistics and fixed capital investments were positive and statistically significant at the same time. This finding reflected that the size of the logistics industry and fixed capital investments increased per capita income in OECD countries.

Keywords: Economic Growth, OECD, Unbalanced Panel Analysis.

JEL Classification Codes: 047, 053, E13, R11.

ÖZET

Bir ülkenin iktisadi ve sosyal refah düzeyindeki artışın en önemli göstergelerinden biri ekonomik büyüme olgusudur. Ekonomik büyümenin bileşenleri ve büyümeye katkılarının belirlenebilmesi amacıyla literatürde çok sayıda çalışma mevcut olup ekonomik büyümeyi belirleyen değişkenler tespit edilmeye çalışılmıştır. Bu çalışmada, ekonomik büyüme belirleyicisi olarak yatırım, nüfus, beşeri sermaye, istihdam, devlet yatırımları ve lojistik sektör büyüklüğü değişkenleri alınmıştır. Çalışmada 34 OECD ülkesindeki ekonomik büyümenin belirleyicisinin ortaya konulması için dengesiz panel analizi yapılmıştır. Sonuçta, çalışma değişkenlerinden lojistik ve sabit sermaye yatırımı değişkeninin pozitif ve aynı zamanda istatistiksel olarak anlamlı olduğu tespit edilmiştir. Bunun anlamı OECD ülkelerinde lojistik sektör büyüklüğünün ve sabit sermaye yatırımlarının kişi başına geliri artırıcı etkide bulunduğuudur.

Anahtar Kelimeler: Ekonomik büyüme, OECD, Dengesiz Panel Analizi.

JEL Sınıflandırma Kodları: 047, 053, E13, R11.

1. INTRODUCTION

Economic growth is the topic of frequent debate among economists. There are several economic growth theories that could be found in the literature. Developed economic growth theories were influenced by the economic and social characteristics of their time and assigned different missions to the state in economic and social fields. In these theories, the state was assigned sometimes active, sometimes passive and sometimes non-interventionist tasks.

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Neo-classical growth theory advocated the balanced growth where per capita capital, per capita production or consumption would increase at the same rate. Neo-classical theory considers technological advances and population increase as external factors and assigns no particular role to the state. In other words, there is no state intervention. However, even in that case, there is the problem of considering the main determinants of growth such as accumulation of knowledge, technology and human capital as external.

On the other hand, endogenous growth theories stress the significance of the state in economy and advocate that developed economies could maintain a sustainable growth mechanism without experiencing recession. In these theories, state plays an active role and could provide more quality health and education services, promote R&D (research and development) and technology transfers, protect property rights, reinforce communication networks and thus, could establish an open economic system. In other words, in endogenous growth theories, in-system powers fuel the economic growth.

Since the emergence of the new growth theory, studies that scrutinized the topic from two different perspectives in economic growth literature pioneered other studies. The first is the classical Solow total production function approach that addresses the problem whether per capita income growth rates in economies have the tendency to converge in the long run. The works of Solow (1956), Aschaur (1989) and Mankiw et al. (1992) could be given as examples of this approach. The second group of studies are those that focused on conditional convergence discussions that stressed the identification of principal resources of economic growth. The studies of Barro and Sala-i- Martin (1991; 1992), Mody and Wang (1997), Madden and Savage (2000), Demurger (2001), Datta and Agarwal (2004), Ding et al. (2008) could be given as examples of this line of debate. During initial studies, ample evidence was found which supported that growth rates in per capita income had the tendency of convergence in the long run in most countries (Barro and Sala-i-Martin, 1991, 1992; Islam, 1995). In the studies conducted later on, several determinants of economic growth were identified. For instance, Chen and Fleisher (1996), Fleisher and Chen (1997), Mody and Wang (1997), Madden and Savage (2000), Demurger (2001), Datta and Agarwal (2004), Ding et al. (2008) determined that fixed capital investments, public infrastructure investments, transportation and telecommunication investments, foreign direct investments (FDI), government expenditures, population increase or density, human capital, foreign trade and R&D were among the determinants of the economic growth.

Thus, the present study aims to identify economic growth determinants in 34 OECD countries between the years of 1968 and 2014. The limitations of the study were the differences in OECD memberships of these countries, in the availability of statistical data for these countries during these years. For these reasons, unbalanced panel analysis was conducted.

The present paper is organized as follows: The first section includes a literature review. In the second section, the economic model developed based on the OECD country data between 1968 and 2014 and the research method are discussed. In the final section, analysis results and recommendations are presented.

2. LITERATURE REVIEW

Economic growth has always been the focus of economics literature. Certain previous studies reported evidence for the convergence tendencies of increase in income per capita in countries in the long run (e.g. Barro and Sala-i-Martin 1991, 1992, İslam 1995, Sala-i-Martin 2002). Other previous studies determined various tools of economic growth such as fixed investments, public infrastructure, transportation and telecommunication investments, FDI, government spending, population increase or density, human capital, trade and R&D (e.g., Chen and Fleisher 1996, Fleisher and Chen 1997, Mody and Wang 1997, Madden and Savage 2000, Demurger 2001, Datta and Agarwal 2004, Ding et al. 2008). Since Chinese economic growth improved rapidly, it was very well researched (e.g., Mody 1997, Wang, Raiser 1998, Demurger 2001, Weeks and Yao 2003, Ding et al. 2008).

When these studies are more specifically investigated, it would be observed that Madden and Savage (1998) examined the correlation between telecommunications investments and economic growth in Central and Eastern European countries. The study stressed that unsatisfactory telecommunication infrastructure investments should be increased in these countries to improve international trade and competitiveness and regional productivity. Also in a study by Madden and Savage (2000), the correlation between economic growth and telecommunications was investigated by adding telecommunication investments to the Cobb Douglas production function in Mankiw's growth model for 43 countries. They utilized main telephone line data for

telecommunications indicator. As a result, they determined that the increases in economic growth and international trade were positively affected by telecommunication investments. Röller and Waverman (2001) studied the relationship between economic growth and telecommunication infrastructure investments in 21 OECD countries for the 20-year period between 1970 and 1990. Study findings reflected a significant and positive correlation between economic growth and telecommunication investments.

Li, Zhang and Zhou (2003) utilized regression analysis in a study they conducted in Tianjin, China. Thus, they explained the relationship between logistics costs and GDP and found the correlation between the development of the logistics industry and the economic development. The study ignored the direction of the change of the correlation between the growth in the logistics industry and the per capita income growth rate. However, it was demonstrated that the developments in national economies were significant in determination of the presence of and the change in the correlation between logistics industry and national economy.

Datta and Agarwal (2004) investigated the effect of telecommunication infrastructure investments on economic growth in the long term in 20 OECD countries using dynamic panel analysis method in their study. Phone lines per 100 individuals was used as a variable in this study. Correlations between consumer spending, population increase, openness of the country, past GDP and delayed growth were also investigated in the study model. The study concluded that telecommunication infrastructure investments affected economic growth positively in the long run and countries that increased these investments would gain more economic growth impetus.

Liu, Li and Huang (2006) analyzed the dynamic correlation between the development of logistics industry in China and GDP growth, utilizing logistics and GDP variables. Based on the fact that logistics industry data did not include a specific definition for Chinese logistics industry and the views that logistics generally included transportation, storage, distribution and loading services and transportations had a lion's share among these services, traffic turnover volume data were utilized in this study. According to empirical unit root and co-integration test findings conducted within the context of econometric analysis, developments in logistics industry in China affected GDP positively and increased the growth rate between 1953 and 2004.

Lu and Yang (2006) examined the manufacturing corporations' investments in important international logistics regions of Kaohsiung in Japan and Hong Kong, and Shanghai harbors in their study. It was found that investors preferred to invest these regions and harbors due to corporate tax incentives, government productivity, labor costs and the advantages in energy costs. It was unraveled that Hong Kong and Kaohsiung harbors had the advantages of international logistics regions infrastructure, political and fiscal investment criteria and the investments preferred these regions as a result.

Hong (2007) analyzed how transportation investments in Chinese provinces affected foreign investments in his study. Study findings indicated that increase in transportation infrastructure investments increased logistic activities and as a result of tax deductions and low labor costs, foreign investments increased in these regions.

Zahra, Azim and Mahmood (2008) scrutinized the effect of developments in communications infrastructure on economic growth using panel data analysis method. The study was conducted in low income, medium income and high income group countries between 1985 and 2003. The correlations between economic growth and fixed investments, population increase, public expenditures and communications infrastructure in scrutinized nations were examined in the study. Study findings demonstrated that communication infrastructure investments significantly increased economic growth.

Yang, Wang, Luqian Wang (2010) analyzed primarily the correlation between direct foreign investments and GDP in their study that scrutinized the effect of direct foreign investments in logistics industry on economic growth. Time series analysis was conducted with annual data for 1998-2008 period. GDP was taken as the dependent variable, while foreign investments variable was accepted as the independent variable. Study findings showed that there was a correlation between direct foreign investments in logistics industry and economic growth.

Aibin, Pionpion and Yuanli (2010) demonstrated the relationship between the logistics industry and economic growth in Xuzhou region using 2000-2009 annual data in their study. GDP was taken as the dependent variable and cargo space was taken as an explanatory variable for logistics capacity and annual data were utilized. Study findings reflected a mutual correlation between economic growth and logistics in Xuzhou region.

In a study by Chu (2012), correlation between logistics and economic growth in China was analyzed for the 1997-2007 period using panel data analysis method. In the study, effects of investments, population, human

capital, employment, public expenditures and logistics (communication, storage and telecommunication) investments within total investments on economic growth were scrutinized. Number of landline phones per capita was accepted as logistic capital variable. Study findings demonstrated that logistics investments resulted in economic growth in the long run.

Hu, Gan and Gao (2012) attempted to measure the effect of logistic infrastructure investments on regional growth in central China between 1986 and 1995. It was determined that central Chinese logistic infrastructure investments were still low level at the end of the study. It was stressed that logistics investments and incentives for logistics investments should be increased, logistics costs should be reduced and optimal logistics environment should be established in the study. Röller and Waverman (2014) investigated the correlation between telecommunications infrastructure and economic growth with simultaneous analysis technique for the twenty-year period between 1970 and 1990 in 21 OECD countries. Study findings showed that telecommunication investments positively affected the economic growth function.

Despite its significance, the effect of logistics (as the whole industry) on economic growth indicators was not thoroughly studied. However, the effects of transportation and telecommunication infrastructure as sub-industries of logistics are widely researched. For instance, Mody and Wang (1997) examined various determinants of Chinese coastal growth in the second half of 1980's using the panel data of 23 industries between 1985-1989 and revealed that both transportation and telecommunication infrastructures were the growth factors in that period. Demurger (2001) investigated the correlation between Chinese infrastructure investments and economic growth using a sample panel data form for 24 Chinese provinces between 1985 and 1998 and found that both transportation and telecommunication infrastructures contributed to economic growth significantly. Recently, Ding et al. (2008) examined the role of telecommunication infrastructure in Chinese regional economic growth between 1986-2002 using System-GMM estimation method and conditional convergence structure and revealed that telecommunication infrastructure increased economic growth and there was an obvious regional revenue convergence.

The aim of the present study is to fill the gaps in the literature. Although there are series of studies in the literature, there are certain basic problems. First, some studies attempted to identify economic growth determinants in a single country and using a few independent variables. However, the countries scrutinized in these types of econometric models were generally developed nations. Another problem was the inability to access long-term data despite the fact that the addressed countries were developed nations. Comparative studies on a single or a few developed countries were conducted, however a generalization for the global economy has not been possible.

The second problem in the literature is the fact that OECD countries were not studies in long time periods and with all member data. In the present study, both long time sections and all OECD member countries are included in the model, logistics industry variable that contributes the economic growth the most is also added and it was considered that such an analysis would be more explanatory.

3. ESTIMATION MODEL AND METHODOLOGY

In the application stage of the study, panel data analysis was used as the econometric model. Econometric literature that could be found in the present section of the article is drawn mostly on Stock and Watson (2011) and Gujarati (2011), Greene (2003) and Wooldridge (2003). Three different econometric and statistical data types are used for the analysis of the existing correlations between economic variables. These are time series, horizontal section data and panel data which is a mixture of the first two (Greene 2003:612). Recently, most applied econometric studies started to use panel data method. It is possible to define the panel data method as the collection of section observations such as households, corporations and nations for a certain time period.

Based on the fact that whether the data observations are missing, certain econometric expressions are utilized. The condition where panel dataset contains equal time series for each horizontal section is called a balanced panel and where time series varies for each horizontal sections is called an unbalanced panel (Wooldridge 2003:250). Since the dataset used in the present study is an unbalanced panel dataset, unbalanced panel was implemented. Certain methods could be used to work with unbalanced panel datasets:

- When the missing observations in data are random, methods used for balanced panels could be developed for unbalanced panels and estimations are consistent.
- It could be recommended to fill the gaps using certain algorithms instead of losing the data with missing observations.

Structural model for the unbalanced panel data analysis could be written as follows.

$$Y_{it} = X_{it}\beta_i + u_{it} \quad i = 1, 2, \dots, n, t = 1, 2, \dots, T \quad (1)$$

$Y_{it} = 1$ if $Y_{it} > 0$, the second line could be expressed as follows:

$$Y_{it} = 1(X_{it}\beta_i + u_{it} > 0)$$

In the second part of the study, the effect of logistics industry on the economies of 34 OECD countries was investigated using unbalanced data analysis. The time interval was chosen as 1970-2013. In the second part of the study, unbalanced panel data analysis was conducted using the model depicted below. In the present study, four different models were implemented using the same or similar econometric model variables to the ones used in the reviewed empirical studies in literature. Statistical data used in the study were obtained from OECD and World Bank databases.

Neoclassical growth model anticipates that long term real growth rates of developing and developed economies would converge based on the assumption that technological level is constant across all nations. This hypothesis is called the convergence hypothesis in the literature. The correlation between economic growth and certain variables was established as a result of tests conducted with different countries and variables within the framework of the convergence theory. The point of origin of these studies that Chu (2012) also took as an example was Barro and Martin (1991; 1992), however the following studies investigated the correlations between the economic growth and fixed investments, public infrastructure investments, transportation and telecommunication investments, direct foreign capital investments, public expenditures, population size and distribution, human capital, trade, and R&D investments. The first econometric model was created by adapting the model used by Chu (2012) in the study that investigated the correlation between economic growth and logistics using panel data analysis in 1998-2007 China to OECD countries. The same variables used by Chu's model were taken to create the model shown below. However, although the variable that reflects the membership of China in World Trade Organization (WTO) was used in Chu's study, this variable was excluded from the present study. Because, only Estonia among the OECD countries became a WTO member in 1999, other 33 OECD member states became a member in 1995. Thus, it was considered that the inclusion of the WTO variable in the model would be meaningless. Furthermore, Chu created the LOGIS variable that reflects the share of logistics investments in the total investments during these years in China. In the present study, LOGIS data was created and included in the model with the same data for OECD countries, further calculations were avoided. 1968-2013 data for 34 OECD member states was used in the present study. The model was as follows:

$$GRTH_{it} = \gamma GRTH_{i,t-1} + \beta_1 Ln(GDP)_{i,t-1} + \beta_2 INV_{it} + \beta_3 POP_{it} + \beta_4 HC_{it} \\ + \beta_5 EMP_{it} + \beta_6 GOV_{it} + \beta_7 LOGIS_{it} + \mu_i + v_{it}$$

Table 1. Variables Used in the Model

GRTH	Per capita annual growth rate
Independent Variables	
LOGIC	The size of the logistics industry which is the total of the transportation, storage, mail, and telecommunications industry sizes
EMP	Ratio of employment to total population over 15
GOV	Government expenditures
HC	Number of individuals with a higher education degree
INV	Fixed capital investments
POP	Annual population growth rate
GDP1	Lagged per capita GDP value
GRTH1	Lagged value of annual per capita GDP growth rate

3.1. Panel Unit Root Tests

In panel data analyses, primarily the stationarity of the series is investigated to determine whether they contain a unit root. Of the series contain a unit root, the difference of the series is taken and the analysis is continued. Unit root tests in panel data models were proposed in the works of Levin and Li (1992, 1993), Breitung and Meyer (1994), Quah (1994), Maddala and Wu (1999), Hadri (2000), and Im, Pesaran and Shin –IPS (2003). In the present study, whether the stationarity of the series contained a unit root was determined with Im, Pesaran Shin - IPS unit root test. Test result demonstrated that all variables were stationary, in other words, they do not contain a unit root. Thus, there was no need to take the difference of the variables.

Three types of models are used in panel data analysis: pooled or classical model; fixed effects model; and random effects model. Initially, F test was used to determine whether the pooled model was valid. Based on the

F test result, H_0 hypothesis was rejected and it was determined that there were individual effects and thus, it was concluded that the pooled model was not adequate. Then, to determine whether the fixed effects or random effects model was suitable, Hausman test was used. This test is used to make a choice between fixed effects and random effects models. The most significant difference between fixed effects and random effects models is whether the unit effect was related to the independent variables or not.

- Hausman test measures whether there is a correlation between the unit effect, hence the error term and explanatory variables, in other words, whether the random effects model was appropriate.
- If there is no correlation between the error term and explanatory variables, random effects models is valid.
- H_0 = Random effects model is adequate. If H_0 is rejected, fixed effects model is suitable.

3.2. Fixed and Random Effects Models

Coefficients used in econometric analyses take on different values for different units in different periods of time. In such a situation, the number estimated parameters would surpass the number of estimations used, resulting in an inability to estimate the model. By the variability of error terms and coefficients in studies conducted with panel data analysis, different assumptions could be made to obtain different models. The models obtained with different assumptions are the “fixed effects” and “random effects” models. In both models, it is assumed that error terms are distributed independently and in the form of $N(0)$ for all individuals and in all time periods (Griffits 1993). In studies conducted using panel data, a way to include the variations that occur due the differences between units or between the units and within time is to assume that the existing variation caused a variation in some or all of the regression model coefficients. The models where the coefficients are assumed to vary based on units or units and time are called “fixed effects models” (Pazarlıoğlu, 2001). Fixed effects model is a method that is used to control the variable which is excluded when it changed based on units (households, corporations, countries, etc.) but did not change with time.

In fixed effects model, variables that define the dependent (Y) variable, related to the independent variable (X) and change in time should be included in regression to prevent excluded variable bias. Fixed effects model could be expressed as follows when $i=1, \dots, n$ and $t=1, \dots, T$, or with multiple regression method:

$$Y_{it} = \beta_1 X_{(1,it)} + \dots + \beta_k X_{(k,it)} + \alpha_i + \dots + u_{it}$$

$$Y_{it} + \beta_0 + \beta_1 X_{1,it} + \dots + \beta_k X_{k,it} + \gamma_2 D2_i + \gamma_3 D3_i + \dots + \gamma_n Dn_i + u_{it}$$

In studies conducted with panel data analysis, the reason for variations that occur based on units and time could not be examined only with the fixed effects model. It could be examined with random effects model as well. Random effects model could be written as follows:

$$Y_{it} = X_{it}\beta_i + v_{it} + u_{it}, \quad i = 1, 2, \dots, n, \quad t = 1, 2, \dots, T$$

While each horizontal section has its own constant value in fixed effects model, in random effects model, the constant is the mean value of all horizontal section constants. However, if time period count (T) is large and the sample section data count (N) is small, fixed effects model is preferred with the expectation of a smaller difference between the results of the two estimations.

If the presence of unit and/or time effects is found as a result of the tests conducted in panel data analyses, it needs to be decided whether these effects are fixed or random. The decision to use either fixed effects or random effects model in panel data analyses is made by applying “Hausman Model Identification Test.” Hausman test aims to determine whether there is a correlation between the explanatory variables of the model and specific effects that belong to the model by assuming the specific effect that belonged to the model was random. Hausman test results conducted for this purpose are as follows:

Table 2. Hausman Test Results

Correlated Random Effects – Hausman Test – Random Effect Test for Horizontal Section		
Test Summary	Chi Square Statistics	p value
Horizontal Section Random	4.2035	0.5205

When the probability value of Hausman test statistic is smaller than 0.005, fixed effects model is valid. The probability value of the above Hausman test statistic is greater than 0.005 and it was determined that the random effects model was valid. Afterwards, to determine whether “one-way random effects model” that includes unit or time effect or “two-way random effects model” that includes both unit and time effects were valid, initially *Likelihood Ratio* (LR) test was used to test whether individual effect was significant, and it was determined that the individual effect was significant. Then, significance of the time effect was tested with LR, and this time it was determined that the time effect was significant. Thus, it was concluded that *Two-Way Random Effects Model* with both individual and time effects was the most suitable model.

After the adequate model was determined, Hall-Pagan test was used to investigate whether there was the problem of heteroscedasticity in the model. At the end of the test, the null hypothesis of there is no heteroscedasticity problem in the model was accepted and it was determined that there was no heteroscedasticity problem in the model.

Hall-Pagan test results are as follows:

Table 3. Hall-Pagan Test Results

Hall-Pagan LM Test: $E2 = Yh$ = 0.9551 P-Value Chi2(1) 0.3284
Hall-Pagan LM Test: $E2 = Yh2$ = 0.0317 P-Value Chi2(1) 0.8586
Hall-Pagan LM Test: $E2 = LYh2$ = 1.0229 P-Value Chi2(1) 0.3118

Also, to determine whether there was autocorrelation problem in the model, Breusch-Godfrey/Wooldridge test was utilized. Test results demonstrated that there was no autocorrelation problem in the model. Test results are as follows:

Table 4. Breusch-Godfrey/Wooldridge Test Results

Chi2(1)= 0.3286
Prob>chi2 = 0.5665

As a result, it was concluded that there were no heteroscedasticity, autocorrelation and inter-unit problems in two-way random effects model that includes individual and time effects.

Model estimate findings are as follows:

Table 5. Two-Way Random Effects Model Estimate Results

Variables	Within Estimator			
	Coefficient	Standard Error	t statistics	p value
Emp	-0.105001	0.105012	-0.9999	0.3217373
Hc	0.068145	0.056947	1.1966	0.2365802
Pop	-1.055021	0.849887	-1.2414	0.2197389
Logic	0.069214	0.030612	2.2610	0.0277338
Inv	0.263735	0.128895	2.0461	0.0455378
Gov	-0.395623	0.162199	-2.4391	0.0179772
gdp1	-1.747804	0.588852	-2.9682	0.0044298
grth1	0.476159	0.115692	4.1158	0.0001304
R²	0.59147			

The effect of employment on per capita income was statistically insignificant based on the findings demonstrated in the above table. Also it was observed that the effect of individuals with higher education was insignificant and positive. The effect of another variable, population growth on per capita income was negative but statistically insignificant as expected. *When we examined the variable of logistics which was important for the present study, it was observed that it was positive and statistically significant. This finding reflected that logistics variable increased per capita income in OECD in the related period, in other words, had an effect of increasing economic growth.* We also observed that fixed capital investments in OECD countries were positive and

statistically significant. This meant that fixed capital investments in OECD had a positive effect on per capita income. We observed that the increase in government expenditures was negative and statistically significant. In other words, an increase in government expenditures decreased per capita income. This was most probably due to the exclusionary effect of government expenditures. Also, it was observed that one-term lagged annual growth rate of per capita GDP had a positive and significant effect on annual growth rate of per capita GDP as expected in the model, while one-term lagged annual growth rate of per capita GDP had negative and significant effect on annual GDP growth rate.

4. CONCLUSIONS AND RECOMMENDATIONS

Economic growth phenomenon bears great importance for measurement of welfare levels of today's national economies. Thus, identification of the factors that affect economic growth and their shares in growth increases the prospects of implemented policies. Therefore, the findings of the present study where growth components and their contributions were analyzed using annual datasets for 34 OECD countries between 1968 and 2014 were consistent with the literature. Furthermore, in the present study where the effect of logistics industry on economic growth was also scrutinized, it was determined that the related variable had a positive and statistically significant effect. This finding showed that logistics variable increased per capita income in the related period in analyzed countries including Turkey, in other words, it increased economic growth. According to the classical view of economics literature economic growth means the growth of the industrial sector and taking into account of the production. And according to modern view, it should be in favor of the service sector by differing the sector structures. In this sense, by taking into account the access to the highest per capita incomes of the economies making the transition to the era of mass consumption, service sector and its component can be expressed as having an important place among the elements of economic growth of logistics investment. The financial size of the investment expenditure made in the logistics sector by reaching to enormous levels with multiplier mechanism may have the flexibility to affect economic activities and emerge different transmission mechanisms. Thus, by sector investments and capacity on growth and logistics revenue enhancing come as a result of the introduction of elements obtained in both studies about the findings it is consistent with the results obtained from studies on both similar structures. Although the findings of the present study are consistent with the literature, the fact that shocks which were not addressed in this study had different magnitudes and had different effects on country groups, more accurate results could be reached using the findings of further studies that would take the abovementioned factors into account.

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