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Does Debt Affect Health?

Cross Country Evidence on the Debt-Health Nexus

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Abstract

We investigate the relationship between aggregate household debt and aggregate health outcomes across 17 European countries over the period 1995 to 2012. Using a dataset of country-level standardized and objective measures of household debt, health outcomes and a rich set of control variables, we estimate an instrumental variable (GMM) model to address possible reverse causality concerns. We find that aggregate household debt affects health outcomes, and that this varies by the maturity of debt. Both short and medium-term debt has a positive effect on health outcomes. Long-term unsecured debt and mortgage debt are associated with poorer health outcomes. These findings are robust after controlling for alternative measures of health and debt. Overall, the results suggest that aggregate household debt is an important determinant of aggregate health outcomes across countries.

Keywords: Europe, Debt burden, Debt maturity, Health outcomes, Generalized Methods of Moments, Cross-country data.

1. Introduction

Over the past decade household debt has risen to record levels in many countries (Guiso & Sodini, 2013). Between 1995 and 2008, the real value of consumer debt expanded by approximately 150% in Europe. In the US, consumer debt grew by approximately 60% during the same period, albeit from a much higher base level (Chmelar, 2013). These trends are also common to most industrialized countries, albeit there is some variation in overall debt levels over the business cycle (Sutherland & Hoeller, 2012).

Prior literature suggests that as well as socio-economic determinants (such as education, income and wealth), household debt plays a role in influencing health outcomes (Jacoby, 2002). High debt repayments can act as a source of anxiety leading to psychological distress and poor mental and physical health, which in turn may worsen financial welfare (Berger et al., 2013; Choi, 2009; Drentea & Lavrakas, 2000; Keese & Schmitz, 2014; Matthews & Gallo, 2011). Stress caused by debt can lead to an increase in unhealthy behaviours, such as smoking, excessive alcohol consumption and poor dietary habits (Bailis et al., 2001; Drentea & Lavrakas, 2000; Gathergood, 2012). Indebted households may accrue further debt to pay for necessities and are more likely to reduce spending on high quality goods and services including food and health care. Debt can also reduce the availability of future resources for healthcare investments and lead to a vicious cycle where greater debt can be both a cause and consequence of poor health (Jacoby, 2002).

To the best of our knowledge, previous literature only offers limited evidence (confined to the US), which suggests that short-term debt has a significant impact on health relative to long-term debt (Drentea & Lavrakas, 2000). In the absence of cross-country empirical evidence, we construct an unbalanced panel of European countries over the period 1995 to 2012 to

examine whether aggregate household debt affects national health outcomes, and whether any impact varies by the maturity of debt (short-, medium-, long-term unsecured debt and mortgage debt). In order to capture the ability of households to meet future expenses or absorb financial shocks, we focus our analysis on household debt as a percentage of Gross Disposable Income (GDI). This relative measure of aggregate household debt burden is often interpreted as a sign of financial vulnerability (Barba & Pivetti, 2009). Drawing on insights afforded by previous research, our measures of health outcomes at country level include years of life expectancy at birth and premature mortality indicators (Kennelly et al., 2003; Or, 2000; Or et al., 2005). The use of these country-level health indicators complements and augments previous research, which uses self-reported health conditions from surveys conducted for individual countries.

By way of preview, our results suggest that debt maturity affects health outcomes. In particular, we find that both the short and medium-term aggregated household debt burden appears to have a beneficial effect on health. Based on these findings, we contend that greater access to short and medium-term debt allows households to respond quickly to unexpected financial shocks, and consequently enjoy better health. However, the long-term burden of unsecured debt (for consumption purposes) and mortgage debt appear to lead to deterioration in health outcomes. The negative effect of debt on health is likely to impact on households' capacity to generate future income, which in turn could leave households vulnerable to future income shocks and hence put health at risk. The results remain robust after dealing with: the possible endogenous nature of household debt; using different measures of debt and health outcomes; and controlling for traditional factors that affect health.

Our work contributes to the established literature in a number of ways. First, by using data which includes standardized measures of health outcomes and household debt, this is the

first study to provide cross-country evidence that debt maturity affects health outcomes. As such, our findings identify empirical regularities across countries with respect to the relationship between debt and health. Second, the use of aggregate data allows us to compare our results with survey data based on self-reported health measures in particular countries. Third, given that debt can be both a cause and an effect of poor health outcomes, we use instrumental variable techniques to deal with this type of endogeneity problem where household debt could depend on health outcomes.

Overall, this paper represents a first attempt to provide cross-country empirical evidence in relation to the link between debt and health. The findings of this study should be of interest to government agencies tasked with the design and execution of policy initiatives that target health outcomes in conjunction with debt advice, and financial literacy programmes to help consumers better manage debt related issues. The rest of the paper proceeds as follows. Section 2 provides a review of salient literature. In Section 3, the empirical model and the data set used are discussed. Section 4 presents the results of the empirical analysis, while Section 5 concludes.

2. Literature review

The observed increase in household debt across countries could have both positive and negative effects on the economy. Bacchetta and Gerlach (1997) and Cecchetti et al. (2011) show that increased household debt could lead to an increase in economic growth. However, empirical evidence suggests that highly leveraged households can become more vulnerable in terms of their capacity to service debt in the face of unexpected income falls or macroeconomic shocks as loans fall due for repayment (Guiso & Sodini, 2013; Jappelli & Pagano, 1989). This in turn could lead to a decline in consumption and reduce economic growth.

A small literature extends the aforementioned research to examine the relationship between household debt and health outcomes. Münster et al. (2009) find that over-indebtedness in Germany is negatively associated with physical health. Evidence also suggests that debt can result in a decline in physical health due to socio-economic hardship and material deprivation (Cohen et al., 2007; Reading & Reynolds, 2001).

The common use of subjective data in the analyses of household debt and health could pose difficulties in drawing cross-country comparisons and identifying empirical regularities across countries (Or, 2000). Grafova (2007) uses US survey data covering the period 1999-2003 finds a positive association between unhealthy behaviours and debt. Bridges and Disney (2010) find a positive association between self-reported credit card debt and depression in the UK for the period of 1999-2005. Keese and Schmitz (2014) use national survey data from Germany between 1999-2009 to analyse the association between household debt and self-reported health outcomes. The authors find indebtedness impacts adversely on physical and mental health. Using UK household survey data from 1991- 2008, Gathergood (2012) finds that adverse psychological effects of high debt results from the perceived social stigma associated with over-indebtedness. Sweet et al. (2013) investigate the relationship between self-reported debt and health using secondary data from 8,400 respondents in four national survey waves between 1994 and 2008 in the US. The authors find that high financial debt relative to available assets is associated with greater perceived stress, depression and poorer self-reported general health.

As discussed above, previous research suggests that debt can lead to detrimental changes in mental and physical health. However, only a small number of papers have been concerned about the bias introduced by the potential reverse causation from health to debt (Gathergood, 2012). For example, an unexpected health shock might increase demand for debt in order to

cover day-to-day expenses. Keese and Schmitz (2014) use a subsample of individuals who were employed continuously during the sample period of their study to reduce problems of reverse causality. By doing this, the authors exclude all those who possibly lost their job or left the labour market due to health problems at least once in the observation period and who then might subsequently have problems in repaying debt. The authors find a strong correlation between different measures of household indebtedness and health satisfaction, mental health, and obesity.

One of the widely explored aspects in previous literature is the effect of aggregate household debt on economic growth and macroeconomic stability. There is a recent strand of literature that investigates the effects of macroeconomic conditions on health (Deaton, 2012; Miller et al., 2009; Ruhm, 2000, 2013). A number of longitudinal studies based on national household surveys find that (surprisingly) health improves during economic downturns, and worsens during economic expansions. Changes in behaviour due to loss of employment lead to changes in lifestyle and, thus, could explain observed declines in mortality rates, tobacco and alcohol consumption and physical inactivity during economic downturns. This results in better physical health (Ruhm, 2005). In addition, poorer general health, following an economic upturn (which is accompanied with increased employment), may result from physical injures in hazardous working conditions, physical exertions of employment, reduced time spent on health-producing activities and engagement in high risk activities and behaviours (Gerdtham & Ruhm, 2006).

During the most recent financial crisis, evidence suggests that health status declined due to increased stress. Currie and Tekin (2011) investigate the impact of the financial crisis on health by modelling the relationship between foreclosure activity and health in four US states between 2005 and 2009. The study finds that there are more non-elective hospitalisations and

emergency room visits during the period associated with increased foreclosures. Gili et al. (2013) examine the association between recession and diagnosed mood and anxiety disorders, and find similar negative effects of foreclosure on health in Spain between 2006 and 2010.

In reviewing salient literature, two apparent gaps emerge. First, empirical evidence is restricted to single country settings, which largely rely on subjective measures of debt and health (drawn from survey evidence on self-reported health status and socio-economic characteristics). While such evidence provides valuable insights for policy makers in a given jurisdiction, it does not provide the necessary information to assess the impact of debt on health in a cross-country context. Consequently, it is difficult to identify empirical regularities across countries with respect to the debt-health nexus. A second gap is that the established literature takes no account of the role of debt maturity in explaining health outcomes. This is somewhat surprising given that short- and/or medium-term debt can aid households by lessening the impact of short-to-medium-term liquidity constraints arising from unexpected income shocks. By contrast, long-term unsecured debt along with mortgage debt might be considered a drain on households and exacerbate physical and mental health problems (Drentea & Lavrakas, 2000; Turunen & Hiilamo, 2014).

Based on the aforementioned insights, the rest of this paper uses standardised comparable macroeconomic data to investigate the relationship between household debt, debt maturity and health outcomes for an unbalanced panel of European countries over the period 1995 to 2012. We utilise instrumental variable techniques to deal with possible reverse causality between health outcomes and household debt.

3. Data and Empirical Strategy

Data

Our data set comprises an unbalanced panel of European countries covering the period 1995-2012. The data used to construct the health outcomes variables is from the OECD Health Database. This database provides high quality and homogenous data that allows for comparisons in health outcomes across countries. Measures of health outcomes include years of life expectancy at birth and premature mortality (from all causes of death). Life expectancy at birth indicates the number of years a newborn infant would live if prevailing patterns of mortality at the time of its birth were to stay the same throughout its life. Potential years of life lost (PYLL) is a summary measure of premature mortality (all causes of death per 100000 population aged 0-69 years old) and provides an explicit way of weighting deaths occurring at younger ages, which are, a priori, preventable. Life expectancy at birth provides relevant information for the two most vulnerable groups of the population, while premature mortality is considered as a comparable measure of health in cross-country studies (Or et al., 2005). These measures are objective, accurate and comparable across countries (despite measurement problems in capturing general health status at macroeconomic level).

The data on household debt is from the Statistical Package on Lending to Households published by the European Credit Research Institute (ECRI). The standardization of the ECRI database in terms of definitions and monetary aggregates (collected from national authorities, financial institutions and central banks) facilitates comparisons over time and between countries (Jappelli et al., 2013; Kösters et al., 2004; Sassi & Gasmi, 2014). The entire retail loan market, including aggregate data on consumer credit (unsecured debt) and mortgage debt (secured debt) to households in Europe are covered by the ECRI database. Consumer credit comprises loans related to credit cards as well as overdrafts. It also includes loans for special purposes such as debt consolidation, education and the purchase of securities. A unique characteristic of ECRI

database is the disclosure of the maturity profile of household unsecured debt across countries. A breakdown by maturity includes short-term unsecured debt (less than one year), medium-term unsecured debt (between one and five years) and long-term unsecured debt (of greater than five years). Mortgage debt corresponds to the outstanding amounts of loans granted by financial intermediaries to households for housing purposes. Household debt variables are expressed as a percentage of GDI of the household sector to measure the indebtedness of households (i.e. household leverage). GDI is also provided by the ECRI database. This measures the monetary income of households that can be used for consumption and saving. High leverage ratios are often interpreted as a sign of financial vulnerability. All aggregate household debt-related values have been deflated using IPC deflator (2010=100) and winsorized at the 1st and 99th percentile. This adjustment ensures that our results are not affected by outliers.

Our final sample covers 17 European countries (comprising Austria, Belgium, Czech Republic, Denmark, Estonia, Finland, France, Germany, Greece, Hungary, Ireland, Italy, Luxembourg, Netherlands, Portugal, Slovakia and Slovenia) during the period 1995 – 2012. Table 1 presents descriptive statistics of health outcomes, debt indicators, control variables and instrumental variables used in the empirical analysis. The first group of variables in Table 1 present the health outcomes used in the present study. The empirical analysis presented in this study uses life expectancy at birth and premature mortality (all causes of death) as summary measures of health. Life expectancy at age 65 and alternative premature mortality indicators (such as acute myocardial infarction and mental and behavioural disorders) are used as a robustness check to ensure that our results are not affected by choice of health outcome measure. The average life expectancy at birth in our sample is 78.09 years (median value of 78.6 years). The average life expectancy at age 65 is 17.87 years (median value of 18.03 years). We also

examine cross-country variations in health using Potential Years of Life Lost (PYLL) as a summary measure of premature mortality. The average values of PYLL from all causes of debt, acute myocardial infarction and, mental and behavioural disorders are 4,358.3, 204.7 and 70.18 respectively.

Turning to our measures of household debt, the average level of short- , medium- and long-term unsecured aggregate household debt burden is 4.4%, 4.6% and 9.2%, respectively. Mortgage debt accounts for 52% of the disposable income of households (with values ranging from 19.9% in the 25th percentile to 65.4% in the 75th percentile) while the average aggregate household debt (overall consumer credit and mortgage debt) accounts for 71.5% of the aggregate disposable income of households.

Specific country conditions can affect the general health of the population. Control variables are similar to those used in previous studies and include educational attainment, real GDP per capita, share of government expenditure in total health expenditure and alcohol consumption. The most widely accepted determinants of health are education and income. Education is measured as the percentage of the population age 15 and above who can read and write a short, simple statement on their everyday life. Education allows for more informed decisions related to health, so we expect a positive relationship with health. Real GDP per capita (deflated using GDP deflator: 2010=100) is used to control for income variation across countries. Higher income generally results in access to better health care, as well as better nutrition and improved access to housing schooling (French, 2012). At aggregate level, real GDP controls for differences in economic development across countries. We attempt to capture the provision, availability and equality of access of healthcare services in a country. To guarantee sensible international comparisons, we adopt an indirect approach and focus on the way in which healthcare is

financed, since this in turn will have an strong influence on the amount, quality and accessibility of services provided (Or et al., 2005). Therefore, in order to represent cross-country differences on the universal access to medical care, the share of public financing in health expenditure is used as a proxy indicator (Kennelly et al., 2003). A positive correlation between public financing and health is expected. These control variables are collected from the World Development Indicators published by the World Bank. Finally, we control by alcohol consumption, which is a well-known risk factor for health. We expect alcohol consumption to have a negative effect on health outcomes (Or et al., 2005). To account for general consumption of alcoholic beverages, we use litres consumed per head of population (aged above 15 years old) using data collected from the OECD health database.

Finally, Table 1 also shows descriptive statistics for the instrumental variables used in the empirical analysis. The average credit provided to non-financial corporations by financial intermediaries represents 37.6% of the GDP. The level of market capitalization as percentage of GDP captures the size of financial system and has an average value of 47% while the average lending rate is 8.3% (the medians are 37.9% and 6.5%, respectively). We provide a rationale for our choice of instrumental variables below.

Insert table 1 near here

Empirical Strategy

We adopt a model consistent with previous literature where cross-country differences in health depend on country-level socio-economic variables and health behaviours (Jiménez-Rubio, 2011; Kennelly et al., 2003; Or, 2000; Or et al., 2005). We expand a traditional health production function developed in the previous literature by introducing different types of debt indicators that

vary across countries and over time in order to test their impact on health outcomes. Our estimable log-linear model has the general form:

$$H_{it} = \alpha + \beta_k DEBT_{kit} + \delta_1 GDP_{it-1} + \delta_2 ALCO_{it-1} + \delta_3 PUB_{it-1} + \delta_4 EDUC_{it} + f_j + T_i + \varepsilon_{it} \quad (1)$$

where H is one of the following measures of health outcomes in country i and year t: life expectancy at birth and premature mortality, both in logarithm form. $DEBT_{kit}$ captures different indicators of household debt burden (i.e. expressed as a percentage of GDI) where k = (short-term household debt to GDI; medium-term household debt to GDI; long-term unsecured household debt to GDI; mortgage debt to GDI; and total aggregate household debt (consumer credit plus mortgage debt) to GDI).

The model includes a vector of control variables (lagged one-period to minimize endogeneity concerns), which affect health outcomes such as real GDP per capita (*GDP*), alcohol consumption (*ALCO*) and public financing of health (*PUB*). We also control for the contemporaneous level of education (*EDUC*) since it is unlikely to be influenced by health outcomes. f denotes regional fixed effects (for Eastern Europe and Western Europe) which capture unobserved geographical characteristics constant over time, which could affect health. We also include a time trend (T_i) to capture any technological improvements over the time, which could contribute to general population wellbeing. ε is a stochastic error term. α is a constant term. β and δ are the unknown coefficients to be estimated. The subscripts *i* and *t* refer to country and time, respectively.

An important assumption in our empirical design is that household debt may be endogenous to health outcomes. Household debt can be both a cause and an effect of poor health

outcomes, which implies a negative relationship between these indicators. Increasing levels of debt could arise from a greater probability of being ill or unhealthy. Poor health can induce households to take on additional debt and encourage unhealthy behaviours. Ultimately, a population in poor health can generate additional costs for healthcare. Good health status should accordingly lead to stable employment and income, and increase resilience in the face of unexpected negative health shocks. Regardless of the sign of the relationship, the potential endogeneity of household debt may bias our findings. To address this, we use the Generalised Methods of Moments estimator (GMM-IV) which allows for heteroscedasticity of unknown form (Hansen, 1982). GMM does not require distributional assumptions on the error terms. It is also more efficient than 2SLS because it accounts for heteroscedasticity (Hall, 2005).

The instruments used in the present study are related to household debt. First-stage explanatory variables expressed as a percentage of GDP are credit to non-financial corporations, market capitalization of listed companies and the interest rate on loans. We use credit to non-financial corporations given that credit extended to corporations is aligned with the provision of household debt over the business cycle. Stock market capitalization captures the size of financial system ("financial depth") which could have a substantial effect on the provision of credit to the economy. Interest rates on loans capture the cost of the debt, which is likely to have a strong influence on the decision of households to take on more debt.

We conduct endogeneity tests under the null hypothesis that the specified endogenous regressors can actually be treated as exogenous, where the test statistic is distributed as chi-squared with degrees of freedom equal to the number of regressors tested (Baum et al., 2007). If the null hypothesis cannot be rejected, the instrumentation is unnecessary and OLS estimates are

more efficient and preferred to instrumental variable counterparts. In such cases, we report both sets of results.

We test for the relevance of the instruments or the endogeneity of debt using the first stage F-test for the joint significance of excluded instruments. We use the Hansen-Sargan test of over-identification to check instrument validity. Valid instruments must be correlated with the endogenous variable and uncorrelated with the error terms (i.e. the unobserved differences in health outcomes). Rejection implies that the instruments are not valid (Baum et al., 2007; Cameron & Trivedi, 2005). In addition, we report the Angrist-Pischke (AP) under-identification test, which tests whether a given equation is identified. A rejection of the null hypothesis indicates that excluded instruments are correlated with endogenous regressors. Both tests are useful to provide support for the validity of instruments employed. As the first-stage excluded instruments are pre-determined, it can be argued that the relationship between debt and health is at least partly causal. The exogenous component of aggregate household debt burden thus captures the unbiased impact on national health outcomes.

4. Results

Tables 2 and 3 present the main results of a regression analysis based on the estimation of health outcomes as specified in Equation (1) for two health indicators: life expectancy at birth and premature mortality (all causes of death).

Insert Table 2 near here

Insert Table 3 near here

For each health indicator, we present a set of five empirical models, which correspond to a reduced equation where health is a function of our proxies for household debt burden across different debt maturities. Since debt variables are expressed as percentage of disposable income and health variables are in logs, the regression results yield a straightforward interpretation of the impact of debt on health, our primary variable of interest. Result shows the percentage change in health outcomes for a percentage point change on aggregate household debt burden.

Results in Table 2 show evidence that aggregate household debt burden is related to aggregate health outcomes. Specifically, we observe a positive relationship between short and medium-term debt and health outcomes, and a negative association between long-term unsecured debt, mortgage debt and health outcomes. In Table 2, the range of estimated coefficients for short and medium-term debt (Model 1 and 2) is between 0.303 and 0.324. That is a one percentage point increase in aggregate household leverage is associated with an increase of life expectancy at birth of between 0.30% and 0.32%, respectively. Model 3 provides results for long-term unsecured debt. The model is estimated via OLS since the null hypothesis of the endogeneity test cannot be rejected and instrumentation is unnecessary. Results show that higher levels of aggregate household debt burden are associated with worse health outcomes, but the economic impact is relatively small when compared to short and medium-term debt. In particular, a one percentage point increase in household debt is associated with a 0.075% decrease in life expectancy at birth.

Table 3 presents the impact of aggregate household debt burden on premature mortality (all causes of death). Results are consistent with those reported in Table 2. Both short-term and medium-term unsecured debt appears to lead to lower levels of premature mortality. However, long term unsecured debt burden, mortgage debt burden and overall household debt burden

(aggregate consumer credit and mortgage debt as percentage of GDI) appear to exert a positive and statistically significant effect on premature mortality. To provide an economic interpretation to the results in Table 3, the estimates of aggregate household debt burden are compared to estimated coefficients of public financing on health, which are also measured in percentage terms. We observe that the predicted effect of debt on health is higher than the effect of public financing on health in the case of short-term debt. However, the impact decreases as the term of debt maturity increases. Specifically, aggregate household debt burden estimates vary between 4.097 and 0.08, while public financing of health vary between 6.786 and 3.448, in absolute value terms.

Overall, results show consistent empirical evidence that short and medium-term debt has a beneficial effect on health outcomes. This could be because households with greater access to short-term funds are able to respond quickly to unexpected health shocks. The negative results related to long-term unsecured debt and mortgage debt suggest that loans with longer maturities may make households more vulnerable to unexpected income shocks, and therefore lead to declines in health.

Control variables exhibit the expected sign and are statistically significant at either the 1% or 5% level depending on the estimated model. Previous research suggests that unemployment, lack of education, lower social class and income are associated with poor health (Arber et al., 2014). In a similar way, our results suggest that education, income and public financing of health lead to improvements in health outcomes, while alcohol consumption leads to a decline. Overall, the direction and magnitude of the estimates on the control variables are consistent with results reported elsewhere in the literature.

We extend the analysis to explore the effect of debt on alternative measures of health and the impact by gender. We introduce life expectancy at age 65 as an alternative health outcome which measures the number of additional years of life a person at age 65 will live on average (given current patterns of mortality). We also add two additional types of premature mortality measures: acute myocardial infarction, and mental and behavioural disorders. Table 4 reports the impact of debt burden on health outcomes as derived from the estimation of Equation 1. In order to conserve space, the coefficients on other covariates are not reported. Both the direction and magnitude of the estimates are consistent with results reported in Tables 2 and 3. Both short and medium-term aggregate debt burden are associated with better health outcomes. Short and medium-term debt exert a positive effect on health outcomes independent of gender and alternative measures of health. The estimates also suggest that the longer the maturity of the debt, the lower the impact on health outcomes associated with an increase in debt. The results presented in Table 4 also demonstrate that aggregate household debt is associated with larger improvements in health outcomes of males.

Insert Table 4 near here

To check the robustness of our results we carry out a series of robustness checks. First, we vary the definition of debt and health measures (See Appendix I, Tables A-E). We repeat the analysis above using the level of debt per capita. The results remain unchanged. We also analyse if previous results remain and different patterns are observed in countries characterized by financially distressed households (i.e. excessive levels debt burden) with respect their low-debt counterparts. We use an indicator variable that takes value one if household leverage to

disposable income ratio of country *i* in year *t* is above 75th percentile of the sample distribution in year *t* and zero if otherwise. Table F in Appendix I reports estimated coefficients of the percentage impact on health from a switch from 0 to 1 of the debt variable. That is the differential impact between countries with financially distressed households (debt burden higher than the 75th percentile in a particular year) and their lower debt counterparts. Overall, estimated coefficients keep the expected sign. Focusing on statistically significant coefficients, we observe that countries with high aggregate short-term household debt burden have higher levels of life expectancy at birth and lower premature mortality rates (all causes of death and mental and behavioural disorders) than those countries with relatively lower levels of aggregate household debt burden. Countries with a high level of medium-term aggregate household debt burden are associated with lower levels of premature mortality (all causes of death, acute myocardial infarction and mental and behavioural disorders) when compared with countries with lower levels of aggregate household debt burden. We also find evidence that countries with over-indebted households in terms of long-term unsecured debt have lower life expectancy at birth and at 65, and higher probability of premature mortality (all causes of death and acute myocardial infarction). Finally, the results show insignificant point estimates for long-term unsecured debt burden, mortgage debt burden and total household debt burden. This suggests that countries with financially distressed households relying on this particular type of debt are not statistically different in terms of health outcomes from countries with low-debt burden levels.

Finally, we check for the robustness of the results by considering the effect of the recent financial crisis on health outcomes. We re-estimate all models including an indicator variable for the financial crisis, which is equal to one after 2007 and zero otherwise. Our results remain quantitatively and qualitatively unchanged. In fact, the coefficient for financial crisis is

statistically insignificant across all regressions (the results of robustness checks using the financial crisis indicator variable are not presented, but are available upon request). This also is consistent with recent findings of a non-relationship between economic decline and health (Catalano et al., 2011).

5. Conclusion

The level of household debt has important implications for the economy. Debt allows households to smooth consumption through fluctuations in income and general economic conditions. Given uncertainties over the timing of future consumption, debt can therefore improve economic welfare by allowing households to reduce liquidity constraints and increase consumption. To date, there have been very few previous estimates of the impact of aggregate household debt and its maturity composition on health outcomes. This is in large part due to a lack of appropriate data.

Recently, a small literature has established an empirical association between household debt and health. This evidence is confined to single country settings, is reliant on subjective measures of both debt and health, and takes no account of debt maturity. Using cross-country data on both household debt and health for European countries during the period 1995-2012, this study moves beyond traditional socio-economic determinants of health to examine the relationship between aggregate household debt, aggregate household debt maturity and aggregate health outcomes. Instrumental variable models are estimated in order to control for the potential reverse causality between debt and health.

The results of the empirical analysis suggest a negative and significant association between the maturity profile of the aggregate household debt burden and aggregate health outcomes across countries. Our results also suggest that both short and medium-term unsecured debt could

improve life expectancy and contribute to a reduction in premature mortality. These results can be explained by the fact that greater access to short and medium-term debt allows households to respond quickly to unexpected financial shocks, and consequently enjoy better health. However, long-term unsecured debt and mortgage debt appear to exert a negative effect on health outcomes since this leaves households vulnerable to future income shocks and puts health at risk. Policy initiatives that bring together health care professionals, debt advisers and debt collection agencies to support financially distressed households may mitigate some of these aforementioned effects.

Overall, the results presented in this paper highlight the importance of household debt maturity in explaining differences in health outcomes across European countries. The use of standardized measures of health outcomes and different types of household debt allow us to identify empirical regularities across countries with respect to the relationship between debt and health, and compare our results with previous studies based on self-reported health measures in particular countries. What emerges is a nuanced picture, whereby short- and medium- term debt appear to be advantageous for population health, but longer-term unsecured and mortgage debt have deleterious consequences.

Nonetheless, caution is required in drawing inferences about the impact of household debt on health outcomes. Our reliance on aggregate measures of household debt and health outcomes, alongside a limited range of confounders (constrained by comparable data availability), allows us to provide only an approximation of how country-level indicators of household indebtedness influence aggregate health outcomes across European countries. Further research might usefully extend the analysis within and between countries in order to gain a greater understanding of the role of household debt in determining health outcomes. In particular, the insights gained from

this study in terms of the importance of debt maturity suggest new avenues of investigation using diverse social science methods (such as subgroup analyses, cohort studies, interview data) to untangle putative mechanisms. Finally, our aggregate measures of debt used do not allow us to disentangle the impact of different types of debt offered by mainstream (banks) and other forms of financial services firms (such as payday lenders) on health. Future work could aim to provide cross-country empirical evidence on these issues.

Household debt is a corner-stone of modern market economies, and many policy choices either encourage or inhibit individuals from taking on that debt. Given the potentially important health consequences of debt (for individuals and in aggregate), and given the complex implications of debts of different types and maturities, greater research-based understanding and greater policy consideration are warranted.

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Supporting Information

Additional supporting information can be found in the Appendix I of this article:

[Insert link to online Appendix I]

Table A1: The Impact of Aggregate Household Debt (thousands of Euros per capita) by Maturities on Life Expectancy at Birth.

Table B: The Impact of Aggregate Household Debt (as a percentage of disposable income of households) by Maturities on Life Expectancy at 65.

Table B1: The Impact of Aggregate Household Debt (thousands of Euros per capita) by Maturities on Life Expectancy at 65.

Table C: The Impact of Aggregate Household Debt (thousands of Euros per capita) by Maturities on Premature Mortality (All causes of death).

Table D: The Impact of Aggregate Household Debt (thousands of Euros per capita) by Maturities on Premature Mortality (Acute Myocardial Infarction).

Table D1: The Impact of Aggregate Household Debt (as a percentage of disposable income of households) by Maturities on Premature Mortality (Acute Myocardial Infarction).

Table E: The Impact of Credit to Households (thousands of Euros per capita) by Maturities on Premature Mortality (Mental and Behavioural Disorders).

Table E1: The Impact of Credit to Households (as a percentage of disposable income of households) by Maturities on Premature Mortality (Mental and Behavioural Disorders).

Table F: The Impact of Over-indebtedness by Maturities on Health Outcomes.

Table 1. Descriptive Statistics

	Variable Code	Mean	Standard deviation	P(25)	P(50)	P(75)
Health outcomes	**Years of life expectancy at birth**	78.092	2.581	77	78.6	79.9
	Years of life expectancy at age 65	17.873	1.498	17	18.025	19.05
	Potential years of life lost (all causes of death)	4358.371	1534.089	3437.2	3840.7	4695.6
	Potential years of life lost (acute myocardial infarction)	204.795	86.808	138.6	178	254.6
	Potential years of life lost (mental and behavioural disorders)	70.183	58.528	21.1	58.5	107.3
Debt Indicators	**Consumer credit to disposable income (short-term) (%)**	0.044	0.03	0.02	0.038	0.062
	Consumer credit to disposable income (medium-term) (%)	0.046	0.025	0.027	0.041	0.057
	Consumer credit to disposable income (long-term) (%)	0.092	0.063	0.046	0.082	0.127
	Mortgage debt to disposable income (%)	0.521	0.479	0.199	0.403	0.654
	Total household debt to disposable income (%)	0.715	0.532	0.356	0.618	0.888
Control variables	**Education**	98.526	2.129	98.4	99.7	99.8
	Real GDP per capita (thousand Euros)	25.675	13.761	15.796	27.064	32.426
	Alcohol consumption (Litres per capita)	11.467	1.826	10	11.8	12.8
	Public financing of health (%)	0.089	0.017	0.078	0.089	0.103
Instrumental variables	**Credit to non-financial corporations (% GDP)**	0.376	0.147	0.273	0.355	0.475
	Market capitalization of listed companies (% GDP)	0.47	0.401	0.189	0.379	0.618
	Lending interest rate (%)	0.083	0.221	0.033	0.065	0.085

Notes: The sample of countries and data coverage for 17 European countries is as follows: Austria, 2001-2012; Belgium, 1995-2012; Czech Republic, 1997-2012; Denmark, 2000-2012; Estonia, 1997-2012; Finland, 2003-2012; France, 1995-2012; Germany, 1995-2012; Greece, 1995-2012; Hungary, 2003-2012; Ireland, 2003-2012; Italy, 1998-2012; Luxembourg, 2006-2011; Netherlands, 1995-2012; Portugal, 1995-2012; Slovakia, 2003-2012; Slovenia, 2004-2012.

Table 2: The Impact of Aggregate Household Debt (as a percentage of disposable income) by Maturities on Life Expectancy at Birth

VARIABLES		Model 1 IV-GMM	Model 2 IV-GMM	Model 3 IV-GMM	Model 3 OLS	Model 4 IV-GMM	Model 5 IV-GMM
Consumer Credit	Short term unsecured debt	0.303***					
		(2.67)					
	Medium term unsecured debt		0.324**				
			(2.33)				
	Long term unsecured debt			0.043	-0.075***		
				(0.38)	(-4.76)		
Mortgage debt						0.020	
						(1.24)	
Total household debt							0.035
							(1.57)
Education		0.242***	0.035	0.107	0.191***	0.308*	0.415**
		(3.08)	(0.50)	(0.73)	(2.81)	(1.84)	(1.99)
Log (Real GDP per capita) $_{t-1}$		0.003	0.014**	0.011*	0.017***	-0.013	-0.027
		(0.44)	(2.52)	(1.95)	(2.87)	(-0.70)	(-1.12)
Alcohol $_{t-1}$		-0.004***	-0.006***	-0.004***	-0.003***	-0.004***	-0.006***
		(-5.92)	(-5.29)	(-3.51)	(-6.02)	(-3.61)	(-2.95)
Public financing of health $_{t-1}$		0.479***	0.688***	0.356**	0.533***	0.562***	0.679***
		(4.34)	(4.34)	(2.17)	(4.93)	(2.91)	(2.76)
Constant		1.775**	2.440***	1.552	0.663	2.059*	3.225*
		(2.39)	(2.98)	(1.37)	(1.35)	(1.80)	(1.90)
Observations		188	174	177	177	188	184
Adjusted R-squared		0.68	0.77	0.77	0.80	0.59	0.36
Wald test		64.47***	70.82***	74.11***	89.14***	44.79***	33.48***
1st stage F-Test		26.61***	11.19***	10.45***		5.68***	4.19***
Hansen-Sargan test (p-value)		0.32 (0.57)	0.14 (0.71)	7.01 (0.03)		3.14 (0.08)	0.96 (0.33)
AP Chi2 (p-value)		55.90 (0.00)	23.60 (0.00)	33.23 (0.00)		11.93 (0.00)	8.81 (0.01)
Endogeneity test (p-value)		20.61 (0.00)	4.71 (0.03)	0.40 (0.53)		10.85 (0.00)	17.32 (0.00)

Note: Numbers in parenthesis are heteroscedasticity-robust t-statistics. All models include a time trend and control by regional differences. The Wald statistic tests the relevance of the variables in the model. Rejection of the null hypothesis implies explanatory variables matter. 1st stage F-Test is an F statistic for the joint significance of excluded instruments. The Hansen-Sargan's statistic tests the validity of the instruments used, and rejection implies that the instruments are not valid. The Angrist-Pischke (AP) underidentification test is a test of whether the equation is identified, i.e., a rejection of the null indicates that the excluded instruments are "relevant", meaning correlated with the endogenous regressors. Endogeneity tests are implemented under the null hypothesis that the specified regressor (i.e. debt-related variables) can be treated as exogenous. If the null of this test cannot be rejected, then instrumentation is unnecessary and OLS estimates are more efficient. All variables have been winsorized at 1% from the top and bottom tails. *** p<0.01, ** p<0.05, * p<0.1

Table 3: The Impact of Aggregate Household Debt (as a percentage of disposable income) by Maturities on Premature Mortality (All causes of death)

VARIABLES		Model 1 IV-GMM	Model 2 IV-GMM	Model 3 IV-GMM	Model 3 OLS	Model 4 IV-GMM	Model 4 OLS	Model 5 IV-GMM	Model 5 OLS
Consumer Credit	Short term unsecured debt	-4.097***							
		(-3.94)							
	Medium term unsecured debt		-3.944**						
			(-2.39)						
	Long term unsecured debt			0.634	0.484***				
				(0.76)	(3.04)				
Mortgage debt						-0.055	0.082***		
						(-0.39)	(4.97)		
Total household debt								-0.105	0.080***
								(-0.54)	(5.19)
Education		-2.476***	0.406	-1.344	-1.096**	-1.078	0.835	-0.867	0.785
		(-3.17)	(0.59)	(-1.17)	(-2.01)	(-0.74)	(1.51)	(-0.45)	(1.45)
Log (Real GDP per capita) $_{t-1}$		-0.060	-0.216***	-0.238***	-0.230***	-0.100	-0.323***	-0.105	-0.329***
		(-0.89)	(-4.84)	(-6.23)	(-5.72)	(-0.57)	(-6.70)	(-0.43)	(-6.86)
Alcohol $_{t-1}$		0.055***	0.086***	0.052***	0.054***	0.053***	0.050***	0.060***	0.049***
		(10.44)	(7.09)	(5.84)	(10.46)	(6.12)	(10.67)	(4.76)	(9.80)
Public financing of health $_{t-1}$		-3.874***	-6.786***	-4.151***	-4.490***	-3.703**	-3.448***	-4.638***	-3.477***
		(-3.85)	(-4.12)	(-2.89)	(-4.05)	(-2.31)	(-3.25)	(-2.96)	(-3.24)
Constant		9.998	4.932	26.089***	23.662***	18.553**	27.330***	15.606	27.938***
		(1.52)	(0.62)	(2.89)	(5.04)	(1.97)	(5.20)	(1.14)	(5.09)
Observations		175	164	164	167	175	178	174	174
Adjusted R-squared		0.66	0.70	0.78	0.79	0.74	0.78	0.70	0.70
Wald test		58.49***	53.33***	73.95***	89.21***	41.27***	71.64***	46.83***	60.05***
1st stage F-Test		24.93***	9.44***	6.71***		4.98**		1.72	
Hansen-Sargan test (p-value)		1.88 (0.17)	0.03 (0.86)	11.22 (0.05)		10.42 (0.00)		0.90 (0.02)	
AP Chi2 (p-value)		52.56 (0.00)	19.98 (0.00)	43.75 (0.00)		10.49 (0.01)		3.63 (0.16)	
Endogeneity test (p-value)		11.84 (0.00)	11.10 (0.00)	0.22 (0.64)		0.55 (0.46)		1.26 (0.26)	

Note: See notes to Table 2.

Table 4: The Impact of Aggregate Household Debt (as a percentage of disposable income) by Maturities on Health Outcomes by Gender

VARIABLES		Life Expectancy at Birth		Life Expectancy at 65		Premature Mortality					
						All causes of death		Acute Myocardial Infarction		Mental and Behavioural Disorders	
		Male	Female	Male	Female	Male	Female	Male	Female	Male	Female
Consumer Credit	Short term unsecured debt	0.523***	0.129	0.528*	0.221	-4.643***	-2.543***	-2.279	-0.468	-7.399**	-6.547***
		(3.46)	(1.27)	(1.71)	(0.72)	(-3.81)	(-2.72)	(-1.18)	(-0.19)	(-2.45)	(-2.92)
	Medium term unsecured debt	0.487**	0.180	0.304***	0.249*	-4.662**	-2.373*	-4.639***	-5.612***	-13.075**	-10.938***
		(2.49)	(1.56)	(2.66)	(1.68)	(-2.38)	(-1.86)	(-4.73)	(-3.51)	(-2.02)	(-2.85)
	Long term unsecured debt	-0.086***	-0.062***	-0.245***	-0.168**	0.528***	0.424**	0.514	-1.780	-3.712	-12.031
		(-4.74)	(-3.26)	(-5.51)	(-2.52)	(2.94)	(2.32)	(0.32)	(-0.97)	(-0.40)	(-1.29)
Mortgage debt		0.006	0.024	0.037	0.078	0.040**	0.161***	-0.078	0.208***	0.060	0.213*
		(0.35)	(1.46)	(0.85)	(1.35)	(2.01)	(8.77)	(-1.64)	(2.71)	(0.42)	(1.76)
Total household debt		0.038	0.028	0.076	0.070	0.039**	0.155***	-0.058	0.219***	0.119	0.235**
		(1.43)	(1.44)	(1.36)	(1.12)	(2.16)	(8.90)	(-1.23)	(2.92)	(0.88)	(2.05)

Note: For the sake of brevity we only report the coefficients of the debt variables. We follow the same methodology to estimate models reported in Tables 2– 6. Numbers in parenthesis are heteroscedasticity-robust t-statistics.

Does Debt Affect Health?

Cross Country Evidence on the Debt-Health Nexus

Highlights

- We examine the relationship between aggregate household debt and aggregate health.
- Short and medium-term aggregate household debt has a positive effect on health outcomes.
- Long-term unsecured aggregate household debt and mortgage debt are associated with poorer health outcomes.
- Our results hold for alternative measures of health and debt.

Appendix I. Supporting Information

Table A: The Impact of Aggregate Household Debt (thousands of Euros per capita) by Maturities on Life Expectancy at Birth

VARIABLES		Model 1 IV-GMM	Model 2 IV-GMM	Model 3 IV-GMM	Model 3 OLS	Model 4 IV-GMM	Model 5 IV-GMM
Consumer Credit	Short term unsecured debt	0.016***					
		(2.68)					
	Medium term unsecured debt		0.028**				
			(2.28)				
	Long term unsecured debt			-0.002	-0.006***		
				(-0.24)	(-6.89)		
Mortgage debt						0.002	
						(1.52)	
Total household debt							0.001
							(1.40)
Education		0.125*	-0.129	0.216	0.300***	0.289*	0.212**
		(1.90)	(-1.18)	(0.93)	(3.83)	(1.84)	(2.40)
Log (Real GDP per capita) $_{t-1}$		0.015**	0.027***	0.011**	0.029***	-0.009	-0.014
		(1.96)	(4.71)	(2.00)	(5.15)	(-0.39)	(-0.83)
Alcohol $_{t-1}$		-0.002***	-0.005***	-0.004***	-0.002***	-0.002**	-0.004***
		(-3.33)	(-3.76)	(-2.80)	(-2.86)	(-2.07)	(-3.54)
Public financing of health $_{t-1}$		0.654***	0.993***	0.432**	0.706***	0.780***	0.485***
		(5.86)	(4.82)	(2.18)	(7.04)	(3.54)	(3.14)
Constant		3.201***	4.841***	0.976	1.958***	4.325***	1.752*
		(4.44)	(4.43)	(1.13)	(3.62)	(3.18)	(1.79)
Observations		194	180	177	183	194	184
Adjusted R-squared		0.65	0.65	0.79	0.77	0.35	0.57
Wald test		54.64***	62.44***	79.23***	79.92***	32.07***	49.62
1st stage F-Test		27.06***	5.80***	4.08***		4.93***	3.05***
Hansen-Sargan test (p-value)		0.87 (0.35)	0.10 (0.76)	7.83 (0.02)		1.92 (0.17)	4.38 (0.11)
AP Chi2 (p-value)		56.76 (0.00)	12.20 (0.00)	12.98 (0.00)		10.34 (0.01)	9.68 (0.02)
Endogeneity test (p-value)		19.31 (0.00)	8.77 (0.00)	0.01 (0.95)		12.84 (0.00)	12.87 (0.00)

Note: Numbers in parenthesis are heteroscedasticity-robust t-statistics. All models include a time trend and control by regional differences. The Wald statistic tests the relevance of the variables in the model. Rejection of the null hypothesis implies explanatory variables matter. 1st stage F-Test is an F statistic for the joint significance of excluded instruments. The Hansen-Sargan's statistic tests the validity of the instruments used, and rejection implies that the instruments are not valid. The Angrist-Pischke (AP) underidentification test is a test of whether the equation is identified, i.e., a rejection of the null indicates that the excluded instruments are "relevant", meaning correlated with the endogenous regressors. Endogeneity tests are implemented under the null hypothesis that the specified regressor (i.e. debt-related variables) can be treated as exogenous. If the null of this test cannot be rejected, then instrumentation is unnecessary and OLS estimates are more efficient. All variables have been winsorized at 1% from the top and bottom tails. *** p<0.01, ** p<0.05, * p<0.1

Table B: The Impact of Aggregate Household Debt (as a percentage of disposable income of households) by Maturities on Life Expectancy at 65

VARIABLES		Model 1 IV-GMM	Model 2 IV-GMM	Model 2 OLS	Model 3 IV-GMM	Model 3 OLS	Model 4 IV-GMM	Model 5 IV-GMM
Consumer Credit	Short term unsecured debt	0.362						
		(1.27)						
	Medium term unsecured debt		0.015	0.276**				
			(0.05)	(2.29)				
	Long term unsecured debt				-0.305	-0.204***		
					(-0.92)	(-3.86)		
Mortgage debt							0.063	
							(1.29)	
Total household debt								0.078
								(1.29)
Education		0.597***	0.501**	0.338*	0.877**	0.639***	0.956**	1.073*
		(3.09)	(2.43)	(1.88)	(1.97)	(3.03)	(1.99)	(1.91)
Log (Real GDP per capita) $_{t-1}$		0.006	0.009	0.025	0.018	0.029	-0.045	-0.060
		(0.31)	(0.57)	(1.44)	(1.08)	(1.58)	(-0.85)	(-0.93)
Alcohol $_{t-1}$		-0.003*	-0.004	-0.006***	-0.001	-0.003	-0.007*	-0.010*
		(-1.82)	(-1.25)	(-3.16)	(-0.35)	(-1.34)	(-1.89)	(-1.72)
Public financing of health $_{t-1}$		1.147***	1.276***	1.361***	1.523***	1.390***	1.612***	1.700**
		(4.07)	(3.44)	(4.58)	(3.10)	(4.89)	(2.78)	(2.54)
Constant		-10.807***	-11.232***	-9.897***	-13.499***	-12.538***	-7.727**	-5.954
		(-5.32)	(-5.46)	(-5.28)	(-4.33)	(-8.09)	(-2.37)	(-1.33)
Observations		183	176	176	176	176	187	183
Adjusted R-squared		0.70	0.76	0.77	0.77	0.78	0.51	0.40
Wald test		87.40***	101.24***	100.29***	113.82***	105.06***	55.50***	45.25***
1st stage F-Test		28.99***	11.91***		1.94		5.27**	3.73***
Hansen-Sargan test (p-value)		0.45 (0.50)	13.32 (0.00)		6.01 (0.05)		0.09 (0.76)	0.04 (0.84)
AP Chi2 (p-value)		60.98 (0.00)	25.10 (0.00)		6.17 (0.10)		11.07 (0.00)	7.84 (0.02)
Endogeneity test (p-value)		26.44 (0.00)	0.46 (0.50)		0.05 (0.83)		28.10 (0.00)	30.47 (0.00)

Note: Numbers in parenthesis are heteroscedasticity-robust t-statistics. All models include a time trend and control by regional differences. The Wald statistic tests the relevance of the variables in the model. Rejection of the null hypothesis implies explanatory variables matter. 1st stage F-Test is an F statistic for the joint significance of excluded instruments. The Hansen-Sargan's statistic tests the validity of the instruments used, and rejection implies that the instruments are not valid. The Angrist-Pischke (AP) underidentification test is a test of whether the equation is identified, i.e., a rejection of the null indicates that the excluded instruments are "relevant", meaning correlated with the endogenous regressors. Endogeneity tests are implemented under the null hypothesis that the specified regressor (i.e. debt-related variables) can be treated as exogenous. If the null of this test cannot be rejected, then instrumentation is unnecessary and OLS estimates are more efficient. All variables have been winsorized at 1% from the top and bottom tails. *** p<0.01, ** p<0.05, * p<0.1

Table B1: The Impact of Aggregate Household Debt (thousands of Euros per capita) by Maturities on Life Expectancy at 65

VARIABLES		Model 1 IV-GMM	Model 2 IV-GMM	Model 2 OLS	Model 3 IV-GMM	Model 3 OLS	Model 4 IV-GMM	Model 5 IV-GMM
Consumer Credit	Short term unsecured debt	0.022						
		(1.29)						
	Medium term unsecured debt		-0.020	0.003				
			(-1.34)	(0.49)				
	Long term unsecured debt				-0.022	-0.018***		
					(-1.58)	(-7.19)		
Mortgage debt							0.004	
							(1.31)	
Total household debt								0.005
								(1.34)
Education		0.446**	0.433*	0.373*	1.279**	0.940***	0.804*	0.765*
		(2.21)	(1.72)	(1.77)	(2.42)	(4.15)	(1.87)	(1.85)
Log (Real GDP per capita) $_{t-1}$		0.042*	0.065***	0.064***	0.013	0.061***	-0.017	-0.032
		(1.94)	(4.07)	(3.99)	(0.80)	(3.67)	(-0.26)	(-0.42)
Alcohol $_{t-1}$		0.001	-0.004*	0.000	-0.000	0.002	-0.001	-0.003
		(0.52)	(1.87)	(0.16)	(-0.06)	(1.23)	(-0.36)	(-0.73)
Public financing of health $_{t-1}$		1.582***	1.327***	1.592***	1.647***	1.884***	2.068***	2.137***
		(5.60)	(3.45)	(5.56)	(3.95)	(7.10)	(3.34)	(3.06)
Constant		-6.565***	-8.154***	-6.556***	-13.371***	-9.035***	-2.726	-0.864
		(-3.32)	(-3.84)	(-3.37)	(-7.01)	(-5.85)	(-0.77)	(-0.18)
Observations		189	182	182	176	182	193	189
Adjusted R-squared		0.67	0.72	0.73	0.77	0.77	0.38	0.23
Wald test		77.48***	97.94***	98.20***	120.69***	120.81***	40.43***	30.77***
1st stage F-Test		29.03***	9.44***		2.70*		4.57**	3.45***
Hansen-Sargan test (p-value)		1.62 (0.20)	8.50 (0.00)		4.06 (0.13)		0.07 (0.80)	0.10 (0.75)
AP Chi2 (p-value)		60.97 (0.00)	19.87 (0.00)		8.58 (0.04)		9.59 (0.01)	7.25 (0.03)
Endogeneity test (p-value)		19.77 (0.00)	1.72 (0.19)		0.48 (0.49)		23.60 (0.00)	27.20 (0.00)

Note: Numbers in parenthesis are heteroscedasticity-robust t-statistics. All models include a time trend and control by regional differences. The Wald statistic tests the relevance of the variables in the model. Rejection of the null hypothesis implies explanatory variables matter. 1st stage F-Test is an F statistic for the joint significance of excluded instruments. The Hansen-Sargan's statistic tests the validity of the instruments used, and rejection implies that the instruments are not valid. The Angrist-Pischke (AP) underidentification test is a test of whether the equation is identified, i.e., a rejection of the null indicates that the excluded instruments are "relevant", meaning correlated with the endogenous regressors. Endogeneity tests are implemented under the null hypothesis that the specified regressor (i.e. debt-related variables) can be treated as exogenous. If the null of this test cannot be rejected, then instrumentation is unnecessary and OLS estimates are more efficient. All variables have been winsorized at 1% from the top and bottom tails. *** p<0.01, ** p<0.05, * p<0.1

Table C: The Impact of Aggregate Household Debt (thousands of Euros per capita) by Maturities on Premature Mortality (All causes of death)

VARIABLES		Model 1 IV-GMM	Model 2 IV-GMM	Model 3 IV-GMM	Model 3 OLS	Model 4 IV-GMM	Model 4 OLS	Model 5 IV-GMM	Model 5 OLS
Consumer Credit	Short term unsecured debt	-0.202***							
		(-4.00)							
	Medium term unsecured debt		-0.226**						
			(-2.44)						
	Long term unsecured debt			0.031	0.010				
				(0.53)	(1.45)				
Mortgage debt						0.007	0.003***		
						(0.85)	(3.18)		
Total household debt								-0.005	0.003***
								(-0.58)	(2.90)
Education		-0.810	1.596	-1.561	-0.865	-1.257	0.404	-0.323	0.271
		(-1.51)	(1.64)	(-0.79)	(-1.57)	(-1.21)	(0.76)	(-0.34)	(0.53)
Log (Real GDP per capita) $_{t-1}$		-0.052	-0.181***	-0.237***	-0.226***	-0.008	-0.295***	-0.109	-0.294***
		(-0.80)	(-3.72)	(-6.21)	(-5.63)	(-0.04)	(-5.79)	(-0.49)	(-5.72)
Alcohol $_{t-1}$		0.057***	0.084***	0.054***	0.056***	0.054***	0.052***	0.059***	0.052***
		(10.55)	(7.55)	(5.12)	(11.05)	(6.32)	(10.69)	(6.04)	(9.96)
Public financing of health $_{t-1}$		-4.151***	-6.568***	-4.260**	-4.140***	-3.905**	-3.752***	-4.362***	-3.788***
		(-3.89)	(-4.33)	(-2.27)	(-3.71)	(-2.56)	(-3.43)	(-3.63)	(-3.44)
Constant		11.422*	6.214	23.655***	20.602***	16.650**	25.050***	17.561*	25.140***
		(1.87)	(0.86)	(2.89)	(4.17)	(2.01)	(4.74)	(1.80)	(4.53)
Observations		175	164	164	167	175	178	174	174
Adjusted R-squared		0.68	0.72	0.77	0.78	0.69	0.78	0.72	0.77
Wald test		60.26***	62.12***	73.91***	81.23***	39.05***	75.99***	48.48***	64.78***
1st stage F-Test		27.06***	5.80***	4.08***		4.93***		1.91	
Hansen-Sargan test (p-value)		1.59 (0.21)	0.07 (0.79)	11.11 (0.05)		8.95 (0.00)		0.00 (0.99)	
AP Chi2 (p-value)		51.54 (0.00)	14.53 (0.00)	24.03 (0.00)		9.51 (0.01)		4.03 (0.13)	
Endogeneity test (p-value)		12.17 (0.00)	8.14 (0.00)	0.26 (0.61)		0.89 (0.35)		0.93 (0.34)	

Note: Numbers in parenthesis are heteroscedasticity-robust t-statistics. All models include a time trend and control by regional differences. The Wald statistic tests the relevance of the variables in the model. Rejection of the null hypothesis implies explanatory variables matter. 1st stage F-Test is an F statistic for the joint significance of excluded instruments. The Hansen-Sargan's statistic tests the validity of the instruments used, and rejection implies that the instruments are not valid. The Angrist-Pischke (AP) underidentification test is a test of whether the equation is identified, i.e., a rejection of the null indicates that the excluded instruments are "relevant", meaning correlated with the endogenous regressors. Endogeneity tests are implemented under the null hypothesis that the specified regressor (i.e. debt-related variables) can be treated as exogenous. If the null of this test cannot be rejected, then instrumentation is unnecessary and OLS estimates are more efficient. All variables have been winsorized at 1% from the top and bottom tails. *** p<0.01, ** p<0.05, * p<0.1

Table D: The Impact of Aggregate Household Debt (thousands of Euros per capita) by Maturities on Premature Mortality (Acute Myocardial Infarction)

VARIABLES		Model 1 IV-GMM	Model 2 IV-GMM	Model 2 OLS	Model 3 IV-GMM	Model 4 IV-GMM	Model 4 OLS	Model 5 IV-GMM	Model 5 OLS
Consumer Credit	Short term unsecured debt	-0.095							
		(-0.97)							
	Medium term unsecured debt		-0.203*	-0.246***					
			(-1.70)	(-3.90)					
	Long term unsecured debt				-0.140				
					(-1.18)				
Mortgage debt						-0.009	-0.001		
						(-0.79)	(-0.37)		
Total household debt								-0.009	-0.000
								(-0.90)	(-0.10)
Education		-0.396	2.037	2.135*	4.809	-0.972	-0.031	-0.710	0.009
		(-0.32)	(1.22)	(1.72)	(1.08)	(-0.55)	(-0.02)	(-0.48)	(0.01)
Log (Real GDP per capita) $_{t-1}$		-0.470***	-0.511***	-0.495***	-0.572***	-0.343	-0.533***	-0.340	-0.558***
		(-3.34)	(-5.21)	(-4.77)	(-5.35)	(-1.17)	(-3.96)	(-1.25)	(-4.08)
Alcohol $_{t-1}$		-0.039***	-0.019	-0.012	-0.016	-0.037**	-0.039***	-0.030*	-0.035**
		(-2.77)	(-0.95)	(-0.79)	(-0.64)	(-2.33)	(-2.77)	(-1.68)	(-2.41)
Public financing of health $_{t-1}$		3.026	0.908	0.390	6.760*	2.105	3.046	2.062	2.889
		(1.54)	(0.42)	(0.18)	(1.81)	(0.98)	(1.61)	(1.02)	(1.55)
Constant		90.231***	91.249***	83.293***	83.397***	88.225***	96.063***	83.717***	93.033***
		(6.93)	(7.21)	(6.47)	(4.21)	(6.18)	(7.72)	(5.61)	(7.27)
Observations		175	164	167	167	175	178	171	174
Adjusted R-squared		0.51	0.59	0.58	0.38	0.52	0.55	0.49	0.53
Wald test		42.33***	47.95***	39.85***	41.03***	43.58***	41.70***	38.01***	34.94***
1st stage F-Test		24.44***	6.86***		5.02***	4.51**		4.44***	
Hansen-Sargan test (p-value)		0.33 (0.56)	0.80 (0.37)		1.57(0.46)	0.44(0.51)		0.34 (0.56)	
AP Chi2 (p-value)		51.54 (0.00)	14.53 (0.00)		16.00 (0.00)	9.51 (0.01)		9.38 (0.01)	
Endogeneity test (p-value)		6.15 (0.01)	0.22 (0.64)		2.87 (0.09)	0.47 (0.49)		0.77 (0.38)	

Note: Numbers in parenthesis are heteroscedasticity-robust t-statistics. All models include a time trend and control by regional differences. The Wald statistic tests the relevance of the variables in the model. Rejection of the null hypothesis implies explanatory variables matter. 1st stage F-Test is an F statistic for the joint significance of excluded instruments. The Hansen-Sargan's statistic tests the validity of the instruments used, and rejection implies that the instruments are not valid. The Angrist-Pischke (AP) underidentification test is a test of whether the equation is identified, i.e., a rejection of the null indicates that the excluded instruments are "relevant", meaning correlated with the endogenous regressors. Endogeneity tests are implemented under the null hypothesis that the specified regressor (i.e. debt-related variables) can be treated as exogenous. If the null of this test cannot be rejected, then instrumentation is unnecessary and OLS estimates are more efficient. All variables have been winsorized at 1% from the top and bottom tails. *** p<0.01, ** p<0.05, * p<0.1

Table D1: The Impact of Aggregate Household Debt (as a percentage of disposable income of households) by Maturities on Premature Mortality (Acute Myocardial Infarction)

VARIABLES		Model 1 IV-GMM	Model 2 IV-GMM	Model 2 OLS	Model 3 IV-GMM	Model 4 IV-GMM	Model 4 OLS	Model 5 IV-GMM	Model 5 OLS
Consumer Credit	Short term unsecured debt	-1.956							
		(-0.99)							
	Medium term unsecured debt		-3.562*	-4.763***					
			(-1.75)	(-4.41)					
	Long term unsecured debt				-0.415				
					(-0.26)				
Mortgage debt						-0.167	-0.027		
						(-0.75)	(-0.53)		
Total household debt								-0.194	-0.008
								(-0.90)	(-0.16)
Education		-1.181	0.935	0.912	0.877	-1.502	-0.175	-1.777	-0.046
		(-0.71)	(0.72)	(0.75)	(0.35)	(-0.63)	(-0.13)	(-0.76)	(-0.03)
Log (Real GDP per capita) $_{t-1}$		-0.474***	-0.538***	-0.526***	-0.575***	-0.361	-0.524***	-0.327	-0.554***
		(-3.43)	(-5.61)	(-5.17)	(-5.73)	(-1.28)	(-3.83)	(-1.15)	(-3.99)
Alcohol $_{t-1}$		-0.040***	-0.016	-0.006	-0.040*	-0.036**	-0.038***	-0.027	-0.035**
		(-2.85)	(-0.78)	(-0.42)	(-1.87)	(-2.12)	(-2.71)	(-1.32)	(-2.37)
Public financing of health $_{t-1}$		3.169	0.584	-0.133	3.694	1.789	2.944	1.547	2.854
		(1.59)	(0.27)	(-0.06)	(1.26)	(0.74)	(1.55)	(0.67)	(1.52)
Constant		89.450***	90.169***	80.889***	96.228***	85.845***	95.301***	79.400***	92.722***
		(6.83)	(7.03)	(6.47)	(5.52)	(5.34)	(7.70)	(4.49)	(7.31)
Observations		175	164	167	164	175	178	171	174
Adjusted R-squared		0.50	0.60	0.59	0.54	0.53	0.55	0.49	0.53
Wald test		42.50***	48.16***	41.21***	49.69***	43.72***	42.29***	38.70***	35.06***
1st stage F-Test		24.93***	9.44***		6.71***	4.98**		3.96***	
Hansen-Sargan test (p-value)		0.29 (0.59)	1.01 (0.32)		7.22 (0.20)	0.55 (0.46)		0.38 (0.53)	
AP Chi2 (p-value)		52.56 (0.00)	19.98 (0.00)		43.75 (0.00)	10.49 (0.01)		8.37 (0.02)	
Endogeneity test (p-value)		6.40 (0.00)	0.58 (0.45)		6.56 (0.00)	0.35 (0.56)		0.71 (0.40)	

Note: Numbers in parenthesis are heteroscedasticity-robust t-statistics. All models include a time trend and control by regional differences. The Wald statistic tests the relevance of the variables in the model. Rejection of the null hypothesis implies explanatory variables matter. 1st stage F-Test is an F statistic for the joint significance of excluded instruments. The Hansen-Sargan's statistic tests the validity of the instruments used, and rejection implies that the instruments are not valid. The Angrist-Pischke (AP) underidentification test is a test of whether the equation is identified, i.e., a rejection of the null indicates that the excluded instruments are "relevant", meaning correlated with the endogenous regressors. Endogeneity tests are implemented under the null hypothesis that the specified regressor (i.e. debt-related variables) can be treated as exogenous. If the null of this test cannot be rejected, then instrumentation is unnecessary and OLS estimates are more efficient. All variables have been winsorized at 1% from the top and bottom tails. *** p<0.01, ** p<0.05, * p<0.1

Table E: The Impact of Aggregate Household Debt (thousands of Euros per capita) by Maturities on Premature Mortality (Mental and Behavioural Disorders)

VARIABLES		Model 1 IV-GMM	Model 1 OLS	Model 2 IV-GMM	Model 2 OLS	Model 3 IV-GMM	Model 4 IV-GMM	Model 4 OLS	Model 5 IV-GMM	Model 5 OLS
Consumer Credit	Short term unsecured debt	-0.640	-0.304**							
		(-1.11)	(-2.13)							
	Medium term unsecured debt			-0.745	-0.925***					
				(-1.15)	(-3.53)					
	Long term unsecured debt					-0.329				
						(-0.78)				
Mortgage debt							0.005	0.006		
							(0.08)	(0.80)		
Total household debt									0.042	0.004
									(0.62)	(0.57)
Education		10.318**	11.201***	18.929***	19.520***	22.746	12.620*	11.623***	8.986	11.984***
		(2.54)	(3.42)	(2.74)	(4.66)	(1.46)	(1.65)	(3.29)	(1.44)	(3.38)
Log (Real GDP per capita) $_{t-1}$		2.366***	2.198***	1.944***	2.160***	1.964***	1.936	2.075***	2.991*	2.015***
		(4.34)	(7.36)	(7.31)	(7.97)	(6.84)	(1.38)	(5.56)	(1.87)	(5.32)
Alcohol $_{t-1}$		0.300***	0.283***	0.389***	0.391***	0.371***	0.304***	0.283***	0.324***	0.279***
		(8.04)	(6.51)	(6.33)	(8.72)	(4.57)	(7.89)	(6.35)	(6.17)	(5.97)
Public financing of health $_{t-1}$		1.942	2.755	-7.247	-7.286	6.811	-1.292	2.789	-1.239	3.325
		(0.22)	(0.29)	(-0.93)	(-0.92)	(0.54)	(-0.16)	(0.29)	(-0.15)	(0.34)
Constant		9.535	45.245	-5.861	6.577	-8.249	29.842	55.638	9.101	60.806
		(0.27)	(0.99)	(-0.16)	(0.16)	(-0.13)	(0.61)	(1.17)	(0.16)	(1.22)
Observations		170	177	163	166	166	174	177	170	173
Adjusted R-squared		0.49	0.51	0.55	0.55	0.36	0.49	0.50	0.43	0.49
Wald test		46.17***	49.06***	52.26***	45.69***	29.16***	44.41***	47.12***	31.74***	41.73***
1st stage F-Test		25.43***		7.01***		2.92*	4.58***		4.50***	
Hansen-Sargan test (p-value)		0.06 (0.81)		0.11 (0.74)		0.64 (0.42)	1.84 (0.17)		1.23 (0.27)	
AP Chi2 (p-value)		53.70 (0.00)		14.84 (0.00)		6.17 (0.05)	9.66 (0.01)		9.50 (0.01)	
Endogeneity test (p-value)		0.47 (0.49)		0.27 (0.60)		4.23 (0.04)	0.06 (0.81)		0.19 (0.66)	

Note: Numbers in parenthesis are heteroscedasticity-robust t-statistics. All models include a time trend and control by regional differences. The Wald statistic tests the relevance of the variables in the model. Rejection of the null hypothesis implies explanatory variables matter. 1st stage F-Test is an F statistic for the joint significance of excluded instruments. The Hansen-Sargan's statistic tests the validity of the instruments used, and rejection implies that the instruments are not valid. The Angrist-Pischke (AP) underidentification test is a test of whether the equation is identified, i.e., a rejection of the null indicates that the excluded instruments are "relevant", meaning correlated with the endogenous regressors. Endogeneity tests are implemented under the null hypothesis that the specified regressor (i.e. debt-related variables) can be treated as exogenous. If the null of this test cannot be rejected, then instrumentation is unnecessary and OLS estimates are more efficient. All variables have been winsorized at 1% from the top and bottom tails. *** p<0.01, ** p<0.05, * p<0.1

Table E1: The Impact of Aggregate Household Debt (as a percentage of disposable income of households) by Maturities on Premature Mortality (Mental and Behavioural Disorders)

VARIABLES		Model 1 IV-GMM	Model 1 OLS	Model 2 IV-GMM	Model 2 OLS	Model 3 IV-GMM	Model 4 IV-GMM	Model 4 OLS	Model 5 IV-GMM	Model 5 OLS
Consumer Credit	Short term unsecured debt	-12.544	-7.172***							
		(-1.09)	(-2.71)							
	Medium term unsecured debt			-13.405	-11.114**					
				(-1.10)	(-2.12)					
	Long term unsecured debt					-6.725				
						(-0.75)				
Mortgage debt							0.280	0.062		
							(0.26)	(0.48)		
Total household debt									-0.701	0.117
									(-0.48)	(0.94)
Education		5.378	8.228**	15.047***	13.402***	19.453	14.809	12.903***	5.741	13.350***
		(0.69)	(2.18)	(3.39)	(3.62)	(1.63)	(1.38)	(3.39)	(0.42)	(3.41)
Log (Real GDP per capita) $_{t-1}$		2.312***	2.226***	1.832***	2.004***	2.028***	1.708	1.863***	2.859	1.774***
		(4.53)	(7.71)	(7.26)	(7.36)	(6.76)	(1.34)	(4.91)	(1.61)	(4.62)
Alcohol $_{t-1}$		0.296***	0.281***	0.398***	0.365***	0.381***	0.299***	0.276***	0.332***	0.268***
		(7.46)	(6.39)	(5.63)	(7.43)	(3.94)	(6.90)	(6.09)	(4.59)	(5.65)
Public financing of health $_{t-1}$		2.767	3.120	-7.961	-4.277	6.758	-0.828	3.725	-3.234	4.363
		(0.30)	(0.33)	(-0.95)	(-0.48)	(0.52)	(-0.10)	(0.39)	(-0.33)	(0.45)
Constant		3.003	40.821	-10.707	19.835	-32.311	38.773	64.413	-2.023	72.712
		(0.08)	(0.90)	(-0.27)	(0.46)	(-0.35)	(0.65)	(1.34)	(-0.02)	(1.46)
Observations		170	177	163	166	166	174	177	170	173
Adjusted R-squared		0.50	0.51	0.52	0.52	0.31	0.49	0.50	0.42	0.49
Wald test		46.79***	50.27***	49.37***	45.76***	30.10***	46.36***	47.92***	29.97***	43.62***
1st stage F-Test		26.63***		9.51***		2.56*	5.08**		4.03***	
Hansen-Sargan test (p-value)		0.10 (0.75)		0.07 (0.79)		0.68 (0.41)	1.72 (0.19)		1.25 (0.26)	
AP Chi2 (p-value)		56.25 (0.00)		20.13 (0.00)		5.42 (0.00)	10.71 (0.00)		8.50 (0.01)	
Endogeneity test (p-value)		0.28 (0.60)		0.01 (0.91)		4.72 (0.03)	0.06 (0.80)		0.19 (0.66)	

Note: Numbers in parenthesis are heteroscedasticity-robust t-statistics. All models include a time trend and control by regional differences. The Wald statistic tests the relevance of the variables in the model. Rejection of the null hypothesis implies explanatory variables matter. 1st stage F-Test is an F statistic for the joint significance of excluded instruments. The Hansen-Sargan's statistic tests the validity of the instruments used, and rejection implies that the instruments are not valid. The Angrist-Pischke (AP) underidentification test is a test of whether the equation is identified, i.e., a rejection of the null indicates that the excluded instruments are "relevant", meaning correlated with the endogenous regressors. Endogeneity tests are implemented under the null hypothesis that the specified regressor (i.e. debt-related variables) can be treated as exogenous. If the null of this test cannot be rejected, then instrumentation is unnecessary and OLS estimates are more efficient. All variables have been winsorized at 1% from the top and bottom tails. *** p<0.01, ** p<0.05, * p<0.1

Table F: The Impact of Over-indebtedness by Maturities on Health Outcomes

VARIABLES		Life Expectancy at Birth	Life Expectancy at 65	Premature Mortality		
				All causes of death	Acute Myocardial Infarction	Mental and Behavioural Disorders
Consumer Credit	Short term unsecured debt	0.023*	0.043	-0.372***	-0.147	-0.479***
		(1.88)	(1.21)	(-3.16)	(-0.75)	(-2.85)
	Medium term unsecured debt	0.001	0.007	-0.675*	-0.310***	-0.638***
		(0.27)	(0.67)	(-1.68)	(-6.50)	(-2.85)
	Long term unsecured debt	-0.037*	-0.045***	0.088***	0.402*	-0.363
		(-1.89)	(-5.76)	(4.09)	(1.75)	(-0.28)
Mortgage debt		0.016	0.052	0.070	0.069	0.821
		(1.42)	(1.49)	(0.10)	(1.00)	(0.65)
Total household debt		0.029	0.071	-0.004	0.070	-0.194
		(1.36)	(1.52)	(-0.12)	(1.11)	(-1.47)

Note: Over indebtedness is a dummy variable that takes value one if leverage to disposable income ratio of country i in year t is above 75th percentile of the sample distribution in year t, and 0 otherwise. For the sake of brevity we only report the coefficients of the debt variables. We follow the same methodology to estimate models reported in Tables 1 – 4. Numbers in parenthesis are heteroscedasticity-robust t-statistics. *** p<0.01, ** p<0.05, * p<0.1