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ARAŞTIRMA MAKALESİ / RESEARCH ARTICLE

EXAMINATION OF THE RELATIONSHIP BETWEEN MACROECONOMIC INDICATORS AND SUICIDE RATE OF HIGH-INCOME GROUP COUNTRIES

ÜST GELİR GRUBU ÜLKELERİN MAKROEKONOMİK GÖSTERGELERİ İLE İNTİHAR ORANI ARASINDAKİ İLİŞKİNİN İNCELENMESİ

Res. Asst. Dr. Osman ŞENOL[1]
Res. Asst. Dr. Fevzi AKBULUT[2]

ABSTRACT

The research is conducted to examine the relationship between suicide rate and the macroeconomic indicators of high-income countries according to the World Bank income classification. In the research, the independent variables comprise of the economic variables, and the dependent variable is the suicide rate seen in a country. An econometric model with a random effects approach is developed for the effect of the specified independent variables on suicide rate in the population. As a result of the analysis, a 1%increase in the Gini index value may cause an increase of 0.26% in the suicide rate; income distribution disorders directly affect the suicide rate and increase suicide; and a 1% increase in the unemployment level causes 0.02% increase in the suicide rate. In addition, it is stated that there is a negative correlation between income per capita and suicide rate, and a 1% increase in income per capita may cause a 0.10% decrease in the suicide rate. Within the scope of the research, suicide rate, which is an important indicator of society, can be examined in different income groups or in similar income groups within the scope of different variables.

Keywords: Suicide Rate, Economic Indicator, Panel Data Analysis.

JEL Classification Codes: B22, C23, C50.

ÖZ

Bu araştırma, Dünya Bankası gelir sınıflandırmasına göre üst gelir grubundaki ülkelerin makroekonomik göstergeleri ile intihar oranı arasında ilişkiyi inceleme amacıyla yapılmıştır. Araştırma kapsamında ekonomik değişkenler bağımsız değişken olup, bir ülkede görülen intihar hızı da bağımlı değişken yapılmıştır. Belirtilen bağımsız değişkenlerin toplumdaki gerçekleşen intihar oranı üzerindeki etkisine yönelik tesadüfi etkiler yaklaşımlı ekonometrik bir model geliştirilmiştir. Analiz sonucunda, Gini endeks değerindeki %1 düzeyinde bir artış olması durumunda intihar oranında %0.26 düzeyinde bir artış olabileceği, gelir dağılım bozukluklarının intihar oranını doğrudan etkileyip intiharı artırıcı bir etki yaptığı, işsizlik düzeyindeki %1 düzeyinde bir artışın intihar oranında %0.02 düzeyinde bir artışa neden olabileceği tespit edilmiştir. Ayrıca kişi başı gelir ile intihar oranı arasında negatif bir korelasyon olduğu kişi başı gelirdeki %1'lik bir artışın intihar oranında %0.10 düzeyinde bir azalmaya sebep olabileceği belirtilmiştir. Araştırma kapsamında toplumun önemli bir göstergesi olan intihar oranı farklı gelir gruplarında veya benzer gelir gruplarında farklı değişkenler kapsamında incelenebilir.

Anahtar Kelimeler: İntihar Oranı, Ekonomik Gösterge, Panel Veri Analizi

JEL Sınıflandırma Kodları: B22, C23, C50.

[1] Karadeniz Technical University, Faculty of Health Sciences, Department of Health Management, osmansenol32@hotmail.com

[2] Bingöl University, Faculty of Health Sciences, Department of Health Management, fevziakbulut07@gmail.com

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GENİŞLETİLMİŞ ÖZET

Amaç ve Kapsam:

Bu araştırmanın amacı ülkelerin ekonomik göstergeleri ile intihar oranları arasında bir ilişkinin olup olmadığının araştırılmasıdır. Bu bağlamda Dünya Bankası'nın gelir sınıflandırmasına göre üst gelir grubunda yer alan ülkelerin makroekonomik göstergeleri ile intihar oranları arasındaki ilişki incelenmiştir. Ekonomik göstergelerin intihar oranları üzerinde etkisinin olup olmadığı belirli modeller ile test edilecektir. Ülke ekonomilerinin zor zamanlardan geçtiği salgın hastalıklar ve savaşların etkisiyle toplum değerlerinin bozulduğu günümüz dünyasında başta ekonomik nedenlerle olmak üzere intihar oranlarının arttığı görülmektedir. Literatürdeki çalışmalar incelendiğinde psikososyal faktörler ile intihar ilişkisini araştıran sınırlı sayıda çalışma olduğu görülmektedir. Araştırmanın literatür kısmında yer alan çalışmalarda da belirtildiği gibi intihar oranı ile ekonomik kriz arasındaki ilişkinin bir ülkenin makroekonomik göstergeleri kapsamından incelendiği çalışmaların sınırlı sayıda olduğu görülmektedir. Bu araştırmanın gelişmiş ülkelerin makroekonomik göstergeleri ile intihar oranları arasındaki ilişkiyi ortaya koyması açısından literatüre katkı sağlayacağı düşünülmektedir.

Yöntem:

Dünya Bankası gelir sınıflandırması dikkate alınarak üst gelir grubunda yer alan 79 ülke araştırmaya dâhil edilmiştir. Ancak verilerine tam olarak ulaşılabilen 28 ülke analiz edilmiştir. Araştırma kapsamında toplam 447 gözlem değeri vardır. Araştırma kapsamında ekonomik değişkenler bağımsız değişken olup, bir ülkede görülen intihar hızı ise bağımlı değişkendir. Araştırmanın bağımsız değişkenleri; GSYİH, Kişi Başı Gelir, genel işsizlik düzeyi, Yoksulluk düzeyi ve Gini Endeks Değeri değişkenleridir. Belirtilen bağımsız değişkenlerin toplumdaki gerçekleşen intihar oranı üzerindeki etkisi belirli modeller ile test edilmiştir. Analize dahil edilen verilerin veri türü yıllıktır. Söz konusu değişkenlere ait en güncel veriler ele alınmış olup zaman boyutu ise 2003-2018 yılları arasını kapsamaktadır. Panel veri modellemeleri kapsamında verilerin yapısına göre üç temel panel veri yaklaşımı içerisinde en uygun olanın belirlenmesi gerekmektedir. Söz konusu belirleme işlemi ise Hausman testi istatistiği sayesinde yapılmaktadır. Gerekli testlerden sonra veri setine en uygun modeller belirlenmiş olmaktadır. Panel veri kapsamında elde edilecek ekonometrik bir modelde tahminlerin doğru olabilmesi için geliştirilen modelin belirli varsayımları karşılaması gerekmektedir. Bu doğrultuda incelenecek ilk husus modelde çoklu doğrusal problemine neden olabilecek bir değişkenin olup olmadığının kontrol edilmesi gerekmektedir. Çoklu doğrusal bağlantı problemini tespit etmek için en çok tercih edilen yöntem Variance Inflation Factor (VIF) değerlerinin hesaplanmasıdır. Model için en uygun yaklaşımın belirlenmesinden sonra dikkat edilmesi gereken bir diğer husus ise modelde otokorelasyon probleminin olup olmadığının kontrol edilmesidir. Literatürde otokorelasyon test istatistik değerlerinin 2 ve 2'ye yakın alması istenmektedir. Söz konusu test istatistik değerlerinin 2'den oldukça düşük olması otekorelasyon probleminin olduğunu göstermektedir. Modellerden karşılaşılan temel varsayım problemlerinin etkilerini arındırmak için dirençli tahmincilerden Driscoll ve Kraay kullanılmıştır.

Bulgular:

Araştırma kapsamında elde edilen bulgularda da görüldüğü gibi 28 üst gelir grubu ülke verilerine dayanarak gelir dağılımı dengesinin oldukça önemli olduğu görülmektedir. Nitekim araştırma sonucunda, yoksulluk ve gelir dağılımı düzeylerinin intihar ile pozitif bir ilişki içinde olduğu ve bu göstergelerin bozulması durumunda intihar oranının incelenen ülkeler ve dönemde artabileceği belirlenmiştir. Öte yandan, kişisel gelir düzeyinin intihar oranı ile negatif bir ilişki içinde olduğu ve kişi başına düşen gelirin artması sonucunda toplumdaki intihar oranlarının azalabileceği tespit edilmiştir. Ancak ülkelerin toplam GSYİH düzeyleri ile intihar oranları arasında bir ilişki bulunmamaktadır.

Sonuç ve Tartışma:

Araştırma kapsamında elde edilen sonuçlara bakıldığında, gelişmiş ülkelerde gelir dağılım dengesinin çok önemli olduğu görülmektedir. Ekonomik göstergelerin bozulması gelir dağılımının bozulmasına, suç oranlarının ve bireylerin suç işleme eğiliminin artmasına ve bireylerin intihara meyilli olmasına neden olmaktadır. İntihar davranışını önlemek için ekonomide temel sorunlardan biri olan işsizlik oranını azaltmak ve istihdamını sağlamak gerekmektedir. Bireylerin iyi yaşam koşullarına ulaşmalarını sağlayacak ücret düzeyinde istihdam edilmeleri de önemlidir. İyi yaşam koşullarına ulaşmak için gereken ücret düzeyine ve sahip olmayan bireyler hayal kırıklığına uğrayarak intihara yönelebilirler. Ülkelerin, gelişmiş ülke grubunda yer alsalar bile gelir dağılım bozukluğunun artması sonucunda sosyal ve toplumsal birçok olumsuzluk yaşayabilecekleri öngörülmektedir. Nitekim araştırma sonucunda da yoksulluk ve gelir dağılım düzeyinin intihar ile pozitif bir ilişki içinde olduğu ve söz konusu göstergelerdeki kötüleşmelerin olması durumunda da intihar oranını ciddi düzeyde artırabileceği tespit edilmiştir. Diğer taraftan kişi başı gelir miktarının intihar oranı ile negatif bir ilişki içerisinde olduğu, kişi başı gelirin artması sonucunda toplumda görülen intihar oranı sıklığının azalabileceğine yönelik bir tespit yapılmıştır. Ancak, ülkelerin toplam GSYİH düzeyi ile intihar oranı arasında herhangi bir ilişki tespit edilememiştir. Araştırmada elde edilen bulguların literatürdeki bulgularla örtüştüğü görülmektedir. Ekonomik göstergeler ile intihar oranları arasında yakın bir ilişki olduğu, kriz dönemlerinde işsizliğin arttığı ve bunların intihar oranlarını artırdığına dair bulguların bu araştırma bulguları ile uyumlu olduğu görülmektedir. Ayrıca işsizlik oranlarındaki artışların intihar oranlarını artırıcı bir etkiye sahip olduğu söylenebilir. Çakışan diğer bir bulgu ise toplumlarda gelir eşitsizliğindeki artışın intihar oranını artırıcı bir etkiye sahip olmasıdır. Sonuç olarak intihar oranının ekonomik göstergelerle yakından ilişkili olduğu, ekonomik göstergelerdeki bozulmanın intihar oranını artırdığı görülmektedir. Araştırma kapsamında farklı gelir grubundaki ülkelerde de benzer çalışmalar yapılabilir. Araştırmaya yeni değişkenler eklenebilir.

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1. INTRODUCTION

According to Durkheim, who is accepted as the founder of modern sociology; any death that is the direct or indirect result of a positive or negative act performed by the victim, whose outcome is known, is suicide (Durkheim, 1992). Suicide, which is encountered in almost every period of life, is a phenomenon that remains up-to-date as it concerns the individual and society (Zastrow & Ashman, 2016, p. 482). On the other hand, it is seen that there are more studies on suicide in the literature (Şeker, 2019, p. 90-110). Considering the studies, it can be said that there are many reasons for suicide. Durkheim found in his research that psychological diseases may affect suicide, that people with high commitment to society tend to commit suicide less than others, that suicide events increase in periods when social values are deteriorated such as economic depression or post-war, that the weakening of the ties between the individual and the social group and his alienation from the group are the main causes of suicide (Durkheim, 2013).

In today's world, where national economies are going through very difficult times and social values are deteriorating because of epidemics and wars, it is seen that economic-related suicide cases are increasing. On the authority of the data of WHO, it is seen that as of 2021, one out of every 100 people committed suicide and 79% of the suicides occurred in low and middle-income countries (WHO, 2021). Deterioration in economic conditions and increasing unemployment decrease the quality of life of individuals. Individuals whose quality of life decreases and who become impoverished cannot meet their needs and individuals who cannot meet their needs and feel lonely have an increased tendency to commit suicide. On the other hand, individuals with low-income levels may turn to products that are harmful to human health, such as cigarettes and alcohol, with the increase in their stress levels, and individuals whose mental health is adversely affected may commit suicide. According to WHO (2009, p. 1-6), economic crises threaten human health by negatively affecting health services.

The economic crisis emerges in an unexpected sense and adversely affects both the country's economy and the business economy (Aktan & Şen, 2001, p. 1225-1230). Along with the economic crisis, unemployment increases, income loss, prices of goods and services increase, and this situation affects people's social life and health negatively. When we look at the literature, there are many studies showing that economic factors have influenced suicide. For example, Lendrum (1933) examined a thousand suicide cases in his study and concluded that 419 of them were because of economic reasons. Fedden (1938) concluded in her study that 25% of the suicides recorded in Great Britain between 1770 and 1830 were because of economic reasons. Brenner (1982) used data from the USA between 1905 and 1976 in her study and found that suicide rates decreased during periods of decreased unemployment, and that suicide rates increased with the decrease in employment during the Great Depression. In their study, Hamermesh & Soss (1974) investigated male suicide rates using data from the USA between the years 1947-1967. They found that suicide rates decreased with increasing income after World War II and that people with lower income groups had three times higher suicide rates than those who worked at the higher level. In addition, Chuang and Huang (2003), Cutler et al., (2003), Rodriguez (2006), Minoiu and Rodriguez (2008), Chang et al., (2009), Kütük (2011) and Okada and Samreth (2013) found a strong link between GDP per capita and suicide rates.

Thanks to this research, it will be determined whether economic indicators affect the suicide rate. If any effect is detected, the strength of this effect will be determined. In the research, panel data analysis method will be used to determine the effect level between variables. Most of the studies on suicide rates in the literature have investigated at the relationship with psychological factors. In studies examining the relationship between economic indicators and suicide cases, Demirci et al. (2020), as in his study, also examines the periods of global economic crisis. It is seen that there is a limited number of studies in the literature on the relationship between the macroeconomic indicators of a country and the suicide rate. This research was carried out to determine the relationship between macroeconomic indicators and the suicide rate in order to fill this gap in the literature. The research is important with this aspect.

In the research, first, a detailed literature review was made, and national and international similar studies were included. Then, in the application part, the purpose of the research, the universe and sample group, the model and data, the determination of panel data model methods, and the findings are included. Finally, the information got because of the analysis is discussed in the conclusion and recommendations section.

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2. LITERATURE REVIEW

In this section, similar studies on the subject will be included. When the existing studies in the literature are examined, it is seen that suicide rates are examined on a small sample group and within the scope of specific indicators. Since there are a limited number of studies that make a general evaluation according to the income groups of the countries, the countries in the developed country group in this research constitute the sample of the research.

Chang et al., Cheng (2009), examined the effects of the 1997-1998 Asian economic crisis on suicide rates in Japan, Taiwan, Singapore, Hong Kong. In their study, they performed Joinpoint Regression Analysis using the data on divorce, marriage, unemployment, alcohol consumption and GDP per capita from the WHO and Taiwan database for the years 1985-2006. They found that suicide rates decreased in the late 1980s and early 1990s, and then increased significantly in all countries except Singapore. They found that the economic crisis in 1998 had the least impact on GDP and unemployment, with fewer deaths in Taiwan and Singapore than in other countries. They also stated that suicide rates are higher in countries where the economic crisis caused more male unemployment.

Inagaki (2009), using 1951-2007 data for Japan, examined the relationship between suicide cases and income inequality with Durbin Hausman, Least Squares and The Lag-Augmented Vector Auto-regression methods. As a result, suicide rates are unemployment and income inequality according to the Durbin Hausman test, and income and unemployment rates with the Least Squares method have a positive relationship on suicide rates in Japan. He also stated that there is one-way Granger Causality from income inequality to the suicide rate. Finally, he noted that changes in Japan's suicide rates are partly related to income inequality.

Pirkola et al., (2009), in their study, examined the relationship between community mental health services and suicide risk using the data of Finland between 01.09.2004 and 31.03.2005. They conducted a comprehensive nationwide survey and measured the suicide risk for each municipality by age and gender. Moreover, they re-analyzed the data by rearranging them according to socioeconomic factors. As a result of the research that providing a wide range of outpatient, outpatient, outpatient-inpatient and 24-hour emergency services reduced the death rate from suicide. After adjusting for socioeconomic factors, they found that providing only large-scale outpatient services reduced suicide mortality rates. Finally, they stated that multidimensional and community-based specialized mental health services have more positive effects on suicide rates than other services.

Kütük (2011), in his study, examined the relationship between social indicators and economics and suicide in Turkey, using the data between 1982 and 2009. He has used GDP per capita, unemployment rate and the number of closed companies from economic indicators, crude divorce rate and urbanization rate from social indicators. He has used ARDL models and error correction models based on bounds testing as a method. He has seen that the increase in GDP per capita, the crude divorce rate and the number of closing companies increase the suicide rates. He has found that unemployment rates lowered suicide rates. He has concluded that the rate of urbanization is ineffective. There is a relationship between the suicide rate and economic indicators in suicide cases in Turkey.

Yur'ye et al., (2012), in their study, examined the relationship between employment status and suicide rates in 26 European countries using the World Health Organization, Conference Board Total Economy Database and European Social Union data from 1980 to 2008 with correlation analysis. As a result of the research, they found that many countries have a negative relationship between employment and suicidal tendencies. In addition, they have seen that as employment decreases in men compared to women, their suicidal tendencies increase more. Finally, they found that suicidal tendencies are associated with unemployment risk and financial resources, and as living standards increase, suicidal tendencies decrease.

Chang et al., (2013), in their study, used the data of 27 European and 27 non-European countries after the 2008 economic crisis between 2000 and 2009. They examined the relationship between suicide and unemployment by using Negative Binomial Regression Analysis according to the change in gender, age, country, and employment. As a result of the research, they found that economic crises significantly increased the risk of suicide. They found that suicide rates increased in men aged 15-24 in European countries and 45-64 years old in American countries. They found that there was no change in women in European countries, and it was lower in American countries than in men. They also stated that after the 2008 economic crisis, there was an increase in suicide rates, especially in men, in European countries where unemployment was high, and in the United States.

Okada and Samreth (2013), in their study, examined the relationship between suicide and GDP, divorce, alcohol use rate and fertility rate by using the ARDL method, using data from 13 OECD countries between 1960 and 2007. As a result of the research, they found that the increase in divorce rates in nine countries increased the suicide rates and the increase in real GDP caused a decrease in the suicide rates. They also stated that the increase in fertility rates in the four countries decreased the suicide rates and the increase in alcohol consumption in the three countries increased the suicide rates.

Jalles and Andresen (2015), in their study, made a panel data analysis using fixed effects and GMM models/ estimators for ten provinces in Canada with the data between 2000 and 2008. In their study, they investigated the relationship between alcohol consumption per capita, GDP per capita, Gini index, unemployment, divorce rate, female labor force participation, and suicide rates. As a result of the research, they found that GDP per capita had a significant positive effect on suicide rates, alcohol consumption had a negative effect on suicide for men and had no effect on women, and unemployment and immigration rates had a positive effect on suicide rates for women.

Rachiotis et al., (2015), in their study, examined the effect of the Global Economic Crisis on suicide rates in Greece, using data from the Greek Statistical Institute between 2003 and 2012. They performed a regression analysis using unemployment and GDP data. They also stated that for each point increase in unemployment among men, suicide increases by 0.19 per hundred thousand people, and that austerity policy are associated with suicide rates.

Bayrak (2017), in their study, examined the relationship between suicide and unemployment using the data between 2005 and 2015 in Turkey. In the study, the relationship between the unemployment rate and hard-to-live-suicide rates because of commercial failure was examined using the Kapenanios unit root test, the Maki cointegration test, and the Toda-Yamamoto causality test. As a result of the research, that there is a causal relationship between suicide and unemployment, that the phenomenon of unemployment supports suicides, and that unemployment is an important factor among the causes of suicides between 2005 and 2015.

Durğun and Durğun (2017), in their study, focused on the hypothesis that economic variables can determine suicide rather than sociological reasons. They examined the view that as the opposite income increases, the suicidal tendency will decrease and Durkheim's view that high income will lead to suicide. In their study, they examined the relationship between GDP per capita and crude suicide rate with time series analysis, using data in 1975 and 2015 from Turkey. First, ADF and Lumsdaine Panel unit root tests were performed, then Hatemi-J Cointegration test and Granger causality test based on Vector Error Correction model were applied. As a result of the research, they found that there is a positive unilateral causality relationship from GDP to crude suicide rate and that an increase in GDP leads to an increase in suicide rates.

Özer and Topal (2017), in their study, examined whether youth unemployment has an effect on other social problems such as crime, migration, suicide and divorce. Data for the period of 2004-2016 for 26 regions of Turkey (Level-II) were used. The relationships between the variables were examined with the help of classical panel regression analysis and Dumitrescu and Hurlin (2012) causality test. As a result of the research, they determined that youth unemployment has a statistically significant and positive effect on crime, migration, suicide, and divorce.

Lin and Chen (2018) examined the relationship between unemployment and suicide rates in the USA using the data between 1928 and 2013 in their study. In this study, in which the impulse-response method was used, the causality relationship between the variables was determined. As a result of the research, they determined that unemployment has an asymmetric effect on suicide rates. They stated that suicide rates increase more especially in the 55-64 age group in times of economic recession (when unemployment increases), and in periods of economic expansion (in the periods when unemployment decreases), suicide rates decrease more especially in the 15-24 age group and the 25-34 age group.

Çıraklı (2019) examined the relationship between crude suicide rate and economic indicators in his study. The time dimension of the research covers the period between 1975 and 2014 in Turkey. Autoregressive distributed lag test was used as a method in the research. As a result of the research, it was determined that the economic crises of 1994 and 2001 affected the crude suicide rate negatively, that the economic growth had a negative effect on the suicide rate in terms of real GDP, and that the economic crises had a negative impact on the crude suicide rate.

Erdem et al., (2019), in their study, examined the effect of youth unemployment on suicide, the direction and magnitude of this effect, with panel data analysis. In their research, they took twelve statistical regions of Turkey and used the data between 2005 and 2013. As a result of the research, they found suicidal tendencies differ between regions and youth unemployment has no effect on suicide.

Atila and Çelikkaya (2020) examined the relationship between the economic crisis and the suicide rate in their study. In this study, in which Granger causality analysis was used, a negative relationship was found between unemployment and economic crisis. Another result of the study also confirmed the hypothesis that the unemployment variable is the Granger cause of suicide variable. Finally, a positive relationship was found between the economic crisis and crime rates.

Demirci et al. (2020), in their study, investigated whether the 2008 economic crisis had any effect on suicides in the United States. Autoregressive distributed lag method was used. For the purpose of the study, the number of suicide-related deaths was taken as the dependent variable, while unemployment rates and 2008 economic crisis were taken as independent variables. The short-term and long-term relationships obtained within the scope of the study indicated that the 2008 economic crisis had a statistically significant effect on suicide cases in the United States.

Dundar and Sağır (2022), in their study, investigated the role of economic factors in the suicidal behavior of higher education graduates by using the data got from TUIK and SGK for 2008 and 2019. In this context, they examined the effects of these factors on suicidal behavior by using the Generalized Moments Method using the ratio of women and men with higher education in the total population, GDP and wages per capita, and the ratio of college, faculty, and graduate graduates in the total population. As a result of the research, they stated economic factors are effective in suicidal behavior and this effect differs according to gender. In addition, they found that higher education graduates had a negative effect on the suicidal behavior of higher education graduates, while higher education graduates had a positive effect on higher education graduates.

3. METHOD

3.1. Purpose of the Research

The aim of this research is to examine the relationship between macroeconomic indicators and the suicide rates of countries in the high-income group according to the World Bank. In this context, it is determining whether the economic indicators influence the suicide rate and if so, the magnitude effect. An econometric model will be developed on the suicide rate in the research, and the research includes certain model tests.

3.2. Population and Sample of the Research

The universe of the research comprises 79 countries in the high-come group according to the World Bank Income Classification. The sample of the research comprises 28 countries whose data we can access and there are 447 observation values within the research. The reason why the research was conducted on the developed country group is that the relationship between the economic indicators of the developed country groups and the suicide rate was not examined. Another reason for including this group of countries in the analysis is the availability of data for more years.

3.3. Dataset

When the methods used in studies examining the relationship between economic factors and suicide rates are examined, it is seen that panel data analysis is used in many studies. Panel data analysis is performing econometric analyzes using the cross-sectional data of the time dimension of the variables (Hansen & King, 1996, p. 27-37). It is an analysis method in which cross-section and time-series are combined in a single data set (Greene, 2003, p. 283). Panel data models are examined under two main headings: static and dynamic (Hsiao, 2003, p. 69). In static panel data analysis, the dependent variable is explained with undelayed independent variables, while in dynamic panel data analysis, the determining dependent variable is explained with delayed dependent variables (Boualleguı, 2006, p. 1-26).

The static panel data analysis method, which is frequently used in similar studies, is divided into three as Fixed Regression Model, Fixed Effects Method and Random Effects Method. The Joint Constant Regression Model is used to predict linear classical panel data analysis. In this method, it is assumed that the observations are

homogeneous, and this method includes consistent and efficient estimators. In the Fixed Effects Method, if some coefficients vary according to time and units, it is seen that the regression coefficients are not known and turn into fixed parameters. In this model, it is seen that the constant term differs from unit to unit, and the slope coefficient remains constant according to unit and time (Baltagi, 2005, p. 11-34). Finally, in the Random Effects Method, the differences between the units are considered as a component of the error term, and including the error term as a separate component in the model allows for including factors that cannot be included in the model (Hsiao, 2003, p. 40).

To reach more accurate results and generalize the results within the research, all countries with data were included in the analysis. Within the research, economic variables are the independent variable, and the suicide rate in a country is the dependent variable. As an independent variable in the research; Gross Domestic Product, per capita income, general unemployment level, poverty level and Gini Index Value are used. An econometric model was created for the effect of the identified independent variables on the suicide rate in the society. The data type of data included in the analysis is annual. The most up-to-date data on the aforementioned variables are considered holistically, and the time dimension covers the years 2003 and 2018.

Tablo 1. Explanations on Variables

Variables	Measurement Method	Data Source	Abbreviated Symbol
Number of Suicide per 100,000 People	Annual number of suicides per 100,000 people.	Our World in Data	SUI
Unemployment rate	The unemployed are people of working age who are without work, are available for work, and have taken specific steps to find work.	World Bank	UNEMP
Gross domestic product	Annual percentage growth rate of GDP at market prices based on constant local currency. Aggregates are based on constant 2015 prices, expressed in U.S. dollars.	World Bank	GDP
Per capita income	Adjusted net national income is GNI minus consumption of fixed capital and natural resources depletion.	World Bank	PCAPITA
Poverty Level	The proportion of people earning less than $2.15 per day.	Our World in Data	POVERTY
Gini Index Value	The Gini index measures the area between the Lorenz curve and a hypothetical line of absolute equality, expressed as a percentage of the maximum area under the line. Thus, a Gini index of 0 represents perfect equality, while an index of 100 implies perfect inequality.	World Bank	GINI

The variables to be used within the scope of the model to be developed are shown in Table 1. Logarithmic transformation was applied to the variables with high numerical values. A logarithmic transformation was performed to achieve more efficient estimator values by applying a linear reduction in the series. Another point to be noted is that panel data models are divided into two as micro and macro according to the time covered.

Table 2. Equation of the Developed Model

	Model Equation	Program Output
Model 1(Sui)	LNSUI i,t = c + α1(GDP)i,t + α2(LNGINI)i,t + α3(LNPCAPİTA)+ α4(POVERTY)+ α5(UNEMP)+ εi,t	LNSUI = -0.0239167877269*LNGDP + 0.79298712457*LNGINI - 0.275053093*LNCAPICA + 1.51389812575*POVERTY - 0.0317857772881* + eqn_01_efct

Table 2 shows the equational formula and programmatic output of the model produced within the scope of the research. In the symbols in the equation on the left; constant variable c represents the coefficients of each independent variable, the symbol α1 represents the cross-section units in the equation, the symbol t represents the relevant period, and finally the symbol εi,t represents the error term. Program Output: The coefficient obtained by solving the equation created in line with the research objective.

3.4. Determination of Panel Data Model Methods

Within the scope of panel data modelling, three basic panel data approaches have been developed according to the structure of the data. The first of these approaches is the Pooled OLS estimation/estimator. If the structure of the model is not suitable for the structure of the pooled model, other approaches that should be examined are the random effects and fixed effects estimation. In the model, different tests are used while preferring each approach over the other.

4. ANALYSIS AND FINDINGS

Models developed in the context of panel data need to provide basic panel assumptions. The first of the basic assumptions to be checked in the model is the multicollinearity problem. If there is a multicollinearity problem in a model, as stated by Gujarati (2004), it leads to incorrect regression results. The VIF values of the variables are calculated for the problem determination in question. It has been stated that the calculated value can be accepted up to 4 in some studies and up to 10 in some studies (Açıkgöz et al., 2015, p. 427). Variables with values above the threshold have to be excluded from the model.

Table 3. Variance Inflation Factor (VIF) Values for Variables

Symbol	R^2	VIF Value
SUI	0.17	1.20
UNEMP	0.65	2.85
GDP	0.26	1.35
PCAPITA	0.48	1.92
POVERTY	0.73	3.70
GINI	0.57	2.37

The VIF values of the variables are shown in Table 3. When the VIF values of the variables are examined, it is seen that they are less than 4. There is no variable in the model that may cause the multicollinearity problem. Within the scope of the research, it is necessary to determine the most appropriate approach to the model to be created with the economic indicators affecting the suicide rate.

Table 4. Panel Data Model Identification Tests

	Model 1 (Suicide Rate)	
Test	**Statistics Value**	**Probability Value**
F- Fixed Effects	19.96	0.000
Hausman Test	7.84	0.16

It is necessary to determine the most appropriate panel approach for the model to be developed. F and Hausman tests are performed to determine the most appropriate approach. As a result of the F test, it was determined that the data structure did not comply with the pooled model approach ($p<0.05$). According to the Hausman test result, the H0 hypothesis testing the validity of the random-effects model was accepted. It has been determined that the most appropriate panel data approach to be developed to determine the effect of economic indicators on the suicide rate is the random effects approach. After determining the most appropriate approach for the model, another point to be considered is to check whether there is an autocorrelation problem in the model.

Table 5. Results of Autocorrelation Tests

	Model 1 (Suicide Rate)	
Test	**Statistics Value**	**Probability Value**
Bhargava et al. Durbin-Watson	0.56	0.000
Baltagi-Wu LBI	0.79	0.000

Another factor to be considered in modelling is checking for autocorrelation. In the model, it is seen that the test statistical values for the autocorrelation problem are less than 2. The fact that these test values are less than 2

indicates that there is an autocorrelation in the model. In the literature, it is requested that the statistical values of this test be two or close to two. The fact that the statistical value of the test in question is much lower than two shows that there is an autocorrelation problem. Robust tests will be used so that the problems specified in the model do not adversely affect the result. After determining the autocorrelation problem in the models, it will be checked whether there is a heteroskedasticity problem.

Table 6. Results of Heteroskedasticity Tests

	Model 1 (Suicide Rate)	
Test	**Chi²**	**Probability Value**
Modified Wald Test	2,042.55	0.000

The panel data models created are based on heteroskedasticity assumption. If the variance changes due to the changes in the unit in the model, there is a variable variance problem. The modified Wald Test was used to detect the problem stated in the model. As a result of the test performed, the H0 hypothesis, which was established that there was no heteroskedasticity, was rejected. This problem encountered in the model needs to be corrected by using a robust estimator.

Table 7. Cross-Section Dependency Test

	Model 1 (Suicide Rate)	
Test	**Statistics Value**	**Probability Value**
Breusch-Pagan LM	1,382.49	0.000
Pesaran Scaled LM	35.51	0.000
Pesaran CD	14.66	0.000

The last assumption to be considered in panel modelling is cross-section dependency. Cross-section dependency in the model was checked with the specified tests. The presence of cross-section dependency in the model causes incorrect estimated values to be obtained. When the test results obtained are examined ($p<0.05$), it is seen that there is a cross-section dependency. The effects of the mentioned problem will be removed from the model by using resistant estimators.

Table 8. Results of Panel Data (Driscoll and Kraay Standard Error)

The dependent variable: LNIO				
Period:2003-2018				
Horizontal section: 28				
Total Number of Observations: 447				
Variable	**Coefficient**	**Drisc/Kraay Standard Error**	**t- Statistics Value**	**Probability Value**
LNGINI	.267	.138	3.90	0.000
ISO	.028	.017	2.81	0.01
GSYİH	-.035	.113	-0.32	0.75
KBG	-.108	.133	-3.24	0.001
POVERTY	.95	.343	2.79	.014
C	3,719	.125	29.06	0.000
R^2 : 0.16		F-statistic:19.29	Prob (F-Statistic): 0.000	

The results of the estimated model for the effect of economic indicators on the suicide rate within the scope of the research are shown in Table 8. Robust estimators are applied to correct the deviations in standard errors and significance levels due to the basic assumption problems encountered in the model. Natural logarithmic transformation was performed for the series with high numerical value. The name of these series is prefixed with the expression ln. It is seen that the model is significant at the 1% significance level (F $p<0.05$). Model prediction

results, it is seen that the percentage of independent variables explaining the dependent variable (R2) is 0.16. This ratio expresses the percentage of the dependent variable used in the model.

It is known that income distribution imbalance in a society has a direct effect on many indicators, especially social indicators. Even if the countries in question are in the high-income group, they may experience many negativities because of the deterioration in the income level distribution. In this study, which examines the relationship between suicide rates and economic indicators in high-income countries, let's first consider the Gini Index Value. The findings in the model obtained as a result of the analysis show that an increase of 1% in the Gini Index Value may cause an increase of 0.26% in the suicide rate. Income distribution disorders directly affect the suicide rate and have an increasing effect. Another important economic indicator is the unemployment indicator. It is estimated that a 1% increase in unemployment levels in high-income countries may cause an increase of 0.02% in the suicide rate. It is seen that there is a negative interaction between the per capita income variable, which is another indicator, and the suicide rate. It is predicted that a 1% increase in per capita income may cause a 0.10% decrease in the suicide rate. It is seen that poverty, which is the main cause of all negativities in society, has a positive relationship with the suicide rate. It is predicted that an increase of 1% in the poverty levels of countries in the high-income group may cause an increase of 0.95% in the suicide rate.

5. CONCLUSION

This research was conducted to examine the relationship between the countries in the upper income group and economic indicators. Since the data set used within the scope of the research has both time and cross-sectional characteristics, panel data analysis method was applied as a method. In order to achieve the most accurate results in the model developed in line with the research objective, the basic assumptions of panel data were checked one by one. When the research results are analysed, it is seen that there is a relationship between economic indicators and suicide rates. In his study, Granados (2005) found that periods of economic growth may increase stress levels and stress-related problems may negatively affect health. In a similar finding, Çıraklı (2019), who analysed suicide rates in Turkey, stated that job stress and increased working hours during periods of economic growth can negatively affect health. At the same time, he stated that increases in people's income levels may trigger an increase in the amount of cigarette and alcohol consumption, which may have an increasing effect on the suicide rate. On the other hand, there are studies (Chang et al., 2009; Pirkola et al., 2009; Wade et al., 2012) indicating that economic crises have an increasing effect on suicide rate. In this study, it was determined that the deterioration in the level of income distribution, which is the biggest indicator of economic deterioration, has an increasing effect on the suicide rate.

The deterioration of economic indicators causes the deterioration of social peace and income distribution, the increase in crime rates and the tendency of individuals to commit crimes, the deterioration of family peace, the risk of divorce and the suicidal tendency of individuals. It is also important for individuals to be employed at a wage level that will enable them to reach good living conditions. Individuals who do not have the wage level and working conditions required to reach good living conditions may turn to suicide by being disappointed. The individual who cannot meet his basic needs and starts to live in isolation from society will undoubtedly enter a negative period in terms of psychology. The inability of the person to be self-sufficient and to realize his goals often causes great destruction in himself. The demolitions can lead to suicide. In times of economic crises such as the Great Depression, it is seen that unemployment and suicides increase in parallel with the collapse of the economy. Today, it can be said that the global economic fluctuations, the emergence of economic problems in all income group countries, the decrease in the purchasing power of people due to the increase in the level of inflation in countries in general will have an increasing effect on suicide rates.

Although the countries are in the developed country group, it is seen that the deterioration in economic indicators has an increasing effect on the suicide rate. Regardless of the income group of the countries, income distribution disorders seem to be very important for a country. Considering the findings got within the research, it is seen that the income distribution balance is very important in a society. It is predicted that countries, even if they are in the developed country group, may experience many social and societal negativities because of the increase in income distribution disorder. As a result of the research, it has been determined that poverty and income distribution levels are positively related to suicide and that in case of an increase in these indicators, the suicide rate may increase significantly. On the other hand, it is thought that the amount of personal income is in a negative relationship with the suicide rate, and because of the increase in per capita income, the frequency of suicide rates in society may

decrease. However, no relationship could be found between the total GDP level of countries and the suicide rate. Within the scope of the research, similar studies can be carried out in countries with different income groups and new variables can be added. On the other hand, suicide rates can be examined with different indicators apart from economic indicators.

It is seen that the findings obtained in the research coincide with the findings in the literature. It is seen that there is a close relationship between economic indicators and suicide rates. It is seen that the findings that unemployment increases during crisis periods and that these increase the suicide rate are in line with the findings of this research. It is observed that increases in unemployment rates have an increasing effect on the suicide rate. Another overlapping finding is that the increase in income inequality in societies has an increasing effect on the suicide rate. As a result, it is seen that the suicide rate is closely related to the economic indicators, and the deterioration in economic indicators increases the suicide rate. Within the scope of the research, suicide rate, which is an important indicator of society, can be examined in different income groups or in similar income groups within the scope of different variables.

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REFERENCE

Açıkgöz, E., Uygurtürk, H., & Korkmaz, T. (2015). Analysis of factors affecting growth of pension mutual funds in Turkey. *International Journal of Economics and Financial Issues*, 5(2), 427- 433.

Aktan, C. C., & Şen, H. (2001). Ekonomik kriz: Nedenler ve çözüm önerileri. *Yeni Türkiye Dergisi Ekonomi Kriz Özel Sayısı*, *7*(42), 1225-1230.

Atila, M., & Çelikkaya, S. (2020). Ekonomik krizlerin toplumsal izdüşümü: Türkiye'de yaşanan ekonomik krizlerin işsizlik, suç ve intihara yansımaları. *Süleyman Demirel Üniversitesi Vizyoner Dergisi*, *11*(26), 245-258.

Baltagi, B. H. (2005). *Economic analysis of panel data* (3th ed.). John Wiley & Sons INC.

Bayrak, S. (2017). İşsizliğin intihar üzerindeki etkileri: Türkiye için bir nedensellik analizi. *Sosyal Siyaset Konferansları Dergisi*, (73), 125-141.

Bouallegui, I. (2006). The dynamics of capital structure: panel data analysis: Evidence from new high-tech German firm. *Enseignante Chercheuse A Institut Superieur Administration Des Entreprises Gafsa*, *1*(1), 1-26.

Brenner, H. (1982). *Mental illness and the economy*, *health and behaviour: a research agenda.* (Report No: 6). Summary of A Conference. https://iris.paho.org/bitstream/handle/10665.2/27319/ev18n4p364.pdf?sequence=1&isAllowed=y

Chang, S. S., Gunnel, D., Sterne, J. A. C., Lu, T. H., & Cheng, A. T. A. (2009). Was the economic crisis 1997-1998 responsible for rising suicide rates in East/Southeast Asia? A time-trend analysis for Japan, Hong Kong, South Korea, Taiwan, Singapore and Thailand. *Social Science & Medicine*, (68), 1322-1331.

Chang, S. S., Stuckler, D., Yip, P., & Gunnell, D. (2013). Impact of 2008 global economic crisis on suicide; time trend study in 54 countries. *BMJ*, *347*, 1-15.

Chuang, H., & Huang, W. C. (2003). Suicide and unemployment: Is there a connection? An empirical analysis of suicide rates in Taiwan. *Journal of Socio-Economics, 26*(3), 277-289.

Çıraklı, Ü. (2019). Türkiye'de ekonomik göstergeler ile intihar hızı arasındaki ilişkinin incelenmesi: Ekonometrik bir analiz. *Sağlık ve Hemşirelik Yönetimi Dergisi*, *3*(6), 218-227.

Cutler, D., Glaeser, E., & Norberg, K. (2000). *Explaining the rise in youth suicide*. (Working Paper No: 7713). NBER.

Demirci, Ş., Konca, M., Yetim, B., & İlgün, G. (2020). Effect of economic crisis on suicide cases: An ARDL bounds testing approach. *International Journal of Social Psychiatry*, *66*(1), 34-40.

Dündar, Ö., & Sağır, Z. (2022). Yükseköğretim mezunlarının intihar davranışının ekonomik boyutu: Dinamik panel veri analizi. *Gaziantep University Journal of Social Sciences*, *21*(1), 41-58.

Durğun, F., & Durğun B. (2017). İntihar-gelir ilişkisi: Türkiye için nedensellik analizi. *Dicle Üniversitesi İktisadi ve İdari Bilimler Dergisi*, *7*(14), 398-415.

Durkheim, E. (2013). *İntihar*. (Z. Z. İlkgelen Trans.), Pozitif Yayıncılık (Original work published 2015).

Erdem, H. F., Demirel, S. K., & Erkan, E. (2019). Genç işsizliğin intihar oranları üzerindeki olası etkisi: Panel veri analizi ile bölgesel karşılaştırma. *Anatolian Journal of Economics and Business*, *3*(2), 76-92.

Fedden, R. (1938). *A social and historical study*. P. Davies.

Granados, J. A. T. (2005). Recessions and mortality in Spain, 1980-1997. *European Journal of Population*, *21*, 393- 422.

Greene, W. H. (2003). *Econometric analysis*. Prentice-Hall (5th ed.). New York University.

Gujarati, D. N. (2004). *Basic econometrics*. McGraw Hill.

Hamermesh, D., & Soss, N. (1974). An Economic Theory of Suicide. *Journal of Political Economy*, (82), 83-98.

Hansen, P., & King, A. (1996). The determinants of health care expenditure: A cointegration approach. *Journal of Health Economic*s, *15*(1), 127-137.

Hsiao, C. (2003). *Analysis of panel data* (2th ed.). Cambridge University Press.

Inagaki, K. (2010). Income inequality and the suicide rate in Japan: Evidence from cointegration and La-Var, *Journal of Applied Economics*, *13*(1), 113-133.

Jalles, J. T., & Andresen, M. A. (2015). The social and economic determinants of suicide in Canadian provinces. *Health Economics Review*, *5*(1), 1-12.

Kütük, Y. (2011). *Türkiye'de intiharların ekonomik ve sosyal göstergelerle ilişkisi* [Ph.D. Dissertation]. İstanbul Teknik Üniversitesi.

Lendrum, F. C. (1933). A thousand cases of attempted suicide. *Journal of Nervous and Mental Disease*, *80*(2), 234-235.

Lin, Y. H., & Chen, W. Y. (2018). Does unemployment have asymmetric effects on suicide rates? Evidence from The United States: 1928-2013. *Economic Research-Ekonomska IStraživanja*, *31*(1), 1404-1417.

Minoru, C., & Rodriguez, A. (2008). The effect of public spending on suicide: Evidence from US state data. *The Journal of Socio-Economics*, (37), 237-261.

Okada, K., & Samreth, S. (2013). A study on the socio-economic determinants of suicide: Evidence from 13 European OECD countries. *The Journal of Socio-Economic*s, *45*, 78-85.

Özer, U., & Topal, M. H. (2017). Genç işsizliği, suç, göç, intihar ve boşanma düzeyleri ile ilişkili midir? Türkiye'den ampirik bir kanıt. *Kırıkkale Üniversitesi İktisadi ve İdari Bilimler Fakültesi Dergisi*, *6*(5), 50-63.

Pirkola, S., Sund, R., Sailas, E., & Wahlbeck, K. (2009). Community mental-health services and suicide rate in Finland: A nationwide small-area analysis. *The Lancet*, *373*, 147-153.

Rachitic, G., Stuckler, D., McKee, M., & Hadjichristodoulou, C. (2015). What has happened to suicides during The Greek economic crisis? Findings from an ecological study of suicides and their determinants 2003-2012. *BMJ Open 2015*, *5*, 1-7.

Rodriguez, A. (2006). *Inequality and suicide mortality: a cross country study development research* (13th ed.). Working Paper.

Şeker, A. (2019). Durkheim'in sosyolojisinde intihar ve intiharlarla mücadelede sosyal hizmetin işlevi. *Mavi Atla*s, *7*(1), 90-110.

Wada, K., Kondo, N., Gilmour, S., Ichida, Y., Fujino, Y., Satoh, T., & Shibuya, K. (2012). Trends in cause specific mortality across occupations in Japanese men of working age during period of economic stagnation, 1980-2005: Retrospective cohort study. *BMJ*, 344:e 1191.

World Health Organization. (2021). Retrieved March 6, 2022 from https://www.who.int/home/search?indexCatalogue=genericsearchindex1&searchQuery=suicide%20rate&wordsMode=AnyWord

World Health Organization. (2009). *The financial crisis and global health, report of a high-level consultation*. January, 1-6.

Yur'yev, A., Värnik, A., Värnik, P., Sisask, M., & Leppik, L. (2012). employment status influences suicide mortality in Europe. *International Journal of Social Psychiatry*, *58*(1), 62-68.

Zastrow, C., & Ashman, K. (2016). *İnsan davranışı ve sosyal çevre I*. (A. Aydın vd., Trans.), Nika Yayınevi (Original work published 2016).