



Association of Income and Wealth with Self-reported Health Status: Analysis of European Countries during the Financial Crisis*

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Abstract

In this paper, we evaluate the association of changes in income and wealth with self-perceived health for the European Union (EU) countries, using a longitudinal sample of individuals. We estimated gen-

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We used Eurosystem's Household Finance and Consumption Survey for the European Union sample of countries, from data available at the European Central Bank and the EU Statistics on Income and Living Conditions (EU-SILC), from Eurostat.

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eralized linear mixed models for three waves of the Eurosystem Household Finance and Consumption Survey (2011, 2015, 2017), adjusting for family and individual heterogeneity and for temporal trends. Results show that variations in income have a positive and significant impact on changes in self-perceived health during the financial crisis, but not after 2015. In conclusion, we find that income, rather than wealth, played an important role in protecting health.

Keywords: Self-perceived health, Wealth, Asset composition, European Union.

JEL Classification: I14, C23, G51.

1. Introduction, literature review and background

There is an extensive body of literature analyzing socioeconomic inequalities in well-being (for a review, see O'Donnell *et al.*, 2015). A better socioeconomic position, generally related to income, is associated with both higher levels and lower variations in self-reported health. More recently, the availability of administrative data has allowed researchers to add wealth into the analysis. This is a stock variable which may provide a better protective role in stabilizing consumption and welfare from economic shocks and/or income fluctuations, providing an appropriate proxy for long life cycle earnings. Its association to self-perceived health is rather intuitive, even though its influence may be much related to rates rather than levels in causing effects on life satisfaction (through anxiety, depression etc.) and health. Moreover, wealth composition, in terms of real versus financial assets, housing prices or the stock of exchange fluctuations may matter too. The levels of indebtedness, mortgage rates, types of credits and liabilities, duration of the shock may be also important. Feeling 'good' may differ between expansions and economic recessions and the degree of volatility on asset pricing.

The joint role wealth and income have in shaping well-being has been studied to a much lesser extent than income, especially for younger adults. Notable exceptions to this are the work of Poterba *et al.* (2011) in the case of retirement, Schwandt (2018) and Pool *et al.* (2018) for wealth shocks, Finkelstein *et al.* (2013) for wealth, health, and well-being, Liu and Menegatti (2019) for wealth investment and health, and Blázquez and Budria (2018) and Saez *et al.* (2019a) for wealth shocks in Spain. Among those who investigate the role asset composition plays on determining well-being, a rather aggregate approach is usually taken, i.e., comparing static levels of wealth rather than their variations as the main explanatory factors influencing health.

Given the number of confounding factors that are present, it is extremely difficult to classify all the relevant literature into separate pieces that translate income to wealth and health, and health to well-being. Some studies have mainly focused on (i) the pure income-wealth-health link (Aittomäki *et al.*, 2010; Martikainen *et al.*, 2003; Perel *et al.*, 2006), (ii) the relation between net wealth (i.e., gross wealth minus debt) and its composition (Clayton *et al.*, 2015; Brown *et al.*, 2005; Berger *et al.*, 2015), or (iii) the impact of over-indebtedness (net wealth burden) and individual health status with regard to emotional states associated with depression, stress, anxiety and mental health (Fitch *et al.*, 2007; Bridges and Disney,

2010; D'Ambrosio *et al.*, 2023), declining physical health (Drentea and Lavrakas, 2000), unhealthy behavior (García-Altés *et al.*, 2018; López-Casasnovas, 2018; Averett and Smith, 2014) and suicidal tendencies (Reeves *et al.*, 2014; Bover, 2018). Aittomäki *et al.* (2010) explored how the wealth of an individual or a household affects health through the effects on living conditions as well as through social comparison and experiences of deprivation. From a Finnish survey of men and women aged 45 to 67 years old, all of whom were civil servants, and in a period before the crisis (2001-2007), they found household wealth to have a strong and consistent association with self-reported health, with poor health decreasing as wealth increased. The relationship was only partly attributable to the association of wealth with employment status, household income, work conditions, and health-related behavior. The association of household income with self-reported health was greatly diminished when considering employment status and wealth, and even further attenuated by work conditions. Benzeval and Judge (2001) pay particular attention to the role of long-term income as a proxy for wealth, to conclude that wealth is more important for health than current income, and persistency is more harmful to health than occasional episodes.

Psychological elements may be moderating factors. Bridges and Disney (2001) show that although there is a positive association between subjective measures of financial well-being and psychological well-being, individuals differ in their psychological response to objective household financial situations. Dietz and Haurin (2003) focus their attention on the effects of real assets to note that homeowners are happier and healthier than non-owners. However, the correlation between both variables has some clear confounding factors, such as income and education. In any case, homeowners report higher self-ratings on their physical health even after controlling for age and socioeconomic factors. Regarding net wealth variations, Gathergood (2012) analyzes over-indebtedness to conclude that individuals exhibiting problems repaying their debt obligations also exhibit much poorer psychological health. Using individual-level UK panel data, local house price movements exogenous to individual households are used to establish the causality from problem mortgage debt to psychological health. Interestingly, there seems to exist a sort of 'social norm effects' of debt (how extended, how general these problems are) when investigating local bankruptcy and repossession rates.

On the importance of asset composition, Berger *et al.* (2015) analyze data from 1987 to 1994 from the USA National Survey of Families and Households in a series of regression models, to estimate associations of particular types and levels of debt with adult depression symptoms. Results suggest that household debt is positively associated with greater depressive symptoms. However, this association appears to be driven by short-term (unsecured) debt; they found little evidence of associations with depressive symptoms for mid- or long-term debt. In similar terms, Brown *et al.* (2005) explore the association between debt and psychological well-being amongst heads of households using the British Household Panel Survey. Household heads who have outstanding (non-mortgage) credit, and who have higher amounts of such debt, are significantly less likely to report complete psychological well-being. However, this significant association is not found in the case of mortgage debt. Their results highlight the psychological cost associated with the consumer credit culture in Britain.

Turunen and Hiilamo's (2014) systematic literature review of 33 peer-reviewed studies, show serious health effects related to indebtedness. Individuals with unmet loan payments had suicidal ideations and suffered from depression more often than those without such financial problems. Unpaid financial obligations were also related to poorer subjective health and health-related behavior. In a similar vein, Richardson *et al.* (2017) conclude that those with depression are more than twice as likely to be in debt; 42% of those in debt have a mental disorder compared to 18% with no debt. Furthermore, 25% of those with a mental disorder are in debt, compared to 9% in those who are healthy.

On the effects of wealth changes, Pool *et al.* (2018) explore how a sudden loss of wealth—a negative wealth shock—may take a significant mental health toll and leave fewer monetary resources for health-related expenses. With limited years remaining to regain lost wealth in older age, the health consequences of these negative wealth shocks may be long-lasting. Among US adults aged 51 years and older, a loss of wealth over two years was associated with an increased risk of all-cause mortality. By estimating how the marginal utility of consumption varies with health, from data on permanent income, health in older people and people of a similar elderly age, and a proxy for utility with measures of subjective well-being, Finkelstein *et al.* (2013), find that the marginal utility of consumption declines as health is felt to deteriorate. This has a substantial effect on the optimal levels of health insurance benefits and life-cycle savings. This latter issue is taken up by Liu and Menegatti (2019) studying how health and wealth investments react to the presence of random returns, distinguishing the case where only the level of health investment is chosen from the case where both health and wealth investments are chosen. The authors show that this reaction depends mainly on certain features of preferences: cross-prudence/imprudence in wealth, cross-prudence/imprudence in health, and the value of the indices of relative prudence in wealth and in health being larger or smaller than the threshold in determining optimal choices.

Building on previous literature, the objective of this paper is to evaluate the association between the variations in income and wealth (aggregated and disaggregated into real estate and financial wealth) and variations in self-perceived health in those European Union (EU) countries which form part of the Eurosystem's Household Finance and Consumption Survey (HFCS) in the three available waves (2011, 2015, 2017). We take advantage of a rich and unique dataset covering the financial crisis suffered in Europe which, in turn, created a plethora of inferences on its effects on European's health (see Saez *et al.*, 2019b, for a critical review) and which refers to variables related to wealth (see Schwandt, 2018; Turunen and Hiilamo, 2014; Bover *et al.*, 2014, among many others).

We meet our objective by considering different levels of wealth and the variation of its two main components—real estate wealth and financial wealth, gross and net wealth—on variations in self-perceived health. As explanatory variables, we include variables at the family level: (i) number of family members; (ii) number of family members who work; and (iii) property regime of the family dwelling (not owned by the family-reference category—or owned by the family). We also include control variables at the individual level: gender, age, educational level, occupation, and marital status. We anchor each estimate of the net wealth and income levels at the start of the periods: 2011-2015 for the recession period and 2015-2017 for the recovery.

Our contribution to the existing literature is twofold. First, we use variations in our estimates instead of levels, thus capturing the importance of time variation. Second, we exploit a rich dataset of EU countries over three periods of time (2011, 2015, 2017), allowing us to investigate the effect of an economic recession first and an expansion later (see Appendix 1 on data for each country).

The remainder of this paper is structured as follows. Section 2 describes the data and methodology used in our analysis. Results are presented in Section 3, and Section 4 concludes the paper with a discussion and concluding remarks.

2. Methods

2.1. Data Sources

We use data from the Eurosystem's Household Finance and Consumption Survey (HFCS)¹, a longitudinal database that collects household-level data on households' finances and consumption. It is a random sample of households within each EU country. We considered thirteen European countries (Austria, Belgium, Cyprus, Germany, Finland, France, Italy, Luxembourg, the Netherlands, Portugal, Slovenia, Slovakia and Spain) which form part of the HFCS in the three available waves allowing for the panel format of the data. We make use of wave 1 in the middle of the financial crisis (2011), wave 2 at the very end of it (2015) and wave 3 for the full recovery (2017)². The HFCS provides detailed information on the assets, debts, income, and spending of the European household units included in the countries' samples. It also contains socioeconomic and demographic information at the household level. The longitudinal nature allows us to follow a set of households at various points in time. More importantly, this survey is the only source of data that provides information on the wealth of those European families over time, allowing us not only to focus on wealth levels, but also on its composition (housing or financial assets). Our study sample for each country includes the members of families who were interviewed in at least two waves of the HFCS and who were interviewed both before and after the crisis.

2.2. Statistical matching

The HFCS does not provide data related to self-reported health status. For this reason, we matched it with the 2011, 2015 and 2017 releases of the cross-section sample survey of the EU Statistics on Income and Living Conditions (EU-SILC)³ EU-SILC provides microdata on income, poverty, social exclusion and living conditions in the EU.

Although in both surveys the subjects come from the same population (i.e., the thirteen EU countries named above), they do not overlap. In fact, in some cases they could be the same subjects, but we do not know because the individual identifiers are not the same. For this reason, we do not carry out a record linkage, of identical units, but a statistical matching, linking records from two different sources that correspond to 'similar' units (Leulescu and Agafitei, 2013).

In fact, we made the assumption that a subject residing in a given country and interviewed in a given year would have, on average, the same data related to the self-reported health status as those subjects from the same country interviewed in the same year, with the same sex, the same age with a maximum difference of 5 years, and the same educational level, employment and marital status.

As Leuescu and Agafitei (2013) point out, matching procedures can be regarded as an imputation problem. Among the different imputation methods, we chose to perform multivariate matching without replacement, using a genetic search algorithm (Sekhon, 2011). The genetic search algorithm determines the weight each covariate is given in the optimal balance. Balance is determined by examining cumulative probability distribution functions of a variety of standardized statistics (including t-tests and Kolmogorov-Smirnov tests) (Sekhon, 2011).

To match the HFCS and EU-SILC databases we used the Matching package (Sekhon, 2011) in the free software R (version 4.1.2) (2023). Specifically, we matched the databases using the matching variables of gender, age (with a margin of +/- 5 years), educational level, employment status, marital status, year of survey and country.

2.3. Variables

2.3.1. Outcome Variables

In the EU-SILC, respondents were asked to rate their health in one of the following five categories: ‘very good’, ‘good’, ‘fair’, ‘poor’ or ‘very poor’. From this, we constructed our outcome variables, variation in self-perceived health between 2011 and 2015 and between 2015 and 2017. We categorized both variables into ‘improved or maintained’ (taking value 0) and ‘worsened’ (taking value 1).

2.3.2. Explanatory Variables

Our key explanatory variables were the variation in gross and net wealth. In addition to this, we considered the variation of its two main components: real estate wealth and financial wealth. We also considered the variation in total debt and real income. In the latter case, this was to compare it with the difference in the wealth variables. Based on existing literature, wealth and income variables are expected to be positively related with better self-perceived health, while debt is expected to be negatively related (Saez *et al.*, 2019a).

As the explanatory variables of control, we included variables at the family level:

- (i) number of family members:
- (ii) number of family members who work;

- (iii) property regime of the family dwelling (not owned by the family-reference category –or owned by the family).

We also included control variables at the individual level: sex, age, level of education, occupation, and marital status.

Finally, we included the level of the variables of wealth, debt and income in 2011 (in the model that analyzes the variation between 2011 and 2015) and in 2015 (in the model of the variation between 2015 and 2017).

2.4. Statistical analysis

2.4.1. Specification of the model

We specified a generalized linear mixed model with binomial response and a logistic link,

$$\log \left(\frac{\text{Prob}(Y_{ij} = 1)}{1 - \text{Prob}(Y_{ij} = 1)} \right) = \eta_{ij} \quad (1)$$

where Y denoted the response variable (1 for worsened, 0 otherwise), the subscript i denoted an identifier of the study subject and the family to which the subject belonged, j the country where the subject was interviewed, and η_{ij} a linear predictor for subject i .

In the linear predictor for each subject in the model, we incorporated the variables that might explain the variation in self-reported health, the explanatory variables described above (i.e., observed confounders) as well as two unstructured random effects to control for unobserved confounders. In particular, we considered individual heterogeneity, associated with each family to which the individual belonged, and country heterogeneity, associated with the country where the subject was interviewed.

2.4.2. Inference

We used a mixed design, with subjects observed at different moments in time. As we have said, in this design there is individual heterogeneity and country heterogeneity. The problem is that both heterogeneities are not constant over time. Thus, it could be that this time-varying heterogeneity could be correlated with the explanatory variables. As a consequence, the standard estimators (for example, fixed effects, random effects, even GMM estimators) will be inconsistent (Greene, 2018). In addition, there could be a problem called ‘spurious state dependency’ (Heckman 1981a and 1981b). There is no inherent dynamic behaviour in the dependent variable but the disturbances are autocorrelated, probably because there are observed individual characteristics or unobserved individual heterogeneity which, when omitted, create a (spurious) relationship between the past and future values of the dependent variable. All this leads to inconsistent estimates.

All these problems can be solved using a Bayesian approach. In particular, we followed the Integrated Nested Laplace Approximation (INLA) approach (Rue *et al.*, 2009 and 2017; Gómez-Rubio, 2020), within a (pure) Bayesian framework.

As is known, a problem with Bayesian inference is that the results are not invariant to the choice of the priors. Fortunately, this problem was solved in the INLA approach. In this sense, we used priors that penalize complexity (PC priors). These priors are robust in that they do not have an impact on the results and, furthermore, they have an epidemiological interpretation (Simpson *et al.*, 2017).

2.4.3. *Endogeneity*

It is known that some of the explanatory variables and, in particular, income, could be endogenous variables, since there could be a bidirectional relationship in changes in the explanatory variable and changes in self-perception of health. It is also known that if instrumental variables are used, consistent estimators would be obtained. In our case, the problem is that we do not have good instruments. For example, we cannot use lagged values of the variable, since the database of explanatory variables does not provide such information. For this reason, we chose to use the strategy of Montes-Rojas and Galvao (2014), which consists of using informative priors distributions to model endogeneity. In particular, we have used the same PC priors explained above.

All analyses were made with the free software R (version 4.1.2) (2023) through the INLA package (Rue *et al.*, 2009; R INLA project, 2023).

3. Results

3.1. Descriptive

Table 1 (a to f) reports the descriptive statistics of the variable of interest by country and year (2011, 2015, 2017). Overall (Table 1a), the net wealth, total real assets, real estate assets and debt followed a similar pattern. These decreased from 2011 to 2015 and then increased from 2015 to 2017. Financial assets and income, however, remained relatively stable from 2011 to 2015, but then increased in 2017. The magnitudes of these variables were different across countries.

The change in self-perceived health is presented in Table 1g. Twenty-one percent of the sample reported a worsening of their self-perceived health from 2011 to 2015 and 17% from 2015 to 2017. Slovakia, Portugal, Germany and Italy have the highest percentages of worsened health between 2011-2015 while for 2015-2017 this is Portugal, Slovenia and Germany. Meanwhile, the countries with the lowest percentage of worsened health are Cyprus, Finland and Luxembourg for 2011-2015 and Italy, Belgium and Cyprus for 2015-2017.

Table 1a
DESCRIPTIVE STATISTICS. NET WEALTH (€)

Country	2011	2015	2017
Austria	n=4,920	n=2,356	n=2,251
	219,210.63 (261,145.76)	160,655.65 (230,468.14)	253,586.12 (488,217.07)
	159,911.0 [37,000.0-297,000.0]	34,757.5 [2,500.0-278,000.0]	129,176.5 [5,500.0-295,516.0]
Belgium	n=5,096	n=2,335	n=2,313
	263,997.74 (231,486.79)	254,809.37 (257,323.14)	352,533.98 (627,692.01)
	223,500.0 [114,133.0-357,600.0]	221,429.0 [34,841.0-355,000.0]	214,925.0 [92,898.8-391,0]
Cyprus	n=1,207	n=724	n=719
	294,355.69 (333,838.14)	237,759.22 (291,842.12)	721,641.59 (1,663,350.14)
	236,193.9 [53,035.0-479,093.2]	165,000.0 [17,062.5-373,000.0]	261,575.0 [116,963.3-595,119.0]
Germany	n=8,007	n=3,847	n=3,842
	217,881.89 (250,248.66)	187,536.01 (261,317.27)	434,296.01 (948,669.74)
	161,000.0 [28,625.0-322,900.0]	90,000.0 [0.0-283,100.0]	194,000.0 [39,950.0-479,500.0]
Spain	n=15,120	n=7,840	n=7,831
	283,253.87 (287,734.23)	260,580.13 (314,889.24)	858,917.17 (4,075,659.49)
	210,354.0 [96,000.0-399,627.0]	172,202.5 [16,239-384,582.0]	160,680.0 [58,417.5-424,700.8]
Finland	n=22,782	n=2,340	n=2,340
	211,723.64 (219,909.31)	208,075.33 (239,052.91)	249,532.19 (350,677.10)
	159,423.6 [59,158.3-295,992.4]	140,354.0 [23,549.2-305,890.0]	161,305.0 [45,677.5-332,218.0]
France	n=22,744	n=8,368	n=8,358
	281,111.75 (282,190.13)	196,196.09 (265,785.09)	444,076.10 (1,694,048.21)
	213,511.0 [84,112.0-402,752.5]	110,913.0 [7,000.0-287,709.0]	174,896.0 [53,318.0-369,963.0]
Italy	n=18,534	n=7,540	n=7,376
	255,797.77 (240,803.71)	209,803.58 (220,835.83)	243,814.54 (394,015.82)
	203,000.0 [89,200.0-342,900.0]	162,100.0 [27,515.3-300,000.0]	144,300.0 [59,000.0-274,500.0]
Luxemburg	n=1,960	n=1,483	n=1,462
	425,333.04 (359,736.48)	368,143.31 (395,881.58)	853,411.05 (1,470,114.54)
	412,948.0 [101,115.0-679,628.0]	283,000.0 [3,000.0-675,000.0]	549,151.0 [221,402.0-961,488.0]
Netherlands	n=2,826	n=566	n=564
	203,093.23 (185,698.68)	146,120.74 (181,023.59)	135,998.73 (258,511.15)
	175,100.0 [71,865.9-283,800.0]	111,250.0 [4,000.0-230,012.5]	92,000.0 [2,000.0-220,500.0]
Portugal	n=10,378	n=6,192	n=6,081
	142,192.15 (180,914.70)	165,645.07 (92,000.0)	204,999.04 (586,073.03)
	90,395.0 [41,500.0-174,200.0]	92,000.0 [25,000.0-207,000.0]	103,200.0 [47,922.5-297,775.0]
Slovenia	n=948	n=103	n=102
	170,328.84 (195,502.30)	138,154.56 (120,601.33)	342,997.75 (1,488,050.67)
	118,950.0 [66,000.0-221,184.4]	115,500.0 [47,287.0-206,500.0]	76,500.0 [11,500.0-159,400.0]
Slovakia	n=5,072	n=2,591	n=2,505
	69,399.22 (110,397.58)	72,543.23 (76,816.70)	87,131.91 (102,145.41)
	59,015.0 [29,113.4-95,269.5]	56,000.0 [30,202.0-90,400.0]	61,000.0 [26,942.0-117,033.0]

Notes: First row: n denotes number of observations. Second row mean (standard deviation). Third row: median [First quartile, Q1-Third quartile, Q3].

Table 1b
DESCRIPTIVE STATISTICS. TOTAL REAL ASSETS (€)

Country	2011	2015	2017
Austria	n=4,920 225,846.28 (253,750.16) 164,000.0 [18,000.0-315,000.0]	n=2,356 181,939.55 (237,795.50) 55,885.0 [4,000.0-319,951.0]	n=2,351 302,815.66 (1,059,193.00) 94,925.0 [8,000.0-319,250.0]
Belgium	n=5,096 324,759.51 (235,217.24) 276,125.0 [181,000.0-408,000.0]	n=2,335 293,593.02 (261,110.78) 261,584.0 [90,000.0-397,000.0]	n=2,313 435,108.48 (670,135.44) 302,750.0 [174,000.0-468,500.0]
Cyprus	n=1,207 406,045.11 (319,825.98) 335,600.0 [160,000.0-589,500.0]	n=724 301,736.88 (290,570.68) 240,000.0 [74,903.0-447,258.8]	n=719 747,217.25 (1,638,783.19) 317,112.1 [145,000.0-629,898.5]
Germany	n=8,007 282,400.32 (269,287.08) 220,000.0 [65,225.0-404,500.0]	n=3,847 232,915.48 (278,679.49) 150,800.0 [5,000.0-355,000.0]	n=3,842 505,299.74 (1,743,685.14) 260,000.0 [40,000.0-528,250.0]
Spain	n=15,120 356,562.86 (291,757.81) 262,000.0 [153,000.0-484,602.0]	n=7,840 297,548.51 (311,585.92) 205,213.0 [54,422.8-425,496.0]	n=7,831 1,266,082.12 (11,399,665.40) 250,894.0 [114,876.5-625,000.0]
Finland	n=22,782 296,183.34 (232,639.14) 239,073.0 [142,546.7-387,533.5]	n=2,340 272,333.13 (249,099.44) 216,239.0 [92,588.8-392,954.3]	n=2,340 348,804.17 (407,492.79) 253,276.0 [132,858.0-429,971.0]
France	n=22,744 331,528.70 (292,099.41) 256,577.0 [129,913.0-453,434.0]	n=8,368 245,495.39 (278,868.42) 177,684.0 [10,010.0-348,832.5]	n=8,358 532,825.50 (1,742,964.62) 228,735.0 [31,000.0-449,234.8]
Italy	n=18,534 249,459.86 (230,741.66) 204,000.0 [91,000.0-329,000.0]	n=7,540 219,831.10 (222,999.61) 175,000.0 [35,000.0-306,000.0]	n=7,376 240,687.80 (346,537.52) 168,000.0 [61,325.0-293,887.5]
Luxemburg	n=1,960 538,659.12 (360,718.50) 520,000.0 [272,759.0-803,430.0]	n=1,483 431,156.21 (400,811.80) 397,000.0 [8,000.0-735,000.0]	n=1,462 1,034,912.19 (1,577,669.64) 728,500.0 [381,750.0-1,143,750.0]
Netherlands	n=2,826 293,492.62 (193,133.83) 257,550.0 [191,827.2-370,900.0]	n=566 199,508.67 (180,179.26) 197,950.0 [12,000.0-281,000.0]	n=564 260,634.67 (257,947.65) 228,050.0 [105,018.0-328,000.0]
Portugal	n=10,378 173,414.43 (190,409.15) 114,724.0 [65,000.0-205,781.4.0]	n=6,192 205,801.71 (230.234.08) 137,101.5 [64,245.0-260,000.0]	n=6,081 267,145.20 (781,950.54) 149,000.0 [82,360.0-266,500.0]
Slovenia	n=948 181,507.82 (196,792.53) 121,750.0 [64,047.3.-229,784.1]	n=103 148,293.01 (128,469.23) 121,000.0 [50,312.0-220,000.0]	n=102 238,382.28 (945,402.51) 106,750.0 [48,053.5-219,625.0]
Slovakia	n=5,072 83,661.70 (90,084.69) 63,250.0 [38,837.4-100,000.0]	n=2,591 75,599.89 (79,829.97) 62,500.0 [35,000.0-96,500.0]	n=2,505 122,538.30 (183,647.33) 84,000.0 [48,000.0-130,519.0]

Notes: First row: n denotes number of observations. Second row mean (standard deviation). Third row: median [First quartile, Q1-Third quartile, Q3].

Table 1c
DESCRIPTIVE STATISTICS. TOTAL FINANCIAL ASSETS (€)

Country	2011	2015	2017
Austria	n=4,920	n=2,356	n=2,351
	35,876.84 (49,957.19)	35,862.36 (49,171.00)	41,602.83 (87,397.35)
	16,200.0 [5,500.0-44,481.0]	17,772.5 [5,036.8-45,952.0]	17,618.0 [5,982.0-44,000.0]
Belgium	n=5,096	n=2,335	n=2,313
	66,321.28 (75,354.09)	55,765.50 (72,605.28)	128,158.99 (299,883.78)
	36,920.0 [9,705.0-97,700.0]	25,510.0 [3,800.0-80,400.0]	42,947.0 [8,100.0-134,000.0]
Cyprus	n=1,207	n=724	n=719
	50,085.14 (64,300.16)	35,618.16 (58,393.03)	52,514.33 (198,543.01)
	25,000.0 [9,943.5-66,435.0]	15,157.0 [184.0-36,331.0]	17,800.0 [1,055.0-59,000.0]
Germany	n=8,007	n=3,847	n=3,842
	58,585.63 (67,859.46)	56,023.23 (68,978.21)	112,720.89 (249,369.85)
	34,200.0 [10,050.0-79,900.0]	30,000.0 [5,100.0-81,900.0]	49,000.0 [12,152.5-126,200.0]
Spain	n=15,120	n=7,840	n=7,831
	43,220.26 (65,568.33)	43,668.91 (69,864.24)	561,690.71 (7,300,927.70)
	14,000.0 [3,000.0-52,000.0]	10,818.0 [750.0-53,542.0]	25,119.0 [4,000.0-139,000.0]
Finland	n=22,782	n=2,340	n=2,340
	33,189.33 (48,822.74)	36,787.41 (54,013.27)	74,055.42 (211,679.24)
	13,628.0 [4,300.0-40,295.0]	14,640.5 [3,212.8-44,473.5]	19,564.0 [4,518.8-67,084.3]
France	n=22,744	n=8,368	n=8,358
	45,586.00 (65,295.46)	37,432.36 (58,862.65)	219,322.05 (2,644,701.36)
	17,911.0 [4,293.0-56,018.0]	12,302.0 [1,791.3-45,370.0]	21,724.5 [4,391.5-76,532.8]
Italy	n=18,534	n=7,540	n=7,376
	28,669.77 (41,819.29)	26,202.35 (44,867.24)	38,865.33 (178,327.22)
	13,000.0 [4,810.3-35,364.1]	7,233.0 [1,424.3-32,000.0]	9,000.0 [2,000.0-31,145.4]
Luxemburg	n=1,960	n=1,483	n=1,462
	69,878.63 (77,358.48)	61,003.56 (78,280.66)	159,624.44 (519,656.51)
	39,991.0 [11,838.8-104,900.0]	25,300.0 [2,149.0-99,766.0]	40,000.0 [7,700.0-135,350.0]
Netherlands	n=2,826	n=566	n=564
	56,165.80 (65,333.63)	55,591.56 (64,286.09)	89,943.73 (192,583.36)
	31,154.0 [11,306.8-75,119.2]	32,095.5 [7,900.0-83,240.0]	34,500.0 [12,000.0-94,798.8]
Portugal	n=10,378	n=6,192	n=6,081
	21,953.32 (40,673.67)	28,905.65 (47,557.75)	36,108.24 (197,176.11)
	5,500.0 [1,000.0-22,800.0]	9,000.0 [1,200.0-34,000.0]	7,300.0 [1,100.0-30,307.0]
Slovenia	n=948	n=103	n=102
	17,444.61 (29,832.49)	15,183.25 (23,846.34)	18,519.99 (41,158.63)
	5,794.5 [1,500.0-21,020.0]	4,179.0 [467.0-19,226.0]	2,301.0 [500.0-12,814.0]
Slovakia	n=5,072	n=2,591	n=2,505
	7,469.16 (13,133.37)	7,814.47 (17,601.58)	9,545.48 (19,448.36)
	3,000.0 [1,000.0-8,159.0]	2,707.0 [500.0-7,830.0]	3,000.0 [555.3-10,189.0]

Notes: First row: n denotes number of observations. Second row mean (standard deviation). Third row: median [First quartile, Q1-Third quartile, Q3].

Table 1d
DESCRIPTIVE STATISTICS. TOTAL REAL STATE WEALTH (€)

Country	2011	2015	2017
Austria	n=4,920 288,677.99 (436,088,381.00) 250,000.0 [150,000.0-394,086.0]	n=2,356 143,787.25 (1,048,404.82) 70,000.0 [0.0-300,000.0]	n=2,351 309,238.88 (429,009.51) 259,106.0 [150,000.0-400,000.0]
Belgium	n=5,096 338,793.77 (450,350,426.00) 300,000.0 [200,000.0-420,000.0]	n=2,335 277,276.14 (620,582,749.39) 250,000.0 [125,000.0-400,000.0]	n=2,313 367,159.60 (392,353.77) 320,000.0 [225,000.0-480,000.0]
Cyprus	n=1,207 715,758.32 (63,359,959.0) 480,000.0 [250,000.0-955,024.0]	n=724 388,502.17 (3,027,123.73) 290,344.0 [139,611.0-549,891.0]	n=719 492,738.87 (1,181,237.55) 342,500.0 [189,080.0-562,366.0]
Germany	n=8,007 356,639.96 (2,920,534.02) 290,000.0 [180,000.0-500,000.0]	n=3,847 225,524.29 (657,601.57) 170,000.0 [0.0-390,000.0]	n=3,842 439,697.83 (708,208.86) 350,000.0 [200,000.0-600,000.0]
Spain	n=15,120 532,753.13 (305,576,896.00) 315,629.5 [180,304.0-712,999.8]	n=7,840 544,839.44 (38,107,938.14) 300,000.0 [144,243.0-750,000.0]	n=7,831 433,682.47 (1,862,527.82) 258,139.0 [131,980.5-620,000.0]
Finland	n=22,782 929,935.55 (9,037,003,222.68) 639,426.0 [244,647.0-14,607,226,104.0]	n=2,340 250,532.43 (467,209.74) 211,926.5 [99,174.3-385,894.8]	n=2,340 329,796.92 (313,842.39) 262,678.5 [152,407.0-427,503.0]
France	n=22,744 520,987.37 (14,569,576.59) 309,254.0 [188,893.3-350,000.0]	n=8,368 357,583.95 (18,970,243.10) 200,000.0 [0.0-445,756.8]	n=8,358 366,003.38 (758,118.03) 270,102.0 [172,359.5-483,566.0]
Italy	n=18,534 269,296.75 (495,502,671.16) 220,000.0 [150,000.0-350,000.0]	n=7,540 182,362.75 (271,146.70) 160,000.0 [0.0-300,000.0]	n=7,376 227,826.77 (300,844.83) 200,000.0 [130,000.0-300,000.0]
Luxemburg	n=1,960 821,154.40 (12,425,375.74) 650,000.0 [450,000.0-1,050,000.0]	n=1,483 708,768.62 (12,054,167.38) 600,000.0 [255,000.0-1,019,828.0]	n=1,462 956,038.35 (1,067,753.26) 800,000.0 [540,000.0-1,200,000.0]
Netherlands	n=2,826 1,507,050.09 (528,436,024.79) 275,000.0 [210,000.0-430,000.0]	n=566 669,782.86 (466,822,037.41) 181,500.0 [0.0-266,250.0]	n=564 275,324.30 (188,490.40) 250,000.0 [180,000.0-346,202.6]
Portugal	n=10,378 274,120.77 (313,911,340.86) 150,000.0 [92,704.0-262,500.0]	n=6,192 158,641.59 (459,648,950.79) 125,000.0 [60,000.0-228,530.8]	n=6,081 183,309.68 (258,327.73) 150,000.0 [90,000.0-250,000.0]
Slovenia	n=948 281,682.12 (1,881,781.21) 175,000.0 [100,000.0-320,000.0]	n=103 125,091.34 (118,923.20) 200,000.0 [120,000.0-281,942.0]	n=102 134,212.52 (426,775.28) 120,000.0 [60,000.0-208,000.0]
Slovakia	n=5,072 148,285.88 (1,209,390.73) 90,000.0 [65,000.0-160,000.0]	n=2,591 52,347.05 (1,281,937.94) 57,566.0 [0.0-89,000.0]	n=2,505 89,637.98 (101,782.76) 80,000.0 [50,000.0-120,000.0]

Notes: First row: n denotes number of observations. Second row mean (standard deviation). Third row: median [First quartile, Q1-Third quartile, Q3].

Table 1e
DESCRIPTIVE STATISTICS. TOTAL DEBT (€)

Country	2011	2015	2017
Austria	n=4,920	n=2,356	n=2,351
	57,558.09 (75,828.61)	21,278.89 (52,625.36)	48,041.34 (135,636.26)
	25,980.0 [6,000.0-80,000.0]	0.0 [0.0-8,232.5.0]	19,639.0 [3,000.0-82,000.0]
Belgium	n=5,096	n=2,335	n=2,313
	72,125.23 (76,964.98)	38,783.65 (68,229.50)	87,227.82 (111,785.51)
	45,000.0 [13,218.5-106,960.0]	1,200.0 [0.0-50,000.0]	66,976.7 [14,000.0-152,117.0]
Cyprus	n=1,207	n=724	n=719
	109,102.08 (100,278.44)	63,977.15 (89,019.01)	118,760.82 (240,065.51)
	78,500.0 [25,835.0-170,000.0]	20,000.0 [0.0-99,428.5]	87,500.0 [29,000.0-198,000.0]
Germany	n=8,007	n=3,847	n=3,842
	80,595.43 (89,232.53)	45,379.47 (79,180.04)	90,856.31 (223,776.42)
	48,000.0 [10,000.0-125,300.0]	1,600.0 [0.0-60,000.0]	61,500.0 [10,575.0-155,000.0]
Spain	n=15,120	n=7,840	n=7,831
	72,246.24 (78,945.54)	71,054.74 (275,229.19)	71,054.74 (275,229.19)
	45,000.0 [12,900.0-106,000.0]	50,500.0 [11,000.0-118,622.0]	50,500.0 [11,000.0-118,622.0]
Finland	n=22,782	n=2,340	n=2,340
	86,106.97 (81,927.67)	64,257.80 (84,169.07)	111,861.93 (165,972.65)
	62,718.0 [17,730.0-132,682.0]	23,335.5 [0.0-107,642.0]	95,276.0 [31,733.3-180,504.0]
France	n=22,744	n=8,368	n=8,358
	71,972.90 (81,595.40)	49,299.29 (80,341.98)	99,929.58 (199,145.30)
	40,902.0 [9,098.5-109,546.0]	4,274.0 [0.0-73,631.0]	80,520.0 [15,713.0-164,600.0]
Italy	n=18,534	n=7,540	n=7,376
	42,834.31 (56,880.70)	10,027.52 (32,631.82)	34,128.36 (91,781.72)
	17,000.0 [5,000.0-60,050.0]	0.0 [0.0-30,000.0]	13,000.0 [4,000.0-66,000.0]
Luxemburg	n=1,960	n=1,483	n=1,462
	112,003.90 (113,041.27)	63,012.90 (104,097.96)	209,291.22 (362,992.40)
	72,001.5 [18,000.0-189,775.0]	2,500.0 [0.0-92,100.0]	140,000.0 [22,000.0-365,921.0]
Netherlands	n=2,826	n=566	n=564
	132,546.54 (95,205.24)	53,387.93 (90,555.27)	167,634.72 (169,845.34)
	120,000.0 [54,000.0-190,750.0]	0.0 [0.0-82,500.0]	169,500.0 [75,400.0-245,000.0]
Portugal	n=10,378	n=6,192	n=6,081
	61,705.31 (60,977.55)	40,156.64 (61,107.91)	60,400.77 (83,618.52)
	45,900.0 [13,700.0-89,900.0]	3,055.0 [0.0-65,000.0]	51,575.0 [16,025.0-96,892.5]
Slovenia	n=948	n=103	n=102
	31,460.86 (56,233.71)	10,138.45 (41,673.10)	16,531.12 (49,764.72)
	8,400.0 [3,000.0-38,750.0]	0.0 [0.0-7,500.0]	7,305.0 [1,500.0-27,500.0]
Slovakia	n=5,072	n=2,591	n=2,505
	30,043.78 (56,700.70)	6,131.67 (15,813.07)	20,256.84 (32,432.30)
	10,000.0 [2,700.0-32,889.9]	0.0 [0.0-2,500.0]	11,300.0 [2,500.0-35,000.0]

Notes: First row: n denotes number of observations. Second row mean (standard deviation). Third row: median [First quartile, Q1-Third quartile, Q3].

Table 1f
DESCRIPTIVE STATISTICS. INCOME

Country	2011	2015	2017
Austria	n=4,920	n=2,356	n=2,351
	44,274.81 (25,669.04)	51,017.48 (29,354.91)	62,130.93 (65,413.99)
	38,700.0 [24,592.5-58,000.0]	46,836.0 [29,776.3-67,930.0]	53,382.5 [36,073.5-75,182.8]
Belgium	n=5,096	n=2,335	n=2,313
	53,613.57 (30,722.52)	57,929.15 (35,545.12)	76,122.38 (68,829.25)
	48,300.0 [27,821.8-75,000.0]	54,540.0 [30,560.0-82,416.0]	61,980.0 [38,000.0-94,910.0]
Cyprus	n=1,207	n=724	n=719
	46,625.67 (29,355.64)	37,718.01 (26,940.57)	50,065.59 (39,129.15)
	39,400.0 [24,400.0-60,937.7]	34,209.0 [17,955.0-53,158.0]	40,100.0 [26,000.0-62,041.5]
Germany	n=8,007	n=3,847	n=3,842
	57,062.65 (32,119.76)	54,693.79 (38,762.22)	91,783.24 (93,229.39)
	51,400.0 [32,000.0-75,940.0]	52,200.0 [25,000.0-81,400.0]	72,900.0 [43,600.0-109,500.0]
Spain	n=15,120	n=7,840	n=7,831
	40,505.24 (27,702.18)	40,248.41 (31,880.85)	63,373.16 (216,382.65)
	32,000.0 [20,500.0-51,800.0]	32,400.0 [17,600.0-56,493.0]	37,200.0 [21,450.0-66,782.0]
Finland	n=22,782	n=2,340	n=2,340
	60,327.66 (30,488.61)	58,070.82 (34,794.85)	83,588.84 (55,492.86)
	56,180.0 [36,543.0-78,288.0]	57,377.5 [31,512.5-80,158.0]	72,366.0 [50,440.0-102,192.0]
France	n=22,744	n=8,368	n=8,358
	47,081.55 (28,213.14)	47,118.83 (33,844.10)	73,921.93 (110,232.79)
	40,019.0 [26,661.5-59,590.0]	41,835.0 [22,770.0-66,435.0]	52,025.0 [32,870.0-85,995.0]
Italy	n=18,534	n=7,540	n=7,376
	38,572.82 (24,055.00)	39,778.58 (27,466.26)	42,363.27 (42,230.89)
	32,745.4 [20,789.4-49,693.4]	34,638.8 [20,405.2-53,496.7]	33,384.1 [19,711.2-53,536.6]
Luxemburg	n=1,960	n=1,483	n=1,462
	77,817.58 (34,864.17)	54,256.41 (46,622.67)	135,716.68 (145,286.95)
	76,450.0 [50,700.0-105,000.0]	53,000.0 [0.0-94,400.0]	110,000.0 [64,000.0-170,000.0]
Netherlands	n=2,826	n=566	n=564
	56,972.43 (27,495.31)	54,607.49 (31,213.09)	72,768.61 (72,864.02)
	52,484.3 [36,526.3-71,466.5]	50,066.1 [30,604.3-76,365.2]	62,400.0 [37,937.0-91,700.3]
Portugal	n=10,378	n=6,192	n=6,081
	27,528.07 (20,495.31)	28,659.21 (23,278.46)	36,242.58 (39,814.14)
	20,650.0 [14,200.0-33,570.0]	22,500.0 [13,760.0-38,000.0]	26,300.0 [15,810.0-44,200]
Slovenia	n=948	n=103	n=102
	33,364.99 (19,724.56)	27,796.71 (21,068.88)	31,418.31 (25,792.50)
	29,257.9 [19,195.4-41,224.0]	23,350.0 [15,585.0-33,840.0]	26,800.0 [15,063.0-41,840.0]
Slovakia	n=5,072	n=2,591	n=2,505
	17,963.78 (10,647.54)	18,125.23 (14,919.23)	21,424.21 (25,427.21)
	15,162.5 [11,500.0-20,323.5]	16,200.0 [9,900.0-24,000.0]	17,759.5 [11,120.0-26,289.0]

Notes: First row: n denotes number of observations. Second row mean (standard deviation). Third row: median [First quartile, Q1-Third quartile, Q3].

Table 1g
DESCRIPTIVE STATISTICS. POOR HEALTH AND WORSENEO HEALTH

Country	2011	2015		2017	
	Poor health	Poor health	Get worse 2015 from 2011	Poor health	Get worse 2017 from 2015
Austria	1,589 - 32.3%	719 - 30.5%	483 - 20.5%	515 - 21.9%	411 - 17.5%
Belgium	1,264 - 24.8%	602 - 25.8%	474 - 20.3%	423 - 18.9%	284 - 12.3%
Cyprus	274 - 22.7%	117 - 16.2%	106 - 14.6%	118 - 16.4%	96 - 13.3%
Germany	2,842 - 35.5%	1,323 - 34.4%	877 - 22.8%	1,068 - 27.8%	826 - 21.5%
Spain	4,082 - 27.0%	2,336 - 29.8%	1,693 - 21.6%	1,402 - 17.9%	1,135 - 14.5%
Finland	6,949 - 30.5%	676 - 28.9%	442 - 18.9%	468 - 20.0%	405 - 17.3%
France	7,164 - 31.5%	2,678 - 32.0%	1,799 - 21.5%	2,073 - 24.8%	1,638 - 19.6%
Italy	6,468 - 34.9%	2,616 - 34.7%	1,704 - 22.6%	892 - 12.1%	72 - 9.8%
Luxemburg	476 - 24.3%	380 - 25.6%	282 - 19.0%	392 - 26.8%	256 - 17.5%
Netherlands	690 - 24.4%	145 - 25.6%	113 - 19.9%	130 - 23.1%	98 - 17.3%
Portugal	5,314 - 51.2%	3,276 - 52.9%	1,560 - 25.2%	2,554 - 42.0%	2,049 - 33.7%
Slovenia	437 - 46.1%	41 - 39.6%	20 - 19.6%	30 - 29.1%	23 - 22.3%
Slovakia	1,531 - 30.2%	1,023 - 39.5%	733 - 28.3%	601 - 24.0%	478 - 19.1%

Notes: Number of subjects - Percentage.

3.2. Regression results

Our dependent variable is the variation in the self-perceived health between the two periods (2011-2015 and 2015-2017). A positive sign in the association with an explanatory variable, other things (the control factors) being equal, means a worsening of the subject's health. The three columns in Table 2 for 2011-2015 and for 2015-2017 provide the results from the different model specifications. Since the estimators of the parameters were transformed to odd ratios, values below 1 mean improvements in health with regard to the base departure year.

To test the endogeneity of the explanatory variables, we used the Wu-Hausman test. In all cases, with the exception of income, we could not reject the null hypothesis of non-endogeneity of the variable. For this reason, we used a structured PC-prior only for this variable.

For all countries at 95% significance, we observe an important effect: a positive percentage change in income during the recession period (2011-2015) reducing the probability of individuals declaring a worsened health (Odds ratio=0.848 for the whole sample and almost all the specifications). However, the effect disappears when the economic situation improves (2015-2017). This result is expected since the improvement is, in itself, an indicator of the recovery. The variation of total debt also shows a significant and negative effect (odds ratio=0.991). A positive percentage change in debt reduces the probability of reporting worsened health in the recession period (2011-2015). This result in debt shows an unexpected sign but it could be the result of a delay effect of having issued debt from a previous more optimistic time interval. It is interesting to see how the effect changes between the two periods (recession vs expansion), losing statistical significance for the most recent one.

Table 2
MAIN RESULTS (all countries)

Dep var: Change to poor health	2011 to 2015			2015-2017		
% change in total real assets 2015-2011	1.0002 (0.999-1.001)			1.000003 (0.999-1.00001)		
% change in total financial assets 2015-2011	1.00001 (0.999-1.0003)			1.0000002 (0.999-1.000001)		
% change in total real estate wealth 2015-2011	0.999 (0.999-1.00001)			1.0001 (0.999-1.0001)		
% change in total debt 2015-2011	0.991 (0.987-0.995)	0.991 (0.987-0.995)		0.999 (0.999-1.0000002)	0.999 (0.999-1.0000002)	
% change in income 2015-2011	0.840 (0.828-0.852)	0.840 (0.828-0.852)	0.836 (0.819-0.853)	1.000002 (0.980-1.0005)	0.999 (0.899-1.0005)	1.00002 (0.980-1.0005)
% change in net wealth 2015-2011	0.9990 (0.999-1.0001)			0.999 (0.999-1.000001)		
N	120865	120865	120865	46285	46285	46285

Notes: ■ 90% significance, ■ 95% significance. Coefficients are reported as odds ratios. Models adjusted by age, gender, education, employment status, marital status, number of family members, number of working members, property status and main explanatory (net wealth and income) in 2011 or 2015.

For higher confidence intervals, 90% significance, the effect of a percentage change in total gross real and estate assets are positive and significant in the expansion period (2015-2017), showing an increase in reporting worsened health. However, the magnitude of the effects is very small.

Results for each country (Table 3) exhibit similar patterns: the importance of income change in the recession period, particularly in the cases of Austria, Belgium, Finland Netherlands, Slovenia and Slovakia, with an effect that disappears thereafter, and a lack of significance of changes in total debt, net and for assets composition. Some minor effects result from changes of net wealth, albeit only in the cases of Netherlands and Germany, during the crisis period. This effect, however, disappears over time.

These results are important because changes in individuals' income seem to be more important than net wealth, and they are differently affected by the shocks in the economic crisis. Even if the financial crisis affected the European countries differently, in most of them

income played an important role in protecting health. However, changes in income prove not to be relevant in the expansion period. Wealth variation in all the specification types shows minor or no effects. All indicate that self-perceived health is very sensitive to short-term income variations, with flow variables dominating the stock variations.

Table 3
RESULTS BY COUNTRIES

Dep var: Change to poor health	2011 to 2015			2015-2017		
<i>Austria</i>						
% change in total real assets 2015-2011	1.0002 (0.996-1.004)			1.00002 (0.999-1.00004)		
% change in total financial assets 2015-2011	1.002 (0.999-1.003)			0.999 (0.999-1.00002)		
% change in total real estate wealth 2015-2011	0.970 (0.014-1.030)			1.0004 (0.999-1.001)		
% change in total debt 2015-2011	0.995 (0.981-1.009)	0.995 (0.981-1.009)		1.00001 (0.999-1.0001)	1.00001 (0.999-1.0001)	
% change in income 2015-2011	0.769 (0.695-0.842)	0.762 (0.686-0.838)	0.761 (0.695-0.827)	1.0001 (0.990-1.005)	1.0002 (0.989-1.0001)	1.0002 (0.990-1.005)
% change in net wealth 2015-2011	0.999 (0.998-1.001)			0.999 (0.999-1.00001)		
N	4921	4921	4921	2356	2356	2356
<i>Belgium</i>						
% change in total real assets 2015-2011	1.001 (0.997-1.005)			1.00001 (0.999-1.0001)		
% change in total financial assets 2015-2011	1.0002 (0.999-1.001)			0.999 (0.999-1.000003)		
% change in total real estate wealth 2015-2011	0.999 (0.999-1.00003)			1.0001 (0.999-1.001)		

(Continued)

Dep var: Change to poor health	2011 to 2015			2015-2017		
% change in total debt 2015-2011	0.994 (0.982-1.005)	0.994 (0.982-1.005)		1.0000002 (0.999-1.00001)	1.0000002 (0.999-1.00001)	
% change in income 2015-2011	0.670 (0.600-0.740)	0.676 (0.600-0.752)	0.663 (0.589-0.737)	1.001 (0.990-1.012)	1.001 (0.990-1.012)	1.001 (0.990-1.012)
% change in net wealth 2015-2011			1.001 (0.999-1.003)			1.00001 (0.999-1.00004)
N	5126	5126	5126	2335	2335	2335
<i>Cyprus</i>						
% change in total real assets 2015-2011	1.001 (0.991-1.011)			0.999 (0.999-1.0001)		
% change in total financial assets 2015-2011		1.001 (0.996-1.007)			1.00002 (0.999-1.00003)	
% change in total real estate wealth 2015-2011		0.982 (0.927-1.041)			1.0001 (0.999-1.0004)	
% change in total debt 2015-2011	0.989 (0.965-1.013)	0.989 (0.966-1.013)		1.0003 (0.999-1.001)	1.0003 (0.999-1.001)	
% change in income 2015-2011	0.860 (0.592-1.128)	0.868 (0.580-1.156)	0.856 (0.599-1.113)	1.0004 (0.989-1.010)	1.0001 (0.990-1.0102)	1.001 (0.989-1.011)
% change in net wealth 2015-2011			1.001 (0.996-1.007)			0.999 (0.999-1.00001)
N	1222	1222	1222	724	724	724
<i>Germany</i>						
% change in total real assets 2015-2011	0.996 (0.992-0.999)			0.999 (0.999-1.00001)		
% change in total financial assets 2015-2011		0.999 (0.998-1.0003)			0.999 (0.999-1.00001)	

(Continued)

Dep var: Change to poor health	2011 to 2015			2015-2017		
% change in total real estate wealth 2015-2011	0.968 (0.934-1.004)			0.999 (0.995-1.00004)		
% change in total debt 2015-2011	0.997 (0.991-1.004)	0.997 (0.990-1.003)		1.00001 (0.999-1.00003)	1.00001 (0.999-1.00003)	
% change in income 2015-2011	0.839 (0.762-0.916)	0.838 (0.760-0.916)	0.824 (0.757-0.891)	0.999 (0.970-1.028)	0.999 (0.974-1.024)	0.999 (0.970-1.028)
% change in net wealth 2015-2011	0.999 (0.999-1.001)			0.999 (0.999-0.999)		
N	8121	8121	8121	3847	3847	3847
<i>Spain</i>						
% change in total real assets 2015-2011	1.001 (0.998-1.004)			1.000004 (0.999-1.00001)		
% change in total financial assets 2015-2011	0.999 (0.999-1.0003)			0.999 (0.999-1.000001)		
% change in total real estate wealth 2015-2011	0.999 (0.999-1.0002)			1.0001 (1.00003-1.0002)		
% change in total debt 2015-2011	0.987 (0.978-0.996)	0.987 (0.978-0.996)		0.999 (0.999-1.00001)	0.999 (0.999-1.00001)	
% change in income 2015-2011	0.853 (0.801-0.905)	0.856 (0.802-0.910)	0.846 (0.800-0.892)	1.0001 (0.990-1.0102)	1.0001 (0.980-1.020)	1.0001 (0.990-1.0102)
% change in net wealth 2015-2011	1.000 (0.999-1.001)			1.000004 (0.999-1.00001)		
N	15310	15310	15310	7840	7840	7840
<i>Finland</i>						
% change in total real assets 2015-2011	0.999 (0.994-1.004)			0.999 (0.999-1.0001)		

(Continued)

Dep var: Change to poor health	2011 to 2015			2015-2017		
% change in total financial assets 2015-2011	1.001 (0.999-1.002)			1.000004 (0.999-1.00001)		
% change in total real estate wealth 2015-2011	0.991 (0.869-1.129)			0.999 (0.999-1.00004)		
% change in total debt 2015-2011	0.978 (0.964-0.993)	0.978 (0.964-0.993)		0.999 (0.999-1.00001)	0.999 (0.999-1.00001)	
% change in income 2015-2011	0.772 (0.685-0.829)	0.768 (0.682-0.853)	0.751 (0.667-0.835)	0.999 (0.999-1.001)	0.999 (0.998-1.001)	0.999 (0.999-1.001)
% change in net wealth 2015-2011	1.000 (0.999-1.0003)			0.999 (0.999-1.00001)		
N	22828	22828	22828	2340	2340	2340
<i>France</i>						
% change in total real assets 2015-2011	1.001 (0.999-1.003)			1.000001 (0.999-1.00001)		
% change in total financial assets 2015-2011	1.0002 (0.999-1.001)			1.0000004 (0.999-1.000001)		
% change in total real estate wealth 2015-2011	1.0002 (0.999-1.001)			0.999 (0.999-1.0002)		
% change in total debt 2015-2011	0.993 (0.989-0.997)	0.993 (0.989-0.997)		0.999 (0.999-1.000001)	0.999 (0.999-1.000001)	
% change in income 2015-2011	0.926 (0.880-0.972)	0.927 (0.881-0.973)	0.915 (0.873-0.957)	0.999 (0.999-1.0002)	0.999 (0.999-1.0002)	0.999 (0.999-1.0002)
% change in net wealth 2015-2011	0.999 (0.999-1.0002)			0.999 (0.999-1.000003)		
N	22966	22966	22966	8368	8368	8368

(Continued)

Dep var: Change to poor health	2011 to 2015			2015-2017		
<i>Italy</i>						
% change in total real assets 2015-2011	1.002 (0.999-1.004)			0.999 (0.999-1.00003)		
% change in total financial assets 2015-2011		1.002 (1.0003-1.003)		1.00001 (0.999-1.00001)		
% change in total real estate wealth 2015-2011		1.0001 (0.972-1.031)		0.999 (0.999-1.00003)		
% change in total debt 2015-2011	0.970 (0.950-0.991)	0.970 (0.950-0.991)		1.00004 (0.999-1.0002)	1.0004 (0.999-1.0002)	
% change in income 2015-2011	0.821 (0.773-0.869)	0.819 (0.762-0.876)	0.820 (0.773-0.867)	1.0001 (0.999-1.001)	1.0002 (0.999-1.001)	1.0001 (0.999-1.001)
% change in net wealth 2015-2011			1.0001 (0.999-1.001)	0.999 (0.999-1.00002)		
N	18622	18622	18622	7540	7540	7540
<i>Luxembourg</i>						
% change in total real assets 2015-2011	0.997 (0.991-1.002)			1.00001 (0.999-1.00004)		
% change in total financial assets 2015-2011		0.998 (0.996-1.001)		1.000004 (0.999-1.00001)		
% change in total real estate wealth 2015-2011		1.002 (0.998-1.005)		1.00003 (0.999-1.001)		
% change in total debt 2015-2011	1.004 (0.995-1.013)	1.004 (0.995-1.013)		1.0000001 (0.999-1.000001)	1.0000001 (0.999-1.000001)	
% change in income 2015-2011	0.874 (0.709-1.039)	0.875 (0.709-1.041)	0.877 (0.709-1.045)	1.0002 (0.999-1.001)	1.0001 (0.999-1.001)	1.0002 (0.999-1.001)

(Continued)

Dep var: Change to poor health	2011 to 2015			2015-2017		
% change in net wealth 2015-2011			0.999 (0.997-1.001)			1.000002 (0.999-1.00001)
N	1995	1995	1995	1483	1483	1483
<i>Malta</i>						
% change in total real assets 2015-2011	1.006 (0.978-1.033)					
% change in total financial assets 2015-2011			0.977 (0.947-1.009)			
% change in total real estate wealth 2015-2011			0.446 (0.234-0.852)			
% change in total debt 2015-2011	1.004 (0.974-1.036)	1.010 (0.980-1.041)				
% change in income 2015-2011	1.068 (0.793-1.343)	1.119 (0.803-1.435)	1.051 (0.752-1.350)			
% change in net wealth 2015-2011			1.005 (0.973-1.038)			
N	351	351	351			
<i>The Netherlands</i>						
% change in total real assets 2015-2011	0.956 (0.917-0.997)					1.0001 (0.999-1.0002)
% change in total financial assets 2015-2011		1.001 (0.996-1.005)				0.999 (0.999-1.00002)
% change in total real estate wealth 2015-2011		0.988 (0.969-1.008)				0.997 (0.994-1.001)

(Continued)

Dep var: Change to poor health	2011 to 2015			2015-2017		
% change in total debt 2015-2011	1.007 (0.914-1.043)	1.007 (0.972-1.042)		1.0001 (0.999-1.001)	1.0002 (0.999-1.001)	
% change in income 2015-2011	0.716 (0.505-0.927)	0.675 (0.435-0.915)	0.675 (0.434-0.916)	0.999 (0.998-1.002)	1.001 (0.999-1.002)	1.0003 (0.999-1.002)
% change in net wealth 2015-2011			0.998 (0.988-1.008)			0.999 (0.999-1.0001)
N	2833	2833	2833	566	566	566
<i>Portugal</i>						
% change in total real assets 2015-2011	1.001 (0.997-1.004)			1.000007 (0.999-1.0003)		
% change in total financial assets 2015-2011		1.001 (0.999-1.001)			0.999 (0.999-1.00001)	
% change in total real estate wealth 2015-2011		1.000004 (0.999-1.00002)			0.999 (0.999-1.0002)	
% change in total debt 2015-2011	0.983 (0.974-0.993)	0.983 (0.974-0.993)		1.00001 (0.999-1.00002)	1.00001 (0.999-1.00002)	
% change in income 2015-2011	0.887 (0.831-0.943)	0.887 (0.831-0.43)	0.862 (0.807-0.967)	0.999 (0.989-1.009)	0.999 (0.989-1.009)	0.999 (0.979-1.019)
% change in net wealth 2015-2011			1.0001 (0.999-1.001)			0.999 (0.999-1.00001)
N	10503	10503	10503	6192	6192	6192
<i>Slovenia</i>						
% change in total real assets 2015-2011	0.888 (0.607-1.292)			0.999 (0.970-1.001)		
% change in total financial assets 2015-2011		1.005 (0.992-1.019)			0.999 (0.999-1.001)	

(Continued)

Dep var: Change to poor health	2011 to 2015			2015-2017		
% change in total real estate wealth 2015-2011	1.409 (0.468-4.234)			0.995		
% change in total debt 2015-2011	0.767 (0.507-1.160)	0.774 (0.514-1.166)		1.0001 (0.999-1.001)	1.0001 (0.999-1.001)	
% change in income 2015-2011	0.303 (0.035-1.580)	0.227 (0.027-1.541)	0.342 (0.005-1.573)	1.004 (0.987-1.021)	1.004 (0.991-1.017)	1.004 (0.987-1.021)
% change in net wealth 2015-2011	0.926 (0.643-1.332)			0.999 (0.998-1.001)		
N	949	949	949	103	103	103
<i>Slovakia</i>						
% change in total real assets 2015-2011	0.996 (0.982-1.011)			0.999 (0.999-1.0002)		
% change in total financial assets 2015-2011	0.995 (0.991-0.999)			0.999 (0.999-1.00002)		
% change in total real estate wealth 2015-2011	1.016 (0.959-1.076)			1.0003 (0.999-1.001)		
% change in total debt 2015-2011	0.926 (0.864-0.992)	0.925 (0.863-0.991)		0.999 (0.999-1.0004)	0.999 (0.999-1.00004)	
% change in income 2015-2011	0.658 (0.577-0.759)	0.664 (0.580-0.748)	0.651 (0.563-0.739)	1.0007 (0.995-1.0064)	1.001 (0.995-1.0064)	1.001 (0.995-1.0064)
% change in net wealth 2015-2011	1.001 (0.996-1.006)			0.999 (0.999-1.0001)		
N	5118	5118	5118	2591	2591	2591

Notes: ■ 90% significance, ■ 95% significance. Coefficients are reported as odds ratios. Models adjusted by age, gender, education, employment status, marital status, number of family members, number of working members, property status and main explanatory (net wealth and income) in 2011 or 2015.

4. Discussion

The objective of this paper was to evaluate the association between variations in income and wealth (aggregated and disaggregated into real estate and financial wealth) and variations in self-perceived health in a set of thirteen EU countries. We reached our goal by taking advantage of a rich and unique dataset: three waves (2011, 2015, 2017) of the HCFS covering both the financial crisis in Europe and the subsequent expansion period.

Our results show that changes in individuals' income seem to be more important than net wealth to explain variations in self-perceived health in the EU countries, and, in particular, in the recession period. Even if the financial crisis affected the European countries differently, in most of them, income changes played an important role in protecting health. However, changes in income prove not to be relevant in the expansion period. Wealth variation in all the specification types shows minor or no effects. All indicate that self-perceived health is very sensitive to short-term income variations, with flow variables dominating over the stock variables. Our results are in line with previous literature showing the importance income has on self-perceived health (see Aittomäki *et al.*, 2010; Benzeval, 2001).

The importance of analysing inequality and the corresponding economy-wide distributions of asset positions as potential sources of individuals' economic instability has been reaffirmed by recent macroeconomic events (see Bárcena-Martín, E. and Silber, J., 2023). In this sense, the distribution of specific components of wealth has important implications for a family exposure to systemic risk and eroding welfare. At the aggregate level, the distribution of home equity, i. e., the net value of housing (excluding the mortgage debt), has transpired to play a crucial role for an assessment of potentially adverse feedback loops. For instance, an economy with a large fraction of households who finance the value of their homes with low levels of home equity is particularly vulnerable to declines in house prices.

Another relevant area of analysis is the potential cross-country asymmetries in responses to measures taken during the crisis at the European level. The HFCS provides the empirical foundation to establish this analysis. As mentioned earlier, housing wealth and mortgage debt are major items on the average balance sheets of households in countries in the Euro area, but with some cross-country heterogeneity of wealth and debt portfolios. For example, 45% of households in Austria and Germany own their main residence, as such, income and rents have a major influence. Mediterranean countries, on the other hand, have much higher homeownership rates, (e. g., Spain 82% and Italy 69%), as a result, mortgage interest rates and house prices are more important there. This, however, cannot be translated automatically to individual welfare since in these last two countries the rates of adult children living with their homeowner parents are very high. Housing wealth amounts twice the average gross household income in Germany and more than five times the average gross household income in Spain. However, in general, heterogeneity across households exceeds heterogeneity across countries. On the other hand, financial rather than real wealth is more important in the Netherlands, Belgium and Germany. The differences between mean and median values of net wealth show higher inequalities in France, Spain, Belgium and Austria.

The cross-country differences in the HFCS data suggest that when analysing the heterogeneity in European household portfolios, we should consider the influence gross and net wealth and not just income, have on health (like it is for consumption and investment). As is reflected in wealth levels and composition, this influence may be different across countries. For instance, the data distinguishes between the value of housing and the value of financial assets while mortgage debt is relevant as a predominant gross liability item on household balance sheets.

Portfolio restrictions are an important feature too. Most household debt is secured by real estate. This explains the importance of the explicit consideration of restrictions between the value of real estate and the amount of debt secured by real estate. Portfolio items on a household balance sheet differ by their degree of liquidity. Owner-occupied housing is a major asset for households in Europe, but transactions involving this asset tend to imply considerable cost adjustments. The maturity dimension of assets and liabilities on the household balance sheet plays a role in the type of risk exposure for households. An example is the distinction between long-term fixed-rate debt and short-term or adjustable-rate debt. The consumption responses resulting from changes in short-term interest rates may vary strongly across countries, depending on the maturity structure of the outstanding debt on the household balance sheets.

Cross-country differences in unemployment insurance schemes, public and private health insurance schemes, bankruptcy regulations, volatility of asset prices and returns, and inflation risk, may also have an influence related to the uncertainty about the sustainability of the position of the individuals' financial stance, which is then reflected on health and welfare. This effect does not result just from wealth changes shaping insecurity and anxiety, but also from changes in the affordability of health care in financial hardship and/or lack of social protection.

Financial protection is central to universal health coverage and a core dimension of health system performance. The financial and economic crisis tested the ability of the Member States. Voluntary health insurance in some countries may either increase (because of a deterioration in the public coverage) or decrease (because of a lack of out-of-pocket money for health care), with some effects on health. The WHO identifies catastrophic health spending when the out-of-pocket amount a household pays for health care exceeds a predefined share of its ability to pay for health care, which may make it difficult for the household to meet other basic needs. Financial strain is a great stressor that can be linked to health because of the resulting inability to manage one's income which can subsequently provoke stress, anxiety, and a feeling of helplessness. It has also been reported that individuals experiencing financial strain are more likely to have unhealthy behaviors. We need, therefore, to compare the prevalence of financial strain among individuals among different welfare state typologies, and to examine whether the relationship between financial strain and health status differs by welfare state regime (Artacoz *et al.*, 2021; Pinilla and González-López-Valcárcel, 2020).

One of the strengths of this research is the dataset we used. The amount of detail in the HFCS dataset related to assets and wealth is greater than any other cross-country dataset like the EU-SILC. As a result, our analysis benefits from a set of variables that allow us to better understand the asset portfolio of the individuals

As a limitation, even if we used a panel format dataset for this study, causal inferences cannot be drawn due to potential endogeneity (unobserved factors). It remains unclear in this study if the burden comes from over-indebtedness rather than indebtedness changes. This may then impair an individual's health in the long run leading to financial difficulties. These unobserved factors may result in a higher risk of being unemployed or employed in a low-income job, to name some features that we have been unable to control for among the countries analysed. This could be the cause of relevant changes in perceived health. However, the assumed causation behind the strong association is possibly reversed or –even more plausibly– bi-directional.

Another possible limitation could reside in the statistical matching. Following this procedure does not mean, in any way, that, in our case, an individual's health is determined solely by the covariates used (i. e., gender, age, education, employment, marital status, and country of residence). No doubt there are other determinants, some of them unobserved. However, in the specified models we have tried to control for them, including random effects that capture heterogeneity (individual and country), both time-invariant and variant. On the other hand, matching could lead to some misclassification (information bias). However, first of all, this is non-differential (i.e., it occurs when errors in classification occur to the same degree regardless of outcome) and, furthermore, the matching method that we have used meets the validity criteria indicated by Rässler (2002), namely : (1) the marginal and joint distributions of variables are preserved in the statistical matching file; (2) the correlation structure and higher moments of the variables are preserved after statistical matching; (3) the true joint distribution of all variables is reflected in the statistical matching file.

Notes

1. https://www.ecb.europa.eu/pub/economic-research/research-networks/html/researcher_hfcn.en.html.
2. HFCS wave 1 corresponds to interviews done between 2010 and 2011, wave 2 between 2013 and 2015 and wave 3 in 2017.
3. <https://ec.europa.eu/eurostat/web/microdata/european-union-statistics-on-income-and-living-conditions>.

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Resumen

En este trabajo, evaluamos la asociación de los cambios en la renta y la riqueza con la salud autopercebida para los países de la Unión Europea (UE), utilizando una muestra longitudinal de individuos. Estimamos modelos lineales generalizados mixtos para tres oleadas de la Eurosystem Household Finance and Consumption Survey (2011, 2015, 2017), ajustando por la heterogeneidad familiar e individual y por las tendencias temporales. Los resultados muestran que las variaciones en los ingresos tienen un impacto positivo y significativo en los cambios en la salud autopercebida durante la crisis financiera, pero no después de 2015. En conclusión, encontramos que la renta, más que la riqueza, desempeñó un papel importante en la protección de la salud.

Palabras clave: salud autopercebida, riqueza, composición de activos, Unión Europea.

Clasificación JEL: I14, C23, G51.