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-RESEARCH PAPER-

UNEMPLOYMENT AND CRIME NEXUS IN EUROPEAN UNION COUNTRIES: A PANEL DATA ANALYSIS[1]

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Abstract

Unemployment is crucial and a chronical problem for many economies due to its social and economic cost dimensions. The problem of unemployment, which causes economies to produce below their potential may also lead to several social problems. In this study, whether unemployment affects crime rates is examined for the first time for 28 countries in the European Union (EU-28) countries with the data of 1993-2016. Second-generation panel cointegration and causality tests were applied to analyze the relationship between unemployment and crime rates, and reciprocal dependence between countries. The cointegration relationship was examined by Westerlund cointegration test and causality relationship was evaluated by panel Granger causality test. Findings of Westerlund cointegration test show that there is a long-term relationship between unemployment and crime rates. At the same time, panel Granger causality test results revealed that the causality relationship is from unemployment to crime rates. The results obtained by panel dynamic least squares method, model coefficients confirm that an increase in unemployment rates positively affect crime rates. According to the results, measures to combat unemployment reduction in EU-28 countries may also lead to a decrease in crime rates.

Keywords: *Unemployment Rate, Crime Rate, European Union, Panel Cointegration Analysis, Panel Causality Analysis.*

JEL Codes: *E24, J69, N34, R15.*

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AVRUPA BİRLİĞİ ÜLKELERİNDE İŞSİZLİK VE SUÇ İLİŞKİSİ: BİR PANEL VERİ ANALİZİ

Öz

İşsizlik, ekonomiler için toplumsal ve iktisadi maliyet boyutları nedeniyle çok önemli ve kronik bir problemdir. Ekonomilerin potansiyel üretim seviyelerinin altında üretim yapmasına neden olan işsizlik sorunu, birçok sosyal soruna yol açabilir. Bu çalışmada, işsizliğin suç oranlarını etkileyip etkilemediği ilk kez Avrupa Birliği'ne üye 28 ülke (AB-28) için 1993-2016 yıllarına ait verilerle incelenmiştir. İşsizlik ve suç oranları arasındaki ilişkiyi ve ülkeler arasındaki karşılıklı bağımlılığı analiz etmek için ikinci nesil panel eşbütünleşme ve nedensellik testleri uygulanmıştır. Eşbütünleşme ilişkisi Westerlund eşbütünleşme testi ile incelenmiş ve nedensellik ilişkisi panel Granger nedensellik testi ile değerlendirilmiştir. Westerlund eşbütünleşme testinin bulguları, işsizlik ve suç oranları arasında uzun vadeli bir ilişki olduğunu ve panel Granger nedensellik testi sonuçları ise işsizlik oranından suç oranlarına doğru nedensellik olduğunu ortaya koymuştur. Panel dinamik en küçük kareler yöntemi sonuçları ise model katsayılarının işsizlik oranlarındaki artışın suç oranlarını olumlu yönde etkilediğini doğrulamıştır. Elde edilen sonuçlara göre, AB-28 ülkelerinde işsizliğin azaltılmasına yönelik tedbirler, aynı zamanda suç oranlarında da bir düşüş sağlayabilir.

Anahtar Sözcükler: *İşsizlik Oranı, Suç Oranı, Avrupa Birliği, Panel Eşbütünleşme Analizi, Panel Nedensellik Analizi.*

JEL Kodları: *E24, J69, N34, R15.*

1. INTRODUCTION

In economics, which focuses on the individual as a branch of social science, the effects of all subjects that concern the individual on economic behaviors are examined extensively. As known, all developments affecting individual behaviors may also affect society. For this reason, the research range of economics is also quite wide. The two essential concepts of "unemployment" and "crime", which are the subject of this research, have a dimension that affects the individual, society, and economy. In this study, the interaction between these concepts is investigated.

Crime is a term that has critical social dimensions in terms of its types, causes, and consequences. The concept of crime, which has many legal, social, psychological, and economic reasons, concerns different disciplines ranging from psychology to law, economy to public administration in terms of its results.

It is seen that crime factors and crime rates have increased significantly due to the increasing complexity of social structures and rising population density. Besides, the scope of crime also varies according to changing social dynamics. When the studies about the subject of crimes are examined, it is noteworthy that the causes of the crime differ. For

instance, violent crimes such as murder, wounding and manslaughter are mostly based on personal motives, while the origin of acts against property such as extortion, theft, and robbery are mostly related to economic factors (Scorcu and Celini, 1998). Therefore, it is accepted the fact that the economic conditions such as the level of employment, general price level, social income distribution, poverty, market conditions, and minimum wage level have a significant impact on the concept of crime (Entorf and Spengler, 2000).

Just as the crime rate, the unemployment problem has become an essential economic and social problem in modern society. Although economic factors are the basis of the unemployment problem, unemployment is also known to trigger other social problems. Because unemployment as a social and economic problem carries many potential risks and problems in its nature. For instance, in societies with the high unemployment rate, it is known that suicidal tendencies, psychological problems, health problems and health expenditures, housing demand, education, infrastructure, security, and environment expenditures increase. And unemployment also increases the burdens on the public budget due to unemployment payments.

Additionally, crime rates increase in societies where unemployment is rising. The increase in crime rates creates crime losses, security, and public order costs as new resource losses. For these reasons, it can be said that unemployment creates a resource efficiency problem. As shown above, both unemployment and crime have a miscellaneous social character and cause high economic and social costs. Dealing with both problems is vital for the regulation of the economy and social life. This situation necessitates significant investment planning and resource utilization such as education, health, justice, and security investments for a systematic and sustainable fight against crime. Efforts and investments for fighting against crime will create a constraint for the economy produces more production and more national income. Therefore, a detailed analysis of the interaction between these two concepts has particular importance.

This study aims to show the interaction between unemployment and crime rates empirically. For this purpose, in this study, the relationship between unemployment and crime rate for the first time in 28 EU countries is analyzed by second-generation panel data cointegration and causality tests with annual data from 1993 to 2016. In the second part of the study, a literature review is presented. In the third section, some information is given about the data. In the fourth part, empirical analysis is made and the findings are interpreted. In the final part, the study is concluded, and policy suggestions are made for future studies.

1.1. Literature Review

In this part of the study, the results of the studies examining the relationship between unemployment and crime in different country samples are summarized. Although it is generally accepted that the rate of crime increases in the periods when unemployment is increasing, the results of the studies on this subject differ. This differentiation is arisen due to the dissimilarities in the countries, time period, the methodology of analysis and the type of crime examined in these studies. However, the predominance in the literature

is that unemployment has increased the crime types (Hale and Sabbagh (1991), Cerro and Meloni (2000), Raphael and Winter-Ebner (2001), Carmichael and Ward (2001), Levitt (2001), Melick (2003), Arvanites and DeFina (2006), Dursun et al. (2011), Ata (2011), Altindag (2012), Philip and Land (2012), Maddah (2013), Tas et al. (2014), Bisschop (2014), Laliotis (2016) and Ha and Andresen (2017)) and also some studies did not have a significant effect on crime (Papps and Winkelman (2000), Luiz (2001), Oliver (2002), Fallahi and Rodriguez (2014), Blomquist and Westerlund (2014) and Zuzana and Popli (2015)).

Merton (1938), Cloward and Ohlin (1960) in their studies, discussed sociological aspects of crime. They concluded that the targets set by society for individuals constitute a pressure and social burden on individuals. In this sense, economic conditions such as employment, wages, job security, and business mobility constitute the economic dimensions of this social burden (Arvanites and DeFina, 2006). Because these targets set by the community, if they are far-off and unreachable, they constitute a motivation to reach these targets illegally and to commit crimes. While the theoretical background of the relationship between unemployment and crime is established, it is thought that individuals can exhibit various criminal behaviors such as theft, extortion, robbery, and burglary in order to maintain the same standard of living and well-being (Mellick, 2003).

Becker (1968) and Ehrlich (1973) in their study, as the first analysis of the subject, accepted that labor market conditions have a significant impact on criminal behavior. Because, if the opportunities in the labor market are limited, illegal behavior is considered as an alternative, and the tendency to commit a crime increases. Besides, the marginal benefit from the unregistered labor force that cannot be obtained from legal activities increases and the leisure time that can be allocated to illegal activities increases. In addition to this, considering the wage and income level and the risk of being punished against the employment of the workforce, they decide by comparing the income level that can be achieved in illegal activities.

When the empirical studies in the literature are examined, it is noteworthy that their findings differ. While some studies concluded that there is a positive relationship between unemployment and crime, some have negative, and some have no relationship, and some have mixed results. In this part, the results of the studies with positive, negative, unrelated, and mixed relationships will be categorized separately, and the literature review will be presented.

1.1.1. The Studies Found Positive Relationship Between Unemployment and Crime Rate

Hale and Sabbagh (1991) found a positive relationship between the unemployment rate and crime rates in his time series analysis in England in 1949-1987 period.

Cerro and Meloni (2000) found that unemployment has a positive effect on crime rates in Argentina from 1990 to 1999 with panel data analysis.

Carmichael and Ward (2001) found that youth and adult unemployment rates were positively correlated with robbery, mugging, fraud, and total crime rates in England and Wales for the period of 1989-1996.

Levitt (2001) found that a 1% increase in the unemployment rate increased the rate of property crime from 1% to 2%.

Arvanites and DeFina (2006) analyzed the motivation and opportunity effect of crime in their study between 1986 and 2001. They concluded that the effect of motivation on offenses related to the violent crime was low and the effect of opportunity was not effective. As a result of the study, it was found that the improvement in macroeconomic indicators would decrease the crime rates.

Mellick (2003) established research on ten different states of the USA from 1979 to 2001 and concluded that the increase in the unemployment rate increased vehicle theft in this period.
Yamak and Topbas (2005) analyzed the causal relationship between the unemployment rate and crime in Turkey for the period of 1995-2007. They found a significant causal relationship from unemployment to crime.

Comertler and Kar (2007) studied the determinants of crime in Turkey, according to their results of the cross-sectional analysis, they found the higher rate of unemployment affected the crime rate.

Dursun et al. (2011) found that the crime rate positively affected by the unemployment rate in the long run according to their cointegration analysis on Turkey for the period 1990-2010.

Ata (2011) examined the relationship between unemployment and crime with a cross-sectional analysis of Turkey. The study found that unemployment affects crime rates significantly and positively.

Philips and Land (2012) analyzed for the 1978-2005 period in the United States for more than 100 thousand people in the study of over 400 cities in 7 different crime index developed by the city, state and country level. At city level analysis, unemployment led to an increase in vehicle theft, while reducing motorcycle theft. At the state level, it was found that the three of seven crime indexes (theft, robbery and vehicle theft) were positively affected by the unemployment rate. In the analysis conducted at the country level, it was found that the unemployment rate was positively related to theft crimes, but this relationship was weak.

Maddah (2013), in his study in Iran, found a strong and positive relationship between the unemployment rate and theft crime for the period 1997-2006. Besides, he found that demographic variables, such as poverty, push people to the crime of theft.

Tas et al. (2014) implemented a panel data analysis for Turkey in 2008-2011. They found

that a 1% increase in the unemployment rate cases an 0,03 increase crime rate in per thousand people.

1.1.2. The Studies Found Mixed Relationship Between Unemployment and Crime Rates

Box (1987) reported that 33 studies found a positive correlation in the analysis of crime and unemployment relationship, while 19 studies found a negative relationship.

Pazarlioglu and Turgutlu (2007) found a relationship between crimes committed against the state and the long term unemployment rate in Turkey for 1968-2004. Besides, they found a negative correlation between total crime, a crime against public morality, and public security crimes, and unemployment rate. In spite of this, they determined that there is no effect on the unemployment rate on the crimes against property.

Bisschop (2014) found that with the regression model 10% increase in the unemployment rate caused a 3% increase in the number of theft crimes in the Netherlands. On the other hand in the study that used the data from 2005 to 2012, there was no significant relationship between the unemployment rate and assault, violence, and sexual crimes.

Zuzana and Popli (2015) examined the relationship between 6 different types of crime and unemployment rate for Canada in 1979-2006 period. According to their error correction model results, there was no significant relationship between the unemployment rate and crime variables in the long-term. However, they found a negative correlation between the crimes against property and unemployment rate in the short term.

Laliotis (2016) examined the relationship between the unemployment rate and crime in Greece with a panel data analysis for the period 1999-2013. He found a positive correlation between the male unemployment rate and crimes related to individual freedom and drug use. There was a weak relationship between the long-term unemployment rate and total crime variable.

Ha and Andresen (2017) employed a decomposition and regression model to investigate the relationship between the unemployment rate and crimes according to the census of 1991, 1996, and 2001 in Canada. They found that unemployment rate positively affects the crimes. But the extent of this effect varies according to the type of crime. In the long run, the effect of unemployment is the highest in assault (0.059%), violence (0.056%) and robbery (0.052%). In the short term, crime and unemployment relationship are more effective in attack (0,016%) and violence (0,012%) crimes.

1.1.3. The Studies Found No Relationship Between Unemployment and Crime Rates

Papps and Winkelman (2000), in their study with panel data analysis, investigated the relationship between unemployment and crime in New Zealand for the period 1984-1996 and found that unemployment has no statistically significant effect on crime.

Luiz (2001) found that there is no statistically significant relationship between economic variables and crimes against the property by the help of Johansen cointegration analysis for the period of 1960-1993 in South Africa.

Oliver (2002), in his study in the United States for the period 1960-1998 didn't found a significant relationship between unemployment and crime rate.

Blomquist and Westerlund (2014) concluded that the unemployment rate had no statistically significant effect on the crime, according to the panel data analysis conducted in Sweden for the period 1975-2010.

1.1.4. The Studies Found Negative Relationship Between Unemployment and Crime Rates

Fallahi and Rodriguez (2014) investigated the effect of the unemployment rate on four types of theft with the Markov switching model for the USA and they found that unemployment had a negative impact on vehicle theft.

Allen (1996) found that in the United States in 1959-1992 period, the unemployment rate caused the increase in the robbery and property theft behavior and motor vehicle theft was found to be affected negatively. In this study, Allen also pointed out that when the unemployment increase, the ones who are unemployed can decrease the crimes related to the goods if they are considered as guardians while waiting at home contrast to the other studies.

As it is seen in the empirical literature analysis, it is noteworthy that the study findings differ depending on the country, method and time interval discussed in the studies. However, the results of empirical literature outweigh the positive relationship between unemployment and crime rates.

It is shown that the unemployment rate and crime rate is related to each other in the literature. Although there are numerous studies examining the relationship between unemployment and crime, with this study, this relationship is analyzed for EU-28 countries that consist of both developed and developing countries. Therefore, this study will provide general information on the relationship between unemployment and crime rates for all economies. In addition, the fact that the study was conducted with contemporary methods and datasets provides up-to-date analysis findings on the subject.

2. METHOD

2.1. Data

The annual unemployment and crime rates data for EU-28 countries in Table 1 were obtained from the World Bank and Eurostat databases. For the last year of the dataset, some figures of EU-28 countries were included in the study. Figure 1 and Figure 2 show

crime and unemployment rates, that found in 100 people, of EU-28 countries in 2016, recursively. The highest crime rates were observed in Lithuania and the lowest one is in Cyprus according to Figure 1. Similarly, the highest unemployment rate was found in Greece and the lowest one was in the Czech Republic according to Figure 2.

Table 1. The Countries (EU-28) Included in the Study

Austria	Estonia	Italy	Portugal
Belgium	Finland	Latvia	Romania
Bulgaria	France	Lithuania	Slovakia
Czech Republic	Germany	Luxembourg	Slovenia
Croatia	Greece	Malta	Spain
Cyprus	Hungary	Netherlands	Sweden
Denmark	Ireland	Poland	United Kingdom

In the study, the crime rate was defined by dividing the number of reported crimes by the total population and the result was multiplied by 100. In addition to these, the natural logarithm (ln) of all data was used in the panel data analysis. All analysis was conducted with Eviews, Gauss, and Stata statistical package programs.

Figure 1. Crime Rates of EU-28 Countries in 2016

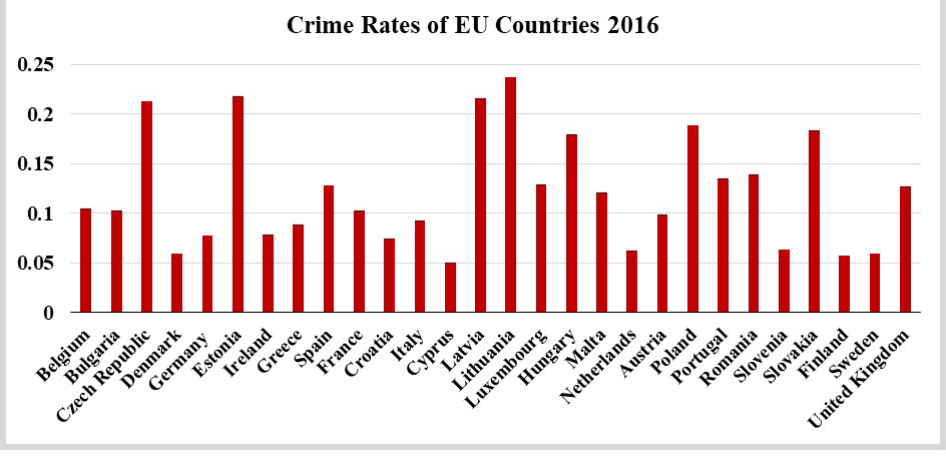
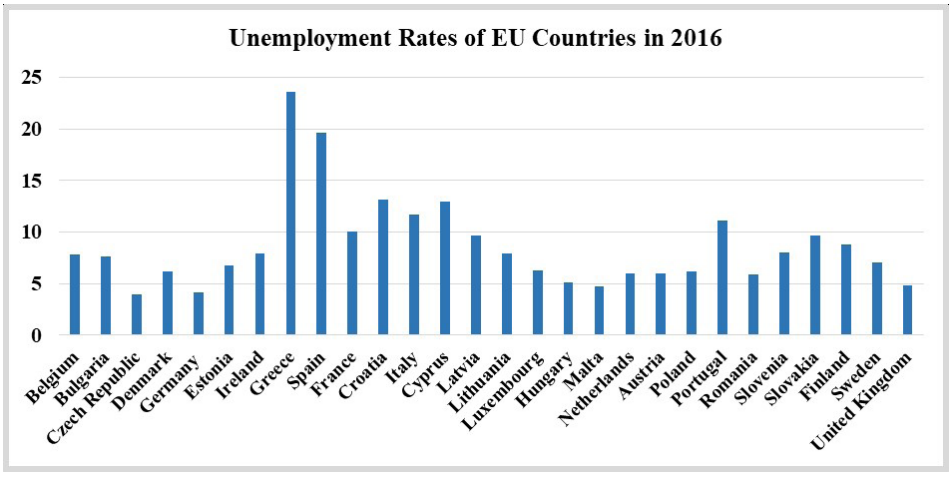


Figure 2. Unemployment Rates of EU-28 Countries in 2016



3. RESULTS

Panel data, which can also be expressed in the form of longitudinal or cross-section time series data, is the data set formed by combining time series observations of units such as country, company, and household in the horizontal cross-sectional form (Hsiao, 2007). Because of its two dimensions such as time series and cross-section, panel data has extensive use in the literature due to advantages such as controlling individual differences, having higher degrees of freedom to increase the reliability of estimation, and allowing to estimate complex models (Baltagi, 2010).

To determine which method is preferred when investigating the cointegration and causality relationship between series in panel data analysis, firstly it should be examined whether there is cross-sectional dependence between series. In this context, there are two groups as first and second-generation tests according to whether they take into account the cross-sectional dependency (CSD) in the panel data literature. In the case of CSD, it is more accurate to choose second generation tests. Therefore, in the study, firstly, the cross-sectional dependence between the panel forming countries was tested.

3.1. Cross-Section Dependency

CSD refers to whether the cross-sectional units are correlated with each other, whether the units are affected by the shocks received from the series to the same extent. In the case of CSD between the series, the results of the analysis without considering this situation will give significant deviations. Therefore, CSD should be considered before starting the analysis. The CSD test was first developed as a CDLM1 (Lagrange Multiplier) test by Breush and Pagan (1980). Then Pesaran (2004) developed the CDLM2 test statistic.

With these statistics the hypotheses for the LM tests are as:

H0: cov(uit,ujt)=0, i≠j (There is no cross-section dependence.)
H1: cov(uit,ujt)=0, i≠j (There is cross-section dependence.)

For standard panel regression in Equation 1, Bresusch and Pagan (1980) and Pesaran (2004) LM statistics are calculated using the significance of the correlation (in Eq.2) between the residuals as in Equation 3 and 4, recursively.

$$y_{it}=\alpha_i+\beta' x_{it}+u_{it},\ i=1,2,\ldots,N;\ t=1,2,\ldots,T \qquad (1)$$

$$\hat{\rho}_{ij}=\hat{\rho}_{ji}=\frac{\sum_{i=1}^{T}\hat{u}_{it}\hat{u}_{jt}}{\sqrt{\left(\sum_{i=1}^{T}\hat{u}_{it}^2\right)}\sqrt{\left(\sum_{i=1}^{T}\hat{u}_{jt}^2\right)}} \qquad (2)$$

$$CD_{LM1}=T\sum_{i=1}^{N-1}\sum_{j=i+1}^{N}\hat{\rho}_{ij}^{\,2}\sim N(0,1) \qquad (3)$$

$$CD_{LM2}=\sqrt{\frac{2T}{N(N-1)}}\left(\sum_{i=1}^{N-1}\sum_{j=i+1}^{N-1}\hat{\rho}_{ij}\right)\sim N(0,1) \qquad (4)$$

If is back to the application dataset again, the null hypothesis that there is no cross-sectional dependence for all series is rejected due to Table 2 results and it is decided there is a cross-sectional dependence in the series. According to this finding, the shocks in the related series of countries in the panel affect the other countries. On the other hand, in the unit root and cointegration analyses of the series used in the study, second-generation unit root and cointegration analyses should be used which produce more consistent results under the assumption of CSD. Because the first-generation panel unit root tests are formed under the assumption that the cross-section units are independent of each other.

Table 2. Results of CSD Tests

	CD_{LM1} Breusch and Pagan (1980)		CD_{LM2} Pesaran (2004)	
	Stat.	**Prob.**	**Stat.**	**Prob.**
lncrime	2347.885	0.000	18.857	0.000
lnunemployment	1756.682	0.000	16.237	0.000

3.2. Panel Unit Root Tests

Unit root tests that take into account the cross-sectional dependence are the second generation unit root tests. In this study, the unit root is tested with Pesaran (2007) CADF

test from the second generation unit root tests and determine whether the series are stationary or not.
The hypotheses for the CADF unit root test are:

H_0: The series is not stationary. (There is unit root.)
H_1: The series is stationary. (There is no unit root.)

The results of the unit root test for application dataset are shown in Table 3. In general, in all series, statistics calculated are seen to be greater than those of Pesaran (2007) table critical values. Accordingly, the null hypothesis is accepted and it is determined that the panel, consists of all countries series, have the unit root. It means that relevant series are affected by previous levels.

Table 3. Results of CADF Unit Root Test for I(0) Series

	CADF Unit Root Test	
	Stat.	**Prob.**
lncrime	0.403	0.656
lnunemployment	0.421	0.663

Table 4. Results of CADF Unit Root Test for I(1) Series

	CADF Unit Root Test	
	Stat.	**Prob.**
lncrime	-10.651	0.000
lnunemployment	-4.869	0.000

It is seen that in Table 4, the lncrime and lnunemployment series are stationary when the first degree differences are taken. For these cointegrated series at I(1), it is possible to perform cointegration analysis. However, which cointegration test is going to be preferred is depending on whether the cointegration coefficients are homogeneous or not. Therefore, before applying cointegration test, slope homogeneity should be investigated.

3.3. Slope Homogeneity Test

The homogeneity of the cointegration coefficients is tested by the slope homogeneity test that is also known as the Delta test developed by Pesaran and Yamagata (2008). This test is an updated version of Swamy test (Swamy, 1970). This Delta test tests whether the coefficients in Equation 1 are homogeneous between the cross-section units. And the hypotheses for this test are:

H_0: The slope coefficients are homogeneous.
H_1: The slope coefficients are not homogeneous.

$$\Delta = \sqrt{N}\left(\frac{N^{-1}\hat{S} - p}{\sqrt{2p}}\right) \quad (5)$$

Table 5. Results of Slope Homogeneity Test While Lncrime Dependent Variable and Lnunemployment Independent Variable

	Delta Test	
	Stat.	**Prob.**
$\hat{\Delta}$	-1.470	0.929
$\hat{\Delta}_{adj}$	-1.571	0.942

Table 6. Results of Slope Homogeneity Test While Lnunemployment Dependent Variable and Lncrime Independent Variable

	Delta Test	
	Stat.	**Prob.**
$\hat{\Delta}$	-2.782	0.997
$\hat{\Delta}_{adj}$	-2.974	0.999

Since the direction of the relationship between the variables was not determined, the Delta test performed considering both cases. According to Table 5 and Table 6, for both cases, slope coefficients are homogeneous at the level of 95% confidence level. Therefore, while is interpreted the results of cointegration test, panel statistics should consider instead of group statistics.

The existence of the cointegration relationship between the series is tested with Westerlund (2007) cointegration test considering CSD. In this test, Westerlund proposed 4-panel cointegration test. Two of them are named as group mean statistics and the other two are named as panel statistics. Panel statistics are formed by combining information about error correction in the cross-section size of the panel. Group means statistics do not use this information.

For calculation of and test statistics, first, estimations re obtained with least squares technique from Equation 6.

$$\Delta y_{it} = \hat{\delta}_i' d_t + \hat{a}_i y_{it-1} + \hat{\lambda}_i' x_{it-1} + \sum_{j=1}^{p_i} \hat{a}_{ij} \Delta y_{it-j} + \sum_{j=0}^{p_i} \hat{\gamma}_{ij} \Delta x_{it-j} + \hat{e}_{it} \quad (6)$$

$$\alpha_i(1) = 1 - \sum_{j=1}^{p_i} \alpha_{ij} \quad (7)$$

$$G_\tau = \frac{1}{N} \sum_{i=1}^{N} \frac{\hat{\alpha}_i}{SE(\hat{\alpha}_i)} \text{ and } G_\alpha = \frac{1}{N} \sum_{i=1}^{N} \frac{T\hat{\alpha}_i}{\hat{\alpha}_i(1)} \quad (8)$$

Equation 9 and 10, which are a similar equation to group statistics, are used to obtain panel statistics.

$$\Delta \tilde{y}_{it} = \Delta y_{it} - \hat{\delta}_i' d_t - \hat{\lambda}_i' x_{it-1} - \sum_{j=1}^{p_i} \hat{\alpha}_{ij} \Delta y_{it-j} - \sum_{j=0}^{p_i} \hat{\gamma}_{ij} \Delta x_{it-j} \quad (9)$$

$$\tilde{y}_{it-1} = y_{it-1} - \tilde{\delta}_i' d_t - \tilde{\lambda}_i' x_{it-1} - \sum_{j=1}^{p_i} \tilde{\alpha}_{ij} \Delta y_{it-j} - \sum_{j=0}^{p_i} \tilde{\gamma}_{ij} \Delta x_{it-j} \quad (10)$$

$$\hat{\alpha} = \left(\sum_{i=1}^{N} \sum_{t=2}^{T} \tilde{y}_{it-1}^2 \right)^{-1} \sum_{i=1}^{N} \sum_{t=2}^{T} \frac{1}{\hat{\alpha}_i(1)} \tilde{y}_{it-1} \Delta \tilde{y}_{it} \quad (11)$$

$$P_\tau = \frac{\hat{\alpha}}{SE(\hat{\alpha})} \text{ and } P_\alpha = T\hat{\alpha} \quad (12)$$

In the Westerlund cointegration test, the null hypothesis is that there is no cointegration relationship between variables. While the alternative hypothesis for panel statistics indicates that there is cointegration in all countries, the alternative hypothesis established for group statistics is that only some countries have cointegration (Westerlund, 2007).

As can be seen from Table 7, when is evaluated the robust p-values of and, the null hypothesis that there is no cointegration between the series can be rejected according to 5% significance level. In this case, it can be said that lncrime and lnunemployment series move together in the long term in all countries.

Table 7. Results of Cointegration Test

Westerlund Panel Cointegration Test				
Statistic	**Value**	**Z-value**	**p-value**	**Robust p-value**
$\mathbf{G_\tau}$	-3.776	-11.801	0.000	0.000
$\mathbf{G_a}$	-21.159	-13.629	0.000	0.000
$\mathbf{P_\tau}$	-20.110	-12.149	0.000	0.000
$\mathbf{P_a}$	-21.752	-20.062	0.000	0.000

In order to define the direction of this long relationship, panel Granger causality was applied to the dataset because the slope coefficients were homogeneous. The results of the causality test can be seen in Table 8. Because of the first hypothesis is rejected in Table 8, it can be said the direction of this relationship is from unemployment towards the crime.

Table 8. Results of Causality Test

Panel Granger Causality Test		
Null Hypothesis	**F-statistic**	**p-value**
lnunemployment does not Granger cause lncrime	3.2423	0.0397
lncrime does not Granger cause lnunemployment	0.9560	0.3850

The long-term cointegration coefficients of the overall panel were estimated by the panel dynamic ordinary least squares (PDOLS) method developed by Kao and Chiang (2001) taking CSD into account. PDOLS is a method that can eliminate the deviations in static regression by incorporating dynamic elements into the model. In this model, $-K_{ii}$ and K_{ii} are leads and lags, respectively.

$$y_{it} = \beta_{0i} + \beta_{1i} K_{1i} + \beta_{2i} x_{1i} + \sum_{k=-K_{ii}}^{K_{ii}} \alpha_{ik} \Delta K_{it} + \sum_{k=-K_{ii}}^{K_{ii}} \lambda_{ik} \Delta x_{it} + \varepsilon_{it} \qquad (13)$$

Table 9. Results of PDOLS

	Cointegration Estimation Results			
Variable	**Coefficient**	**Standard Error**	**Z-statistic**	**p-value**
lnunemployment	0.4265	-11.801	0.000	0.000

In Table 9, when lnuemployment is independent variable and lncrime is dependent variable, PDOLS results are summarized. According to Table 9, lnunemployment variable has statistically significant and long term positive effect on lncrime variable. It can be seen when the unemployment rate increase by 1 unit, crime rate increase by 1.53 ($e^{0.4265}$=1.53) units.

4. DISCUSSION AND CONCLUSION

Why people commit crimes, why criminal activities are higher in some countries and regions, and what are the economic-social-political-cultural factors that determine the crime are the most discussed issues.

Crimes are shaped by social, economic, political, and spiritual dynamics of societies.

The unemployment rate is a versatile concept and it's generally accepted that the unemployment rate is an important factor in the crime rate.

In this study, the relationship between the crime rate and unemployment was examined for the first time in EU-28 countries by the panel data techniques. Although the other studies often carried out at the developed country levels in the related literature, our analysis examined the relationship between these variables by the help of panel data analysis and the contemporary methods for EU-28 which is a successful and important sample of economic and political integration and has noteworthy strength on the world scale. In parallel with the literature, which the studies found a positive relationship between unemployment and crime rate, such as Levitt (2001), Bisschop (2014), Tas et al. (2014) a long-term relationship between the two variables is found. According to empirical findings, when the unemployment rate increase by 1 unit in EU-28 countries, the crime rate increase by 1.53 units.

The findings of the study reveal that preventive policies should be put into effect, which is an important factor in the fight against crime in terms of social and economic dimensions, especially in EU-28 countries. Therefore, depending on the increase in crime rates in societies where the unemployment rate is relatively higher, it will be ensured that the budget to be allocated for fighting crime will decrease by mitigated unemployment rates. This progress will increase social welfare by increasing the production level and will increase production efficiency. In this sense, the prevention of unemployment as a different tool of fighting against crime is one of the most important findings of this study. In particular, the reflections of the 2008 Global Financial Crisis have increased unemployment and crime rates in the EU-28 countries. Reducing the unemployment rate and increased employment facilities is recommended to the policymakers to combat crime in developing and developed economies. These also provide to reduce crime rates simultaneously.

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AVRUPA BİRLİĞİ ÜLKELERİNDE İŞSİZLİK VE SUÇ İLİŞKİSİ: BİR PANEL VERİ ANALİZİ

1. GİRİŞ

Suç kavramı; türleri, nedenleri ve sonuçları bakımından sosyal hayatı derinden etkileyen önemli bir kavramdır. Suç kavramının yasal, toplumsal, psikolojik ve ekonomik sebepleri olabildiği için çok farklı disiplinlerin çalışma kapsamına girmektedir. Şiddet ve saldırganlıkla ilgili suç davranışları genel olarak kişisel özelliklere bağlı iken hırsızlık, çalma ve dolandırıcılık gibi suç davranışları ise daha ziyade ülkelerin istihdam düzeyleri, gelir dağılımı, piyasa koşulları ve asgari ücret düzeyi gibi ekonomik değişkenlere bağlıdır (Scorcu ve Celini, 1998; Entorf ve Spengler, 2000).

Bu çalışmada, hem iktisat bilimini hem de toplumu yakından ilgilendiren iki önemli kavram, işsizlik ve suç incelenmiştir. Bu iki kavram arasındaki etkileşim, ilk kez Avrupa Birliği ülkeleri açısından ikinci nesil panel eşbütünleşme ve nedensellik testleri ile analiz edilmiştir.

1.1. Literatür Özeti

İşsizlik ve suç ilişkisiyle ilgili yapılan çalışmalar incelendiğinde, genel olarak işsizlik oranındaki artışın suç oranlarını artırdığı sonucu ağırlık gösterse de (Dursun vd. (2011), Ata (2011), Altindag (2012), Philip ve Land (2012), Maddah (2013), Tas vd. (2014), Bisschop (2014), Laliotis (2016) ile Ha ve Andresen (2017)); ele alınan ülkelerin, kullanılan araştırma yöntemlerinin ve veri kümelerindeki farklılıkların çalışma

sonuçlarının değişiklik göstermesine neden olduğu ve bazı çalışmalarda (Fallahi ve Rodriguez (2014), Blomquist ve Westerlund (2014) ile Zuzana ve Popli (2015)) bu iki kavram arasında anlamlı bir ilişki bulunmadığı görülmektedir.

2. YÖNTEM

Çalışmada 28 AB ülkesinin 1993-2016 dönemi için Dünya Bankası ve Eurostat veri tabanından elde edilen işsizlik ve suç oranı verileri kullanılmıştır. İşsizlik ve suç oranları 2016 yılı verileri ile değerlendirildiğinde, suç oranlarının en yüksek olduğu AB üyesi ülkelerin Çekya, Estonya, Litvanya ve Letonya olduğu, en yüksek olduğu ülkelerin ise Yunanistan, İspanya, Hırvatistan ve Kıbrıs olduğu dikkat çekmektedir.

Çalışmada panel eşbütünleşme ve nedensellik testleri kullanılmış olup, ilk olarak işsizlik ve suç serileri arasında karşılıklı bağımlılık olup olmadığını kontrol etmek amacıyla Bresusch ve Pagan (1980) ile Pesaran (2004) CDLM istatistikleri hesaplanmıştır. Pesaran (2007) tarafından geliştirilen CADF testleri ile birim kök testi uygulanmıştır. Eşbütünleşme testinden önce Pesaran ve Yamagata (2008) tarafından geliştirilen Delta testi ile eğim homojenliği analizi yapılmıştır. Westerlund (2007) eşbütünleşme analizi işsizlik ve suç serilerinin uzun dönemdeki ilişkileri araştırılmış ve daha sonra Panel Granger Nedensellik testi uygulanmıştır.

3. BULGULAR

Çalışmada hesaplanan Bresusch and Pagan (1980) and Pesaran (2004) CD_{LM} istatistiklerine göre seriler arasında karşılıklı bağımlılık olduğu tespit edilmiştir. Bu sonuca göre, AB-28 ülkelerinden birinin suç ya da işsizlik serilerinde meydana gelen şok, diğer ülkeleri de etkilemektedir. Pesaran (2007) tarafından geliştirilen CADF testi sonuçlarına göre düzey halinde serilerin birim köke sahip olduğu ve suç ve işsizlik serilerinin önceki değerlerinden etkilendiği sonucu elde edilmiştir. Serilerin farkı alındıktan sonra tekrarlanan birim kök testinde I (1) düzeyinde durağan oldukları ve eşbütünleşme analizinin yapılabileceğine karar verilmiştir.

Araştırma bulgularına göre Delta Testi sonuçlarına göre %95 güven düzeyinde eğim katsayılarının homojen olduğu bulunmuş ve eşbütünleşme testi sonucu elde edilecek sonuçlardan panel istatistiklerinin yorumlanması gerektiğine karar verilmiştir. Uygulanan Westerlund (2007) eşbütünleşme analizi işsizlik ve suç serilerinin uzun dönemde bütün ülkeler için birlikte hareket ettiğini göstermektedir. Panel Granger nedensellik analizi sonucunda ise değişkenler arasında işsizlikten suça doğru bir nedensellik olduğu, suçtan işsizliğe doğru bir nedensellik olmadığı tespit edilmiştir. Bu bağlamda, Kao ve Chiang (2001) tarafından geliştirilen panel dinamik en küçük kareler regresyonu modeli oluşturulmuş ve işsizlik değişkeninin suç değişkeni üzerinde uzun dönemde pozitif ve istatistiksel olarak anlamlı bir etkisi olduğu ve işsizlik oranındaki 1 birimlik artışın suç oranlarını 1,53 birim artırdığı sonucuna varılmıştır.

4. TARTIŞMA VE SONUÇ

İnsanların neden suç işlediği, suç faaliyetlerinin neden bazı ülke ve bölgelerde yüksek olduğu ve suçun belirleyici faktörlerinin neler olduğu oldukça önemli ve çokça araştırılan konular arasında yer almaktadır. Çalışma kapsamında bu nedenlerden biri olan işsizlik, farklı ekonomik ve toplumsal gelişmişlik düzeylerine sahip ülkelerin oluşturduğu AB için incelenmiştir. Analizler sonucunda AB-28 ülkelerinde, işsizlik ve suç arasında uzun dönemli bir ilişki bulunduğu ve işsizlikte meydana gelen artışın suç oranlarını da artırdığı görülmüştür. Bu bağlamda, AB-28 ülkelerinin suç oranlarını azaltabilmeleri için işsizlik oranlarını azaltacak politikalara ihtiyaç duydukları söylenebilir. Daha fazla istihdam alanları yaratacak politikalar ile hem ülkelerin üretim düzeylerinin artırılması, hem de işsizlik sorununun ortadan kalkması ve böylece suç oranlarının azaltılması sağlanabilir. Bu sayede, suçu önleyici uygulamaları ortaya koymak için gerekli ek maliyetlere de gerek duyulmayarak ülke kaynakları daha etkin kullanılabilir ve milli gelir artışı sağlanabilir.