

Divorce and Suicide: A Subnational Analysis in Turkey

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Abstract

This paper investigates the relationship between divorce and suicide in Turkey. To this end, we employ province-level data between 2008-2017 and estimate two-way fixed-effect models. We find that divorce is positively correlated with suicide, with greater effects for males than females. However, the coefficient estimate of divorce on suicide is smaller for the prime working-age group. Divorce also has an indirect impact on suicide through income and unemployment. Accordingly, low income and high unemployment exacerbate the effect of divorce on suicide. Finally, results indicate that divorce increases the skilled male suicide rate and unskilled female suicide rate. These results are robust to several sensitivity analyses. This study's main policy implication is that divorce prevention could be more effective than other factors to decrease suicide mortality.

Key Words: Divorce; Suicide; Panel Data; Turkey

JEL Classifications: J12, C33, I10

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1. INTRODUCTION

In his seminal work, published more than a century ago, Durkheim (1897) argued that society's suicide rate is determined by social regulation and social integration. Social regulation refers to the level to which an individual's life is governed by traditions and norms. Social integration is expressed as relationships that ensure loyalty and commitment to the moral norms of the society to which the individual feels connected. Thus, as social integration increases among the individuals who make up the society, the sense of commitment increases. Divorce can be considered as an indicator of social isolation in Durkheim's analysis, given the regulatory and integrative characteristics of the marriage institution. (Stack 1990). As a result of divorce, the individual's social order and integration level will decrease due to the decrease of responsibilities towards spouses and children. The individual isolates from society since the feeling of belonging to a person, family, or group causes an obligation to continue life and fulfill personal responsibilities despite all life problems (Denney 2009).

Moreover, being married offers advantages to individuals, such as supporting each other in the face of stressful situations, avoiding destructive habits such as alcohol, drugs, smoking, etc. It provides a sense of security, financial support, mental and physical health support, and happiness (Durkheim 1965, Denney 2009, Yamauchi 2012, Yeh 2008, Kyung-Sook 2017). However, the divorced individual will be deprived of these opportunities offered by marriage. She could be under stress and pressure due to a supportive loss of friends, disorientation, and failure to reach an important life goal -having a happy marriage- (Stack 1990). The economic situation may be the underlying mechanism for the relationship between divorce and suicide. As a result of the divorce, the spouses' financial support against each other ends (Stack 1990). According to Durkheim, a sudden change in general economic conditions may increase suicidal tendencies (Durkheim 1965). Spouses who lose their financial support will be more likely to work in a full-time job to continue their usual living standards. The individual who tries to survive alone under heavy economic conditions will also have to struggle with stress accompanied by full-time employment (Yeh 2008, Masocco et al., 2008).

Hamermesh and Soss (1974) develop a different framework for the study of suicide through economic channels. They argue that although suicide, to a large extent, can be explained by noneconomic factors, indicators such as income and unemployment are significantly correlated with the suicide rate. Based on neoclassical utility theory, suicide is a rational choice. Namely, a individual will commit suicide when the present value of lifetime utility reaches zero or falls under a particular value of death. In this regard, a negative shock, such as divorce, may decrease the expected utility and make committing suicide an optimal decision. In Durkheim's perspective, divorce disintegrates the individual's ties to the family/society and increases the probability of suicide.

Divorce is an adverse shock to utility as previous research established a clear link between marital dissolution and health outcomes. One line of the research shows that marital dissolution is correlated with poor physical health. For instance, Canady and Broman (2003) argue that divorce has a statistically significant negative impact on physical health. Accordingly, divorced individuals experience higher doctor visits and report a greater number of days in bed. In a similar vein, the sickness absence rate among divorced people increases dramatically (Dahl et al., 2015). Zulkarnain and Korenman (2019) suggest that while divorce is positively related to adverse physical health changes in middle or old ages, remarriage leads to restoration of health and depression to pre-divorce levels. According to the second line of research, divorce is also detrimental to mental health. Divorced people tend to experience higher stress, anxiety, and depression (Simon and Marcussen, 1999; Barret, 2000; Hewitt et al., 2007; Cohen and Finzi-Dottan, 2012). Moreover, Cohen and Finzi-Dottan (2012), Liu (2012), and Dahl et al. (2015) show that physical and/or mental health deteriorates for both sexes even several years after the marital dissolution, suggesting the long-run adverse impacts of divorce.

The aim of this paper is to empirically examine the relationship between divorce and suicide in Turkey. To that end, we employ regional data at the Nomenclature of Units for Territorial Statistics (NUTS)-3 level for the period 2008-2017. We contribute to the literature by providing evidence from a developing country, where regional disparities are considerably higher than those developed countries. There are several reasons why Turkey is a good choice for studying the impact of divorce on suicide. First, suicide is one of the leading indicators of death in Turkey. According to the Turkish Statistical Institute (TurkStat), it corresponds to 13.4% of the external cause of death in 2017 .

Moreover, between 2008 and 2017, the suicide rate has increased with an annual average of 1.7%. Second, the divorce rate reaches 1.6 for every 1000 population in 2017, the highest since 2001. According to the OECD family database, this rate is lower than the suicide rate of many developed (2.0 in Belgium, 1.9 in Germany, and 2.1 in Spain) and developing (2.5 in Estonia, 3.0 in Lithuania, and 1.8 in the Slovak Republic) countries. However, the divorce rate varies widely across Turkish provinces due to the economic, cultural, and demographic differences. In 2017, the highest rate, 2.57 in İzmir (situated along with the Aegean coast in the west), is 12.85 times greater than the lowest rate, 0.2 in Hakkari (in the southeast of Turkey).

Estimation results indicate that divorce has a statistically significant positive effect on suicide. Moreover, this effect differs across genders, age groups, and education levels. The impact of divorce on the suicide rate is greater for males than females. Further, we find that the coefficient estimate of divorce on suicide is smaller for the prime working-age group. Although there seems to be no significant relationship between economic indicators and suicide, we find that divorce is the channel through which income and unemployment affect suicide. Accordingly, the impact of divorce on suicide is disproportionately larger in provinces with lower income per capita and higher unemployment rates. In addition, we argue that divorce increases the skilled

male suicide rate and unskilled female suicide rate, suggesting the importance of education. Finally, results show that human capital is negatively related to male suicide, whereas there exists a positive relationship between population density and female suicide in Turkey.

The rest of the paper is structured as follows. Section 2 provides a brief summary of related literature. Section 3 describes the data. Section 4 presents the empirical results and Section 5 concludes.

2. RELATED LITERATURE

Based on the theory of social integration (Durkheim, 1897 and 2013) and lifetime utility maximization (Hamermesh and Soss, 1974), a vast body of research has emerged in economics interested in suicide. Although there is a sizable literature on the socioeconomic determinants of suicide in developed countries (Bussu et al., 2013; Breuer, 2015; Jalles and Andresen, 2015; Huikari and Korhonen, 2016; Chang and Chen, 2017; Rivera et al., 2017), suicide in developing countries has received little attention. Moreover, while some studies do not take into account the relationship between divorce and suicide (Noh, 2009; Breuer, 2015; Rivera et al., 2017, Rambotti, 2019, Mattei and Pistorresi, 2018; Comunale, 2020), some others give mixed results (Kunze and Anderson, 2002; Neumayer, 2003; Minoiu and Andres, 2008; Yamamura, 2010; Ross, 2012). Reasons for conflicting results may be different time periods, countries, and estimation strategies. Roughly, these studies can be divided into three groups; those use cross-county data, those use time series analysis for one country, and those focus on one country with regional data.

The first group of studies find that divorce is insignificantly related to suicide (Pampel, 1996; Korhonen et al., 2017), divorce is positively associated with both male and female suicides (Fernquist and Cutright, 1998; Brainerd 2001), and divorce is positively associated to only male suicide (Andres, 2005; Chen, 2009). Regarding the second group, results confirm the positive correlation between divorce and suicide in Canada (Trovato, 1987), in Taiwan (Chuang and Huang, 2007), -for only males- in Japan (Koo and Cox, 2008; Andres et al., 2011), and in Denmark (Andres and Halicioğlu, 2010).

Recently, several studies draw attention to the necessity and advantages of using regional-level data. For instance, Ross et al. (2012) argue that divorce is not significantly related to suicide in the U.S. In contrast, Minoiu and Andres (2008) find a positive association between divorce and suicide across U.S. states. Moreover, their results indicate that the impact of divorce on suicide is higher for females than males. In particular, a one-unit increase in the divorce rate (per 1000 people) leads to around 5 percent and 3.7 percent rise in female and male suicide rates, respectively.

Similarly, Phillips (2013) reports a positive association between divorce and suicide across the U.S. states. Considering Japan, Yamamura (2010) shows that divorce is positively related to the suicide rate, with a larger effect on males than females. Since males are more likely to bear the compensation cost, the economic and physiological damage of divorce on males is more than females. Two studies, Detotto and Sterzi (2013) and Bussu et al. (2013) argue that divorce has an insignificant effect on suicide in Italy. In Canada, Jalles and Andresen (2015) find no evidence of any relationship between divorce and suicide. In a similar vein, Huikari and Korhonen (2016) suggest that divorce is insignificantly related to suicide in Finland during 1991-2011.

Our paper is more closely related to Altınanahtar and Halıcioğlu (2009), who use time-series data for the period 1974-2007. According to their results, divorce is positively correlated with suicide in Turkey, albeit with a small magnitude. A 1 percent increase in the divorce rate leads to 0.01 percent increase in total suicide in the long run. In addition, they argue that income has a statistically significant negative impact on suicide. This paper differs from Altınanahtar and Halıcioğlu (2009) in several key respects. First, we exploit both time variation and unobserved heterogeneity by using regional panel data. It allows us to increase the number of observations and sample variability and provide more accurate inference. Second, while they use only total suicide, we investigate the differential impact of divorce on males and females in line with other studies in the literature. Third, we explore a number of alternative explanations. In particular, we consider the role of prime working age and education level for the relationship between divorce and suicide.

3. DATA SET

Our data set consists of 81 NUTS-3 provinces in Turkey for the period 2008-2017. We use age-adjusted suicide rate per 100,000 population as a dependent variable¹. According to the literature, female suicide rates tend to be smaller than male suicide rates in most countries (Breuer, 2015; Jalles and Andresen, 2015; Huikari and Korhonen, 2016). More importantly, the results indicate that the socio-economic conditions have differential impacts on gender groups (Andres 2005; Minoiu and Andres, 2008; Kuroki, 2010). To that end, we also use gender-specific suicide rates as dependent variables. The main variable of interest, divorce rate, is defined as the rate for 1000 population.

¹ The list of NUTS regions are provided in the Appendix.

We include a series of control variables that are likely to correlate with both divorce and suicide. First, we add the real GDP per capita to control the wealth of provinces. A priori, we expect a negative relationship between income and suicide since living becomes more attractive than suicide when income rises, as in Hamarmesh and Soss (1974). However, the literature provides mixed results. For instance, Breinerd (2001) finds that income level is negatively related to the male suicide rate in 22 transition countries for the period 1988-1998. Andres et al. (2011) suggest that income is negatively related to suicide in Japan, whereas Rambotti (2019) finds an insignificant relationship between suicide and income level in the U.S.

Minoiu and Rodríguez (2008) argue that the share of public health and welfare expenditure in total public spending is negatively correlated with suicide rate in the U.S. Similarly, Rambotti (2019) reports a negative association between Supplemental Nutrition Assistance Program participation and overall and male suicide rates. Bussu et al. (2013) find a negative relationship between resources for social programs and suicide in Italy. Since we do not have detailed data on such indicators, we include the share of public expenditures in provincial GDP to measure the impact of government policies. We expect it to be negatively correlated with the suicide rate.

Third, we use the unemployment rate to measure the state of the economy. Working in a job increases motivation and reduces the risk of suicide by directing the individual's energy to her work. Unemployment reduces economic opportunities, causes loss of income, loss of self-confidence, and suicide (Andres, Halıcıoğlu, and Yamamura 2011). Furthermore, the loss of household income from unemployment causes family incompatibility, drug and alcohol consumption, violence, and divorce (Classen, Dunn 2012). Hence we expect a positive relationship between unemployment and divorce. Empirical results for Japan (Andres et al., 2011), Canada (Jalles and Andresen, 2014), Europe (Breuer, 2015), Spain (Rivera et al., 2017), and to some extent in Taiwan (Chan et. al., 2018) support this expectation.

In line with the previous literature, we also add the marriage rate as it may affect the suicide rate through social integration and health conditions. Marital status and relationship quality are essential in terms of mental and heart health. Married individuals have lower blood pressure rates and lower stress and depression levels than singles. They get more pleasure from life than single individuals, and their happiness level increases (Holt, Brimingham, Jones 2008). On the other hand, an uneasy marriage environment eliminates the mitigating effect of marriage on suicide. It causes a higher risk of suicide for those who live a troubled marriage compared to singles. The restriction of divorce option and unhappy marriage are situations that increase suicide (Durkheim, 2013). Hence, from a theoretical point of view, marriage may positively or negatively affect the suicide rate. Nonetheless, empirical literature identifies a negative relationship between marriage and suicide in eighteen advanced countries (Pampey, 1996), in Italy (Detotto and Sterzi, 2011; Bussu, Detotto, and Sterzi, 2013), and in Japan (Yamamura, 2010).

Fifth, we use population density as the number of people per square kilometer. As for marriage, we do not hypothesize a positive or negative impact of population density on suicide. Since social interaction is directly proportional to the number of people living in the region, population density can play a crucial role in increasing integration. Besides, individuals in areas with high population density are more likely to benefit from the protective influence of religious communities (Barkan, Rocque, Houle 2013). However, density might also be related to poverty and poverty-related issues in big metropolitan areas (Bussu et al., 2013). Regarding the existing empirical research, it appears that population density is negatively associated with suicide in the U.S. (Mathur and Freeman, 2002; Ross et al., 2002; Minoiu and Andres, 2008), and in Italy (Detotto and Sterzi, 2011; Bussu et al., 2013).

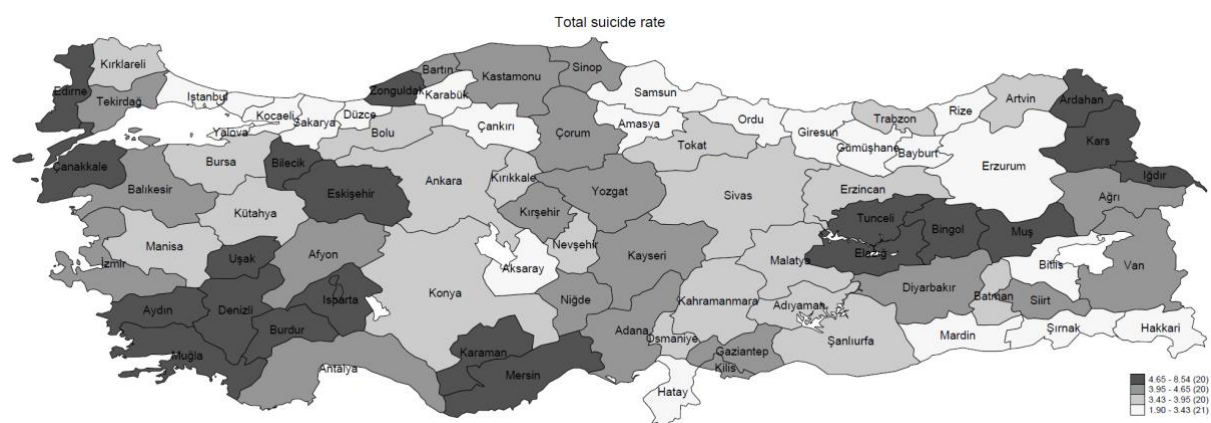
Finally, we include the share of university graduates in the total population as human capital. Since education level is the factor that will determine the individual's access to higher education, having a low education level means limited career opportunities in the future. As a result, an individual with a low education level may have to live in limited career opportunities, low income, and low social status. Therefore, the level of education can lead to more economic struggles and stress that can increase the risk of suicide. Moreover, a low level of education can undermine self-confidence and cause antisocial behavior and behavioral disorders (Stack, 1998). Neither cross-country nor cross-region studies include education as an explanatory variable. However, following longitudinal studies (Denney et al., 2009; Denney, 2010; and Botha, 2012), we expect human capital to be negatively related to the suicide rate.

All data are taken from the TurkStat's online databases. Table 1 provides descriptive statistics of the sample data. It appears that there is a considerable amount of variation in both suicides and divorce rates across different provinces. The male suicide rate ranges between 0 and 9.91, whereas the female suicide rate variation is relatively smaller, between 0 and 8.54. On average, the male suicide rate is 2.4 times of female suicide rate. Regarding the divorce rate, the province with the maximum value is approximately 26 times higher than the province with the minimum value.

Table 1: Descriptive Statistics

Label	Definition	N	Mean	Std. Dev.	Min	Max
Total suicide	Total age-adjusted suicide rate per 100,000 inhabitants	810	4.14	1.65	0	14.33
Male suicide	Male age-adjusted suicide rate per 100,000 inhabitants	810	2.90	1.20	0	9.91
Female suicide	Female age-adjusted suicide rate per 100,000 inhabitants	810	1.22	0.83	0	8.54
DR	Divorce rate: Divorce per 1000 inhabitants	810	1.31	0.63	0.11	2.84
LOGRGDPPC	Logarithm of real GDP per capita	810	9.79	0.36	8.75	10.84
PUBINV	Share of public expenditures in GDP, %	810	2.72	2.54	3.4	28.3
UR	Unemployment rate, %	810	9.77	4.31	3.4	28.3
MR	Marriage rate: Marriage per 1000 inhabitants	810	7.82	1.17	4.14	13.34
POPDENS	Population density: Population per square kilometer	810	120.5	297.4	10	2892
HC	Human capital: Share of university graduate, %	810	7.20	2.90	1.01	17.30

Figure 1 depicts the dispersion of the total suicide rate and the divorce rate for a 2008 to 2017 average. There is not a geographical distinction in terms of total suicide. The highest rates occur both in the east and west provinces of Turkey together with two provinces in the south. However, the divorce rate has an entirely different pattern. It appears that there is a spatial dichotomy in Turkey. The provinces with the lowest divorce rate are clustered in the east and southeast. The divorce rate is highest in the Eagan and Mediterranean regions and to some extent in Central Anatolia.



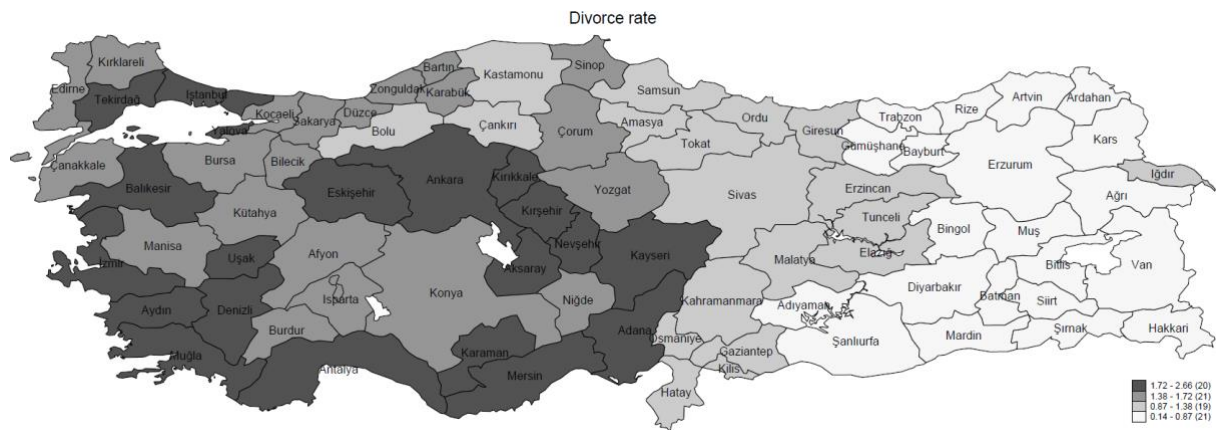
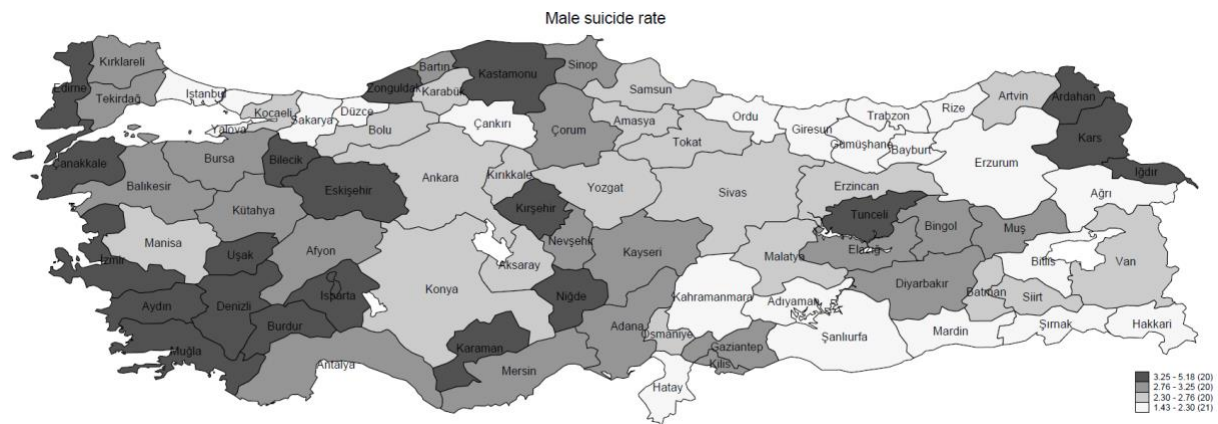


Figure 1: Total suicide rate and divorce rate (2008-2017)

Figure 2 shows the dispersion of male and female suicide rates for the sample period. The geographical distribution of the male suicide rate is very similar to the total suicide rate. It is higher in the western provinces, except in three provinces in the northeast; Ardahan, Kars, and Iğdır. In addition, the male suicide rate is relatively high in Central Anatolia. Regarding the female suicide rate, we observe a different pattern. The female suicide rate is lower in provinces in the west than in those provinces in the east.



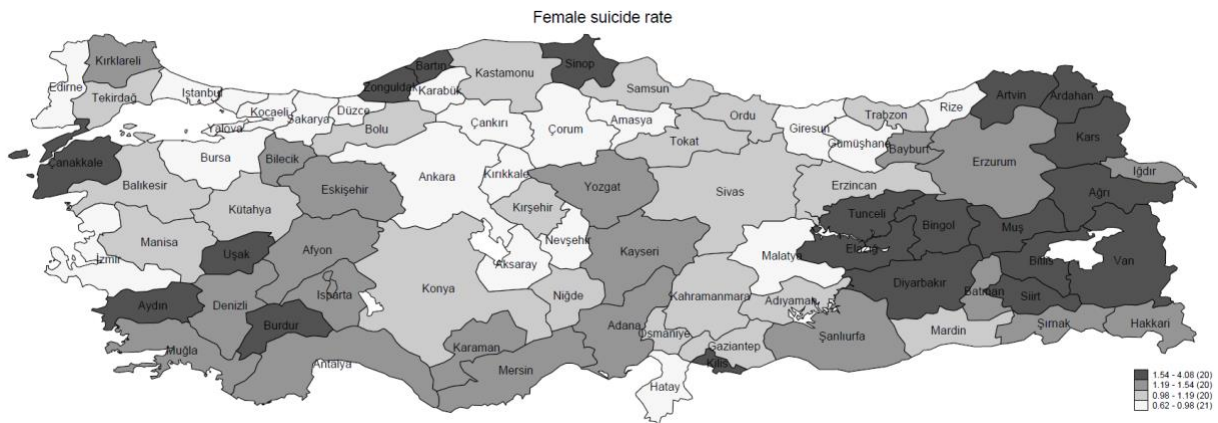


Figure 2: Male and female suicide rates (2008-2017)

These figures demonstrate that there is substantial regional dispersion in suicide and divorce rates. Therefore, a time series analysis of aggregated data at the national level or a panel data analysis with cross-country data is not suitable for considering the regional socioeconomic differences.

4. EMPIRICAL ANALYSIS

We employ a standard cross-region panel data model to examine the relationship between divorce and suicide. Following the literature, we include both time-invariant province fixed effects and province-invariant time effects²:

$$S_{it} = \beta_0 + \beta_1 DR_{it} + X' \alpha_i + \gamma_i + \delta_t + \varepsilon_{it} \quad (1)$$

where S_{it} is the age-adjusted suicide rate (total, male or female) in province i and year t , DR_{it} is the divorce rate, X' is a vector of control variables, γ_i is province fixed effect, δ_t is time fixed effect, and ε_{it} is idiosyncratic error term.

Table 2 reports the results of the estimation equation (1). In columns 1-3, we use total, male and female suicide rates respectively. We find that divorce rate is statistically significant with positive sign in all three specifications. Accordingly, a one standard deviation increase in divorce rate leads to 0.89 points increase in total suicide rate, 0.66 points increase in male suicide rate, and 0.22 points increase in female suicide rate. Regarding the control variables, we find that total and male suicide rates tend to be lower in regions with more human capital. In addition, it appears that income level is positively correlated with male suicide rate. This result is similar to findings reported by Yamamura (2010) and Jalles and Andresen (2015), while contradicts with Breuer (2015). Interestingly, population density has statistically

² See Breuer (2005), Ross et al., (2012), and Rambotti, 2019 for a similar methodology.

significant positive impact on female suicide rate, a result contradicts with Bussu et al., (2013) and Minoiu and Andres, (2015).

Following Ruhm (2000) and Breuer (2015), we also employ the logarithm of the dependent variables to check whether the results are robust to an alternative functional form specifications. According to the estimation results in columns 4-6, divorce rate is positively related with total and male suicide rate. However, it does not have statistically significant effect on female suicide rate (with 0.14 p-value). While the coefficients are different as expected, their order remains the same. Divorce has the highest positive impact on total suicide and lowest on the female suicide. Among the control variables, only income loses its significance for the male suicide rate.

Table 2: Divorce and suicide

	(1)	(2)		(3)	(4)	(5)		(6)
	Total	Level		Female	Total	Log		Female
DR	1.415*** (0.455)	1.057*** (0.365)		0.355* (0.199)	0.289*** (0.094)	0.274*** (0.097)		0.129 (0.091)
LOGRGDPPC	1.389 (1.058)	1.452* (0.864)		-0.229 (0.464)	0.270 (0.204)	0.407* (0.233)		0.014 (0.198)
PUBINV	0.014 (0.076)	0.005 (0.061)		0.005 (0.022)	0.001 (0.014)	0.001 (0.018)		0.006 (0.009)
UR	-0.002 (0.024)	0.002 (0.018)		-0.005 (0.014)	0.001 (0.005)	0.002 (0.005)		-0.002 (0.006)
MR	0.104 (0.168)	0.099 (0.132)		0.010 (0.088)	0.023 (0.033)	0.023 (0.033)		-0.003 (0.035)
POP DENS	0.001 (0.001)	-0.001 (0.002)		0.002* (0.001)	0.000 (0.000)	-0.000 (0.000)		0.001* (0.001)
HC	-0.254* (0.139)	-0.214** (0.100)		-0.073 (0.088)	-0.031 (0.021)	-0.040* (0.023)		-0.016 (0.029)
Region FE	YES	YES		YES	YES	YES		YES
Year FE	YES	YES		YES	YES	YES		YES
Constant	-10.745 (10.629)	-12.413 (8.891)		3.345 (4.485)	-1.425 (2.089)	-3.000 (2.312)		0.568 (1.949)
N	810	810		810	810	810		810
R ²	0.05	0.07		0.09	0.05	0.07		0.08

Notes: Dependent variable: age-adjusted suicide rate per 100,000 inhabitants (level and log). Robust standard errors clustered by province are reported in parentheses. *, **, and *** indicate significance at the 10, 5, and 1% level.

Are these results driven by a particular province/region? If this is the case, the effect would disappear when this subgroup is excluded from the panel. To check whether our results are robust to outliers, we reestimate equation (1) by eliminating one NUTS-2 region at a time and present the results in Table 3. It appears that the main finding, the positive association between divorce and suicide, is robust to variation of region coverage.

Table 3: Sensitivity analysis

Region excluded	Total	Male	Female	Provinces
TR10	1.41***	1.08***	0.43**	80
TR21	1.48***	1.12***	0.48**	78
TR22	1.44***	1.1***	0.44**	79
TR31	1.45***	1.12***	0.45**	80
TR32	1.43***	1.1***	0.44**	78
TR33	1.38***	1.11***	0.38*	77
TR41	1.42***	1.1***	0.44**	78
TR42	1.46***	1.1***	0.44*	76
TR51	1.43***	1.09***	0.45**	80
TR52	1.38***	1.09***	0.43*	79
TR61	1.4***	1.12***	0.39*	78
TR62	1.42***	1.1***	0.43**	79
TR63	1.32***	1.01***	0.42*	78
TR71	1.23**	0.83**	0.56**	76
TR72	1.35***	1.00***	0.46**	78
TR81	1.38***	1.18***	0.35*	78
TR82	1.35***	1.06***	0.38*	78
TR83	1.47***	1.13***	0.47**	77
TR90	1.55***	1.16***	0.46**	75
TRA1	1.53***	1.18***	0.42*	78
TRA2	1.25***	0.94**	0.41**	77
TRB1	1.67***	1.28***	0.52**	77
TRB2	1.49***	1.12***	0.48**	77
TRC1	1.3***	0.99***	0.43**	78
TRC2	1.44***	1.12***	0.43**	79
TRC3	1.46***	1.14***	0.44*	77
Full sample	1.41***	1.05***	0.35*	81

Notes: Dependent variable: age-adjusted suicide rate per 100,000 inhabitants (level). *, **, and *** indicate significance at the 10, 5, and 1% level.

As another robustness check, we probe whether estimation results are sensitive to the inclusion of additional variables. For that reason, we replace public expenditures with public education expenditures (EDUCPUBEXP); unemployment with GDP growth rate (GROWTH) and log of total credits in GDP (LOGCREDIT), and finally marriage rate with birth rate (FERTILITY). We use EDUCPUBEXP to assess the role of the state through education channel. Unemployment is statistically insignificant in the previous estimations. Therefore we use GROWTH and LOGCREDIT to measure the state of the economy and the role of financial development. We employ FERTILITY to take into account the impact of voluntary social cohesion (Detotto and Sterzi, 2011). Table 4 presents the estimation results. It appears that the coefficient estimate of divorce is statistically significant and positive as in previous estimations. With regards to the control variables, we find that male suicide rate tends to be higher in more affluent provinces than poorer provinces. The coefficient of GROWTH is negative in all

specifications as expected but it is not statistically different from zero. LOGCREDIT has statistically significant negative impact on female suicide rate, suggesting the importance of financial constraints. In line with Chen et al. (2009), FERTILITY is positively related to female suicide rate in Turkey. Finally, EDUCPUBEXP and HC are insignificant in all the specifications.

Table 4: Divorce and suicide, additional control variables

	(1)	(2)	(3)	(4)	(5)	(6)
	Total	Level Male	Female	Total	Log Male	Female
DR	1.192** (0.474)	0.883** (0.387)	0.307* (0.180)	0.267*** (0.096)	0.245** (0.096)	0.136 (0.091)
LOGRGDPPC	1.599 (1.093)	1.655* (0.989)	-0.162 (0.452)	0.370* (0.214)	0.494** (0.238)	0.072 (0.214)
EDUCPUBEXP	-0.113 (0.261)	0.027 (0.205)	-0.147 (0.145)	-0.018 (0.046)	0.033 (0.043)	-0.078 (0.066)
GROWTH	-0.015 (0.013)	-0.009 (0.010)	-0.006 (0.006)	-0.002 (0.003)	-0.002 (0.003)	-0.003 (0.003)
FERTILITY	-0.007 (0.101)	-0.074 (0.088)	0.074 (0.046)	0.007 (0.023)	-0.023 (0.025)	0.040* (0.021)
POPDENS	-0.000 (0.002)	-0.001 (0.002)	0.001* (0.001)	-0.000 (0.000)	-0.000 (0.000)	0.000 (0.000)
HC	-0.291 (0.239)	-0.228 (0.208)	-0.090 (0.073)	-0.023 (0.033)	-0.016 (0.043)	-0.035 (0.031)
LOGCREDIT	-0.309 (0.656)	0.111 (0.539)	-0.455* (0.265)	0.058 (0.128)	0.141 (0.128)	-0.144 (0.115)
Region FE	YES	YES	YES	YES	YES	YES
Year FE	YES	YES	YES	YES	YES	YES
Constant	-10.211 (11.598)	-11.879 (10.538)	2.770 (4.601)	-2.439 (2.483)	-3.639 (2.579)	-0.243 (2.127)
N	727	724	694	727	724	694
<i>within</i> R ²	0.05	0.08	0.08	0.06	0.09	0.08

Notes: Dependent variable: age-adjusted suicide rate per 100,000 inhabitants (level and log). Robust standard errors clustered by province are reported in parentheses. *, **, and *** indicate significance at the 10, 5, and 1% level.

These results are robust to further empirical tests. First, we include different control variables such as age average household size, population growth rate, and public health expenditures. Results reveal that divorce is statistically significant with positive sign while the new controls are insignificant. Second, we calculate Moran's I and Geary's C spatial autocorrelation tests to check whether the spatial dimension of the regional data influences the estimation results. However, we cannot reject the hypothesis of spatial randomness. As we discuss in Section 3, male and/or female suicide rates are zero in some years. We finally test whether there is any systematic distribution of zero suicide rates by dropping these observations. The finding that divorce is positively associated to suicide remains statistically significant. The results are available upon request.

4.1. Alternative Explanations

One may argue that divorce and suicide relationship might depend on age structure since one must reach a certain age to divorce. For instance, 79% of the married couples who divorced in 2017 in Turkey are between 25 and 54 years old. In addition, socioeconomic indicators that we employ as control variables might be less important for the relatively young and elderly (Ross et al., 2012). To that end, we estimate the equation (1) using the age-adjusted suicide rates for the prime working age population (those 25 to 54 years old) and present the results in Table 5. Although divorce rate is statistically significant with positive sign in all specifications but column 6, we observe that coefficients are much smaller compared to the results in Table 2. Similarly, human capital and population density has smaller impact on male and female suicide rates respectively. Finally, Table 5 demonstrates that other control variables are not significantly associated to suicide rates of 25-54 age group. These results imply that in contrast to our expectation, divorce rate, human capital and population density have considerable impact on the suicide rate of relatively young and elderly.

Table 5: Divorce and suicide, prime working age population

	(1)	(2)		(3)	(4)		(5)		(6)
	Total, 25-54	Level Male, 25-54	Female, 25-54	Female, 25-54	Total, 25-54	Log Male, 25-54	Female, 25-54	Female, 25-54	Female, 25-54
DR	0.859*** (0.312)	0.658** (0.262)	0.212* (0.125)	0.212* (0.125)	0.288*** (0.104)	0.247** (0.103)	0.113 (0.074)	0.113 (0.074)	0.113 (0.074)
LOGRGDPPC	0.732 (0.746)	0.820 (0.593)	-0.172 (0.366)	-0.172 (0.366)	0.204 (0.237)	0.288 (0.247)	-0.082 (0.208)	-0.082 (0.208)	-0.082 (0.208)
PUBINV	0.018 (0.035)	0.010 (0.024)	0.007 (0.016)	0.007 (0.016)	0.013 (0.011)	0.010 (0.011)	0.009 (0.009)	0.009 (0.009)	0.009 (0.009)
UR	-0.009 (0.015)	0.001 (0.011)	-0.011 (0.009)	-0.011 (0.009)	-0.002 (0.005)	0.001 (0.005)	-0.006 (0.006)	-0.006 (0.006)	-0.006 (0.006)
MR	-0.032 (0.104)	-0.007 (0.084)	-0.016 (0.051)	-0.016 (0.051)	-0.006 (0.039)	-0.007 (0.035)	-0.008 (0.031)	-0.008 (0.031)	-0.008 (0.031)
POPDENS	0.000 (0.001)	-0.001 (0.001)	0.001* (0.001)	0.001* (0.001)	-0.000 (0.000)	-0.000 (0.000)	0.0006* (0.0004)	0.0006* (0.0004)	0.0006* (0.0004)
HC	-0.005 (0.082)	0.004 (0.057)	-0.029 (0.047)	-0.029 (0.047)	0.023 (0.028)	0.013 (0.028)	0.002 (0.021)	0.002 (0.021)	0.002 (0.021)
Region FE	YES	YES	YES	YES	YES	YES	YES	YES	YES
Year FE	YES	YES	YES	YES	YES	YES	YES	YES	YES
Constant	-5.611 (7.284)	-7.138 (5.706)	2.321 (3.658)	2.321 (3.658)	-1.268 (2.393)	-2.208 (2.416)	1.157 (2.082)	1.157 (2.082)	1.157 (2.082)
N	804	797	682	682	804	797	682	682	682
within R ²	0.04	0.05	0.05	0.05	0.04	0.05	0.05	0.05	0.05

Notes: Dependent variable: age-adjusted suicide rate per 100,000 inhabitants (level and log). Robust standard errors clustered by province are reported in parentheses. *, **, and *** indicate significance at the 10, 5, and 1% level.

Having established positive and statistically significant relation between divorce and suicide, we now analyze whether this positive relation is affected by the economic controls. Although LOGRGDPPC and UR are statistically insignificant in the baseline estimations, they might be correlated with suicide through divorce rate. That is, divorce might have also an indirect impact through the income level and the state of the economy. To that end, we interact divorce rate with LOGRGDPPC and UR and add them into the estimation equation as additional explanatory variables. Estimation results are summarized in Table 6. Results in column 1 show that DR×LOGRGDPPC is statistically significant with negative sign, suggesting that the positive impact of divorce on total suicide rate is lower in richer provinces. According to the results in column 2, DR×UR is positive and significant. Therefore, divorce increases total suicide more in provinces with higher unemployment. In columns 3-4, we use male suicide rates dependent variable. The previous results apply to male suicide rate as well, albeit with smaller magnitudes. When female suicide rate is concerned (columns 5-6), we find that divorce affects suicide with growth but with unemployment. Accordingly, higher unemployment aggravates the positive impact of divorce on female suicide rate.

Table 6: Divorce and suicide, the role of economic conditions

	Total (1)	Total (2)	Male (3)	Male (4)	Female (5)	Female (6)
DR	10.349* (5.253)	0.706 (0.571)	10.298** (4.240)	0.576 (0.425)	-0.496 (2.991)	0.129 (0.270)
LOGRGDPPC	2.221* (1.248)	1.359 (1.056)	2.313** (0.998)	1.432* (0.855)	-0.309 (0.587)	-0.239 (0.470)
PUBINV	0.011 (0.073)	0.009 (0.072)	0.002 (0.058)	0.002 (0.059)	0.005 (0.022)	0.003 (0.021)
UR	-0.011 (0.025)	-0.072* (0.038)	-0.007 (0.019)	-0.045* (0.026)	-0.004 (0.014)	-0.027 (0.020)
MR	0.112 (0.168)	0.161 (0.173)	0.108 (0.129)	0.138 (0.132)	0.009 (0.088)	0.028 (0.089)
POPDENS	0.001 (0.001)	0.000 (0.001)	-0.001 (0.001)	-0.002 (0.002)	0.002* (0.001)	0.002* (0.001)
HC	-0.209 (0.150)	-0.253* (0.139)	-0.168 (0.109)	-0.214** (0.098)	-0.077 (0.091)	-0.073 (0.089)
DR×LOGRGDPPC	-0.912* (0.543)		-0.943** (0.432)		0.087 (0.29)	
DR×UR		0.081** (0.033)		0.055** (0.024)		0.026* (0.013)
Region FE	YES	YES	YES	YES	YES	YES
Year FE	YES	YES	YES	YES	YES	YES
Constant	-19.045 (12.609)	-10.357 (10.647)	-20.999** (9.778)	-12.150 (8.818)	4.135 (5.795)	3.469 (4.553)
N	810	810	810	810	810	810
within R ²	0.05	0.06	0.08	0.08	0.09	0.09

Notes: Dependent variable: age-adjusted suicide rate per 100,000 inhabitants (level). Robust standard errors clustered by province are reported in parentheses. *, **, and *** indicate significance at the 10, 5, and 1% level.

Finally, we take into account the role of education level in the relationship between suicide and divorce. To that end, we divide suicide rate into two; skilled (those with greater or equal to high school degree) and unskilled (those with lower than high school degree)³. Regarding the skilled suicide rate (see columns 1-3 in Table 7), we find that divorce rate has statistically significant positive impact on total suicide and male suicide rates. However, it is not significantly related to female suicide. Results in columns (4-6) show that divorce is positively correlated with unskilled total and female suicide rates, but uncorrelated with unskilled male suicide rate. These results indicate that although divorce increases suicide irrespective of age and gender, we find a different empirical regularity when education is concerned. Accordingly, divorce increases the suicide rate of highly educated men, but less educated women.

In addition, we find that the impact of control variables on suicide rates differ substantially between genders and education levels. First, marriage rate is positively related to skilled male suicide rates. Second, unskilled male suicide rate tend to be higher in richer provinces. Third, un/skilled female suicide rate tends to be higher in more densely populated provinces.

Table 7: Divorce and suicide, the role of education

	(1)	(2)	(3)	(4)	(5)	(6)
	Total	Skilled Male	Female	Total	Unskilled Male	Female
DR	0.515** (0.200)	0.520** (0.215)	-0.005 (0.081)	0.685* (0.389)	0.393 (0.355)	0.321* (0.185)
LOGRGDPPC	0.450 (0.580)	0.293 (0.495)	0.157 (0.189)	1.269* (0.701)	1.325** (0.613)	-0.10 (0.37)
PUBINV	-0.009 (0.015)	-0.008 (0.014)	-0.001 (0.005)	0.034 (0.078)	0.031 (0.058)	0.0004 (0.023)
UR	0.002 (0.010)	-0.002 (0.008)	0.004 (0.004)	0.005 (0.016)	0.010 (0.013)	-0.004 (0.011)
MR	0.095* (0.053)	0.077* (0.046)	0.017 (0.022)	0.055 (0.138)	0.077 (0.104)	-0.027 (0.080)
POPDENS	-0.000 (0.001)	-0.001 (0.001)	0.0005* (0.0003)	0.002** (0.001)	-0.000 (0.001)	0.002* (0.001)
HC	-0.001 (0.083)	0.041 (0.058)	-0.042 (0.040)	-0.109 (0.103)	-0.135 (0.092)	0.026 (0.055)
Region FE	YES	YES	YES	YES	YES	YES
Year FE	YES	YES	YES	YES	YES	YES
Constant	-4.823 (5.898)	-3.449 (5.110)	-1.375 (1.795)	-9.863 (7.052)	-11.318* (6.012)	1.96 (3.51)
N	810	810	810	810	810	810
<i>within R</i> ²	0.12	0.14	0.02	0.06	0.05	0.09

Notes: Dependent variable: Suicide rate per 100,000 inhabitants (level). Skilled refers to the population with greater than or equal to high school degree. Unskilled refers to population with less than high school degree. Robust standard errors clustered by province are reported in parentheses. *, **, and *** indicate significance at the 10, 5, and 1% level.

³ Since data breakdown both by age and by education is not available, we do not use age-adjusted suicide rates.

5. CONCLUSION

A substantial amount of literature focuses on suicide, and existing studies identify income per capita, unemployment, marriage rate, and population density as significant explanatory variables. However, the relationship between divorce and suicide is still an unsettled issue; while some find positive effects, others find statistically insignificant results.

In this paper, we investigate the relationship between divorce and suicide using a panel data set of NUTS-3 regions of Turkey over the period 2008-2017. We subject our findings to a variety of robustness checks, for example, using a different age group, eliminating provinces in a region consecutively, and including additional control variables. Our results provide compelling evidence that divorce has a statistically significant positive effect on suicide. We also find that divorce increases the propensity to commit suicide among men more than women. Regarding the control variables, results imply that male suicide is lower in regions with higher human capital and female suicide tends to be higher in regions with greater population density. More importantly, unemployment and income per capita have no direct effect on suicide but indirectly affect the divorce. Accordingly, lower income and higher unemployment rates exacerbate the impact of divorce on suicide, suggesting that economic conditions have secondary importance in determining suicide. Finally, it appears that divorce is positively associated with skilled male suicide rate and unskilled female suicide rate.

The results suggest several promising directions for future research. One extension of this work would be to use more disaggregated data, e.g., municipal level data. Such an analysis would better capture the spatial relationship between divorce and suicide. Although panel data estimation methods have some advantages over cross-section and time-series models, it may lead to biased results. Therefore, another line of future research should investigate the impact of divorce on suicide using causal inference techniques. Finally, with a longer span of data one can apply techniques such as panel vector autocorrelation and panel Granger causality.

REFERENCES

- Aksoy, T., Tastan, H., & Kama, O. (2019). Revisiting income convergence in Turkey: Are there convergence clubs? *Growth and Change*, 50(3), 1185-1217.
- Altinanahtar, A., & Halicioglu, F. (2009). The Dynamic Econometric Model of Suicides in Turkey. *The Journal of Socio-Economics*, 38(6), 903-907.
- Andrés, A. R. (2005). Income Inequality, Unemployment, and Suicide: A Panel Data Analysis of 15 European Countries. *Applied Economics*, 37(4), 439-451.
- Andres, A., & Halicioglu, F. (2010). Determinants of Suicides in Denmark: Evidence from Time Series Data. *Health Policy*, 98(2-3), 263-269.
- Andres, A., Halicioglu, F., & Yamamura, E. (2011). Socio-Economic Determinants of Suicide in Japan. *The Journal of Socio-Economics*, 40(6), 723-731.
- Barkan, S., Rocque, M., & Houle, J. (2013). State and Regional Suicide Rates: A New Look at an Old Puzzle. *Sociological Perspectives*, 56(2), 287-297.
- Barrett, A. E. (2000). Marital Trajectories and Mental Health. *Source: Journal of Health and Social Behavior*, 41(4), 451-464.
- Bayar, A. A. (2016). The Decomposition of Regional Income Inequalities of Turkey. Unpublished Manuscript. <https://www.aeaweb.org/conference/2016/retrieve.php?pdfid=1382>, 15.10.2019.
- Botha, F. (2012). The Economics of Suicide in South Africa. *South African Journal of Economics*, 80(4), 526-552.
- Brainerd, E. (2001). Economic Reform and Mortality in the Former Soviet Union: A Study of the Suicide Epidemic in the 1990s. *European Economic Review*, 45(4-6), 1007-1019.
- Breuer, C. (2015). Unemployment And Suicide Mortality: Evidence From Regional Panel Data in Europe. *Health Economics*, 24(8), 936-950.
- Bronselaer, J., Koker, B. D., & Peer, C. V. (2008). The Impact of Divorce on the Health Status of Ex-Partners. *Archives of Public Health*, 66(4), 168-186.
- Bussu, A., Detotto, C., & Sterzi, V. (2013). Social Conformity and Suicide. *The Journal of Socio-Economics*, 42, 67-78.
- Canady, R., & Broman, C. (2003). Marital Disruption and Health: Investigating the Role of Divorce in Differential Outcomes. *Sociological Focus*, 36(3), 241-255.
- Chan, Y. S., Liu, T. C., Chen, C. S., & Peng, Y. I. (2018). A Changing Nexus between Unemployment and Suicide in Taiwan: Before and After Labor Welfare Improvement in the Late 1990s. *Social Indicators Research*, 140(1), 333-346.

- Chang, T., & Chen, W.-Y. (2017). Revisiting the Relationship Between Suicide and Unemployment: Evidence from Linear and Nonlinear Cointegration. *Economic System*, 41(2), 266-278.
- Chen, J., Choi, Y. J., & Sawada, Y. (2009). How is Suicide Different in Japan? *Japan and the World Economy*, 21(2), 140-150.
- Chuang, H. L., & Huang, W. C. (2007). A Re-Examination of the Suicide Rates in Taiwan. *Social Indicators Research*, 83(3), 465-485.
- Classen, T., & Dunn, R. (2012). The Effect of Job Loss and Unemployment Duration on Suicide Risk in the United States: A New Look Using Mass-Layoffs and Unemployment Duration. *Health Economics*, 21, 338-350.
- Cohen, O., & Finzi-Dottan, R. (2012). Reasons for Divorce and Mental Health Following the Breakup. *Journal of Divorce & Remarriage*, 53, 581-601.
- Comunale, M. (2020). The Persistently High Rate of Suicide in Lithuania: An Updated View. *Bank of Lithuania Discussion Paper Series* (21), 1-42.
- Dahl, S.-A., Hansen, H.-T., & Vignes, B. (2015). His, Her, or Their Divorce? Marital Dissolution and Sickness Absence in Norway. *Journal of Marriage and Family*, 77(2) 461-479.
- Denney, J. T. (2010). Family and Household Formations and Suicide in the United States. *Journal of Marriage and Family*, 72, 202-213.
- Denney, J., Rogers, R., Krueger, P., & Wadsworth, T. (2009). Adult Suicide Mortality in the United States: Marital Status, Family Size, Socioeconomic Status, and Differences by Sex. *Social Science Quarterly*, 90(5), 1167-1185.
- Detotto, C., & Sterzi, V. (2011). The role of family in suicide rate in Italy. *Economics Bulletin*, 31(2), 1509-1519.
- Durkheim, É. (1897). *Suicide*. (1951 Edition, J. Spaulding, & G. Simpson, Trans.) London: Routledge Classics.
- Durkheim, É. (1965). *The Division of Labor*. New York: Free Press.
- Fernquist, R. M., & Cutright, P. (1998). Societal Integration and Age-Standardized Suicide Rates in 21 Developed Countries, 1955–1989. *Social Science Research*, 27, 109-127.
- Hamarmesh, D., & Soss, N. (1974). An Economic Theory of Suicide. *The Journal of Political Economy*, 82(1), 83-98.
- Hewitt, B., Turrell, G., & Katrina, G. (2012). Marital Loss, Mental Health and the Role of Perceived Social Support: Findings From Six Waves of an Australian Population Based Panel Study. *Journal of Epidemiology and Community Health*, 66, 308-314.
- Holt-Lunstad, J., Birmingham, W., & Jones, B. (2008). Is There Something Unique about Marriage? The Relative Impact of Marital Status, Relationship Quality, and Network

- Social Support on Ambulatory Blood Pressure and Mental Health. *Annals of Behavioral Medicine*, 35, 239–244.
- Huikari, S., & Korhonen, M. (2016). The Impact of Unemployment on Well-Being: Evidence from the Regional Level Suicide Data in Finland. *Social Indicators Research*, 128, 1103–1119.
- Jalles , J. T., & Andresen, M. (2014). Suicide and Unemployment: A Panel Analysis of Canadian Provinces. *Archives of Suicide Research*, 18(1), 14-27.
- Jalles, J., & Andresen, M. (2015). The Social and Economic Determinants of Suicide in Canadian Provinces. *Health Economic Review*, 1-12.
- Karahasan, B. C. (2020). Winners and losers of rapid growth in Turkey: Analysis of the spatial variability of convergence. *Papers in Regional Science*, 99(3), 603-644.
- Koo, J., & Cox, W. (2008). An Economic Interpretation of Suicide Cycles in Japan. *Contemporary Economic Policy*, 26(1), 162-174.
- Korhonen, M., Puhakka, M., & Viren, M. (2017). Economic Hardship and Suicides. *International Journal of Social Economics*, 44(10), 1348-1360.
- Kunce, M., & Anderson, A. (2002). The Impact of Socioeconomic Factors on State Suicide Rates: A Methodological Note. *Urban Studies*, 39(1), 155-162.
- Kuroki, M. (2010). Suicide and Unemployment in Japan: Evidence from Municipal Level Suicide Rates and Age-Specific Suicide Rates. *The Journal of Socio-Economics*, 39, 683-691.
- Kuroki, M. (2014). The Effect of Sex Ratios on Suicide. *Health Economics Letter*, 23, 1502-1510.
- Kyung-Sook, W., SangSoo, S., Sangjin, S., & Young-Jeon, S. (2018). Marital status integration and suicide: A meta-analysis and meta-regression. *Social Science & Medicine*, 197, 116-126.
- Lavelle, B., Lorenz, F., & Wickrama, K. (2012). What Explains Divorced Women’s Poorer Health? The Mediating Role of Health Insurance and Access to Health Care in a Rural Iowan Sample. *Rural Sociology*, 77(4), 601-625.
- Lavelle, B., & Smock, P. (2012). Divorce and Women’s Risk of Health Insurance Loss. *Journal of Health and Social Behavior*, 53(4), 413-431.
- Liu, H. (2012). Marital Dissolution and Self-Rated Health: Age Trajectories and Birth Cohort Variation. *Social Science and Medicine*, 74, 1107-1116.
- Lorant, V., Kunst, A., Huisman, M., Bopp, M., Mackenbach, J., & EU Working Group[Corporate Author]. (2005). A European comparative study of marital status and socio-economic inequalities in suicide. *Social Science and Medicine*, 60(11), 2431-2441.

- Masocco, M., Pompili, M., Vichi, M., Vanacore, N., Lester, D., & Tatarelli, R. (2008). Suicide and Marital Status in Italy. *Psychiatr Quarterly*, 79(4), 275-285.
- Mathur, V., & Freeman, D. (2002). A Theoretical Model of Adolescent Suicide and Some Evidence from US Data. *Health Economics*, 11, 695-708.
- Mattei, G., & Pistorresi, B. (2018). Unemployment and Suicide in Italy: Evidence of a Long-Run Association Mitigated by Public Unemployment Spending. *The European Journal of Health Economics*, 20, 569-577.
- Minoiu, C., & Andres, A. R. (2008). The effect of public spending on suicide: Evidence from U.S. state data. *The Journal of Socio-Economics*, 37, 237-261.
- Neumayer, E. (2003). Socioeconomic Factors and Suicide Rates at Large-unit Aggregate Levels: A Comment. *Urban Studies*, 30(13), 2769-2776.
- Noh, Y.-H. (2009). Does Unemployment Increase Suicide Rates? The OECD Panel Evidence. *Journal of Economic Psychology*, 30, 575-582.
- Paerregaard, G. (1975). Suicide Among Attempted Suicides: A Ten Year Follow Up. *Suicide and Life Threatening Behavior*, 5, 140-144.
- Pampel, F. C. (1996). Cohort Size and Age-Specific Suicide Rates: A Contingent Relationship. *Demography*, 33(3), 341-355.
- Phillips, J. A. (2013). Factors associated with temporal and spatial patterns in suicide rates across US states, 1976–2000. *Demography*, 50(2), 591-614.
- Rambotti, S. (2019). Is there a relationship between welfare-state policies and suicide rates? Evidence from the U.S. states, 2000–2015. *Social Science and Medicine*, 246, 1-37.
- Rivera, B., Casal, B., & Currais, L. (2017). Crisis, suicide and labour productivity losses in Spain. *The European Journal of Health Economics*, 18, 83-96.
- Ross, J., Yakovlev, P., & Carson, F. (2012). Does State Spending on Mental Health Lower Suicide Rates? *The Journal of Socio-Economics*, 41, 408-417.
- Ruhm, C. J. (2000). Are Recessions Good for Your Health? *The Quarterly Journal of Economics*, 115(2), 617-650.
- Simon, R., & Marcussen, K. (1999). Marital Transitions, Marital Beliefs, and Mental Health. *Journal of Health and Social Behavior*, 40(2), 111-125.
- Stack, S. (1990). The Effect of Divorce on Suicide in Denmark, 1951-1980. *Sociological Quarterly*, 31(3), 359-370.
- Stack, S. (1990). New Micro-Level Data on the Impact of Divorce on Suicide, 1959-1980: A Test of Two Theories. *Journal of Marriage and Family*, 52(1), 119-127.
- Stack, S. (1998). Education and Risk of Suicide: An Analysis of African Americans. *Sociological Focus*, 31(3), 295-302.

- Trovato, F. (1987). A Longitudinal Analysis of Divorce and Suicide in Canada. *Journal of Marriage and Family*, 49(1), 193-203.
- Yamamura, E. (2010). The Different Impacts of Socio-Economic Factors on Suicide Between Males and Females. *Applied Economics Letters*, 17, 1009-1012.
- Yamauchi, T., Fujita, T., Tachimori, H., Takeshima, T., Inagaki, M., & Sudo, A. (2012). Age-adjusted relative suicide risk by marital and employment status over the past 25 years in Japan. *Journal of Public Health*, 35(1), 49-56.
- Yeh, J.-Y., Xirasagar, S., Liu, T.-C., Li, C.-Y., & Lin, H.-C. (2008). Does Marital Status Predict the Odds of Suicidal Death in Taiwan? A Seven-Year Population-Based Study. *Suicide and Life-Threatening Behavior*, 38(3), 302-310.
- Zulkarnain, A., & Korenman, S. (2019). Divorce And Health in Middle and Older Ages. *Review of Economics of the Household*, 17, 1081–1106.

Appendix

NUTS Regions in Turkey

NUTS-1	NUTS-2	NUTS-3
Istanbul Region (TR1)	Istanbul Subregion (TR10)	Istanbul Province
West Marmara Region (TR2)	Tekirdağ Subregion (TR21)	Tekirdağ Province
		Edirne Province
		Kırklareli Province
	Balıkesir Subregion (TR22)	Balıkesir Province
		Çanakkale Province
Aegean Region (TR3)	Izmir Subregion (TR31)	Izmir Province
	Aydın Subregion (TR32)	Aydın Province
		Denizli Province
		Muğla Province
	Manisa Subregion (TR33)	Manisa Province
		Afyonkarahisar Province
		Kütahya Province
Uşak Province		
East Marmara Region (TR4)	Bursa Subregion (TR41)	Bursa Province
		Eskişehir Province
		Bilecik Province
	Kocaeli Subregion (TR42)	Kocaeli Province
		Sakarya Province
		Düzce Province
		Bolu Province
		Yalova Province
West Anatolia Region (TR5)	Ankara Subregion (TR51)	Ankara Province
	Konya Subregion (TR52)	Konya Province
		Karaman Province
Mediterranean Region (TR6)	Antalya Subregion (TR61)	Antalya Province
		Isparta Province
		Burdur Province
	Adana Subregion (TR62)	Adana Province
		Mersin Province
	Hatay Subregion (TR63)	Hatay Province
		Kahramanmaraş Province
Osmaniye Province		
Central Anatolia Region (TR7)	Kırıkkale Subregion (TR71)	Kırıkkale Province
		Aksaray Province
		Niğde Province
		Nevşehir Province
		Kırşehir Province

	Kayseri Subregion (TR72)	Kayseri Province
		Sivas Province
		Yozgat Province
West Black Sea Region (TR8)	Zonguldak Subregion (TR81)	Zonguldak Province
		Karabük Province
		Bartın Province
	Kastamonu Subregion (TR82)	Kastamonu Province
		Çankırı Province
		Sinop Province
	Samsun Subregion (TR83)	Samsun Province
		Tokat Province
		Çorum Province
Amasya Province		
East Black Sea Region (TR9)	Trabzon Subregion (TR90)	Trabzon Province
		Ordu Province
		Giresun Province
		Rize Province
		Artvin Province
		Gümüşhane Province
Northeast Anatolia Region (TRA)	Erzurum Subregion (TRA1)	Erzurum Province
		Erzincan Province
		Bayburt Province
	Ağrı Subregion (TRA2)	Ağrı Province
		Kars Province
		Iğdır Province
		Ardahan Province
Central East Anatolia Region (TRB)	Malatya Subregion (TRB1)	Malatya Province
		Elazığ Province
		Bingöl Province
		Tunceli Province
	Van Subregion (TRB2)	Van Province
		Muş Province
		Bitlis Province
		Hakkari Province
Southeast Anatolia Region (TRC)	Gaziantep Subregion (TRC1)	Gaziantep Province
		Adıyaman Province
		Kilis Province
	Şanlıurfa Subregion (TRC2)	Şanlıurfa Province
		Diyarbakır Province
	Mardin Subregion (TRC3)	Mardin Province
		Batman Province
		Şırnak Province
		Siirt Province