THE SOCIOECONOMIC DETERMINANTS OF SUICIDE IN OECD COUNTRIES [1]

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ABSTRACT In addition to the sociological, economic, and demographic determinants, this study aims to examine the impact of informal employment on suicide rates through the rate of wage and salaried workers, which distinguishes it from existing literature. The study is estimated using the Fixed Effects Estimator (with Driscoll Kraay robust standard errors) with 2007-2020 annual data for 30 OECD countries. Results indicate that increase in GDP per capita, inflation, wage and salaried worker, and female labor participation rate contribute to the decrease in suicide rates. No significant relationship has been found between unemployment and suicide; however, unemployment benefits are effective in preventing suicide. Besides, a positive relationship has been observed between the increase in the level of education and suicide rates. Marital status were found to be unrelated, but parenthood was determined to have a diminishing effect on suicide. Alcohol addiction and densely populated urban areas trigger suicide has been reached.

Keywords: *Suicide, socioeconomic factors, mental health, informal employment*

JEL Codes: *C23, I15, I31*

Scope: *Economics*
Type: *Research*

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[1] It has been declared that the relevant study complies with ethical rules.

OECD ÜLKELERİNDE İNTİHARIN SOSYOEKONOMİK BELİRLEYİCİLERİ

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ÖZ | Bu çalışmada intihar vakalarının sosyolojik, ekonomik ve demografik belirleyicilerinin yanında literatürden farklı olarak ücretli ve maaşlı çalışanların oranı üzerinden kayıt dışı istihdamın, intihar üzerindeki etkisi incelenmektedir. Çalışma, 30 OECD ülkesinin 2007-2020 yıllık verileri kullanılarak Sabit Etkiler (Driscoll Kraay dirençli standart hataları) ile tahmin edilmiştir. Kişi başına düşen milli gelir, enflasyon ve kadınların işgücüne katılımındaki iyileşmelerin intihar oranlarını düşürdüğü tespit edilmiştir. Kayıtlı istihdamın önemli bir göstergesi olan ücretli ve maaşlı çalışma şeklinin yaygınlaşmasının intihar oranlarını düşürdüğü bulgusuna ulaşılmıştır. İşsizlik ile intihar arasında anlamlı bir ilişkiye rastlanılmamış, ancak işsizlik ödeneklerinin intiharı önlemede etkin olduğu tespit edilmiştir. Bununla birlikte eğitim düzeyindeki artış ile intihar oranları arasında pozitif yönlü ilişki bulunmuştur. Medeni durumdaki değişmenin intihar ile ilişkisiz olduğu, ancak çocuk sahipliğinin intiharı azalttığı tespit edilmiştir. Alkol bağımlılığı ile yoğun kent nüfusunun intiharı tetiklediği bulgusuna ulaşılmıştır.

Anahtar Kelimeler: *İntihar, sosyoekonomik faktörler, zihin sağlığı, kayıt dışı istihdam*

JEL Kodları*: C23, I15, I31*

Alan: *İktisat*
Türü: *Araştırma*

1. INTRODUCTION

According to the World Health Organization (WHO), global suicide rates have declined from 800,000 to 700,000 over the past two decades. Despite the decrease in suicide rates, the European Region has the highest suicide rate at 12.8 per 100,000 population. Studies attempting to explain the temporal and regional variations in suicide rates have revealed that understanding the phenomenon of suicide cannot be solely evaluated from an individual perspective, independently of its societal, economic, and public dimensions. Factors deeply influencing an individual's choice between life and death can include societal norms and values, cultural elements, economic well-being, equitable access to public services, the establishment of law and justice in society, and political stability.

Suicide, a significant issue both for individuals and consequently for society, has also gathered considerable attention in social sciences. Émile Durkheim, with his 1897 study, contributed to the subject's more systematic and comprehensive examination in the following years when he analyzed the societal causes and types of suicide. Durkheim noted that individuals may view suicide as an option due to reasons such as social isolation, alienation from societal norms, and prioritizing societal well-being over their own (Johnson, 1965, p. 883). Following Durkheim's work, the topic of suicide has become an interdisciplinary subject in academic literature, involving fields such as psychology, medicine, economics, law, politics, and environmental science.

The first comprehensive study on the economic dimension of suicide was conducted by Hamermesh & Soss, (1974), who discussed suicide from the perspective of rational behaviors, aimed at maximizing their utility of life. According to their work, people compute the benefit and cost of their lives, and those who choose suicide do not believe they can change their socioeconomic condition before the end of their lives. Since Hamermesh and Soss's work, the issue of suicide has been studied from different economic aspect for a large number of countries across various time series. There is a substantial literature suggesting that deteriorations in macroeconomic variables such as economic development, inflation, unemployment, income inequality and consumer confidence, minimum wage trigger suicide cases. Economic fluctuations and unemployment are among the economic factors that have a substantial impact on suicide deaths across a variety of countries and times.

The effect of unemployment benefits, which are provided to compensate for the loss of income of individuals and households during periods of unemployment, on suicidal behavior is another issue addressed in the literature (Antonakakis & Collins, 2015; Cylus, Glymour & Avendano, 2014). Another dimension addressed in the literature is the impact of increased visibility of

women in the public sphere on individual and social economic progress and its effects on suicide cases (Chen, Chen, Lui & Yip, 2017; Cutright, 1998; Fernquist & Davis, 1981; Stack, 1978). Moreover, the effect of the average education level of the society, which is considered as an economic indicator, on suicide cases has taken its place in the discussions in the literature (O. Monak, Arroyave & Cardona, 2021; Phillips & Hempstead, 2017; Pompili et al., 2013).

The assessment of suicide cases cannot be conducted independently of sociological indicators in conjunction with the economic dimension. Within the literature, studies suggest that individuals marital and parenthood status or loneliness influence suicide cases (Andres, 2005; Choi, Sempungu, Lee, Chang & Lee, 2022; Cook, 2019; De Bruin, Agyemang & Chowdhury, 2020; Næss, Mehlum & Qin, 2021; Yang, Liu & Li, 2023). Additionally, there is literature indicating that alcohol, substance, or drug addiction can lead individuals towards suicide by isolating them from social life, as demonstrated by studies conducted by Lau, Hamzah, Tan, and Simonetti, (2017); Merrill, Milner, Owens, and Vale, (1992); Razvodovsky, (2011). Furthermore, another factor in the literature affecting individual loneliness is the population density of cities. In densely populated cities, challenges in transportation, access to healthcare, nutrition, and living conditions may negatively impact individuals' quality of life, potentially triggering suicidal thoughts (Bussu, Detotto, & Sterzi, 2013; Kurbin & Weitzer, 2003).

The indicator of the rate of wage and salaried workers among the total employed, provides information about the economic development dynamics of a society. While a high proportion of wage and salaried workers can be interpreted as an indicator of advanced economic development, a high proportion of self-employed workers is considered as an indicator of the agricultural sector and high informal employment in the economy (World Bank, 2023h)[2].

Self-employed and informal employment, have a temporary, irregular, and precarious working conditions. These workers are generally low-educated and earn below the minimum wage in temporary jobs. Besides, informal employees, who have no job security are constantly at risk of unemployment. Another major issue encountered by informal workers is the lack of social health insurance. This group, who often work long hours in physically challenging jobs

[2] The high proportion of workers in family businesses, often informal, unpaid and uncompensated, points to weak development and large rural economies. Although each type of employment carries its own risks, family workers and own-account workers are the most vulnerable and at the highest risk of falling into poverty. They are the least likely to have social safety nets to protect them from economic shocks and often lack the ability to save enough to avoid these shocks (World Bank, 2023h).

under unhealthy conditions, is exposed to serious health risks. Moreover not only the informal worker but also other family members remain without health insurance. Under such adverse circumstances, this group, which is economically, socially, and legally insecure, struggles with weakened resilience in dealing with psychological issues.

Individuals or households engaged in informal employment may experience health, economic, and legal difficulties that could lead them to self-harm. Therefore, this study primarily seeks to answer whether type of employment has an impact on suicide cases. While the relationship between unemployment and suicide has been frequently addressed in the literature, no study has been found that examines the link between wage and salaried workers and suicide. In this respect, our study distinguishes itself from the existing literature on the socioeconomic determinants of suicide.

As the level of development of countries increases, the size of the informal economy decreases. This is indirectly related to the education level of society as well. Individuals with a high level of education tend to work in qualified, high-paying, and especially socially secured jobs. On the other hand, individuals with a low level of education may struggle to compete in the labor market and may be forced to prefer informal employment in order to avoid unemployment. Low education levels, unskilled jobs, low wages, and the harsh living conditions associated with informal employment can negatively affect individuals' mental health, leading them to harm themselves.

There are many studies in the literature that examine the relationship between education level, educational attainment, or human development index and suicide. The studies in the literature have explored the relationship between literacy rates, primary or secondary school graduates, and suicide rates (Bálint, Osváth, Rihmer & Döme, 2016; O. Monak et al., 2021; Phillips & Hempstead, 2017; Pompili et al., 2013). In particular, education levels in the countries of the Organisation for Economic Co-operation and Development (OECD) have significantly increased over the past thirty years. In these countries, literacy rates and the completion rates of primary or secondary school are quite high. However, the enrollment rate in higher education, which represents a significant part of human capital in society, is still limited, even in developed countries. This study seeks to answer the question of how suicide rates follow a pattern as education levels increase, in addition to the level of economic development. This study is the first analysis to examine the effect of higher education enrollment on suicide behavior in OECD countries. In this regard, the study is expected to make a new contribution to the literature.

The remainder of this study is scheduled as follows: the next section discusses socioeconomic background of suicide section 3 explore literature review, section 4 defines methodology, section 5 defines data, section 6 explore empirical findings, sections 7 discussion of the empirical findings, section 8 includes concluding remarks and recommendations.

2. SOCIOECONOMIC BACKGROUND OF THE SUICIDE

Durkheim proposed that suicide in a society stems from four fundamental reasons: egoistic, anomic, altruistic, and fatalistic (Durkheim, 2013, p. 187). Egoistic suicide stems from the weak social relations and individual feel become lonelier in their private and social life. Anomic suicide occurs when old traditions are no longer accepted and new traditions have not yet gained a strong position in society, as a result of individuals' alienation from society due to the loss of their sense of belonging. Altruistic suicide arising from prioritizing the welfare of society over its own welfare. In terms of fatalistic suicide, the expectation of future life has vanished due to the significant changes in individual lives (Johnson, 1965, p. 878)

Durkheim argued that social isolation could trigger feelings of loneliness, depression, and an increased risk of self-harm. Therefore, factors such as marriage, divorce, and fertility can affect an individual's social integration and subsequent life decisions. Durkheim's concept of anomic and egoistic suicide suggests that marriage strengthens an individual's social integration and promotes psychological well-being, resulting in a negative relationship between marriage and suicide. Conversely, divorce can result in feelings of loneliness and depression, which can heighten the risk of suicide (Durkheim, 2013, p. 275, 285).

The concept of individual loneliness on suicide has also been discussed in urban sociology literature. In densely populated cities, individuals may experience a heightened sense of loneliness and depression, potentially leading to self-destructive behavior. Additionally, according to Social Disintegration Theory proposed by Kurbin and Weitzer (2003), rapid urbanization can lead to family or social disintegration, which is considered a primary cause of urban suicide.

Excessive alcohol use may also trigger a sense of loneliness by distancing individuals from social environments and may increase the risk of depression (Merrill et al., 1992, p. 84). In addition, heavy alcohol use leads to distraction and negatively affects the quality of life of the individual in private and professional life (Field, Claassen & O'Keefe, 2001, p.13). High levels of alcohol consumption are known to be detrimental to psychological health, leading to an increase in anxiety, depression, and suicidal tendencies (Caces & Harford, 1998; Roy, 2003).

In addition to social reasons, economic reasons affecting suicide are as follows: There are two different viewpoints in the literature about the relationship between income and suicidal behavior. According to Ginsberg (1967), there is a positive relationship between economic growth and suicide rate. He argues that during the economic downturn, individuals' expectations of consumption worsen, which leads to a decrease in suicide rates. Conversely, during an economic expansion, individuals' demand and expectations become more optimistic, and if these expectations are not met despite economic growth, suicidal behavior may increase. However, Henry and Sort (1954) present a different argument, stating that people in high economic positions may be more likely to commit suicide if they lose their status during an economic recession.

Employment takes up most of individual's time specializing them in particular field (DeFina & Hannon, 2014, p. 218). Over time, the work an individual performs permeates their character, social status, and network. Moreover, it influences their consumption and investment decision, as well as how and where they spend their leisure time. In contrast, prolonged unemployment may lead to loss of self-confidence and social status, while also causing the erosion of various habits related to consumption and the use of leisure time. During economic crisis or unemployment, individuals lives financial strain and psychological distress, this fact potentially leading to suicide. Governments provide unemployment benefits to support individuals who have lost their jobs, offering both financial assistance and psychological comfort (Burgard, Brand & House, 2009, p. 778). On the other hand, high inflation reduces the purchasing power of households, resulting in income loss, and limiting both compulsory and luxury consumption. During times of high inflation, consumption expenditures of individuals may decrease potentially leading to an increase in suicide rates (C. Nelli & Priebe, 2011, p. 980).

There are two prevalent perspectives on the relationship between female education and labor force participation. The first is the Status Integration Theory, which posits that an increase in the female labor force participation (FLFP) rate enhances their economic and psychological power. However, this may lead to a conflict between work and family responsibilities, as well as a fear of losing status among men, potentially triggering suicidal behavior in both men and women (Stack, 1978, p. 645). According to the Accumulation/Expansion Theory, the increase in household income resulting from female's participation in the labor force facilitates access to expenditures such as clean food, housing, quality education, and healthcare. This situation brings about an increase in welfare at the individual, household, and societal levels, ultimately leading to economic

development. These positive externalities provided by women's involvement in the labor market will help reduce suicide rates (Sieber, 1974, p. 577).

In addition to women's participation in the labor force, another significant factor that affects suicide rates is the average level of education within a society. Studies have found that increases in literacy rates and participation in primary and secondary education contribute to protecting individuals' mental health and improving their quality of life, thereby reducing suicide rates (Bálint et al., 2016; Phillips and Hempstead, 2017; Næss et al., 2021). However, there are also studies suggesting that higher levels of education, by increasing individuals' awareness of societal issues, may have differing impacts on suicide rates across genders (Pompili et al., 2013).

In summary, the combination of one or more problems such as economic problems experienced by households or the broader economy, rapid urbanization, alcohol or drug addiction, problems in an individual's marital status, and loneliness can negatively affect an individual's mental health (Erdem et al., 2019). Economic, social or environmental problems experienced by the individual or the society as a whole can lead to a loss of joy and hope in life. The next level of this situation may result in mental illness or self-harm (Gültekin & Emsen, 2023).

3. LITERATURE REVIEW

In this section, studies in the literature are summarized based on socioeconomic background of suicide. The summary of studies in the literature is presented in Table 1. It is observed that macroeconomic variables such as economic size, unemployment, social welfare policies, income inequality and household debt ratio are commonly used as the economic determinants of suicide. On the other hand, Durkheim’s seminal work, which the first study is to systematically and comprehensively address the issue of suicide, it is argued that social phenomena lead individuals to suicide (Stack, 1978, p. 647). In this context, there is a widespread literature suggesting that, gender, marital status or factors leading to individual isolating from society may be associated with suicide.

As can be seen in Table 1, it is realized that the most common macroeconomic variable among the economic determinant of suicide is economic size. Contrary to Ginsberg (1964) argument, it is widely observed that economic development commonly reduce suicide rates. On the other hand, the impact of inflation on suicide mortality is mixed in the literature. C. Nelli and Priebe (2011) found negative relationship, Akyuz and Karul (2022), Lari and Sefiddashti (2023) found a positive relationship between inflation and suicide.

After economic size, another macroeconomic variable frequently

discussed in the suicide literature is unemployment rate. There is a wide literature suggesting that unemployment trigger suicide as can seen in Table 1. However, the literature presents diverse conclusions on the relationship between unemployment and suicidal behavior, which can depend on factors such as the period, age, gender, and geography. The variation in the impact of unemployment on suicide is may be due to the unemployment benefits provided by government during periods of unemployment. Antonakakis and Collins (2015), and Cylus et al. (2014) found that unemployment benefits prevent suicide, while Reeves et al. (2015) and Stuckler (2009) did not found a significant relationship.

The impact of FLFP on suicide is another indicator frequently discussed in the literature. As can be seen in Table 1, Davis (1981); Erdem and Dinc (2022); Fernquist and Cutright (1998) found positive relation; Chen et al. (2017); Inagaki (2010) observed negative relation, Lari and Sefiddashti (2023) found insignificant relation between them.

Table 1: Empirical Literature on the Socioeconomic Determinants of Suicide

Author/s Year	**Sample Period**	**Method**	**Results**
Hamermesh and Soss (1974)	USA 1947-1967 By age	POLS	Unemployment and loss of income trigger suicide among older individuals.
Stack (1978)	45 Nations 1970	Pearson Corr.	FLFP is most closely related with male suicide.
Minoiu and Andres (2008)	USA 1982-1997	SGMM	Public health and welfare consumptions are related with suicide, while income equality and unemployment lack of robust impact on suicide.
Altinanahtar and Halicioglu (2009)	Türkiye 1974–2007	ARDL	Urbanization, real income and liquidity are associated with suicide.
Stuckler (2009)	26 EU 1970-2007	Multiv. Regres.	Unemployment trigger suicide younger than older. Active labor market investment reduce suicide.
Inagaki (2010)	Japan 1951-2007	DOLS FMOLS	Income equality and unemployment have a positive effect on suicide, while FLFP has a negative effect.

Andres, Halicioglu, and Yamamura (2011)	15 OECD 1970-2004	ARDL	Unemployment and divorce lead to suicide.
Razvodovsky (2011)	Russia 1980-2005	ARIMA	Alcohol consumption effect suicide in both genders.
Amin M. Cheraghlou (2013)	USA 1979-2004	FE	Unemployment causes suicide in 35-64 age group.
Bussu et al. (2013)	Italy 1996-2005	GMM, D. spatial panel data	Social conformity, alcohol cons. and population density increase suicide.
Okada and Samreth (2013)	13 OECD Countries	Times series ARDL	Divorce, alcohol and loss of income trigger suicide in a small number of countries. Fertility reduces suicide in only 4 countries (Different times for each country).
Pompili et al. (2013)	Italy 2006-2008	Pearson Log. Reg.	Suicide rate increasing as the level of education increase.
Cylus et al. (2014)	USA 1968-2008	Fixed Effect	The effect of unemployment rate on suicide is suppressed by unemployment benefits.
Antonakakis and Collins (2015)	5 EU Count. 1968-2012	Fixed Effect	Fiscal austerity prevent suicide among men aged 65-89.
Reeves et al. (2015)	20 EU Countries 1981-2011	Multivariate statistical models	Unemployment and indebtedness have an impact on male suicide, while unemployment benefits and total social protection do not prevent suicide.
Bálint et al. (2016)	Hungary 1980,1990, 2001, 2011	Negative binomial regression	Being female, young age, higher educational level and marriage were significantly associated with a reduced risk of suicide.
Chang and Chen (2017)	USA 1928-2013	ARDL NARDL	Unemployment and economic situation effect suicide by age group.

Lau et al. (2017)	Canada 1978-2008	VAR	Economic status, unemployment, alcohol consumption and fertility affect suicide for both genders.
Chen et al. (2017)	70 Countries 2012	Bayesian information criteria	The lower ratio of human development index to FLFP were associated with higher suicide rate.
Phillips and Hempstead (2017)	USA 2000-2014	Poison distribution	Suicide rate decreasing as the education level increases.
Erdem, Demirel and Erkan (2019)	Türkiye /12 statistical region 2005-2013	Fixed Effect	Youth unemployment has no impact on suicide.
Mattei and Pistoresi (2019)	Italy 1977-2015	Cointegration	Unemployment benefits are effective in weakening the impact of unemployment on suicide.
De Bruin et al. (2020)	17 Countries 1990-2015	Fixed Effect	Lower voice and accountability and political stability is associated with suicide.
Næss et al. (2021)	Norway 1992-2012	Conditional regression	Suicide is higher among unmarried, divorced, widowed people, or those with low education and those who have never been married.
O. Monak et al. (2021)	Colombia 1998-2015	Poisson regression	Educational inequalities increase suicide.
Saraçoğlu & Gültekin (2021)	Türkiye 26 statistical region 2008-2018	Cointegration	There is a Kuznets Curve (U) effect of income level on suicide.
Choi et al. (2022)	South Korea 2008-2017	Conditional log. reg.	Low education, singleness, economic status and unemployment were associated with suicide.
Erdem and Dinc (2022)	47 Countries 1995-2015	Panel ARDL	Unemployment, fertility, alcohol consumption, divorce were

			associated with suicide.
Akyuz and Karul (2022)	Türkiye 1988-2018	F.Coint. DOLS	Industrial production and investment developments and inflation effect suicide.
Kızılkaya & Kuzucu (2022)	44 countries 2000-2019	GMM	Increases in unemployment, FLFP and inflation increase suicide for both gender.
Yang et al. (2023)	China 1987-2017	Cointeg., Lineer regression	Marriage, divorce and economic status affect suicidal behavior according to the gender of those living in rural and urban areas.
Lari and Sefiddashti (2023)	17 Count. 1990-2019	Random Effect	Suicide rates was associated with inflation, unemployment, mental disorders, urbanization, and internet using.
Kavaklı (2023)	Türkiye Level-2 2004-2019	GMM	Economic recovery and marriage negatively affect suicide.

Besides economic factor, reasons such as individual's isolation from society, resulting in alienation and deteriorating future prospects as Durkheim suggested, can trigger mental illness (Gültekin & Emsen, 2023). Based on the Durkheim's suicide theory, there are numerous studies in the literature suggesting that factors leading social isolation may trigger suicide. These studies emphasize on factors such as marital status, parenthood, and population density. Among these studies Choi et al. (2022); De Bruin et al. (2020); Næss et al. (2021); Okada and Samreth (2013), revealed that suicide risk is significantly higher for individuals who are never married, separated, divorced, or widowed than for those who are married. So that Andres et al. (2011), found that sociological aspects, such as divorce and fertility rate, had a greater effect on suicide risk than economic aspects such as GDP or unemployment.

However, there are other studies that have found insignificant relationship between marriage/divorce and suicide. Yang et al. (2023), have not reached a significant relationship between marriage/divorce and suicides among urban residents in China. Yang et al. (2023), associates this situation with the notion that urban women, being economically and psychologically independent, marriage and divorce decision cover a small part of their lives. Nevertheless, having children can strengthen family ties and increase parental the responsibilities, which may motivate parents to strive for survival despite

difficulties, thereby reducing the suicide risk in families with children (Andres, 2005; Lester & Yang, 1992; Neumayer, 2003).

A review of the literature on the socioeconomic determinants of suicide reveals that the most prominent macroeconomic variables are economic size and unemployment. Though, the impact of unemployment on suicide is controversial in the literature. One possible reason for this uncertainty could be attributed to the unemployment benefits provided by governments.

Besides economic size and unemployment, the ratio of wage and salaried workers in a society, provides crucial information about both the economic development level and distribution of employment. A low ratio of wage and salaried workers often accompanies an underdeveloped or developing countries, characterized by precarious employment conditions and a lack of social protections.

As the level of development of countries progresses, the number of large-scale corporate companies expands and the proportion of self-employed workers shrinks. However, in less developed and developing countries, the self-employment rate is relatively high due to the lack of factors such as capital, quality education, and job security, as well as the reliance on traditional production methods. The lack of adequate protection of social security rights of employees in underdeveloped or developing countries leads to unregistered employment. Since formal employment has job, wage and health security, it is less affected by a sectoral or economy-wide shock than informal employment. On the other hand, those who are employed informally or self-employed in small family enterprises are in an invisible employment without economic, health, social and legal security. This fact may make it difficult for employees to protect their mental health in times of economic crisis by being deprived of any job security (Gültekin & Emsen, 2023). Therefore, a low ratio of wage and salaried workers may trigger crime and suicide rate in a society. No study has been found in the literature that specifically highlights the relationship between suicide and wage and salaried workers, which include both economic development and employment. Our study differs from the empirical literature in this regard.

The other socioeconomic variable whose effect on suicide is controversial is the level of education. Pompili et al. (2013) in Italy and Lusyne and Page (2008) in Belgium found a positive relationship between education level and suicide. However, Bálint et al. (2016) in Hungary, O. Monak et al. (2021) in Colombia, and Phillips and Hempstead (2017) in the USA identified a negative relationship. Dündar & Sağır (2022) identified that the impact of economic factors on suicidal behaviors among university graduates in Turkey varies based on gender. No study has been found examining the impact of higher education

level on suicide for OECD countries. This study distinguishes from other studies in the literature in this respect.

As evidenced by the extensive literature attempting to elucidate the socioeconomic roots of suicide, an individual's propensity towards suicidal behavior is rooted in the intricate mental, social and cultural struggles they confront both within themselves and their larger community, often spurred by economic circumstances. In the next part we define the data and method used in research.

4. METHODOLOGY

Classical panel data models consist of Pooled Ordinary Lest Square (OLS), fixed effects, and random effects models. In the pooled OLS model, unit and/or time effects are not included within the model. In the fixed effects model, while slope of coefficients remain constant, the cross-sectional units and/or time periods exhibit variations. In the fixed effects (FE) model, dummy variables are included in the model for observed and unobserved individual effects. Thus, differences between cross-sectional units can be observed (Asteriou & Hall, 2021, p. 357). In the random effects (RE) model, changes in cross-section units or cross-section units and time are included in the model as a component of the error term. Thus, the loss of degrees of freedom encountered in the fixed effects model is prevented (Baltagi, 2005, p. 17).

Pooled, fixed effects, and random effects models used in panel data analyses accept the existence of correlation between error terms and the presence of heteroscedasticity, but ignore cross-sectional dependence. In this case, the estimates obtained as a result of regression lose their efficiency and lead to unreliable results. The Driscoll-Kraay standard errors estimator produces estimators that are robust to models in which error terms have heteroscedasticity, autocorrelation and errors are correlated across groups (Hoechle, 2007, p. 310). We utilized the Fixed Effect estimator with Driscoll-Kraay standard errors, which can handle missing values and can be utilized to both balanced and unbalanced panels. This approach is not restricted by the number of panel observations and is not affected by heteroscedasticity, autocorrelation, and cross-sectional dependence (Hsiao, 2003, p. 331). The Driscoll Kraay standard errors is a variation of the Newey-West (1987) test, which involves averaging the explanatory variables and residual terms before applying them to the data. These data are then used to generate standard errors for the weighted HAC (Heteroskedasticity and Autocorrelation Consistent) estimator, which is not robust to cross-sectional dependency (Baltagi, 2005, p. 213). In this method, the autocorrelation problem is solved by taking into account the variance and

covariance of the model's error terms. On the other hand, the Driscoll Kraay estimator uses the Weighted Least Square method to deal with the problem of heteroscedasticity. This method gives a different weight to each observation by taking into account the change in the variance of each error term. Lastly, in the Driscoll Kraay method, the common effects in the model are estimated by adjusting the weights assigned to the common observations arising from each cross-section. (Wooldridge, 2010, p. 288-293).

5. DATA

This study empirically examine for 30 OECD country from 2007-2020 annual data. A dataset composed of OECD countries provides an opportunity to identify not only the economic but also demographic, sociological and political determinant of suicide. Moreover, since OECD countries have similar level of development in terms of education and economic standarts, they have been chosen as the sample for this study. The basic empirical model in Eq. (1) is used to investigate the socioeconomic cause of suicide.

$$Suicide_{it} = \alpha_i + \beta_k EC_{it} + \gamma_l S_{it} + \delta_m EN_{it} + \nu_i + \mu_t + \varepsilon_{it} \quad (1)$$

Where i indicates the country (i=1,…,N) and t indicates time period (t=1,…,T). Where the dependent variable is that $Suicide_{it}$ stands for the total suicide rate per 100,000 person for i country at the end of the period t. In Eq. (1) the vector of EC_{it} is economic variables, S_{it} sociological variables, EN_{it} environmental variable hypothesized to affect of suicide rate. ν_i are country specific effects, μ_t are period specific effects and, ε_{it} is the error term.

Table 2 provides a summary of the definitions, sources and the expected sign of variables used in this study. In this study, GDP per capita is logarithmic and other variables are used at their level values. The following economic variables will be employed in the empirical analysis of this study: *Lgdppc* is the level of GDP Per capita, *Inf* is the inflation rate derived from the consumer price index, *unemp* is the unemployment rate, *benefit* is the ratio of income earned during the unemployment period to income earned during the working period, *wage* is the rate of salaried and waged workers, *female* is the female labor force participation rate, *tertiary* refers to the level of tertiary education enrolment rate. S_{it} constituted from marriage (*marrriage*), divorce rate (*divorve*), fertility rate (*fertility*) and alcohol consumption rate (*alcohol*). These factors, as identified by Durkheim in his theories on anomic and egoistic suicide, can affect an individual's sense of loneliness, which in turn can influence their decision to commit suicide. Developments such as economic growth, education and employment may encourage individuals to migrate from their region to larger cities. The shrinking family population within the growing urban population may cause the individual to live an isolated life. Finally, the *density* data used in the study represents population density of

countries. For missing data points in the suicide and tertiary variables, linear interpolation[3] was used. The data was collected from the World Bank and OECD statistics.

Table 2: Variable Definition and Data Sources

Variable	Definition	Source	Expected Sign
Suicide	Suicide rate (total) Per 100,000 person	OECD	
Lgdppc	Log of GDP per capita (constant 2015 US$)	World Bank	-
Infl	Inflation, consumer prices (annual %)	World Bank	+
Unemp	Unemployment, total (% of total labor force)	World Bank	+
Benefit	Net replacement rate in unemployment	OECD	-
Female	Labor force participation rate, female (% of female population ages 15+)	World Bank	+/-
Wage	Wage and salaried workers, total (% of total employment)	World Bank	-
Tertiary	School enrollment, tertiary (% gross)	World Bank	+/-
Marriage	Crude marriage rate (marriages per 1000 people)	OECD	-
Divorce	Crude divorce rate (divorces per 1000 people)	OECD	+
Fertility	Fertility rate, total (births per woman)	World Bank	-
Alcohol	Alcohol consumption	OECD	+
Density	Population density (people per sq. km of land area)	World Bank	+

Note: The fact that the expected sign is + or - indicates that there are two different common findings in the literature.

6. EMPIRICAL FINDINGS

Figure 1 shows the mean suicide rates of countries between 1990 and 2020. Türkiye, Greece, Mexico, Colombia and Italy have the lowest rates, while Lithuania, Hungary, Latvia and Estonia have the highest rates over the last three decades. These countries have 50% higher suicide rates than the overall European average. According to the OECD report, the high suicide rates in these countries are due to rapid socioeconomic change, increasing psychological and social insecurity, and the lack of a national suicide prevention strategy (OECD, 2020).

[3] The interpolation procedure for a series fills in missing or NA observations based on available values (Eviews12, 2020).

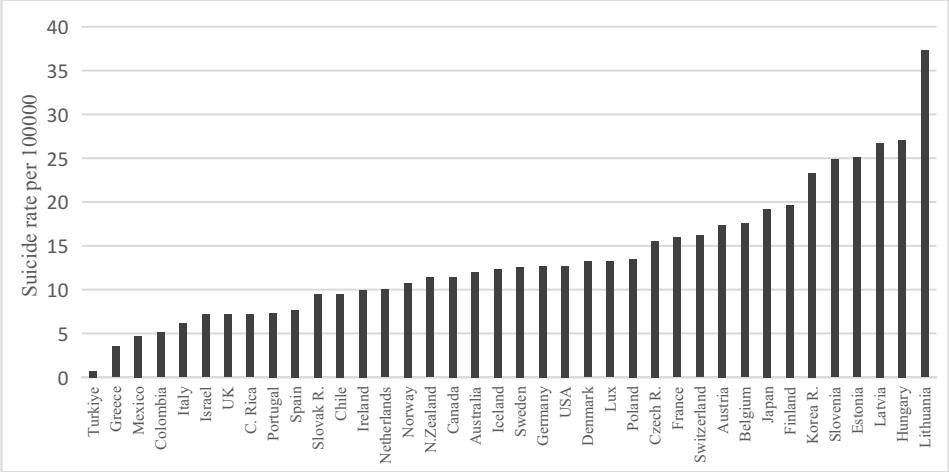

Figure 1: Mean suicide rates of countries between 1990 and 2020
Source: World Bank, 2023f.

Table 3 presents the descriptive statistics of the variables used in the study. The highest suicide rate during the study period was observed in Lithuania in 2013 with 35,4 per 100,000 individuals. In contrast, Greece had the lowest suicide rate, with 3,1 suicides per 100,000 individuals in 2007. The years with the most negative observations for the macroeconomic variables were those corresponding to periods of economic crisis. The countries with the highest marriage rates were Korea, the United States, The Republic of Korea, Lithuania, and Mexico, while the highest divorce rates were observed in the United States, Lithuania, and Latvia in generally.

Table 3: Descriptive Statistics

	Mean	Maximum	Minimum	Std, Dev.	Skewness	Kurtosis	J-B
Suicide	13,7526	35,4	3,1	6,3505	1,1868	4,6436	123,299***
Lngdppc	10,2931	11,2335	9,1832	0,5282	-0,3523	1,9077	24,9915***
Infl	1,8605	15,4023	-4,4781	1,879	1,9472	13,2084	1765,797***
Unemp	7,9437	27,47	2,01	4,5218	1,8358	7,024	438,9231***
Benefit	69,5859	88,0	44,0	10,2426	-0,324	2,3857	11,7943***
Wage	84,8527	93,91	63,01	6,0758	-1,444	5,4119	209,4221***
Female	53,5946	64,665	37,945	5,2231	-0,662	3,3719	27,9735***
Marriage	4,8849	7,6	3,0	1,0537	0,4531	2,6882	13,5857***
Divorce	2,1361	4	0,6	0,6222	0,0022	3,3926	2,2803
Fertility	1,6528	3,11	0,918	0,3548	1,9126	8,5731	675,8688***
Tertiary	75,2402	143,93	45,3672	17,3264	1,2563	4,9536	149,8302***
Alcohol	9,7458	14,8	2,6	2,1499	-0,9613	4,9315	109,8643***
Density	152,7308	530,377	2,7111	143,9556	1,2421	3,5027	95,0255***

Note: *** indicates 1% level of significance.

The problem of multicollinearity occurs when two or more variables in the model are highly correlated with each other. The correlation values between the variables used in the analysis are presented in Table 4. According to Kennedy, a correlation coefficient of 90% or higher indicates the presence of multicollinearity (Asteriou & Hall, 2021, p. 85). The study found that the variables of *wage* and *female* had the highest correlation coefficient, at 0.53. Based on the threshold mentioned above, it can be concluded that there is no multicollinearity in the model.

Table 4: Correlation Matrix

Prob,	Suicide	Lngdppc	Infl	Unemp	Benefit	Wage	Female	Mar	Div	Fert	Tert	Alch	Den
Suicide	1												
Lgdppc	-0,3532 [0,0000]	1											
Infl	0,2314 [0,0000]	-0,1996 [0,0002]	1										
Unem	-0,1804 [0,0006]	-0,3691 [0,0000]	-0,1523 [0,004]	1									
Benefit	-0,0509 [0,3391]	0,1785 [0,0007]	-0,0919 [0,0837]	-0,0997 [0,0607]	1								
Wage	0,1127 [0,0337]	0,2825 [0,0000]	0,0654 [0,219]	-0,3178 [0,0000]	0,2460 [0,0000]	1							
Female	-0,1159 [0,029]	0,5244 [0,0000]	-0,0424 [0,4262]	-0,3141 [0,0000]	0,1254 [0,0181]	0,5303 [0,0000]	1						
Mar.	0,3165 [0,0000]	-0,0408 [0,443]	0,1578 [0,0029]	-0,2593 [0,0000]	-0,3031 [0,0000]	0,1754 [0,0009]	0,2201 [0,0000]	1					
Div.	0,3920 [0,0000]	-0,1024 [0,0539]	0,2151 [0,0000]	-0,0776 [0,1446]	-0,0618 [0,2452]	0,4373 [0,0000]	0,2556 [0,0000]	0,4670 [0,0000]	1				
Fert.	-0,2959 [0,0000]	0,4283 [0,0000]	-0,0290 [0,586]	-0,2173 [0,0000]	0,1093 [0,0396]	0,3764 [0,0000]	0,5150 [0,0000]	0,2564 [0,0000]	-0,0271 [0,6103]	1			
Tert.	0,0955 [0,0722]	0,1726 [0,0011]	0,0382 [0,4735]	0,1188 [0,0252]	-0,1399 [0,0083]	-0,3503 [0,0000]	0,1820 [0,0006]	0,1614 [0,0023]	0,0363 [0,4957]	-0,0195 [0,7139]	1		
Alch.	0,3869 [0,0000]	-0,3707 [0,0000]	0,2384 [0,0000]	0,0687 [0,1965]	-0,0767 [0,1493]	0,089 [0,0941]	-0,1358 [0,0104]	-0,0890 [0,0942]	0,2534 [0,0000]	-0,4438 [0,0000]	-0,1053 [0,0474]	1	
Dens.	0,0796 [0,1344]	0,1291 [0,0149]	-0,0957 [0,0716]	-0,2859 [0,0000]	0,1751 [0,0009]	-0,2336 [0,0000]	-0,1645 [0,0019]	-0,0635 [0,2324]	-0,1707 [0,0012]	0,0116 [0,8278]	-0,1647 [0,0018]	-0,3257 [0,0000]	1

Note: Values in parentheses indicate the probability value of the correlation coefficients.

Variance inflation factor (VIF) is another test that provides information about multicollinearity. If the value of VIF is higher than 10, it is concluded that there is a multicollinearity problem (David, Lawrence & Keith, 1988). In Table 5, (VIF) values of the variables used in the model are shown to be less than 5, indicating that there is no issue of multicollinearity among the variables.

Table 5: Multicollinearity Test

Variable	wage	lngdppc	female	ter	unemp	mar	div	fer	dens	alch	benefit	infl	Mean VIF
VIF	3,42	2,2	2,12	2,06	1,91	1,8	1,78	1,67	1,63	1,43	1,32	1,21	1,88
1/VIF	0,2922	0,4552	0,4727	0,4858	0,5226	0,5541	0,5618	0,5971	0,6124	0,6988	0,7576	0,8263	

Figure 2 displays the scatter plot depicting the relationship between the dependent and explanatory variables. The pattern of the scatter plot provides insights regarding the pattern of the relationship between the dependent and independent variables. The scatter plot pattern of lngdppc, inflation, benefit, female, divorce, fertility, alcohol, and density is in line with our expectations. The scatter plot implies that a strong relationship between inflation, divorce, birth rate, alcohol consumption and suicide rates. However, the scatter plot pattern of

unemp, wage, and marriage differs from our anticipated pattern. Table 6 presents the Fixed Effect estimator with Driscoll Kraay standard error results to obtain a more comprehensive estimation of the model.

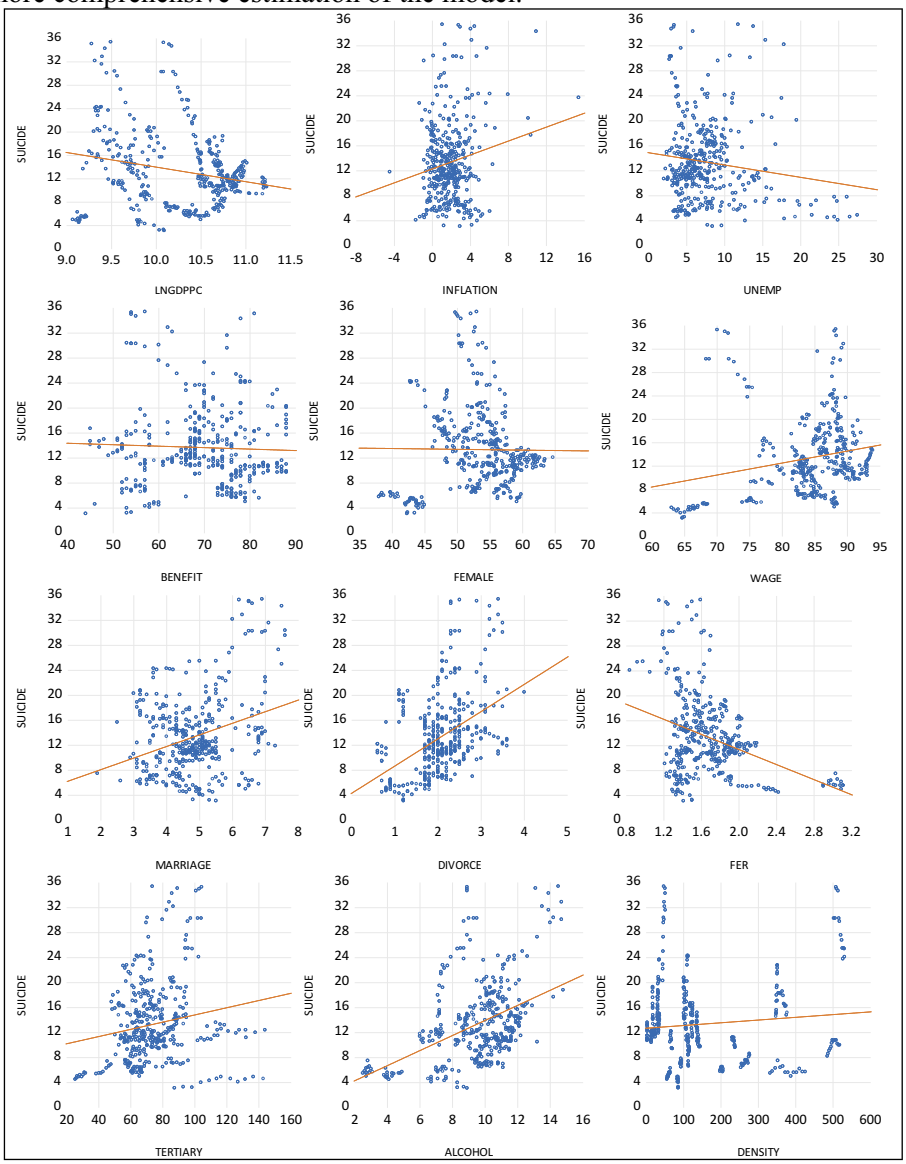

Figure 2: Scatter Graph between Dependent and Independent Variable

Table 6 presents the results of Pooled OLS, Fixed Effect (FE), Random Effect (RE) and Driscoll-Kraay standard errors. According to the F-test result asserting the absence of unit effects and the validity of the classic model, the null hypothesis is rejected. The F test of the FE model shows that cross-country effects are significant, indicating that the FE model is stronger than the pooled OLS model. On the other hand, the Breush Pagan LM test, which tests the existence of individual heterogeneity based on the random effects model, rejects the null hypothesis that the variance of random unit effects is zero. Hence, it can be concluded that the random effects model is preferred over the classic model. To determine the appropriate model between FE and RE, the Hausman test was used. The null hypothesis, which posits no correlation between explanatory variables and unit effects, is rejected based on the Hausman test. In other words, as there is a correlation between explanatory variables and unit effects, the fixed effects model is deemed superior to the random effects model.

To obtain efficient estimates in the fixed effect model, the model must be devoid of heteroscedasticity, autocorrelation and cross sectional dependence. In the study, the Wald test developed by Green was employed to detect the presence of the heteroscedasticity among groups. According to this result, the null hypothesis claiming absence of heteroscedasticity in the model was rejected, leading to this conclusion that there is heteroscedasticity in the model. In the fixed effect model estimated with the within-group estimation method, an autocorrelation problem may be encountered among the error terms due to the difference in unit averages over time (Tatoğlu, 2012, p. 238).

The Durbin-Watson test statistic, whose null hypothesis states that there is no relationship between the error terms, was used to test for autocorrelation in the model. As can be seen in the Table 6, test result less than 2, indicates the presence of autocorrelation problem in the model. Another assumption of classic panel data model is that there is no relationship between cross sectional units. Since the cross-sectional (CD) dimension is higher than the time dimension, the cross-section dependence test developed by Pesaran was used in this study. According to the C-D test results in Table 6 there is cross-sectional dependence in the model. These three test results show that there are autocorrelation, heteroscedasticity, and cross-section dependence in the model. Fixed Effect estimator with Driscoll-Kraay standard errors is used to generate consistent and robust coefficient estimates towards these problems (Driscoll & Kraay, 1998, p. 558).

Table 6: Results of OLS, *FE, RE and Driscoll Kraay Standard Errors*

Variables	OLS	FE	RE	FE (Driscoll Kraay SE's)
Lngdppc	-4,6834*** (0,6326)	-9,1434*** (1,823)	-6,0615*** (1,4548)	-9,1434*** (2,3471)
Wage	0,4937*** (0,0683)	-0,2080** (0,0734)	-0,0886 (0,071)	-0,208*** (0,0526)
Inflation	0,0109 (0,1354)	0,16104*** (0,046)	0,1831*** (0,0474)	0,161** (0,0578)
Unemp	-0,2535*** (0,0668)	0,0193 (0,05)	0,07 (0,0457)	0,0193 (0,0701)
Benefit	0,0101 (0,0257)	-0,0797*** (0,0175)	-0,0838*** (0,0185)	-0,0797*** (0,013)
Female	-0,1932*** (0,0674)	-0,4046*** (0,0803)	-0,3078*** (0,077)	-0,4046*** (0,1011)
Tertiary	0,156*** (0,0182)	0,01836* (0,0095)	0,0255* (0,0099)	0,0183** (0,0069)
Marriage	1,3264*** (0,304)	-0,1998 (0,22)	-0,1764 (0,2177)	-0,1998 (0,1459)
Divorce	0,3904 (0,5278)	-0,2673 (0,3529)	0,31722 (0,3614)	-0,2673 (0,2249)
Fertility	-3,5939*** (0,9291)	-1,8281* (0,974)	-1,9109* (0,9807)	-1,8281* (1,0046)
Alcohol	0,7896*** (0,1407)	0,5331*** (0,1473)	0,5711*** (0,1482)	0,5331*** (0,1524)
Density	0,0150*** (0,002)	0,0381** (0,0132)	0,0135** (0,006)	0,0381*** (0,0089)
Dum2009	1,7134** (0,8434)	0,7487** (0,2635)	0,9737*** (0,2734)	0,7487*** (0,2348)
Cons	8,468 (7,5756)	144,4042*** (18,1157)	98,8334*** (14,809)	144,4042*** (34,962)
Observation	355	355	355	355
LM			387,23***	
F test		139,65***		
R2	0,5612	0,6057	0,5866	0,6057
Hausman Chi(2)		108,48***		
Wald test		870,86***		
D-W		0,8345		
C-D		10105,402***		

The brackets represent the standard errors, *** 1%, ** 5%, * 10% indicates significance level.

In Table 6, socioeconomic and demographic causes of suicide in 30 OECD countries between 2007 and 2020 are modeled with Fixed Effect estimator with Driscoll-Kraay standard errors. The impact of per capita income (lngdppc) on suicide rate is negative and significant at the 1% level, which is as expected.

An increase of 1% in *lngdppc* is found to decrease the suicide rate by 0.09 per 100,000 population. High level of wage and salaried workers gives an insight into the level of economic development of a society. On the other hand, the ratio of wage and salaried workers also provides information on the extent to which employment is registered. This study found that increase of 1% rate of *wage* reduced suicide by 0,28 per 100,000 people. High inflation weakens the purchasing power of households and leading to reel income loss and decreased individual's consumption expenditure. In Table 6, *inflation* is found to be positive and significant at %1 level. An increase of 1% in *inflation* is associated with a 0,61 per 100,000 person increase in suicide rate.

The relationship between unemployment and suicide rate has been frequently discussed in the literature. However, there are various findings regarding the direction and significance of this relationship. In this study, no significant impact of *unemployment* on suicide rate has been observed. On the other hand, the effect of social benefit payment to the *unemployed* on suicide, as expected, is found to be negative and significant. Increase of 1% in *benefit* decreases suicide by 0,7 per 100,000 people. Another variable that we found to be significantly related to suicide rate is female labor force participation rate. Our results indicate that higher female labor force participation is associated with lower suicide rates. An increase of 1% in *female* decrease suicide 0,4 per 100,000 people. Another variable that assumed to effect suicide is tertiary education enrollment rate which is an essential indicator of human capital. This study found that the increase in tertiary education rates has a positive, but weak effect on suicide rate as expected. Increase of %1 in *tertiary* increases suicide rates by 0,4 per 100,000 people.

According to Durkheim's sociological theory of suicide, marital status and child ownership can be used to detect the effect of loneliness on self-harm. In this study no significant relationship was found between *marital status* and suicide. In addition to the marital status, it is frequently studied in the literature that having children affect the individual's sense of loneliness and responsibility and that this may affect on suicidal behavior. Our study found a negative and significant impact of fertility rates on suicide rates, it is found that an increase of %1 in *fertility rate*, decreases suicide rate by 1,81 per 100,000 people.

Heavy alcohol use may cause individuals to withdraw from their social environment, disruptions in their professional and personal lives, depression and suicide. In this study, it was found that a one unit increase in the rate of *alcohol consumption* per capita increased suicide by 0,53 per 100,000 people. Intense urbanization, high population density, and living in a small and narrow houses may isolate individuals and trigger depression and that may be trigger suicidal

ideation. This study found an increase of %1 in *density* rate leads to increase in suicide 0,038 per 100,000 people.

7. DISCUSSION

Economic development and increase in the level of well-being, facilitate the public's access to education, health, goods, and services. It is believed that this increase in well-being in the quality of life, distances individuals from suicidal thoughts. Contrary to economic expansion periods, during the economic recession, individuals may commit suicide if they experience a decline in their income level. This result is parallel with the Henry and Sort (1954)'s economic downturn and suicide argument. On the other hand, our result is similar to findings by Branas et al. (2015); Corcoran, Griffin, Arensman, Fitzgerald and Perry, (2015); De Bruin et al. (2020); L. Bernal, Gasparrini, Artundo, and Mckee, (2013); Kavaklı (2023); Okada and Samreth (2013).

Another macroeconomic indicator that provides considerable information on the economic performance of countries is the level of registered employment. In informal employment, workers are employed in low-paid, temporary jobs without social and health insurance. As capital accumulation deepens, the ability of precarious and informal workers, who occupy the lowest rung of the income distribution, to cope with economic hardships is progressively weakening. With the addition of poor and unhygienic working conditions to this situation, the health status of workers without social security is endangered. In addition to these unfavorable working conditions, working hours in informal employment may exceed national or international standards[4]. Similar working conditions also prevail for self-employed workers. All of these reasons exploit the livelihood of those who are self-employed or informally employed. In this study, it has been observed that increase in the rate of wage and salaried workers decreases suicide rates, as expected. The effect of wage and salaried workers on suicide rate has not been examined in previous studies. This study differs from the literature in this respect.

The inflation rate provides a significant information about the macroeconomic outlook of the country. In countries experiencing high inflations, the purchasing power and reel income of household tend to weaken, leading to increased uncertainties regarding the future. In this inflationary environment, the repayment of debts incurred through goods and foreign exchange rates become more challenging, potentially pushing individuals into a deadlock. In this study,

[4] According to the International Labour Organization Convention No. 48, weekly working hours should not exceed 48 hours (ILO, 2022).

it was revealed that suicide rates increase during the inflationary periods, as Akyuz and Karul, (2022); Kızılkaya and Kuzucu (2022); Lari and Sefiddashti (2023)'s findings.

There is a substantial body of literature suggesting that a positive relationship between suicide and unemployment. Unemployment is a multifaceted social issue that can lead individuals to lose their income and social status and social environment. The various problems caused solely by unemployment can push individuals towards depression, loneliness and helplessness, potentially undermining their position within the family. While there are studies in the literature supporting the idea that unemployment triggers suicide, there are also studies claiming that unemployment has no effect on suicide. This study has determined that there is no relationship between unemployment and suicide rate. This finding aligns with the results of Kunce and Anderson (2002); Minoiu and Andres (2008); Vandoros, Avendano and Kawachi, (2019) in the literature.

In this paper, another reason for the absence of a significant relationship between unemployment and suicide may be the preventive effect of unemployment benefit provided by governments to the unemployed. The allowances of financial support in order to prevent income losses of individuals during the periods of unemployment may have a relieving effect on the economic situation of individuals or families. This may protect the unemployed individual from self-harm. As a matter of fact, the findings that unemployment benefit prevents suicidal behavior strengthens our predictions. This finding is consistent with the results of Antonakakis and Collins (2015); Burgard et al. (2009); Cylus et al. (2014).

Our results indicate that higher FLFP is associated with lower suicide rates, which is in line with the accumulation theory. This theory suggests that women's participation in the labor force will expand women's social networks and help them overcome individual isolation. In addition, it points out that women's participation in the labor force will increase household income and make it possible to provide for consumption needs more feasibly, which in turn will reduce suicide rates. Our results are supported by previous studies, including Burr, McCall, and P. Griner, (1997); Chen et al. (2017); Inagaki (2010).

Increasing in enrollment rate of tertiary education may require moving to another city or country and living alone. Similarly, participation in the labor market following the completion of higher education may again necessitate mobility and living alone. In addition, participation in education and labor market may postpone the age of marriage and cause them to live alone. On the other hand, the increase in the level of education may increase the individual's sensitivity and

awareness of social problems and trigger unhappiness in the individual. This may lead to isolation of individual and committing egoistic suicide as suggested by Durkheim. This study concludes that the increase in tertiary education enrollment rate increases in suicide rate. The result obtained in this study is in line with the studies of Lusyne and Page (2008); Pompili (2013) which assert that suicide rates tend to rise with higher levels of education.

In existing literature, studies suggest that establishing a family creates a supportive and trusting environment for couples, leading to happiness and consequently reducing suicidal tendency. On the contrary, research indicates that individuals who are divorced establish a solitary life by leaving their partner and homes and social lives, and this situation triggers suicide (Choi et al., 2022; Denney, Wadsworth, Rogers & Pampel, 2015; Næss et al., 2021). In this study, no significant relationship was encountered between marriage/divorce and suicide. The reason for that might be that marriages do not necessarily guarantee solidarity, togetherness, and happiness. Conversely, ending unhappy marriages may liberate individuals, potentially distancing them from suicidal thoughts.

Marital status may carry less significance in developed and developing countries that constitute the sample this study compared to countries with traditional societal structures. The result obtained from this study is consistent with conducted by Cook (2019); Yang et al. (2023). In contrast to divorce, having a child increases the responsibilities of the parents to each other and to the child, which may lead to a decrease in suicide rates in families with children. There is a widespread literature suggesting that suicide rate decrease in family with child. Our study found a negative and significant impact of fertility rates on suicide rates, which is consistent with studies by Andres and Halicioglu (2011); Breuer (2015); Neumayer (2003); Okada and Samreth, (2013).

Intense alcohol consumption may trigger feelings of loneliness and depression in individuals. Additionally, heavy alcohol use may lead to attention deficit and deterioration of quality of life in private and formal life. These problems may trigger suicidal thoughts in individuals with heavy alcohol use. This study has revealed a positive relationship between alcohol consumption and suicide cases. This result is in accordance with the studies of Bussu et al. (2013); Lau et al. (2017); Razvodovsky (2011) in the literature.

Economic development brings about urban and environmental problems. High level of urbanization make it necessary for individuals to live and work in cramped and crowded dwellings, leading to increased commuting times between home and workplace. Additionally, migration, which is sometimes necessary for work and education, may result in individuals experiencing loneliness and isolation in city life. For this reasons, urbanization may push individuals to

suicide. This study has determined that increase in urban population density is associated with an increase in suicide in parallel with Social Disintegration Theory proposed by Kurbin and Weitzer (2003).

8. CONCLUDING REMARKS

While there has been a decrease in suicide rates worldwide over the past 20 years, European countries continue to be the highest suicide rates. This study examines the economic, sociological and environmental causes of suicide rates in 30 OECD countries, mostly consisting of European developed and developing countries. In the study, annual data from 2007 to 2020 was analyzed using the Fixed Effect estimator with Driscoll-Kraay standard errors. This study differs from the existing literature in taking into account the effect of wage and salaried employees, which is an important indicator of formal employment, on the suicide rate. This study, compared to the existing literature, stands out by comprehensively addressing multiple indicators explaining the socioeconomic causes of suicide in a single study.

In this study, improvements in economic indicators such as the per capita income, FLFP, inflation, wage and salaried workers and unemployment benefit are observed to enhance societal well-being and suppress suicide rates. From this point of view, we can infer that the deterioration in economic indicators may negatively impact societal welfare, potentially leading individuals towards suicide. Therefore, worsening economic indicators should not be viewed solely as a loss of economic well-being for households, governments and firms, but also as potential creators of social problems.

This study identifies economic development level as the most significant determinant of suicide, with an increase in income level being the dominant factor in preventing suicide. We can infer that economic welfare has positive effects on psychological health by increasing the quality of life of individuals. The presence of a high proportion of wage and salaried workers in a society is directly related to the development of its institutional structure and the breadth of its social security networks. A high rate of wage and salaried workers, provides individuals to benefit from social security opportunities, health insurance and unemployment benefit in case of unemployment. This situation may prevent individuals from harming themselves in times of economic recession. The opportunities and social support provided by the level of economic development play a leading role in ensuring societal well-being. However, self or informal employed individuals face greater challenges in overcoming economic difficulties and associated traumas due to the significant responsibility resting on their shoulders.

Besides the level of economic development, recovery in inflation rate reduce uncertainty, preserving the real purchasing power of households and firms and maintaining the value of the local currency. In a low inflation environment, the wage level earned by the workforce also maintains its real value. This will minimize uncertainty in individuals' consumption, investment, savings or borrowing decisions. This economic confidence contributes to the establishment of individual and societal peace. Based on these developments, the finding that suicide rates decrease in a low inflation environment emphasizes the importance of economic improvements in protecting social welfare and individual mental health.

Women's participation in the labor force, on the one hand, increases their productivity, socialization and personal development by breaking away from the stagnant living conditions imposed by the home environment, and on the other hand, it helps to ensure gender equality. Thus, while household income increases, it contributes to the increase of national income and public revenues through taxes by mobilizing inactive labor force. These positive psychological and economic consequences may prevent individuals from harming themselves and contribute to increased peace within the family. In this regard, it will be particularly impactful for governments in developing economies to undertake various responsibilities in terms of education and vocational training to increase women's participation in the workforce. This can play a significant role in mitigating societal issues.

On the other hand, no significant impact of unemployment rates on suicide has been identified. However, it has been determined that unemployment benefit are effective in preventing suicide. The lack of a significant relationship between unemployment and suicide could be attributed to the partial compensation of income loss by unemployment benefit. In this context, unemployment benefits should not be set at a level that would encourage individuals to refrain from seeking employment. Simultaneously, these benefits should be sufficiently high to prevent individuals from being pushed into social problems due to the lack of income.

Findings from Durkheim and numerous studies in the literature show that marriage prevents suicide, while divorce triggers it. However, this paper did not yield evidence supporting the association between marriage/divorce and suicide. This fact implies that the perception of that marriage prevents loneliness and divorce inevitably causing unhappiness may be invalid. Single individuals can engage in education, work, various sports and artistic activities, thereby socializing and distancing themselves from self-harm thoughts. Besides, becoming a parent and taking on the responsibility of a child may deter

individuals from contemplating suicide. In other words, being a parent may serve as a preventive factor against suicidal ideation (Yang, 2023).

Another factor influencing the individual's solitude, alongside the cohesion of family unity, is alcohol addiction. Alcohol addiction may reach a dimension that a level of that disrupts social and professional life of individual. This situation may lead to suicide by diminishing the quality and joy of life of the individual. This study, it has been identified that an increase in alcohol consumption, consistent with expectation, triggers suicide. Governments have a responsibility to ensure the availability of clinics that can be easily accessible to individuals with alcohol consumption.

Urbanization can increase social isolation by increasing population density, leaving individuals feeling alone in crowds. Living in densely populated cities can also increase psychological stress and anxiety. However, urban areas offer more job opportunities, social services, education, and healthcare options. Therefore, the impact of urbanization on suicide rates can vary depending on various factors. In this study, it was found that urban population density increases the likelihood of suicidal behavior. Urbanization in modern society, emerges as a multifaceted phenomenon, presenting both significant challenges and substantial opportunities. Governments have various responsibilities to create more livable cities, such as preserving green and natural spaces, ensuring that residence are spacious and comfortable, facilitating easy and accessible transportation, and ensuring easy access to social, sports and artistic activity centers in neighborhoods.

Due to the narrow time span of some variables in the panel data set of this study, which includes various socioeconomic observations, the time dimension of our study had to be restricted. As data compilation techniques develop, it will be possible for future researchers to conduct long-term, spatial and regional analyses. Moreover in this study, determinants of suicide by age and gender were sought, but explanatory variables could not be obtained for age and gender within the relevant time period for OECD countries. On the other hand, indicators such as consumer confidence index, household debt ratio, poverty rate, and so on have mostly been studied for a single country in the literature. Since these observations are incomplete for OECD or European Countries, they could not be used in this study. If these relevant observations can be obtained in the future, further comprehensive investigations can be carried out by future researchers. In case reliable data are available, it is recommended to examine the socioeconomic dimension of suicide cases in underdeveloped and developing country groups.

Suicidal behavior implies that the individual has lost any hope regarding life and sees death as a better option than staying alive. This study aims to investigate the socioeconomic reasons that lead individuals to attempt suicide due to this sense of hopelessness. Eliminating or alleviating these issues that have been identified as leading to suicide is among the responsibilities of public authorities.

9. CONFLICT OF INTEREST STATEMENT

There is no conflict of interest between the authors.

10. FINANCIAL SUPPORT

No funding or support was used in this study.

11. AUTHOR CONTRIBUTIONS

The entire study was conducted by a single author.

12. ETHICS COMMITTEE STATEMENT AND INTELLECTUAL PROPERTY COPYRIGHTS

There has been no situation requiring permission within the framework of ethics committee approval, intellectual property and copyrights.

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