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THE RELATIONSHIP BETWEEN UNEMPLOYMENT AND ECONOMIC GROWTH UNDER OKUN'S LAW: A SPATIAL ECONOMETRIC ANALYSIS ON EU COUNTRIES

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Abstract

The relationship between economic growth and the unemployment problem, which is so important, has been a subject that has been debated and sought from past to present. With the general acceptance that economic growth is not sufficient to create employment on its own, the concept of growth does not create employment in the economic literature. This concept means that in the light of Okun's Law, the increase in productivity in the workforce can increase the real difference without lowering the unemployment rates. The aim of the study was to measure the validity of the Okun's Law in European Union countries. In this context, the spatial econometric method was used in which the effects of neighborhood relations of the member states of the European Union were taken into consideration. As a result of the empirical findings, it is concluded that there is a spatial dependence among the member states of the European Union and the Okun's coefficient is similar in neighboring countries.

Keywords: Economic Growth; Unemployment; Okun's Law; Spatial Panel Data Analysis.
JEL codes: E24, C21, O11

OKUN YASASI BAĞLAMINDA İŞSİZLİK VE EKONOMİK BÜYÜME ARASINDAKİ İLİŞKİ: AB ÜLKELERİ ÜZERİNE BİR MEKANSAL EKONOMETRİK ANALİZ

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Öz

Ekonomik büyüme ve en az onun kadar önemli olan işsizlik sorunu arasındaki ilişki geçmişten günümüze tartışılan ve çözüm aranan bir konu olmuştur. Ekonomik büyümenin, tek başına istihdam yaratmada yeterli olmadığının genel kabul görmesiyle birlikte ekonomi literatürüne istihdam yaratmayan büyüme kavramı girmiştir. Bu kavram, Okun Yasası ışığında, iş gücündeki verimlilik artışının işsizlik oranlarını düşürmeden de reel çıktı farkını artırabileceği anlamına gelmektedir. Çalışmada Avrupa Birliği ülkelerinde Okun Yasası'nın geçerliliğinin ölçülmesi amaçlanmıştır. Bu çerçevede, Avrupa Birliği üye ülkelerinin komşuluk ilişkisi etkilerinin de dikkate alındığı mekansal ekonometri yöntemi kullanılmış olup 26 ülkeye ait veriler ile 2003-2016 dönemine yönelik mekansal panel veri analizi yapılmıştır. Ampirik bulgular neticesinde, Avrupa Birliği üye ülkeleri arasında mekansal bağımlılığın var olduğu ve Okun katsayısının komşu ülkelerde benzerlik gösterdiği sonucuna varılmıştır.

Anahtar Kelimeler: ekonomik büyüme; işsizlik; Okun yasası; mekansal panel veri analizi.

СВЯЗЬ МЕЖДУ БЕЗРАБОТИЦЕЙ И ЭКОНОМИЧЕСКИМ РОСТОМ ПО ЗАКОНУ ОУКЕНА: ПРОСТРАНСТВЕННЫЙ ЭКОНОМЕТРИЧЕСКИЙ АНАЛИЗ СТРАН ЕС

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Аннотация

Взаимосвязь между экономическим ростом и уровнем безработицы, которая так важна, была предметом споров и поисков как в прошлом, так и в настоящем. При общем признании того, что экономический рост сам по себе недостаточен для создания рабочих мест, в экономическую литературу вошла концепция роста без создания рабочих мест. Эта концепция означает, что в свете закона Оукена рост производительности труда может увеличить разрыв в реальном выпуске без снижения уровня безработицы. Цель исследования состояла в том, чтобы измерить действие Закона Оукена в странах Европейского союза. В этом контексте был использован пространственный эконометрический метод, в котором учитывались эффекты соседских отношений государств-членов Европейского союза. В результате эмпирических данных делается вывод о наличии пространственной зависимости между государствами-членами Европейского союза и сходстве коэффициента Оукена в соседних странах.

Ключевые слова: экономический рост; безработица; закон Оукена; анализ пространственных панельных данных.

ОКУН МЫЙЗАМЫ БОЮНЧА ЖУМУШСУЗДУК МЕНЕН ЭКОНОМИКАЛЫК ӨСҮҮНҮН ОРТОСУНДАГЫ БАЙЛАНЫШ: ЕБ ӨЛКӨЛӨРҮНҮН МЕЙКИНДИК ЭКОНОМЕТРИКАЛЫК АНАЛИЗИ

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Кыскача мүнөздөмө

Экономикалык өсүү менен жумушсуздук маселесинин ортосундагы байланыш көп убакыттан бери талкууланган жана чечүү жолдору изилденген темалардын бири. Жумуштуулук деңгээлин жогорулатуу үчүн бир гана экономикалык өсүштүн жетиштүү эмес экендигинин кабыл алынышы экономикалык адабияттарда жумуштуулукту пайда кылбаган өсүш түшүнүгүнүн келип чыгышына себеп болду. Бул түшүнүк боюнча, жумушчу күчүнүн өндүрүмдүүлүгүнүн жогорулашы жумушсуздук деңгээлин төмөндөтпөстөн, реалдуу кирешени өстүрүшү мүмкүн экендигин көрсөтөт. Бул эмгектин максаты Европа Биримдигине мүчө өлкөлөрдө Оукен мыйзамынын жарамдуулугун текшерүү. Максатка жетүү үчүн Биримдикке мүчө өлкөлөрдүн кошуналык байланыштарын да эске алган мейкиндик эконометрика ыкмасы колдонулуп, 26 өлкөнүн 2003-2016-жылдарга таандык статистикалык маалыматтары мейкиндик панель маалымат анализи аркылуу изилденген. Эмпирикалык жыйынтыктар Европа Биримдигине мүчө өлкөлөрдүн ортосунда мейкиндик көз-карандылыктын бар экендигин жана Оукен коэффициентинин кошуна өлкөлөрдө окшоштугун көрсөттү.

Негизги сөздөр: экономикалык өсүш; жумушсуздук; Оукен мыйзамы; мейкиндик панель маалыматтары анализи.

1. Introduction

Today, unemployment is considered to be one of the most important problems in the world and constitutes a major obstacle to the development of countries. In order to eliminate this obstacle, it is necessary to implement the policies that will increase the employment to the whole country and to increase the production of the real sector and especially the foreign trade. Undoubtedly, increasing the economic growth rates by creating new employment opportunities through increasing production comes first in the policies to be implemented.

Since unemployment is a comprehensive problem, economic policy models alone cannot be analyzed and analyzed. How economic growth occurs, whether it is facing the domestic market or the foreign market, whether it is labor intensive growth, the amount of labor-capital composition percentage in production, and the direction and strength of the relationship between economic growth and unemployment (Yılmaz, 2005: 65) [19].

In an article published by Arthur M. Okun in 1962, the empirical study of the United States (US) economy, which tested the inverse relationship between unemployment rate and economic growth, entered the economics literature as Okun's Law. Briefly, this law argues that high or positive growth rates decrease the unemployment rate and low or negative growth rates increase the unemployment rate.

The fact that the global economy has nearly doubled in recent years and the targeted decline in unemployment rates has not been realized indicates that the link between economic growth and unemployment rate is becoming weaker. It has been realized that economic growth is not enough to create employment and that growth that does not increase employment can be realized. This growth, which does not reduce unemployment, by some economists it is expressed as virtual growth (Sugözü, 2011: 268) [14].

The empirical review of the study will also examine the validity of Okun's Law for European Union (EU) countries, and a discussion of the concepts of "non-employment growth' or "virtual growth" during this period. For this purpose, the spatial econometric method was used in order to reveal the relationship between economic growth and unemployment rate variables and spatial econometric methods of EU member countries were used.

The study is important for studying the effect of space. As a matter of fact, when we look at the literature, it is seen that the effect of space effect analysis for EU countries has been made very little. However, the lack of analysis covering 26 countries of the EU shows the contribution of this study to the literature.

In this study, firstly, the economic growth and unemployment concepts and the situation of these macroeconomic sizes in the EU member states were examined in a summary way. After a brief summary of concepts and magnitudes, the basic theory of Okun's Law was examined and a third summary of the empirical literature was made. After that, econometric methods and models were introduced and application results were given. In the conclusion section, in the light of the findings, a general evaluation was made about the whole study.

2. Economic Growth and Unemployment, Concepts and Situation in EU Countries

A country is called economic growth by increasing the amount and quality of its limited resources and expanding its production possibilities, or by achieving higher production levels by differentiating production technology and institutional structure (Üstünel, 1988: 58) [16].

The measurement of economic growth is made in real terms by calculating the periodical increase in a country in real terms free of price changes. As a result of this measurement, the change in the production level or capacity of the economy will have emerged. The change may be in a negative direction, which is called shrinkage or, more generally, negative growth. Briefly, changes in real GDP in an economy refer to economic growth.

When the average of the growth rates of the European Union countries is analyzed, it is seen that there has been a significant contraction with the global financial crisis. Despite being interrupted during the 2012-2013 period, the EU economy has been in the process of recovery in the last decade.

Unemployment can be regarded as the loss of manpower due to the fact that the labor force is not included in employment in different ways. This loss can be seen in the form of non-working, which is the exact opposite of the study, and can be seen in the working state, especially in developing countries (Ekin, 2003: 115) [8]. However, unemployment at work is also defined as frictional or incidental unemployment and falls outside the scope of unemployment.

Although there are many types of unemployment, the unemployment which is the subject of the study is irrevocable, so it should not be able to find a job although it wants to work first. For this reason, some conditions are required to be considered as unemployed when measuring unemployment. First of all, the person should be able to work (within two weeks to be able to work). In addition, within a certain period (is accepted as the European Union and Turkey in 4 weeks) have not found any channel in the job application business current wage level, although it has made and still need to be any job does not work even one hour.

The unemployment problem, which is one of the damages caused by the financial crisis in the member states of the European Union, declined with the growth in the economy. In the EU countries where technology is developing rapidly and therefore it is difficult to create new employment opportunities, the recent decline in unemployment rates in the recent period is a significant development (fig.1 and fig.2).

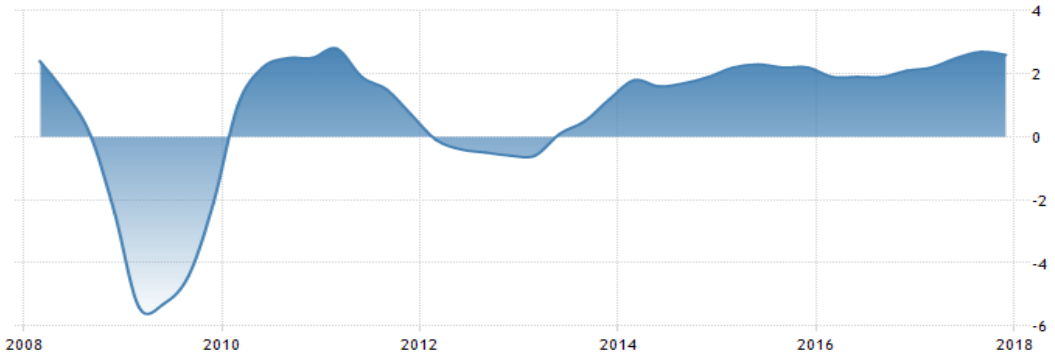

Figure 1. Average Growth Rates in European Union Countries (2008-2018)
Source: Tradingeconomics.com, Eurostat.

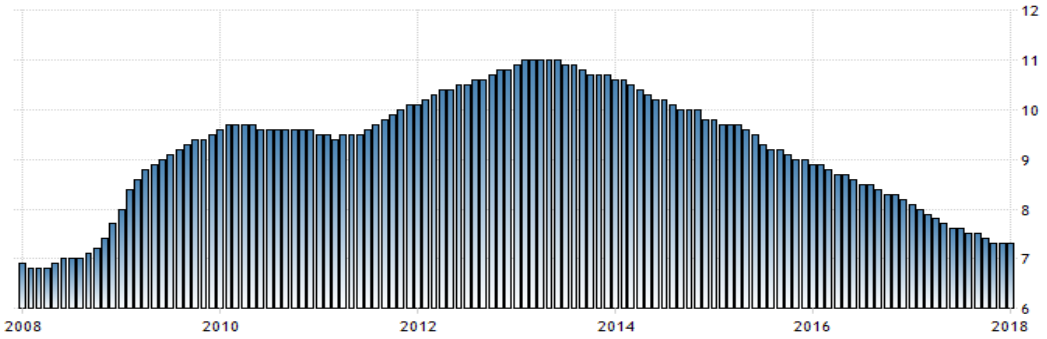

Figure 2. European Union Countries Unemployment Rates Average (2008-2018)
Source: Tradingeconomics.com, Eurostat.

3. Okun's Law: Economic Growth and Unemployment Relations

Arthur M. Okun has examined the growth and unemployment rates for the US economy and found that the unemployment rate declined in the period when the real growth rate was high, and the unemployment rate increased in the period when the real growth rate was low. This relationship between the real growth and unemployment rates with the help of a formula, this finding led to the introduction of the literature as the Okun's Law in the process (Case and Fair, 1999: 148) [3]. In other words, this law is based on the assumption that high growth rates reduce the unemployment rate and low or negative growth rates increase the unemployment rates. (Ceylan and Şahin, 2010: 158) [4].

The theoretical basis of the relationships analyzed by Okun is based on the fact that the increasing workforce needs to produce more goods and services. In order to express the analysis in its simplest form, it assumes the use of unemployment rates for the amount of labor used in an economy for production purposes. Okun's equations are generally accepted as an empirical law, and unemployment rates are used when the data are converted into output differences. (Demirgil, 2010: 140) [5].

First Difference Equation:

In this regression equation; Okun measures the simultaneous relationship between the trend in unemployment rates and the increase in output.

$u = u^* - \beta (y – y^* / y^*)$ (1)

Where u is the actual unemployment rate, u* natural unemployment rate, y actual reel product, y* indicates potential real net. The β parameter in the equation is Okun coefficient. This coefficient is expected to be negative. Okun tested this model with 55 observations using quarterly data from the 1947-1960 period and reached the following conclusion:

$u = 0{,}30 - 0{,}30y$ (2)

The actual unemployment rate will be 0.3% below the natural unemployment rate if the actual product is 1% higher than the potential product.

Spacing Equation:

The relationship that the Okun has established here; between the potential and actual output level and the unemployment rate. This model consists of the testing and selection of certain exponential paths of the potential output. In this selection and testing process, alternative growth rates and comparative levels are used. The regression equation has been established by associating the percentage deficits implied in the current situation with the unemployment rate.

$u = c + d (gyt – gy)$ (3)

Here, u indicates unemployment, gy potential yield, (gyt - gy) the gap between actual and potential output level, and d is the coefficient of Okun. The constant term of the model is the unemployment rate which is valid at the point of full employment (Stock and Ludwig, 2010: 19-20) [13]. Okun found that this regression model was established for different paths with different periods and the unemployment rate was between 0.28 and 0.38.

Okun's Law; It has brought practicality to transform the growth rate of the product into a decrease in the unemployment rate. The analysis gives an approximate result and does not function clearly from year to year. Nevertheless, it provides a meaningful transformation from growth to unemployment. (Dornbusch and Fischer, 1998: 19) [6].

4. Empirical Literature

The relationship between economic growth and the unemployment problem, which is so important, has been a subject that has been debated and sought from past to present. One of the main policies to reduce unemployment is to increase the growth rates by creating new jobs. Arthur M. Okun argued that economic growth rates would reduce unemployment rates. In his study named "Potential GNP: Its Measurement and Significance" for the US economy, which he used quarterly data during the 1947-1960 period, he identified a disproportional relationship between growth and unemployment. In the ongoing process, the number of studies investigating the relationship between unemployment rate and economic growth with different methods has increased. However, this study summarizes the studies that have used spatial econometric methods.

Katos, Pallis and Katsouli (2004) [10], "System Estimates of Cyclical Unemployment and Cyclical Output in the 15 European Union Member-States", named study, they analyzed the validity of the Okun's Law for EU member states with maximum likelihood method. The result is that growth shortens unemployment in the short term.

Similarly, Herwartz and Niebuhr (2011) [9], in their work using spatial panel data analysis, tested the validity of the Okun's Law for the period of 1980-2002 on behalf of 15 EU member states at NUTS 2 level. Another study using the aforementioned method is the study of Dreger, Erber and

Wesker (2013) [7] for 27 EU member states at NUTS 1 level. Although the existence of the spatial effect was determined, the findings confirmed Okun's Law.

Another study on the relationship between economic growth and unemployment, using the spatial econometrics method, is the work performed by Yazgan and Yılmazkuday (2009) [17]. With the data of 1978-2002 period, Okun's Law for USA was analyzed. In the study, geographic weighted regression was used to evaluate possible geographical interactions between states. Different coefficients have been reached for each country. The possible stability clubs for the coefficients of Okun's Law were also examined and the "clusters of Okun" were mostly geographically found.

Another study conducted by the method in question is the study of Kuscevic (2014) [11] for the 2002-2010 period using Okun's Law for 358 metropolitan statistical fields. It has been concluded that specific growth has a small impact on the unemployment rate and that unemployment at an urban level is highly dependent on the surrounding conditions, national labor and commodity markets.

On the other hand, Oberst and Oelgemöller (2013) [12], applied the spatial panel data analysis with the data of 2002-2009 period in the study of the question of whether the inequality between economic growth and unemployment is a driving force for regional economic growth in Germany after 2008-2009 economic crisis effects. As a result, spatial dependence was determined.

5. Empirical Analysis

In this part of the study, the first econometric method will be introduced and then the data set will be given with the regression model. Finally, the findings of the analysis will be given and a general evaluation will be made in the light of these findings.

5.1. Methods

Studies that pioneered spatial econometrics began to develop rapidly since the 1970s. Because the studies using multi-zone data did not take into account the regional or neighboring relations created a lack of analysis. As Tobler (1979) [15] states, everything is related to everything, but close things are more related to distant ones (Yeşilyurt, 2008: 166) [18].

The need to demonstrate the interactions and comparison of geographic positions with each other gradually increased the use of cross-sectional data. Spatial econometrics is a science branch for spatial and spatial heterogeneity in regression models for section and panel data (Zeren, 2010: 19) [20].

In the analyzes, the spatial weight matrix is defined in order to reveal the spatial successive dependence, in other words the neighborhood relationship. The spatial weight matrix generated by reference to the geographical arrangement of the observations or their proximity to each other is defined as *W* and is *n* x *n* dimension. n is the number of locations or objects in the geography. For each geographic location (region, state, county) there is a column with one row and each element (w*ij*) indicates whether the elements in the row and column are adjacent. For ease of use, locations or objects are shown in i and j. The elements of the weight matrix are formed according to boundary or distance-dependent weights (Zeren, 2010: 22) [20].

When W*ij* = when it is 1, i and j are adjacent to each other.

When W*ij* = when it is 0, i and j are not adjacent to each other.

In the weight matrix, standardization is generally used. After this process, the row sum must be 1. Two weighting methods available:

- Geographic weighting

a. Distance to the neighborhood

b. Border neighborhood

The definition of the neighborhood depends on the distance between borders. Anselin has developed different neighborhood definitions by resembling a border neighbor to a game of chess. These are neighbor to the castle, elephant and queen (Anselin, 1988: 18) [1]. Castle neighborhood; the neighborhood, which shares the common edge, the elephant neighborhood; the neighborhood that shares the common corner, queen is the neighborhood sharing the edge and the corner of the neighborhood.

- Socio-economic weighting

The regression models that take spatial consecutive dependence into consideration are two, namely the spatial delay dependent variable model and the spatial delay error model. In the spatial delayed dependent variable model, the delayed dependent variable is included as an explanatory variable again.

$y = \rho Wy + X\beta + \varepsilon$ (4)

ρ; It shows spatial autocorrelation.

H_0: ρ = 0 No spatial interaction

H_1: ρ ≠ 0 Spatial interaction

In the case of the spatial delay error model, the error term of the neighboring regions is correlated with the error term of our region.λ shows spatial autocorrelation.

$y = x\beta + \varepsilon$ (5)

$\varepsilon = \lambda w\varepsilon + u$ (6)

The hypotheses of the model are as follows;

H_0 : λ= 0 No spatial interaction

H_1 : λ ≠0 Spatial interaction is exist

Provides different observation opportunities for all units in the sample, in the analysis of the region and country where the possibility of heterogeneity is high, spatial panel data analysis with the possibility to analyze and take into account these heterogeneities (Baltagi, 1995) [2] the method used in the study.

In the spatial panel data analysis method, there are four regression models showing the effects of space. These;

• Constant Effective Spatial Delayed Dependent Variable Model

$y_{it} = \alpha_i + \rho Wy_{it} + X_{it}\beta + \varepsilon_{it}$ (7)

• Spatial Delayed Dependent Variable Model with Random Effect

$y_{it} = \rho Wy_{it} + X_{it}\beta + \mu_i + \varepsilon_{it}$ (8)

• Constant Effective Spatial Delayed Error Model

$y_{it} = \alpha_i + X_{it}\beta + \varepsilon_{it}$ (9)

$\varepsilon_{it} = \phi w\varepsilon_{it} + u_{it}$ (10)

• Random Effective Spatial Delayed Error Model

$y_{it} = X_{it}\beta + \mu_i + \varepsilon_{it}$ (11)

$\varepsilon_{it} = \phi\varepsilon_{it} + u_{it}$ (12)

5.2. Model and Data Set

In this study, it was aimed to measure the validity of the Ok Law in EU countries and spatial panel data analysis method was used in this context and vizier neighborhood was chosen among the weighting methods. The second equation of Okun's equations is the Regression model of the study. As mentioned above, this equation; The model consists of the testing and selection of certain exponential paths of the potential output.

uit = cit + d(gyt – gy) (13)

According to the equation, the dependent variable of the regression model is the unemployment rate. The explanatory variables are clear between the current unemployment rate and the actual and potential output level at the point of full employment. The data sets of the unemployment rate and the current unemployment rate variables at the point of full employment were obtained from EUROSTAT data and the output difference data were obtained from ECONOMYWATCH data.

Table 1. Defining Variables

Symbol	Variable's Name	Variable Description
u	Unemployment rate	EU 26 member countries - Not seasonally adjusted data set. It includes all age and gender classifications and reflects the unemployment rate.

c	Unemployment at the point of full employment	EU 26 member countries - Not seasonally adjusted data set.
d	Okun's coefficients	The EU 26 member countries - the coefficient of the difference between the potential output (gyt) and actual output (gy)

In the study, while the analysis of the EU countries for the period of 2003-2016 is aimed, it is excluded from the data set of Cyprus and Malta. Because both countries do not have any border with any of the other member countries.

5.3. Application and Findings

In the study, the findings were obtained using the codes prepared by Lesage with MATLAB program. The results of the analysis of the least squares method for the range models of Okun are shown in Table 2.

Table 2. Least Squares Method (OLS) Estimation Results

OLS Dependent Variable: Unemployment Rate			
Variables	Coefficient	t statistic	Probability Value
c (unemployment at full employment)	1.1688***	22.640	0.0000
d (Okun's coefficient)	-0.3012***	-5.4138	0.0000

Meaningfulness Rates: ***%1, **%5, *%10.

According to the results of OLS estimation, it is seen that the coefficients of the two explanatory variables are statistically significant at 1% significance level. The reading coefficient was negative, as expected, supporting the theory. It has been found that every 1% increase exceeding the output difference will decrease unemployment by 0.30%.

However, if there is spatial interaction between EU Member States and the interaction is neglected and the least-squares method is applied, the model's estimator will be deviated and inconsistent. Therefore, the spatial effect of the model was determined by LM test.

Table 3. Test Results for Model Selection

		Probability value
LM test spatial delay no	7.9770	0.005
Resistant LM test spatial delay no	0.4889	0.484
LM test spatial error	11.3907	0.001
Resistant LM test no spatial error	3.9026	0.048

As seen in Table 3, there is a spatial effect among the member countries and the appropriate model is the spatial delay error model.

In the model, the MATLAB program did not provide the results of the LR test, which would indicate whether the pooled effects or the fixed effects were valid. For this reason, the Restricted F test was performed. At the end of the test, the F test statistic was found to be 10 and the hypothesis H0, which indicated pooled effect, was rejected. Therefore, fixed effects are valid in the model.

As a next step, the Hausman test was performed to determine whether the model had fixed effects or random effects and the Hausman test statistic was found to be 0.7790. According to this result, H0 hypothesis is considered to show random effects. In other words, random effects are valid in the

model. However, as EU member states have been studied, it is more appropriate to make a constant effect estimation in the study. Therefore, the spatial panel data model to be applied in the study is a constant-acting spatial delay error model.

The estimation results of the constant-acting spatial delay error model are given in Table 4. As can be seen, both explanatory variables are statistically significant at 5% significance level. As in the OLS estimation results, Okun's coefficient was negative in the direction of expected, which is the theory. An increase of 1% in excess of the output difference will reduce unemployment by 0.31%. On the other hand spatial effect showed significant results. In summary, in this study where the validity of Okun's Law is analyzed, it is concluded that there is a spatial dependence among EU member states and the reading coefficient is similar in neighboring countries. However, the findings of the study support the literature.

Table 4. Prediction Results for Model

Spatial Delay Error Model - Constant Effects Dependent Variable: Unemployment Rate			
Variables	Coefficient	t Statistic	Probability Value
c (unemployment at full employment)	1.1303**	18.9266	0.0000
d (Okun coefficient)	-0.3170**	-6.9485	0.0000
spat. aut.	0.1859**	3.0445	0.0023

Meaningfulness Levels: ***%1, **%5, *%10.

6. Result

Unemployment is one of the leading problems in the socio-economic context all over the world. In order to solve this problem, policies to increase employment have always been an indispensable element of the economic policies of the countries. In this context, Okun's Law, which predicts that the increase in growth rates will decrease unemployment rates, is important.

In the study, the validity of Okun's Law which analyzes the relationship between economic growth and unemployment rates has been investigated. In order to examine this relationship, the second equation of the equations is used, the unemployment rate as the dependent variable for the period of 2003-2016, and the unemployment rate, which is valid at the point of full employment, and the output difference between the potential and the actual product. The model also includes the neighborhood relationship between EU member states. In practice, the existence of spatial interaction has been tested and the spatial delay error model has been chosen as a suitable model. Pooled estimation and fixed estimation results were then obtained. The Delimited F test on which to choose these two results showed that the model has fixed effects. The findings obtained from the analysis of the constant-acting spatial delay error model showed that Okun's Law was valid for EU member states. In other words, the increasing output gap has a decreasing effect on unemployment.

In addition, economic growth cannot directly contribute to the solution of the employment problem. The reflection of economic growth in countries on the labor force depends on certain conditions, and the only way to create new employment opportunities is not only to increase growth. Therefore, unemployment should be explained by other factors than growth. Indeed, it is noteworthy that unemployment cannot be prevented by a high growth rate.

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