Master Thesis

The effects of the financial crisis and the business cycle on the health of the European population.

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Date:	September 2016
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1. Abstract

This research examines whether the business cycle and the financial crisis of 2008 have had an effect on the health of European residents aged 50 and above. Individual-level data have been used to analyze the effects of the unemployment rate on both mental and physical health. Furthermore, the question has been examined whether individuals' self-perceived health differs with unemployment rate and if certain lifestyle variables, such as tobacco consumption, alcohol consumption and BMI level are related to it. The mental health state is reflected by the eurod scale and the proxy for physical health is the number of chronic diseases. Multiple regression analyses such as logit, probit, OLS, random- and fixed effects regression models are applied and combined to find sustained conclusions. Crisis years (2008-2012) have been separated from non-crisis years to isolate and study the crisis in more detail. The results of this study indicate a negative relation between unemployment rate and mental health. People encounter higher levels on the eurod scale and are more depressed at times of a high unemployment rate. For physical health, there is a more ambiguous relation, but overall the relation is also negative, indicating worse physical health states when unemployment rates are high.

The self-perceived health analysis confirms these outcomes. It states that economic downturn is associated with worse self-perceived health of individuals. Besides, when unemployment rates are high, people reduce tobacco and excessive alcohol consumption, but BMI levels will increase.

2. Introduction

The last financial crisis, that started in 2008 and ended around 2012[1], had a huge impact on countries worldwide and affected many people (Roberts, 2009). Compared to the peak of the economic upturn in 2007, the world economy decreased with approximately 6% during the crisis. For example, the GDP of the Organisation for Economic Cooperation and Development (OECD) countries decreased with approximately 6.5%. The average decrease of the GDP worldwide was 4.5%. Of all EU countries, only in Poland the GDP did not decrease (Karanikolos, 2013). The main cause of the financial crisis was the US mortgage-related securities, which were woven in the world economy and suddenly decreased in value and

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[1] In this paper '2008-2012 financial crisis' is also referred to as 'the financial crisis' or 'the crisis'.

collapsed. As a consequence, many large financial institutions, stock markets and housing markets in the USA (and the rest of the world) were affected. According to Roberts (2009), the total wealth of those markets around the world fell with almost 11 trillion US dollars. This caused a chain reaction that, in the end, affected almost the whole world. The economic situation of many countries deteriorated and they ended up in a recession. This period is worldwide known as The Great Recession (Kotz, 2009). This recession caused a steep increase in unemployment rates in many countries. For example, in European countries such as Portugal, Bulgaria and Slovakia, unemployment rates increased by 3%. In Denmark, Hungary and Greece by 5%, and in Spain and Estonia the increase was around 12%. In Latvia and Lithuania, unemployment increased by 13% and 14% respectively (Karanikolos, 2013).

History has shown that the economic situation of countries is not stable over time. Therefore, it is important to study the effects of economic up- and downturns in detail. According to Karanikolos et al (2013), the general health of a population varies with the economic situation of a country they live in. Ruhm (2015) also studied this topic and confirms the conclusion of Karanikolos et al (2013). He used mortality rate as a proxy for health and states that this rate is lower during a crisis: The general health of individuals increases during a financial crisis. Meanwhile, Junankar (1991) found an opposite relation between unemployment and health.

Much research about this topic is contradictory and the effects are thus not unambiguous. This means that more research is needed to clarify the effects of a financial crisis on health. Combining this with the magnitude and the severity of the crisis, increases the importance of investigating this topic. It raises the question to what extent the health of European people was affected by the economic crisis. Besides, most studies focus on population health and often use total mortality rate as a measurement of health. However, health is a broad concept which can be measured in many ways and therefore not be captured in one variable. As is explained in the next chapter, both mental and physical health are measured on an individual level. In this way, a better and wider display of health is established and better conclusions can be drawn. Also, self-perceived health is used in the analyses to provide information about how individuals feel. Besides, an insight in the relation between unhealthy lifestyles, such as smoking, drinking and BMI, and economic downturn is given. This is done because lifestyle and health are very closely related.

This all makes the study different and innovative. Most of the research about this topic is performed in the US and covers the general population. It is interesting to see if the conclusions of those studies are valid for Europe as well.

This study adds to the understanding of the relation between health in combination with the economic business cycle and the financial crisis. The business cycle will be represented by the unemployment rate. The health of European people will be divided in a mental- and a physical part. Mental health will be determined on the basis of the eurod scale and the proxy for physical health is the amount of chronic diseases individuals of the sample suffer. Then, multiple regression models are used to find a relation between the variables, and the role the financial crisis on the health of those residents is investigated. Also, self-perceived health of individuals during the crisis will be investigated. Finally, an insight in the relation between unhealthy lifestyles, such as smoking, drinking and BMI, and economic downturn is established.

The research questions which this thesis tries to answer are:

- *Does unemployment rate have an effect on BMI level, alcohol & tobacco consumption?*
- *Is there a relationship between the business cycle and the health of Europeans aged 50 and above and if so, what is that relation?*
- *Is the effect of unemployment rate on health of these Europeans different in the years of the financial crisis?*

The structure of this study is as follows, it starts with a literature review in which an overview of previous research is given. Thereafter, additional information about the economic crisis and its relation with health is given. The third section gives an explanation of the data, a description of the methodology, hypotheses and the regression models with its variables. A summary statistics of the data is provided as well and finally, in the last section, the results are discussed and a conclusion of the research is given. In this last part, advice is also proposed with respect to further research.

3. Literature review:

This section provides an overview of previous research in this field. Also, additional information with respect to the financial crisis is given.

The financial crisis:

As already mentioned in the introduction, the main cause of the financial crisis was US mortgage-related securities which were woven into the world economy. According to Kotz (2009), there are three important developments which are the ingredients for a systematic financial crisis.

Firstly, there is an increase in inequality in the society. Both in the capitalist process between wages and profits as well as in the whole society, including households. This process feeds the second development, which is the increasing amount of investments in speculative, high risk activities of large financial sectors. Those investments become woven and absorbed in the economy. This is often the result of unfair and unrestrained competition and financial deregulation (Kotz, 2009). Large financial institutions, such as banks or pension funds, preferably invest in all kinds of investment opportunities which may give the highest profits. Without any restraints or a lack of rules/supervision, those large financial institutions will invest in the more profit giving speculative and riskier activities such as subprime and alt-A mortgages intended for securitization, debt obligations and credit default swaps instead of the more traditional financial activities such as deposits, loans, bond issues and selling insurances. This causes the market for those traditional financial activities to decrease and the market for riskier investments to increase strongly and become more important. If those markets collapse, the investment banks will experience an enormous financial shock.

Thirdly, the previous two developments often cause a series of large asset bubbles to develop. The profits of the risky investments will rise relatively more than the wages, which results in a large and growing volume of riskier investable funds that most likely will exceed the available productive investment opportunities. This facilitates the growth of asset bubbles in for example the real estate market (Kotz, 2009). This is also what happened in the 2008 financial crisis. The asset bubble of the real estate market snapped and many houses came 'under water' (i.e. the mortgage is higher than the value of the house). The result was that the market for mortgages also snapped, causing a deficit of the financial flows of many banks. This was the basis for the crisis which started in 2008.

Reinhart and Rogoff (2009) also state that a financial crisis is characterized by three phases. Those phases deviate from those mentioned by Kotz (2009). According to Reinhart and Rogoff (2009), the first phase of a financial crisis is that the asset market collapse. Often, the housing market collapse and prices strongly decreases. The second phase is that the output of banks and companies will fall and as a result, people have to leave the company or companies

go bankrupt and the unemployment rate increases, which is likely to continue for a couple of years. In the third phase, the real value of government debts will rise uncontrollably, which causes the financial situation of the government and country to deteriorate (Reinhart and Rogoff, 2009).

Economic downturn and population health:

In previous research, a positive relation between economic downturn and population health was established. However, also negative relations, or no relations at all were found. An overview of the most important research with respect to economic up- and downturns (such as crises) and population health is given in the section below.

Cutler et al. (2002) state that there are four possible mechanisms through which a crisis can affect health:

Firstly, people could face a decrease in income. A crisis could harm the average monthly income of an individual, resulting in lower levels of consumption. This could force people to adapt their lifestyles which may harm their health. Especially, when on top of that, the prices of for example imported (necessity) goods does increase.

Secondly, a crisis could cause a deficit in the amount of public money. As a consequence, governments will spend less money on, among other things, healthcare. The result is that healthcare will become more expensive and people will lessen the use of medical care services.

Thirdly, it is possible that due to a financial crisis people other than the working population (e.g. elderly) will be forced to work, since the financial situation in their families has deteriorated. This may well have an impact on their health state.

Finally, a crisis could force voluntary caregivers to enter the labor market. This could chase up the costs of healthcare services which may result in a decrease in volume of health care services because costs are limited.

In Mexico the effects of the previous economic crisis (1995-1996) on health were studied by Cutler et al (2000). A difference-in-difference model indicated that the crisis of the mid 90's was very much associated with an increase in the mortality rate (i.e. a decrease in health) among vulnerable population groups, such as elderly and very young individuals. An overall increase of 5 to 7 percent was associated with the crisis if it is compared with the years just prior to the crisis (Cutler et al, 2000).

Stuckler et al. (2009) also tried to find out whether there is a relation between mortality and unemployment rate. They used data of 26 European Union countries between 1970 and 2007. They used a multivariate regression model and also according to them, a higher unemployment rate correlates positively with mortality, i.e. a higher unemployment rate results in a higher mortality. They concluded that an increase in the unemployment rate is associated with a rise in suicides and homicides. However, those findings were not significant and differ per country. According to them, a higher unemployment rate results in less deaths by traffic. Junikar (1991) confirms that there is a positive association between mortality rate and unemployment when controlled for geographic regions and social factors.

Snyder & Evans (2002) did a similar research, and found that the older group of the population (65+) experience a higher mortality rate compared to the lower aged population (<65).

On the other hand, Ruhm (2015) states that there is a strong inverse relationship between macro-economic conditions, such as unemployment rate, and the general health of a population. He analyzed state and country level data from the United States in the years between 1976 and 2013 with a fixed-effects regression model, and concludes that economic recessions could reduce stress due to work, and could increase sleep- and leisure time. Also, if people become unemployed, they often start with healthier food diets and reduce alcohol and tobacco consumption. This is because the income elasticity of alcohol and cigarettes is greater than one, i.e. luxury goods. This results in a healthier living style, which reduces overall mortality. And besides, the amount of people who drink & drive will decrease, resulting in less fatal traffic accidents.

Miller et al. (2009) elaborated on the research of Ruhm by doing a similar research, but with different age groups and cause of death. They added statistical extensions to the model and concluded two things. First, they found out that 'the primary causes of death contributing to cyclical mortality fluctuations among working-age adults are not typically associated with stress levels or health behaviors' (Miller et al., 2009). They found it unlikely that work or labor force status, or a change in health behavior are the main causes of the aggregate mortality changes across the economic cycle. Changes in the working age population mortality are mostly caused by motor vehicle accidents. The second conclusion is that, if focused on cause of death and age, conclusions can only be drawn if mortality patterns among elderly are known and understood. 96 Percent of the additional cardiac victims that are related to the business cycle occur in the age group of individuals aged 65 and older.

According to Stern (1983), unemployment is associated with unhealthy behavior. And therefore, smoking and drinking will increase with a higher unemployment. He states that this is due to the fact that unemployed individuals face more poverty and are exposed to the extra burden of being unemployed which induces higher level of stress compared to the labor force.

So, many research results in this field are contradictory. Most researchers conclude that a deterioration of the economy benefits the health of a population because it reduces stress, unhealthy lifestyles and fatal traffic accidents by increasing sleep- and leisure time. On the other hand, there is also evidence that indicates that the health of individuals does not benefit from a deterioration of the economy since it will increase poverty. Poverty will result in a change of the consumption pattern of individuals to the worse. When on top of that medical services will become more expensive it may harm the population. Likewise, suicides and homicides tend to increase when poverty increases.

4. Research methods

This chapter, describes the approach towards answering the central questions. This study is based on a quantitative research and conclusions are thus based on regression analyses and statistical evidence. In this chapter the data that is used is discussed and the descriptive statistics is provided. The explanation of the regression models and its variables follows thereafter and the subsequent subsection provides the hypotheses.

Data:

In this study, individual-level data are used from the Survey of Health, Aging, and Retirement in Europe database (SHARE; www.share-project.org). This database contains longitudinal information of more than 20.000 people aged 50 and above from many European countries. Different thematic modules with different subjects are available. Those thematic modules contain information about demographics, physical/mental health, employment, housing, consumption, and more. Five waves, which all stand for periods in time, are available. The first wave started in 2004/2005, the second wave in 2006/2007, the third wave, also called Sharelife, in 2008/2009, wave four in 2010/2011, and the fifth wave in 2013. Because in the

Sharelife wave, some important thematic modules with (health) variables are missing, all these waves, except for the Sharelife wave are used. The four waves are captured in one (panel) data set called the Easyshare database. This dataset forms the basis of this study. Furthermore, unemployment rates of European countries were used as extracted in a quarterly structure from the Eurostat database (EUROSTAT; http://ec.europa.eu/eurostat). According to Eurostat, unemployment rates are based on unemployed persons, which are *'persons aged 15-74 who were without work during the reference week, but who are currently available for work and were either actively seeking for work in the past four weeks or had already found a job to start within the next three months.'*

Summary statistics:

Table 1 provides an overview of all data used in this thesis. The total amount of observations is 145,351. This number of questionnaires was asked to 85,800 individuals. The number of unemployment rate observations which were successfully linked to questionnaires are 141,278. This is 97.2% of the total sample. Because not all information is available for every individual and not every individual completed the questionnaires in all waves, this panel dataset is unbalanced. According to the summary statistics, approximately 56 percent of the whole sample is female. The mean age of the whole sample is 65.86 years with a standard deviation of 10.37 years. Also, information about drinking, education, income, etc. is available. For example, information about smoking is available for 123,166 observations. It follows that the mean of smokers is approximately 0.188. The average number of chronic diseases individuals in the sample suffer, is 0.972. The average unemployment rate of all the European countries included is 8%, with a standard deviation of 4.1%. The unemployment rate during the crisis is 8.6%. The lowest unemployment rate measured in the sample is 2.6%. This is measured in the fourth quarter of 2008 in The Netherlands. It is quite surprising since this was in the year the crisis started. However, this is probably because the effects of the crisis were not yet (fully) felt in society. The highest unemployment rate measured is 26.9% in the first quarter of 2013 in Spain. The individual with the most chronic diseases in the sample suffers from nine chronic diseases.

Table 1 Descriptive statistics for the whole sample N=145,351	Observations	Mean	Std. deviation	Min	Max
EUROD	120141	2.425	2.262	0	12
CHRONIC_MOD	145182	.972	1.196	0	9
UNEMPLOYMENT	141278	0.080	0.041	0.026	0.269
CRISISUNEMPLOY-MENT	141278	0.086	0.038	0.026	0.226
AGE	145351	65.826	10.524	14.7	104.3
SMOKING	123166	0.188	0.390	0	1
BMI_MOD	84480	26.589	4.714	12.487	88.376
ISCED_R (EDUCATION)	141398	2.718	1.489	0	7
BR010_MOD (ALCOHOL)	122902	3.446	2.209	1	7
FEMALE	145351	.561	.496	0	1
MAR_STAT	122583	2.264	1.982	1	6
VERYPOOR	145351	.319	.466	0	1
POOR	145351	.171	.376	0	1
NORMAL	145351	.172	.377	0	1
RICH	145351	.085	.280	0	1
VERYRICH	145351	.169	.375	0	1

Dependent variables

The regression equations used in this study are shown in the next subsection. As can be seen, the dependent variable of the models is health. Health is a broad, complex variable to

measure. There is not a uniform health variable definition and it can therefore not be fully captured in one variable. Examples of health measurements can be mortality rate, hospitalizations, life expectancy, amount of diseases, etc. Most researchers apply an aggregate health measurement like mortality rate, or life expectancy. In this study however, health is taken on an individual level and it is divided in a mental part and a physical part. By doing so, both aspects of health are captured and taken into account. This amplifies the statistical conclusions, since unemployment could affect health in many ways. Besides, the effect may not be similar on every health aspect.

Stern (1983) and Ruhm (2015) both found a relation between unemployment rate and mental health, in particular stress and depression. Stern (1983) states that a crisis causes high unemployment rates and that the individuals who lose their job have to face the extra burden of being unemployed. Besides, the common wealth of a country decreases. This causes extra levels of stress and depression. Ruhm (2015) claimed that the relation between unemployment rate and stress is the other way around. He states that leisure time and time for sleeping increases if individuals lose their job. He concludes that this causes a reduction of stress and an increase in the mental health state.

The proxy for mental health in this thesis is the eurod index. This variable gives information about the depression state of the individual. It comes in the form of a score. It combines multiple independent mental health scores available in the Easyshare data into one variable. Those health scores are for example pessimism, suicidality, sleeping problems, enjoyment, etc. The eurod symptom scale ranges from zero to twelve. The higher the level on the scale, the higher the depression of the person. So, a very depressed person will score a high value on the scale.

The importance of taking physical health taken into account lies, according to Cutler et al (2002), in the fact that a crisis can increase prices of many (health care) services. This will result in a decrease in the use of medical (care) services. Individuals may postpone necessary doctor- and hospital visits because they are more or too expensive. This may harm the (physical) health state of individuals. The variable in this study which represents physical health, is the number of chronic diseases that respondents suffer. A doctor has to diagnose this chronic disease. The Easyshare variable includes 14 chronic diseases such as cardiovascular diseases, high blood pressure, high cholesterol, diabetes, lung diseases, Parkinson, etc. Both the number of chronic diseases and the eurod index are directly available in the Easyshare dataset.

The lifestyle regression analyses use excessive alcohol consumption, tobacco use and BMI level as dependent variables. According to Dee (2001) and Ruhm (2002) there is a relation

between alcohol consumption and unemployment rate. Besides, McGinnis and Foege (1993) state that almost half of all deaths in the United States are associated with alcohol, tobacco consumption and poor diets. In this way, a more specified analysis is done on the effects of unemployment on health.

The regression models:

To find an answer to the central question, multiple regression models are used. This subsection describes and explains the regression models as used in this study.

Main equations:

First, an ordinary least squares (OLS) regression is done on mental health. Subsequently, an OLS is be performed on physical health. A Breusch-Pagan test for heteroscedasticity is done to see whether there has to be correct for robust standard errors. The p-value of this test is 0.000 which results in a rejection of the H0. So, the standard errors do not have a constant variance. Therefore, robust standard errors are required. An even better way of overcoming this is to make use of the cluster option in the regression model. This is done to control for individual correlation in the error term.

The OLS models do not take into account that the dataset is a panel set. Therefore, fixed and random effects regression analyses are expedient and thus performed. Among other things, those regression models take into account the different time frames. Besides, the fixed effects regression model also corrects for unobserved effects, such as time and country specific conditions.

In all regression equations, the $\beta 0$ indicates the intercept of the regression line with the Y-axis. The β's are the regression coefficients which show the contribution of the specific variable to the dependent variable. The $i's$ indicate individuals and the $t's$ indicate periods in time (specific waves). The significance level is a threshold to determine whether a variable is significant or not. This threshold is often 1, 5 or 10 percent. The unobserved time-invariant individual effect is represented by α, and finally, the u stands for the idiosyncratic error term. The equation of the regression model described and performed is as follows:

$Mental\ or\ physical\ \ health_{it} = \beta0 + \beta1 * UNEMPLOYMENT\ RATE_{it} + \beta2 * CRISISUNEMPLOYMENTRATE_{it} + \beta3 * COUNTRY_{it} + \beta4 * AGE_{it} + \beta5 * PENSIONAGE_{it} + \beta6 * CIGARETTESCONSUMPTION_{it} + \beta7 * BMI_{it} + \beta8 * EDUCATION_{it} + \beta9 * ALCOHOLCONSUMPTION_{it} + \beta10 * FEMALE_{it} + \beta11 * MARITAL\ STATUS_{it} + \beta12 * INCOME_{it} + \alpha i + u_{it}$

The choice between the fixed effects and the random effects regression model is based on a Durbin-Wu-Hausman test or a Hausman specification test with the 'xtoverid' option. In doing it this way, the Hausman test can still be performed although cluster options are used. The Hausman test determines which regression model is appropriate, and gives an answer to the following hypotheses:

H0: The difference in coefficients is not systematic.
H1: The difference in coefficients is systematic.

Lifestyle equations:

Also, self-perceived health is regressed on unemployment rate, age, gender, marital status, education and income. This is done in the form of an ordered logit (ologit) regression model. It will give an insight in how individuals rate their own health at times of high unemployment rates and at times of crisis. The self-rated health variable consists of five health states ranging from 1 to 5. Value 1 indicates an excellent self-perceived health and value 5 indicates a very poor health state. Since it gives an indication how people feel, it contributes to the overall conclusion of the research.

Finally, three health lifestyle regressions are performed. Those regression analyses display whether unemployment rate and has an effect on alcohol-, tobacco- and food consumption. Because alcohol consumption (number of alcohol units consumed in the last six months) is a discrete variable, and BMI level a continuous variable, both an OLS and Fixed effects regression model is done on those variables. Tobacco consumption (smoke at present time) is a dummy variable, and therefore a logit and probit analyses is done. Regression equations 2, 3 and 4 below, show the equations of those health lifestyle regression models.

$HEALTH\ LIFESTYLES\ _{it} = \beta0 + \beta1 * UNEMPLOYMENT\ RATE_{it} + \beta2 * AGE_{it} + \beta3 * CIGARETTESCONSUMPTION_{it} / BMI_{it} + \beta4 * FEMALE_{it} + \beta5 * COUNTRY_{it} + \beta6 * EDUCATION_{it} + \beta7 * MARITAL\ STATUS_{it} + \beta8 * INCOME_{it} + \alpha_i + u_{it}$

Regression equation 3:

$SMOKING(Y=1|$x1, x2, x3, x4, x5, x6, x7$) = (\exp(\beta0 + \beta1 * UNEMPLOYMENT\ RATE + \beta2 * AGE + \beta3 * FEMALE + \beta4 * BMI + \beta5 * COUNTRY + \beta6 * EDUCATION + \beta7 * MARITAL\ STATUS + \beta8 * INCOME)) / (1 + \exp(\beta0 + \beta1 * UNEMPLOYMENT\ RATE + \beta2 * AGE + \beta3 * FEMALE + \beta4 * BMI + \beta5 * COUNTRY + \beta6 * EDUCATION + \beta7 * MARITAL\ STATUS + \beta8 * INCOME))$

Regression equation 2:

$SMOKING(Y=1|$x1, x2, x3, x4, x5, x6, x7$) = \Phi\ (\beta0 + \beta1 * UNEMPLOYMENT\ RATE + \beta2 * AGE + \beta3 * FEMALE + \beta4 * BMI + \beta5 * COUNTRY + \beta6 * EDUCATION + \beta7 * MARITAL\ STATUS + \beta8 * INCOME)$

Financial crisis measurement

Since the financial crisis was a concurrence of circumstances, with multiple effects, there is not one variable in which the crisis can be reflected. It is, just like health, difficult to translate a financial crisis, or the business cycle as a whole, in terms of regression variables. Different economic conditions such as unemployment rate, income, bankruptcies, GDP or stock-exchange values can all be possible proxies for economic conditions, and thus for a crisis or recession. In this study the unemployment rate is chosen as the proxy for economic conditions. This is done, because it is mostly related to the fluctuations along the business cycle. According to Reinhart and Rogoff (2009), high unemployment rates are directly caused by a crisis and are thus closer related to the business cycle than for example stock-exchange values, incomes and/or bankruptcies, which may have more causes than just an economic crisis. On top of that, it is known that the unemployment rate fluctuates along with the business cycle.

The country specific, quarterly based unemployment rates from the Eurostat database are linked to the Easyshare data using Stata. The Share database contains information about the

month in which the interview took place. Subsequently, 3 dummies (quarter1, quarter2, quarter3) were made (quarter 4 follows when all dummies take value 0). Then, the data from the Eurostat database were linked to the Share individuals based on the country of the individual, the interview year and interview month.

An interaction term between crisis (years) and the unemployment rate is then made. This is done because it separates the crisis years from the non-crisis years. The crisis dummy takes value 1 if the interview year is in times of crisis (2008-2012). The dummy takes value 0, if the interview took place in a non-crisis year. Subsequently, this dummy is interacted with the unemployment rate variable. In this way an interaction term arises which only takes a value if a certain unemployment rate arises in the crisis. In doing so, the crisis can be isolated and studied separately from the business cycle. Thus, by testing whether this relation differs significantly from 0, there is tested whether the association between health and unemployment rate varies between the crisis and the non-crisis years.

As already discussed in the theoretical section; the beta of the unemployment rate on mental and/or physical health in normal times and in the crisis can go either way. It is possible that unemployment or an economic crisis has a positive effect on population health because people experience less stressful times and start to live healthier (Ruhm, 2015). If this is the case, the (crisis) unemployment regression-beta will take a positive value. Also, it might be possible that unemployment has a negative effect on population health because of the reasons Cutler (2002) mentioned. If this is true, the (crisis) unemployment regression-beta will take a negative value. It may also be possible that there is no relation between the business cycle and/or financial crisis and population health at all. If that is the case, the regression-beta will either take a zero value or an insignificant value.

Regression (control) variables

In the regression analyses, certain control variables are used. Firstly, according to Baum & Ruhm (2009) and Junankar (1991), income is an important control variable. Income and health are closely related since healthcare is costly. Furthermore, if costs of products and services (both health and non-health) increase during a crisis, income is even more important according to Cutler (2002). The income variable is therefore included in the regression models. Information about income is available and subtracted out of the Easyshare database. A small adaptation is done: people in the ten income percentiles of the database were divided and

categorized in 5 different categories/quintiles: very poor, poor, normal, rich and if all dummies take value 0, very rich. In this way a relative comparison between the different waves is possible.

Secondly, Lleras-Muney (2004) state that education and health have a large and positive correlation. The higher the level of education, the better is the health of an individual. This is partly caused by the fact that a person with a higher education is more likely to be employed, and has therefore a higher income, compared to someone with a lower level of education. Information regarding the education level is also obtained from the Share database. Since the level and duration of education differs among different countries, it is not a good display if the education level is captured, in for example, years of education. Every extra year of education may be good since often, more education is better. However, a person who is a repeater and has to re-do a certain year, also has an additional education year which is not a good thing. Besides, the duration of a certain degree of education may differ among different European countries. Therefore, the level of education is scaled according to a standard coding, the 1997 International Standard Classification of Education, isced-97. This is an education scale which is applied in statistics worldwide. In this way, education can be assembled and compared objectively and cross-nationally (Share release guide, 2013) (International Standard Classification of Education Isced 2011, Unesco institute for statistics, 2012). It is an ordered, categorical scale which ranges from 0, 'no education', to 6, 'second stage of tertiary education'. In between are different education levels such as 'primary education', 'lower secondary education', 'upper secondary education', 'bachelor's degree or equivalent/first stage of tertiary education' and 'master's degree or equivalent/second stage of tertiary education'. So, a higher level on the scale indicates a higher level of education. The scale has been divided into dummies before included in the regression equation. For every level of education, another dummy is made. In this way, the information of the categorical variable can be used in the regression model without any problems.

Thirdly, in the regressions, there is controlled for age, country, gender and marital status. This is done since older individuals are more likely to develop health related problems. The country people live in, is included as well since it is well known that certain people have higher chances to develop certain health problems because of their background, country they live in, gender and/or ethnicity. Marital status may also have an effect on depression since unmarried persons often live on their own. This may possibly contribute to health related problems such as depressions. This variable contains six categorical options: 1, 'married and living together with spouse', 2, 'registered partnership', 3, 'married but living separate', 4, 'never married', 5,

'divorced', 6, 'widowed'. The information of both the country and marital status variable is separated into dummies before included in the regression.

Finally, certain lifestyle variables are included in the regression model. Those lifestyle variables are tobacco consumption, alcohol consumption and the BMI level. They affect an individuals' health directly since an unhealthy lifestyle leads to a higher chance on diseases and mortality. According to McGinnis and Foege (1993), approximately half of all deaths in America is, among other things, caused by tobacco use, poor diets and too much alcohol usage. A high BMI level (>25) for example, will have a direct increased risk on several (deadly) diseases. According to Stommel and Schoenborn (2010) it increases the chance on several diseases such as hypertension, type II diabetes, coronary heart diseases and arthritis. The data for these variables are taken out of the Share database. The variable that indicates smoking is a dummy variable. The variable indicating alcohol consumption is divided into six dummies, ranging from 2, 'less than once a month', to 7, 'almost every day' (and 1, 'no alcohol at all' comes if al dummies take value 0).

Hypotheses

In this thesis one of the central questions is: What is the effect of the financial crisis and the business cycle on the health of the Europeans population. Two statistical hypotheses are drawn and tested to come to an answer on this question. Those hypotheses are:

H0: There is no relation between the health of European people aged 50 and above and the business cycle.

H1: There is a relation between the health of European people aged 50 and above and the business cycle.

If the first null hypothesis is tested, again, two hypotheses can be drawn for the second question:

H0: The relation between the health of European people aged 50 and above and the unemployment rate in the crisis years is equal to the non-crisis years.

H1: The relation between the health of European people aged 50 and above and the unemployment rate in the crisis years is not equal to the non-crisis years.

5. Results:

This section provides information about the results of the analyses. A descriptive overview of all data is given in table 1. Then, mental health is discussed. The regression outcomes are given in table 2. The OLS model is discussed and available under the OLS column. After that, the random and fixed effects regression models are discussed. A Hausman test determines which of these two tests is most suitable.

The next subsection contains the physical health part. Again, first the effects of the models are given in a table (3), followed by the OLS model, the fixed and random effect models and a Hausman test. The tables contain coefficients of the variables and standard errors which are listed in between parentheses under the coefficient.

Mental health variable:

Table 2 **Regression outcomes, eurod as y-variable**	OLS N=78554	Fixed effects N=78554	Random effects N=78554
CRISISUNEMPLOY-MENT	.022*** (.002)	.007*** (.002)	.017*** (.002)
UNEMPLOYMENT	.016*** (.002)	.018** (.006)	.014*** (.002)
COUNTRY	See footnote	Omitted	See footnote
AGE	.013*** (.001)	.003 (.004)	.013*** (.001)
SMOKING	.236*** (.022)	-.148** (.058)	.214*** (.022)
BMI_MOD	.014*** (.002)	-.047*** (.008)	.011*** (.002)
ISCED_R1	-.506*** (.058)	Omitted	-.490*** (.057)
ISCED_R2	-.683*** (.059)	Omitted	-.687*** (.058)
ISCED_R3	-.885*** (.058)	Omitted	-.909*** (.057)
ISCED_R4	-.930*** (.069)	Omitted	-.971*** (.068)
ISCED_R5	-.1.002*** (.059)	Omitted	-1.036*** (.058)

ISCED_R6	-1.027***	Omitted	-1.079***
	(.103)		(.099)
ISCED_R7	-.299	Omitted	-.383
	(.363)		(.357)
DRINKING2	-.329***	-.094*	-.292***
	(.030)	(.049)	(.028)
DRINKING3	-.396***	-.129**	-.357***
	(.028)	(.053)	(.027)
DRINKING4	-.492***	-.204***	-.457***
	(.025)	(.053)	(.024)
DRINKING5	-.447***	-.208***	-.432***
	(.032)	(.062)	(.031)
DRINKING6	-.439***	-.121	-.409***
	(.044)	(.084)	(.043)
DRINKING7	-.390***	-.153**	-.364***
	(.027)	(.061)	(.026)
FEMALE	.644***	Omitted	.638***
	(.018)		(.018)
MAR_STAT2	.066***	.327	.089
	(.060)	(.397)	(.061)
MAR_STAT3	.430***	.208	.428***
	(.085)	(.314)	(.079)
MAR_STAT4	.181***	-.059	.217***
	(.040)	(.554)	(.034)
MAR_STAT5	.352***	.205	.401***
	(.038)	(.195)	(.034)
MAR_STAT6	.440***	.974***	.498***
	(.031)	(.132)	(.031)
VERYPOOR	.245***	-.046	.184***
	(.027)	(.046)	(.025)
POOR	. 133***	-.049	.104***
	(.024)	(.040)	(.023)
NORMAL	. 076***	.007	.063***
	(.022)	(.035)	(.021)
RICH	. 040	-.005	.031
	(.026)	(.038)	(.025)
CONSTANT	-1.383***	3.311***	1.401***
	(.117)	(.315)	(.114)

*= significant at 10% significance level
**=significant at 5% significance level
***=significant at 1% significance level
There has been controlled for 20 countries in the form of 19 dummies.

Ordinary least squares regression model:

As can be seen in the OLS column in table 2, there is a small, significant, positive relation of 0.016 between unemployment and mental health. A value of 0.016 means that, for every extra unit of y (Δy), every extra unit of x increases with beta times x ($\beta 1 * \Delta x$). In other words, if the unemployment rate increases with 1 unit (percent), the eurod scale will increase with 0.016 units (i.e. higher eurod value). Thus, higher unemployment rates are accompanied with higher eurod scales, and thus with worse mental health states. The crisis unemployment variable indicates a value of 0.022. Since this is an interaction term, it displays information about the contribution of unemployment rate to mental health in times of crisis compared to times of non-crisis. The effect of the unemployment rate in the crisis is visible when this latter coefficient is compared with, and added up to the regular coefficient of unemployment rate. Because both unemployment variables are positive, the effect of unemployment rate on mental health is even larger in times of crisis. This effect is 0.038 (0.016+0.022). So according to the OLS model, more people are depressed when unemployment rates are higher. In times of crisis, unemployment rate has an even larger effect in developing a depression. Age, smoking, higher BMI levels and a lower income also have a positive relation with a high eurod scales and contribute to worse mental health states as well.

Fixed and Random effects regression model:

Besides OLS, also fixed and random effects regression analyses are done. As stated above, a Hausman test determines which regression model is most appropriate. The output of this test is 245.695, with a p-value of 0.000. Based on the level of significance and the p-value, the null hypotheses should be rejected (i.e. the difference in the coefficients is not systematic) which implies that the random effects regression model is not consistent and should therefore be replaced by a fixed effects regression model. A fixed effects regression model is thus more appropriate. The outcomes of both regression models are shown in table 2.

As can be seen in the two most right columns of table 2 above, the relation between mental health and unemployment rate is in both regression models significant. The fixed effects regression model finds a positive relation between unemployment rate and mental health of 0.018. The crisis unemployment variable indicates a positive effect of 0.007. Both coefficients are significant at 5% at least. This implies that the effect of unemployment rate on mental health is, just as the OLS, stronger in times of crisis, specifically 0.025.

According to the random effects regression model, the relation between unemployment rate and mental health is 0.014. In the crisis, this relation is stronger since the crisis unemployment variable is also positive in this model (0.017). The aggregate effect is thus 0.031. All three models indicate a positive relation between depression and unemployment rate. This effect is even stronger in times of crisis. However, the preferable fixed effects model shows the smallest contribution of the crisis.

A positive coefficient of 0.003 and 0.013 is also found between age and eurod in respectively the fixed effects model and the random effects model. This seems logical, since older people are more likely to develop health issues. However, in the fixed effects model, this variable is not significant.

The effect of income on mental health is also interesting. As can be seen in table 2, the lower an individual's income, the higher the effect on the eurod score. The fixed effects model however, shows an opposite relation, but these income variables are insignificant. This implies that individuals with lower incomes are more depressed compared to individuals with higher incomes. Thus, income has a negative relation with the mental health state.

Physical health variable:

Table 3 **Regression outcomes, chronic as y-variable**	OLS N=80411	Fixed effects N=80411	Random effects N=80411
CRISISUNEMPLOY-MENT	.007*** (.001)	.007*** (.001)	.007*** (.001)
UNEMPLOYMENT	-.002** (.001)	.013*** (.003)	-.001 (.001)
COUNTRY	See footnote	Omitted	See footnote
AGE	.034*** (.001)	.020*** (.002)	.034*** (.001)
SMOKING	.027** (.011)	-.087*** (.029)	.008 (.011)
BMI_MOD	.050*** (.001)	.011*** (.004)	.046*** (.001)
ISCED_R1	.015 (.028)	Omitted	.010 (.003)
ISCED_R2	-.044 (.029)	Omitted	-.062** (.028)

ISCED_R3	-.075***	Omitted	-.098***
	(.028)		(.028)
ISCED_R4	-.085**	Omitted	-.116***
	(.035)		(.034)
ISCED_R5	-.137***	Omitted	-.167***
	(.029)		(.028)
ISCED_R6	-.108**	Omitted	-.171***
	(.051)		(.050)
ISCED_R7	-.113**	Omitted	-.328**
	(.159)		(.163)
DRINKING2	-.087***	.021	-.064***
	(.016)	(.024)	(.014)
DRINKING3	-.133***	.053**	-.092***
	(.015)	(.025)	(.014)
DRINKING4	-.174***	.000	-.143***
	(.013)	(.026)	(.013)
DRINKING5	-.164***	.009	-.136***
	(.017)	(.030)	(.016)
DRINKING6	-.182***	-.045	-.166***
	(.024)	(.039)	(.022)
DRINKING7	-.113***	.036	-.088***
	(.014)	(.028)	(.013)
FEMALE	-.064***	Omitted	-.068***
	(.010)		(.010)
MAR_STAT2	.042	-.158	.032
	(.033)	(.112)	(.031)
MAR_STAT3	.036	-.059	.037
	(.043)	(.148)	(.041)
MAR_STAT4	-.051***	-.086	-.049***
	(.019)	(.229)	(.019)
MAR_STAT5	.035**	-.089	.041**
	(.017)	(.087)	(.017)
MAR_STAT6	.013	-.025	.021
	(.017)	(.054)	(.016)
VERYPOOR	.061***	-.017	.042***
	(.014)	(.022)	(.013)
POOR	.106***	.016	.084***
	(.013)	(.020)	(.012)
NORMAL	.045***	-.010	.034***
	(.012)	(.017)	(.011)
RICH	.041***	-.023	.026**
	(.014)	(.019)	(.012)

CONSTANT	-2.373***	-.584***	-2.244***
	(.060)	(.150)	(.059)

*= significant at 10% significance level
**=significant at 5% significance level
***=significant at 1% significance level
There has been controlled for 20 countries in the form of 19 dummies.

Ordinary least squares regression model:

The OLS output of physical health is given in table 3. The relation between unemployment rate and physical health is according to OLS -0.002. This implies that a higher unemployment rate results in a smaller amount of chronic diseases. Although the effect is very small, it is significant at the highest level. The effect of the crisis unemployment rate variable is 0.007. This means, that the crisis voids the favorable effect of unemployment rate on physical health and increases the amount of chronic diseases instead. The effect in the crisis is 0.005 (-0.002+0.007). Being a female, having a higher level of education or consuming alcohol has a positive effect on physical health, i.e. a lowers the amount of chronic diseases. Those effects are negative for every 1-unit increase in unemployment rate (percent). Variables such as age, smoking and BMI contribute to worse physical health states, i.e. increases the amount of diseases.

Fixed and Random effects regression model:

Again, a Hausman test is performed to determine the preferred model. The outcome values of the test are 289.007 and a P-value of 0.000. This implies that, anew, the fixed effects model is preferred above the random effects model. According to the random effects model, the relation between unemployment and physical health is negative (-0.001). The value of the variable is positive if the normal years are compared with the crisis years (0.007). This results in the same conclusion as with the OLS, namely: unemployment rate has a positive effect on the physical health state of individuals. However, in the crisis, this effect is nullified and even reversed. Though, with a P-value of 0.225 the variable for the overall unemployment rate is insignificant at all three levels. The preferable fixed effects regression model shows an overall positive relation of 0.013 between unemployment and chronic diseases. In the crisis, this effect is increased with 0.007 to a total of 0.020. This indicates thus an amplification of the health deteriorating effect of unemployment rate on physical health.

Self-perceived health:

To expand the research, another regression analysis with additional information about self-perceived health was performed. This analysis provides information about the estimation of the individuals' health. It was tested whether individuals rate their own health differently in times of high unemployment. The outcomes are given in table 4. Although it is not a very objective measurement, it gives an extra insight in how people feel and rate their own health in these situations. This information can also be considered when conclusions are drawn. An ordered logit regression of unemployment rate, age, gender, marital status, education and income on self-perceived health is done. The variable indicating self-perceived health (sphus) ranges from 1 to 5. Value 1 indicates an excellent health and 5 a poor health. The output indicates, all coefficients are positive and significant.

A closer look on the analysis indicates that on average, a higher unemployment rate decreases the probability of rating one's own health in category 1 (excellent health) with -.42 percent points, ceterus paribus. As can be seen, the probability of being in category 5 (poor health) increases with 0.57 percent points if someone is unemployed. So, according to this model, the self-perceived health of Europeans correlates negatively with unemployment rate. I.e. individuals rate their own health lower in times of high unemployment. Females and older people (both men and women), in general, rate their own health better, ceterus paribus.

Table 4 ***Ordered logit regression outcomes, self-perceived health***	OLOGIT N=80429	MARGINS OUTCOME 1 (Health= excellent)	MARGINS OUTCOME 2 (health= very good)	MARGINS OUTCOME 3 (health= good)	MARGINS OUTCOME 4 (health= fair)	MARGINS OUTCOME 5 (health= poor)
UNEMPLOY-MENT	.052*** (.001)	-.004*** (.000)	-.005*** (.000)	-.002*** (.000)	.006*** (.000)	.005*** (.000)
COUNTRY	See footnote	See footnote	See footnote	See footnote		
AGE	.043*** (.001)	-.003*** (.000)	-.004*** (.000)	-.001*** (.000)	.005*** (.000)	.004*** (.000)
FEMALE	.027** (.013)	.002 *** (.001)	.002*** (.001)	.001** (.000)	-.003 *** (.002)	-.002* (.001)
ISCED_R1	-.238*** (.043)	.018 *** (.003)	.022*** (.004)	.005*** (.001)	-.025*** (.004)	-.020*** (.004)
ISCED_R2	-.467*** (.044)	.035*** (.003)	.043*** (.004)	.010*** (.001)	-.048*** (.005)	-.039*** (.004)

ISCED_R3	-.691***	.051***	.063***	.015***	-.072***	-.058***
	(.044)	(.003)	(.004)	(.001)	(.005)	(.004)
ISCED_R4	-.798***	.059***	.073***	.018***	-.083***	-.067***
	(.055)	(.004)	(.005)	(.001)	(.006)	(.005)
ISCED_R5	-1.019***	.076***	.093***	.023***	-.106***	-.086***
	(.046)	(.003)	(.004)	(.001)	(.005)	(.004)
ISCED_R6	-1.308***	.097***	.120***	.029***	-.136***	-.110***
	(.096)	(.007)	(.009)	(.002)	(.010)	(.008)
ISCED_R7	-.498**	-.037***	-.046*	-.011*	-.052*	-.042*
	(.294)	(.022)	(.027)	(.007)	(.030)	(.025)
MAR_STAT2	.080	-.006	-.007	-.002	.008	.007
	(.061)	(.005)	(.006)	(.001)	(.006)	(.005)
MAR_STAT3	.123*	-.009*	-.011*	-.003*	.013*	.010*
	(.070)	(.005)	(.006)	(.002)	(.007)	(.006)
MAR_STAT4	.027	-.002	-.003	-.001	.003	.002
	(.033)	(.002)	(.003)	(.001)	(.003)	(.003)
MAR_STAT5	.035	-.003	-.003	-.001	.004	.003
	(.030)	(.002)	(.003)	(.001)	(.003)	(.003)
MAR_STAT6	-.030	.002	-.003	.001	-.003	-.003
	(.025)	(.002)	(.002)	(.001)	(.003)	(.002)
VERYPOOR	.433***	-.032***	-.040***	-.010***	.045***	.037***
	(.023)	(.002)	(.002)	(.001)	(.002)	(.002)
POOR	.368***	-.027***	-.034***	-.008***	.038***	.031***
	(.021)	(.002)	(.002)	(.001)	(.002)	(.002)
NORMAL	.244 ***	-.018***	-.022***	-.005***	.025***	.021***
	(.019)	(.001)	(.002)	(.000)	(.002)	(.002)
RICH	.165***	-.012***	-.015***	-.003***	.017***	.014***
	(.023)	(.002)	(.002)	(.001)	(.002)	(.002)

*= significant at 10% significance level
**=significant at 5% significance level
***=significant at 1% significance level
There has been controlled for 20 countries in the form of 19 dummies.

Health lifestyle regressions:

This analysis is done to get an insight in certain lifestyles of individuals. Since lifestyle and thus bad habits have a direct effect on health, it is important to take into consideration. Tables 5 and 5a show the outcomes of the health lifestyle regressions. The variable indicating alcohol consumption is used to create the excessive alcohol dummy. This dummy takes value 1 if an individual drinks alcoholic beverages more than twice a week. An OLS and fixed effects regression model is done for BMI level. A linear probability model (LPM), a fixed effects LPM, a logit and probit model are done for tobacco consumption and excessive alcohol consumption. Those dependent variables are regressed on unemployment rate, age, BMI, gender, country, education, marital status and income. According to all regression models performed, a higher unemployment rate has a negative effect on both tobacco and excessive alcohol consumption. The older a person gets, the less likely he or she is to smoke or excessively drink alcohol compared to younger individuals, ceterus paribus. Also, females are less likely to smoke tobacco or excessively drink alcohol compared to men. All the variables are significant at 1 percent.

The relation of unemployment rate on BMI is ambiguous. According to the OLS model, unemployment rate has a positive effect on BMI. This means that if unemployment rate increases, BMI levels of individuals' increase. At the same time, the fixed effects model claims that this relation is negative. But, with a P-value of 0.789 this variable is very insignificant.

Table 5 LPM/Fixed effects regression outcomes, health lifestyles	SMOKING N=120297 (LPM)	SMOKING N=80471 (FE LPM)	EXCESSIVE-ALCOHOL N=120038 (LPM)	EXCESSIVE-ALCOHOL N=80476 (FE LPM)	BMI N=82269 (OLS)	BMI N=80476 (FE)
UNEMPLOYMENT	-.002*** (.000)	-.001** (.000)	-.019*** (.001)	-.001 (.001)	.042*** (.004)	-.002 (.005)
AGE	-.009*** (.000)	-.002*** (.001)	-.006*** (.001)	-.003*** (.001)	.029*** (.002)	.021*** (.005)
BMI_MOD	-.008*** (.000)	-.004 (.001)	-.014*** (.001)	-.008*** (.001)	Omitted	Omitted
TOBACCO	Omitted	Omitted	.030** (.013)	-.026** (.011)	-.287 (.076)	-.331 (.082)
FEMALE	-.071*** (.004)	Omitted	-.709*** (.011)	Omitted	-.915*** (.041)	Omitted
COUNTRY	See footnote	Omitted	See footnote	Omitted	See footnote	Omitted
ISCED_R1	.019*** (.007)	Omitted	.172*** (.031)	Omitted	-.336*** (.114)	Omitted
ISCED_R2	.036*** (.008)	Omitted	.309*** (.032)	Omitted	-.738*** (.118)	Omitted
ISCED_R3	.009 (.008)	Omitted	.380*** (.031)	Omitted	-1.139*** (.116)	Omitted
ISCED_R4	-.005 (.011)	Omitted	.423*** (.041)	Omitted	-1.377*** (.154)	Omitted
ISCED_R5	-.051*** (.008)	Omitted	.538*** (.032)	Omitted	-1.826*** (.119)	Omitted
ISCED_R6	-.027 (.018)	Omitted	.433*** (.068)	Omitted	-2.475*** (.209)	Omitted

ISCED_R7	-.022	Omitted	. 660***	Omitted	.844***	Omitted
	(.037)		(.190)		(.706)	
MAR_STAT2	.062***	.014	-.009	-.084	-.318**	.070
	(.014)	(.034)	(.044)	(.068)	(.145)	(.286)
MAR_STAT3	.095***	-.019	-.023	-.074	-.093	.101
	(.016)	(.062)	(.051)	(.088)	(.188)	(495)
MAR_STAT4	.065***	.046	-.108***	-.003	-.626***	.147
	(.008)	(.082)	(.025)	(.046)	(.095)	(.493)
MAR_STAT5	.118***	.0133	-.006	-.039	-.263***	.133
	(.007)	(.033)	(.021)	(.040)	(.077)	(.212)
MAR_STAT6	.045***	.023	-.076***	-.049**	-.134**	-.485***
	(.005)	(.011)	(.019)	(.022)	(.069)	(.124)
VERPOOR	.049***	-.001	-.363***	-.025***	.276***	-.027
	(.005)	(005)	(.016)	(.009)	(.060)	(.053)
POOR	.024***	.002	-.212***	-.021**	.426***	-.057
	(.004)	(005)	(.015)	(.008)	(.054)	(.047)
NORMAL	.018***	-.001	-.133***	-.005	.313***	-.029
	(.004)	(005)	(.014)	(.007)	(.048)	(.041)
RICH	.006	.009	-.074**	-.015*	.254***	.013
	(.005)	(005)	(.017)	(.008)	(.059)	(.048)
CONSTANT	.939***	.411***	.904***	.518***	30.631***	25.101***
	(.020)	(043)	(.067)	(.062)	(.219)	(.307)

Table 5a **Probit/logit outcomes, health lifestyles**	SMOKING (Probit) N=80612	SMOKING (Logit) N=80612	EXCESSIVE ALCOHOL (Probit) N=80476	EXCESSIVE ALCOHOL (Logit) N=80476
UNEMPLOYMENT	-.005** (.002)	-.009** (.004)	-.001* (.001)	-.002* (.001)
AGE	-.035*** (.001)	-.062*** (.001)	-.006*** (.001)	-.009*** (.001)
FEMALE	-.341*** (.013)	-.598*** (.023)	-.709*** (.011)	-1.164*** (.019)
TOBACCO	Omitted	Omitted	.177*** (.014)	.296*** (023)
BMI_MOD	-.031*** (001)	-.055*** (.003)	-.014 *** (.001)	-.024*** (002)
COUNTRY	See footnote	See footnote	See footnote	See footnote
ISCED_R1	.156*** (.039)	.302*** (.073)	.172*** (.031)	.283*** (.052)
ISCED_R2	.231*** (.040)	.426*** (.082)	.309*** (.032)	.513*** (.053)
ISCED_R3	.138*** (.040)	.253*** (.073)	.380*** (.031)	.627*** (.053)
ISCED_R4	.090* (.050)	.166* (.091)	.423*** (.041)	.700*** (.068)
ISCED_R5	-.076* (.041)	-.135* (.077)	.538*** (.032)	.890*** (.054)
ISCED_R6	.019 (.079)	.040 (.143)	.433*** (.068)	.715*** (.112)
ISCED_R7	-.147 (.249)	-.212 (.486)	.660*** (.190)	1.097*** (.319)
MAR_STAT2	.222*** (.048)	.377*** (.082)	-.009 (.044)	-.015 (.074)
MAR_STAT3	.323*** (.051)	.560*** (.086)	-.023 (.051)	-.037 (.086)
MAR_STAT4	.201*** (.027)	.335*** (.047)	-.108*** (.025)	-.183*** (.041)
MAR_STAT5	.389*** (.022)	.664*** (.037)	-.006 (.021)	-.008 (.035)
MAR_STAT6	.149*** (.023)	.258*** (.042)	-.076*** (.019)	-.125*** (.031)
VERYPOOR	.166*** (.018)	.303*** (.032)	-.363*** (.016)	-.603*** (.027)

POOR	.088***	.162***	-.212**	-.351**
	(.018)	(.031)	(.015)	(.025)
NORMAL	.066***	.122***	-.134*	-.218*
	(.016)	(.029)	(.014)	(.024)
RICH	.024	.040*	-.074	-.120
	(.020)	(.035)	(.017)	(.029)
CONSTANT	2.184***	3.934***	.904***	1.492***
	(.082)	(.147)	(.067)	(.112)

*= significant at 10% significance level
**=significant at 5% significance level
***=significant at 1% significance level
There has been controlled for 20 countries in the form of 19 dummies.

6.Discussion:

This section provides information on the findings of the study and the interpretation of the results. Furthermore, the limitations of the study are discussed and likewise, suggestions for further research are made.

The aim of this study is to find a relation between the recent financial crisis of 2008 and the health of European residents. To broaden the conclusions and to get an accurate and broad measurement of health, two sets of health variables were used and analyzed separately: mental health variables and physical health variables. The number of chronic diseases that an individual suffers from displays the physical health state, and the eurod scale is a proxy for the mental health state. Multiple regression analyses are done with the first being the OLS regressions. Subsequently, fixed and random effects analyses are done. The results of the regressions are small, but statistically significant. On mental health, all three analyses show positive relations with unemployment. The preferred fixed effects model shows an unemployment coefficient of 0.018. This indicates that every unit increase of the unemployment rate increases the eurod scale with 0.018 units. If the crisis years are compared with the normal years, the coefficient is 0.007. This makes the total effect 0.018 + 0.007 = 0.025. A higher unemployment rate results thus in a worse mental health state, especially in the crisis.

Income has an effect on mental health too. According to the OLS and the random effects model, a lower income has a positive effect on a higher eurod value. The fixed effects model shows an opposite relation. However, these coefficients are rather insignificant. A possible

explanation for the above could be that lower income, and thus unemployment, reduces the consumption of individuals. In addition, in times of crisis goods become more expensive for a number of reasons. For example, high levels of inflation, higher relative prices for imported goods, etc. This may decrease the purchasing power. A result may be that people become depressed much easier. Also, if people encounter lower levels of income, a lower amount of money and time is available for leisure activities. It becomes more difficult to go on a holiday or other trips which may increase the chance on a depression. Likewise, people might encounter more stress since they are unemployed. As a consequence, issues such as depression, pessimism, sleep problems or fatigue might occur. Besides, age and being female have a positive effect on depression. This indicates that females and older individuals are more prone to develop depressions. These are interesting findings since much previous research, such as Ruhm (2015) found different results. They often focus on mortality rate instead of mental and physical complaints.

On the other hand, regressions were done on physical health. The OLS and random effects model show negative contributions of unemployment rate on physical health. This corresponds with less chronic diseases if unemployment rates are high. However, the random effects model is insignificant and since the fixed effect model is thus preferred, the same conclusion holds. A coefficient of 0.013 is found for unemployment. During the crisis, this coefficient becomes 0.007, making the total effect of unemployment in the crisis 0.013 + 0.007 = 0.020. So the amount of chronic diseases increases with 0.013 in normal times, and 0.020 for every 1-unit (percent) increase of unemployment rate in the crisis. Thus unemployment rate has a negative effect on both mental and physical health. In the crisis, this effect is even stronger. Age and BMI level also have a positive effect on the number of chronic diseases. This is not surprisingly since many chronic diseases are associated with age and obesity. The level of education is also positively correlated with physical health up to a certain level. This is not surprisingly since many researchers found a positive relation between education and health. Therefore, this variable is mostly taken into account when determining health outputs with the health production function. The effect of income on physical health is ambiguous. The income coefficients are insignificant according to the fixed effects model, and the other two models show no clear relations.

The self-perceived health regression shows the relation between unemployment and individuals' rating of health. Five ordered categories are captured in a self-perceived health variable. Value 1 indicates a perfect health and higher values indicate worse health states. An ordered logit model is performed to test this relation. Even though the outcomes are not an

objective measurement, is interesting to take into consideration when drawing conclusions. The model shows that individuals rate their own health worse in times of high unemployment. A negative beta is found for the margins outcome 1, which indicates that a higher unemployment rate decreases the highest value of self-perceived health. Subsequently, positive betas are found for the predicted outcome 4 or 5 (worse health states). So, it can be stated that a higher unemployment rate contributes to worse self-rated health states. These outcomes confirm the main outcomes of the study: a higher unemployment rate decreases the health. An explanation for this might be that individuals reflect the economic state of a country on their selves. If much work is available, unemployment rates are high and the economy is growing, people feel useful and happier which reflects on their self-perceived health state.

Finally, lifestyle regressions are done with respect to smoking, excessive drinking and BMI level. Again, multiple models are done. For tobacco and excessive alcohol consumption, a (fixed effects) linear probability model and logit & probit analyses are done. For BMI level, ordinary least squares and a fixed effects analysis are done. The dependent variables are regressed on unemployment rate, age, gender, BMI, country, education, marital status and income. According to those the regression models, the effect of unemployment rate on tobacco- and alcohol consumption is negative. So, a higher unemployment rate will result in less excessive alcohol- and tobacco consumption. In times of crisis or economic downturn when unemployment rates are high, excessive consumption of alcohol and tobacco products thus declines. A possible explanation could be, that due to taxation, those products will be seen as luxury goods. Since the price elasticity of luxury goods is greater than 1, a lower income, the result of unemployment, will decrease the consumption of those products. Another reason could be that the people who are unemployed have to be sharp, focused and good looking in order to get a new job and will therefore start to live healthier by adapting their bad habits. This is surprisingly since Stern (1983) discovered the opposite. He is of the opinion that unemployment is associated with unhealthier lifestyles. According to him, unemployment causes more poverty and therefore more stress. This will result in an increase of both tobacco- and alcohol consumption.

The findings do correspond with the research outcomes of Ruhm (2015). He states that in a period of economic downturn people will start to live healthier by lowering their alcohol consumption. He goes a step further by stating that this results in less drink-and-drive which eventually leading to less fatal traffic accidents.

The effect of unemployment on BMI level is more ambiguous. The OLS shows a positive relation, but the fixed effects analysis shows an (insignificant) negative relation. According to

the OLS, people become more obese in times of crisis. This increase in BMI level may be the underlying cause of the increase in the number of chronical diseases, such as diabetes. This is possibly (one of) the underlying cause of the increase in chronic diseases during high unemployment rates.

So, in times of high unemployment rate, people start to live healthier when it comes to certain bad habits such as smoking and drinking. However, diets will deteriorate and the BMI level will increase. Then, it may seem logical that people feel and even become healthier. However, this is not true. Both the self-perceived health and the true health of individuals will deteriorate with unemployment and economic downturn. Therefore, more research needs to be done on the causes of the health deterioration. If the main causes of deaths in the USA (McGinnis and Foege, 1993) are not the causes of the health deterioration, what could then be the reason?

The study has certain limitations. For example, the dataset is not fully complete, i.e. unbalanced. Also, the unemployment rate is not fully available for every country in every time period. This may have a negative effect on the results because it can cause potential biases. This may result in wrong conclusions. However, because of the large amount of interviews, more information is available which results in a more precise estimation and thus a smaller confidence interval. This reasonably tackles the problem. Another problem is the measurement of health. It is difficult to capture health in variables. This makes is difficult to choose a proper, valid variable. Other studies have used other health measurements, such as mortality rate, number of physician visits, hospitalizations, etc. This can give different outcomes and eventually a different answer on the central question. The same problem is true for the crisis measurement. There is not one best variable to express the crisis, which makes it difficult to capture all effects of the crisis.

7. Conclusion:

The financial crisis, which started in 2008, had a huge impact on many countries around the world. The world economy decreased with approximately 6% which had many consequences. One of those consequences was for example the increase in the unemployment rate. In Europe, unemployment rates increased from 3% in Portugal to approximately 14% in Lithuania. This study has tried to identify whether a relation exists between those unemployment rates and the

health of European residents in general and at times of crisis. Panel data between 2004 and 2013 were used from the Easyshare database and Eurostat unemployment data were matched to this Easyshare data. Health is divided and expressed in a mental- and physical part to come to more sustained conclusions. The financial crisis acts as a special event in this time period and will therefore be highlighted. Multiple regression analyses were done to give an answer to the central question of this study: Does the financial crisis and the business cycle affect the health of European residents? Besides, a sub question is also answered: Does unemployment rate have an effect on BMI, alcohol- & tobacco consumption?

All three analyses conclude that unemployment has a positive effect on the eurod scale, i.e. a higher value on the scale. In other words, a higher unemployment rate corresponds with a worse mental health state. During the crisis, all regression analyses find an even larger effect. A Hausman test indicates that the fixed effects regression model is the most appropriate model to use. In all models, the unemployment- and crisis unemployment variable are significant.

The relation with physical health is more ambiguous. According to the OLS and the random effects model, the relation is negative. However, the fixed effects model is preferred and it indicates a positive relation. So, a higher unemployment rate increases the amount of chronic diseases. In the crisis, this effect is even larger.

The lifestyle regressions indicate that individuals start to live healthier when it comes to tobacco- and alcohol consumption, but not when it comes to diets (the BMI level increases). The same conclusion arises when logit & probit analyses are applied. Thus there is a negative relation between the business cycle and the health of Europeans aged 50 and above. The effect is even worse during the crisis.

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