

Household debt and depressive symptoms among older adults in three continental European countries

AAPO HIILAMO* and EMILY GRUNDY[‡]

* Department of Social Policy, London School of Economics and Political Science, London, UK

‡ Institute for Social and Economic Research, University of Essex, Essex, UK

ABSTRACT

In this comparative study focusing on the population aged 50 and over in three European countries, we investigate the association between household debt and depressive symptoms, and possible country differences in this association, using data from waves 1, 2, 4, 5 and 6 of the Surveys of Health, Ageing and Retirement in Europe (SHARE) for Belgium, France and Germany. Multilevel regression models with random intercepts for individuals were used to analyse the association between household debt status and number of depressive symptoms (EURO-D score). Country differences in the household debt-depression nexus were tested using country interaction models. After controlling for other measures of socioeconomic position and physical health, low or substantial financial debt was associated with a higher number of depressive symptoms in all countries. Housing debt was strongly linked to depressive symptoms for women while the association was weaker for men. The only country difference was that for both sexes substantial financial debt (more than 5,000€) was strongly associated with depressive symptoms in Belgium and Germany, but the association was weak or non-significant in France. Associations between financial debt and depression were also evident in analyses of within individual changes in depressive symptoms for a longitudinal subgroup, and in analyses using a dichotomised, rather than a continuous, measure of depression. The findings indicate that measures of household indebtedness should be taken

into consideration in investigations of social inequalities in depression and suggest a need for mental health services targeted at indebted older people.

KEY WORDS - depression; social inequalities; indebtedness; midlife; older age; longitudinal studies; country comparison

Running title: Household debt and depressive symptoms among older adults

Introduction

The burden of depression has increased significantly in recent decades (Lepine and Briley 2011). It is estimated that in the EU-27 area depression is the main mental health disorder contributing to disability adjusted life years lost (DALYs) and a major contributor to the overall burden of disease (Wittchen *et al.* 2011). Further understanding of the determinants of depression is therefore an important public health issue.

The era of democratised credit availability has led to a growing household debt-burden, which has been aggravated by continuing economic recession. Existing evidence shows that although debt provides a financial tool for consumption smoothing, it is also a risk factor for depression (Richardson, Elliott and Roberts 2013). However, little is known about the association between household indebtedness and depression among older Europeans, even though, for reasons discussed below, older adults may be particularly susceptible to stress and other adverse mental health consequences arising from indebtedness.

In this paper we investigate whether household debt status is associated with depressive symptoms in people aged 50 years and over in three European countries, Belgium, France and Germany; we also examine variations in this association by country. These three countries were chosen due to the similarities in their welfare state structures (Ferragina and Seeleib-Kaiser 2011), near levels of household indebtedness (Sierminska 2014), and shared economic downturn in 2008 and thereafter. Comparative social epidemiological research indicates that welfare state context and specific social policies are important factors that may modify health inequalities (Bergqvist *et al.* 2013). However, we are unaware of any previous research exploring the potential effect of country context in the debt-depression nexus. The three selected countries are underrepresented in the literature on the debt-depression

relationship (Richardson, Elliott and Roberts 2013) and are particularly suitable for our purposes as there are quite similar contextual policy influences – with some minor but relevant variations discussed below.

Household debt and socioeconomic status

Previous research focusing on mental health inequalities in advanced economies has shown that low socio-economic position (SEP) is an important risk factor for depression, and that psychosocial factors, especially stress, may contribute to this association (Lorant *et al.* 2003). However, conventional measures of SEP – occupational status, income and education – may be inadequate for investigating inequalities in mental health, especially in the older population (Pollack *et al.* 2007). Occupational measures are often outdated for the retired population, income does not necessarily reflect real purchasing power, as older people are increasingly dependent on accumulated wealth, and education levels tend to be lower and much more homogenous than in younger cohorts (Grundy and Holt 2001). Debt may capture various resource, stress and social dimensions of SEP that are not included in these other measures. Firstly, high interest rates, loss of creditworthiness and debt-collection action, such as home foreclosure, may have a serious impact on material resources and cause severe economic hardship, which is not fully revealed in income or wealth measures. Debt and debt payment difficulties may also involve social stigma (Georgarakos, Lojschova and Ward-Warmedinger 2010), and payment defaults may make it difficult to secure rented housing or employment. Secondly, repayment difficulties and debt-collection actions cause psychological stress (Drentea and Reynolds 2015, Gathergood 2012). This may especially be the case for older people who are often largely dependent on accumulated wealth from earlier life phases and have limited opportunities for increasing income.

It is important to note that, there are some dimensions of debt which may have positive rather than negative effects (Berger, Collins and Cuesta 2016). Normal and manageable debt may, in fact, have a beneficial effect on an individual's welfare and health because of increased ability to smooth consumption over time (Clayton, Liñares-Zegarra and Wilson 2015). However, when debt becomes unmanageable due to, for example, a sudden drop in repayment ability, it may have severe psychological, social and economic consequences (Richardson, Elliott and Roberts 2013).

Debt and depression

Studies from Europe and US contexts have found that debts or debt payment difficulties have an independent relationship with mental health, perceived stress, overall depression, maternal depression and early disability retirement due to mental illness (Blomgren, Maunula and Hiilamo 2017, Fitch *et al.* 2011, Richardson, Elliott and Roberts 2013). A meta-analysis by Richardson *et al.* (2013) concluded that unsecured personal debt was a predictor of depression even after controlling for other socioeconomic factors.

Only a few studies have looked at the implications of debt for mental health in older age groups. Longitudinal evidence is provided by Drentea & Reynolds (2012) who found, when analysing US-based panel data, that debt status was a more consistent predictor of depression in older age groups than income or assets. This study concluded that the association was moderated by perceived stress about debt. Consistent with this, Lee and Brown (2007) found in analysis of US Health and Retirement Study data on people aged 65 and over that levels of consumer debt were a significant predictor of depression and that this association was stronger in women than men.

Despite increasing efforts to integrate debt measures into the health inequalities literature, serious gaps remain in our understanding of the debt-depression nexus. Previous studies have focused on single-country study populations without systematic country comparison which might provide insights into the possible role of the policy context. To our knowledge, no previous studies have looked at the debt-depression relationship among older adults in a comparative European context.

The study context

Thanks in part to the increasing availability of cross-country datasets, accumulating evidence indicates that social inequalities in health are bound to a country context and a specific social policy environment (e.g. Eikemo et al 2008; Bambra 2011). Country context and social policies may shape social inequalities in health through multiple channels. In brief, a state and its institutions may seek to prevent or mitigate socio-economic adversity, including household (over)-indebtedness by, for example, the provision of pensions and welfare payments and additionally, or alternatively, provide measures to alleviate health-related risks factors related to socio-economic disadvantage (Mackenbach 2012, Angel and Heitzmann 2015). State provision and regulation may also offset socio-economic consequences of poor health, such as costs of healthcare which in some contexts, such as the United States may lead to indebtedness (Seitfert and Rukavina 2006). Welfare state context and social policies, including regulation of credit, may thus have an important modifying impact on the debt-depression nexus.

In terms of welfare state structure and health care system, the countries selected for this study, Belgium, France and Germany, are relatively similar (e.g. Wendt 2009). Social policy scholars have repeatedly included these countries in the same welfare state cluster, for

example under a label of a Bismarckian or Conservative model, which is characterised by “status maintaining” social policies with earnings related income protection, a stronger role of the family in welfare provision than in Social Democratic societies, and limited vertical redistribution (Ferragina and Seeleib-Kaiser 2011). It is noteworthy that old age social security and income redistribution policies are similar in the three countries (Börsch-Supan and Nisticò, 2007). Furthermore, these countries share quite similar health care systems (Bambra, 2005) characterised by high total and public health expenditure and moderate out-of-pocket healthcare costs (Wendt, 2009), which limits the risk of indebtedness arising from healthcare costs. Given the lack of any major ~~dissimilarities~~dissimilarity in social policy institutions potentially influencing the debt-depression nexus, a *first hypothesis* might be, that there are no differences between the countries in the debt-depression nexus.

However, the legal and institutional environment relating to debt may also have a strong influence on the lives of those in debt and here there is some indication of differences between the three countries. Hoffman (2012) has classified a number of EU countries by consumer insolvency policies into different debt discharge regimes according to how debtor-friendly they are, e.g. how strict are the legal conditions for debt discharges. The author classifies Germany and Belgium (which is influenced by German legislation) into the same cluster whereas France falls into a different cluster. According to other public policy comparisons, in France it is possible for private debts to be discharged through insolvency procedures in less than three years if some special requirements are fulfilled, whereas the minimum duration in Belgium and Germany is 3 to 6 years (Drometer & Oesingmann 2015). Furthermore, descriptive evidence suggests that while Germany and France have quite similar levels of debt relative to disposable income, consumer insolvency filings are more common in France (Ramsay 2015; see also, EC 2008 p. 95). These differences suggest that debt laws

in France may be more debtor friendly which might also indicate a more understanding public perception of indebtedness. Therefore, an alternative *second hypothesis* could be offered that the depression-debt association is less severe in the more debtor friendly legal context of France.

Research questions

This study aims to investigate the following research questions:

- i. Is household debt associated with depressive symptoms among people aged 50 and over in three Western European countries?
- ii. Does the association differ between these three countries?

Methods

Data

This study employs data from the Survey of Health, Ageing and Retirement in Europe (The Harmonized SHARE version D.2) waves 1, 2, 4, 5 and 6 (2003/4, 2006/7, 2011, 2013 and 2015 respectively) for Belgium, France and Germany. Wave 3, which collected retrospective life history information, was not used as it did not include the necessary variables. The target population of SHARE is those who are aged fifty years and older at the time of the interview (excluding the institutionalised population), hold a known address and speak one (or more) of the country's official languages. Spouses of sample members were also interviewed, regardless of age. All parts of the data generation process have been harmonised across countries (Borsch-Supan *et al.* 2013). In each wave, the dataset provides both cross-sectional information (from those subjects who participated only in one wave) and longitudinal data for subjects who participated in at least two waves. Response rates have varied between waves and countries with a previously estimated average response rate of almost 60 % (Penger,

Strobl and Grill 2017). Refreshment samples were added in some countries in various years resulting in some fluctuation in the size of the cross-sectional samples.

The datasets we analysed were merged, cleaned and made comparable using the coding provided through the Gateway to Global Aging Data (2017). Some missing item responses were imputed for monetary variables (Angrisani *et al.* 2017, Gateway to Global Aging Data 2017). However, the proportion of fully imputed debt indicators was very low (ranging from 2 to 3% of observations) and did not vary in any consistent fashion by country or wave (Supplementary Table S1a-b). We excluded spouses aged under 50 from our analyses as this group does not constitute a representative sample. Observations with missing information on the variables used in this study were dropped (912 observations for women and 684 observations for men were dropped). After these exclusions, the merged data, from all countries from all waves pooled, consisted of 31,409 observations from 13,767 women and 26,382 observations from 11,781 men (supplementary Table S2).

Measures

The outcome measure was the number of depressive symptoms measured by the Euro Depression (EURO-D) score, which is designed for cross-country comparisons and has been validated as a measure of depression (Prince *et al.* 1999). To construct the EURO-D measure, trained interviewers asked informants about twelve depression-related items, namely depression, pessimism, wishing death, guilt, irritability, tearfulness, fatigue, sleeping troubles, loss of interest, loss of appetite, reduction in concentration, and loss of enjoyment over the last month. The sum of the dichotomous items ranging from 0 to 12 (higher score representing a higher number of depressive symptoms) is used as the outcome measure.

Although the EURO-D score can be used as a dichotomous measure indicative of clinically

significant depression, with a cut-point of score >3 , we preferred to use it as a continuous variable which has been suggested as more appropriate for studies of population health (Castro-Costa *et al.* 2008, Prince *et al.* 1999). However, we additionally undertook some sensitivity analysis using the dichotomised score.

The main exposure variable was household debt. Information on household debt was gathered from the household member, characterised as the ‘financial respondent’, able to provide the most reliable information about the household’s financial situation. Respondents were asked about various items of household debt divided into: household housing debt referring to the total amount of outstanding mortgage, and household financial debt referring to outstanding debt other than a mortgage. For this study, both debt measures were first adjusted for consumer price index (CPI) and purchasing power parity (PPP)¹ using Germany in 2010 as a reference point to allow comparison across time and between countries. Then, having any financial debt up to and including 5,000€ was defined as “low financial debt”, with household financial debt over 5,000€ defined as “substantial financial debt”. We also distinguished between those with ‘low’ and ‘substantial’ housing debt, in this case using a cut-point of 20,000€ to distinguish the two groups. The rationale for these cut-points was that they equalled approximately the highest 10% of the given debt type for all households in all countries and, therefore represented a comparatively substantial debt burden.

We included in all analyses several control variables potentially associated with both mental health and household indebtedness. Key socioeconomic measures included a three-category classification of education level (*I ‘pre-primary, primary and lower secondary education’, II ‘upper secondary and post-secondary, non-tertiary education’, III ‘first and second stage of*

¹ PPP-values were provided by OECD (2018), Purchasing power parities (PPP) (indicator). doi: 10.1787/1290ee5a-en (Accessed on 21 May 2018)

tertiary education’); employment status (*employed; retired; unemployed or permanently sick; and in addition, homemaker for women*); household gross wealth. Following previous work (e.g. Riumallo-Herlet *al.* 2014) gross wealth, adjusted for country and time period, ~~were~~was converted to a log scale (ln).

Given its known association with indebtedness and with depression (Richardson, Elliott and Roberts 2013), we controlled for physical health status using the number of self-reported diagnosed diseases with categories of 0, 1 and 2 or more diagnosed diseases (these included high blood pressure, diabetes, cancer, lung disease, heart problems, stroke and arthritis). A dichotomous measure of obesity (BMI>30) was also included (Munsteret *al.* 2009). Furthermore, two categorical disability measures were used, namely the number of limitations in activities of daily living (ADL) with categories of 0, 1 and 2 or more limitations, and the number of limitations in instrumental activities of daily living (IADL) with the same categories as the former. In addition, given their potential association with debt and depression, measures of age (age and age#age), marital status (partnered; never-married, divorced or separated; and widowed), housing status (owner versus not owner), household size (1-2 versus 2 or more household members), time (wave dummies) and country#time interaction dummies were used where appropriate.

All variables were time-varying (measured at each wave) except country and education levels, which were stable over the study period. All analyses were undertaken separately for men and women given known differences in levels of depression and in measures of socioeconomic status.

Statistical analyses

Following descriptive analysis, we fitted regression models to investigate the link between household debt and depressive symptoms with the number of depressive symptoms (EURO-D score) as the continuous outcome variable. Due to the nested nature of the data within individuals, linear mixed ('multilevel') models with random intercepts for subjects were utilised. These mixed models are the most appropriate for the study as the data included both cross-sectional and longitudinal observations and the method allowed inclusion of both time-invariant and time-varying co-variables and analysis of variation between and within individuals throughout the study period (Gardiner, Luo and Roman 2009). Clustered standard errors at individual level, or household level in case of same sex respondents from the same household, were used. We first analysed the association between depressive symptoms and socioeconomic predictors in pooled analysis of all countries, controlling for health and disability indicators. Country#wave interaction controls were included to adjust for differences in depression and debt levels between countries and over time.

We then undertook the same analysis for each country separately. Additionally, a separate all countries pooled mixed effect model with random intercepts for individuals including *country#socioeconomic variable* interaction terms was fitted. The interaction terms indicate country differences in the socioeconomic variable-depression associations, including the debt-depression nexus. In this model all other significant differences in socioeconomic variable-depression associations were simultaneously accounted for with their interaction terms. The full model is shown in supplementary materials (Supplementary table S3) but the magnitudes of the differences are shown in Figure 1 which presents unstandardized coefficients and 95 % confidence intervals. Similarly, potential sex differences were separately checked with a sex interaction model with all countries pooled and clustered errors

at household level. The magnitude of the sex differences is shown in the supplementary file (supplementary figure s1). All statistical analyses were conducted using Stata 15 (STATA Corp, College Station, TX).

Results

The mean age of respondents in all countries was around 65 years. Levels of depressive symptoms and household debt differed somewhat by country and sex (Table 1). France had the highest levels of depression with an average of 3.24 depressive symptoms (EURO-D) in women and 2.29 in men. Overall, the percentage of people with low and substantial household financial debt was also highest in France. Proportions with low housing debt were rather low across countries, whereas substantial housing debt was more common in Germany, where an average of 11-12 per cent of respondents' households had substantial housing debt. Germany also had the smallest proportion of women and men with the lowest education level and the highest proportions of employed participants.

< Insert Table 1 about here >

Table 2 presents the results for women from the country specific and whole sample analysis, the latter based ~~on pooled~~ on pooled data for all the three countries and all waves. The magnitude of the country differences tested in a full interaction model is shown in Figure 1.

The analysis of the pooled data (last column Table 2) showed that all socioeconomic variables were associated with the number of depressive symptoms for women. Compared to those with no financial debt, having a low (coef.= 0.212 [95% confidence interval 0.124–0.299]) and substantial financial debt (coef.= 0.282 [CI 0.203–0.362]) was associated with a

higher depressive symptom score. Furthermore, having low or substantial housing debt was linked to a greater number of depression symptoms when compared to those without housing debt (coef.= 0.126 [CI 0.025–0.227] and 0.298 [CI 0.196–0.399], respectively).

The results of the country specific models for women are broadly similar to the results from the pooled sample analysis. In all countries, educational level, employment status and household debt were significantly associated with depression without consistent country differences. There were a few exceptions, however. Compared to those with no financial debt, having low financial debt was associated with a higher number of depressive symptoms in all countries but substantial financial debt was only weakly associated with depressive symptoms in France; the coefficient, although positive, was small (coef. = 0.136 [CI 0.009–0.263]). In contrast, this association was substantial in Germany (coef. = 0.387 [CI 0.230–0.545]) and Belgium (coef. = 0.350 [CI 0.215–0.485]). In Belgium, low and substantial financial debt compared to not having any financial debt had a similar or stronger effect size to having the lowest education when compared to the highest education level (coef. = 0.210 [CI 0.079–0.341]). Having low housing debt was not associated with a higher number of depressive symptoms in the country subgroups, but substantial housing debt was significantly linked to a higher depressive symptom score in all countries. Country differences in associations between depressive symptoms and the debt indicators (see Table S4) are presented in Figure 1. This shows that the association between substantial financial debt and depressive symptoms was greater in Belgium and Germany than in France, but there were no significant differences in associations between depressive symptoms and any of the other debt indicators.

< *Insert Table 2 about here* >

Table 3 presents equivalent results for men. In line with the results for women, educational level, being unemployed or disabled, wealth, and financial debt were significantly associated with depression score in the pooled sample of men (Table 3 last column). Low and substantial financial debt were significantly associated with a higher number of depressive symptoms (coef. = 0.217 [CI 0.133–0.301] and 0.202 [CI 0.130–0.274], respectively). The effect size of having low financial debt when compared to not having any financial debt was higher or similar to the effect of having the lowest education level compared to the highest education level (coef. = 0.144 [CI 0.063–0.226]). In contrast to women, the association between low housing debt and depressive symptoms was not statistically significant and the association with substantial housing debt was milder compared to women (p-value for the sex interaction = 0.011, see supplementary figure s1). On the other hand, the coefficient of being out of work (unemployment, permanently sick or disabled) was significantly higher for men (p-value for the sex interaction < 0.001).

The country specific analysis for men shows similarly that there were no consistent country differences in the socioeconomic predictors of depression, although a few exceptions exist. In all countries, low levels of financial debt were linked to a higher number of depression symptoms without significant country differences in this association (Table 3, Figure 1). In line with results for women, there was a noteworthy difference between the countries in the effect of substantial financial debt. This did not have a significant association with the number of depressive symptoms in France, whereas it was significantly linked to the higher depression score in Germany (coef. = 0.354 [CI 0.213–0.494]) and Belgium (coef. = 0.219 [CI 0.099–0.339]) when compared to those not having this debt. In general, household debt was not associated with the depressive symptoms score although substantial housing debt was

linked to depression with a small effect size in Germany (coef. = 0.158 [CI 0.025–0.291]).

However, the full interaction model showed that the housing debt effect was not significantly different compared to the other countries (Figure 1).

< *Insert Table 3 about here* >

< *Insert Figure 1 about here* >

Sensitivity analyses

Fixed effects modelling of associations between changes in debt and changes in depressive symptoms

Three types of alternative analysis were carried out as a form of sensitivity analysis. First, for the longitudinal subgroup, linear fixed-effect (FE) “within” person regression models were conducted to test whether *changes* in socioeconomic variables, including household debt status, predicted *changes* in depressive symptoms. FE models control for unobserved differences between individuals’ time-invariant characteristics (for example, personality and childhood experiences) that are potentially linked to the outcome variable (Firebaugh, Warner and Massoglia 2013). The fixed effect models (Table 4) largely confirmed the results with regard to household financial debt and substantial housing debt. A change from not having any financial debt to substantial financial debt was associated with an increase in depressive symptoms for women (coef. = 0.127 [CI 0.030–0.224]), and weakly also for Men (coef. = 0.087 [CI -0.001–0.175]). Furthermore, the within individual association between substantial

housing debt and depressive symptoms was as strong and of similar magnitude to the coefficient obtained from the random intercept model for women (coef. = 0.305 [0.158–0.451]). However, it must be noted that only some 22% of participants with two consecutive observations experienced a change in financial debt value and only 10 % a change in housing debt value. As a result of this, and the smaller sample available for this longitudinal analysis, the statistical power in the within individual analysis is not comparable with that of the random effect model presented above.

< *Insert Table 4 about here* >

Results using a dichotomised depression indicator

The second sensitivity analysis checked whether the results were robust when using a dichotomised depression measure using EURO D>3 as a cut-point. A logistic regression with random intercepts for individuals was undertaken focusing on between and within individual variation (Rabe-Hesketh and Skrondal 2008). This sensitivity analysis (Table 5) showed that the results from the pooled analysis were robust even when the outcome was the dichotomized depression measure. After adjustments, both women and men with a substantial financial debt had around 1.5-fold (OR=1.51 [CI 1.34–1.82] for women and 1.42 [CI 1.23–1.64] for men) higher odds of having a depression score above the cut – indicating symptoms that would be clinically identified- compared to those without any financial debt.

The final sensitivity analysis undertaken was a conditional (fixed effect) logistic regression studying intra-individual changes in the dichotomized depression status and household debt status (Allison 2009). This analysis was conducted for a considerably smaller subgroup who experienced changes in the dichotomised depression measure during the study period. The

analysis confirmed that the effect of financial debt on depression was evident also when focusing on within individual changes (Table 5). If a person changed from not having any financial debt to having a substantial financial debt within the study period, his or her odds of being depressed were multiplied by 1.23 (CI 1.00–1.51 for women, CI 1.02-1.50 for men).

< *Insert Table 5 about here* >

Discussion

In this paper we investigated the relationship between household debt and depressive symptoms in a sample of the population aged 50 and over from Belgium, France and Germany, and differences in this relationship between these countries. The results showed that in all countries, after control for measures of socioeconomic position, physical health and disability, financial debt in some form was associated with a higher number of depressive symptoms for both men and women, although low and substantial housing debt was associated with depressive symptoms only for women. There were no consistent differences between the countries in the household debt-depression nexus except that substantial financial debt was not significantly associated with a higher number of depressive symptoms in France for either men or women.

Earlier studies have shown that debt-based measures are independently associated with depression, suicide and other indications of mental illness (Hatcher 1994, Jenkins *et al.* 2008, Richardson, Elliott and Roberts 2013). The results yielded here are consistent with this research. For men the effect of having a low level of financial debt, compared with no debt, on depressive symptoms was of equal magnitude to the effect of having the lowest educational level compared to the highest. On average, after all relevant adjustments, women

with substantial financial debt had nearly 0.3 higher number of symptoms of depression (on a scale of 0 to 12) compared to those without any financial debt. The figure for men was around 0.2.

Rather few earlier relevant studies have used a range of measures of debt and depression so an accurate comparison of these effect sizes with results from previous research is not possible. However, it can be briefly noted that the effect of having any financial debt on a dichotomous indicator of depression (tested in the second sensitivity analysis) seems somewhat lower than found in the previous UK nationally representative cross-sectional studies conducted by Meltzer et al (2012) and Jenkins et al (2008). However, this may be because neither of these previous studies included the range of control for other indicators of SEP, and of health, that we included here, because of the age differences in the samples or potentially because of a difference between the UK and the countries we considered.

The finding that housing debt was a stronger predictor of depression for women, confirms earlier findings about the gendered nature of the debt-depression nexus (Lee and Brown 2007, Nettleton and Burrows 1998). One potential explanation for this is that women may worry more about household housing debt because they tend to be more risk-averse (Jianakoplos and Bernasek 1998). Moreover, joint housing debt may be more stressful for women because their wealth and income tend to be linked to that of their spouse. Women are also likely to lose economically in the event of a divorce (Andress and Hummelsheim 2009), and evidence shows that women are likely to suffer more debt problems after a divorce (Fisher and Lyons 2006). Furthermore, debt may have other gendered effects on various areas of life (see e.g. Dwyer et al 2013), and further studies are needed to study these effects in later age.

Interestingly, the effect of financial debt did not seem to differ notably between low and substantial debt categories. This might be because a substantial debt burden may be qualitatively different from the low financial debt category. A higher proportion of debt in the low financial debt category may be in the form of unsecured loans with high interest rates (e.g. credit card debt or smaller consumer credits) causing more stress and fear of, or actual debt-collection actions. In contrast, the substantial financial debt might be associated with large non-housing assets which are, if necessary, more easily repayable through liquidation (e.g. car loans) and have lower interest rates. This finding highlights the need for a debt-depression scrutiny also with qualitatively oriented debt measures, such as reported debt problems, arrears or payment defaults.

An association between debt and depression does not necessarily imply that debt leads to depression. Firstly, the association might be the other way round, i.e. depression and poor mental health might increase the risks of indebtedness. One potential mechanism for a reverse link, especially when it comes to the effect of low financial debt, is the well-established predatory strategy of some consumer credit companies which target their loans on more vulnerable people (Autio *et al.* 2009). A further potential inverse mechanism might be due to decreased financial judgement or cognitive capacity among people with depressive symptoms, and costs arising from the depression (e.g. reduced work). It is also possible that personal characteristics, such as risk taking propensity, may be related to both depression and household indebtedness (Meltzer *et al.* 2012). However, in our longitudinal analysis we undertook fixed effect sensitivity analysis studying within individual changes which controlled for potential third-factor influence related to unobservable time-invariant characteristics (Table 4 and 5). Results of this were mainly consistent, although weaker with

our main analysis and, therefore, suggest that an explanation based on personality characteristics is unlikely to fully explain the associations between debt and depression that we found in the main analysis. Our analysis also indicated other measures of socioeconomic position or differences in physical health and disability did not account for the associations found between debt and depressive symptoms.

Finally, the reason behind the link might be a causal relationship between indebtedness and depression, although in this observational study we are not able to provide hard evidence of this. Nevertheless, given the evidence presented here and elsewhere (Gathergood 2012, Hojman, Miranda and Ruiz-Tagle 2013), it is not unreasonable to hypothesise for future studies that such a causal link exists. Previous work has suggested that stress and social norms related to debt are important mechanisms mediating the link between debt and depression (Drentea and Reynolds 2012, Drentea and Reynolds 2015, Gathergood 2012). Moreover, there may be various other mechanisms linking the two, such as a lack of material resources due to repayment and debt-collection actions, health behavioural related factors (Drentea and Lavrakas 2000), health care access (Alley *et al.* 2011), social isolation or sense of failure.

Regarding the second research question, the study showed a robust association between household debt and depression in all the three countries considered. We did not find consistent differences between the countries in the effect of housing and low financial debt on depression, which might be due to the similar welfare state structure and the relatively similar economic environment during the study period. It is also noteworthy that we did not find any major differences between the countries in the other socioeconomic predictors of depression, namely wealth, labour market status and education except a somewhat stronger association

between lowest education level and depressive symptoms among women in Germany compared to women in the two other countries. Previous comparative studies on socioeconomic status and health have shown that inequalities in general health are comparable between these three continental European countries and moderate or low when compared to other countries (e.g. Mackenbach et al 2008). The fact that we similarly did not find any consistent country differences in socioeconomic predictors of depression is consistent with this.

The only country-specific debt-depression nexus and socioeconomic predictor of depression was that substantial financial indebtedness was not associated with depressive symptoms for men and the association was weaker for women in France compared to the other two countries. The magnitude of the country difference in the debt-depression nexus was substantial for both sexes. Although this finding might be due to differences in sample composition or other unaccounted factors, we offer here two potential explanations worthy of more investigation. The first potential explanation is that the more debtor-friendly legal environment in France attenuates the debt-depression association (Hoffmann 2012), an explanation we call here *an institutional explanation*. The more debtor-friendly legal environment, indicating a shorter jurisdictions period for debt-discharges and/or more understanding attitudes towards those in debt, in France might alleviate the stress and hopelessness related to substantial financial debt. No country differences in associations between low financial debt and depressive symptoms, but it might be that the consumer debt legal environment is only relevant when the debt burden is substantial and significant.

The second, alternative, explanation for the country difference found here might be the fact that substantial financial debt was generally more common in France and therefore it might

be less associated with feelings of shame and stigma. This explanation for the country differences can be called as *a social norm explanation*. Evidence for the social norm explanation is provided by Gathergood (2012) who found in analyses of UK panel data that the effect of debt problems on psychological health was smaller in the UK areas where estimated indebtedness levels were higher and vice a versa. This he interpreted as evidence that local (neighbourhood) social norms are important in the debt-depression nexus possibly as a result of reduced shame and stigma about debt in areas where it was more common. Consistent with this, Angel (2017) in a study of associations between self-rated health, (which is associated with depression), and indicators of over-indebtedness (arrears etc.) across 25 EU countries, reported weak descriptive evidence that countries with a stronger association between self-reported health and over-indebtedness had lower proportions of persons with arrears. However, this explanation would not account for our finding that it was only the association between substantial debt- not lower levels of debt- and depressive symptoms that seemed stronger in France.

All and all, this explorative study can only offer hypothetical explanations for the country differences as we did not have data before and after an introduction of any major consumer debt legislations and we lacked the information regarding the qualitative element of the debt measures. For example, it is also possible that the substantial debt burden comprised more stressful loans, ie. those yielding debt collection actions, in Belgium and Germany than in France. Given that we are unaware of any previous cross-country comparative studies on debt-depression nexus, detailed analyses of country comparisons are needed, also with qualitative measures of indebtedness, to verify our country difference finding, to explore potential explanations more in detail and to test both *institutional* and *social norm explanations* (while the two are interactive and not mutually exclusive).

Lastly, it is important to consider the implications of our main finding from the perspective of older people. Traditional economic models of saving conceptualise older age as a life phase reliant on consumption of accumulated wealth from earlier life-phases (e.g. Danziger et al 1982). For this age group incomes are not usually increasing, and persons are more dependent on social security, family and earlier savings. However, this reliance on accumulated savings or pensions may make older people particularly vulnerable to fiscal and economic shocks affecting returns on savings and the value of pensions. Additionally, in some cases older people may be called upon to provide support to adult children affected by economic downturns or experience other events, such as a deterioration in health or bereavement, involving a loss of income, loss of capacity to gain income, or increased expenditure (e.g. Health & Calvert 2013; Brandt & Deindl 2013). These changes in circumstances may lead to taking on debt, but also a reduced capacity to meet repayments of existing or new debts resulting in socio-economic and psychological stress.

Methodological consideration

The main strength of this study was the use of a population representative cross-national data set with comparative measures and large samples of both cross-sectional and longitudinal participants. The follow-up design from up to five data-points allowed a detailed analysis of the relationship under study. Furthermore, the models controlled for several potential confounding factors. Additionally, this study used a well-validated outcome measure of depressive symptoms designed for country comparisons (Prince et al. 1999), and also verified the results using a dichotomized measure of clinically significant depression.

Several limitations must be taken into consideration in the interpretation of the results. The data excluded the institutional population (potentially correlated with depression), which decreases the national representativeness of the results. The internal validity of the data might be compromised due to selection bias related to mortality and drop-outs from the longitudinal sample. Furthermore, the differences in the sample size and composition (cross-sectional observations vs. longitudinal observations) between the waves and countries may weaken the reliability of the country comparison part. Also, our data consisted some imputed values for item missingness, although the results did not differ significantly when fully imputed debt values were deleted.

The measures of household debt and wealth were provided by the financial respondent of a household having the most up-to-date information about the household's financial situation. However, potential reporting bias still exists due to, for example, cognitive limitations or shame which might have influenced reporting. Previous studies indicate that people tend to underreport their credit card debt (Zinman 2009), which might partly explain the finding that the substantial financial debt category was not a notably stronger predictor of depression than low financial debt.

Moreover, the debt measures used were insufficient to differentiate manageable and unmanageable debt and we lacked information on payment difficulties or arrears. It is argued that debt may have a detrimental effect on mental health only when it is associated with stress or debt-collection actions (Drentea and Reynolds 2012). Normal and manageable debt may even have a positive effect on health and well-being through improved consumption power (Clayton, Liñares-Zegarra and Wilson 2015).

We considered continuous debt variables inappropriate for this study because the debt-depression relationship is not easily modelled and clearly nonlinear. In financial and housing debt measures, a simple cut-point of approximately the highest 10% of the adjusted monetary amount of the given debt type within the study population was used in separating low and substantial debt burden categories. Although this cut-point is arguably somewhat arbitrary, it is justified as no universal metrics of debt status exist (Betti *et al.* 2007). A validation check using interactions between the monetary amount of the given debt and the corresponding debt categories provided also some support for our cut-point; a continuous debt amount was more strongly associated with higher number of depressive symptoms within the low financial debt category than within the substantial debt category (Supplementary Table S4). However, for the housing debt we did not find any significant interactions between the continuous debt measure and categories suggesting that for this debt measure debt status might be more important than the actual amount per se.

Furthermore, we re-estimated all our models using a continuous natural logarithm debt scale measure, in which lower amounts of debt are given more weight than higher amounts of debt. Using this continuous debt measure verified our main findings. First, In scale of financial debt was significantly associated with higher number of depressive symptoms in all countries, but the association was weaker in France (significant at the 10% significance level). Secondly, In scale of housing debt was associated with depressive symptoms for women without significant country differences but not for men in Belgium and France (Supplementary Figure S3 and S4). Additionally, to account for differences in consumption power between the three countries, we used the purchasing power parity value adjusted monetary variables (debt and wealth) to provide comparative estimates to the country

comparison part. However, it is worth noting that our analyses without the ppp-adjustments yielded similar results.

We did not employ previously used debt-to-income based measures for this study, as these do not investigate the effect of debt per se, being a combination of two variables, which both have their own distinct socioeconomic dimensions. Debt-to-wealth measures are unsuitable as at older ages as risk of misclassifications of debt-to-wealth measures is high. Nevertheless, to evaluate potential protective effect of high wealth on the debt-depression nexus, we ran a sensitivity check with the full all countries pooled model with an interaction term for dichotomous financial debt (low or substantial) and wealth quartiles (Figure S4). This analysis showed that those with financial debt had higher depression scores in almost all wealth quartiles compared to those without any financial debt although the effect sizes were indeed significantly larger in the lower than the higher wealth groups. Therefore, further studies are needed to investigate the co-occurrence effect of debt with other socioeconomic dimensions on depression. Lastly, we did not adjust our models for household income as household wealth is a measure of cumulative income. In our dataset, there was not comparable household net income variable available in all five waves used in the present study. Nevertheless, we ran our models with four waves for which a comparable household income measure was available. This did not change our results and showed that household income (logarithm converted) was generally a non-significant predictor of depressive symptoms when controlling for the other socioeconomic predictors.

Conclusion

Having a small or substantial amount of financial debt was a robust predictor of depression for older European adults included in this study. Furthermore, this study found that the association existed in some form in all three countries studied. However, some variations in France indicate the need to further investigate the effect of legal policies on the association between debt and depression. Measures and dimensions of indebtedness should be taken into consideration in future work on social inequalities in depression in Europe. Further work is needed to investigate in detail the effect of country context utilising various of debt and debt problem measures, and to understand the interaction between household debt and other socioeconomic disadvantages.

Policy implications

The finding that even low financial debt is associated with depression highlights the importance of consumer protection and regulation of the companies making even smaller financial loans including consumer credits and payday loans. Moreover, this study suggested that having a substantial financial debt did not affect strongly depressive symptoms in France; the country with arguably the most debtor friendly legal system in continental Europe. Therefore, further evidence would be needed to evaluate the practices regarding the debt-discharge legal environment in continental Europe and debt-advice services in order to mitigate the mental health concern related to debt. Studies are needed to investigate debt-depression nexus before and after major debt legislative change.

Acknowledgements:

Aapo Hiilamo would like to acknowledge Dr. Steen Mangen (London School of Economics and Political Science) for his supervision and commitment in the design phase of this study. The research

leading to these results has received funding from the European Research Council (ERC) under the European Union's Seventh Framework Programme (FP7/2007-2013), ERC grant agreement n° 324055, entitled 'FAMHEALTH' awarded to Emily Grundy.

This paper uses data from SHARE Waves 1, 2, 4, 5 and 6 (DOIs: 10.6103/SHARE.w1.610, 10.6103/SHARE.w2.610, 10.6103/SHARE.w3.610, 10.6103/SHARE.w4.610, 10.6103/SHARE.w5.610, 10.6103/SHARE.w6.610), see Börsch-Supan et al. (2013) for methodological details. (1)

The SHARE data collection has been primarily funded by the European Commission through FP5 (QLK6-CT-2001-00360), FP6 (SHARE-I3: RII-CT-2006-062193, COMPARE: CIT5-CT-2005-028857, SHARELIFE: CIT4-CT-2006-028812) and FP7 (SHARE-PREP: N°211909, SHARE-LEAP: N°227822, SHARE M4: N°261982). Additional funding from the German Ministry of Education and Research, the Max Planck Society for the Advancement of Science, the U.S. National Institute on Aging (U01_AG09740-13S2, P01_AG005842, P01_AG08291, P30_AG12815, R21_AG025169, Y1-AG-4553-01, IAG_BSR06-11, OGHA_04-064, HHSN271201300071C) and from various national funding sources is gratefully acknowledged (see www.share-project.org).

References

- Alley, D.E., Lloyd, J., Pagan, J.A., Pollack, C.E., Shardell, M. and Cannuscio, C. (2011). Mortgage delinquency and changes in access to health resources and depressive symptoms in a nationally representative cohort of Americans older than 50 years. *American Public Health Association*, 101, 12, 2293-8.
- Allison, P.D. (2009) *Fixed effects regression models*. SAGE publications.
- Andress, H.-J. and Hummelsheim, D. (2009) *When marriage ends: Economic and social consequences of partnership dissolution*. Edward Elgar Publishing.
- Angel, S., and Heitzmann, K. (2015) Over-indebtedness in Europe: The relevance of country-level variables for the over-indebtedness of private households. *Journal of European Social Policy*, 2, 3, 331-51.
- Angrisani, M., Chien, S., Lin, A., Meijer, E., Phillips, D., Wilkens, J. and Lee, J. (2017) Harmonized SHARE Documentation. In *Gateway to Global Aging Data*, Produced by the USC Program on Global Aging, Health & Policy.
- Autio, M., Wilska, T.A., Kaartinen, R. and Lähteenmaa, J. (2009) The use of small instant loans among young adults—a gateway to a consumer insolvency? *International Journal of Consumer Studies*, 33, 4, 407-15.
- Bambra C. (2005) Worlds of welfare and the health care discrepancy. *Social Policy and Society*, 4, 31-41.
- Bambra, C. (2011) Health inequalities and welfare state regimes: theoretical insights on a public health 'puzzle'. *Journal of epidemiology and community health*, 65, 9, 740.

Berger, L.M., Collins, J.M. and Cuesta, L. (2016) Household debt and adult depressive symptoms in the United States. *Journal of Family and Economic Issues*, 37, 1, 42-57.

Bergqvist, K., Yngwe, M. Å., and Lundberg, O. (2013) Understanding the role of welfare state characteristics for health and inequalities—an analytical review. *BMC public health*, 13, 1, 1234.

Betti, G., Dourmashkin, N., Rossi, M. and Ping Yin, Y. (2007) Consumer over-indebtedness in the EU: measurement and characteristics. *Journal of Economic Studies*, 34, 2, 136-56.

Blomgren, J., Maunula, N. and Hiilamo, H. (2017) Do debts lead to disability pension? Evidence from a 15-year follow-up of 54,000 Finnish men and women. *Journal of European Social Policy*, 27, 2, 109-22.

Börsch-Supan A and Nisticò S. (2007) European welfare state regimes and their generosity toward the elderly. *Government spending on the elderly*. Springer, 23-52.

Borsch-Supan, A., Brandt, M., Hunkler, C., Kneip, T., Korbmacher, J., Malter, F., Schaan, B., Stuck, S., Zuber, S. and Team, S.C.C. (2013). Data Resource Profile: the Survey of Health, Ageing and Retirement in Europe (SHARE). *International Journal of Epidemiology*, 42, 4, 992-1001.

Brandt, M., and Deindl, C. (2013) Intergenerational transfers to adult children in Europe: do social policies matter?. *Journal of Marriage and Family*, 75, 1, 235-251.

Castro-Costa, E., Dewey, M., Stewart, R., Banerjee, S., Huppert, F., Mendonca-Lima, C., Bula, C., Reisches, F., Wancata, J. and Ritchie, K. (2008) Ascertaining late-life depressive symptoms in Europe: an evaluation of the survey version of the EURO-D scale in 10

nations. The SHARE project. *International journal of methods in psychiatric research*, 17, 1, 12-29.

Clayton, M., Liñares-Zegarra, J. and Wilson, J.O. (2015) Does debt affect health? Cross country evidence on the debt-health nexus. *Social science and medicine*, 130, 51-8.

Danziger, S., Van Der Gaag, J., Smolensky, E., & Taussig, M. K. (1982). The life-cycle hypothesis and the consumption behavior of the elderly. *Journal of Post Keynesian Economics*, 5, 2, 208-27.

Drentea, P. and Lavrakas, P.J. (2000) Over the limit: the association among health, race and debt. *Social Science and Medicine*, 50, 4, 517-29.

Drentea, P. and Reynolds, J.R. (2012) Neither a borrower nor a lender be: The relative importance of debt and SES for mental health among older adults. *Journal of Aging and Health*, 24, 4, 673-95.

Drentea, P. and Reynolds, J.R. (2015) Where does debt fit in the stress process model? *Society and Mental Health*, 5, 1, 16-32.

Drometer, M., and Oesingmann, K. (2015). Household debt and the importance of effective private insolvency laws. *DICE Report*, 13, 2, 63.

Dwyer, R. E., Hodson, R., and McCloud, L. (2013). Gender, debt, and dropping out of college. *Gender & Society*, 27, 1, 30-55.

Dwyer, R. E., McCloud, L., & Hodson, R. (2012). Debt and graduation from American universities. *Social Forces*, 90, 4, 1133-55.

EC. (2008) *Towards a common operational European definition of over-indebtedness.*

European Commission, Directorate-General for Employment Social Affairs Equal Opportunities.

Eikemo, T. A., Bambra, C., Judge, K., and Ringdal, K. (2008). Welfare state regimes and differences in self-perceived health in Europe: a multilevel analysis. *Social Science and Medicine*, 66, 11, 2281-2295.

Ferragina, E. and Seeleib-Kaiser, M. (2011) Thematic Review: Welfare regime debate: past, present, futures? *Policy and Politics*, 39, 4, 583-611.

Firebaugh, G., Warner, C. and Massoglia, M. (2013) Fixed effects, random effects, and hybrid models for causal analysis. In *Handbook of causal analysis for social research*. Springer, 113-32.

Fisher, J. and Lyons, A. (2006) The ability of women to repay debt after divorce. *Journal of Women, Politics and Policy*, 27, 3-4, 161-8.

Fitch, C., Hamilton, S., Bassett, P. and Davey, R. (2011). The relationship between personal debt and mental health: a systematic review. *Mental Health Review Journal*, 16, 4, 153-66.

Gardiner, J.C., Luo, Z. and Roman, L.A. (2009) Fixed effects, random effects and GEE: what are the differences? *Statistics in medicine*, 28, 2, 221-39.

Gateway to Global Aging Data. (2017) Harmonized SHARE Stata Code. Gateway to Global Aging Data, Produced by the USC Program on Global Aging, Health & Policy, with funding from the National Institute on Aging (R01 AG030153).

Gathergood, J. (2012) Debt and depression: causal links and social norm effects. *The Economic Journal*, 122, 563, 1094-114.

- Georgarakos, D., Lojschova, A. and Ward-Warmedinger, M.E. (2010) Mortgage indebtedness and household financial distress. In *Working Paper Series*. Frankfurt.
- Grundy, E. and Holt, G. (2001) The socioeconomic status of older adults: how should we measure it in studies of health inequalities? *Journal of Epidemiology and Community Health*, 55, 12, 895-904.
- Hatcher, S. (1994) Debt and deliberate self-poisoning. *The British Journal of Psychiatry*, 164, 1, 111-4.
- Heath, S., and Calvert, E. (2013) Gifts, loans and intergenerational support for young adults. *Sociology*, 47, 6, 1120-35.
- Hoffmann, T. (2012). The Phenomenon of “Consumer Insolvency Tourism” and its Challenges to European Legislation. *Journal of consumer policy*, 35, 4, 461-75.
- Hojman, D., Miranda, A. and Ruiz-Tagle, J. (2013). Over indebtedness and depression: Sad debt or sad debtors. *Serie de Documentos de Trabajo*, 384, 1-45.
- Jenkins, R., Bhugra, D., Bebbington, P., Brugha, T., Farrell, M., Coid, J., Fryers, T., Weich, S., Singleton, N. and Meltzer, H. (2008). Debt, income and mental disorder in the general population. *Psychological Medicine*, 38, 10, 1485-93.
- Jianakoplos, N.A. and Bernasek, A. (1998). Are women more risk averse? *Economic inquiry*, 36, 4, 620-30.
- Lee, Y. and Brown, S. (2007) Financial distress and depressive symptoms: How do older women and men differ. *Hallym International Journal of Aging*, 9, 2, 125-44.

Lepine, J.P. and Briley, M. (2011). The increasing burden of depression. *Neuropsychiatric Disease and Treatment*, 7, Suppl 1, 3-7.

Lorant, V., Deliege, D., Eaton, W., Robert, A., Philippot, P. and Ansseau, M. (2003) Socioeconomic inequalities in depression: a meta-analysis. *American Journal of Epidemiology*, 157, 2, 98-112.

Mackenbach, J. P. (2012) The persistence of health inequalities in modern welfare states: the explanation of a paradox. *Social Science and Medicine*, 75, 4, 761-9.

Mackenbach, J. P., Stirbu, I., Roskam, A. J. R., Schaap, M. M., Menvielle, G., Leinsalu, M., and Kunst, A. E. (2008) Socioeconomic inequalities in health in 22 European countries. *New England Journal of Medicine*, 358, 23, 2468-81.

Meltzer, H., Bebbington, P., Brugha, T., Farrell, M. and Jenkins, R. (2012) The relationship between personal debt and specific common mental disorders. *The European Journal of Public Health*, 23, 1, 108-13.

Munster, E., Ruger, H., Ochsmann, E., Letzel, S. and Toschke, A.M. (2009) Over-indebtedness as a marker of socioeconomic status and its association with obesity: a cross-sectional study. *BMC Public Health*, 9, 286.

Nettleton, S. and Burrows, R. (1998) Mortgage debt, insecure home ownership and health: an exploratory analysis. *Sociology of health & Illness*, 20, 5, 731-53.

Penger, M., Strobl, R. and Grill, E. (2017) Country-specific and individual determinants of dizziness in Europe: results from the Survey of Health Ageing and Retirement in Europe (SHARE). *Public Health*, 149, 1-10.

Pollack, C.E., Chideya, S., Cubbin, C., Williams, B., Dekker, M. and Braveman, P. 2007.

Should health studies measure wealth? A systematic review. *American Journal of Preventive Medicine*, 33, 3, 250-64.

Prince, M.J., Reischies, F., Beekman, A.T., Fuhrer, R., Jonker, C., Kivela, S.L., Lawlor, B.A., Lobo, A., Magnusson, H., Fichter, M., van Oyen, H., Roelands, M., Skoog, I., Turrina, C. and Copeland, J.R. (1999). Development of the EURO-D scale--a European, Union initiative to compare symptoms of depression in 14 European centres. *The British Journal of Psychiatry*, 174, 330-8.

Rabe-Hesketh, S. and Skrondal, A. (2008). *Multilevel and longitudinal modeling using Stata*. STATA press.

Ramsay, I. (2012). Between neo-liberalism and the social market: Approaches to debt adjustment and consumer insolvency in the EU. *Journal of consumer policy*, 35, 4, 421-41.

Richardson, T., Elliott, P. and Roberts, R. (2013) The relationship between personal unsecured debt and mental and physical health: a systematic review and meta-analysis. *Clinical Psychology Review*, 33, 8, 1148-62.

Riumallo-Herl, C., Basu, S., Stuckler, D., Courtin, E. and Avendano, M. (2014) Job loss, wealth and depression during the Great Recession in the USA and Europe. *International Journal of Epidemiology*, 43, 5, 1508-17.

Seifert, R. W., and Rukavina, M. (2006) Bankruptcy is the tip of a medical-debt iceberg. *Health Affairs*, 25, 2, w89-w92.

Sierminska, E. (2014) Indebtedness of households and the cost of debt by household type and income group. In Directorate-General for Employment, S.A.a.I. (ed), *Research note no*

10/2014. Directorate-General for Employment, Social Affairs and Inclusion, European Commission, Brussels.

Wendt, C. (2009) Mapping European healthcare systems: a comparative analysis of financing, service provision and access to healthcare. *Journal of European Social Policy*, 19, 5, 432-45.

Wittchen, H.U., Jacobi, F., Rehm, J., Gustavsson, A., Svensson, M., Jonsson, B., Olesen, J., Allgulander, C., Alonso, J., Faravelli, C., Fratiglioni, L., Jennum, P., Lieb, R., Maercker, A., van Os, J., Preisig, M., Salvador-Carulla, L., Simon, R. and Steinhausen, H.C. (2011) The size and burden of mental disorders and other disorders of the brain in Europe 2010. *European Neuropsychopharmacology*, 21, 9, 655-79.

Zinman, J. (2009) Where is the missing credit card debt? Clues and implications. *Review of income and wealth*, 55, 2, 249-65.

Accepted 31st July 2018

Address for correspondence:

Aapo Hiilamo, Department of Social Policy, London School of Economics and Political Science,
Houghton Street, London, WC2A 2AE, UK

E-mail: a.hiilamo@lse.ac.uk

Tables

Table 1. *Debt levels and depression by country*

	Women				Men			
	France All waves	Germany All waves	Belgium All waves	Total All waves	France All waves	Germany All waves	Belgium All waves	Total All waves
Mean age	66	65	65	65	65	65	65	65
Euro-D								
Mean	3.24	2.51	2.90	2.91	2.29	1.79	2.03	2.04
Standard deviation	2.37	2.07	2.29	2.28	2.06	1.87	2.04	2.00
3+ (%)	41	28	35	35	24	16	20	20
Household financial debt								
None %	78	86	84	83	75	84	82	80
Low ($\leq 5,000\text{€}$) %	11	5	7	8	12	5	7	8
(Median €)	1199	2058	1583	1480	1270	2058	1772	1627
Substantial ($> 5,000\text{€}$) %	11	9	9	10	14	11	11	12
(Median €)	13689	16484	13403	14191	13839	18709	13575	14691
Total %	100	100	100	100	100	100	100	100
Household housing debt								
None %	90	84	86	87	87	82	84	84
Low ($\leq 20,000\text{€}$) %	4	5	8	6	6	6	9	7
(Median €)	8910	9355	6646	7569	9226	9355	6861	7805
Substantial ($> 20,000\text{€}$) %	5	11	6	7	7	12	8	9
(Median €)	46130	56764	43034	49143	46130	56764	44675	50544
Total %	100	100	100	100	100	100	100	100
Education (time invariant, based on subjects)								
I - Pre-primary, primary and lower secondary education %	52	22	45	40	41	6	41	30
II - Upper secondary and post-secondary, non-tertiary education %	29	57	27	37	38	58	26	40
III - First and second stage of tertiary education %	18	21	28	23	21	35	33	30
Total	100	100	100	100	100	100	100	100
Employment status								
Employed or self-employed %	25	31	24	26	27	32	30	30
Unemployed, permanently sick or disabled %	5	6	10	7	7	8	9	8
Retired %	59	49	44	51	66	60	61	62
Homemaker (women) %	11	14	22	16				
Total	100	100	100	100	100	100	100	100

Table 2. Results (unstandardized coefficients and 95 % confidence intervals) from multilevel regression analysis of associations between socioeconomic measures and depressive symptoms among women aged 50 and over in France, Germany and Belgium.

	France		Germany		Belgium		Pooled	
	B	95 % CI	B	95 % CI	B	95 % CI	B	95 % CI
Household financial debt (ref. no financial debt)								
Low ($\leq 5,000\text{€}$)	0.176**	[0.047,0.306]	0.142	[-0.061,0.345]	0.270***	[0.124,0.416]	0.212***	[0.124,0.299]
Substantial ($> 5,000\text{€}$)	0.136*	[0.009,0.263]	0.387***	[0.230,0.545]	0.350***	[0.215,0.485]	0.282***	[0.203,0.362]
Household housing debt (ref. no housing debt)								
Low ($\leq 20,000\text{€}$)	0.091	[-0.108,0.290]	0.152	[-0.030,0.333]	0.106	[-0.050,0.263]	0.126*	[0.025,0.227]
Substantial ($> 20,000\text{€}$)	0.284**	[0.074,0.494]	0.304***	[0.153,0.455]	0.275**	[0.097,0.454]	0.298***	[0.196,0.399]
Education (ref. education III)								
Education I	0.353***	[0.188,0.518]	0.569***	[0.406,0.732]	0.210**	[0.079,0.341]	0.343***	[0.256,0.430]
Education II	0.125	[-0.037,0.288]	0.239***	[0.122,0.356]	0.040	[-0.095,0.176]	0.118**	[0.039,0.196]
Employment status (ref. employed)								
Unemployed or disabled	0.532***	[0.307,0.757]	0.402***	[0.184,0.619]	0.646***	[0.464,0.828]	0.552***	[0.435,0.670]
Retired	0.077	[-0.084,0.238]	-0.031	[-0.179,0.117]	0.170*	[0.017,0.323]	0.087+	[-0.002,0.176]
Homemaker	0.139	[-0.045,0.323]	0.094	[-0.066,0.254]	0.121	[-0.037,0.280]	0.102*	[0.006,0.198]
Household wealth								
Gross wealth (ln)	-0.027+	[-0.059,0.005]	-0.026*	[-0.050,-0.001]	-0.051***	[-0.077,-0.024]	-0.035***	[-0.051,-0.020]
Random effect parameters								
Standard deviation of intercepts	1.527	[1.471,1.585]	1.249	[1.190,1.311]	1.466	[1.416,1.518]	1.426***	[1.395,1.458]
Residual standard deviation	1.674	[1.637,1.711]	1.478	[1.438,1.520]	1.552	[1.517,1.587]	1.578***	[1.556,1.599]
Observations								
Observations	10665		8694		12050		31409	
Subjects	4,353		4,424		4,990		13,767	
Mean number of observations	2.5		2		2.4		2.3	

Notes: +p<0.1, *p<0.05, **p<0.01, ***p<0.001, All models adjusted for age, age#age, marital status, housing status, household size, physical health (IADL, ADL, the number of reported diseases, and obesity) and country#wave interaction dummies

Table 3. Results (unstandardized coefficients and 95 % confidence intervals) from multilevel regression analysis of associations between socioeconomic measures and depressive symptoms among men aged 50 and over in France, Germany and Belgium.

	France B	95 % CI	Germany B	95 % CI	Belgium B	95 % CI	Pooled B	95 % CI
Household financial debt (ref. no financial debt)								
Low ($\leq 5,000\text{€}$)	0.199**	[0.072,0.326]	0.153 ⁺	[-0.026,0.333]	0.244***	[0.100,0.388]	0.217***	[0.133,0.301]
Substantial ($>5,000\text{€}$)	0.063	[-0.054,0.181]	0.354***	[0.213,0.494]	0.219***	[0.099,0.339]	0.202***	[0.130,0.274]
Household housing debt (ref. no housing debt)								
Low ($\leq 20,000\text{€}$)	0.027	[-0.143,0.197]	0.110	[-0.061,0.280]	-0.061	[-0.188,0.065]	0.023	[-0.064,0.109]
Substantial ($>20,000\text{€}$)	0.106	[-0.059,0.272]	0.158*	[0.025,0.291]	-0.005	[-0.166,0.156]	0.105*	[0.017,0.192]
Education (ref. education III)								
Education I	0.170*	[0.021,0.318]	0.330**	[0.095,0.564]	0.059	[-0.058,0.176]	0.144***	[0.063,0.226]
Education II	0.125 ⁺	[-0.015,0.266]	0.124*	[0.027,0.220]	-0.047	[-0.173,0.079]	0.067 ⁺	[-0.001,0.134]
Employment status (ref. employed)								
Unemployed or disabled	0.526***	[0.303,0.750]	0.597***	[0.393,0.801]	0.707***	[0.520,0.893]	0.629***	[0.512,0.746]
Retired	-0.001	[-0.152,0.150]	0.116	[-0.027,0.259]	0.012	[-0.124,0.148]	0.040	[-0.043,0.122]
Household wealth								
Gross wealth (ln)	-0.052**	[-0.087,-0.018]	-0.058***	[-0.086,-0.029]	-0.073***	[-0.106,-0.041]	-0.062***	[-0.080,-0.043]
Random effect parameters								
Standard deviation of intercepts	1.123	[1.151,1.279]	1.118	[1.054,1.187]	1.270	[1.213,1.330]	1.202	[1.167,1.239]
Residual standard deviation	1.506	[1.464,1.550]	1.299	[1.256,1.341]	1.410	[1.372,1.445]	1.415	[1.391,1.439]
Observations								
Observations	8315		7816		10251		26382	
Subjects	3,504		3,952		4,325		11781	
Mean number of observations	2.4		2		2.4		2.2	

Notes: + $p < 0.1$, * $p < 0.05$, ** $p < 0.01$, *** $p < 0.001$. All models adjusted for age, age#age, marital status, housing status, household size, physical health (IADL, ADL, the number of reported diseases, and obesity) and country#wave interaction dummies

Table 4. Results (unstandardized coefficients and 95 % confidence intervals) from analysis of the association between changes in debt measures and changes in EURO-D, among women and men aged 50 and over in France, Germany and Belgium, fixed effect analyses, longitudinal subgroup.

Household financial debt (ref. no financial debt)	Women		Men	
Low ($\leq 5,000\text{€}$)	0.058	[-0.046,0.162]	0.147**	[0.048,0.246]
Substantial ($>5,000\text{€}$)	0.127*	[0.030,0.224]	0.087+	[-0.001,0.175]
<hr/>				
Household housing debt (ref. no housing debt)				
Low ($\leq 20,000\text{€}$)	0.119+	[-0.013,0.252]	-0.004	[-0.118,0.110]
Substantial ($>20,000\text{€}$)	0.305***	[0.158,0.451]	0.033	[-0.094,0.161]
<hr/>				
Observations				
R-sq: within	0.0288		0.0426	
R-sq: between	0.0088		0.0253	
R-sq: Overall	0.0108		0.0276	
Observations	26795		22342	
Subjects	9153		7741	
Mean number of observations	2.9		2.9	

Notes: +p<0.1, * p<0.05, ** p<0.01, *** p<0.001, All models adjusted for age, age#age, marital status, housing status, household size, wealth, employment, physical health (IADL, ADL, the number of reported diseases, and obesity) and country#wave interaction dummies

Table 5. Results (odds ratios and 95 % confidence intervals) from random intercept logistic regression (RE) and fixed effect (FE) logistic regression. Outcome measure depression (EURO-D>3) at waves 1, 2, 4 and 5.

	Women RE	Women FE	Men RE	Men FE
	OR [95% CI]	OR [95% CI]	OR [95% CI]	OR [95% CI]
Household financial debt (ref. no financial debt)				
Low ($\leq 5,000$ €)	1.36*** [1.19,1.55]	0.99 [0.81,1.21]	1.49*** [1.27,1.75]	1.43*** [1.16,1.75]
Substantial (>5,000 €)	1.51*** [1.34,1.71]	1.23* [1.00,1.51]	1.42*** [1.23,1.64]	1.23* [1.02,1.50]
Household housing debt (ref. no housing debt)				
Low ($\leq 20,000$ €)	1.17* [1.00,1.38]	1.15 [0.87,1.52]	1.00 [0.83,1.22]	1.06 [0.80,1.41]
Substantial (>20,000 €)	1.56*** [1.33,1.82]	1.39* [1.00,1.92]	1.24* [1.03,1.49]	1.18 [0.87,1.61]
Education (ref. education IV)				
Education I	1.53*** [1.35,1.74]		1.19* [1.03,1.38]	
Education II	1.21** [1.07,1.36]		1.11 [0.97,1.27]	
Employment status (ref. employed)				
Unemployed or disabled	1.72*** [1.47,2.03]	1.08 [0.79,1.47]	2.36*** [1.95,2.85]	1.20 [0.90,1.61]
Retired	1.09 [0.95,1.25]	0.89 [0.69,1.15]	1.10 [0.92,1.31]	0.88 [0.68,1.13]
Homemaker	1.15+ [1.00,1.33]	0.94 [0.69,1.28]		
Observations	31409	7796	26382	6927
Subjects	13767	2678	11781	2178
Mean number of observations	2.3	2.9	2.2	3.2

Notes: +p<0.1, *p<0.05, **p<0.01, ***p<0.001, All models adjusted for age, age#age, marital status, housing status, household size, wealth, physical health (IADL, ADL, the number of reported diseases, and obesity) and country#wave interaction dummies

Figures

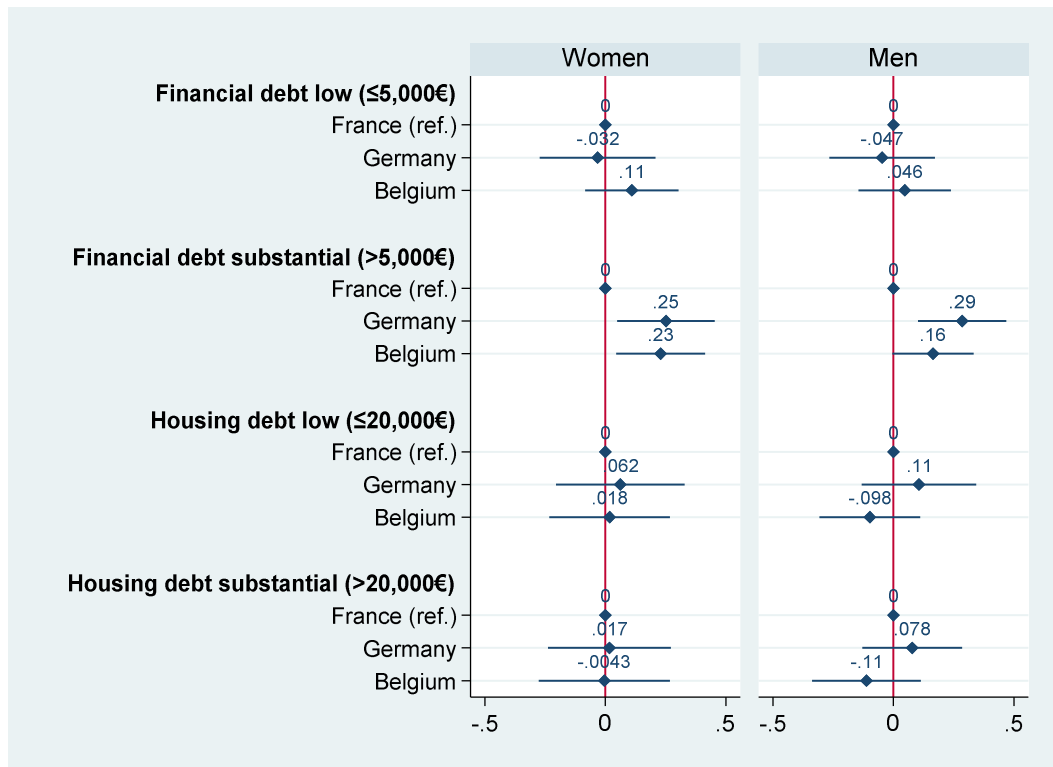


Figure 1. Country differences in debt depression associations: Beta coefficients from the country interaction models. France is the reference. Lines are 95 % confidence intervals for the country interaction term. Full model in Table S4.

Supplementary materials:
tables

Supplementary table S1A: *Fully imputed debt values by country.*

A	Country			
	FR	DE	BE	Total
	%			
Financial debt flag				
Continuous value reported (no imputations)	19	12	13	15
Imputed based on a complete bracket information	2	1	2	2
imputed based on an incomplete bracket information	0	0	0	0
Fully imputed (no bracket information)	2	1	2	2
No given debt (set to 0)	76	85	83	81
Both asset ownership and asset value were imputed	0	1	0	0
Total	100	100	100	100
Housing debt flag				
Continuous value reported (no imputations)	8	13	10	10
Imputed based on a complete bracket information	2	2	3	2
imputed based on an incomplete bracket information	0	0	0	0
Fully imputed (no bracket information)	1	2	2	2
No given debt (set to 0)	88	82	84	85
Both asset ownership and asset value were imputed	1	1	1	1
Total	100	100	100	100

Supplementary table S1B: *Fully imputed debt values by wave.*

B	Survey wave					Total
	Wave 1	Wave 2	Wave 4	Wave 5	Wave 6	
	%					%
Financial debt flag						
Continuous value reported (no imputations)	13	14	16	15	15	15
Imputed based on a complete bracket information	2	2	2	2	1	2
imputed based on an incomplete bracket information	0	0	0	0	0	0
Fully imputed (no bracket information)	2	2	2	2	2	2
No given debt (set to 0)	83	82	79	81	82	81
Both asset ownership and asset value were imputed	1	0	0	0	0	0
Total	100	100	100	100	100	100
Housing debt flag						
Continuous value reported (no imputations)	8	9	9	11	11	10
Imputed based on a complete bracket information	2	2	2	2	2	2
imputed based on an incomplete bracket information	0	0	0	0	0	0
Fully imputed (no bracket information)	2	2	2	1	1	2
No given debt (set to 0)	85	86	85	84	84	85
Both asset ownership and asset value were imputed	1	1	1	1	1	1
Total	100	100	100	100	100	100

Table S2. *Number of participants by country*

	Women				Men			
	France (FR)	Germany (DE)	Belgium (BE)	Total	France (FR)	Germany (DE)	Belgium (BE)	Total
	N	N	N	N	N	N	N	N
Participants by number of observations								
Only 1 Obs. (x-sectional)	1272	1681	1661	4614	1111	1440	1489	4040
2 obs. (longitudinal)	1026	2015	1266	4307	829	1865	1144	3838
3 obs. (longitudinal)	1254	205	1048	2507	979	182	843	2004
4 obs. (longitudinal)	426	247	362	1035	316	225	300	841
5 obs. (longitudinal)	375	276	653	1304	269	240	549	1058
Total number of participants	4353	4424	4990	13767	3504	3952	4325	11781
Observations by wave								
Wave 1	1577	1527	1898	5002	1274	1339	1675	4288
Wave 2	1535	1319	1626	4480	1206	1158	1413	3777
Wave 4	3027	812	2670	6509	2369	711	2254	5334
Wave 5	2416	2824	2881	8121	1847	2594	2430	6871
Wave 6	2110	2212	2975	7297	1619	2014	2479	6112
Total number of observations	10665	8694	12050	31409	8315	7816	10251	26382

Supplementary table S3. *Distribution of changes in the debt variables between two consecutive observations.*

Time 0 (wave t) housing debt status	Time 1 (wave t+1) housing debt status			
	None	Low	Substantial	Total
None (n)	23,427	1,178	1,429	26,034
%	89.99	4.52	5.49	100.00
Low (n)	1,585	608	422	2,615
%	60.61	23.25	16.14	100.00
Substantial (n)	1,782	657	1,155	3,594
%	49.58	18.28	32.14	100.00
Total	26,794	2,443	3,006	32,243
	83.10	7.58	9.32	100.00
Negative change (decreasing debt)				12.5 %
Positive change (increasing debt)				9.4 %
Stable (no change)				78.1 %
Total				100 %

Time 0 (wave t) financial debt status	Time 1 (wave t+1) financial debt status			
	None	Low	Substantial	Total
None (n)	26,718	397	367	27,482
%	97.22	1.44	1.34	100.00
Low (n)	1,052	803	262	2,117
%	49.69	37.93	12.38	100.00
Substantial (n)	623	627	1,394	2,644
%	23.56	23.71	52.72	100.00
Total	28,393	1,827	2,023	32,243
	88.06	5.67	6.27	100.00
Negative change (decreasing debt)				7.1 %
Positive change (increasing debt)				3.2 %
Stable (no change)				89.7 %
Total				100 %

Supplementary table S4: *Interaction between the debt measures and monetary debt amount.*
All participants in the same model

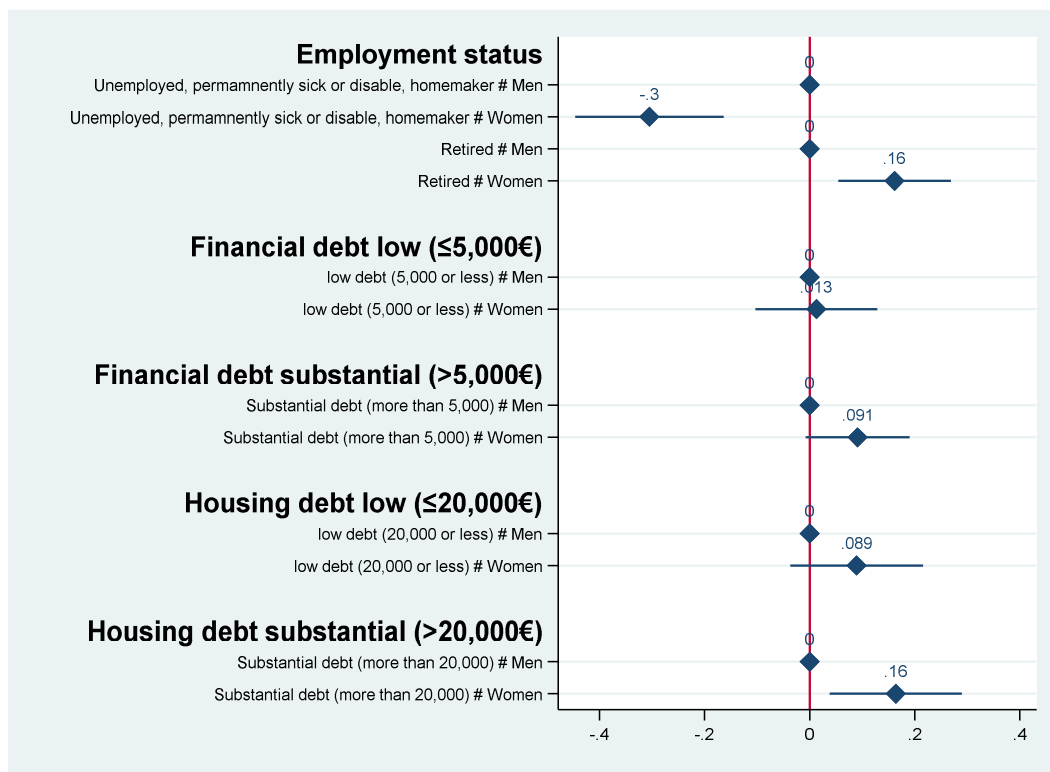
	Women		Men	
	B	95 % CI	B	95 % CI
Financial debt (within the low category)				
Amount (/1000 euros)	0.061 ^{***}	[0.026,0.095]	0.068 ^{***}	[0.035,0.100]
Financial debt measures: interaction with the monetary amount				
Low # amount (/1000 euros)	Ref.		Ref.	
Substantial # amount (/1000 euros)	-0.057 ^{**}	[-0.091,-0.022]	-0.066 ^{***}	[-0.099,-0.033]
Financial debt (within the low category)				
Amount (/1000 euros)	0.007	[-0.002,0.016]	0.004	[-0.004,0.012]
Housing debt measures: interaction with the category				
Low debt # amount (/1000 euros)	Ref.		Ref.	
Substantial # amount (/1000 euros)	-0.005	[-0.013,0.004]	-0.003	[-0.011,0.005]
All adjustments				

Supplementary table S5. Results from the full interaction model.

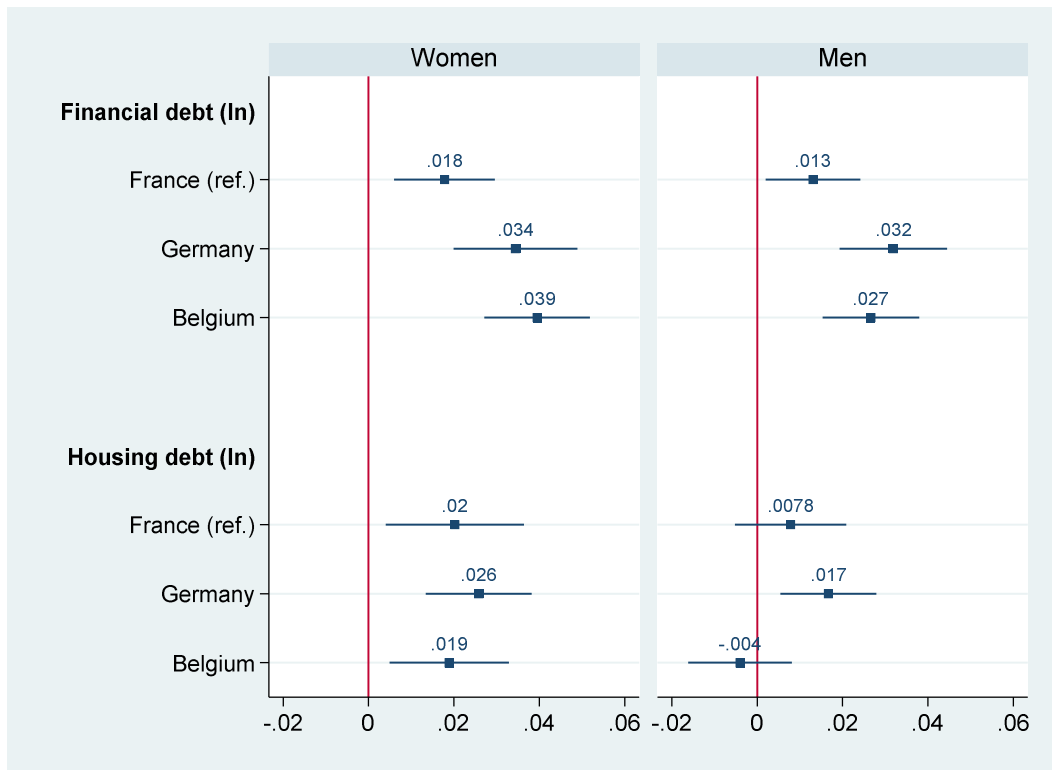
	(Women) EURO-D: Score /0-12		(Men) EURO-D: Score /0-12	
Dependent variable: EURO-D: Score /0-12				
Financial debt				
None	ref.	ref.	ref.	ref.
Low financial debt	0.173**	[0.043,0.302]	0.200**	[0.073,0.327]
Substantial financial debt	0.134*	[0.007,0.261]	0.064	[-0.054,0.181]
None # DE	ref.	ref.	ref.	ref.
None # FR	ref.	ref.	ref.	ref.
None # BE	ref.	ref.	ref.	ref.
Low financial debt # DE	-0.032	[-0.272,0.208]	-0.047	[-0.267,0.172]
Low financial debt # FR	ref.	ref.	ref.	ref.
Low financial debt # BE	0.110	[-0.085,0.304]	0.046	[-0.145,0.238]
Substantial financial debt # DE	0.251*	[0.049,0.454]	0.285**	[0.102,0.468]
Substantial financial debt # FR	ref.	ref.	ref.	ref.
Substantial financial debt # BE	0.229*	[0.044,0.414]	0.164+	[-0.004,0.332]
Housing debt				
None	ref.	ref.	ref.	ref.
Low housing debt	0.089	[-0.108,0.287]	0.028	[-0.140,0.196]
Substantial housing debt	0.282**	[0.074,0.491]	0.103	[-0.059,0.265]
None # DE	ref.	ref.	ref.	ref.
None # FR	ref.	ref.	ref.	ref.
None # BE	ref.	ref.	ref.	ref.
Low housing debt # DE	0.062	[-0.205,0.329]	0.105	[-0.132,0.343]
Low housing debt # FR	ref.	ref.	ref.	ref.
Low housing debt # BE	0.018	[-0.233,0.268]	-0.098	[-0.307,0.110]
Substantial housing debt # DE	0.017	[-0.238,0.272]	0.078	[-0.130,0.285]
Substantial housing debt # FR	ref.	ref.	ref.	ref.
Substantial housing debt # BE	-0.004	[-0.276,0.268]	-0.112	[-0.338,0.114]
Education				
Pre-primary, primary and lower secondary education	0.342***	[0.178,0.506]	0.173*	[0.024,0.322]
upper secondary and post-secondary, non-tertiary education	0.119	[-0.043,0.281]	0.128+	[-0.012,0.269]
First and second stage of tertiary education	ref.	ref.	ref.	ref.
Pre-primary, primary and lower secondary education # DE	0.244*	[0.014,0.475]	0.175	[-0.104,0.453]
Pre-primary, primary and lower secondary education # FR	ref.	ref.	ref.	ref.
Pre-primary, primary and lower secondary education # BE	-0.139	[-0.347,0.069]	-0.126	[-0.315,0.062]
upper secondary and post-secondary, non-tertiary education # DE	0.130	[-0.070,0.331]	0.006	[-0.165,0.177]
upper secondary and post-secondary, non-tertiary education # FR	ref.	ref.	ref.	ref.
upper secondary and post-secondary, non-tertiary education # BE	-0.083	[-0.294,0.128]	-0.178+	[-0.367,0.010]
First and second stage of tertiary education # DE	ref.	ref.	ref.	ref.
First and second stage of tertiary education # FR	ref.	ref.	ref.	ref.
First and second stage of tertiary education # BE	ref.	ref.	ref.	ref.
Employment status				
employed or self-employed	ref.	ref.	ref.	ref.
unemployed, permanently sick or disabled	0.510***	[0.285,0.734]	0.696**	[0.444,0.948]
retired	0.056	[-0.095,0.207]	0.054	[-0.103,0.212]
homemaker (women)	0.125	[-0.057,0.306]		
employed or self-employed # DE	ref.	ref.	ref.	ref.
employed or self-employed # FR	ref.	ref.	ref.	ref.
employed or self-employed # BE	ref.	ref.	ref.	ref.
unemployed, permanently sick or disabled # DE	-0.099	[-0.410,0.211]	-0.054	[-0.387,0.279]
unemployed, permanently sick or disabled # FR	ref.	ref.	ref.	ref.
unemployed, permanently sick or disabled # BE	0.145	[-0.143,0.433]	0.098	[-0.228,0.424]
retired # DE	-0.069	[-0.270,0.133]	0.052	[-0.156,0.260]
retired # FR	ref.	ref.	ref.	ref.
retired # BE	0.114	[-0.089,0.317]	-0.051	[-0.254,0.152]
homemaker (women) # DE	-0.017	[-0.257,0.222]		
homemaker (women) # FR	ref.	ref.		
homemaker (women) # BE	-0.003	[-0.238,0.232]		
Wealth				
Cross wealth (ln)	-0.027+	[-0.054,0.000]	-0.050***	[-0.080,-0.021]
DE # Cross wealth (ln)	0.003	[-0.030,0.035]	-0.001	[-0.037,0.035]
FR # Cross wealth (ln)	0.000	[0.000,0.000]	0.000	[0.000,0.000]
BE # Cross wealth (ln)	-0.026	[-0.059,0.006]	-0.032	[-0.070,0.007]
Age				
Age	-0.066**	[-0.106,-0.026]	-0.099***	[-0.140,-0.057]
Age*Age	0.000**	[0.000,0.001]	0.001***	[0.000,0.001]
DE # Age	0.004	[-0.007,0.015]	-0.004	[-0.015,0.006]
FR # Age	ref.	ref.	ref.	ref.
BE # Age	-0.006	[-0.016,0.004]	-0.007	[-0.017,0.003]
Country				

DE	-1.209**	[-1.953,-0.464]	-0.594	[-1.359,0.172]
FR	ref.	ref.	ref.	ref.
BE	0.293	[-0.419,1.004]	0.576	[-0.189,1.340]
Marital status				
married or partnered	ref.	ref.	ref.	ref.
divorced, separated or never married	0.108	[-0.059,0.274]	0.225*	[0.051,0.398]
widowed	0.250**	[0.097,0.402]	0.470***	[0.208,0.731]
married or partnered # DE	ref.	ref.	ref.	ref.
married or partnered # FR	ref.	ref.	ref.	ref.
married or partnered # BE	ref.	ref.	ref.	ref.
divorced, separated or never married # DE	-0.007	[-0.253,0.240]	0.001	[-0.246,0.248]
divorced, separated or never married # FR	ref.	ref.	ref.	ref.
divorced, separated or never married # BE	0.021	[-0.207,0.248]	0.021	[-0.212,0.254]
widowed # DE	0.083	[-0.140,0.306]	-0.002	[-0.361,0.357]
widowed # FR	ref.	ref.	ref.	ref.
widowed # BE	0.018	[-0.199,0.236]	0.039	[-0.303,0.381]
Number of household members				
2 or less	ref.	ref.	ref.	ref.
More than 2 household members	0.028	[-0.050,0.107]	0.061 ⁺	[-0.005,0.128]
Tenant	ref.	ref.	ref.	ref.
Home owner	-0.134**	[-0.218,-0.050]	-0.038	[-0.123,0.047]
Wave				
Wave 1	ref.	ref.	ref.	ref.
Wave 2	-0.070	[-0.189,0.050]	-0.177**	[-0.304,-0.050]
Wave 4	0.137*	[0.016,0.259]	0.045	[-0.080,0.170]
Wave 5	0.025	[-0.105,0.155]	-0.036	[-0.166,0.093]
Wave 6	-0.004	[-0.139,0.131]	-0.062	[-0.202,0.078]
Wave 1 # DE	ref.	ref.	ref.	ref.
Wave 1 # FR	ref.	ref.	ref.	ref.
Wave 1 # BE	ref.	ref.	ref.	ref.
Wave 2 # DE	0.062	[-0.107,0.232]	0.212*	[0.046,0.377]
Wave 2 # FR	ref.	ref.	ref.	ref.
Wave 2 # BE	0.127	[-0.034,0.288]	0.204*	[0.045,0.364]
Wave 4 # DE	0.263**	[0.075,0.451]	0.246**	[0.062,0.431]
Wave 4 # FR	ref.	ref.	ref.	ref.
Wave 4 # BE	0.020	[-0.142,0.183]	0.115	[-0.046,0.275]
Wave 5 # DE	0.302***	[0.128,0.475]	0.440***	[0.272,0.607]
Wave 5 # FR	ref.	ref.	ref.	ref.
Wave 5 # BE	0.030	[-0.139,0.199]	0.126	[-0.040,0.291]
Wave 6 # DE	0.242**	[0.059,0.424]	0.338***	[0.160,0.517]
Wave 6 # FR	ref.	ref.	ref.	ref.
Wave 6 # BE	0.119	[-0.056,0.294]	0.152 ⁺	[-0.023,0.327]
Morbidity				
0	ref.	ref.	ref.	ref.
1	0.425***	[0.361,0.489]	0.296***	[0.237,0.354]
2+	0.835***	[0.760,0.909]	0.664***	[0.592,0.736]
Limitations in daily activities				
0	ref.	ref.	ref.	ref.
1	0.526***	[0.432,0.620]	0.696***	[0.594,0.797]
2+	0.813***	[0.673,0.953]	1.019***	[0.843,1.196]
limitations in instrumental daily activities				
0	ref.	ref.	ref.	ref.
1	0.785***	[0.669,0.901]	0.731***	[0.591,0.871]
2+	0.967***	[0.799,1.135]	0.776***	[0.571,0.981]
Obese				
No	ref.	ref.	ref.	ref.
Yes	-0.059 ⁺	[-0.126,0.009]	-0.032	[-0.099,0.034]
Observations	31409		26382	

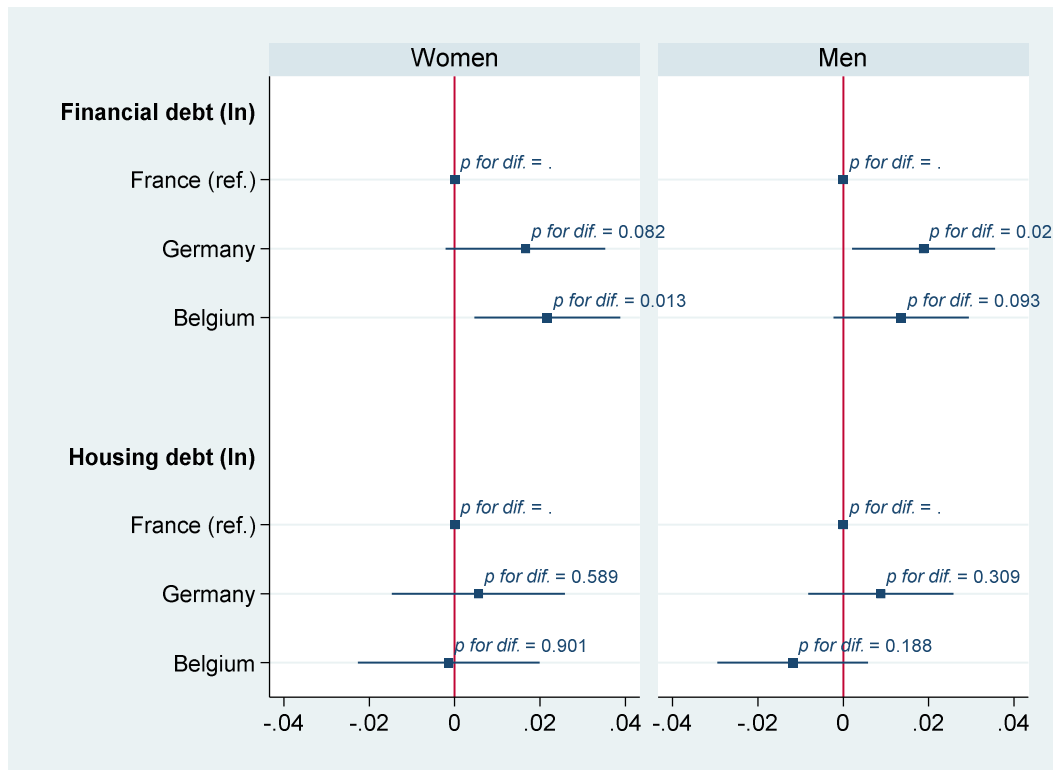
**Supplementary materials:
figures**



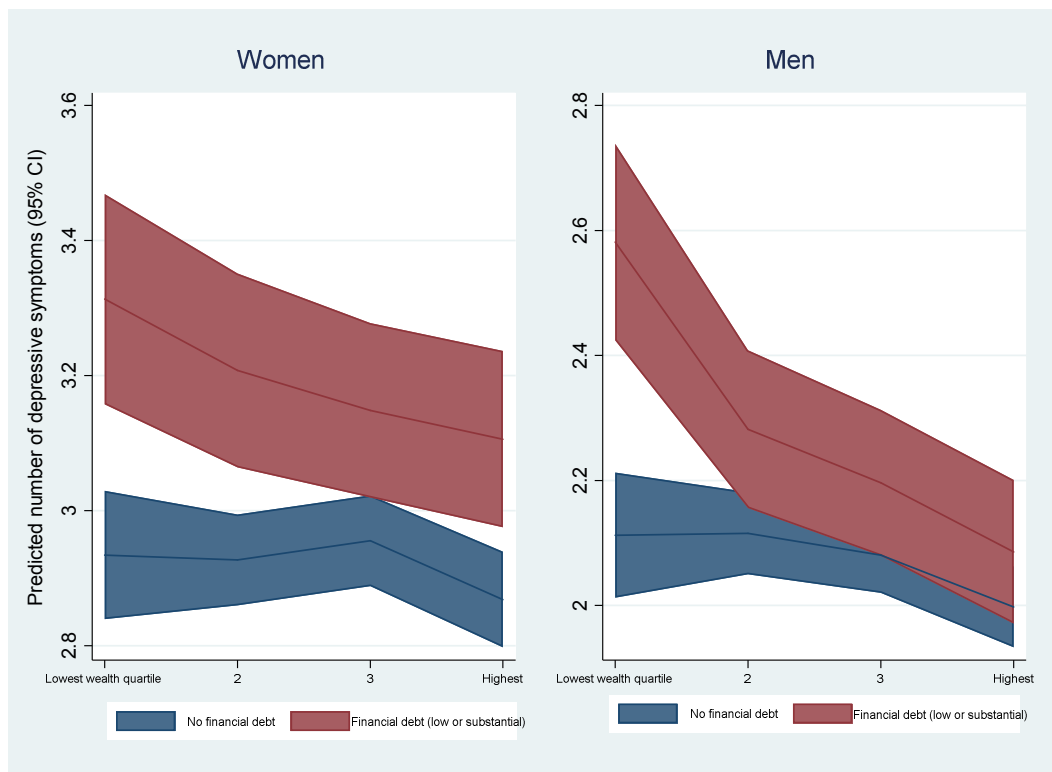
Supplementary Figure S1. Sex interaction with selected socioeconomic variables. Unstandardized coefficients and 95% Confidence Intervals. Results from random intercept model with all adjustments and sex interactions. Household clustered SE.



Supplementary Figure S2. Country specific associations between depressive symptoms and natural logarithm of the debt measures. Unstandardized coefficients and 95% Confidence Intervals. Results from random intercept model with all adjustments and country interactions. Clustered SE.



Supplementary Figure S3. Country differences in the association between depressive symptoms and natural logarithm debt measures. France as a reference country. Results from random intercept model with all adjustments and country interactions. Same model as Figure S1. Clustered SE.



Supplementary Figure S4. *Interaction between wealth quartiles (all countries wealth, PPP and CPI adjusted) and dichotomous financial debt status (low or substantial). Predicted values from random intercept model, in which all countries were pooled and fully adjusted. Clustered SE.*