

## **The Impact of Fiscal Austerity on Suicide: On the Empirics of a Modern Greek Tragedy**

Antonakakis, Nikolaos; Collins, Alan

*Published in:*  
Social Science and Medicine

*DOI:*  
[10.1016/j.socscimed.2014.04.019](https://doi.org/10.1016/j.socscimed.2014.04.019)

Published: 01/07/2014

*Document Version*  
Version created as part of publication process; publisher's layout; not normally made publicly available

[Link to publication](#)

*Citation for published version (APA):*  
Antonakakis, N., & Collins, A. (2014). The Impact of Fiscal Austerity on Suicide: On the Empirics of a Modern Greek Tragedy. *Social Science and Medicine*, 112, 39-50. <https://doi.org/10.1016/j.socscimed.2014.04.019>

# The Impact of Fiscal Austerity on Suicide: On the Empirics of a Modern Greek Tragedy<sup>1</sup>

Nikolaos Antonakakis<sup>a,b,\*</sup>, Alan Collins<sup>a</sup>

<sup>a</sup>*University of Portsmouth, Economics and Finance Subject Group, Portsmouth Business School, Portland Street, Richmond Building, Portsmouth, PO1 3DE, United Kingdom.*

<sup>b</sup>*Vienna University of Economics and Business, Department of Economics, Institute for International Economics, Welthandelsplatz 1, 1020, Vienna, Austria.*

---

## Abstract

Suicide rates in Greece (and other European countries) have been on a remarkable upward trend following the global recession of 2008 and the European sovereign debt crisis of 2009. However, recent investigations of the impact on Greek suicide rates from the 2008 financial crisis have restricted themselves to simple descriptive or correlation analyses. Controlling for various socio-economic effects, this study presents a statistically robust model to explain the influence on realised suicidality of the application of fiscal austerity measures and variations in macroeconomic performance over the period 1968–2011. The responsiveness of suicide to levels of fiscal austerity is established as a means of providing policy guidance on the extent of suicide behaviour associated with different fiscal austerity measures. The results suggest (i) significant age and gender specificity in these effects on suicide rates and that (ii) remittances have suicide-reducing effects on the youth and female population. These empirical regularities potentially offer some guidance on the demographic targeting of suicide prevention measures and the case for ‘economic’ migration.

*Keywords:* Greece, Fiscal austerity, Suicide, Unemployment, Debt crisis, Migration

---

## 1. Introduction

Greece has historically had one of the lowest suicide rates in the world, peaking in 1993 and then following a downward trend until 2008. However, in the aftermath of the 2008 financial crisis it has increased markedly, with even a case of public suicide of a 77-year-old Greek pensioner shooting himself with a handgun in the head in front of Syntagma Square, one of the capital’s busiest main squares near the Greek Parliament (Kitsantonis,

---

<sup>1</sup>The authors like to thank the participants at the Annual Meeting of the Austrian Economic Association (NOeG 2013) for helpful suggestions, the editor (Joanna Coast) and two anonymous reviewers for helpful comments on a previous version of this paper. The usual disclaimer applies.

\*Corresponding author, phone: +44 (0)23 9284 4261, fax: +44 (0)23 9284 4037, email: nikolaos.antonakakis@port.ac.uk

2012). Suicide rates in Greece and other European countries have been on a remarkable upward trend following the global recession of 2008 and the European sovereign debt crisis of 2009 (see, for instance, Kentikelenis et al., 2011; Economou et al., 2011; Kentikelenis et al., 2012; Fountoulakis et al., 2012; Karanikolos et al., 2013). This period coincided with the implementation of fiscal austerity in Greece (and in other Eurozone countries), soaring unemployment rates and negative economic growth. Fiscal austerity refers to measures taken by governments (during downturns of economic activity) to reduce expenditures and increase tax revenues in an attempt to cut excessive levels of government budget deficits and debts. There are numerous empirical studies on the determinants of suicide rates which indicate that recessions and rises in unemployment rates are associated with suicide rates (see, the comprehensive survey and review of literature provided by Chen et al. (2012) and the key literature highlighted in Chen et al. (2010)). However, none of the reviewed studies specifically focuses on the effects of fiscal austerity (public expenditure reductions) on suicide. This is a phenomenon that particularly affects individuals on fixed incomes (such as state pensions) and as such is likely to impact differently on various age cohorts. Suicides are becoming more common in Greece, and in addition to pension effects, budget cuts have also restricted access to health care and medicines. The study of Karanikolos et al. (2013) suggests that the fiscal austerity might have contributed to an epidemic of suicides in Greece, among other Eurozone countries. Yet, a systematic investigation to address the effect of fiscal austerity on suicidality in Greece is still lacking since Karanikolos et al. (2013) and others in the medical literature have hitherto adopted approaches based exclusively on descriptive analysis and correlation analysis.

To address this gap in the literature, we specifically investigate the effects of fiscal austerity, among other socio-economic control variables, on suicide rates in Greece. To support this study we use data collected over the period 1968-2011.

Our empirical findings suggest that fiscal austerity, higher unemployment rates, negative economic growth and reduced fertility rates lead to significant increases on overall suicide rates in Greece, while increased alcohol consumption and divorce rates do not exert any significant influence on overall suicide rates. Interestingly, the effects of fiscal austerity and economic growth are gender-specific, as fiscal austerity and negative economic growth significantly increase male suicide rates, while no significant effects from fiscal austerity and negative economic growth on female suicide rates could be identified. In addition, the effects of fiscal austerity on suicide rates are also age-specific, as fiscal austerity affects mostly the population between 45 and 89 years of age. Finally, remittances have suicide-reducing effects on the youth and female population.

These results have important implications for policy makers, and for the creation and implementation of specialised suicide prevention programmes in Greece by national health agencies. From an economic policy perspective, our results suggest that Eurozone leaders should put greater emphasis on stimulating their economies instead of fiscal consolidation and austerity, if they wish to mitigate some or even all of the negative effects of fiscal austerity on suicide rates. While, from a health policy perspective, specialised suicide prevention programmes focusing on the most distressed part of the population should be established.

The remainder of this paper is organised as follows. Section 2 presents some brief remarks

on the extant theory relating to suicide, outlines the sources of our theoretical expectations and sets out our key research hypotheses. Section 3 provides a background of the economic crisis and the increased suicidality in Greece, while Section 4 describes the empirical methodology and the data used. Section 5 presents the empirical results and Section 6 summarises and offers some concluding remarks.

## 2. Key Hypotheses

Suicide has long been the subject of theoretical and empirical scrutiny. Durkheim (1897) and other sociologists in their wake have posited a positive relationship between suicide and age premised on the level of social regulation in a given society. Economists too have entered the arena led by Hamermesh and Soss (1974) who advanced a rationality driven model of suicide founded on an assessment of the likely expected cumulative lifetime utility. On this basis, they also posit a positive relationship between suicide rates and age, and an inverse relationship with permanent income which can be expected to boost expected cumulative lifetime utility. Based on the extensive and very comprehensive review of studies presented in Chen et al. (2012), this study extracts a full set of a priori expectations for the macroeconomic performance and demographic control variables based on the consensus readily discernible in the literature. These are set out in Table 2. However, in the context of fiscal austerity (specifically public expenditure reductions) we posit the following hypotheses:

*Hypothesis 1:* Fiscal austerity (public expenditure reductions) is positively related to the suicide rate.

*Hypothesis 2:* Fiscal austerity will impact significantly differently across age cohorts. Specifically, we postulate that older age cohorts will be more likely to commit suicide as a consequence of fiscal austerity than younger age cohorts, given their reliance on fixed incomes and arguably less suicide offsetting behaviours (such as migration) being perceived to be available to them. For those individuals subject to pension reductions, clearly their permanent income is directly impacted and as Hamermesh and Soss (1974) would indicate this is posited to increase the suicide rate.

## 3. Background and context: Economic Crisis and Suicide in Greece

Since the advent of the Eurozone government debt crisis, extraordinary measures were taken by individual governments and the European Central Bank (ECB) so as to prevent a potential collapse of the Eurozone (see, for instance, Roman and Bilan, 2012). Among them, the Greek government found underreporting of the budget deficit by nearly 50%, shortly after the Greek elections, in November 2009. According to the study of Rauch et al. (2011), macroeconomic data, such as the budget deficit and debt, among others, reported by Greece shows the greatest deviation from Benford's law (that is used to detect manipulated data) among all euro member states. In particular, on 5 November 2009, the Greek public sector revised its budget deficit to 12.7% of Gross Domestic Product (GDP) from the 6% originally disclosed, which was then revised once again to the unprecedented 15.6% in November 15,

2009 (see, Figure 1). This event initiated a sovereign debt crisis that has resulted in large financial interventions in Greece and other Eurozone countries. As a consequence, fears of a Greek sovereign default on its debt and possible contagion to other Eurozone countries were developed among investors, that led to a crisis of confidence and a widening of bond yield spreads and credit default swaps between several Eurozone members and the Eurozone's largest economy, Germany.

[Insert Figure 1 around here]

At that point of time, Greece's options were limited, as the Greek government ruled out leaving the Euro, which instantaneously ceased the possibility of using a currency devaluation so as to increase competitiveness and possibly reduce its budget deficit and public debt. Instead, after time-consuming negotiations between the European Commission, the European Central Bank (ECB) and the International Monetary Fund (IMF), (the tripartite committee led by the European Commission, the European Central Bank and the International Monetary Fund, that organise loans to the government of Greece, among other countries, is also known as 'Troika') it was decided to offer a €110 bailout package on May 2010 to Greece so as to finance and service its debt. However, this bailout loan was accompanied by strict conditions, including: (i) austerity measures, such as drastic curtailing of government spending and large increases in tax rates, (ii) large privatisation of government owned assets worth of €50 billion by the end of 2015, and (iii) strict implementation of structural reforms, so as to improve its competitiveness and growth prospects.

Indeed, Greece accepted the bailout package and started applying austerity measures, implementing structural reforms and privatising its government owned assets in order to put its economy back to a long-term sustainable path.

Conventional wisdom suggests that fiscal austerity has contractionary rather than expansionary effects. Contrary to conventional wisdom Alesina and Perotti (1995) and Alesina and Ardagna (2010) have argued that fiscal consolidations may be expansionary if implemented mainly by cutting government spending. Few will contest the effects of fiscal austerity on the economy, such as soaring unemployment rates and sharp declines in GDP (see, for instance, Stiglitz, 2012; Krugman, 2012; Beetsma et al., 2012; Guajardo et al., 2011; Bluedorn and Leigh, 2011; IMF, 2010). Besides, one of fiscal austerity's core aims in Greece has been to achieve large scale reductions in public sector employment. But what are the implications of fiscal austerity measures for health in Greece? Put differently, what are the effects of fiscal austerity on suicide rates in Greece?

The recent financial and economic crisis has raised major concerns in the public health community that suicide rates will rise across the globe. Since then, an increasing amount of research on the effects of financial and debt crisis, and of unemployment on suicide rates in Greece has been conducted (see, among others, Fountoulakis et al., 2013, 2012; Rihmer et al., 2013; Kentikelenis et al., 2012; Economou et al., 2011; Kentikelenis et al., 2011; Stuckler et al., 2011, 2009). Suicides are becoming more common in Greece, and budget cuts have restricted access to health care. Yet, the literature on the effects of fiscal austerity on suicide rates, according to the best of our knowledge, is absent.

## 4. Data and Methodology

### 4.1. Data

We collect annual observation of overall, male and female suicide rates for Greece from the World Health Organization (WHO) Mortality Database between 1968-2009, and we extend them up to 2011. In particular the 2010 figure is estimated based on data cited in Kentikelenis et al. (2011), while the 2011 figure comes from Kathimerini (2012), a Greek newspaper which cites police records. The unemployment data come from the Annual Macroeconomic (AMECO) database. The evolution of these series presented in Figure 2 are revealing. In particular, overall suicide rates per 100,000 inhabitants increased by 30.69% from 391 suicides in 2009 to 511 suicides in 2011. A similar percentage increase is observed for male suicides (from 333 to 435) and female suicides (from 58 to 76) during the same period, however, female suicides are much lower than male suicides throughout the sample. In addition, overall unemployment rates increased from 7.7% in 2009 to the unprecedented 17.7% in 2011, and male and female unemployment rates increased from 6.9% to 15% and from 13.1% to 21.4%, respectively, between these two periods.

[Insert Figure 2 around here]

According to Figure 2, unemployment rates and suicide rates seem to be highly correlated. Indeed, the correlation between overall suicide rates and unemployment rates over the period 1968–2011 is 0.45, while between male suicide rates and male unemployment rates and between female suicide rates and female unemployment the correlation is 0.76 and -0.50, respectively, over the period of 1980–2011. The link between suicide and unemployment is much stronger for males than females, indicating the necessity to look at gender-specific suicide rates. In addition, there is clear evidence that suicide rates increase with age for both males and females.

Table 1 presents suicide rates by time, age group and sex for a selection of years. According to this table, there is also clear evidence that suicide rates increase with age, and that males are more prone to commit suicide than females are, which are in line with the theoretical justifications of Hamermesh and Soss (1974) and Durkheim (1897).

[Insert Table 1 around here]

In order to examine the effects of fiscal austerity on suicide rates, we use several variables as proxies of fiscal austerity. Given the large scale reduction in public sector salaries and pensions in Greece, our principal proxy of fiscal austerity is government expenditure. We collect data for general government final consumption expenditure as a % of GDP from the World Bank World Development Indicators (WDI) database. According to the World Bank's WDI definition, general government final consumption expenditure (formerly general government consumption) includes all government current expenditures for purchases of goods and services (including compensation of employees). It also includes most expenditures on national defense and security, but excludes government military expenditures that are part of government capital formation. Given that this measure might produce biased

results during period when nominal GDP is falling, such as the period of the financial crisis, we have explored the robustness of our results by dividing general government final consumption expenditure by real GDP. Our results, which are available upon request, remain qualitatively and quantitatively almost identical. This is due to the fact that the correlation between the two alternative measures is very high, namely 0.7868. For robustness purposes we also use taxes, budget deficit and public debt as proxies of fiscal austerity (see below). In addition, we collect data on per capita real GDP growth from WDI so as to examine the effects of business cycles on suicide mortality. Finally, to control for social factors on suicide rates and to minimize errors arising from unobserved effects, we collect data for fertility rates from the World Bank World Development Indicators (WDI) database; alcohol consumption from OECD Health database and divorce rates from EUROSTAT. Definitions and descriptive statistics for all these variables are included in Table 2.

[Insert Table 2 around here]

#### 4.2. Empirical Methodology

Our baseline equation to be estimated is as follows:

$$\begin{aligned}
 SR_{it} = & \alpha + \beta_1 SR_{it-1} + \beta_2 Growth_t + \beta_3 Fiscal_t + \beta_4 Unemp_t + \beta_5 Fert_t + \beta_6 Alc_t \\
 & + \beta_7 Div_t + \varepsilon_t
 \end{aligned} \tag{1}$$

where  $SR_{it}$  is the natural logarithm of suicide rates per 100,000 of  $i$  population, where  $i$  = overall, male, female, over time  $t$ , where  $t = 1968, \dots, 2011$ .  $SR_{it-1}$  is the first lag of  $SR_{it}$  and is included to account for dynamic effects and to filter autocorrelation of order one, AR(1), found in the series.  $Growth_t$  denotes per capita real GDP growth.  $Fiscal_t$  is fiscal austerity which is proxied by either: (i) the first difference of the natural logarithm of government expenditure as a % of GDP,  $Gov\_Exp_t$ , (ii) the first difference of budget deficit as a % of GDP,  $Def_t$ , and (iii) the first difference of the natural logarithm of tax revenues as a % of GDP,  $Tax_t$ .  $Fert_t$  is the fertility rate,  $Unemp_t$  is the unemployment rate,  $Alc_t$  is litres of per capita alcohol consumption,  $Divorce_t$  is the divorce rate and  $\varepsilon_t$  is the error term which is assumed to be independently and identically distributed (IID) with zero mean and variance  $\sigma^2$  for all  $t$ .

The rationale for including these variables follows the recent literature (for instance, see an excellent survey by Chen et al., 2012). Andrés (2005) and Viren (2005) show that economic growth has a significantly negative impact on suicides. If positive economic growth brings better occupational and financial prospects for the future, people will be hopeful and the probability of committing suicide may decrease. Likewise, unemployment can be considered to be a predictor of future income, therefore rising unemployment rate should lead to an increase in the incidence of suicide and suicide attempts. In addition, unemployment may be associated with mental and/or physical illness, which could lead to suicide. According to the seminal work of Durkheim (1897), suicide mortality is also influenced by social regulations and integration. From this angle, divorce and fertility rates can be viewed as indicators of social integration. In particular, Durkheim (1897) posits that divorce reduces

social integration and family ties. Divorce can cause perceived shame, stress and ultimately result in risky behaviour such as suicide. Therefore, higher divorce rates are likely to be related with higher suicide rates (see, for instance Minoiu and Andres, 2008; Neumayer, 2003, among others). In a similar vein, fertility rates can also be viewed as an indicator of social integration, and thus high fertility rates would be associated with lower suicide mortality, supporting a negative relationship between social integration and suicides. Andrés (2005) and Durkheim (1897) show that high fertility rates are related with lower suicide mortality as the absence of children is associated with more fluidity in family integration and social ties. Finally, Neumayer (2003) and Andrés (2005) find that, individuals with a higher alcohol consumption are more likely to commit suicide.

## 5. Estimation results

### 5.1. Baseline results

Results of various specification of model (1) for the overall, male and female population are presented in Tables 3, 4 and 5, respectively. According to the results of Table 3, most of the socio-economic variables have a significant impact on overall suicide rates in Greece. In particular, the estimated parameter of the lagged dependent variable and of real per capita GDP growth have a statistically significant positive and negative effect, respectively, on overall suicide rates. These results suggest that suicides are of persistent nature and that negative output growth leads to higher suicide rates. The latter finding is line with the arguments that economic growth helps to reduce suicide rates (see, e.g., Neumayer, 2003, among others).

[Insert Table 3 around here]

The estimate of fiscal austerity, proxied by percentage changes in government expenditure, on overall suicide rates is negative and significant at the 10% or 5% level under columns (3)–(6). This result denotes that reductions in government expenditure are associated with increased suicide rates. According to the ‘best’ specification (determined by the goodness-of-fit statistic and the statistical significance of the variables included) under column (5) of Table 3, a 1% decrease in government expenditure leads to a 0.3% increase on overall suicide rates in Greece. That is, 0.3% is the semi-elasticity of suicide rates with respect to fiscal austerity. To put things into perspective, final consumption government expenditure as a % of GDP has been reduced by 11.3% between 2009 and 2010 resulting in a  $(11.3\% \times 0.3\% =)$  3.39% increase in suicide rates solely due to fiscal austerity. Given that the number of the overall suicides in 2009 and 2010 was 391 and 488, respectively, 13 out of the 97 (13.4%) who committed suicide between 2009 and 2010 were only because of fiscal austerity. And given that the population of Greece in 2009 was 11,260,402 according to Eurostat, the 3.39% increase in suicide rates corresponds to 381 suicides in Greece due to austerity measures between 2009 and 2010.

The coefficient of unemployment rates is positive and statistically significant under columns (4)–(6) denoting that higher unemployment leads to increased suicide rates and which is in line with Andrés (2005) and Gerdtham and Johannesson (2003).



Moreover, our findings suggest that increased fertility rates reduce suicide rates, while alcohol consumption and divorce rates do not exert any significant influence on overall suicide rates in Greece.

Although our estimation results for male suicide rates in Table 4 are not substantially different from those of the overall suicide rates, real per capita GDP growth and fiscal austerity measures do not have a significant effect on female suicide rates, as shown in Table 5. The effects of fiscal austerity on male suicide rates reported in Table 4 suggest that a 1% decrease in government expenditure leads to a 0.43% increase in male suicide rates in Greece. That is,  $(11.3\% \times 0.43\% =)$  a 4.86% increase in male suicide rates, or 19 out of the 102 males (18.6%), or 551 males among the Greek population who committed suicide between 2009 and 2010 in Greece was solely due to fiscal austerity.

[Insert Table 4 around here]

[Insert Table 5 around here]

These results have important implications for policy makers and for the creation and implementation of specialised suicide prevention programmes in Greece by national health agencies. From a economic policy perspective, our results suggest that Greek officials, as well as Eurozone leaders, should put greater emphasis on stimulating the Greek and other debt-stricken economies, instead of fiscal consolidation and austerity, so as to mitigate some or even eliminate all of the negative effects of fiscal consolidation and austerity on suicide rates. While, from a health policy perspective, specialised suicide preventions programmes focusing on the most distressed and vulnerable citizens in Greece should be established, as the empirical literature supports the idea that the correct diagnosis of suicide determinants, and the creation of suicide prevention programmes can lead to a reduction, if not prevention, of suicides (see, for instance, McKee et al., 2012; Matsubayashi and Ueda, 2011, among others).

However, the Directorate-General for Health and Consumer Protection of the European Commission, despite its legal obligation to assess the health effects of EU policies, has been rather inactive in terms of assessing the effects of the troika's drive for austerity, and has instead limited EU commentary to advice about how health ministries can cut their budgets. Only until recently, the European Commission begun measures to release structural funds, according to "the role of health as part of the Europe 2020 policy framework" to support access to health care for those otherwise without cover (see, for instance EC, 2013). The complete EU's Health Strategy "Together for Health" that supports the overall Europe 2020 strategy is available at: [http://ec.europa.eu/health/strategy/policy/index\\_en.htm](http://ec.europa.eu/health/strategy/policy/index_en.htm).

## 5.2. Robustness analysis

As a robustness check, we also examine how fiscal austerity affects suicide rates by utilising different proxies of fiscal austerity, and by examining different age groups effects.

### 5.2.1. Alternative proxies of fiscal austerity

In this section, we estimate model (1) but with government budget deficit as a % of GDP (obtained from the AMECO database) as proxy of fiscal austerity instead of government expenditure as a % of GDP. In particular, we include the first difference of government budget deficit as a % of GDP,  $Def_t$ . Given the discovery of underreporting the fiscal balance by the Greek government, one of the main concerns has been its reduction, even its elimination and the return to budget surpluses. Therefore, we are very interested to examine whether and how deficit changes affect suicide rates in Greece. The results of this analysis for the overall, male and female population are reported in Tables 6, 7 and 8, respectively.

[Insert Table 6 around here]

[Insert Table 7 around here]

[Insert Table 8 around here]

According to these tables, the effects of reductions in the budget deficit have a positive and statistically significant, albeit limited, effect on overall suicide rates, as the estimated parameter of  $Def_t$  is significant only at the 5% or the 10% level, under columns (3) and (4) of Table 6, respectively. Distinguishing between male and female population, we observe that reductions in budget deficits lead to increased male suicide rates, while no significant effects on female suicide rates could be identified. In particular, under column (4) or (5) of Table 7, a 1% reduction in the government deficit leads on average to a 1% increase in male suicide rates in Greece. Put differently, the reduction in the budget deficit as a % of GDP by 4.77% between 2009 and 2010 resulted *ceteris paribus* in a ( $4.77\% \times 1\% =$ ) 4.77% increase in male suicide rates. Given that the number of male suicides in 2009 and 2010 was 333 and 416, respectively, 16 out of the 83 (19.3%) who committed suicide between 2009 and 2010 were only because of fiscal austerity. Given that the male population of Greece in 2009 was 5,499,396 according to Eurostat, the 4.77% increase in suicide rates corresponds to 262 suicides in Greece solely due to austerity measures between 2009 and 2010. As an additional robustness check, we repeated the above analysis with government tax revenues as a % of GDP, and then with government debt as a % of GDP (both series obtained from the AMECO database) instead of deficit as proxies of fiscal austerity. We also included private debt as a % of GDP obtained from the AMECO database so as to examine whether increases in private debt lead to increased suicides. These results, which are available upon request, suggest that changes in the government tax revenues as a % of GDP, or in government debt as a % of GDP, or in the private debt as a % of GDP do not exert any significant influence on either overall, male or female suicide rates. These results are plausible due to the large amount of tax evasion in Greece. However, these results should be interpreted with caution, as the number of observations is very limited due to data unavailability for these series during the early years of our sample, and the goodness-of-fit statistic,  $R^2$ , is relatively low. In particular, the starting date for the deficit variable is 1988 and thus our results might be biased due to the limited number of degrees of freedom.

### 5.2.2. Fiscal austerity and suicide rates by age groups and gender

Several studies have found evidence of age and/or gender dependent effects of socio-economic variables on suicide rates (see, for instance, Pitman et al., 2012; Andrés, 2005; Neumayer, 2004; Markowitz et al., 2003; Jungeilges and Kirchgassner, 2002, among others). Thus, we now examine whether the effects of fiscal austerity (among other socio-economic variables) on suicide rates are also age and/or gender specific. To achieve that, we estimate model (1) with the dependent variable,  $SR_{it}$ , now denoting the natural log of the suicide rates by four age groups, namely, 10–24, 25–44, 45–64 and 65–89 years, and by overall, male and female groups.

Before discussing these results, we present some descriptive statistics on suicide rates for these four age groups and by gender in Table 9. It is clear from this table that suicide rates increase with age, which is in line with theoretical arguments of Hamermesh and Soss (1974). In addition, male suicide rates are consistently higher than female suicide rates throughout all age groups.

[Insert Table 9 around here]

Even though, suicide rates are the highest for the age group 65–89 years, Figure 3 shows a declining trend of suicide rates for this age group, and especially for females, since the beginning of the 1990s. Interestingly, suicide rate for both gender of that age group fell below those of the age group 45–64 years in 2003 and 2009.

[Insert Figure 3 around here]

The results of model (1) by the four age groups for the overall population are presented in Table 10. According to this table, our findings suggest age-specific effects of suicide rate determinants.

[Insert Table 10 around here]

First, none of the socio-economic variables, apart from the lagged dependent variable, have a significant impact on suicide rates for the age group 10–24 years. This result is plausible, as there might be other individual risk factors for suicide rates in the young population, such as childhood and personality disorders and drug dependence (Pitman et al., 2012). More importantly, the young stricken population faced with austerity measures often emigrates (alone or as young couples). Given their flexibility they can potentially mitigate some or all of the negative effects of fiscal austerity. Ultimately, we would like to include emigration as another explanatory variable, however, data on emigration are very limited and feature many gaps. However, we are able to overcome this issue below where we conduct another robustness check with emigration proxied by the inflow of remittances. We postulate that inflow of remittances are a good proxy of emigration as many people who emigrate usually transfer a part of their income to support their stricken families left back in their home country.

Second, and more importantly, fiscal austerity proxied by reductions in government spending leads to a significant increase in suicide rates for the age group 65-89 years (columns (7) and (8) of Table 10) and 45-64 years (column (6) of Table 10). This is very plausible as those age groups include the largest parts of the population in Greece that have been heavily affected by large scale reductions in their pensions and salaries, respectively.

Third, negative economic growth leads to a significant increase in suicide rates for the age groups 25-44 and 65-89 years (columns (3)-(4) and (7)-(8) of Table 10), and, to a smaller extent, for the age group of 45-64 years (column (6) of Table 10).

Fourth, unemployment is a significant determinant of increased suicide rates for the age group 25-44 years (columns (3)-(4) of Table 10) and, to a smaller extent, of reduced suicide rates for the age group 65-89 (column (7) of Table 10), while no significant effects of unemployment on suicide rates for the age groups 10-24 and 45-64 could be identified. Therefore, our results suggest that the unemployment-stricken population between the years 25 and 44, i.e., the most highly productive and skilled part of the labour force, have a higher probability to commit suicide if they become unemployed compared to the population in any other age group. In particular, a 1% increase in unemployment rates leads to 3.5% increase in suicide rates for the age groups 25-44 years (column (3) of Table 10).

Fifth, the estimated parameter of fertility rates is negative and statistically significant only for the age groups 25-44 and 45-64 years. These results suggests that only the declines in fertility rates of the most fertile population between the ages of 25 and 64, lead to significant increases in suicide rates in Greece.

Finally, the estimated parameters of alcohol consumption and divorce rates are paradoxically significantly negative for the age groups 45-64 and 65-89, respectively, indicating that alcohol consumption and divorce rates reduce suicide rates for these age groups in Greece.

Next, we examine whether our previous findings in each of the four age groups are gender specific. In Tables 11 and 11, we report the results for males and females, respectively, in each of these four age groups.

[Insert Table 11 around here]

[Insert Table 12 around here]

The results of these tables reveal gender specificity in addition to age group specificity. In particular, fiscal austerity measures significantly increase the suicide rates of males between the ages of 45 and 89. Again this result is very plausible, as those age groups include the largest parts of the population in Greece that have been heavily affected by large scale reductions in their pensions and salaries, respectively. Moreover, downturns of economic activity, such as recessions, significantly increase only males suicide rates between the ages of 10 and 44, and 65 and 89. Females between ages of 10 and 89 seem to be insulated to periods of negative economic activity and to implementation of austerity measures in Greece, as there are no significant effects recorded related to changes in government expenditures and economic growth on female suicides. The only exception are females between the ages of 65 and 89, as negative economic growth increases suicide rates in that age group of females.

In addition, reduction in fertility rates increases suicide rates of both gender and across almost all age groups. However, the effect is more pronounced for the female population in the most fertile ages rather than those of the male population, as the estimated parameters are larger in the former group compared to the latter. For instance, a 1% reduction in fertility rates leads to a significant increase of 2.54% in female suicide rates between the ages of 25 and 44, while only to 1.68% in male suicide rates of the same age groups.

Furthermore, increases in unemployment only of males between the years of 25 and 64 lead to significant and fourfold increases in male suicides. A 1% increase in unemployment of males between the ages of 25 and 44 leads to a significant increase in suicide rates of around 4.5% for this age group of the male population in Greece. In the case of females across all the different age groups, we observe a negative effect of unemployment on suicides. This negative relationship between female unemployment and suicide rates is in line with Kuroki (2010). Using semi-aggregate level data for Japan, the author obtains a coefficient of -0.05 which is similar to ours of around -0.078. See Kuroki (2010) for a discussion about the mixed findings on the unemployment-suicide relationship across genders and age groups.

Turning to effect of divorce rates on suicide, we observe that the significantly negative effect found for the age group of 65–89 years in Table is driven by females. That is, an increase in divorces leads to a significant reduction in female suicides between the ages of 65 and 89. This may seem plausible if marriage serves to over-regulate the lives of women. In that case, increasing divorce rates may be, among others, the result of financial independence for women, laws favouring women in financial settlements and women's search for identity and freedom. Therefore, divorce rates may be associated with lower female suicide rates (see, for instance, Neumayer, 2003; Andrés, 2005; Koo and Cox, 2008, among others).

Last but not least, alcohol consumption is not significantly associated with suicides of neither genders nor across different age groups.

As a final robustness check, we include inflow of remittances obtained from the World Bank database as an additional explanatory variable in model (1) so as to proxy emigration and examine its effects on suicide mortality. In particular, we include the first lag of inflow of remittances so as to allow their effects to be fully materialized. We have also repeated the analysis with current inflow of remittances and the results, which are available upon request, remained qualitatively identical. The results, with lagged inflow of remittances as an additional explanatory variable, are presented in Table 13. For the sake of brevity, in Table 13 we present a subset of the most relevant results. Full results are available from the authors upon request.

[Insert Table 13 around here]

The inclusion of remittances in model 1 suggests the following empirical regularities. Increases in remittances reduce significantly suicide rates for the age group between 10 and 24 years of age and female suicide rates, while no significant effects on remittances on overall, male and for the population with age between 25 and 44 years could be identified. These findings are very plausible as, in most of the cases, the male member of the family works abroad and sends money back to his family. Moreover, our results indirectly suggest that

emigration reduces suicide rates in the younger population in Greece, as many individuals under 24 years of age emigrate for a better future and income. They send money home, easing off some of the huge reductions in personal incomes and therefore reducing significantly the risk of committing suicide. Put differently, supporting genuinely ‘economic’ migration has suicide reduction effects. The results regarding the remaining variables are very similar to our previous findings. That is, negative economic growth significantly increases overall and male suicide rates, while fiscal austerity significantly increases only male suicide rates. Moreover, increases in unemployment significantly increase suicide rates in all cases apart from the female population which is relatively insulated. In addition, reduced fertility rates significantly increase the risk of suicidality in all cases. Finally, increases in divorce rates now significantly increase the risk of suicides only for the age group 25-44 years.

## 6. Summary and Concluding Remarks

Recent investigations of the impact on Greek suicide rates from the 2008 financial crisis and the subsequent Eurozone debt crisis of 2009 have restricted themselves to simple descriptive or correlation analyses. Controlling for various socio-economic effects, this study presents a statistically robust model to explain the influence on realised suicidality of the application of fiscal austerity measures and variations in macroeconomic performance over the period 1968-2011.

The study provides novel results on the specific effects of fiscal austerity, among other socio-economic variables, on suicide rates in Greece over the period under scrutiny. Our findings suggest that fiscal austerity, higher unemployment rates, negative economic growth and reduced fertility rates, lead to significant increases in overall suicide rates in Greece, while increased alcohol consumption and divorce rates do not exert any significant influence on overall suicide rates.

We find that the effects of fiscal austerity and economic growth are gender-specific, as fiscal austerity measures and negative economic growth significantly increase male suicide rates, while no significant effects of fiscal austerity and negative economic growth on female suicide rates could be identified. It is also found that the effects of fiscal austerity on suicide rates in Greece are age-specific, as fiscal austerity affects mostly the population between 45 and 89 years of age. Emigration proxied by inflow of remittances helps in mitigating some of the negative effects of fiscal austerity on suicide rates for some of the population in the 10–24 years age group and for the female population. These results have important implications for policy makers, and potentially for the implementation of specialised suicide prevention programmes in Greece by national health agencies.

Given that austerity has been a worldwide phenomenon, especially among European countries since the beginning of the financial crisis and the Eurozone debt crisis, an examination of the extent to which these results can be generalized to other European countries is warranted.

## References

- Alesina, A., Ardagna, S., 2010. Large Changes in Fiscal Policy: Taxes versus Spending. In: *Tax Policy and the Economy*, Volume 24. NBER Chapters. National Bureau of Economic Research, Inc, pp. 35–68.
- Alesina, A., Perotti, R., 1995. Fiscal Expansions and Adjustments in OECD Economies. *Economic Policy* 21, 207–248.
- Andrés, A. R., 2005. Income Inequality, Unemployment, and Suicide: A Panel Data Analysis of 15 European Countries. *Applied Economics* 37 (4), 439–451.
- Beetsma, R., Giuliodori, M., Hanson, J., 2012. Budgetary Consolidation Under Different Exchange Rate Regimes. *Economics Letters* 117 (3), 912–916.
- Bluedorn, J., Leigh, D., 2011. Revisiting the Twin Deficits Hypothesis: the Effect of Fiscal Consolidation on the Current Account. *IMF Economic Review* 59 (4), 582–602.
- Chen, J., Choi, Y. J., Mori, K., Sawada, Y., Sugano, S., 2012. Socio-Economic Studies On Suicide: A Survey. *Journal of Economic Surveys* 26 (2), 271–306.
- Chen, Y.-Y., Yip, P. S., Lee, C., Fan, H.-F., Fu, K.-W., 2010. Economic Fluctuations and Suicide: A Comparison of Taiwan and Hong Kong. *Social Science & Medicine* 71 (12), 2083–2090.
- Durkheim, E., 1897. *Le Suicide: Étude de Sociologie*. Alcan, Paris. (Spaulding, J.A., Simpson, G (Trans.), 1951. *Suicide: A Study of Sociology*). Free Press, New York.
- EC, February 2013. *Investing in Health*. Commission Staff Working Document, Social Investment Package, European Commission.
- Economou, M., Madianos, M., Theleritis, C., Peppou, L. E., Stefanis, C. N., 2011. Increased Suicidality Amid Economic Crisis in Greece. *The Lancet* 378 (9801), 1459.
- Fountoulakis, K. N., Grammatikopoulos, I. A., Koupidis, S. A., Siamouli, M., Theodorakis, P. N., 2012. Health and the Financial Crisis in Greece. *The Lancet* 379 (9820), 1001–1002.
- Fountoulakis, K. N., Grammatikopoulos, I. A., Koupidis, S. A., Siamouli, M., Theodorakis, P. N., 2013. Suicide, Recession, and Unemployment. *The Lancet* 381 (9868), 721–722.
- Gerdtham, U.-G., Johannesson, M., 2003. A Note on the Effect of Unemployment on Mortality. *Journal of Health Economics* 22 (3), 505–518.
- Guajardo, J., Leigh, D., Pescatori, A., 2011. Expansionary Austerity: New International Evidence. *Working Paper Series WP/11/158*, IMF Working Paper.
- Hamermesh, D. S., Soss, N. M., 1974. An Economic Theory of Suicide. *Journal of Political Economy* 82 (1), 83–98.
- IMF, 2010. Will It Hurt? Macroeconomic Effects of Fiscal Consolidation, in: *World Economic Outlook*, Chapter 3. International Monetary Fund.
- Jungeilges, J., Kirchgassner, G., 2002. Economic Welfare, Civil Liberty, and Suicide: An Empirical Investigation. *The Journal of Socio-Economics* 31 (3), 215–231.
- Karanikolos, M., Mladovsky, P., Cylus, J., Thomson, S., Basu, S., Stuckler, D., Mackenbach, J. P., McKee, M., 2013. Financial Crisis, Austerity, and Health in Europe. *The Lancet* 381 (9874), 1323–1331.
- Kathimerini, 2012. Mourners Pay Tribute to Pensioner.  
URL [http://news.kathimerini.gr/4dcgi/\\_w\\_articles\\_e11\\_2\\_05/04/2012\\_478105](http://news.kathimerini.gr/4dcgi/_w_articles_e11_2_05/04/2012_478105)
- Kentikelenis, A., Karanikolos, M., Papanicolas, I., Basu, S., McKee, M., Stuckler, D., 2011. Health Effects of Financial Crisis: Omens of a Greek Tragedy. *The Lancet* 378 (9801), 1457–1458.
- Kentikelenis, A., Karanikolos, M., Papanicolas, I., Basu, S., McKee, M., Stuckler, D., 2012. Health and the Financial Crisis in Greece - Authors' Reply. *The Lancet* 379 (9820), 1002.
- Kitsantonis, N., April 2012. Public Suicide for Greek Man With Fiscal Woe. *The New York Times*.
- Koo, J., Cox, W. M., 2008. An Economic Interpretation Of Suicide Cycles In Japan. *Contemporary Economic Policy* 26 (1), 162–174.
- Krugman, P., April 2012. Europe's Economic Suicide. *The New York Times*.
- 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 (6), 683–691.
- Markowitz, S., Chatterji, P., Kaestner, R., 2003. Estimating the Impact of Alcohol Policies on Youth Suicides. *Journal of Mental Health Policy Economics* 6 (1), 37–46.

- Matsubayashi, T., Ueda, M., 2011. The Effect of National Suicide Prevention Programs on Suicide Rates in 21 OECD Nations. *Social Science & Medicine* 73 (9), 1395–1400.
- McKee, M., Basu, S., Stuckler, D., 2012. Health Systems, Health and Wealth: The Argument for Investment Applies Now More than Ever. *Social Science & Medicine* 74 (5), 684–687.
- 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 (1), 237–261.
- Neumayer, E., 2003. Are Socioeconomic Factors Valid Determinants of Suicide? Controlling for National Cultures of Suicide with Fixed Effects Estimation. *Cross-Cultural Research* 37, 307–329.
- Neumayer, E., 2004. Recessions Lower (Some) Mortality Rates: Evidence from Germany. *Social Science & Medicine* 58 (6), 1037–47.
- Pitman, A., Krysinska, K., Osborn, D., King, M., 2012. Suicide in Young Men. *The Lancet* 379 (9834), 2383–2392.
- Rauch, B., Götttsche, M., Brähler, G., Engel, S., 2011. Fact and Fiction in EU–Governmental Economic Data. *German Economic Review* 12 (3), 243–255.
- Rihmer, Z., Kapitany, B., Gonda, X., Dome, P., 2013. Suicide, Recession, and Unemployment. *The Lancet* 381 (9868), 722–723.
- Roman, A., Bilan, I., 2012. The Euro Area Sovereign Debt Crisis and the Role of ECB’s Monetary Policy. *Procedia Economics and Finance* 3, 763–768.
- Stiglitz, J., May 2012. ‘Austerity Europe’s man-made disaster’. *Social Europe Journal*.
- Stuckler, D., Basu, S., Suhrcke, M., Coutts, A., McKee, M., 2009. The public Health Effect of Economic Crises and Alternative Policy Responses in Europe: an Empirical Analysis. *The Lancet* 374 (9686), 315–323.
- Stuckler, D., Basu, S., Suhrcke, M., Coutts, A., McKee, M., 2011. Effects of the 2008 Recession On Health: a First Look at European Data. *The Lancet* 378 (9786), 124–125.
- Viren, M., 2005. Suicide and Business Cycles: new Empirical Evidence. *Applied Economics Letters* 12 (14), 887–891.



Figure 1: Real per capita GDP growth, Government Expenditure, Tax Revenues, Budget Deficit and Public Debt in Greece, 1968–2011

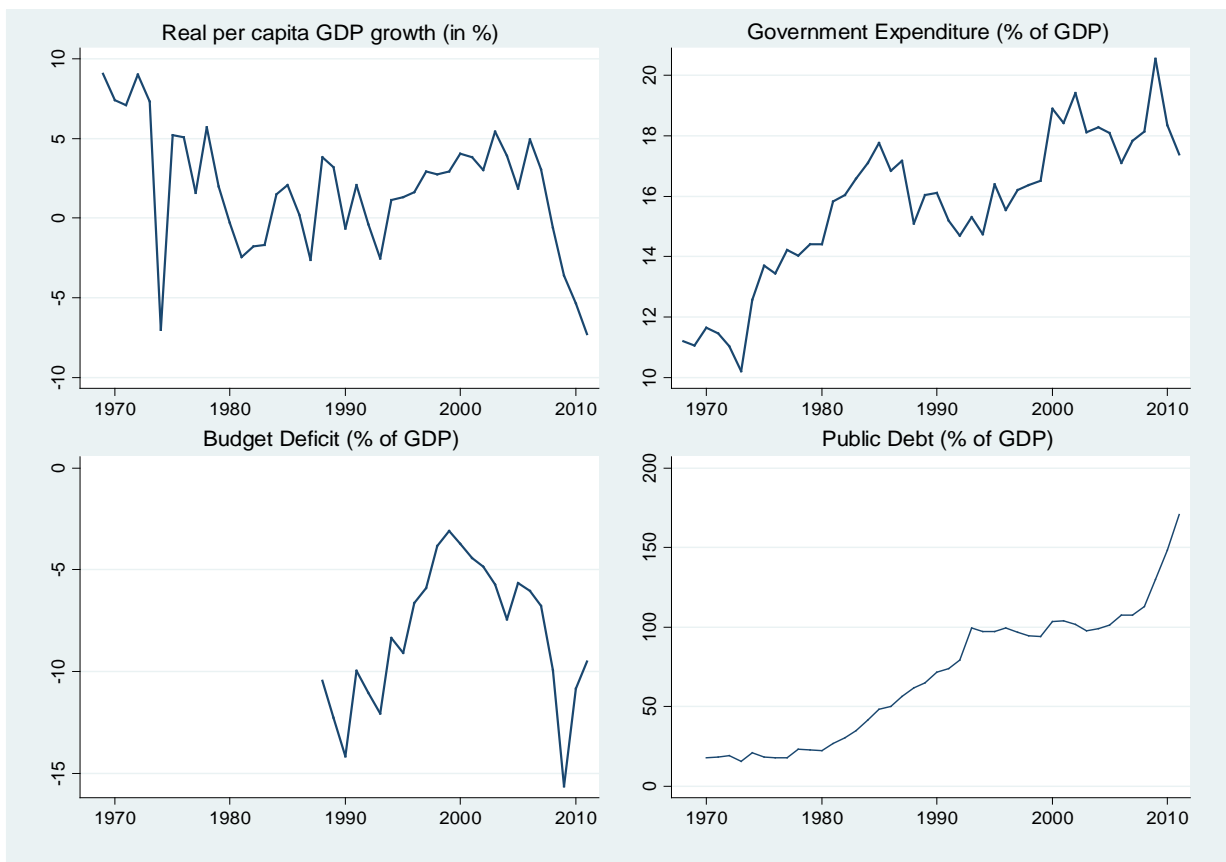
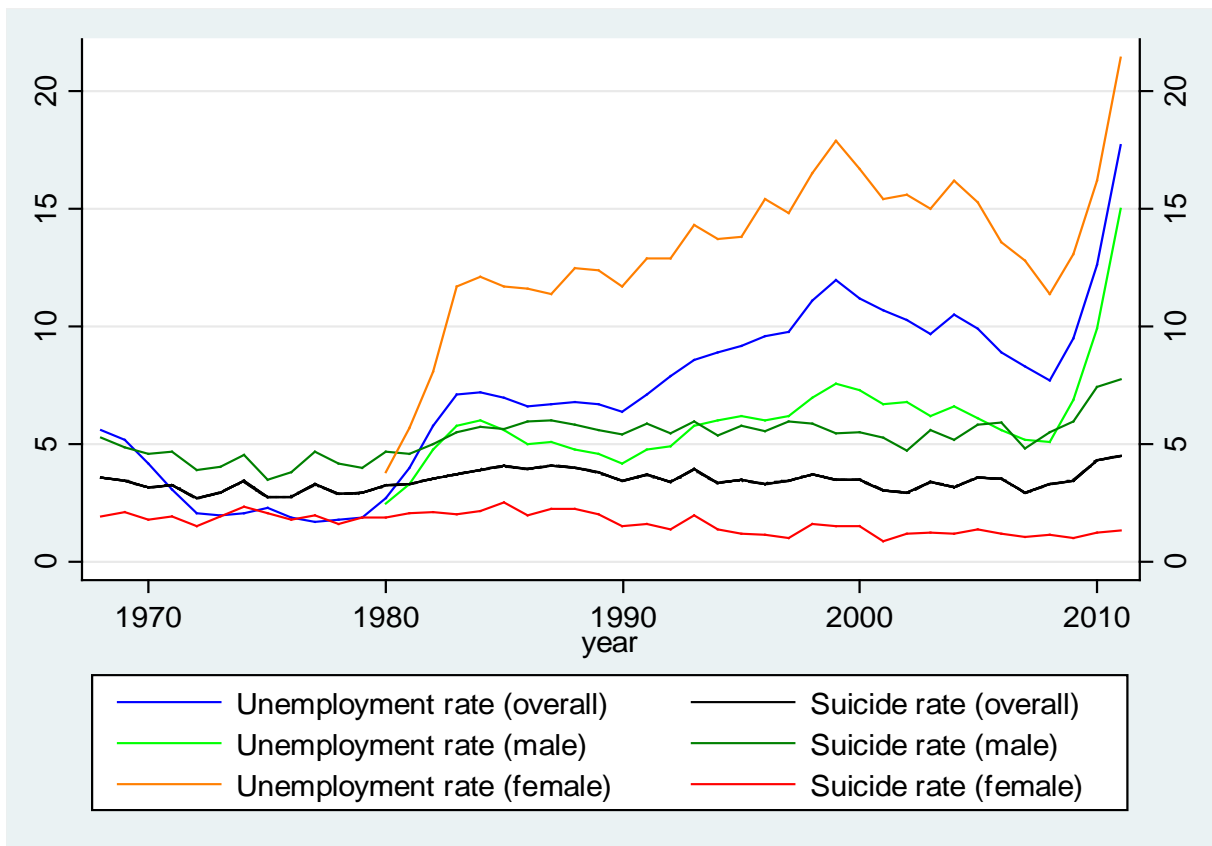
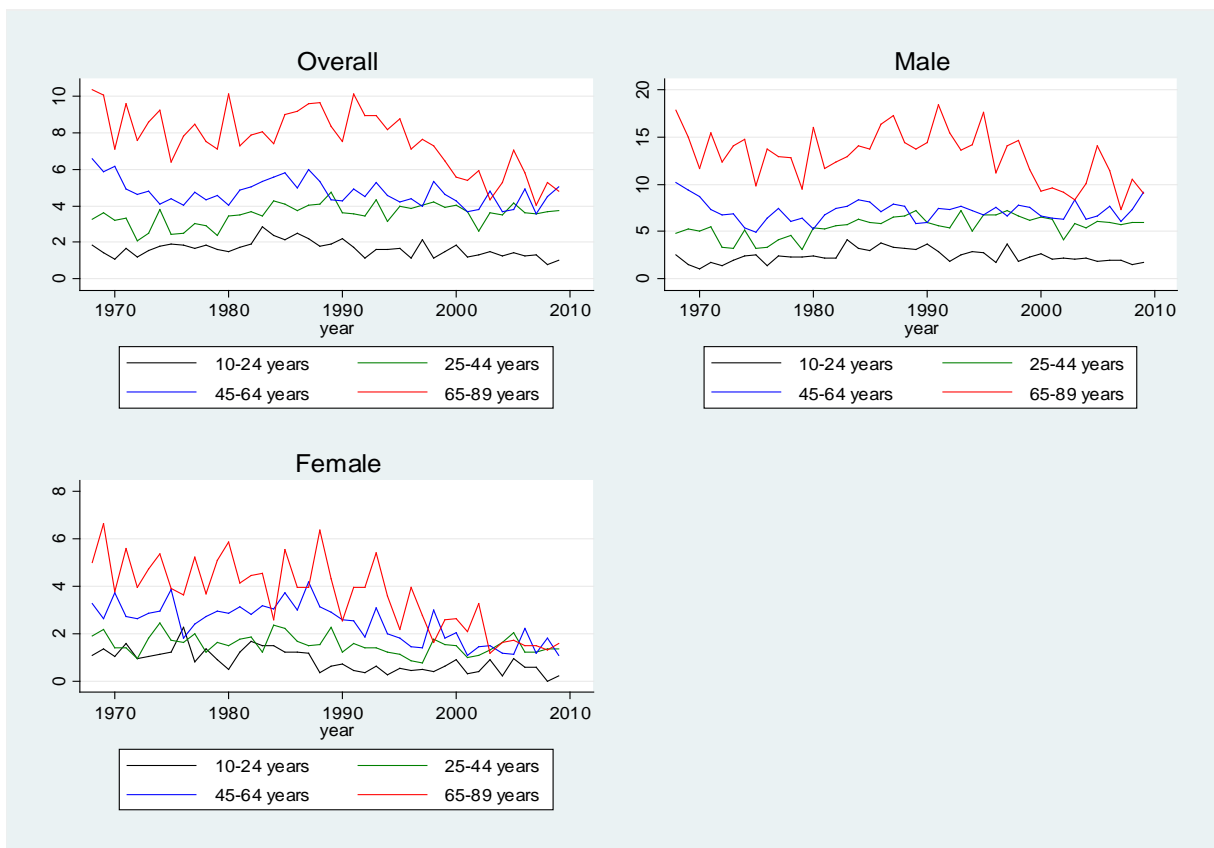


Figure 2: Suicide rates per 100,000 residents (%) and Unemployment rates (%) in Greece, 1968–2011



Source: WHO 2012, WDI, Kentikelenis et al. (2011) and [http://news.kathimerini.gr/4dcgi/\\_w\\_articles\\_e11\\_2\\_05/04/2012\\_478105](http://news.kathimerini.gr/4dcgi/_w_articles_e11_2_05/04/2012_478105).

Figure 3: Suicide rates by age group and gender in Greece, 1968–2009



Note: Suicide rates by age group are not available for 2010 and 2011.  
 Source: WHO 2012.

Table 1: Suicide rates per 100,000 resident, by time, sex and age group in Greece, 1968–2011

Age group	1970			1980			1990			2000			2009			2011		
	Overall	Male	Female	Overall	Male	Female	Overall	Male	Female	Overall	Male	Female	Overall	Male	Female	Overall	Male	Female
0–4	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
5–9	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
10–14	0.14	0	0.29	0.77	1.24	0.27	0.40	0.78	0	0.33	0.64	0	0	0	0	0	0	0
15–19	1.36	0.59	2.17	1.10	1.61	0.57	1.32	2.05	0.54	2.59	3.12	2.00	1.05	1.69	0.36	2.05	3.64	0.33
20–24	1.72	2.74	0.64	2.58	4.51	0.58	4.89	8.17	1.56	2.63	4.34	0.75	2.05	5.08	1.58	3.40	5.08	1.58
25–29	4.32	6.47	2.29	3.08	5.16	0.94	4.04	6.72	1.38	4.51	7.61	1.22	4.61	7.78	1.20	3.87	6.21	1.40
30–34	1.46	1.71	1.23	3.35	5.56	1.20	3.94	6.24	1.67	3.83	5.50	2.12	4.61	7.78	1.20	3.87	6.21	1.40
35–39	2.10	3.72	0.58	3.02	4.03	2.06	2.97	5.04	0.89	3.98	6.66	1.28	3.87	6.21	1.40	3.87	6.21	1.40
40–44	4.87	8.46	1.48	4.29	7.06	1.76	3.48	6.06	0.91	3.87	6.51	1.28	3.87	6.21	1.40	3.87	6.21	1.40
45–49	3.32	4.94	1.86	2.64	3.34	1.99	3.49	3.88	3.11	2.98	5.41	0.57	5.48	9.51	1.49	5.48	9.51	1.49
50–54	6.56	8.76	4.65	5.27	7.07	3.59	4.65	6.37	3.02	5.84	8.02	3.74	5.87	11.10	1.77	5.87	11.10	1.77
55–59	7.49	10.20	4.95	4.30	6.37	2.37	3.95	7.13	0.89	3.34	6.17	0.68	4.46	7.32	1.70	4.46	7.32	1.70
60–64	7.22	11.08	3.53	3.85	4.18	3.56	5.00	6.73	3.41	4.99	7.00	3.22	4.41	8.90	2.29	4.41	8.90	2.29
65–69	6.63	13.14	0.99	5.71	9.39	2.54	5.08	6.70	3.69	4.07	7.31	1.23	4.08	6.46	2.06	4.08	6.46	2.06
70–74	4.56	6.96	2.70	8.77	11.06	6.82	3.83	7.29	1.06	5.25	9.09	2.06	2.61	4.7	0.94	2.61	4.7	0.94
75–79	8.95	8.93	8.97	6.29	8.17	4.85	7.31	13.80	2.35	5.76	8.25	3.79	4.38	8.74	1.05	4.38	8.74	1.05
80–84	5.76	12.05	1.59	16.85	30.47	7.43	10.72	21.12	2.83	6.26	11.21	2.69	7.38	13.85	2.66	7.38	13.85	2.66
85–89	9.76	17.42	4.65	12.99	21.28	7.72	10.76	23.01	2.74	12.76	44.49	0	5.65	11.69	1.22	12.58	25.70	0
90–94	-	-	-	-	-	-	-	-	-	0	0	0	0	0	0	0	0	0
95 and above	-	-	-	-	-	-	-	-	-	0	0	0	0	0	0	0	0	0
All ages	3.16	4.59	1.80	3.27	4.69	1.89	3.44	5.42	1.51	3.50	5.51	1.52	3.47	5.96	1.02	3.47	7.78	1.33

Note: - sign denotes no data availability.

Table 2: Variable definitions and descriptive statistics

<b>Variable</b>	<b>Definition</b>	<b>Obs.</b>	<b>Mean</b>	<b>Std.</b>	<b>Min.</b>	<b>Max.</b>
Suicides	Overall	44	351.68	58.444	240	511
	Male	44	267.30	60.588	154	435
	Female	44	84.386	18.215	48	128
Suicide rate <sub>t</sub>	Overall	44	3.4554	0.4165	2.7001	4.5205
	Male	44	5.2979	0.8501	3.4750	7.7759
	Female	44	1.6633	0.4281	0.8682	2.5360
Real GDP per capita growth <sub>t</sub>	Growth rate of per capita real GDP (%)	43	1.8399	3.8711	-7.268	9.0744
Government Expenditure <sub>t</sub>	General government final consumption expenditure as a % of GDP	44	15.6667	2.4890	10.1991	20.5371
Unemployment <sub>t</sub>	Total	44	7.0931	3.5963	1.7	17.7
	Male	32	6.05	2.1079	2.5	15
	Female	32	13.3625	3.3426	3.8	21.4
Fertility <sub>t</sub>	Fertility rate (births per woman)	44	1.7201	0.4520	1.24	2.559
Alcohol <sub>t</sub>	Per capita alcohol consumption (liters, age 15+)	44	9.5705	1.8012	6.5	13.2
Divorce <sub>t</sub>	Divorce rates (per 1,000 people)	42	0.75	0.2716	0.4	1.2

Table 3: Fiscal austerity and overall suicide rates in Greece, 1968–2011

Variable	(1)	(2)	(3)	(4)	(5)	(6)	(7)
SR <sub>t-1</sub>	0.6515*** (0.1046)	0.5577*** (0.0924)	0.5080*** (0.0971)	0.4221*** (0.1191)	0.4418*** (0.1193)	0.2856** (0.1214)	0.2796** (0.1338)
Growth <sub>t</sub>		-0.0148*** (0.0032)	-0.0165*** (0.0031)	-0.0151*** (0.0030)	-0.0139*** (0.0031)	-0.0142*** (0.0032)	-0.0165*** (0.0045)
Gov_Exp <sub>t</sub>			-0.0035* (0.0018)	-0.0031* (0.0016)	-0.0031* (0.0018)	-0.0032* (0.0018)	-0.0041 (0.0024)
Unemp <sub>t</sub>				0.0086** (0.0041)	0.0086** (0.0040)	0.0083* (0.0043)	0.0079 (0.0065)
Fert <sub>t</sub>					-0.0109*** (0.0038)	-0.0111*** (0.0038)	-0.0126*** (0.0040)
Alc <sub>t</sub>						-0.0020 (0.0062)	-0.0059 (0.0065)
Div <sub>t</sub>							0.0233 (0.0774)
Constant	0.4330*** (0.1284)	0.5752*** (0.1138)	0.6430*** (0.1191)	0.6847*** (0.1307)	0.8345*** (0.1246)	0.8559*** (0.1396)	0.8918*** (0.1836)
Obs.	43	43	43	43	43	43	41
R <sup>2</sup>	0.3721	0.5874	0.6205	0.6359	0.7075	0.7081	0.6357

Note: Robust SEs in parenthesis. \*, \*\* and \*\*\* indicate significance at 10%, 5% and 1% level, respectively.

Table 4: Fiscal austerity and male suicide rates in Greece, 1968–2011

Variable	(1)	(2)	(3)	(4)	(5)	(6)	(7)
SR <sub>t-1</sub>	0.8443*** (0.1013)	0.7496*** (0.0814)	0.6883*** (0.0770)	0.3490*** (0.1204)	0.2761** (0.1231)	0.2780** (0.1241)	0.2657** (0.1301)
Growth <sub>t</sub>		-0.0152*** (0.0034)	-0.0177*** (0.0032)	-0.0150*** (0.0029)	-0.0142*** (0.0028)	-0.0136*** (0.0030)	-0.0160*** (0.0038)
Gov_Exp <sub>t</sub>			-0.0047** (0.0023)	-0.0043** (0.0018)	-0.0043** (0.0018)	-0.0042** (0.0017)	-0.0052** (0.0023)
Unemp <sub>t</sub>				0.0186*** (0.0057)	0.0217*** (0.0058)	0.0220*** (0.0060)	0.0191** (0.0082)
Fert <sub>t</sub>					-0.0060* (0.0034)	-0.0055 (0.0035)	-0.0081** (0.0034)
Alc <sub>t</sub>						0.0031 (0.0071)	-0.0021 (0.0069)
Div <sub>t</sub>							0.0805 (0.0681)
Constant	0.2651 (0.1707)	0.4489*** (0.1394)	0.5593*** (0.1301)	0.9798*** (0.1684)	1.0675*** (0.1691)	1.0312*** (0.1784)	1.0656*** (0.2116)
Obs.	43	43	43	43	43	43	41
R <sup>2</sup>	0.6123	0.7329	0.7635	0.8162	0.8290	0.8298	0.7924

Note: Robust SEs in parenthesis. \*, \*\* and \*\*\* indicate significance at 10%, 5% and 1% level, respectively.

Table 5: Fiscal austerity and female suicide rates in Greece, 1968–2011

Variable	(1)	(2)	(3)	(4)	(5)	(6)	(7)
SR <sub>t-1</sub>	0.7426*** (0.0958)	0.7610*** (0.1020)	0.7551*** (0.1052)	0.5976*** (0.1287)	0.4329*** (0.1345)	0.4416*** (0.1376)	0.3673** (0.1492)
Growth <sub>t</sub>		-0.0086 (0.0069)	-0.0076 (0.0064)	-0.0106 (0.0068)	-0.0112 (0.0077)	-0.0130 (0.0081)	-0.0171 (0.0103)
Gov_Exp <sub>t</sub>			0.0024 (0.0037)	-0.0000 (0.0035)	0.0002 (0.0044)	-0.0001 (0.0044)	-0.0018 (0.0055)
Unemp <sub>t</sub>				-0.0212** (0.0092)	-0.0264*** (0.0094)	-0.0273*** (0.0095)	-0.0195 (0.0129)
Fert <sub>t</sub>					-0.0250*** (0.0082)	-0.0263*** (0.0079)	-0.0265*** (0.0089)
Alc <sub>t</sub>						-0.0111 (0.0136)	-0.0126 (0.0158)
Div <sub>t</sub>							-0.1884 (0.1614)
Constant	0.1146* (0.0583)	0.1216** (0.0594)	0.1201* (0.0600)	0.3602*** (0.1130)	0.4366*** (0.1127)	0.5479*** (0.1895)	0.7024*** (0.2383)
Obs.	43	43	43	43	43	43	41
R <sup>2</sup>	0.5510	0.5655	0.5686	0.6099	0.6851	0.6891	0.6969

Note: Robust SEs in parenthesis. \*, \*\* and \*\*\* indicate significance at 10%, 5% and 1% level, respectively.



Table 6: Government deficit and overall suicide rates in Greece, 1988–2011

Variable	(1)	(2)	(3)	(4)	(5)	(6)	(7)
SR <sub>t-1</sub>	0.5059** (0.1952)	0.3889** (0.1780)	0.1934 (0.2084)	0.1813 (0.2274)	0.0892 (0.2119)	0.0493 (0.2583)	-0.1305 (0.2760)
Growth <sub>t</sub>		-0.0158*** (0.0053)	-0.0182*** (0.0043)	-0.0168*** (0.0045)	-0.0153*** (0.0046)	-0.0150*** (0.0043)	-0.0018 (0.0090)
Def <sub>t</sub>			0.0128** (0.0053)	0.0114* (0.0056)	0.0088 (0.0057)	0.0075 (0.0060)	-0.0025 (0.0110)
Unemp <sub>t</sub>				0.0054 (0.0067)	0.0060 (0.0060)	0.0104 (0.0106)	0.0060 (0.0158)
Fert <sub>t</sub>					-0.0084 (0.0069)	-0.0077 (0.0073)	-0.0046 (0.0086)
Alc <sub>t</sub>						0.0124 (0.0258)	0.0414 (0.0361)
Div <sub>t</sub>							-0.0334 (0.1854)
Constant	0.6236** (0.2426)	0.7912*** (0.2250)	1.0326*** (0.2585)	0.9934*** (0.2601)	1.0981*** (0.2435)	0.9882*** (0.2874)	0.9734 (0.5962)
Obs.	24	24	23	23	23	23	21
R <sup>2</sup>	0.2160	0.4415	0.5483	0.5599	0.6030	0.6082	0.3355

Note: Robust SEs in parenthesis. \*, \*\* and \*\*\* indicate significance at 10%, 5% and 1% level, respectively.

Table 7: Government deficit and male suicide rates in Greece, 1988–2011

Variable	(1)	(2)	(3)	(4)	(5)	(6)	(7)
SR <sub>t-1</sub>	0.6165** (0.2910)	0.3013 (0.1955)	0.1257 (0.2277)	-0.0538 (0.2624)	-0.1021 (0.3078)	-0.0944 (0.3364)	-0.1977 (0.3584)
Growth <sub>t</sub>		-0.0193*** (0.0055)	-0.0216*** (0.0050)	-0.0198*** (0.0047)	-0.0192*** (0.0044)	-0.0192*** (0.0042)	-0.0063 (0.0101)
Def <sub>t</sub>			0.0130** (0.0054)	0.0111** (0.0049)	0.0097* (0.0049)	0.0101* (0.0050)	0.0019 (0.0088)
Unemp <sub>t</sub>				0.0146* (0.0077)	0.0155* (0.0076)	0.0144 (0.0126)	0.0076 (0.0162)
Fert <sub>t</sub>					-0.0041 (0.0072)	-0.0043 (0.0069)	-0.0034 (0.0079)
Alc <sub>t</sub>						-0.0030 (0.0264)	0.0325 (0.0422)
Div <sub>t</sub>							0.0699 (0.1585)
Constant	0.6747 (0.4987)	1.2458*** (0.3412)	1.5494*** (0.3929)	1.7148*** (0.3928)	1.7880*** (0.4716)	1.8136*** (0.4903)	1.6195* (0.8732)
Obs.	24	24	23	23	23	23	21
R <sup>2</sup>	0.2439	0.5214	0.6034	0.6661	0.6758	0.6761	0.2065

Note: Robust SEs in parenthesis. \*, \*\* and \*\*\* indicate significance at 10%, 5% and 1% level, respectively.

Table 8: Government deficit and female suicide rates in Greece, 1988–2011

Variable	(1)	(2)	(3)	(4)	(5)	(6)	(7)
SR <sub>t-1</sub>	0.5165*** (0.1552)	0.5309*** (0.1662)	0.4282** (0.1768)	0.3897* (0.1948)	0.3042* (0.1661)	0.1936 (0.2653)	0.0849 (0.3235)
Growth <sub>t</sub>		-0.0061 (0.0107)	-0.0076 (0.0105)	-0.0105 (0.0138)	-0.0048 (0.0143)	-0.0016 (0.0115)	0.0058 (0.0241)
Def <sub>t</sub>			0.0175 (0.0126)	0.0205 (0.0137)	0.0121 (0.0147)	0.0038 (0.0149)	-0.0052 (0.0312)
Unemp <sub>t</sub>				-0.0119 (0.0177)	-0.0147 (0.0192)	0.0043 (0.0179)	0.0032 (0.0330)
Fert <sub>t</sub>					-0.0226 (0.0134)	-0.0193 (0.0140)	-0.0085 (0.0195)
Alc <sub>t</sub>						0.0701 (0.0825)	0.0435 (0.1200)
Div <sub>t</sub>							-0.3988 (0.3447)
Constant	0.1319** (0.0594)	0.1354** (0.0618)	0.1551** (0.0585)	0.2860 (0.2103)	0.3255 (0.2308)	-0.4926 (0.8277)	0.1582 (1.1883)
Obs.	24	24	23	23	23	23	21
R <sup>2</sup>	0.3214	0.3287	0.2714	0.2838	0.3647	0.4021	0.4522

Note: Robust SEs in parenthesis. \*, \*\* and \*\*\* indicate significance at 10%, 5% and 1% level, respectively.

Table 9: Suicide rates, by age groups and sex in Greece, 1968–2009

Age group	Sex	Obs.	Mean	Std.	Min.	Max.
10–24	overall	42	1.6489	0.4321	0.7806	2.8388
	male	42	2.4044	0.7000	1.1122	4.0993
	female	42	0.8452	0.4815	0	2.2487
25–44	overall	42	3.5368	0.5861	2.1110	4.7410
	male	42	5.5458	0.1129	3.1724	7.2461
	female	42	1.5407	0.4060	0.7807	2.4681
45–64	overall	42	4.7334	0.7099	3.5735	6.5891
	male	42	7.1781	1.0914	4.9488	10.216
	female	42	2.4448	0.8342	1.0589	4.1987
65–89	overall	42	7.6553	1.6745	4.0567	10.3729
	male	42	13.027	2.7215	7.3419	18.4373
	female	42	3.6511	1.5041	1.1539	6.6505

Note: The analysis is based on data between 1968 and 2009, as suicide rates by age are not available for 2010 and 2011.

Table 10: Fiscal austerity and overall suicide rates, by age group in Greece, 1988–2009

Variable	10–24 years			25–44 years			45–64 years			65–89 years		
	(1)	(2)	(3)	(4)	(5)	(6)	(7)	(8)				
SR <sub>t-1</sub>	0.3344** (0.1550)	0.2887* (0.1631)	0.0075 (0.1139)	0.0209 (0.1226)	0.2147* (0.1181)	0.1447 (0.1331)	0.4664*** (0.1235)	0.2684* (0.1447)				
Growth <sub>t</sub>	-0.0121 (0.0130)	-0.0052 (0.0145)	-0.0170** (0.0069)	-0.0177** (0.0086)	-0.0048 (0.0055)	-0.0115* (0.0057)	-0.0187** (0.0081)	-0.0232** (0.0088)				
Gov_Exp <sub>t</sub>	0.0026 (0.0064)	0.0047 (0.0075)	-0.0002 (0.0039)	-0.0005 (0.0038)	-0.0042 (0.0026)	-0.0065** (0.0030)	-0.0098** (0.0046)	-0.0111** (0.0053)				
Unemp <sub>t</sub>	-0.0116 (0.0113)	-0.0045 (0.0223)	0.0349*** (0.0084)	0.0298*** (0.0103)	-0.0025 (0.0050)	-0.0016 (0.0085)	-0.0207*** (0.0074)	-0.0002 (0.0102)				
Fert <sub>t</sub>	-0.0221 (0.0138)	-0.0168 (0.0146)	-0.0162** (0.0064)	-0.0182*** (0.0064)	-0.0198*** (0.0059)	-0.0246*** (0.0059)	-0.0116 (0.0070)	-0.0109 (0.0071)				
Alc <sub>t</sub>		0.0282 (0.0283)		-0.0047 (0.0156)		-0.0227** (0.0108)		0.0008 (0.0170)				
Div <sub>t</sub>		-0.1117 (0.2524)		0.0721 (0.0994)		-0.0331 (0.1314)		-0.4169** (0.1932)				
Constant	0.3765*** (0.1315)	0.1493 (0.2927)	1.0228*** (0.1222)	1.0308*** (0.2535)	1.2132*** (0.1889)	1.5727*** (0.2751)	1.2405*** (0.2702)	1.8242*** (0.4615)				
Obs.	41	41	41	41	41	41	41	41				
R <sup>2</sup>	0.3477	0.3688	0.5710	0.5756	0.4114	0.4593	0.5704	0.6280				

Note: Robust SEs in parenthesis. \*, \*\* and \*\*\* indicate significance at 10%, 5% and 1% level, respectively.

Table 11: Fiscal austerity and male suicide rates, by age group in Greece, 1988-2009

Variable	10-24 years			25-44 years			45-64 years			65-89 years		
	(1)	(2)	(3)	(4)	(5)	(6)	(7)	(8)				
SR <sub>t-1</sub>	0.2930*	0.2420	0.0517	0.0651	0.3390**	0.2973*	0.2837**	0.1552				
	(0.1586)	(0.1653)	(0.1474)	(0.1531)	(0.1482)	(0.1713)	(0.1345)	(0.1740)				
Growth <sub>t</sub>	-0.0303**	-0.0203	-0.0192**	-0.0184**	-0.0043	-0.0077	-0.0203**	-0.0246**				
	(0.0149)	(0.0157)	(0.0073)	(0.0090)	(0.0065)	(0.0072)	(0.0077)	(0.0112)				
Gov_Exp <sub>t</sub>	-0.0024	0.0005	-0.0022	-0.0020	-0.0067**	-0.0080**	-0.0113**	-0.0125*				
	(0.0073)	(0.0084)	(0.0045)	(0.0047)	(0.0030)	(0.0029)	(0.0054)	(0.0067)				
Unemp <sub>t</sub>	0.0063	0.0102	0.0466***	0.0422***	0.0109*	0.0077	-0.0142	0.0052				
	(0.0123)	(0.0228)	(0.0116)	(0.0139)	(0.0054)	(0.0091)	(0.0097)	(0.0125)				
Fert <sub>t</sub>	-0.0179	-0.0122	-0.0161**	-0.0168**	-0.0110*	-0.0152**	-0.0123*	-0.0107				
	(0.0136)	(0.0158)	(0.0065)	(0.0079)	(0.0059)	(0.0060)	(0.0066)	(0.0079)				
Alc <sub>t</sub>		0.0380		0.0008		-0.0151		-0.0020				
		(0.0327)		(0.0211)		(0.0158)		(0.0220)				
Div <sub>t</sub>		-0.0268		0.0615		0.0541		-0.3396				
		(0.2495)		(0.1033)		(0.1270)		(0.2153)				
Constant	0.5920***	0.2403	1.3176***	1.2673***	1.2207***	1.4340***	1.9541***	2.4420***				
	(0.1462)	(0.3182)	(0.2085)	(0.3431)	(0.2824)	(0.4006)	(0.3633)	(0.6375)				
Obs.	41	41	41	41	41	41	41	41				
R <sup>2</sup>	0.3443	0.3719	0.6141	0.6159	0.3758	0.3967	0.3525	0.4044				

Note: Robust SEs in parenthesis. \*, \*\* and \*\*\* indicate significance at 10%, 5% and 1% level, respectively.

Table 12: Fiscal austerity and female suicide rates, by age group in Greece, 1988–2009

Variable	10–24 years			25–44 years			45–64 years			65–89 years		
	(1)	(2)	(3)	(4)	(5)	(6)	(7)	(8)				
SR <sub>t-1</sub>	0.0970 (0.1915)	0.0833 (0.2010)	0.1678 (0.1751)	0.1625 (0.1732)	0.1488 (0.1835)	0.0455 (0.1988)	0.2991** (0.1367)	0.0454 (0.1513)				
Growth <sub>t</sub>	0.0177 (0.0211)	0.0091 (0.0245)	-0.0079 (0.0127)	-0.0136 (0.0155)	-0.0112 (0.0125)	-0.0214 (0.0172)	-0.0195 (0.0173)	-0.0304* (0.0155)				
Gov.Exp <sub>t</sub>	0.0192 (0.0123)	0.0169 (0.0134)	0.0058 (0.0062)	0.0039 (0.0068)	-0.0024 (0.0085)	-0.0056 (0.0094)	-0.0093 (0.0105)	-0.0115 (0.0105)				
Unemp <sub>t</sub>	-0.0840** (0.0320)	-0.1094** (0.0464)	-0.0183 (0.0127)	-0.0231 (0.0173)	-0.0547*** (0.0170)	-0.0330 (0.0216)	-0.0642*** (0.0198)	-0.0199 (0.0280)				
Fert <sub>t</sub>	-0.0393** (0.0192)	-0.0496** (0.0239)	-0.0205 (0.0123)	-0.0254* (0.0130)	-0.0473*** (0.0163)	-0.0466** (0.0172)	-0.0359* (0.0184)	-0.0310* (0.0158)				
Alc <sub>t</sub>		-0.0339 (0.0555)		-0.0207 (0.0267)		-0.0138 (0.0262)		-0.0001 (0.0241)				
Div <sub>t</sub>		0.3879 (0.4804)		0.0641 (0.2282)		-0.4627 (0.2982)		-1.0740*** (0.3899)				
Constant	0.1761 (0.2206)	0.3956 (0.4931)	0.4311*** (0.1310)	0.6268* (0.3585)	1.0302*** (0.2507)	1.4850*** (0.4029)	1.2656*** (0.2609)	2.1252*** (0.4201)				
Obs.	39	39	41	41	41	41	41	41				
R <sup>2</sup>	0.4378	0.4521	0.2489	0.2602	0.5751	0.6116	0.5735	0.6714				

Note: Robust SEs in parenthesis. \*, \*\*, and \*\*\* indicate significance at 10%, 5% and 1% level, respectively.

Table 13: Fiscal Austerity and suicide rates in Greece, 1976–2011. The role of remittances

Variable	Overall population			Males			Females			10–24 years			25–44 years		
	(1)	(2)	(3)	(4)	(5)	(6)	(7)	(8)	(9)	(10)					
SR <sub>t-1</sub>	0.2703** (0.1174)	0.2778* (0.1570)	0.2325* (0.1353)	0.2463 (0.1642)	0.3617** (0.1421)	0.1639 (0.1899)	0.1352 (0.2319)	0.0231 (0.2007)	0.0820 (0.1271)	0.2090 (0.1388)					
Growth <sub>t</sub>	-0.0102** (0.0042)	-0.0115** (0.0051)	-0.0116*** (0.0040)	-0.0128*** (0.0045)	-0.0032 (0.0108)	-0.0100 (0.0124)	0.0054 (0.0189)	0.0072 (0.0173)	-0.0055 (0.0092)	0.0005 (0.0087)					
Gov_Exp <sub>t</sub>	-0.0035 (0.0021)	-0.0039 (0.0032)	-0.0045** (0.0020)	-0.0053* (0.0027)	-0.0005 (0.0054)	-0.0010 (0.0077)	0.0031 (0.0081)	0.0070 (0.0076)	-0.0023 (0.0041)	-0.0040 (0.0048)					
Unemp <sub>t</sub>	0.0115** (0.0052)	0.0150 (0.0109)	0.0204*** (0.0063)	0.0149 (0.0113)	0.0130 (0.0097)	0.0305 (0.0212)	0.0142 (0.0167)	0.0771*** (0.0244)	0.0281* (0.0146)	0.0077 (0.0196)					
Remit <sub>t-1</sub>	-0.0324 (0.0346)	-0.0422 (0.0479)	-0.0002 (0.0362)	-0.0127 (0.0485)	-0.2040** (0.0779)	-0.3077** (0.1175)	-0.2764* (0.1414)	-0.4976*** (0.1500)	-0.0105 (0.0666)	-0.0971 (0.0882)					
Fert <sub>t</sub>	-0.0117** (0.0044)	-0.0114* (0.0057)	-0.0059 (0.0044)	-0.0089* (0.0051)	-0.0305*** (0.0100)	-0.0202 (0.0124)	-0.0342* (0.0189)	-0.0124 (0.0157)	-0.0188** (0.0080)	-0.0257** (0.0096)					
Alc <sub>t</sub>		0.0101 (0.0123)		-0.0011 (0.0158)	0.0487 (0.0286)			0.0635 (0.0493)		0.0304 (0.0257)					
Div <sub>t</sub>		0.0475 (0.1054)		0.1122 (0.1009)	-0.3231 (0.2166)			-0.3289 (0.2546)		0.3640** (0.1597)					
Constant	1.0643*** (0.2827)	0.9599* (0.4718)	1.1551*** (0.3058)	0.9940* (0.5508)	1.2643** (0.5732)	2.1628** (0.8334)	2.2813** (0.9810)	3.3033** (1.3390)	0.8822 (0.5182)	-0.3977 (0.8654)					
Obs.	33	33	33	33	33	33	33	33	33	33					
R <sup>2</sup>	0.6798	0.5810	0.7616	0.6488	0.7206	0.7675	0.5039	0.6132	0.4219	0.5180					

Note: Robust SEs in parenthesis. \*, \*\*, and \*\*\* indicate significance at 10%, 5% and 1% level, respectively.