

# **The effects of the economic crisis on the health status: The case of Greece**

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## **Abstract**

The impact of economic crisis on health outcomes is mixed. The adverse influences that recession has on health depend on many economic and non-economic factors. The purpose of this paper is to investigate the impact of the economic crisis on the self-rated health status in Greece during the period of economic crisis using data from the SILC dataset. Except the investigation of the impact of the economic crisis on the health status, special emphasis is given on the role of the family support as determinant of health status. We used data for the 2008 – 2016 period using two different methods (Pooled-cross sectional approach and Pseudo-panel approach). Our findings suggest that health status improves during the latest economic crisis, in accordance with some studies (Bezruchka, 2009); (Gerdtham & Ruhm, 2002). However, when we adopt the pseudo-panel approach we find a robust negative impact of the implemented austerity measures as a result of the recent economic crisis on the self-rated health of the unemployed in Greece, implying that the selection of the appropriate estimation method is of primary importance. The controversial effects of the economic crisis on health could be explained via the type of the methodology and the data that we use as well as via the different and interactive pathways through which an economic crisis may affect health.

**Keywords :** economic crisis, health status, Pseudo-Panel

**JEL :** I10, I12, I15

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## 1. Introduction

The downturns in economic activity increase the rates of unemployment continuously (especially, youth unemployment rates) which consequently have their tolls on the mental and physical health (OECD, 2008). High unemployment rates are associated with individual's worsened mental well-being and higher mental distress levels (Davalos & French, 2011) ; (Flint, Shelton, Bartley, & Sacker, 2013) ; (Strandh, Novo, & Hammarström, 2011). Specifically, a recent study in 26 European countries reported that every 1% increase in unemployment was associated with 0.79% risk in suicides for people younger than 65 years old (Stuckler D. , Basu, Suhrcke, Coutts, & McKee, 2009).

Moreover, a number of studies showed that people who lost their job suffered from adverse symptoms for health (depression, anxiety,) and furthermore they were more likely to ask for healthcare services. Especially, a meta-analysis of 237 cross-sectional and 87 longitudinal studies estimated that unemployed people exhibit greater distress than employed persons (Paul & Moser, 2009). At the same time, during economic crises, increased suicide rates among unemployed people have been noticed (Theocharous, 2014). Job insecurity is also linked with health-risk behaviors and mental disorders, especially for those in low socioeconomic classes.

The literature suggests that the impact of the economic crisis on health outcomes is mixed. However, the adverse influences that recessions have on health depend on (Stuckler, Basu, & McKee, 2010):

- how governments respond to crises how governments respond to crises - variations in social spending (e.g. countries like Sweden and Finland that respond to recession by funding “active labor market programs” can neutralize the effect of recession on mortality in their countries) - variations in tax and transfer policies
- the extent to which people are protected from harm (availability of social support, social cohesion)
- the rapidity of economic change and the depth of economic fluctuations
- the population group you belong (e.g. the effects of economic crises are greater on the poor, immigrants, members of racial minorities etc.)

The purpose of this paper is to analyze the impact of economic crisis and the application of MoU programs on the health status of persons in Greece. For this reason we use raw data from EU-SILC for the 2008-2016 period using two different methods:

- A. Pooled-cross sectional approach
- B. Pseudo-panel approach

From the methodological point of view in the next section we present the literature review on the determinants of the health status as well as the theoretical background concerning the economic crisis as determinant of health. In the third section the econometric model is presented. The econometric results are presented and discussed in the fourth section and the last section concludes the paper.

## **2. Literature review**

Extensive scientific literature highlights five major categories of factors (health determinants) that are positively or negatively correlated with health: genetics, behavioral factors, socioeconomic circumstances, physical and environmental influences and medical care (McGovern, Miller, & Hughes-Cromwick, 2014). In order to understand how these factors relate to each other and to health we must have in mind that there are multiple determinants of health that affect the multiple dimensions of health (mortality, morbidity, functioning and well-being) through multiple causal pathways (including direct or indirect effects on health which are realized across the life course) and with multiple levels of influence (from individual to community and societal effects).

Generally speaking, the literature suggests that medical factors affect only a relatively small portion of overall health (Marmot M., 2005) ; (McGinnis, Williams-Russo, & Knickman, 2002) implying that socioeconomic factors play a substantially larger role in health (Lee & Paxman, 1997) ; (Chiu, 2009). In other words, researchers estimate that access to quality medical care may not prevent more than 20% of avoidable deaths. Additionally, genetics are responsible for another 20% of deaths whilst the remaining 60% of avoidable deaths are attributable to socioeconomic, behavioral and environmental determinants of health (McGinnis, Williams-Russo, & Knickman, 2002).

There is a growing body of evidence demonstrating that socioeconomic factors are key drivers for a healthy population. Social determinants are defined by WHO as “the

conditions in which people are born, grow, live, work and age, and which are shaped by the distribution of money, power and resources at global, national and local levels”, whilst Paula Braveman and coauthors (2011) voice that “the term social determinant of health is often used to refer broadly to any nonmedical factor influencing health”.

Generally, the social determinants (that we’ll briefly analyze below) include factors such as: income, wealth and social status, social support networks, education, employment and working conditions, social environments, physical environments, personal health practices and coping skills, early childhood development, gender and culture. Thus, the social determinants of health can be conceptualized as affecting health at multiple levels throughout the life course (Hernandez & Blaze, 2006) .

In 2009, the Canadian Senate’s Subcommittee on Population Health (Keon & Pépin, 2009), after two-year investigation, assessed that over 50% of Canadian’s health can be attributable to intersectional effects of social, economic and environmental factors (Senate Subcommittee on Population Health, 2009). Furthermore, there is indication showing that income and education account for about 40% of health outcomes (Booske, Athens, Park, & Remington, 2010).

However, it is worth mentioning that recent studies have suggested that other factors such as stress (which is seemed as a component of psychosocial circumstances) and social exclusion have a significant impact on health and might be regarded as mechanisms linking direct and indirect determinants.

For example, job stress may lead to reduced health. Moreover, an imbalance between high endeavors and low rewards in terms of esteem, wage, job promotion or job security causes negative emotions and harmful stress (Marmot M, 2006) ; (Nieuwenhuijsen K, 2010). Stress appears to have a unique direct impact on health outcomes as well as it may affect the way in which a person responds to other determinants (McGovern, Miller, & Hughes-Cromwick, 2014). In particular, a WHO’s report regards different risk factors, including psychosocial working stress, social relationships and social capital, as intermediate social factors in the pathways between social inequality and health outcomes (WHO, 2008).

Social exclusion results from poverty, racism, discrimination, hostility and unemployment. Being socially excluded means that you are not participate in labor market, education, you do not interact with other people, you do not have access to basic material necessities of life, you do not have access to services and citizenship

activities. Hence, being excluded from the life of society you live and being treated as less than equal, results in worse health and greatest risks of premature death. Of course, the greater the period of time that people live in disadvantaged conditions, the higher the possibility for these people to suffer from a variety of health problems.

The influence of income on health may be direct (through income's effect on material conditions necessary for biological survival such as poor housing, not having the resources to pay for a healthy diet and so on) or indirect (through an influence on social participation and ability to control life circumstances), for example, through another determinant of health such as employment-a major source of income- that will be affected by education which in turns is affected by childhood health and circumstances that will have been affected by the income and wealth of the parents. (Benzeval M. J., 2001); (Marmot M., 2002).

As we all know, income provides economic resources that shape choices about eating habits, medical care/ health insurance, child care, housing, education and more. Thus, it is inevitable that people with higher income will be capable of obtaining much more required necessities that everyone needs to be healthy –such as shelter, warmth, adequate food, sanitation (Marmot M. , 2002). At the same time, the literature suggests that there is a threshold (e.g. if there is clean water for all) beyond which more income does not improve material conditions for health (Ettner, 1996); (Aittomaki, 2010).

Broadly, affluent people can more easily afford healthier lifestyle choices as they will have more disposable income (because, for example, they are more likely to sustain a stable job and with provided benefits such as health insurance) to spend on medical care, in comparison to people struggling to ensure the basics and tending to have more restricted access to medical care [income - health gradient]. People with higher incomes are more likely to afford better- quality homes, while poorer people are more likely to reside in lower-quality homes and neighborhoods (Anderson, 2003); (Braubach, 2010); (Quinn, 2010). Therefore, more affluent people have higher chances of experiencing place-based health benefits , in the sense that health is positively influenced by the conditions and assets in their living environment .

It is well-established that increases in levels of income and wealth generally correspond with improvements in health (Braveman, Cubbin, Egerter, Williams, & Pamuk, 2010) but, these improvements in health (as the income increases) tend to be more significant at the lower end of the income scale while among the most rich

people such increases in income may not correspond to better health. Therefore, the difference in health due to the level of income someone earns, persists not only between the highest and the lowest incomes but throughout all incomes brackets i.e., the income-health gradient is seen over the entire income spectrum but with lower effects as the income increases (Braveman P. S., 2011) ; (Braveman, Cubbin, Egerter, Williams, & Pamuk, 2010) ; (Minkler, Fuller-Thomson, & Guralnik, 2006).

In USA there is evidence showing that the level of income predicts the mortality rates and moreover, that rich people tend to report better health and longer life as well as they tend to have lower risk of disease or dying than those who are worse off. In some studies the relationship between income and mortality weakens when accounting for differences in employment (Tarkiainen, 2013). Now, according to Marmot M. (2004) those with higher socioeconomic position (SEP) tend to have lower mortality risk compared with those with lower SEP highlighting again the existence of a gradient in health across the social spectrum rather than a plainly gap between those poor and not. Despite the gradient between health-income, the relationship between income and health at higher incomes may weaken and at some point there may no longer be any health gains from more income. That is because the majority of people in rich developed countries do not experience material deprivation, and therefore it is argued that material living conditions are likely not to be a key driver of the health gradient that extends across all the social grades. Income can affect health through access not only to material living conditions but also to social conditions (social participation) that are good for health -more income allows access to better social living conditions, (Marmot M., 2002). For some people with lower SEP -due to factors such as travel time, transportation cost and availability etc. (Adler & Stewart, 2010) -the access to healthcare can be reduced.

Well off people usually live in areas with healthier resources available (like safer neighborhoods and housings, opportunities to exercise and so forth) and also, the accumulation of savings and assets (i.e. wealth) can be used as a protective means in times of economic distress so, it is clear, why the income is so important determinant of health. In particular, concerning the poverty's key role as a determinant of health, in recent reviews of the linkages between poverty and health, it has been proven and accepted that poverty is causally related to poor health at both the societal and individual levels (Kawachi, Subramanian, & Almeida-Filho, 2002).

Moreover, a number of studies showed that people who lost their job suffered from adverse symptoms for health (depression, anxiety,) and furthermore they were more likely to ask for healthcare services. Especially, a meta-analysis of 237 cross-sectional and 87 longitudinal studies estimated that unemployed people exhibit greater distress than employed persons (Paul & Moser, 2009). At the same time, during economic crises, increased suicide rates among unemployed people have been noticed (Theocharous, 2014). Job insecurity is also linked with health-risk behaviors and mental disorders, especially for those in low socioeconomic classes.

Evidence in the United States shows that people who lost their jobs (not because of their own mistake), were 50% more likely to report fair or poor health compared to those who didn't lose their job (Strully, 2009). In Sweden, people displaced from their jobs were more prone to alcohol-related behaviors, traffic injuries and self-harm (Eliason & Storrie, 2009). According to the 10-year British Household Survey (Bartley, Sacker, & Clarke, 2004), unemployed people (both men and women) had over a double risk to become ill (due to unemployment).

Simultaneously, austerity measures like cost-cutting or increased cost-sharing in health care policies, can exacerbate the situation leading not only in limited access to healthcare and to extra financial burden of households but also to reduced quality of health services (Theocharous, 2014). Moreover, literature suggests that households experiencing reductions in income and employment tend to reduce the use of health care services, the drug expenses and the frequency of visits in physicians (Yang, Prescott, & Bae, 2001) ; (Gottret, Gupta, Sparkes, Tandon, Moran, & Berman, 2009). Concerning the recent 2008 global crisis, evidence suggests that the impact of the crisis on health was greatest in countries that suffered protracted austere programs or the hardest hit by the latest crisis (Karanikolos, Heino, McKee, Stuckler, & Legido-Quigley, 2016). Many countries (such as Greece, Spain, and Portugal) adopted strict fiscal policies during this crisis resulting in restricted access to health care (Karanikolos, et al., 2013). In particular, in Greece after the passage of new **austerity measures in June 2011**, noted unprecedented suicides rates especially among males. However, Iceland rejected austerity measures through a popular vote and the financial crisis seems to have had few or no discernible effects on health (Karanikolos, et al., 2013).

Economic recessions have been found to significantly influence the population's health and well-being, which applies, specifically, to vulnerable groups of people

(Zivin, Paczkowski, & Galea, 2011) ; (Karanikolos, et al., 2013) ; (Modrek, Stuckler, McKee, Cullen, & Basu, 2013) ; (WHO, Impact of economic crises on mental health, 2011) ; (Marmot M., 2012). A recent review (Karanikolos, Heino, McKee, Stuckler, & Legido-Quigley, 2016) about the effects of the 2008 global financial crisis in high-income OECD countries found that this crisis affected negatively the mental health, including suicides, and to some extent the contagious or not diseases as well as the access to health care. At the same time, health risk behaviors (such as drinking, smoking) appeared to decline during the crisis but this was not the case for all.

The latest systematic literature review on the mental health outcomes in times of economic recession (Frasquilho, et al., 2016) deduced that economic recessions are linked with higher prevalence of mental health problems, including common mental disorders, related disorders, and suicidal behaviors. Despite the fact that unhealthy behaviors like tobacco use and alcohol consumption seem to have decreased in the population as a whole during the recession, people in lower socioeconomic groups seem to have engaged more in unhealthy behaviors (Harhay, Bor, Basu, & al., 2014).

A Longitudinal Labor Market Study (LLMS), concerning Greek data for the period time 2008-2013, compared the unemployment effects on health during the 2008-2009 period with the 2010-2013 period (i.e. a period in which the Greece's unemployment reached the unprecedented rate of 21% -compared with 9.7% during the 2008-2009 period- as a result of the financial crisis) and indicated that mental health and self-reported health were negatively affected by unemployment, especially in periods of high unemployment rates (Drydakis, 2015). It is worth mentioning that this study by Drydakis, according to a recent systematic literature review on health outcomes during the 2008 financial crisis in Europe, was rated as having a low risk of bias showing that its results are more consistent in comparison to other empirical studies (Parmar, Stavropoulou, & Ioannidis, 2016).

Furthermore, a difference-in-differences approach (Vandoros, Hessel, Leone, & Avendano, 2013) that compared pre and post-financial crisis health trends in Greece with those of Poland , for the years 2006-2009 using data from the European Union Statistics on Income and Living Conditions, provided a statistically significant negative effect of the financial crisis on health trends- worsened self-rated health. In accordance with this finding, are also repeated cross-sectional studies from Greece which support that the recession period was strongly linked with deteriorated population's self-reported health and increased likelihoods of rating their health fair



or poor when compared to control populations (Zavras, Tsiantou, Pavi, Mylona, & Kyriopoulos, 2013) ; (Kentikelenis, Karanikolos, Papanicolas, & al, 2011).

Additionally, Greek comparable data from pre and post-economic recession exhibited a statistically significant rise in the prevalence rates of depression - from the point of 3.3% in 2008 to the point of 8.2% in 2011 - (Economou, Madianos, Peppou, Pantelakis, & Stefanis, 2013) ; (Madianos, Economou, Alexiou, & Stefanis, 2011) . Another Greek study examined the changes in suicidal behaviors from before and after the onset of the recession and marked increased rates of suicidal ideation, especially in men (Economou, Madianos, Peppou, Theleritis, Patelakis, & Stefanis, 2013). Two other studies in Greece suggest strong correlation between unemployment rates and suicide (Antonakakis & Collins, 2014) ; (Madianos, Alexiou, Patelakis, & Economou, 2014), nonetheless, there is one study reporting no correlation and no increase in suicide behaviors (Fountoulakis, et al., 2013).

### **3. Empirical Investigation**

#### **3.1.Pooled – cross sectional approach**

##### The selection of data

To empirically examine the health determinants during the latest economic crisis as well as to identify whether the economic crisis is really responsible for the deterioration of health status of Greece's people, we used data from the EU-SILC<sup>3</sup> (European Union Statistics on Income and Living Conditions) for the 2008-2016 period concerning Greece. Access to the data was provided by the Hellenic Statistical Authority.

The EU- SILC questionnaire provides two types of annual data for 28 European Union countries, Iceland, Norway, Switzerland and Turkey:

- ✓ cross-sectional data pertaining to a given time or a certain time period with variables on income, poverty, social exclusion and other living conditions
- ✓ longitudinal data pertaining to individual-level changes over time, observed periodically over a four-year period.

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<sup>3</sup> The EU-SILC project was launched in 2003, on the basis of a 'gentlemen's' agreement' in six Member States (Belgium, Denmark, Greece, Ireland, Luxembourg, and Austria) as well as in Norway.

The reference population of EU-SILC is all private households and their current members residing in the territory of the Member States (MS) at the time of data collection. Persons living in collective households and in institutions are generally excluded from the target population. All household members are surveyed, but only those aged 16 and more are interviewed<sup>4</sup>.

As for the contribution of our study to the Greek case, is that health is approached directly (self-rated health). In addition, this database was selected for our research not only due to the provision of nationally representative, comparable data but also, because, to the best of our knowledge, there is no other study that used the SILC data from the onset of crisis till now (9-year period) in order to measure the impact of crisis on health of Greece's people, let alone to measure the impact of crisis on self-rated health. In this way we'll be able to draw long-term conclusions, while up to now we had only short-term estimations of the crisis's impact on health as well as to see what is really going on before and after the economic crisis's onset. The most of the research that used data from the SILC firstly, used other periods of time (reaching only until 2013) and secondly, they measured the health status in terms of suicides rates (Branas, Kastanaki, & Michalodimitrakis, 2015) ; (Kontaxakis, Papaslanis, Havaki-Kontaxak, Tsouvelas, Giotakos, & Papadimitriou, 2013) ; (Madianos, Alexiou, Patelakis, & Economou, 2014) ; (Rachiotis, Stuckler, McKee, & Hadjichristodoulou, 2015). Furthermore, except the investigation of the crisis (approached in terms of the adoption of strict fiscal austerity in Greece) as determinant of health we further investigate the role of the family support as determinant of health status.

### Sample, variables and empirical identification

#### Sample

Our initial sample consists of 168,784 observations. Nevertheless, the number of observations used in the logistic and ordered logistic analyses is lower due to the missing information for specific questions (actually, the final sample consists of approximately 127,000 observations more or less).

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<sup>4</sup> For further information about the database, follow the link:

<http://ec.europa.eu/eurostat/web/income-and-living-conditions/overview>

### *Variables and descriptive statistics*

For the purposes of this study, we pooled cross-sectional data for the nine-year period (2008-2016), combining both household and personal data. For the exact description of the used original variables see Appendix. We provide an explicit description of the variables and their codes in Table 1, report summary statistics in Table 2 and frequency statistics in Table 3.

[Insert Tables 1, 2 & 3]

### Dependent variables

In our model we use either the ordinal dependent variable *GH* (General Health) as it given by the survey<sup>5</sup> (taking the values 1 for very good health, 2 for good health, 3 for fair health, 4 for bad health, 5 for very bad health), or the dummy variable *GH2* that we have constructed in order to have only two categories (1 if the health status is good and very good, and 0 if health status is fair, bad and very bad). Self-rated health (SRH) is a subjective reflection of health status and it has been widely studied in survey research. It is popular for its simplicity and more importantly is seems as a reliable measure of health status. SRH is strongly linked with morbidity and disability and furthermore economic or social factors are also its main determinants (Wu & al., 2013) ; (Bowling, 2004). Therefore, as in our model we'll control for socio-economic factors to a great extent, we deem that the selection of SRH as a measure of health status is pretty wise. In other words, the use of such factors as drivers of self-rated health it's of primary importance. Approximately, 79.13% of the sample reports good and very good self-perceived health and only the 20.87% reports fair, bad and very bad health.

### Explanatory variables

As for the control variables, as we have mentioned, we focused on socio-economic confounders of health that depict the living conditions of the households as well as on factors that provide information about the household's living conditions, as they are suggested by the literature as main mediating mechanisms between economic crisis and health. In addition, some commonly demographic characteristics were

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<sup>5</sup> The individuals were asked to rate their health in general as they perceived it from 1(very good health) to 5 (very bad health). More specifically, they answered the question: "How is your health in general? Would you say it is.." with five categories of response "very good", "good", "fair", "bad", "very bad".

included in the model as they have a known and indisputable interrelation with self-rated health. Finally, we introduced the dummy variable *MoU* in order to identify whether there is a change in our main results during a year with implemented austerity measures (due to the outbreak of the recent economic crisis).

*Age* is a measure of the age of respondents. We group age in four bands, beginning at age of 17 and rising to 65+, with the band (17-29) as reference category. Apparently, as we grow older we are more likely to report bad health. At this point we should mention that 15% of the sample is between 17 and 29 years old and 29.58% are 65 years and over. The variable *gender* is a dummy for men (which compose the 48.19% of the sample). The variable *Marital Status* is a measure for the marital status of individuals and the reference category is *married* (the 61.9% of the sample) and we consider two more groups, namely: (i) *unmarried* and (ii) *widowed/ divorced/ separated*. *Education* measures the highest completed educational level and again, we classify education in three-point ordinal scale, with the first one (*primary education*) serving as the reference group and which comprises the 39.26% of the sample. The other two groups are: *secondary education* and *tertiary education*. The occupational classification (*Skills*) represents the occupational status of the individual. It's also grouped in four categories namely (i) *High Skilled white collar*, (ii) *Low skilled white collar*, (iii) *High skilled blue collar*, (iv) *Low skilled blue collar*. Another significant variable could be the *Self-defined Economic Status* because provides information about the person's perception of their main activity, and it's categorized in five groups namely (i) employee or self-employed working full time (34.16%), (ii) employee or self-employed working part-time (4.42%), (iii) unemployed (12.82%), (iv) in retirement (27.27%) (v) student, disabled, military, domestic tasks, other inactive person (21.33%). Of course, from our analysis, we couldn't omit an income variable. We use the logarithm of the total gross household income  $-\ln(\text{gross income})$ - to deal with the skewness of income and to interpret our results in terms of rate of change of income. We tried our model and with the use of income categories, but the results was the same. Furthermore, we employed with the first income category (family income less than 8.000 €), in order to approach the notion of *family support*. Therefore, the higher the family income, the bigger the family support for the unemployed members of the family. Thus, the variable *family support* takes the value one if the person belongs to the lower family income scale (implying low financial family support), and zero otherwise. The percentage of those at the lower end of the

economic scale reaches the 11.55%. The physical environment also plays a meaningful role as determinant of health and for this reason we introduced in the model the following variables: *Dwelling problems*, *Warm Home* and *Ability to make ends meet*. The first one, *dwelling problems*, it's a dummy variable for those that encounter a problem with leaking roof etc. The second one, *warm home*, it's a dummy variable that takes the value one if the household's response about the affordability to keep home warm is positive, and zero if the response is negative. The third one, *ability to make ends meet*, is equal to one if the household is easily able to make ends meet and, zero if the household finds difficulty in making ends meet, and zero if. Fortunately the majority of our sample does not encounter a dwelling problem (84.33%) and they are able to keep their home warm (74.55%) but 10.7% of the sample declares that it finds difficulty in making ends meet. Last but not least, in our model we'll introduce the variable *MoU* in order to examine the impact of the adoption of austerity measures on the health of the unemployed.

#### Model-theoretical framework of the (ordered) logistic analysis

As our outcome variable (self-rated health) is ordinal or binary, the literature suggests the use of (ordered) logistic analysis for such estimations (hear, for the estimation of the impact on health of our control variables). Therefore, logistic regression analysis and ordered logistic regression analysis were used to evaluate the influence on self-rated health (of the unemployed) of several demographic, socio-economic and disease-related factors. Data analysis was conducted using the STATA 13 statistical package. A brief theoretical framework of the (ordered) logistic analysis is presented below.

Generally, in the simple logit model it is deemed that the available data inform us whether an event it is true or not. In our study, the data inform us whether an individual has good and very good health ( $Y=1$ ) or poor health ( $Y=0$ ). For this reason, the dependent variable ( $Z_i$ ) is a dummy variable that takes the value one if the individual reports a good level of health and the value zero if not. The logit model assumes that the existence of good and very good health, given the individuals' person characteristics ( $X_{ij}$ ) – that we have use as explanatory variables in our model– is represented by the following probability:

$$P_i = E(Y = 1|X_i) = \frac{1}{1+e^{-(a+\beta_1X_{i1}+\dots+\beta_nX_{in})}} \quad (1).$$

For simplicity the equation (1) can be written as:

$P_i = \frac{1}{1+e^{-Z_i}}$  (2), where  $Z_i = a + \beta_1 X_{i1} + \dots + \beta_n X_{in}$  and (2) represents the cumulative logistic distribution function. It is worth mentioning that  $Z_i$  ranges from  $-\infty$  to  $+\infty$ , while  $P_i$ , which ranges from 0 to 1, is nonlinearly related to  $Z_i$  and therefore, with  $X_i$ 's and  $\beta$ 's. Consequently, the OLS regression cannot be used to estimate the above parameters.

However, if the probability of being in good health is represented by (2), then the probability of not being is  $1 - P_i = \frac{1}{1+e^{Z_i}}$ . The odds ratio in favor of having good health is given by the term  $\frac{P_i}{1-P_i}$  and is given by the following term:

$$\frac{P_i}{1-P_i} = \frac{\frac{1}{1+e^{-Z_i}}}{\frac{1}{1+e^{-Z_i}} - \frac{1}{1+e^{Z_i}}} = \frac{1+e^{-Z_i}}{e^{-Z_i}(1+e^{Z_i})} = \frac{1}{e^{-Z_i}} = e^{Z_i} \quad (3).$$

By taking the natural logs of (3), we obtain:

$$\ln \left( \frac{P_i}{1-P_i} \right) = Z_i \quad (4),$$

where  $L_i$ , the log of the odds ratio, is not only linear in  $X_i$ 's but also in  $\beta$ 's. To estimate the logit model, apart from  $X_i$ , it is necessary to possess the values of the regressand  $L_i$ .

In the logit analysis, the probability given by equation (1) cannot be observed. However, we can observe whether an individual is in good health ( $Y=1$ ) or not ( $Y=0$ ). Since each  $Y_i$  is a Bernoulli random variable we can write  $P(Y_i=1) = P_i$  and  $P(Y_i=0) = 1 - P_i$ . As Neter et al. (1996) suggested, if  $f_i(Y_i)$  is the probability that  $Y_i=1$  or 0, the joint probability  $f(Y_1, Y_2, \dots, Y_n)$  is

$$\prod_{i=1}^n P_i^{Y_i} (1-P_i)^{1-Y_i} \quad (5).$$

This term is the likelihood function. By taking its' natural logarithm we obtain

$$\ln f(Y_1, Y_2, \dots, Y_n) = \sum [Y_i \cdot \ln P_i + (1 - Y_i) \cdot \ln(1 - P_i)] = \sum [Y_i \cdot \ln P_i - Y_i \cdot \ln(1 - P_i) + \ln(1 - P_i)] \\ \sum \left[ Y_i \cdot \ln \left( \frac{P_i}{1 - P_i} \right) \right] + \sum \ln(1 - P_i) \quad (6).$$

Using (1) and (4), equation (6) can be written as:

$$\ln f(Y_1, Y_2, \dots, Y_n) = \sum [Y_i \cdot Z_i + \ln(1 - P_i)] \quad (7).$$

In our analysis, the method of estimation used is the “maximum likelihood method”, where our objective is to maximize (7), that is to obtain the values of  $\beta$ 's in such a manner that the probability of observing the given Y's is as high as possible.<sup>6</sup>

On the other hand, in the ordered logit analysis it is assumed that the dependent variable (health) is an ordered one that takes the values 1 – very good health, 2 – good health, 3 – fair health, 4 – bad health, and 5- very bad health. The ordered logit model, that has to be estimated, takes the form:

$$P_k = \frac{e^{\beta_k X}}{1 + e^{\beta_1 X} + e^{\beta_2 X} + \dots + e^{\beta_k X}} \text{ where } P_1 + P_2 + \dots + P_k = 1.$$

In the ordered logit model multiple equations are simultaneously estimated, the number of which equals the number of the dependent variables minus one. Thus in our analysis 4 equations were estimated.

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<sup>6</sup> For further details on the logistic regression analysis, see: a) (Maddala, 1983), b) (Wooldridge, 2001), c) (Gujarati, 2003).

### **3.2.Pseudo – Panel approach**

The approach used in this paper is the Pseudo-Panel approach. This current approach aims in investigating the role of the economic crisis (more specifically, the adoption of strict fiscal austerity) in affecting the health status of Greece's unemployed people as well as in investigating the role of the existence of unemployment benefits as determinant of the health status of the unemployed by using fixed effect model taking into account individual heterogeneity, generation and gender effects.

The repeated cross-sectional data (from the SILC concerning Greece that we have used in the previous section) are not capable of following the same individuals over time. This makes impossible to identify and include the individual's past into a fixed effects model. For this reason, we now adopt an innovative methodological approach, known as "a pseudo-panel approach", which is based on cohort data, defined here in terms of the year of birth and the gender of each individual and constructed from the European Union Statistics on Income and Living Conditions over the years 2008-2016 concerning Greece. Access to the data was provided by the Hellenic Statistical Authority. In this way, we will be able to use a fixed effect model taking into account individual heterogeneity and gender and generation effects.

The reason we apply a pseudo-panel model with fixed effects is that the logit model (that we have used previously) does not allow the estimation of fixed effects model in a panel framework. Therefore, the use of pseudo-panel estimates makes possible to control for time invariant characteristics (such as gender, year of birth) and to account for intercept heterogeneity.

One advantage of the pseudo-panel approaches is that they suffer less from problems related to sample attrition (which is a problem that plagues the genuine panels). A second advantage is the wide availability of cross-sectional data that provides the means for the construction of pseudo-panels that are representative, covering long time periods. A third benefit is that repeated cross-sectional data suffer less from the common panel data problem of non-response, which leads to missing values.

The pseudo-panel approach was first introduced by Deaton (1985). Deaton (1985) suggests tracking cohorts (stable groups of individuals sharing some common characteristics such as year of birth) and estimating relationships based on cohort



means rather than individual observations. Deaton's approach for estimating a fixed effect model using cohort means as observations was extended to nonlinear and dynamic models by Moffit (1993) and Collado (1997) while alternative types of asymptotics was discussed by McKenzie (2004).

### Data and Sample

Our pseudo-panel approach is based on the construction of stable cohorts defined by gender and generation (i.e. year of birth). Specifically, the gender characteristic consisted of a male cohort and a female cohort and the generation characteristic consisted of 31 cohorts with each cohort representing a two-year span. The first generation cohort contains individuals aged between 18 and 19 years old in 2008 (and therefore born in period (1990-1991)). In 2009 this cohort will be aged between 19 and 20 and in 2010 the age of this cohort will range from 20 to 21. Other cohorts are constructed by considering all individuals aged 20-21 in 2008, those aged 22-23 in 2008 and so on. In this way we construct a series of means of the variables reported in Table 1 considering those individuals who are members of the same birth and gender cohort from 2008 to 2016. Our choice of cohorts (2 gender cohorts and 31 generation cohorts) gives a balanced pseudo-panel of 62 cohorts. Repeated over the nine years (2008-2016), there was a potential of 558 cells of cohort mean data.

### Empirical Identification

Following Deaton (1985), we construct age and gender cohorts in order to estimate a fixed effects model from repeated cross-sectional data. After having aggregated the individuals into cohorts and computed averages for each cohort, we can specify the following model:

$$\overline{\text{GHZ}}_{ct} = \bar{a}_{ct} + \beta_1 \bar{Z}_{ct} + \beta_2 \log(\overline{\text{income}})_{ct} + \text{MoU}_t + \bar{\mu}_c + \varepsilon_{ct} \quad (1)$$

where,  $c = 1, \dots, C$ ,  $t = 1, \dots, T$

$\overline{\text{GHZ}}_{ct}$  : is the average value of all observed self-reported health status levels for the unemployed coded from very good to very bad in cohort  $c$  and time  $t$

$\log(\overline{\text{income}})_{ct}$  : denotes the average logarithm of household income

$\bar{Z}_{ct}$  : is a vector of average household's living conditions, socio-economic and demographic factors values

$\text{MoU}_t$  : is a time-specific vector of indicators showing whether we are during a period with adopted austerity measures due to the economic crisis or not

$\bar{\mu}_c$  : controls for individuals effects

$\varepsilon_{ct}$  : expresses the error term which we assume to be iid

### Empirical results

To examine the trend of some of the most important determinants of health during the latest economic crisis as well as to investigate the impact of the crisis and the family support on the health of Greece's people, three different models were used. First of all, a binary dummy for the self-rated health status was regressed on a number of factors. Therefore, as our dependent variable is dichotomous measure of health status, we employ logistic analysis (logit). However, for the purposes of the present study, we approach our dependent variable as an ordinal variable as well, and in this case we employ ordered logistic analysis (ologit). Finally, a pseudo-panel was also conducted in order to compare the results of the logit analysis with those of the pseudo-panel approach.

For analysis purposes, all used variables were transformed into dummy-variables or categorical variables apart from income that we have used its logarithm. The included explanatory variables in our model are: age, gender, education, marital status, skills-occupational status, dwelling problems, ability to keep home warm, ability to make ends meet, logarithm of gross income, family support and MoU (signing of Memorandum of Understanding). In the pseudo-panel approach we include the mean values of the above mentioned variables.

We measure the model's goodness of fit using McFadden's pseudo R-squared (with higher values indicating in general a better fit) and a chi-square Wald test of all

coefficients. The latter rejects the null hypothesis that the dependent and independent variables are not related, if the chi-square is of a significant value. As can be seen from the tables 4 (logit analysis) and 5 (ologit analysis), all alternative specifications are highly significant in this respect. We report marginal effects and robust standard errors (clustered by household) to deal with possible heteroskedasticity.

## 4. Presentation of Results

### 4.1. Results for the binary dependent variable (GH2) – logit model

The table 4 presents the results for the logit analysis, where our dependent variable *GH* (general health status of the unemployed) takes two values (1: for good health, 0: for bad health). In columns (1) and (3) we report the results from the regressions including only the standard set of explanatory variables (age, gender, education, marital status, skills-occupational status, dwelling problems, ability to keep home warm, ability to make ends meet), which were previously found to impact health status, but the difference is on the income variable which in column (1) we regress the logarithm of the total gross family income whilst, in column (3) we regress the variable *family support* (in terms of family income) to draw results for those who are below the lower end of income scale (threshold1= 8.000 € (annually)) - as we have defined it in our model- and therefore, for those that are mostly in need of family support. Therefore, given the type of income variable that we have used in the regression, in columns (2) and (4) respectively, we augment our empirical model by adding the variable of interest, *MoU*, in order to capture the impact of the implementation of austerity measures in Greece on the health status.<sup>7</sup>

[Insert Table 4]

Some interesting outcomes, related to the demographics, socio-economic variables and living conditions, emerge from Table 4<sup>8</sup>. We note that as we grow older, the individuals are more likely to be in worse health levels relative to the reference group which is individuals aged (17-29) years old. Therefore, the *negative relationship between ageing and health status* is strongly verified by the findings,

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<sup>7</sup> After the year 2010 we have defined as a period in which Greece has adopted austerity measures.

<sup>8</sup> Panel A shows the marginal effects ( $dy/dx$ , for factor levels is the discrete change from the base level) of a multivariate logit regression, with general self-rated health (GH2) as the dependent variable.

especially for those aged 65+ (-0.394 in  $p < 0.001$  with logarithm of income / -0.398 in  $p < 0.001$  with family support). However, when controlled the period with or not restricted fiscal policy, these negative odds are increasing apart from the odds of the aged 65+ that (albeit negative) are decreasing during a period with austerity measures (-0.390 / -0.395). As for *gender*, in all specifications, we did not manage to find a statistically significant result. Furthermore, the results strongly support the positive relationship between *education* and health. As for the *marital status*, the results indicate that both never married and separated/ widowed/ divorced respondents face decreasing odds of exhibiting better health outcomes compared to married individuals. The statistical significance for *skills* is rather weak as the corresponding coefficient is negative and significant only for the low skilled blue collars respondents and the high skilled blue collars respondents. Regarding the living conditions, individuals that encounter *dwelling problems* are more likely to exhibit lower health scores compared to those who do not. Moreover, those able to keep their *homes warm* and those able to *make ends meet* face increasing odds of exhibiting better health outcomes relative to those who do not. It is worth mentioning that when we are in a memorandum period these odds are even bigger. As for the impact of income on the health of Greece's population, when we use the *logarithm of income* (see columns (1), (2)), we detect a positive statistical significant relationship between income and health even when controlled for the crisis (which implies that more income in hard times benefits health). On the other hand, when we use the *family support* in our regressions and controlled for the memorandum period we note an adverse statistical significant relationship between family support and health. This means that, the families with lower income are less able to support their family members and thereby, the individuals that belong to poor families are more likely to have impaired health (in comparison to those that are part of richer families). Finally, concerning the variable Self-defined socioeconomic status as can be seen in the Table 4, all the categories are found to have impaired health compared to those that are high-skilled white collars.

We now turn to the variable of interest, *MoU*. In order to investigate the impact of the recent crisis on the health we use the variable *MoU (as index of the economic crisis)* and we notice a positive and statistically significant relationship between health and the existence of austerity measures (due to the latest economic crisis), implying that when we undergoing a year with implemented austerity measures (in our study a year

with austerity measures and therefore a year in economic crisis, it is a period from 2010 and after) the Greek population is more likely to be in a good state of health.

The positive impact of the economic crisis (implying the existence of strict fiscal austerity) on health of Greece's people could be attributed in the healthier lifestyles that people tend to adopt during hard times. According to scientific findings, recessions tend to reduce exposures to certain risk agents, as people have less disposable income to spend on alcohol or tobacco and lower affordability of transport may encourage people to cycling or walking (Ruhm, 2005). A recent review (Karanikolos, Heino, McKee, Stuckler, & Legido-Quigley, 2016) about the effects of the 2008 global financial crisis in high-income OECD countries found that this crisis affected negatively the mental health, including suicides, and to some extent the contagious or not diseases as well as the access to health care. At the same time, health risk behaviors (such as drinking, smoking) appeared to decline during the crisis but this was not the case for all. Moreover, some nutritional improvements may occur, as during crises people tend to avoid eating out and they prefer cooking at home<sup>9</sup> (Ruhm C. , 2000). In addition, the unemployed have plenty of free time in order to rest and exercise, resulting therefore in better health. Finally, we could simply expect that people (due to the lack of money) start to take care of their health to a greater extent in order to avoid getting sick easily. In this way, they will be able to save money for covering other basic needs instead of spending this money on a health specialist or on medication.

Another explanation could be the social cohesion. In difficult times, people (especially the vulnerable groups) in some communities are able to bond together and help each other more, resulting in better conditions for health (Kaplan, 2012). In light of this, the social support as well may protect people from harm, resulting thus in higher health scores. In the case of Greece, probably, the widespread form of horizontal solidarity and the existence of social and health structures might have absorbed a large part of these adverse effects on health, i.e. the public health system has absorbed the shocks of the crisis, paying extra attention to vulnerable groups of

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<sup>9</sup> (Ruhm C. , Macroeconomic conditions, health and government policy. In: Schoeni R, House JS, Kaplan GA, Pollack H, editors. Making Americans healthier: Social and economic policy as health policy, 2008) ; (Ruhm C. , Macroeconomic conditions, health and mortality. In: Jones A, editor. Elgar Companion to Health Economics, 2006).

people<sup>10</sup>. Social benefits and social transfers (i.e. social assistance), family allowances, unemployment and sickness benefits, disability allowances, educational benefits and pensions, may significantly reduce the poverty rate and therefore may ensure that all people have access to “health”. In light of this, in a report of Michael Marmot, it is highlighted the importance of investments in a variety of social policies that eventually benefit health (Marmot M. , Fair society, healthy lives., 2010).

Another explanation could be the fact that some people may have had money to pay for health services (“black money”), so, in spite of the crisis ‘s outbreak, they had the means to keep themselves healthy.

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<sup>10</sup> (Kyriopoulos & Tsiantou, 2010)

## **4.2. Results for the ordinal dependent variable (GH)-ologit model**

The results from the ordinal logit analysis are presented in the Table 5. As can be seen, the estimated coefficients for all variables are quite the same but the magnitude of the effect is now quite higher for the majority of the variables. As you grow older, if you are separated/widowed/divorced, if you are low/high skilled blue collar, if you face dwelling problems, if you are employee or self-employed part time or unemployed or retired or student and if you are part of the lowest income scale (low family support), all may have a negative impact on the health of unemployed Greek people. On the other hand, education, the ability to make ends meet and to keep home warm, being never married, more income and the adoption of strict fiscal austerity, all may affect health of the unemployed in a positive way.

[Insert Table 5]

## **4.3. Results for the pseudo-panel approach**

The Table 6 presents the results for the pseudo-panel analysis, where our dependent variable is the average value of the GH2 (general health status of Greeks). As can be seen from the Table 6, we draw statistical significant results only for the variables: marital status, ability to make ends meet, logarithm of gross income, self-defined economic status and MoU.

[Insert Table 6]

More specifically, the marital status and the self-defined economic status are associated with lower levels of general health of Greece's people. The logarithm of the household income is associated with higher levels of health outcomes (in line with the findings from the logit analysis). Concerning the adoption of strict fiscal austerity (MoU), the pseudo-panel analysis indicates a significant negative impact of the existence of austerity measures on the health status of Greece's people while the pooled cross-sectional analysis supports a significant positive relationship between health and strict fiscal austerity (due to the outbreak of the recent economic crisis in Greece). This contradictory outcome may be explained partly by the literature and partly by the use of different methods of estimation.

Concerning the recent 2008 global crisis, evidence suggests that the impact of the crisis on health was greatest in countries that suffered protracted austere programs or the hardest hit by the latest crisis (Karanikolos, Heino, McKee, Stuckler, & Legido-Quigley, 2016). Many countries (such as Greece, Spain, and Portugal) adopted strict fiscal policies during this crisis resulting in restricted access to health care (Karanikolos, et al., 2013). In particular, in Greece after the passage of new austerity measures in June 2011<sup>11</sup>, noted unprecedented suicides rates especially among males<sup>12</sup>. However, Iceland rejected austerity measures through a popular vote and the financial crisis seems to have had few or no discernible effects on health (Karanikolos, et al., 2013).

On the other hand, generally speaking, the use of the pseudo-panel approaches is most useful for exploring aggregate data. Pseudo-panel approach makes possible to follow the same individuals over time - to be more specific, to follow “cohorts” with some common characteristics- and therefore to control for time invariant characteristics (such as gender, year of birth) and to account for intercept heterogeneity. Therefore, the results of the pseudo-panel analysis might be more robust, and we should take only these into consideration.

#### **4.4. LINEAR PROBABILITY MODEL (LPM)**

To test the results of the logit model, we also run a Linear Probability Model (LPM) using least squares. As can be seen, the results from the LPM are in line with those of the logit model, but the problem is that the LPM assumes linearity, and therefore it predicts probabilities outside [0,1]. Thus, given the binary dependent variable in our model, it is more appropriate to use the logit analysis.

However, using the LPM we are now able to compare the linear OLS (from the logit model) with the linear pseudo-panel approach, and we note again the difference in the direction of the effect of the MoU on the general health<sup>13</sup>.

[Insert Table 7]

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<sup>11</sup> “The impact of crisis reached its peak in 2011. The proportion of the population in Greece living under the poverty threshold reached the number of 2.6 million (about 33% of the population) in 2011” (Madianos, Alexiou, Patelakis, & Economou, 2014)

<sup>12</sup> reports a 2015 British Medical Journal study (<http://www.counterpunch.org/2015/07/28/effect-of-greeces-economic-crisis-on-public-health/> )

<sup>13</sup> The pseudo-panel approach indicates a negative impact of the adoption of austerity measures on the health, while the logit approach indicates a positive effect.



## 5. Concluding remarks – Discussion

This paper investigates the impact of economic crisis on the health status in the case of Greece using data from the SILC dataset. Except the investigation of the impact of the economic crisis on health Greece's people, special emphasis is given on the role of the family support as determinant of health. The empirical research is based on a series of logit models and on to a pseudo-panel model. First, using the logit model, we obtain statistically significant results for the majority of the demographic/ socio-economic and living conditions factors. Specifically, higher level of education, ability to keep home warm and to make ends meet and more income are positively associated with the self-rated health of the Greeks. On the other hand, growing older, being separated/widowed/divorced or never married, being high/low skilled blue collar, facing dwelling problems, being unemployed, retired, student, self-employed par-time and being part of the lowest income scale (annually family income < 8.000) – low family support may have adverse effects on health. Second, we add a variable to control for the adoption of austerity measures as a result of the recent economic crisis, and we found that in spite of the adoption of strict austerity measures in Greece, the people are more likely to exhibit good health. However, when using the pseudo-panel approach with Fixed Effects we take a negative impact of the implementation of austerity measures on the health of the Greek population.

Generally speaking, the results of our study are in line with the findings of previous studies. As expected, our findings indicate that income and high education are strongly linked with better self-rated health. These two variables characterize mainly the socio-economic status of the population and have been related to health inequalities among people of different socio-economic status (Kennedy, Kawachi, & Glass, 1998) ; (Molarius, Berglund, & Eriksson, 2006). As for age, our findings are supported by the literature as well, showing that as we grow older we are more likely to exhibit bad health. Furthermore, high-quality living conditions and higher skills are also consistent with the existed evidence (Ludwig, 2012) ; (Thomson, Thomas, Sellstrom, & Petticrew, 2013). As for marital status, we found that never married and separated/widowed/divorced are less likely to report good health. Finally, our findings suggest that health status improves during the latest economic crisis, in accordance with some studies (Bezruchka, 2009) ; (Gerdtham & Ruhm, 2002). However, when we adopt the pseudo-panel approach we find a robust negative impact of the

implemented austerity measures as a result of the recent economic crisis on the self-rated health in Greece, implying that the selection of the appropriate estimation method is of primary importance. The controversial effects of the economic crisis on health could be explained via the type of the methodology and the data that we use as well as via the different and interactive pathways through which an economic crisis may affect health.

The literature suggests that the impact of the economic crisis on health outcomes is mixed. However, the adverse influences that recessions have on health depend on (Stuckler, Basu, & McKee, 2010):

- how governments respond to crises - variations in social spending (e.g. countries like Sweden and Finland that respond to recession by funding “active labor market programs” can neutralize the effect of recession on mortality in their countries) - variations in tax and transfer policies
- the extent to which people are protected from harm (availability of social support, social cohesion)
- the rapidity of economic change and the depth of economic fluctuations
- the population group you belong (e.g. the effects of economic crises are greater on the poor, immigrants, members of racial minorities etc.)

Therefore, possible explanations for the findings of our study that indicate a positive relationship between Greece’s people and self-rated health could be: the adoption of healthier behaviors (as people have more time to rest and to exercise) and the reduction of risky behaviors such as, eating unhealthy foods, smoking and alcohol (as people have less money), the existence of a strong social welfare system especially for the vulnerable groups, the social cohesion, the possible existence of “black money” that enables people to have access on health services and medication and the implementation of necessary structural changes-reforms (that had been postponed for many years prior to crisis) in the National Health System (making it thus more efficient and effective) that eventually act in the best interest of population health.

However, depending on the methodology used, this relationship between crisis and health may also become negative. In general, a pseudo-panel analysis makes possible to control for time invariant characteristics (such as gender and year of birth)

and to account for intercept heterogeneity. Thus, the pseudo-panel approach enables us to introduce in our model the individual's past taking thereby more robust results compared to the results from the logit analysis.

To conclude, healthier people mean healthier economies. Therefore, action must be taken in order to ensure health for all as well as in order to limit the socioeconomic inequalities and consequently the health disparities. Especially, during hard times, where we face more limitations and barriers, communities, governments and people all over the world must collaborate in order to achieve universal health coverage (if possible).

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## APPENDIX - TABLES

**Table 1: Description of variables**

<b>A. Dependent variables</b>	
GH	Categorical-ordinal variable grouped in five categories: (i) "very good health" (reference group), (ii) "good health", (iii) "fair health", (iv) "bad health", (v) "very bad health".
GH2	Dummy variable equal to one if the health status is very good and good, and zero if the health status is fair, bad and very bad.
<b>B.Explanatory Variables</b>	
Age	Dummy variable accounting for the age of the household's members. Age is grouped in four bands, namely (i) 17-29 (reference group), (ii) 30-44, (iii) 45-64, (iv) 65+.
Gender	Dummy variable equal to one if the household's member is male and zero if the household's member is female.
Education	Dummy variable accounting for the household's member highest level of education was successfully completed. The variable Education is grouped in 3 categories, namely (i) primary education ( $\leq 9$ years), (ii) secondary education ( $> 9$ years & $\leq 12$ years), (iii) tertiary education ( $> 12$ years).
Marital Status	Dummy variable accounting for the marital status of the household's member. Marital Status is grouped in three categories, namely (i) married (reference group), (ii) never married, (iii) separated/widowed/divorced.
Skills	Dummy variable accounting for the occupational classification (according to European Foundation). This variable is grouped in four categories, namely (i) High Skilled white collar, (ii) Low skilled white collar, (iii) High skilled blue collar, (iv) Low skilled blue collar.
Dwelling Problems	Dummy accounting for the condition of the dwelling. The variable takes the value one if the dwelling has a problem with a leaking roof and/or damp ceilings etc. and the value zero

otherwise (the dwelling has not a problem).

Warm Home

Dummy accounting for the affordability (ability to pay) to keep the home adequately warm, regardless of whether the household actually needs to keep it adequately warm. The variable takes the value one if the household's response about the affordability to keep home warm is positive, and zero if the response is negative.

Ability to make ends meet

Dummy assessing the respondent feeling about the level of difficulty experienced by the household in making ends meet. This dummy is equal to one if household is easily able to make ends meet and, zero if the household finds difficulty in making ends meet.

ln (Gross Income)

Logarithm of the total gross household income.

Family support

We approach the concept of family support in terms of income, meaning that the higher the family income, the bigger the family support for all family members. Thus, family support is a dummy variable taking the value one if a person is on the first income scale (0-7999) which implies low family support and, zero if we are above this income scale (8000+) implying high family support.

SD\_EconomicStatus (Self-defined current economic status)

Categorical variable accounting for the person's own perception of their main activity at present. SD\_EconomicStatus is grouped in five categories, namely (i) employee or self-employed working full time, (ii) employee or self-employed working part-time, (iii) unemployed, (iv) in retirement (v) student, disabled, military, domestic tasks, other inactive person.

**C.Control variables**

MoU

Dummy variable that takes the value one if we are in a year that Greece has adopted strict austerity measures (i.e. 2010 - 2016) and zero if we are on a year like 2008 or 2009 (where there is no implementation of austerity measures).

**Table 2: Descriptive Statistics**

<b>Variable</b>	<b>Obs</b>	<b>Mean</b>	<b>Std. Dev.</b>	<b>Min</b>	<b>Max</b>
GH	168,784	2.0017	1.111192	1	5
GH2	168,784	0.7111515	0.4532287	0	1
Age	168,784	2.771.181	1.033.399	1	4
Gender	168,784	0.4818999	0.4996738	0	1
Education	160,538	1.917.951	0.8345181	1	3
Marital status	168,784	1.523.284	0.7307059	1	3
Skills	134,696	2.423.465	1.003.439	1	4
Dwelling problems	168,784	0.1566855	0.363505	0	1
Warm home	168,784	0.7451654	0.4357695	0	1
Ability to make ends meet	168,784	0.1007382	0.3009827	0	1
ln(gross income)	168,026	986.754	0.7925716	4.017.464	144.033
Family support	168,784	0.1154849	0.3196071	0	1
Self-defined economic status	168,784	2.971.846	1.592.398	1	5
MoU	168,784	0.8271874	0.3780863	0	1

**Table 3. Frequencies of the sample drawn from the SILC (2008-2016)**

		<b>Frequency</b>	<b>Percent (%)</b>	<b>Cumulative percent</b>
<b>GH2</b>	Fair, bad and very bad health	48,753	28.88	28.88
	Good and very good health	120,031	71.12	100
	Total	168,784	100	
<b>GH</b>	Very good health	73,475	43.53	43.53
	Good health	46,556	27.58	71.12
	Fair health	29,319	17.37	88.49
	Bad health	13,859	8.21	96.7
	Very bad health	5,575	3.3	100
	Total	168,784	100	
<b>Age</b>	17-29	25,311	15	15
	30-44	37,919	22.47	37.46
	45-64	55,634	32.96	70.42
	65+	49,920	29.58	100
	Total	168,784	100	
<b>Gender</b>	Female	87,447	51.81	51.81
	Male	81,337	48.19	100
	Total	168,784	100	
<b>Education</b>	Primary education	63,027	39.26	39.26
	Secondary education	47,656	29.69	68.95
	Tertiary education	49,855	31.05	100
	Total	160,538	100	
<b>Marital status</b>	Married	104,469	61.9	61.9
	Never married	40,308	23.88	85.78
	Separated/widowed/divorced	24,007	14.22	100
	Total	168,784	100	
<b>Skills</b>	High Skilled white collar	30,136	22.37	22.37
	Low Skilled white collar	38,618	28.67	51.04

	High Skilled blue collar	44,709	33.19	84.24
	Low Skilled blue scollar	21,233	15.76	100
	Total	134,696	100	
<b>Dwelling problems</b>	No	142,338	84.33	84.33
	Yes	26,446	15.67	100
	Total	168,784	100	
<b>Warm home</b>	No	43,012	25.48	25.48
	Yes	125,772	74.52	100
	Total	168,784	100	
<b>Ability to make ends meet</b>	No	151,781	89.93	89.93
	Yes	17,003	10.07	100
	Total	168,784	100	
<b>Family support</b>	income>8.000	149,292	88.45	88.45
	income<8000	19,492	11.55	100
	Total	168,784	100	

**Table 4: Logit model for the binary GH=1= Good health of the whole population**

	(1)	(2)	(3)	(4)
<i>Panel A: Marginal Effects</i>				
Age (30-44)	-0.065*** (0.003)	-0.066*** (0.003)	-0.066*** (0.003)	-0.067*** (0.003)
Age (45-64)	-0.210*** (0.003)	-0.212*** (0.003)	-0.210*** (0.003)	-0.211*** (0.003)
Age (65+)	-0.394*** (0.005)	-0.390*** (0.005)	-0.398*** (0.005)	-0.395*** (0.005)
Gender (Male=1)	-0.002 (0.002)	-0.001 (0.002)	-0.002 (0.002)	-0.002 (0.002)
Secondary education	0.070*** (0.003)	0.067*** (0.003)	0.073*** (0.003)	0.071*** (0.003)
Tertiary education	0.072*** (0.003)	0.069*** (0.003)	0.077*** (0.003)	0.075*** (0.003)
Marital status (Never married)	-0.011*** (0.004)	-0.012*** (0.004)	-0.016*** (0.004)	-0.017*** (0.004)
Marital status (Separated/widowed/divorced)	-0.073*** (0.003)	-0.072*** (0.003)	-0.079*** (0.003)	-0.078*** (0.003)
Skills (Low Skilled white collar)	-0.003 (0.003)	-0.004 (0.003)	-0.007* (0.003)	-0.008** (0.003)
Skills (High Skilled blue collar)	-0.031*** (0.004)	-0.030*** (0.004)	-0.038*** (0.004)	-0.038*** (0.004)
Skills (Low Skilled blue scollar)	-0.025*** (0.004)	-0.025*** (0.004)	-0.030*** (0.004)	-0.031*** (0.004)
Dwelling problems (Yes)	-0.078*** (0.003)	-0.076*** (0.003)	-0.079*** (0.003)	-0.077*** (0.003)
Warm home (Yes)	0.042*** (0.003)	0.044*** (0.003)	0.047*** (0.003)	0.049*** (0.003)
Ability to make ends meet (Yes)	0.039*** (0.004)	0.042*** (0.004)	0.048*** (0.003)	0.051*** (0.003)

ln(gross income)	0.022*** (0.002)	0.025*** (0.002)		
Employee OR self-employed part-time	-0.036*** (0.006)	-0.036*** (0.006)	-0.040*** (0.006)	-0.040*** (0.006)
Unemployed	-0.089*** (0.004)	-0.084*** (0.004)	-0.096*** (0.004)	-0.093*** (0.004)
Retired	-0.159*** (0.004)	-0.167*** (0.004)	-0.163*** (0.004)	-0.171*** (0.004)
Other (student, domestic tasks ..)	-0.196*** (0.005)	-0.196*** (0.005)	-0.202*** (0.005)	-0.203*** (0.005)
MoU (year>=2010)		0.032*** (0.003)		0.028*** (0.003)
Family Support (income<8000, low support)			-0.021*** (0.004)	-0.024*** (0.004)
obs	127,696	127,696	128,174	128,174
Pseudo R2	0.2852	0.2859	0.2838	0.2844
Wald-test	42714.24	42831.16	42653.65	42743.78
p-value	0	0	0	0

Notes: **Panel A** shows the marginal effects (dy/dx, for factor levels is the discrete change from the base level) of a multivariate logit regression, with general self-rated health (GH2) as the dependent variable. All variables are defined in Table 1. Standard errors (below coefficients) are clustered at the household level. The overall significance of each model is assessed using McFadden's pseudo R<sup>2</sup> and the Wald-test.

\*, \*\*, \*\*\* denote statistical significance at the 10%, 5% and 1% level, respectively.

**Table 5: Ordered logit model for the ordinal GH=1= Good health of the whole population**

	(1)	(2)	(3)	(4)
<i>Panel A: Marginal Effects</i>				
Age (30-44)	-0.184*** (0.005)	-0.185*** (0.005)	-0.188*** (0.005)	-0.189*** (0.005)
Age (45-64)	-0.443*** (0.005)	-0.444*** (0.005)	-0.445*** (0.005)	-0.446*** (0.005)
Age (65+)	-0.622*** (0.006)	-0.621*** (0.006)	-0.626*** (0.006)	-0.626*** (0.006)
Gender (Male=1)	-0.002 (0.002)	-0.002 (0.002)	-0.003 (0.002)	-0.003 (0.002)
Secondary education	0.069*** (0.003)	0.068*** (0.003)	0.072*** (0.003)	0.072*** (0.003)
Tertiary education	0.071*** (0.003)	0.070*** (0.003)	0.077*** (0.003)	0.076*** (0.003)
Marital status (Never married)	0.027*** (0.003)	0.027*** (0.003)	0.023*** (0.003)	0.022*** (0.003)
Marital status (Separated/widowed/divorced)	-0.065*** (0.003)	-0.065*** (0.003)	-0.071*** (0.003)	-0.070*** (0.003)
Skills (Low Skilled white collar)	0 (0.003)	-0.001 (0.003)	-0.004 (0.003)	-0.005 (0.003)
Skills (High Skilled blue collar)	-0.020*** (0.003)	-0.019*** (0.003)	-0.027*** (0.003)	-0.027*** (0.003)
Skills (Low Skilled blue scollar)	-0.025*** (0.003)	-0.025*** (0.003)	-0.030*** (0.003)	-0.031*** (0.003)
Dwelling problems (Yes)	-0.079*** (0.002)	-0.078*** (0.002)	-0.079*** (0.002)	-0.079*** (0.002)
Warm home (Yes)	0.039*** (0.002)	0.040*** (0.002)	0.045*** (0.002)	0.046*** (0.002)
Ability to make ends meet (Yes)	0.040***	0.042***	0.051***	0.052***



	(0.003)	(0.003)	(0.003)	(0.003)
ln(gross income)	0.023***	0.025***		
	(0.001)	(0.001)		
Employee OR self-employed part-time	-0.032***	-0.032***	-0.038***	-0.038***
	(0.005)	(0.005)	(0.005)	(0.005)
Unemployed	-0.077***	-0.076***	-0.087***	-0.086***
	(0.003)	(0.004)	(0.003)	(0.003)
Retired	-0.164***	-0.168***	-0.170***	-0.172***
	(0.003)	(0.004)	(0.003)	(0.004)
Other (student, domestic tasks ..)	-0.184***	-0.184***	-0.191***	-0.191***
	(0.004)	(0.004)	(0.004)	(0.004)
MoU (year>=2010)		0.014***		0.010***
		(0.003)		(0.003)
Family Support (income<8000, low support)			-0.022***	-0.023***
			(0.003)	(0.003)
obs	127,696	127,696	128,174	128,174
Pseudo R2	0.1910	0.1911	0.1901	0.1901
Wald-test	64267.8	64297.43	64192.45	64207.64
p-value	0	0	0	0

Notes: **Panel A** shows the marginal effects (dy/dx, for factor levels is the discrete change from the base level) of a multivariate logit regression, with general self-rated health (GH2) as the dependent variable. All variables are defined in Table 1. Standard errors (below coefficients) are clustered at the household level. The overall significance of each model is assessed using McFadden's pseudo R<sup>2</sup> and the Wald-test.

\*, \*\*, \*\*\* denote statistical significance at the 10%, 5% and 1% level, respectively.

**Table 6: Pseudo-panel Approach –binary GH2**

	(1)
Education	0.022 (0.017)
Marital status	-0.144*** (0.017)
Skills	-0.005 (0.020)
Dwelling problems	0.023 (0.053)
Warm home	0.016 (0.040)
Ability to make ends meet	0.176*** (0.048)
ln(gross income)	0.045*** (0.017)
Self-defined economic status	-0.022*** (0.004)
MoU	-0.012*** (0.004)
Constant	0.482*** (0.170)
obs	558
F(9,487)	84.25
Prob > F	0.0000
R-squared : within	0.6089
between	0.4207
overall	0.4009

**Table 7: Linear Probability Model (LPM) - whole population**

	GH2
Age (30-44)	-0.051*** (0.005)
Age (45-64)	-0.156*** (0.005)
Age (65+)	-0.392*** (0.006)
Gender (Male=1)	0.006*** (0.002)
Secondary education	0.088*** (0.003)
Tertiary education	0.082*** (0.003)
Marital status (Never married)	-0.017*** (0.003)
Marital status (Separated/widowed/divorced)	-0.100*** (0.003)
Skills (Low Skilled white collar)	0.001 (0.003)
Skills (High Skilled blue collar)	-0.034*** (0.004)
Skills (Low Skilled blue scollar)	-0.024*** (0.004)
Dwelling problems (Yes)	-0.079*** (0.003)
Warm home (Yes)	0.046*** (0.003)
Ability to make ends meet (Yes)	0.041***

	(0.004)
ln(gross income)	0.025***
	(0.002)
Employee OR self-employed part-time	-0.014***
	(0.005)
Unemployed	-0.057***
	(0.003)
Retired	-0.167***
	(0.004)
Other (student, domestic tasks ..)	-0.176***
	(0.004)
MoU (year>=2010)	0.033***
	(0.003)
Constant	0.655***
	(0.018)
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obs	127,696
R-squared	0.3112
Adj R-squared	0.3111
F-test	2884.35
Prob > F	0.0000
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