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HOUSEHOLD DEBT BURDEN AND FINANCIAL VULNERABILITY IN LUXEMBOURG

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Household debt burden and financial vulnerability in Luxembourg[*]

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Abstract

We construct debt burden indicators at the level of individual households and calculate the share of households that are financially vulnerable using Luxembourg survey data collected in 2010 and 2014. The share of households that were indebted declined from 58.3% in 2010 to 54.6% in 2014, but the median level of debt (among indebted households) increased by 22% to reach € 89,800. This suggests that indebted households in 2014 carried a heavier burden than indebted households in 2010. However, among several debt burden indicators considered, only the debt-to-income ratio and the loan-to-value ratio of the outstanding stock registered a statistically significant increase. The median debt service-to-income ratio actually declined, mainly reflecting lower costs on non-mortgage debt. Using conventional thresholds to identify financially vulnerable households, we find that their share in the population of indebted households increased, although the change was only statistically significant when measured by the debt-to-income ratio. The different indicators of debt burden and financial vulnerability are highly correlated with several socio-economic characteristics, including age, gross income and net wealth. In particular, low income households have lower leverage and disadvantaged socio-economic groups (in terms of education, employment status and home-ownership status) tend to be less financially vulnerable. However, after controlling for other factors, low income or low wealth increase the probability of being identified as vulnerable.

JEL-codes: D10, D14, G21

Keywords: Household debt; Household financial vulnerability; Financial stability; HFCS; Household finance

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Non technical summary

This paper investigates financial vulnerability across the population of Luxembourg households using balance sheet information from the 1st and 2nd wave of the Luxembourg Household Finance and Consumption Survey. We analyse indicators of household debt burden by socio-economic characteristics in a representative sample in the years 2010 and 2014. In addition, we identify which household characteristics are more closely linked to financial vulnerability.

The evidence we provide does not lead to one overarching key message but draws a mixed picture on the changes of household indebtedness and financial vulnerability in Luxembourg across the two currently available waves (the third wave is planned to be conducted at the end of 2017/ beginning of 2018). Although the share of indebted households fell from 58.4% in 2010 to 54.6% in 2014, on average those households that were indebted in 2014 carried a heavier debt burden, mainly reflecting larger mortgage loans on the main residence. Increases in the median debt-to-income ratio and the median loan-to-value ratio of the outstanding stock are statistically significant, but those for other debt burden indicators are not. The median debt service-to-income ratio actually declined, reflecting mainly lower costs of non-mortgage debt.

In the related literature, financially vulnerable households are identified as those whose debt burden indicators exceed conventional thresholds. We perform this exercise for the population of Luxembourg households using both a single indicator approach and a multiple indicator approach. We find that the share of financially vulnerable households did not change in a statistically significant way between 2010 and 2014, except for the case of the debt-to-income ratio. We combine several indicators to identify those vulnerable households that could run into serious problems and represent a risk of losses for the lender. These households represent 1.4% of indebted households in 2010 and increase to 2.2% in 2014; this constitutes a sizable but still not statistically significant increase.

Estimated correlations between vulnerability indicators and household characteristics also suggest that, on the one hand, financial vulnerability is less likely for disadvantaged socio-economic groups (in terms of education, employment and home-ownership status). On the other hand, low income and low wealth increases the likelihood of households' vulnerability. However, the analysis of the median debt burden indicators suggests that low income households are those with the lowest median debt-to-asset ratio and the lowest median loan-to-value ratio of the outstanding stock.

In summary, there is some but no unequivocal evidence that the median debt burden and the share of financially vulnerable households increased from 2010 to 2014. Additional research is needed to assess financial stability implications of household financial vulnerability by stress testing household balance sheets to adverse economic shocks.

Résumé non-technique

Cet article examine la vulnérabilité financière de la population des ménages au Luxembourg, en utilisant des informations bilantaires collectées lors de la 1ère et 2e vague de l'enquête sur le comportement financier et de consommation des ménages. Nous analysons la répartition des indicateurs de la charge de la dette et de la vulnérabilité financière des ménages, selon leurs caractéristiques socio-économiques en utilisant des échantillons représentatifs pour les années 2010 et 2014. De plus, nous identifions les caractéristiques socio-économiques les plus étroitement liées à la vulnérabilité financière des ménages.

Nos résultats empiriques n'aboutissent pas à un message général mais dressent une image mitigée concernant les changements de l'endettement et de la vulnérabilité financière des ménages au Luxembourg entre les deux vagues actuellement disponibles (la troisième vague de l'enquête est prévue pour la fin de 2017/ début 2018). Bien que la part des ménages endettés ait baissé de 58,4 % en 2010 à 54,6 % en 2014, le poids de la dette pour ces ménages s'est alourdi en moyenne, principalement à cause de prêts hypothécaires plus importants pour l'achat de la résidence principale. Les valeurs médianes du ratio dette-sur-revenu et du ratio prêt/valeur calculé sur la base de l'encours ont augmenté de manière statistiquement significative, mais cela n'est pas le cas pour d'autres indicateurs de la charge de la dette. La médiane du ratio service de la dette-sur-revenu a diminué, surtout en raison de la baisse des coûts de la dette non hypothécaire.

Dans la littérature, les ménages vulnérables sont identifiés comme étant ceux pour lesquels des indicateurs de la charge de la dette dépassent certains seuils conventionnels. Nous suivons cette démarche pour la population des ménages luxembourgeois, en considérant les indicateurs individuellement ou en combinaison. Nos résultats montrent qu'en général la part des ménages endettés qui sont financièrement vulnérables n'a pas changé de manière statistiquement significative entre 2010 et 2014. Cependant, l'augmentation est statistiquement significative si le ratio dette-sur-revenu est employé pour identifier les ménages vulnérables. En utilisant une combinaison de plusieurs indicateurs nous identifions les ménages qui pourraient connaître de sérieux problèmes et qui sont susceptibles de présenter un risque de crédit pour les prêteurs. Ces ménages représentent 1,4 % des ménages endettés en 2010 et 2,2 % en 2014; ceci constitue une ample augmentation de la part de ménages vulnérables mais qui reste non significative statistiquement.

Les corrélations estimées entre les indicateurs de vulnérabilité et les caractéristiques des ménages suggèrent, d'une part, qu'il est moins probable que des ménages dans des groupes socio-économiques défavorisés (en termes d'éducation, de situation professionnelle et de statut de propriétaire de la résidence principale du ménage) soient financièrement vulnérables. D'autre part, des niveaux faibles de revenu et de patrimoine augmentent la probabilité des ménages d'être identifiés comme étant financièrement vulnérables. Cependant, l'analyse de la médiane des indicateurs suggère que les ménages à faible revenu sont ceux qui ont les plus faibles ratios de dette-sur-actif et prêt/valeur (encours).

Pour résumer, il y a des signes mais pas de preuves incontestables d'une augmentation entre 2010 et 2014 de la charge de la dette médiane et de la part des ménages financièrement vulnérables. Un travail de recherche supplémentaire est nécessaire afin d'établir les implications, en termes de

stabilité financière, de la vulnérabilité financière des ménages, notamment, en effectuant des tests sur l'endurance des ménages à des chocs économiques défavorables.

Abbreviations

BCL	Banque centrale du Luxembourg
CAPI	computer-assisted personal interviews
DA	debt-to-asset (ratio)
DI	debt-to-income (ratio)
DSI	debt-service-to-income (ratio)
EA	euro area
ECB	European Central Bank
FKP	financially knowledgeable person
HFCN	Household Finance and Consumption Network
HFCS	Household Finance and Consumption Survey
HMR	household main residence
IMF	International Monetary Fund
LTV	loan-to-value (ratio)
LU	Luxembourg
MDSI	mortgage debt service-to-income (ratio)
NLAI	net liquid assets to income (ratio)
ppt	percentage points
UK	United Kingdom
US	United States

1   Introduction

Despite their relative wealth, Luxembourg households are generally more indebted than households in other European countries (HFCN, 2013). This emphasises the need for a detailed assessment of household debt sustainability in Luxembourg. During the global financial crisis, mortgage defaults had consequences for financial stability around the world. Unsustainable household debt also contributed to deepening the economic consequences of systemic banking crises in certain European countries following the global financial crisis. More recently, in responding to the low inflation environment, the European Central Bank (ECB) took unprecedented monetary policy measures, which cut household borrowing costs in the euro area (EA).

More recently, the Luxembourg central bank drew attention to concerns regarding household financial vulnerability (BCL 2015, 2016, 2017).[1,2] In particular, the latest financial stability reviews noted the substantial share of loans with a short mortgage rate fixation period, which are vulnerable to unexpected interest rate increases. They also noted that household debt was growing faster than the value of household assets, implying higher bank losses in case of default. However, this analysis is limited by its reliance on aggregate data and population averages. The picture drawn from the analysis of time series data can be enriched using detailed cross-sectional balance sheet data at the individual household level. However, our cross-sectional balance sheet data refers to 2010 and 2014 and is less timely than aggregate data.

This paper calculates household-level indicators of debt burden and identifies financially vulnerable households using the 1st and 2nd wave of the Luxembourg Household Finance and Consumption Survey (LU-HFCS). Our analysis extends work reported in BCL (2013) to include the 2nd wave of the LU-HFCS conducted in 2014, and aims to complement the BCL (2017) assessment of household financial vulnerability by studying survey data. In particular, we provide a detailed description of the distribution of debt burden indicators by household socio-economic characteristics. In addition, we investigate which characteristics are more closely linked to household financial vulnerability. In future research we plan to implement a household stress test using micro-simulation methods.The evidence we provide draws a mixed picture on the changes of household indebtedness and financial vulnerability in Luxembourg across the two waves. In 2014, 54.6% of all resident households were indebted. These households are the reference population for the analysis in this paper. The share of indebted households actually fell by 3.8 percentage points (ppt) since 2010, but the level of debt in the typical household increased. The conditional mean of household total debt increased by 27% to reach € 178,400 (the conditional median increased by 22% to reach € 89,800). Among the debt burden indicators we study, there were increases in the median debt-to-asset ratio, the median loan-to-value ratio (of the outstanding stock) and the median debt-to-income ratio. However, these changes are only statistically significant for the debt-to-income ratio and the loan-to-value ratio (of the outstanding stock). In contrast, the debt service-to-income ratio declined due to the low interest rate environment. This was mostly driven by lower debt service on non-mortgage debt.

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[1]   See the Section 3 in the first chapter of Revue de Stabilité Financière 2015 (pages 17-25) and Box 1.1 in Revue de Stabilité Financière 2016 (pages 21-23).

[2]   The European Systemic Risk Board also addressed a warning to Luxembourg about residential real estate developments and their financial stability consequences (ESRB/2016/09).

Financially vulnerable households are identified following two alternative approaches. The first approach considers one debt burden indicator at a time. This approach does not indicate a uniform significant increase in the share of financially vulnerable households between 2010 and 2014. The second approach combines information from several debt burden indicators and shows a larger (in relative terms) but still not statistically significant increase. The share of financially vulnerable households is 2.2% of the indebted population and 2.6% of the population with mortgages on their main residence in 2014.

Finally, we analyse the household socio-economic characteristics most closely associated with a higher probability of being financially vulnerable. We find that age, gross income and net wealth are highly correlated with various debt burden indicators and the share of financially vulnerable households. Disadvantaged socio-economic groups (in terms of education, employment and home-ownership status) tend be less often financially vulnerable. Conversely, low income and low wealth increase the probability of being identified as vulnerable. However, the analysis of the median debt burden indicators suggests that low income households are those with the lowest median leverage (debt-to-asset ratio and loan-to-value ratio of the outstanding stock).

The paper is organized as follows. In section 2, debt burden indicators are defined and the different approaches to identify vulnerable households are explained. The dataset used is briefly presented. Section 3 compares household debt burden indicators and the share of financially vulnerable households in 2010 and 2014. The distribution by demographic characteristics is also described. In addition, we use multivariate regression techniques to identify which household characteristics are more closely correlated with the probability of having a high median debt burden or being financially vulnerable. Section 4 concludes.

2 Methodology and data

To investigate different dimensions of the household debt burden, we consider several possible indicators (HFCN, 2013). These indicators are calculated for every indebted household. We identify indebted households as those with outstanding loans from financial institutions (mortgage, consumer, personal, instalment, etc.) and/or from relatives, friends, employers, etc. Households with credit lines/overdraft debt or credit card debt are also considered indebted. Overall debt is divided into non-mortgage debt and mortgage debt. Unless indicated differently, the indicators below are all calculated over the entire population of indebted households.

Financially vulnerable households are identified as those for which the debt burden indicators exceed certain thresholds. We adopt both single indicator and multiple indicator approaches for this purpose as detailed below.

Table 1 below reports the definitions of the different debt burden indicators. Three of them refer to the level of household leverage. The debt-to-asset (DA) ratio is the most traditional of these leverage measures. The debt-to-income (DI) ratio captures households' ability to service their debt from income streams rather than by selling their assets. The outstanding loan-to-value (LTV) ratio captures the current leverage position of the household in relation to the current self-assessed selling price of their household main residence (HMR). The outstanding LTV should not be confused with the LTV ratio at mortgage origination. The former contains the current stock of all HMR mortgages taken out. The outstanding LTV (stock) is the preferred measure to assess the current debt burden of

households. The initial LTV (flow) is of additional interest as it can be the object of macro-prudential regulation.

We also consider two indicators based on the flow of payments servicing the debt. The debt-service-to-income (DSI) ratio focuses on short-term requirements by measuring the drain on current income from payments of interest and principal. The mortgage debt service-to-income (MDSI) ratio provides similar information but only considers debt with real estate collateral. Since these ratios compare flows, they can vary with changes in the interest rate.

Finally, we calculate the net liquid assets to income (NLAI) ratio. This does not really measure the debt burden, but rather a household's ability to continue servicing debt (by selling its liquid assets) when faced with a sudden temporary drop in income. Unlike the debt burden indicators introduced above, NLAI focuses on the liquidity of household balance sheets. Specifically, it represents the number of months that a household can replace its usual sources of income by selling its liquid assets.

Table 1: Household debt burden indicators and financial vulnerability thresholds

Debt burden indicator	Definition	Vulnerability threshold	Number of observations[3]
Debt-to-assets ratio (DA)	Total outstanding debt divided by household assets.	≥ 75%	2010: 580 2014: 952
Debt-to-income ratio (DI)	Total outstanding debt divided by annual household gross income.	≥ 3	2010: 580 2014: 952
Debt service-to-income ratio (DSI)	Monthly debt payments divided by monthly gross income. No debt service information is collected in the HFCS for credit lines/overdraft liabilities (set to zero). Debt service includes interest and principal repayment but excludes taxes, insurance and any other related fees. Payments for leasing contracts are also excluded.	≥ 40%	2010: 580 2014: 952
Mortgage debt service-to-income ratio (MDSI)	Total monthly mortgage debt payments (mortgages on the HMR and other properties) divided by household gross monthly income. Only defined for households with mortgage debt.	≥ 40%	2010: 405 2014: 664
Outstanding loan-to-value ratio of HMR (LTV) - stock	Outstanding stock of HMR mortgages divided by the current value of the HMR. Only defined for households with HMR mortgage debt.	≥ 75%	2010: 328 2014: 547

Complementary indicator	Definition	Threshold	Number of observations
Net liquid assets to income ratio (NLAI)	Net liquid assets divided by gross annual income. Net liquid assets include deposits, mutual funds, debt securities, non-self-employment business wealth, (publicly traded) shares and managed accounts, net of credit line/overdraft debt, credit card debt and other non-mortgage debt.	< 2 months of income	2010: 580 2014: 952

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[3] We report the unweighted numbers of observations. The weighted numbers of observations would be smaller as we oversample high income households, which are also more likely to hold debt.

We classify a household as vulnerable if its debt burden indicator exceeds the associated threshold reported in the last column of Table 1. These are conventional thresholds common across the existing literature on household financial vulnerability and were applied in similar exercises for the US (Bricker et al., 2011), the EA (ECB, 2013), the UK (IMF, 2011), Canada (Djoudad, 2012), Korea (Karasulu, 2008), Spain (IMF, 2012) and Austria (Albacete and Lindner, 2013).

These conventional thresholds are chosen by economic reasoning. Households with a DA ratio above 75% might have difficulties repaying their debt even if they sell all their assets. In this case, the 75% threshold was chosen to represent a plausible haircut, accounting for transaction costs, search costs, and the risk of future drops in asset prices. Likewise, an outstanding LTV ratio (stock) above 75% serves to identify households for whom bank losses given household default could be substantial. In the same vein, a ratio of total debt to gross income in excess of three suggests that households will remain indebted for a long period of time and are therefore more exposed to future shocks that could affect their repayment capacity. As regards debt service, households with a DSI (or MDSI) ratio above 40% devote an important share of their current gross income flow to debt service. Therefore, any shock increasing the debt service flow or decreasing the income flow would jeopardise debt repayment. Finally, a NLAI ratio below 2 may indicate a household that is unable to cover debt payments following a sudden drop in income. However, the thresholds chosen might seem somewhat arbitrary. Thus, we perform a sensitivity analysis of the share of vulnerable households and of the changes between the two waves.

We also identify vulnerable households by combining several of the indicators above. The aim is to focus on those vulnerable households that could run into serious problems which would represent a risk of losses for the lender. The single indicator approach may identify many households as vulnerable because they have high DSI and/or MDSI ratios and a low NLAI ratio. However, many of these households will not represent a substantial loss because they are not highly leveraged (i.e. low DA, and/or outstanding LTV ratios (stock)). Even if these household default, bank losses will be limited after liquidating household assets. Thus, a banks' loss given default perspective suggests to focus on households that meet the following conditions: (i) the DSI or MDSI ratio breaches its threshold and ii) the NLAI ratio breaches its threshold; as well as (iiia) the DA ratio *or* (iiib) outstanding LTV ratio (stock) breach their threshold. Finally, we also report the share of indebted households satisfying at least one of these conditions (i.e. the union of the conditions instead of their intersection).

In order to calculate the debt burden indicators, this paper uses household micro data from the 1st and 2nd wave of the LU-HFCS. Both are representative samples of the population of households resident in Luxembourg. The 1st wave was conducted mostly in 2010 and included 950 households. The 2nd wave was conducted in 2014 and included 1601 households. Both waves were conducted by computer-assisted personal interviews (CAPI). Table 1 provides also the underlying number of observations for the analysis. Four indicators are defined for the indebted population. The MDSI can only be calculated for households with mortgage debt and the outstanding LTV ratio (stock) is defined for HMR mortgage holders only.

Survey data are not free of drawbacks. In general, they suffer from a bias due to underreporting and missing responses, especially among the wealthiest households. In order to limit this bias, HFCS data is multiply imputed and the analyses included here account for uncertainty due to sampling and

imputation methods. Unless indicated differently, the standard errors and confidence intervals reported below account for both sampling and imputation variability. They are based on 1000 replicate weights and 5 multiply imputed implicates of the dataset. This ensures a more accurate analysis of financial vulnerability for the full population of households resident in Luxembourg. References below to personal characteristics of a household (indicated by a *) always refer to those of the *"financially knowledgeable person"* (FKP). The FKP is the person within the household who was self-declared as the best informed about household finances and responded to survey questions on financial matters.

3   Results

We first describe the demographic and socio-economic characteristics of indebted households and provide an overview on the mean and median level of debt (subsection 3.1). Subsection 3.2 compares the debt burden indicators for 2010 and 2014 and subsection 3.3 identifies household characteristics most closely correlated with higher debt burden indicators in 2014. Subsection 3.4 compares the share of financially vulnerable households in 2010 and in 2014 and subsection 3.5 identifies household characteristics most closely correlated with financial vulnerability in 2014.

3.1   Indebted households

In 2014, 54.6% of all households were indebted. This is a 3.8 percentage point (ppt) decline compared to 2010. Girshina, Mathä, and Ziegelmeyer (2017; section 2.2) provide details on participation rates and mean/median debt across debt categories[4] conditional on participation.

Figure 1 shows the population composition for all households and for indebted households according to various socio-demographic and economic variables for both 2010 and 2014. Indebted households are younger relative to the total population of households, have more household members, have more dependent children, and are less likely to be single and widowed. They are less likely to have low educational attainment and more likely to have high educational attainment. Indebted households are more likely to be (self-)employed, more likely to belong to the higher income quintiles, less likely to belong to the top or the bottom net wealth quintile, but more likely to belong to the second lowest net wealth quintile. More than half of indebted households have outstanding mortgage debt.

The share of households that were indebted declined from 2010 to 2014. However, among those households that were in debt, the mean level of total debt increased by 27% (the median level rose by 22%). The nominal mean value of debt reached € 178,400 in 2014 (the median level reached € 89,800). This increase was mainly driven by mortgage debt on the HMR and exceeded the increase in total real assets, whose mean value rose by only 4.3% (median value rose 7%). The different growth of debt and real assets corroborates the analysis in BCL (2016) and will influence the debt burden and vulnerability measures as discussed below.

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[4]   Mortgage debt comprises that on the HMR and that on other real estate property. Non-mortgage debt includes overdraft debt, credit card debt, private and consumer loans.

Figure 1: Population composition – all households and indebted households
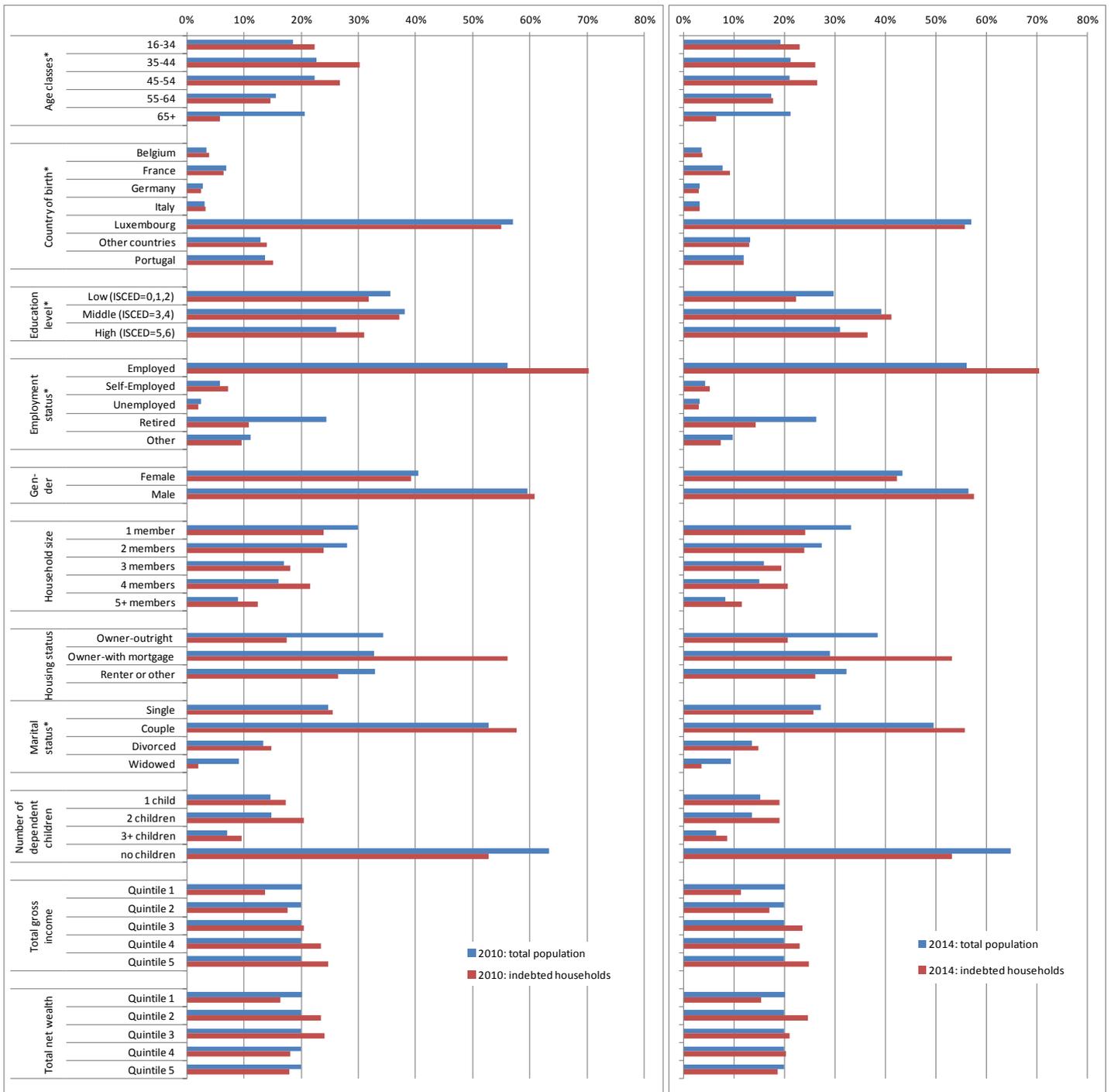
Source: Own calculations based on the 1st and 2nd wave of the LU-HFCS; data are multiply imputed and weighted.

3.2 Debt burden indicators

Table 2 presents the median value of several debt burden indicators in the population of indebted households in Luxembourg. These ratios suggest that households that were indebted in 2014 carried a heavier debt burden than those that were indebted in 2010. The increase in debt exceeded the increase in the value of assets which could be pledged as collateral, as well as the increase in annual gross income. However, the p-values in the final column indicate that the difference between 2010

and 2014 was only statistically significant for the DI and outstanding LTV ratios (stock). The DSI ratio, instead, declined between 2010 and 2014, mainly driven by the lower cost of non-mortgage debt.

Table 2: Median debt burden indicators

Debt burden indicators	Year	Median	Std. err.	[90% conf. interval]		p-value	
Debt-to-asset ratio	2010	18.2%	2.1%	14.6%	21.7%	16.1%	
	2014	22.2%	2.1%	18.7%	25.6%		
Debt-to-income ratio	2010	86.9%	11.2%	68.4%	105.4%	8.9%	*
	2014	114.1%	10.6%	96.7%	131.5%		
Debt service-to-income ratio	2010	15.7%	0.9%	14.3%	17.2%	36.7%	
	2014	14.8%	0.6%	13.8%	15.8%		
Mortgage debt service-to-income	2010	16.3%	0.7%	15.2%	17.3%	17.3%	
	2014	17.6%	0.7%	16.4%	18.7%		
Outstanding loan-to-value ratio of main residence (stock)	2010	27.5%	2.6%	23.2%	31.7%	5.6%	*
	2014	34.6%	2.8%	30.1%	39.2%		
Net liquid assets to income	2010	12.2%	2.2%	8.6%	15.9%	79.0%	
	2014	11.5%	1.7%	8.8%	14.2%		

Source: Own calculations based on the 1st and 2nd wave of the LU-HFCS; data are multiply imputed and weighted; variance estimation based on 1000 replicate weights. P-values indicate whether difference between 2010 and 2014 is significant: *** p<0.01, ** p<0.05, * p<0.1.

In part, these changes reflect macro-economic developments between the two waves of the survey. Weakness in the EA and abroad lead to a drop in inflation that prompted the Eurosystem to implement a series of unprecedented monetary policy measures (both conventional and unconventional). This lowered the cost of borrowing as well as the return on many financial investments. This context could explain why the increase in the median DA ratio was not statistically significant in Luxembourg. On the other hand, the statistically significant increase in the DI ratio may reflect the fact that around 70% of indebted households are reported as "employed" (see Figure 1), and wages progressed little given low inflation during those years (mean household gross income increased by only 4% between 2010 and 2014; the median was unchanged). Finally, the accommodating monetary policy stance contributes to lower the cost of debt service.

The tables and graphs in Appendix A provide median values for all the debt burden indicators in subsamples defined by different household characteristics. In general, households with higher debt burden indicators, that is the most financially vulnerable, tend to be those whose FKP is young (mainly in the first age class but sometimes in the second), born in Portugal, active in the labour force and single. The debt burden tends to fall at higher quintiles of gross income and of net wealth although the pattern is not always smooth. Indicators related to the flow of income (DI and DSI) tend to have low median values in the first net wealth quintile.

3.3   Linking debt burden and household characteristics

We use a median regression[5] (see Christelis et al. 2013; Bauer et al., 2011) to quantify the correlation between the debt burden indicators defined above and the household characteristics shown in

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[5]   Median regression, also known as least-absolute-deviations regression, is a quantile regression at the median. While quantile regression minimizes a sum of absolute errors with asymmetric penalties for over- and underprediction, the median regression uses symmetric penalties and therefore provides the optimal prediction at the conditional median.

Figure 1.[6] We run the median regressions only for 2014 as we are interested in identifying groups of households with higher debt burdens using the most recent data (estimated coefficients are shown in Table 3). A statistically significant effect on the median identifies correlation not necessarily causation, so the results should be interpreted as descriptive analysis. For some indicators, income or wealth appears on both sides of the regression (as a ratio for the dependent variable and a set of dummy variables for the independent variables), so we acknowledge that there is a potential simultaneity bias, although this may be limited given the different nonlinear transformations used. Despite this drawback, the regression approach provides the important advantage that we can control for other explanatory variables when testing for a significant correlation.

The benchmark or reference group is defined for each explanatory variable separately: it is a household with a male FKP, between 16 and 34 years old, born in Luxembourg, low educated, married, and employed. Referring to the household characteristics the reference group is also defined for each explanatory variable separately: single person household, no dependent children, renting the HMR, belonging to the highest quintiles of gross income and net wealth. Given that our independent variables are all binary, the estimated coefficients presented in Table 3 indicate the difference with respect to the median of the reference group. The estimated coefficient on the intercept term represents the median of the reference group. Coefficient estimates reported in Table 3 demonstrate that some household characteristics are significantly related to the debt burden indicators. These characteristics include net wealth quintiles, age classes, and (to a lesser extent) gross income quintiles. As will be explained below, the pattern of the estimated coefficients is consistent with theoretical models of the life-cycle (Modigliani and Brumberg, 1954; Friedman, 1957). First, net wealth correlates negatively with most debt burden indicators (except the DSI ratio). This was expected, particularly for the DA ratio and the outstanding LTV ratio (stock), as higher assets (or lower debts) increase net wealth while reducing these ratios. Less wealthy households have less net liquid assets relative to their gross income, as confirmed by the larger (negative) coefficient for higher net wealth quintiles in column 6 (Net liquid assets to income ratio).[7] For instance, a household in the middle net wealth quintile has a median ratio of net liquid assets to gross income which is 64ppt smaller than in the highest net wealth quintile. Surprisingly, differences in the median NLAI ratio across gross income quintiles are not statistically significant.

Second, columns 1, 2 and 5 suggest that debt is lower among households where the FKP is older. The outstanding LTV ratio (stock) declines with age, confirming that households purchase their main residence at early stages of their active life.

As expected, the median DSI and MDSI ratios (columns 3 and 4) gradually decline with gross income. However, the first quintile of gross income is associated with a significantly lower DA ratio and a lower outstanding LTV ratio (stock). These results indicate that low income households are also those with the lowest median leverage.

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[6]   We use a bootstrap procedure for complex survey data using the *bs4rw* command in Stata. It is based on 1000 replicate weights to ensure that our estimates are representative of the population (Kolenikov, 2010).

[7]   Net wealth quintiles are almost the only explanatory variables significantly correlated with the median NLAI.

Table 3: Median regression - Debt burden indicators on household characteristics - 2014

VARIABLES	(1) Debt-to-asset ratio	(2) Debt-to-income ratio	(3) Debt service-to-income ratio	(4) Mortgage debt service-to-income ratio	(5) Outstanding loan-to-value ratio of HMR (stock)	(6) Net liquid assets as a fraction of annual gross income
Female	0.009	0.097	0.013	0.016	0.005	0.058
	(0.025)	(0.150)	(0.012)	(0.014)	(0.027)	(0.049)
Age class 35-44	-0.053	-0.002	0.020	0.013	-0.091*	0.013
	(0.047)	(0.259)	(0.016)	(0.021)	(0.049)	(0.065)
Age class 45-54	-0.144***	-0.594***	-0.009	-0.005	-0.231***	-0.010
	(0.052)	(0.229)	(0.018)	(0.026)	(0.059)	(0.086)
Age class 55-64	-0.154***	-0.835***	0.003	-0.018	-0.265***	0.076
	(0.052)	(0.275)	(0.021)	(0.030)	(0.064)	(0.117)
Age class 65+	-0.117*	-0.753**	0.020	0.023	-0.193	0.161
	(0.063)	(0.340)	(0.036)	(0.046)	(0.160)	(0.199)
Country of birth: PT	0.034	0.071	-0.042*	-0.059**	0.053	0.081
	(0.048)	(0.282)	(0.024)	(0.027)	(0.056)	(0.068)
Country of birth: FR	-0.035	-0.300	0.011	-0.010	-0.024	-0.023
	(0.038)	(0.231)	(0.020)	(0.027)	(0.063)	(0.089)
Country of birth: BE	-0.027	-0.307	-0.023	-0.041	0.060	0.126
	(0.046)	(0.260)	(0.027)	(0.032)	(0.074)	(0.157)
Country of birth: IT	0.080	0.088	-0.031	0.012	0.116**	0.061
	(0.310)	(0.338)	(0.032)	(0.037)	(0.059)	(0.123)
Country of birth: DE	0.061	0.043	0.024	0.002	0.051	0.153
	(0.055)	(0.679)	(0.032)	(0.029)	(0.064)	(0.304)
Country of birth: Other	-0.056*	-0.560***	-0.037**	-0.049***	-0.012	0.007
	(0.030)	(0.203)	(0.015)	(0.018)	(0.038)	(0.084)
1 child	0.078**	0.275	0.021	0.030	0.063	-0.105
	(0.035)	(0.247)	(0.020)	(0.023)	(0.053)	(0.083)
2 children	0.051	0.108	0.012	0.017	0.027	-0.132
	(0.039)	(0.287)	(0.024)	(0.030)	(0.064)	(0.103)
3+ children	0.082	0.144	0.049	0.008	0.068	-0.179
	(0.063)	(0.487)	(0.038)	(0.061)	(0.110)	(0.166)
Education: ISCED=3,4	0.008	0.028	-0.025	-0.025	0.031	0.102
	(0.028)	(0.193)	(0.020)	(0.024)	(0.049)	(0.062)
Education: ISCED=5,6	0.043	0.319	-0.023	-0.005	0.091*	0.179*
	(0.034)	(0.244)	(0.022)	(0.027)	(0.053)	(0.092)
Self-employed	0.034	0.227	-0.027	0.022	0.090	-0.073
	(0.040)	(0.330)	(0.032)	(0.044)	(0.064)	(0.108)
Unemployed	-0.179	-0.481	-0.084*	-0.059	-0.130	0.105
	(0.115)	(0.391)	(0.047)	(0.055)	(0.164)	(0.177)
Retired	-0.011	0.062	-0.061***	-0.054*	0.014	-0.096
	(0.029)	(0.219)	(0.022)	(0.028)	(0.052)	(0.123)
Other employment status	-0.005	0.085	-0.039*	-0.022	-0.001	-0.120
	(0.053)	(0.258)	(0.022)	(0.052)	(0.141)	(0.131)
Owner-outright	0.084*	0.916***	0.010			-0.158
	(0.046)	(0.328)	(0.021)			(0.133)
Owner with mortgage	0.174***	2.246***	0.111***			-0.065
	(0.041)	(0.300)	(0.018)			(0.081)
Gross income quintile 1	-0.113**	0.573	0.153***	0.208*	-0.173**	0.041
	(0.057)	(0.355)	(0.049)	(0.117)	(0.084)	(0.115)
Gross income quintile 2	-0.044	0.286	0.080***	0.142***	-0.067	0.003
	(0.040)	(0.308)	(0.019)	(0.034)	(0.059)	(0.110)
Gross income quintile 3	-0.046	0.318	0.063***	0.101***	-0.063	0.035
	(0.029)	(0.210)	(0.015)	(0.022)	(0.046)	(0.084)
Gross income quintile 4	-0.027	0.277	0.022	0.035**	-0.038	-0.031
	(0.025)	(0.198)	(0.014)	(0.017)	(0.036)	(0.069)
Net wealth quintile 1	0.852***	0.695*	-0.012	0.206*	0.974***	-1.023***
	(0.112)	(0.402)	(0.030)	(0.120)	(0.205)	(0.191)
Net wealth quintile 2	0.361***	1.088***	0.022	0.019	0.412***	-0.751***
	(0.035)	(0.305)	(0.019)	(0.031)	(0.049)	(0.163)
Net wealth quintile 3	0.103***	-0.004	0.001	0.009	0.163***	-0.642***
	(0.036)	(0.242)	(0.017)	(0.021)	(0.040)	(0.148)
Net wealth quintile 4	0.039*	-0.150	-0.009	0.007	0.068*	-0.564***
	(0.022)	(0.194)	(0.016)	(0.017)	(0.036)	(0.162)
Constant	0.085	-0.122	0.056	0.098*	0.244**	0.827***
	(0.075)	(0.562)	(0.039)	(0.051)	(0.098)	(0.214)
Observations	952	952	952	664	547	952

Standard errors in parentheses, *** p<0.01, ** p<0.05, * p<0.1

Source: Own calculations based on the 2nd wave of the LU-HFCS; data are multiply imputed and weighted; variance estimation based on 1000 replicate weights. The reference group is defined for each explanatory variable separately: it is a household with a male FKP, between 16 and 34 years old, born in Luxembourg, low educated, married, and employed. Referring to the household characteristics the reference group is also defined for each explanatory variable separately: single person household, no dependent children, renting the HMR, belonging to the highest quintiles of gross income and net wealth. Dummies related to household size and marital status are not shown as they are not statistically significant. Significant results are highlighted in grey.

3.4 Vulnerable households

3.4.1 Single indicator approach

For each debt burden indicator, Table 4 reports the share of the population of indebted households that are identified as financially vulnerable. Comparing the wave in 2010 to the one in 2014, these results do not signal a substantial change in financial vulnerability. The only statistically significant increase (at the 5% significance level) is for the share of households with a DI ratio higher or equal than 3. The increases in the share of households with DSI ≥ 40% and those with MDSI ≥ 40% are not statistically significant. Finally, the share of households with outstanding LTV ≥ 75% is lower than in 2010 (not statistically significant), possibly reflecting regulatory changes introduced between the two waves.

Changes in the share of vulnerable households tend to be consistent with changes in median debt burden indicators (described in section 3.2). The tables and graphs in Appendix B provide detailed statistics by household characteristics for each of the vulnerability measures. In general, most vulnerable households tend to be those whose FKP is young (mainly in the first age class but sometimes in the second too), born in Portugal or Germany, female, with a low level of education, self-employed and single/divorced. These households are also characterized by several dependent children, low net wealth, moderate gross income and renting their main residence or owning it with a mortgage.

Table 4: Share of vulnerable households: single indicator approach

Vulnerability measures	Year	Mean	Std. err.	[90% conf. interval]		p-value	
Debt-to-asset ratio ≥ 75%	2010	12.8%	1.6%	10.2%	15.5%	70.0%	
	2014	12.0%	1.4%	9.7%	14.3%		
Debt-to-income ratio ≥ 3	2010	20.6%	1.9%	17.5%	23.7%	4.7%	**
	2014	25.8%	1.8%	22.8%	28.8%		
Debt service-to-income ratio ≥ 40%	2010	7.0%	1.3%	4.9%	9.2%	31.4%	
	2014	8.9%	1.3%	6.8%	11.0%		
Mortgage debt service-to-income ratio ≥ 40%	2010	6.8%	1.6%	4.1%	9.5%	10.7%	
	2014	10.3%	1.7%	7.4%	13.1%		
Outstanding loan-to-value ratio of main residence (stock) ≥ 75%	2010	15.9%	2.3%	12.0%	19.8%	40.7%	
	2014	13.4%	1.9%	10.3%	16.4%		
Net liquid assets < 2 months income	2010	55.5%	2.5%	51.4%	59.7%	94.6%	
	2014	55.7%	1.9%	52.6%	58.9%		

Source: Own calculations based on the 1st and 2nd wave of the LU-HFCS; data are multiply imputed and weighted; variance estimation based on 1000 replicate weights. P-values indicate whether difference between 2010 and 2014 is significant: *** p<0.01, ** p<0.05, * p<0.1.

The vulnerability thresholds we employ are conventional in the literature, but they remain somewhat arbitrary. In order to assess the robustness of the result (share of vulnerable households) to alternative values of the threshold, Figure 2 depicts the cumulative distributions for each debt burden indicator in 2010 (blue lines) and in 2014 (red lines). The dashed horizontal lines represent the conventional thresholds reported in Table 1 and applied in Table 4. Moderate changes in the threshold around their conventional levels would not generally produce significant changes in the share of vulnerable households. This reflects a fairly flat slope of the cumulative distributions in the relevant range.

Figure 2: Cumulative distribution of debt burden indicators
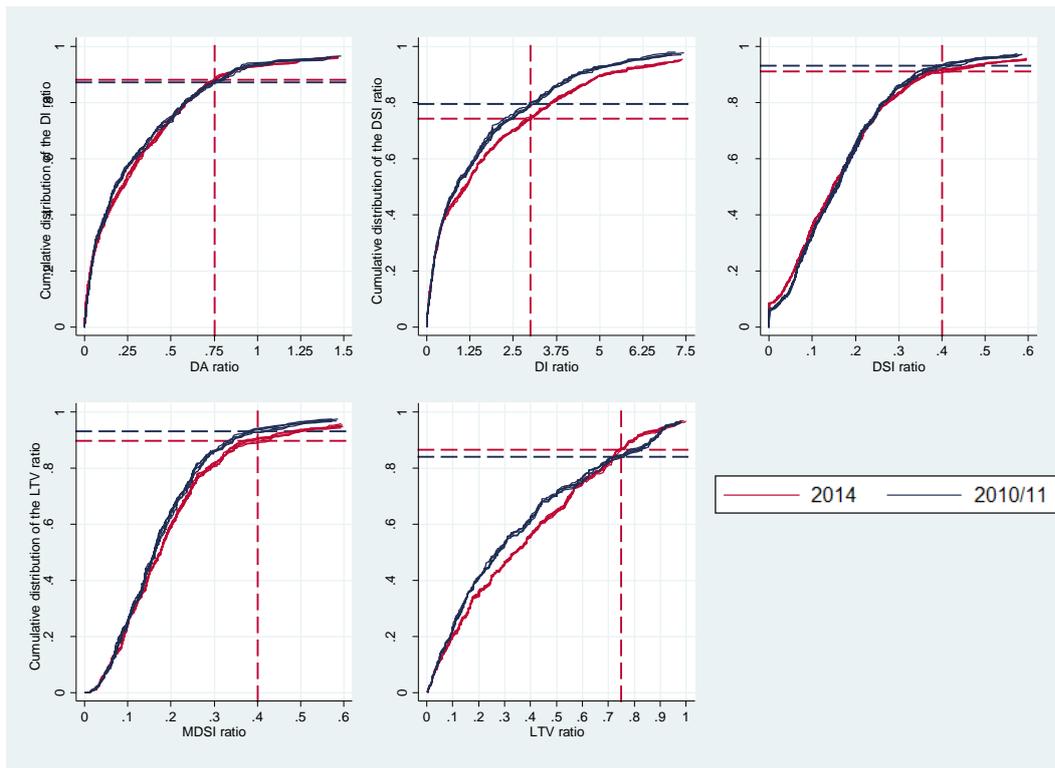
Figure 3: Cumulative distribution of net liquid assets to income ratio indicators
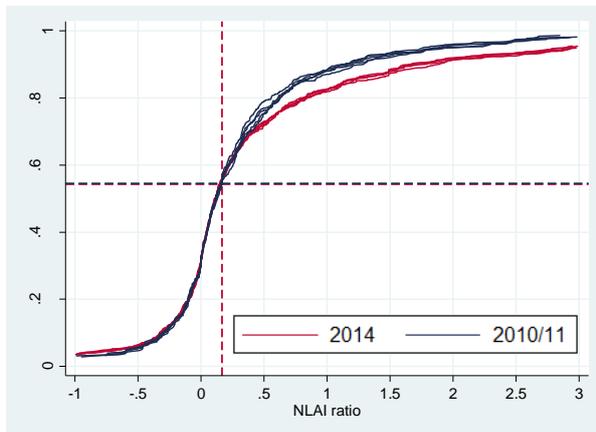
On the other hand, a small change in the threshold of the liquidity indicator, the NLAI ratio, would make a dramatic difference to the share of vulnerable households identified on this measure (Figure 3). In fact, the cumulative distribution is relatively steep around the conventional threshold for the net liquid assets to income ratio, which is set at 0.17 (equivalent to two months of annual income). This means that small changes in the threshold will switch the status of relatively many households. A closer look reveals that the conventional threshold for the NLAI ratio occurs near the population median, while the conventional thresholds for the other indicators only cut off 10-20% of the population in the tail of the distribution. Therefore, according to the conventional threshold for the

NLAI ratio, it appears that more than half of Luxembourg's indebted households suffer from insufficiently liquid balance sheets (last row in Table 4). This does not seem plausible and suggests that the conventional threshold is not appropriate for Luxembourg. In fact, according to international evidence from the HFCN annual gross income is significantly higher for households in Luxembourg than in other EA countries (HFCN, 2013, 2016). While a data-driven selection of the vulnerability thresholds might be more appropriate, we propose to leave this for future research.

The difference in the share of vulnerable households between 2010 and 2014 also turns out to be robust to small changes in the level of the vulnerability thresholds for most debt burden indicators. In Figure 2, the cumulative distributions in 2010 and in 2014 do not differ much. The only possible exception is the outstanding LTV ratio (stock), where the distributions cross. In fact, in the neighbourhood of the conventional threshold the slope of the cumulative distribution appears to flatten in 2010 while it appears to steepen in 2014. Therefore, a small increment in the threshold for this indicator would reduce the share of vulnerable households much more in 2014 than in 2010.

Finally, focussing on the DI ratio, the 2014 distribution stochastically dominates the 2010 distribution (weak dominance at order one). This means that the statistically significant increase in the share of vulnerable households reported for this indicator would probably also hold using other threshold levels (spanning almost the full distribution). In particular, we have already shown a significant difference at the median (Table 2). Accordingly, in section 3.2 we argue that the combination of slack economic conditions and accommodating monetary policy contributed to debt growing faster than income while leaving debt service almost unchanged.

3.4.2 Multiple indicator approach

We also calculate the share of vulnerable households using the more restrictive multiple indicator approach presented in section 2. We argued that such an approach would focus on those households that could run into serious problems and represent a more acute risk of bank losses. Table 5 reports the outcome. Households simultaneously meeting condition (i) a debt service-to-income ratio above the threshold and condition (ii) a net liquid assets to income ratio below the threshold represent 4.3% of the indebted population in 2010 and 6% in 2014. If condition (i) is restricted to mortgage debt, the share of vulnerable households more than doubled from 3.3% in 2010 to 6.8% in 2014.

Table 5: Share of vulnerable households across waves: multiple indicator approach

		(i)	(ii)	(iiia)	(iiib)
				Additional conditions	
	Year	DSI ratio ≥ 40% or MDSI ratio ≥ 40%	Net liquid assets < 2 months income	DA ratio ≥ 75%	Outstanding LTV ratio of HMR (stock) ≥ 75%
DSI ratio ≥ 40%	2010	7.1	4.3	1.4	-
	2014	8.9	6.0	2.2	-
MDSI ratio ≥ 40%	2010	6.8	3.3	-	1.6
	2014	10.9	6.8	-	2.6

Source: Own calculations based on the 1st and 2nd wave of the LU-HFCS; data are multiply imputed and weighted. The rows on the DSI ratio refer to all indebted households. The rows on the MDSI ratio refer only to households with mortgage debt on their main residence.

Bank losses will only be important if these vulnerable households are also highly leveraged. When we add condition (iiia), a DA ratio breaching the threshold, there remain 1.4% of indebted households in 2010 and 2.2% in 2014 (the change between years is not statistically significant). If instead we add condition (iiib), the outstanding LTV ratio (stock) on the HMR breaching the threshold, there remain 1.6% of indebted households in 2010 and 2.6% in 2014 (the change between years is not statistically significant). The aggregate value of banks' exposure of default can be approximated by summing up the debt holdings of these population shares. In future research, we plan to calculate loss given default, exposure at default and probabilities of default at the individual household level in a stress test of household balance sheets.

While Table 5 focuses on households with a DSI ratio above the 40% threshold, Figure 4 provides more detailed information on the whole distribution of indebted households, including those with DSI ratios below the threshold. The upper panel refers to the population of all indebted households, while the bottom one focuses only on households with mortgage debt on their main residence. The bar on the far right in each panel provides the same information as in Table 5.

Figure 4: Distribution of households by multiple indicators

Source: Own calculations based on the 1st and 2nd wave of the LU-HFCS; data are multiply imputed and weighted. The upper panel on the DSI ratio refers to all indebted households. The lower panel on the MDSI ratio refers only to households with mortgage debt on their main residence. The figures in the bottom row provide the share of households in the respective category.

Most households have moderate DSI ratios below 20% or 30% (first two columns on the left account for 83.2% of indebted households in 2014). Comparing household groups according to their DSI ratios (the different bars) reveals heterogeneous distributions of the NLAI ratio. In 2014, the share of households with net liquid assets above 2 months income (green segment) decreases from around 50% for indebted households with a DSI below 20% (first bar) to around 32% for households with a DSI above 30% (last two bars). In addition, the share of households that combine an insufficient NLAI

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ratio with an excessive DA ratio (red segment) increases from 7% for households with a DSI below 20% (first bar) to 25% for households with a DSI of more than 40% (last bar). Thus, households with high DSI ratios tend to have proportionally less favourable NLAI and DA ratios. The pattern is generally confirmed if we focus on debt service-to-income ratio from mortgage on the main residence only (lower panel). Finally, we complement these analyses by calculating the shares of the indebted population that satisfy at least one of the vulnerability conditions used in Table 5. While relatively few indebted households fell in the intersection of the three vulnerability conditions (see Table 5), we expect a larger share to be captured by the union of conditions. The outcome is depicted in Table 6. The share of indebted households that breach the vulnerability threshold for either the DSI or the DA ratio is 18% in 2010 and in 2014. Similarly, the share of households that breach the vulnerability threshold for either the MDSI or the outstanding LTV ratio (stock) is around 21% in both waves. These shares increase dramatically when we add those households that breach the vulnerability threshold of the NLAI ratio (last column of Table 6). However, as discussed above, the latter result is not robust to small changes in the vulnerability threshold of the NLAI ratio (see section 3.4.1).

Table 6 : Share of households classified as vulnerable by at least one indicator

| | | Additional conditions | | |
| | | (iia) | (iib) | (iii) |
	Year	DA ratio ≥ 75%	Outstanding LTV ratio of HMR (stock) ≥ 75%	Net liquid assets < 2 months income
DSI ratio ≥ 40%	2010	18.0	-	60.7
	2014	18.0	-	59.3
MDSI ratio ≥ 40%	2010	-	21.1	73.9
	2014	-	21.2	73.4

Source: Own calculations based on the 1st and 2nd wave of the LU-HFCS; data are multiply imputed and weighted. The rows on the DSI ratio refer to all indebted households. The rows on the MDSI ratio refer only to households with mortgage debt on their main residence.

3.5 Linking vulnerability and household characteristics

We use a probit model to estimate the probability that a given household is classified as vulnerable (using the conventional thresholds and the standard single indicator approach). This adds to the median regression on the debt burden indicators as the probit model helps identifying the characteristics of vulnerable households which are by definition in the tail of the corresponding distribution (the conventional vulnerability thresholds are, for 5 out of 6 measures, at the right tail of the distribution, Figure 2 and Figure 3). As one can see below, the relevant characteristics differ in the two exercises.

The dependent variable is unity if the household is identified as vulnerable on a given measure and zero otherwise. Thus, the model can be written as follows:

$$\Pr(V_i = 1 \mid x) = \Pr(V_i^* > 0 \mid x) = \Phi(x) \tag{1}$$

$$V_i^* = \beta_0 + \beta_X X_i + \varepsilon_i \tag{2}$$

Household *i's* probability of being classified as vulnerable is expressed as a function of several determinants *x*, which influence a latent variable V_i^*. We use the same explanatory variables as for the median regression on debt burden indicators (Table 3). Again, we aim to identify household characteristics which are correlated with financial vulnerability while controlling for other household characteristics. Marginal effects are calculated at the observation level and then averaged. Potential simultaneity bias may also arise in this setting. Table 7 reports the estimated average marginal effects. These are strong for net wealth, gross income and the age of the FKP in the household. Including four net wealth quintiles allows the DA ≥ 75% regression in column 1 to perfectly identify households in our sample. This is why only the first net wealth quintile is included in column 1. In column 5, the marginal effect on the probability that LTV ≥ 75% is highest for households in the first net wealth quintile and the marginal effects tend to decrease with higher wealth. For instance, the probability that a household in the lowest net wealth quintile is vulnerable is 54% higher compared to a household in the reference (highest) quintile. In column 6, low net liquid assets relative to gross income are more likely for low wealth households. Marginal effects decline steadily with higher wealth. In column 4, the probability that the MDSI ratio exceeds 40% is significantly higher for households in the lowest net wealth quintile compared to those in the reference (highest) quintile. The average marginal effects in this column are negative for quintiles 2 and 3. This means that households belonging to these middle quintiles are less likely to be classified as vulnerable on this criterion compared to those in the reference (highest) net wealth quintile.

As expected, gross income tends to play a significant role in columns 3 and 4 (probability that total DSI or MDSI exceeds 40%). According to these indicators, the probability of being identified as vulnerable is lowest for the top gross income quintile and increases steadily as you approach the lower end of the income distribution.

If the indicator is based on the stock of debt (columns 1, 2 and 5), the probability that the household will be classified as vulnerable decreases with the age of the FKP. This pattern is consistent with the life cycle pattern of indebtedness, which suggests that high DTI ratios are in line with models of optimal portfolio choice over the life-cycle.

Some results in Table 7 may appear puzzling at first sight, such as those concerning ownership status, education level and occupation. The positive and highly significant coefficient for outright owners compared to renters might be surprising in columns 2, 3 and 6. We also ran the regressions omitting net wealth quintiles from the set of explanatory variables (results not shown to save space). In this case, owners (with or without a mortgage) were less likely to be identified as vulnerable in column 6. This suggests a high correlation between net wealth and housing status that may be biasing the coefficient on the latter variable.

Similarly, in columns 2 and 4 households where the FKP is highly educated tend to be more vulnerable. This may be related to a higher potential income growth. Likewise, in columns 2-4 households where the FKP is self-employed are more likely to be vulnerable, while in column 1 those where the FKP is unemployed are less likely to be vulnerable. The latter result might be explained by credit constraints facing the unemployed.

Table 7 : Probit regression – Vulnerable dummy on household characteristics – 2014

VARIABLES	(1) Debt-to-asset ratio ≥ 75%	(2) Debt-to-income ratio ≥ 3	(3) Debt service-to-income ratio ≥ 40 %	(4) Mortgage debt service-to-income ratio ≥ 40 %	(5) Outstanding loan-to-value ratio (stock) ≥ 75 %	(6) Net liquid assets < 2 months gross income
Female	0.016	0.006	0.004	-0.025	0.040	-0.049
	(0.020)	(0.029)	(0.022)	(0.025)	(0.028)	(0.039)
Age class 35-44	-0.059**	-0.026	0.013	0.045	-0.080**	0.033
	(0.026)	(0.042)	(0.028)	(0.034)	(0.035)	(0.061)
Age class 45-54	-0.104***	-0.173***	-0.033	0.002	-0.110**	0.086
	(0.031)	(0.047)	(0.036)	(0.043)	(0.047)	(0.064)
Age class 55-64	-0.159***	-0.207***	-0.009	-0.000	-0.176***	-0.046
	(0.049)	(0.074)	(0.055)	(0.063)	(0.065)	(0.073)
Age class 65+	0.008	-0.081	-0.035	-0.049	†	-0.094
	(0.059)	(0.101)	(0.087)	(0.088)		(0.115)
Country of birth: PT	-0.001	-0.036	-0.036	-0.067	0.075*	-0.075
	(0.032)	(0.052)	(0.035)	(0.050)	(0.040)	(0.066)
Country of birth: FR	-0.029	-0.067	-0.116**	-0.103	0.054	0.026
	(0.034)	(0.054)	(0.045)	(0.064)	(0.051)	(0.073)
Country of birth: BE	0.001	-0.120	-0.201***	-0.146***	0.064	-0.168*
	(0.037)	(0.075)	(0.055)	(0.054)	(0.062)	(0.099)
Country of birth: IT	0.055	-0.020	-0.101**	-0.082*	0.064	-0.043
	(0.044)	(0.084)	(0.048)	(0.049)	(0.068)	(0.093)
Country of birth: DE	-0.108**	0.064	0.079	0.065	-0.275***	-0.045
	(0.045)	(0.101)	(0.060)	(0.051)	(0.090)	(0.114)
Country of birth: Other	-0.074**	-0.177***	-0.099***	-0.076*	-0.096*	-0.012
	(0.034)	(0.049)	(0.037)	(0.040)	(0.058)	(0.057)
Household size: 2	0.025	-0.022	0.072**	0.101**	0.091*	0.109
	(0.036)	(0.055)	(0.035)	(0.044)	(0.053)	(0.070)
Household size: 3	-0.012	-0.092	0.042	0.080	0.017	0.228**
	(0.056)	(0.072)	(0.052)	(0.065)	(0.077)	(0.096)
Household size: 4	0.040	-0.012	0.068	0.115*	0.020	0.181*
	(0.054)	(0.079)	(0.061)	(0.067)	(0.068)	(0.102)
Household size: 5	-0.116	-0.070	0.155**	0.245***	-0.504	0.203
	(0.226)	(0.105)	(0.069)	(0.072)	(0.312)	(0.164)
1 child	0.004	0.117**	-0.003	-0.027	-0.037	-0.009
	(0.048)	(0.054)	(0.041)	(0.047)	(0.055)	(0.077)
2 children	-0.011	0.025	-0.019	-0.052	-0.001	-0.028
	(0.050)	(0.062)	(0.052)	(0.060)	(0.064)	(0.079)
3+ children	0.191	0.100	-0.041	-0.078	0.631**	0.044
	(0.217)	(0.098)	(0.061)	(0.067)	(0.305)	(0.154)
Single	-0.066**	-0.013	-0.007	-0.000	-0.014	0.078
	(0.030)	(0.042)	(0.032)	(0.038)	(0.035)	(0.051)
Divorced	0.018	0.059	0.022	0.023	0.017	0.034
	(0.035)	(0.048)	(0.032)	(0.038)	(0.049)	(0.067)
Widowed	0.077	-0.127	-0.011	†	†	-0.046
	(0.048)	(0.140)	(0.073)			(0.106)
Education: ISCED=3,4	-0.000	0.024	0.008	0.051	0.056	-0.146***
	(0.027)	(0.046)	(0.026)	(0.031)	(0.040)	(0.056)
Education: ISCED=5,6	0.005	0.088*	0.029	0.063*	0.028	-0.221***
	(0.033)	(0.054)	(0.031)	(0.035)	(0.057)	(0.062)
Self-employed	-0.055	0.105**	0.081**	0.102***	-0.023	0.083
	(0.038)	(0.050)	(0.033)	(0.035)	(0.058)	(0.075)
Unemployed	-0.133**	-0.219	†	†	†	-0.002
	(0.066)	(0.133)				(0.118)
Retired	-0.148***	0.015	0.001	0.028	†	0.043
	(0.049)	(0.101)	(0.074)	(0.070)		(0.083)
Other employment status	0.012	0.004	0.018	0.060	0.018	0.036
	(0.037)	(0.068)	(0.043)	(0.046)	(0.050)	(0.087)
Owner-outright	-0.089	0.160**	0.086*			0.162**
	(0.062)	(0.070)	(0.052)			(0.079)
Owner with mortgage	0.071**	0.358***	0.146***			0.076
	(0.036)	(0.053)	(0.045)			(0.067)
Gross income quintile 1	0.080*	0.209***	0.278***	0.347***	0.003	-0.007
	(0.045)	(0.079)	(0.051)	(0.059)	(0.072)	(0.096)
Gross income quintile 2	0.060	0.259***	0.170***	0.235***	0.007	0.006
	(0.040)	(0.059)	(0.041)	(0.048)	(0.075)	(0.071)
Gross income quintile 3	0.092***	0.167***	0.086**	0.111**	-0.019	0.023
	(0.031)	(0.050)	(0.043)	(0.047)	(0.046)	(0.059)
Gross income quintile 4	0.029	0.132***	0.066*	0.081**	-0.034	0.012
	(0.030)	(0.045)	(0.037)	(0.041)	(0.043)	(0.049)
Net wealth quintile 1	0.257***	0.089	0.045	0.156***	0.543***	0.726***
	(0.030)	(0.079)	(0.054)	(0.053)	(0.078)	(0.094)
Net wealth quintile 2	†	0.138***	-0.040	-0.076*	0.160***	0.384***
		(0.052)	(0.038)	(0.043)	(0.049)	(0.074)
Net wealth quintile 3	†	-0.005	-0.084**	-0.156***	0.038	0.248***
		(0.051)	(0.037)	(0.042)	(0.050)	(0.059)
Net wealth quintile 4	†	0.001	-0.054	-0.041	0.073	0.171***
		(0.051)	(0.035)	(0.039)	(0.061)	(0.063)
Observations	952	952	952	664	547	952

Standard errors in parentheses; *** p<0.01, ** p<0.05, * p<0.1; † variable omitted to avoid perfect collinearity.

Source: Own calculations based on the 2ⁿᵈ wave of the LU-HFCS; data are multiply imputed and weighted; variance estimation based on final weights. The reference group is defined for each explanatory variable separately: it is a household with a male FKP, between 16 and 34 years old, born in Luxembourg, low educated, married, and employed. Referring to the household characteristics the reference group is also defined for each explanatory variable separately: single person household, no dependent children, renting the HMR, belonging to the highest quintiles of gross income and net wealth. Marginal effects are calculated at the observation level and then averaged. Dummies related to the marital status are not shown as they are not statistically significant. Significant results are highlighted in grey.

We conclude that highly leveraged households (columns 1, 2 and 5) and household with a high debt servicing burden (columns 3 and 4) tend, on the one hand, to be part of the less vulnerable socio-economic groups of the population (in terms of education, employment and HMR ownership status) but, on the other hand, also to be part of more vulnerable groups (low income and wealth), which is at least partly opposite to the findings for the median regression reported in Table 3.

4   Conclusion

This paper investigates household financial vulnerability in Luxembourg using balance sheet information from the 1st (2010) and 2nd (2014) wave of the Luxembourg Household Finance and Consumption Survey. To account for different dimensions of household vulnerability, we calculate several indicators for each household in a representative sample.

The evidence we provide does not lead to one overarching key message but draws a mixed picture on the changes of household indebtedness and financial vulnerability in Luxembourg across the two currently available waves (the third wave is planned to be conducted at the end of 2017/ beginning of 2018). Indebted households in 2014 carried a heavier burden than indebted households in 2010, mainly because of mortgage loans on the main residence. However, increases in the median ratios between 2010 and 2014 are only statistically significant for the debt-to-income ratio and the outstanding loan-to-value ratio (stock). The median debt service-to-income ratio declined, although mostly due to lower costs of non-mortgage debt.

First we analyse the distribution of median debt burden indicators across household characteristics. The median regression estimates indicate that low income households are also those with the lowest median leverage. Thus, debt appears to be concentrated on the less vulnerable households.

Then we identify financially vulnerable households as those where debt burden indicators exceed conventional thresholds. On several measures, financial vulnerability of indebted households appears to have increased between 2010 and 2014. However, only the debt-to-income ratio suggests a statistically significant increase in the share of vulnerable households. On the one hand, disadvantaged socio-economic groups (in terms of education, employment status and HMR ownership status) are less often financially vulnerable. On the other hand, low income and wealth increases the likelihood of households' vulnerability.

In addition to the standard single indicator approach, we also combine the information derived from several indicators. The multiple indicator approach shows a larger increase (in relative terms) than the single indicator approach but the increase is still not statistically significant. The share of financially vulnerable households is 2.2% of the indebted population and 2.6% of the population with mortgages on their main residence in 2014.

Finally, we conclude with some suggestions for further research. First, our assessment of household financial vulnerability depends on the thresholds chosen for the different indicators. These are set at conventional levels that remain somewhat arbitrary. In future research one could develop a data driven selection of these thresholds when measuring household financial vulnerability. Second, the impact of a rise in household financial vulnerability on bank balance sheets also depends on other negative shocks facing the sector. Therefore, we plan to implement alternative severe but plausible macroeconomic scenarios in a stress test of individual Luxembourg households.

5 References

Albacete, N., and P. Lindner (2013): Household Vulnerability in Austria – A Microeconomic Analysis Based on the Household Finance and Consumption Survey. Financial Stability Report 25, Österreichische Nationalbank, June.

Bauer, T. K., D.A. Cobb-Clark, V.A. Hildebrand, and M. Sinning (2011): A comparative analysis of the nativity wealth gap. Economic Inquiry, 49(4), 989-1007.

BCL (2013): L'endettement des ménages au Luxembourg. Bulletin 2013-2, Encadré 3, 38-44.

BCL (2015): Revue de Stabilité Financière de la Banque centrale du Luxembourg, June.

BCL (2016): Mesure de l'endettement des ménages et évaluation de leur vulnérabilité. Revue de Stabilité Financière, Encadré 1.1, 21-23.

BCL (2017): Revue de Stabilité Financière de la Banque centrale du Luxembourg, May.

Bricker, J., Bucks, B., Kennickell, A., Mach, T., and Moore, K. (2011): Surveying the Aftermath of the Storm: Changes in Family Finances from 2007 to 2009. Finance and Economics Discussion Series, Federal Reserve Board, 2011-17.

Christelis, D., D. Georgarakos, and M. Haliassos (2013): Differences in portfolios across countries: Economic environment versus household characteristics. Review of Economics and Statistics, 95(1), 220–236.

Djoudad, R. (2012): A Framework to Assess Vulnerabilities Arising from Household Indebtedness Using Microdata. Discussion Paper Number 2012-3. Bank of Canada.

European Systemic Risk Board (2016): Vulnerabilities in the EU residential real estate sector. November 2016, ISBN 978-92-95081-86-4 (online).

ECB (2013): Financial Stability Review. November 2013, ISSN 1830-2025 (online).

Friedman, M. (1957): A Theory of the Consumption Function. Princeton: Princeton University Press.

Girshina, A., Mathä, T., and M. Ziegelmeyer (2017): The Luxembourg Household Finance and Consumption Survey: results from the 2nd wave. Banque centrale du Luxembourg Working Paper 106.

Household Finance and Consumption Network (2013): The Eurosystem Household Finance and Consumption Survey – Results from the First Wave. ECB Statistics Paper No. 2.

Household Finance and Consumption Network (2016): The Household Finance and Consumption Survey – results from the second wave. ECB Statistics Paper No. 18.

IMF (2011): United Kingdom: Vulnerabilities of Household and Corporate Balance Sheets and Risks for the Financial Sector Technical Note. IMF Country Report No. 11/229. July.

IMF (2012): Spain: Vulnerabilities of Private Sector Balance Sheets and Risks to the Financial Sector. Technical Notes. IMF Country Report No. 12/140. June.

Karasulu, M. (2008): Stress Testing Household Debt in Korea. IMF Working Paper WP/08/255.

Modigliani, F., and R. Brumberg (1954): Utility analysis and the consumption function: An interpretation of cross-section data. in: Flavell, J. H., and L. Ross (eds): Social Cognitive Development Frontiers and Possible Futures. Cambridge, NY: University Press.

6 Appendix

Appendix A: Tables and Figures for debt burden indicators

Table 8: Median debt burden indicators by household characteristics

		Year	As share of total population	As share of indebted households	Debt-to-asset ratio Quantity	Std. err.	Debt-to-income ratio Quantity	Std. err.	Debt service-to-income ratio Quantity	Std. err.	Mortgage debt service-to-income ratio Quantity	Std. err.	Outstanding loan-to-value ratio of HMR (stock) Quantity	Std. err.	Net liquid assets to income Quantity	Std. err.
Percentile	P10	2010			1.6%	0.3%	7.8%	1.7%	3.2%	0.9%	6.2%	0.5%	4.1%	0.7%	-28.8%	4.7%
		2014			1.1%	0.2%	6.0%	1.1%	1.9%	0.9%	5.9%	0.4%	4.3%	0.7%	-32.2%	4.0%
	P25	2010			5.0%	0.5%	23.0%	2.6%	7.8%	0.6%	10.0%	0.6%	10.9%	1.2%	-5.1%	2.6%
		2014			5.0%	0.7%	23.6%	2.7%	7.1%	0.5%	10.2%	0.5%	13.2%	1.4%	-4.0%	1.5%
	P50	2010			18.2%	2.1%	86.9%	11.2%	15.7%	0.9%	16.3%	0.7%	27.5%	2.6%	12.2%	2.2%
		2014			22.2%	2.1%	114.1%	10.6%	14.8%	0.6%	17.6%	0.7%	34.6%	2.8%	11.5%	1.7%
	P75	2010			51.4%	3.2%	250.8%	26.1%	24.6%	0.9%	24.4%	0.9%	59.0%	4.6%	45.9%	6.3%
		2014			51.2%	2.7%	308.2%	20.4%	24.5%	0.8%	25.6%	1.0%	60.4%	3.3%	59.2%	6.1%
	P90	2010			84.2%	4.6%	438.0%	30.8%	34.6%	2.1%	34.3%	2.6%	87.5%	3.1%	118.4%	15.2%
		2014			82.1%	6.1%	521.0%	39.0%	36.5%	2.9%	40.5%	4.4%	80.1%	3.0%	174.7%	19.3%
					Median	Std. err.	Median	Std. err.	Median	Std. err.	Median	Std. err.	Median	Std. err.	Median	Std. err.
Gender	Male	2010	59.5%	60.8%	16.4%	2.1%	73.5%	12.0%	14.3%	1.0%	14.9%	1.2%	24.5%	3.4%	14.9%	2.9%
		2014	56.5%	57.7%	21.3%	2.5%	99.9%	14.5%	14.2%	0.7%	16.0%	1.2%	32.3%	3.5%	10.9%	1.8%
	Female	2010	40.5%	39.2%	22.6%	3.8%	117.0%	22.4%	17.2%	0.9%	17.0%	1.2%	32.2%	4.5%	7.1%	3.2%
		2014	43.5%	42.4%	23.3%	3.2%	128.6%	16.5%	16.5%	1.1%	18.3%	0.9%	38.4%	4.1%	12.8%	3.2%
Age classes*	16-34	2010	18.6%	22.4%	54.9%	5.2%	190.6%	56.2%	16.9%	2.0%	20.9%	1.7%	69.1%	7.6%	10.5%	4.8%
		2014	19.2%	23.1%	50.3%	4.6%	195.6%	49.0%	17.0%	2.1%	21.3%	1.9%	59.1%	4.2%	5.5%	3.1%
	35-44	2010	22.7%	30.3%	25.2%	4.4%	149.1%	15.6%	18.4%	1.2%	16.7%	1.0%	30.7%	5.5%	12.3%	3.4%
		2014	21.2%	26.1%	32.7%	3.7%	198.6%	25.7%	19.2%	1.4%	19.0%	1.3%	43.5%	3.5%	11.4%	2.6%
	45-54	2010	22.3%	26.8%	13.1%	2.5%	58.7%	9.6%	13.3%	1.6%	13.3%	1.7%	15.0%	2.3%	10.9%	6.2%
		2014	21.1%	26.5%	15.9%	2.3%	83.4%	14.9%	14.6%	0.8%	14.8%	1.1%	19.9%	3.0%	9.7%	2.8%
	55-64	2010	15.6%	14.7%	5.7%	1.2%	27.0%	8.1%	11.0%	1.4%	13.3%	1.3%	9.6%	2.9%	9.5%	6.5%
		2014	17.4%	17.7%	6.5%	1.5%	36.2%	6.4%	9.2%	1.2%	14.0%	1.4%	8.0%	2.2%	25.0%	7.6%
	65+	2010	20.7%	5.7%	4.3%	1.9%	38.3%	17.6%	11.0%	4.8%	22.0%	4.9%	9.2%	10.6%	28.2%	18.7%
		2014	21.2%	6.6%	4.0%	1.8%	34.9%	16.8%	9.9%	2.2%	20.2%	4.8%	17.4%	12.8%	23.9%	17.9%
Country of birth*	Luxembourg	2010	57.1%	55.0%	14.4%	2.0%	98.0%	15.9%	16.6%	0.9%	16.6%	0.9%	26.4%	3.3%	20.6%	5.2%
		2014	57.1%	55.8%	16.3%	2.8%	111.6%	16.4%	15.4%	1.0%	18.3%	0.8%	32.2%	3.9%	12.6%	3.1%
	Portugal	2010	13.7%	15.2%	39.6%	6.6%	48.2%	42.3%	14.7%	2.0%	14.7%	1.7%	41.7%	7.7%	0.0%	2.4%
		2014	11.9%	11.9%	44.2%	4.9%	183.1%	45.8%	19.6%	1.4%	19.8%	1.6%	51.0%	7.5%	3.0%	2.7%
	France	2010	7.0%	6.4%	22.9%	8.1%	33.5%	28.1%	14.6%	3.2%	20.6%	2.8%	22.2%	7.7%	18.0%	11.2%
		2014	7.9%	9.2%	29.1%	6.9%	101.1%	27.5%	14.5%	2.0%	19.0%	2.9%	39.0%	9.1%	12.9%	4.5%
	Belgium	2010	3.4%	3.9%	12.1%	7.2%	85.5%	39.3%	12.6%	4.9%	13.8%	5.0%	37.3%	14.0%	19.2%	28.7%
		2014	3.6%	3.7%	17.4%	6.2%	68.5%	39.6%	11.3%	2.3%	11.7%	2.0%	51.0%	12.8%	24.5%	20.0%
	Italy	2010	3.1%	3.2%	27.7%	24.8%	47.7%	65.6%	13.0%	5.4%	15.4%	3.8%	24.9%	11.5%	0.7%	5.8%
		2014	3.2%	3.2%	19.2%	33.7%	73.6%	37.4%	10.3%	2.1%	14.7%	5.1%	24.9%	15.9%	10.1%	14.5%
	Germany	2010	2.7%	2.4%	27.5%	25.5%	114.3%	67.7%	19.0%	8.8%	16.8%	15.0%	27.4%	9.8%	12.7%	19.9%
		2014	3.2%	3.1%	27.3%	6.3%	172.7%	50.1%	18.0%	2.9%	17.1%	3.3%	25.0%	7.7%	35.9%	38.0%
	Other countries	2010	12.9%	14.0%	18.1%	8.1%	79.5%	33.9%	14.1%	2.0%	14.0%	2.3%	22.6%	9.8%	12.4%	6.9%
		2014	13.2%	13.0%	22.2%	3.9%	54.5%	25.7%	11.5%	1.4%	14.3%	1.3%	22.6%	4.3%	6.3%	5.0%
Household size	1 member	2010	30.0%	23.9%	28.5%	5.5%	96.5%	34.2%	18.5%	2.3%	20.7%	2.1%	40.5%	9.2%	14.8%	5.1%
		2014	33.3%	24.2%	26.8%	5.3%	123.5%	33.0%	16.8%	2.0%	21.1%	1.3%	38.0%	6.5%	15.2%	6.6%
	2 members	2010	28.0%	24.0%	10.5%	2.9%	48.6%	11.4%	14.1%	1.1%	16.6%	1.3%	25.2%	8.8%	19.9%	8.1%
		2014	27.4%	24.0%	13.4%	3.1%	72.6%	18.8%	14.2%	1.1%	17.9%	1.7%	33.4%	7.2%	16.3%	4.1%
	3 members	2010	17.0%	18.2%	17.7%	3.4%	111.9%	30.6%	15.0%	1.8%	15.1%	1.4%	21.8%	5.3%	12.1%	3.5%
		2014	15.9%	19.5%	26.5%	4.5%	126.0%	21.6%	13.7%	1.8%	14.9%	1.2%	40.9%	4.0%	7.3%	2.6%
	4 members	2010	16.0%	21.5%	16.2%	4.5%	112.2%	22.2%	16.9%	1.9%	14.7%	1.6%	28.7%	7.4%	7.2%	3.1%
		2014	15.0%	20.7%	21.4%	2.7%	146.1%	20.3%	16.0%	1.2%	16.0%	1.1%	29.7%	3.9%	10.1%	3.6%
	5+ members	2010	9.0%	12.4%	20.6%	4.7%	122.1%	24.2%	16.3%	2.3%	14.0%	1.6%	21.7%	4.7%	3.9%	7.0%
		2014	8.4%	11.6%	18.9%	4.4%	92.4%	15.5%	15.9%	1.6%	15.9%	1.9%	20.5%	6.7%	8.2%	3.0%
Number of dependent children	no children	2010	63.4%	52.7%	15.3%	2.4%	56.6%	10.7%	14.4%	1.2%	16.8%	1.5%	26.8%	5.2%	15.6%	4.1%
		2014	64.8%	53.2%	16.2%	2.8%	75.1%	17.4%	13.8%	0.9%	18.1%	1.0%	32.6%	3.9%	15.3%	3.4%
	1 child	2010	14.7%	17.3%	22.9%	5.3%	131.2%	27.5%	16.3%	1.4%	16.3%	1.1%	28.0%	5.6%	9.4%	3.3%
		2014	15.2%	19.1%	29.3%	4.1%	162.1%	29.3%	16.6%	1.8%	17.2%	1.6%	41.5%	3.8%	9.8%	2.7%
	2 children	2010	14.8%	20.4%	18.4%	4.5%	122.6%	24.9%	16.7%	2.1%	15.6%	1.5%	26.7%	7.1%	9.1%	3.8%
		2014	13.5%	19.1%	25.2%	2.8%	153.0%	19.6%	16.6%	1.3%	15.9%	1.4%	30.4%	4.1%	9.5%	3.6%
	3+ children	2010	7.1%	9.6%	25.1%	7.0%	147.3%	27.0%	19.6%	2.0%	16.6%	2.3%	28.1%	6.0%	5.0%	10.7%
		2014	6.4%	8.7%	23.2%	6.7%	103.3%	18.9%	16.9%	1.9%	17.2%	2.1%	24.0%	9.8%	7.3%	3.7%
Marital status*	Single	2010	24.7%	25.5%	32.7%	6.7%	88.3%	30.0%	15.5%	2.0%	18.6%	2.6%	38.2%	8.1%	12.7%	6.3%
		2014	27.2%	25.8%	31.4%	4.5%	141.7%	32.0%	17.1%	1.8%	21.6%	1.4%	45.9%	5.9%	8.6%	2.8%
	Couple	2010	52.8%	57.7%	14.7%	1.1%	88.4%	10.3%	15.5%	1.0%	15.2%	0.9%	25.9%	4.3%	13.7%	2.5%
		2014	49.6%	55.7%	18.7%	2.8%	112.5%	12.1%	14.7%	0.8%	15.4%	0.9%	32.0%	3.4%	12.9%	2.0%
	Divorced	2010	13.4%	14.8%	18.6%	4.5%	128.5%	38.8%	16.8%	2.7%	19.9%	2.6%	26.1%	5.4%	5.3%	4.8%
		2014	13.7%	14.9%	20.9%	4.0%	106.1%	25.9%	14.3%	1.9%	17.5%	1.8%	29.9%	4.8%	6.8%	5.0%
	Widowed	2010	9.1%	2.0%	8.3%	47.9%	19.0%	18.0%	6.1%	4.8%	5.7%	6.2%	24.2%	7.0%	12.7%	44.7%
		2014	9.5%	3.6%	4.2%	2.3%	32.6%	20.1%	7.4%	3.8%	11.1%	7.7%	12.2%	3.8%	21.5%	16.0%
Education level*	Low (ISCED=0,1,2)	2010	35.7%	31.8%	26.1%	6.1%	61.7%	19.4%	14.9%	1.4%	15.6%	1.5%	27.1%	4.8%	0.0%	1.4%
		2014	29.8%	22.3%	22.9%	4.7%	94.1%	22.4%	17.8%	1.4%	19.2%	1.5%	32.4%	7.4%	2.1%	2.4%
	Middle (ISCED=3,4)	2010	38.2%	37.2%	14.9%	2.5%	88.7%	16.9%	16.6%	1.8%	18.2%	1.7%	25.7%	5.2%	16.5%	3.5%
		2014	39.2%	41.2%	17.9%	2.9%	69.1%	19.3%	13.8%	1.0%	17.6%	1.3%	26.3%	4.2%	8.0%	2.9%
	High (ISCED=5,6)	2010	26.2%	31.1%	18.8%	3.0%	109.6%	20.1%	15.8%	1.1%	14.8%	1.1%	30.7%	4.7%	29.3%	5.3%
		2014	31.0%	36.5%	25.3%	2.6%	145.7%	12.2%	14.4%	0.9%	15.9%	1.1%	40.0%	3.4%	26.5%	4.2%

Continued Table		year	As share of total population	As share of indebted households	Debt-to-asset ratio		Debt-to-income ratio		Debt service-to-income ratio		Mortgage debt service-to-income ratio		Outstanding loan-to-value ratio of HMR (stock)		Net liquid assets to income	
					Quantity	Std. err.	Quantity	Std. err.	Quantity	Std. err.	Quantity	Std. err.	Quantity	Std. err.	Quantity	Std. err.
Employment status*	Employed	2010	56.1%	70.4%	25.0%	3.3%	125.7%	14.0%	16.5%	0.9%	16.4%	0.7%	33.1%	4.1%	11.4%	3.0%
		2014	56.1%	70.5%	27.9%	2.4%	143.1%	11.4%	16.9%	0.8%	17.9%	0.7%	38.5%	2.8%	12.0%	1.8%
	Self-Employed	2010	5.9%	7.2%	13.7%	3.6%	84.4%	39.5%	14.5%	2.7%	17.1%	3.3%	25.3%	11.0%	19.3%	10.4%
		2014	4.4%	5.2%	20.7%	6.0%	160.7%	45.4%	12.0%	4.5%	16.3%	4.3%	37.4%	5.7%	18.5%	14.8%
	Unemployed	2010	2.5%	2.0%	48.1%	25.7%	55.1%	58.6%	17.5%	7.0%	18.0%	7.4%	39.2%	24.7%	-6.1%	31.6%
		2014	3.3%	3.0%	24.1%	6.9%	27.9%	26.4%	9.6%	4.2%	11.0%	5.8%	25.0%	15.5%	3.9%	20.4%
	Retired	2010	24.3%	10.9%	4.7%	1.3%	33.1%	9.5%	11.4%	2.3%	14.1%	2.6%	7.1%	2.3%	26.2%	14.1%
		2014	26.3%	14.4%	5.3%	1.6%	31.8%	8.8%	8.8%	1.0%	13.9%	2.7%	9.0%	4.1%	16.5%	8.9%
	Other	2010	11.1%	9.6%	7.7%	4.7%	53.9%	17.4%	13.1%	3.1%	15.5%	3.8%	24.2%	5.2%	2.3%	5.2%
		2014	9.8%	7.5%	18.0%	8.3%	44.7%	20.7%	9.3%	3.0%	20.3%	5.1%	35.3%	17.2%	2.3%	7.4%
Housing status	Owner-outright	2010	34.3%	17.4%	2.9%	0.5%	23.8%	4.4%	8.2%	1.2%	9.9%	2.5%			26.1%	10.2%
		2014	38.5%	20.7%	1.8%	0.4%	19.6%	5.3%	6.7%	0.7%	8.6%	2.2%			19.2%	9.3%
	Owner-with mortgage	2010	32.8%	56.2%	22.6%	2.3%	171.1%	16.2%	19.8%	0.9%	16.4%	0.7%			16.5%	2.8%
		2014	29.1%	53.3%	28.2%	1.9%	239.1%	18.4%	21.1%	0.6%	18.3%	0.6%			15.6%	2.1%
	Renter or other	2010	32.9%	26.4%	39.9%	7.5%	24.6%	4.6%	9.8%	1.3%	16.9%	3.3%			-0.6%	2.5%
		2014	32.4%	26.1%	41.5%	6.8%	31.2%	5.0%	9.0%	0.8%	13.2%	3.1%			-2.5%	2.1%
Total gross income	Quintile 1	2010	20.2%	13.7%	26.7%	13.9%	45.2%	29.0%	17.0%	4.1%	36.0%	8.7%	17.7%	10.0%	-0.5%	4.4%
		2014	20.2%	11.4%	28.9%	7.6%	83.7%	44.1%	19.6%	3.3%	29.5%	11.5%	25.3%	12.0%	2.0%	6.1%
	Quintile 2	2010	20.0%	17.6%	37.6%	10.6%	92.1%	48.9%	19.6%	2.4%	22.6%	2.3%	44.8%	12.1%	8.1%	6.8%
		2014	19.9%	17.1%	34.6%	6.2%	139.6%	64.3%	19.6%	3.3%	25.6%	2.7%	48.5%	7.7%	5.6%	2.8%
	Quintile 3	2010	19.9%	20.5%	21.8%	7.1%	115.3%	32.4%	18.4%	2.5%	19.4%	1.8%	31.0%	6.6%	6.2%	4.0%
		2014	19.9%	23.6%	26.1%	5.0%	138.3%	25.7%	17.5%	1.9%	20.8%	1.5%	32.5%	5.4%	7.8%	3.2%
	Quintile 4	2010	20.0%	23.4%	15.7%	2.4%	103.4%	20.9%	16.6%	1.8%	14.6%	1.1%	25.5%	6.0%	20.5%	6.9%
		2014	20.0%	23.0%	15.2%	4.5%	106.2%	23.6%	14.5%	1.0%	15.3%	1.6%	34.4%	6.8%	14.1%	4.6%
	Quintile 5	2010	20.0%	24.8%	13.8%	2.1%	71.4%	15.6%	10.9%	1.3%	10.9%	1.1%	24.3%	4.4%	28.6%	7.3%
		2014	19.9%	24.9%	14.6%	1.6%	100.4%	13.4%	11.4%	0.9%	11.7%	0.8%	31.0%	4.1%	30.3%	5.5%
Total net wealth	Quintile 1	2010	20.1%	16.3%	84.0%	15.5%	30.6%	8.6%	11.1%	2.1%	28.2%	7.5%	92.6%	34.2%	-8.0%	4.6%
		2014	20.1%	15.5%	91.1%	12.6%	32.4%	6.1%	9.7%	1.5%	41.0%	11.4%	129.3%	21.4%	-14.1%	3.4%
	Quintile 2	2010	20.0%	23.5%	52.3%	5.8%	262.8%	42.0%	20.6%	1.9%	20.6%	1.9%	68.0%	4.8%	10.1%	4.1%
		2014	20.0%	24.7%	47.4%	3.8%	280.3%	30.3%	21.4%	1.3%	21.7%	1.3%	64.3%	4.2%	7.5%	2.2%
	Quintile 3	2010	20.0%	24.1%	17.7%	3.1%	121.1%	23.3%	17.1%	1.2%	15.5%	1.1%	24.3%	4.1%	10.6%	3.1%
		2014	20.0%	21.0%	18.2%	3.5%	143.6%	25.5%	17.5%	1.2%	17.4%	1.0%	33.4%	5.2%	13.9%	3.1%
	Quintile 4	2010	20.0%	18.1%	8.9%	2.1%	72.9%	19.5%	12.5%	1.6%	13.5%	1.3%	14.7%	1.8%	25.7%	6.3%
		2014	20.0%	20.3%	9.7%	2.2%	79.5%	20.1%	13.5%	1.3%	14.2%	1.1%	18.5%	3.0%	20.8%	6.7%
	Quintile 5	2010	19.9%	17.9%	4.3%	0.8%	61.7%	11.4%	12.2%	1.9%	12.7%	1.6%	12.1%	3.3%	69.6%	14.3%
		2014	20.0%	18.6%	5.6%	1.3%	73.3%	13.6%	10.5%	1.0%	11.3%	1.1%	12.9%	1.8%	75.8%	13.8%

Source: Own calculations based on the 1ˢᵗ and 2ⁿᵈ wave of the LU-HFCS; data are multiply imputed and weighted; variance estimation based on 1000 replicate weights. Note: One outlier excluded in the calculation of the debt-to-assets ratio for the unemployed in 2010 (debt=11,000; assets=1).

Figure 5: Median Debt-to-Assets ratio by household characteristics
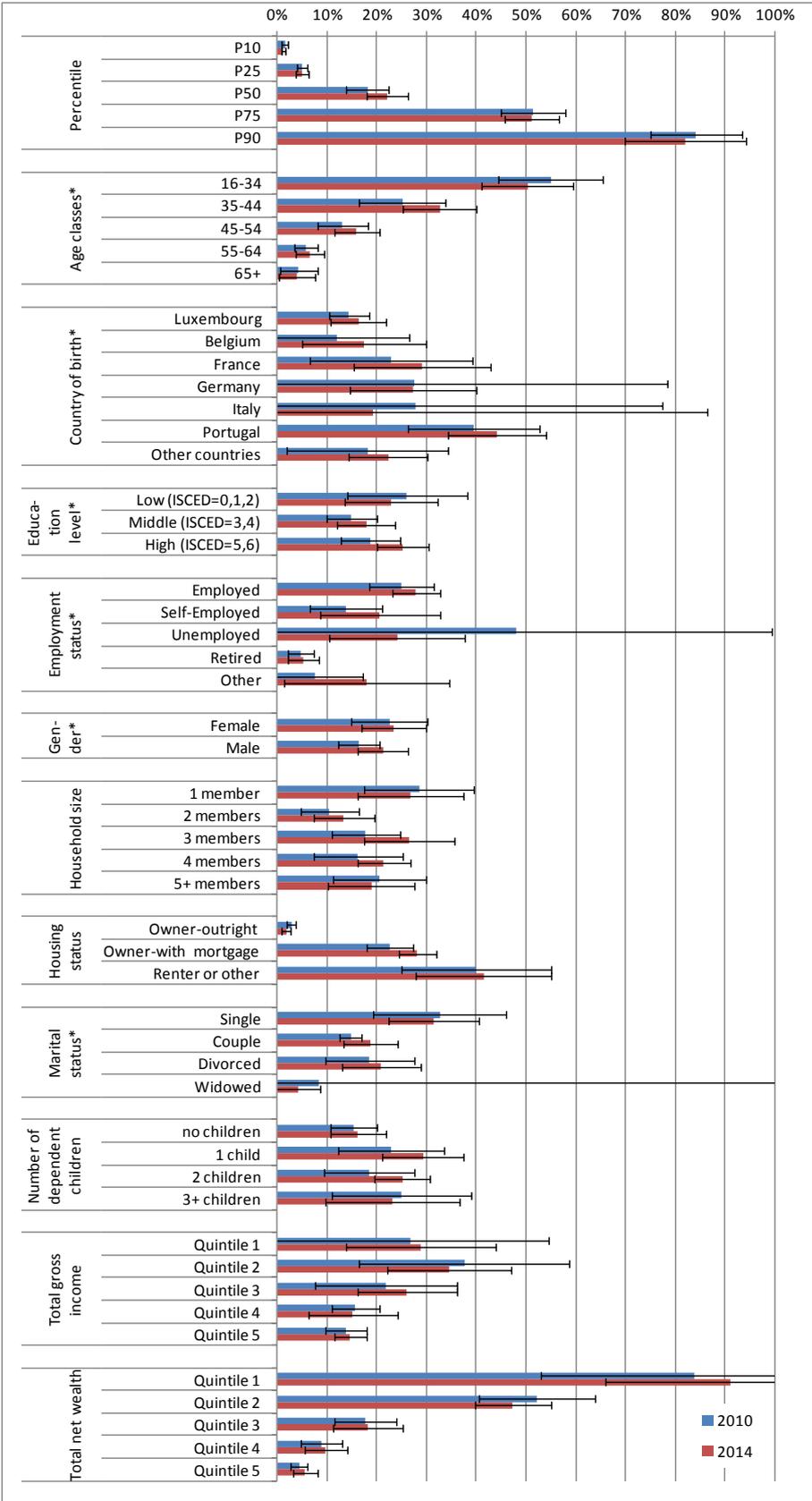
Source: Own calculations based on the 1ˢᵗ and 2ⁿᵈ wave of the LU-HFCS; data are multiply imputed and weighted; variance estimation based on 1000 replicate weights. Note: One outlier excluded in the calculation of the debt-to-assets ratio for the unemployed in 2010 (debt=11,000; assets=1). Brackets indicate the 90% confidence interval.

Figure 6: Median Debt-to-Income ratio by household characteristics
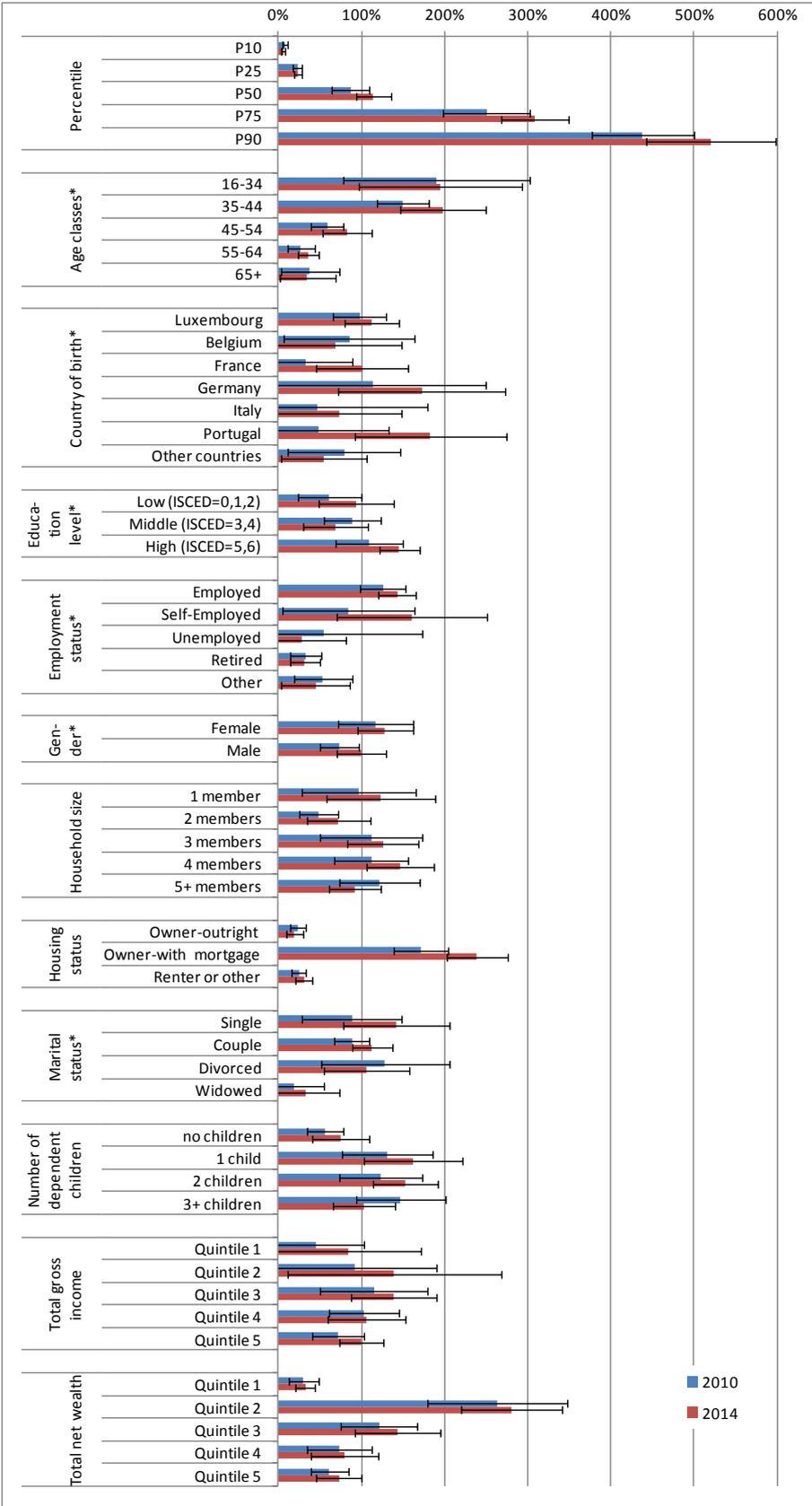
Source: Own calculations based on the 1st and 2nd wave of the LU-HFCS; data are multiply imputed and weighted; variance estimation based on 1000 replicate weights. Brackets indicate the 90% confidence interval.

Figure 7: Median Debt Service-to-Income ratio by household characteristics
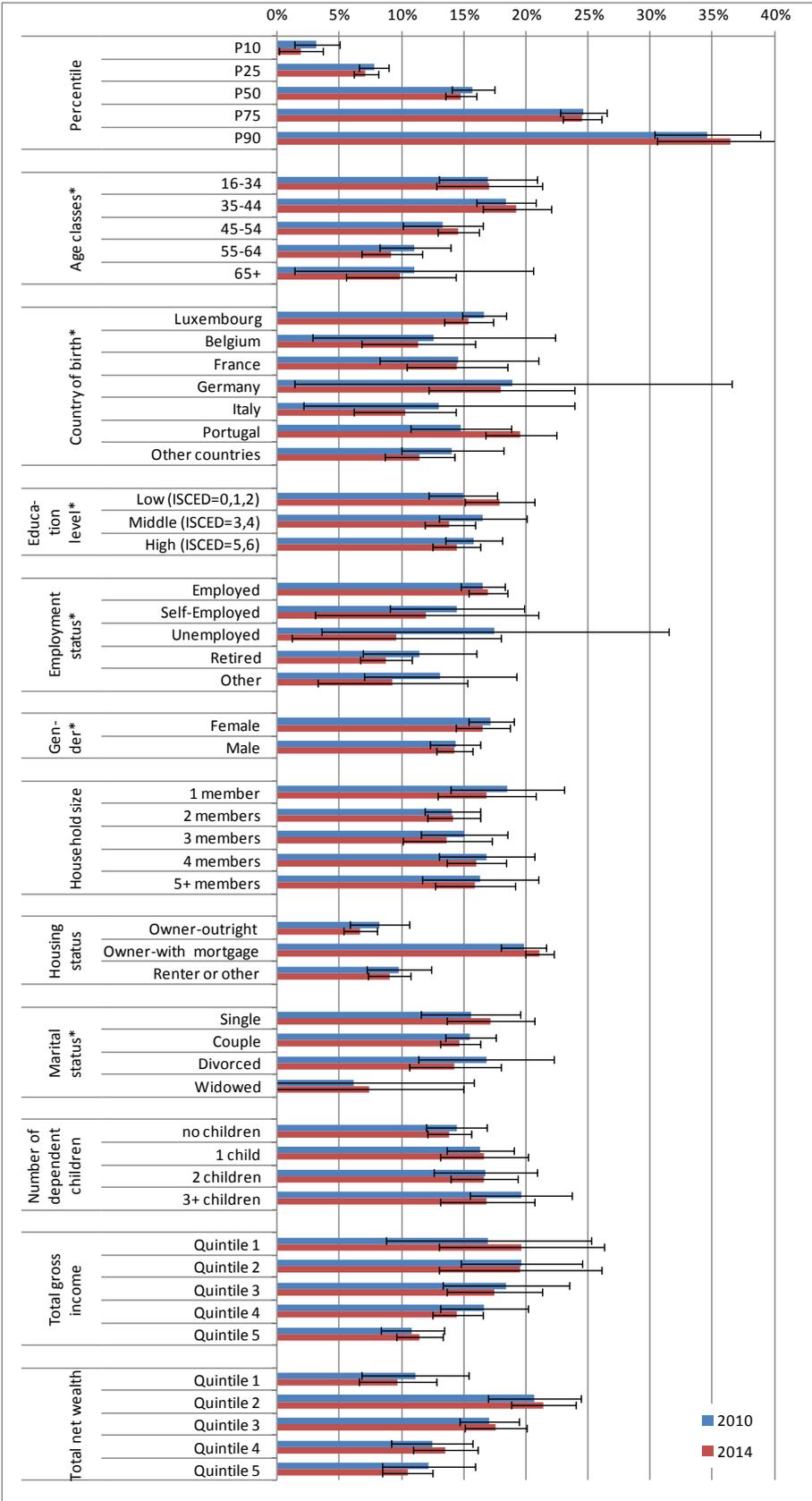
Source: Own calculations based on the 1st and 2nd wave of the LU-HFCS; data are multiply imputed and weighted; variance estimation based on 1000 replicate weights. Brackets indicate the 90% confidence interval.

Figure 8: Median Mortgage Debt Service-to-Income ratio across household characteristics
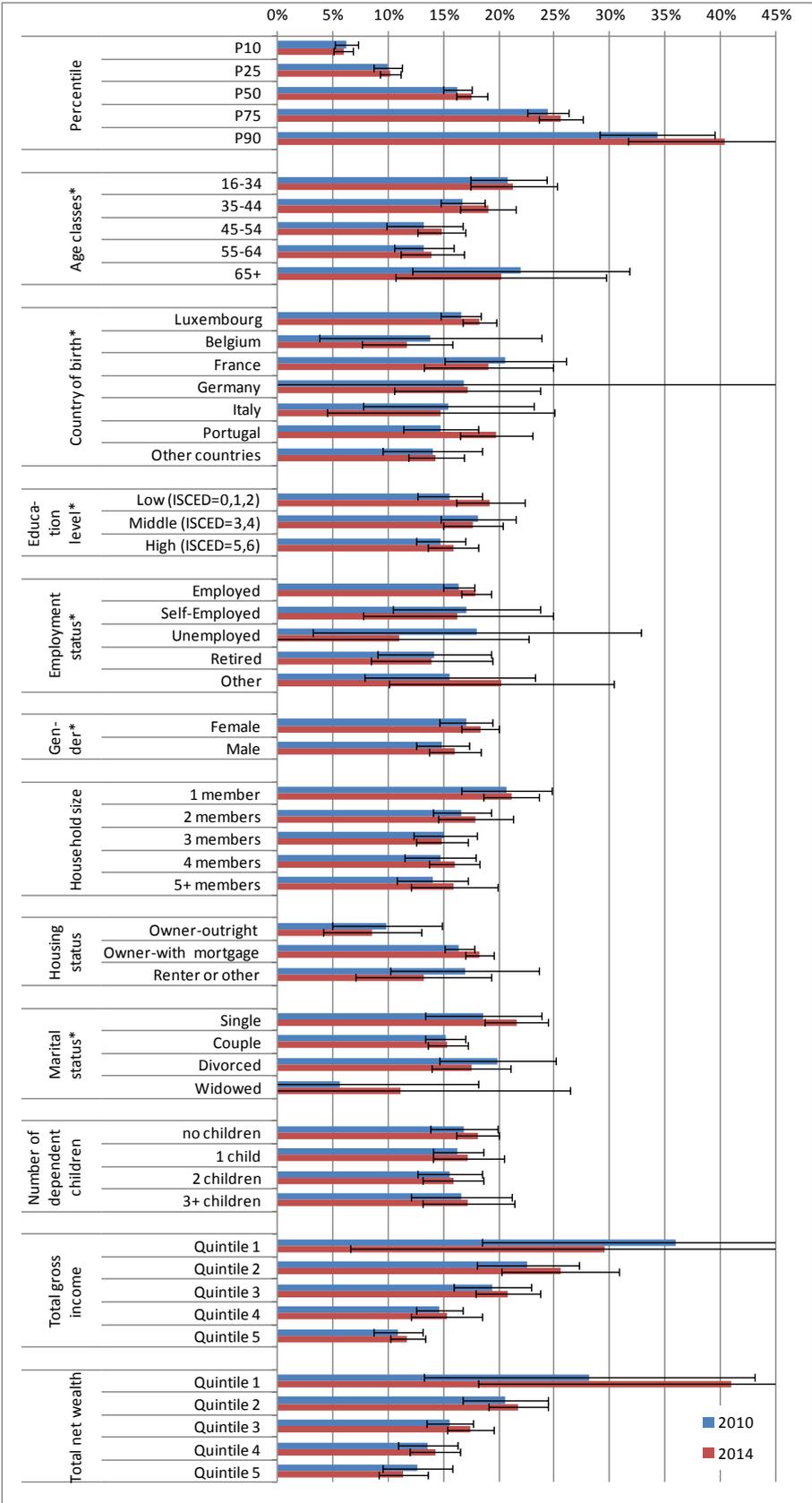
Source: Own calculations based on the 1st and 2nd wave of the LU-HFCS; data are multiply imputed and weighted; variance estimation based on 1000 replicate weights. Brackets indicate the 90% confidence interval.

Figure 9: Median outstanding Loan-to-Value ratio (stock) by household characteristics
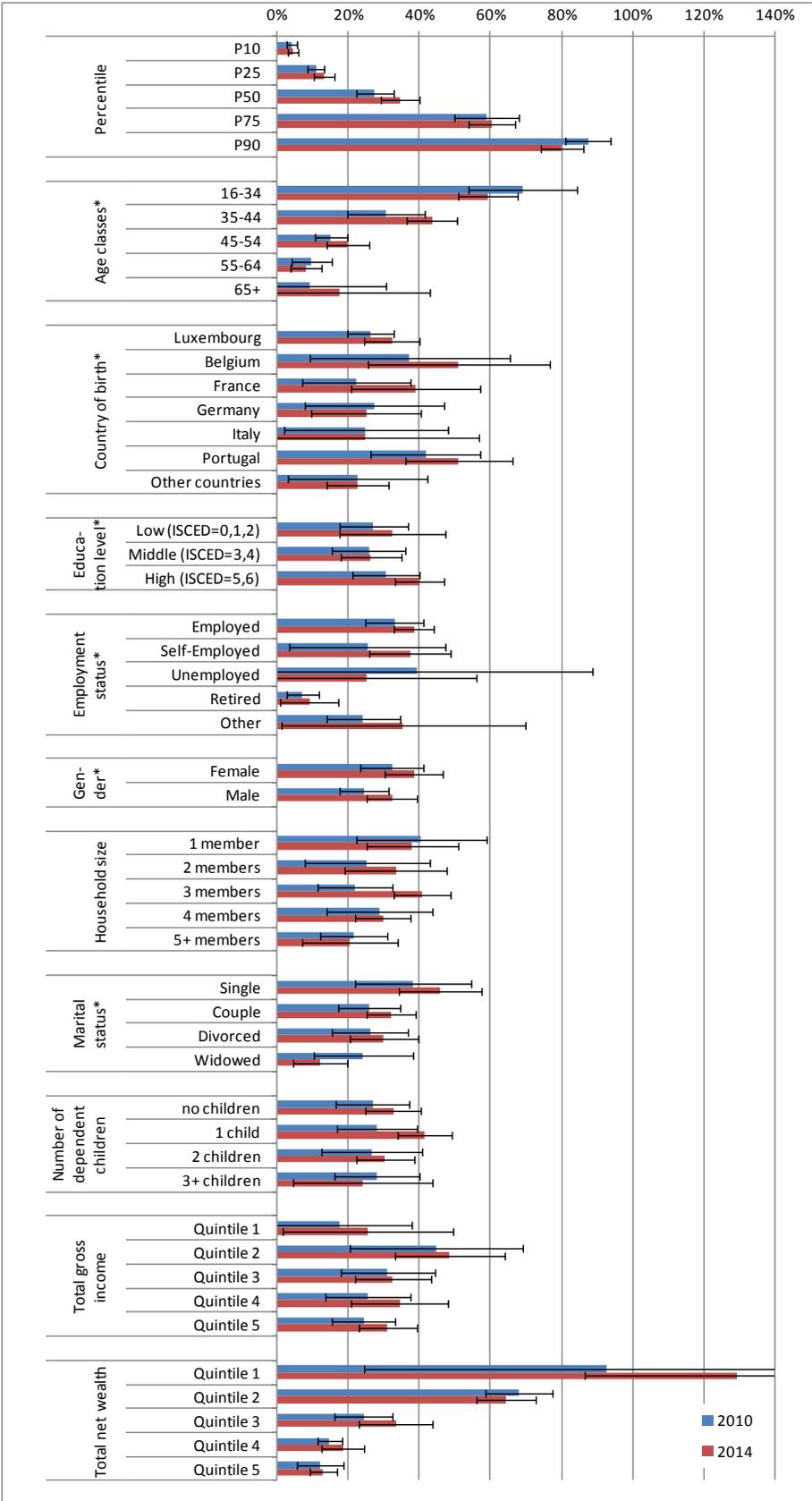
Source: Own calculations based on the 1st and 2nd wave of the LU-HFCS; data are multiply imputed and weighted; variance estimation based on 1000 replicate weights. Brackets indicate the 90% confidence interval.

Figure 10: Median Net Liquid Assets to Income ratio by household characteristics
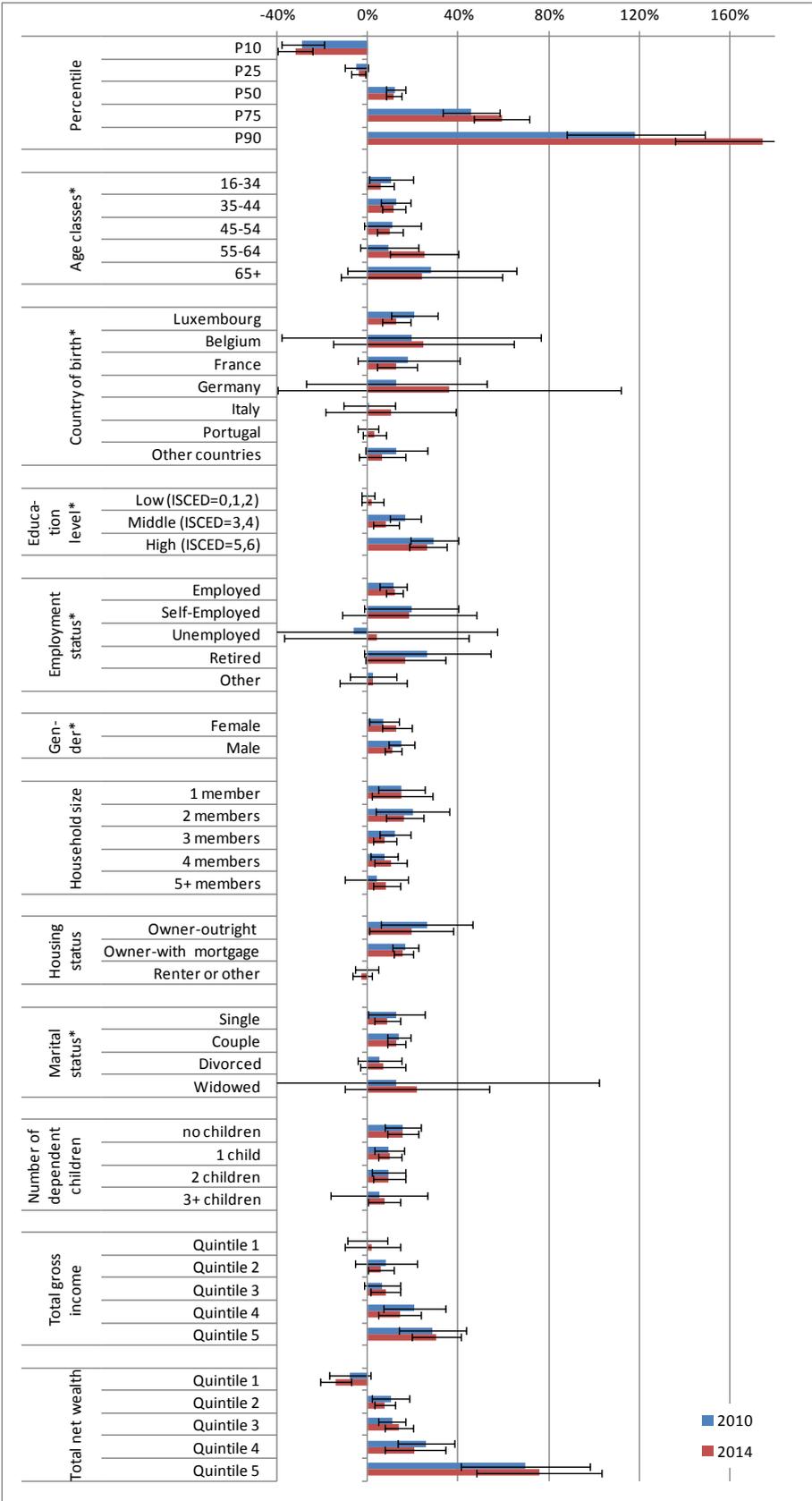
Source: Own calculations based on the 1st and 2nd wave of the LU-HFCS; data are multiply imputed and weighted; variance estimation based on 1000 replicate weights. Brackets indicate the 90% confidence interval.

Appendix B: Tables and Figures for the share of financially vulnerable households

Table 9: Share of financially vulnerable households by household characteristics

		Year	Debt-to-asset ratio ≥ 75%		Debt-to-income ratio ≥ 3		Debt service-to-income ratio ≥ 40%		Mortgage debt service-to-income ratio ≥ 40%		Outstanding loan-to-value ratio of HMR (stock) ≥ 75%		Net liquid assets < 2 months income	
			Mean	Std. err.	Mean	Std. err.	Mean	Std. err.	Mean	Std. err.	Mean	Std. err.	Mean	Std. err.
Total		2010	12.8%	1.6%	20.6%	1.9%	7.0%	1.3%	6.8%	1.6%	15.9%	2.3%	55.5%	2.5%
		2014	12.0%	1.4%	25.8%	1.8%	8.9%	1.3%	10.3%	1.7%	13.4%	1.9%	55.7%	1.9%
Gender	Male	2010	9.7%	1.9%	18.5%	2.5%	5.5%	1.5%	6.5%	2.0%	15.0%	3.2%	52.9%	3.2%
		2014	10.4%	1.7%	23.5%	2.4%	7.5%	1.4%	9.6%	1.9%	10.5%	2.1%	56.9%	2.6%
	Female	2010	17.6%	3.0%	23.9%	3.3%	9.5%	2.5%	7.1%	2.9%	17.2%	3.8%	59.6%	4.0%
		2014	14.3%	2.3%	28.9%	2.9%	10.8%	2.3%	11.2%	3.0%	17.3%	3.3%	54.2%	3.0%
Age classes*	16-34	2010	26.8%	4.8%	42.5%	5.5%	8.4%	2.9%	6.5%	3.3%	46.3%	7.2%	56.5%	5.5%
		2014	26.7%	4.3%	40.7%	4.6%	10.4%	3.0%	12.5%	4.1%	32.2%	6.3%	62.1%	4.6%
	35-44	2010	12.5%	3.0%	23.2%	3.7%	9.2%	3.0%	9.9%	3.6%	13.3%	3.5%	58.9%	4.4%
		2014	11.6%	2.4%	36.8%	3.9%	10.5%	2.7%	10.5%	3.1%	13.5%	2.8%	57.2%	4.0%
	45-54	2010	10.1%	2.9%	9.8%	2.7%	6.1%	2.3%	4.9%	2.6%	2.1%	1.4%	53.6%	4.9%
		2014	7.5%	2.1%	15.1%	2.7%	6.2%	1.8%	7.6%	2.4%	5.5%	2.2%	59.0%	3.6%
	55-64	2010	2.3%	1.7%	5.7%	2.5%	3.2%	2.4%	1.6%	1.6%	1.4%	1.3%	58.6%	7.0%
		2014	1.9%	1.3%	9.5%	2.9%	8.4%	2.8%	11.4%	4.3%	1.5%	1.5%	44.9%	4.7%
	65+	2010	0.0%	0.0%	9.8%	6.9%	4.9%	5.0%	10.4%	10.5%	4.4%	†	35.1%	12.1%
		2014	7.4%	4.5%	16.4%	6.6%	9.2%	5.4%	11.4%	8.2%	5.2%	†	43.6%	9.2%
Country of birth*	Luxembourg	2010	10.8%	2.0%	22.1%	2.7%	8.6%	1.9%	8.4%	2.3%	16.0%	3.1%	47.5%	3.4%
		2014	9.8%	1.7%	29.2%	2.5%	10.9%	1.9%	13.2%	2.7%	13.6%	2.6%	53.5%	2.6%
	Portugal	2010	14.6%	4.8%	22.1%	5.6%	5.5%	3.5%	3.5%	4.0%	16.6%	7.1%	84.1%	5.5%
		2014	27.5%	5.1%	35.2%	5.3%	13.0%	4.1%	9.6%	4.4%	26.4%	6.0%	74.5%	4.9%
	France	2010	14.9%	6.2%	12.5%	5.4%	5.0%	3.2%	5.4%	4.1%	9.3%	6.9%	50.7%	10.7%
		2014	10.6%	4.4%	22.6%	6.3%	1.7%	1.3%	2.1%	1.4%	14.5%	6.6%	56.6%	7.4%
	Belgium	2010	8.9%	6.3%	13.2%	7.1%	6.5%	5.9%	3.4%	†	12.5%	12.6%	50.1%	11.1%
		2014	6.8%	5.1%	11.9%	5.5%	0.3%	0.2%	0.4%	0.3%	12.3%	9.0%	34.2%	10.1%
	Italy	2010	21.4%	10.7%	17.6%	9.9%	0.0%	0.0%	0.0%	0.0%	13.6%	11.4%	82.4%	10.1%
		2014	11.8%	8.8%	13.8%	7.4%	2.5%	2.5%	4.6%	4.8%	12.8%	11.8%	56.9%	10.7%
	Germany	2010	13.5%	12.4%	12.1%	13.0%	13.7%	13.5%	20.5%	18.8%	0.5%	0.9%	54.7%	16.9%
		2014	0.4%	0.3%	32.1%	10.6%	19.4%	9.5%	19.9%	9.8%	0.2%	0.2%	37.5%	12.3%
	Other countries	2010	16.9%	5.3%	20.8%	5.6%	4.1%	2.7%	3.3%	2.8%	19.8%	7.0%	53.4%	6.4%
		2014	13.0%	4.1%	10.1%	3.1%	3.0%	2.0%	5.1%	3.3%	1.9%	1.8%	57.8%	5.5%
Household size	1 member	2010	16.9%	4.1%	24.2%	5.1%	9.3%	3.3%	11.2%	4.8%	25.5%	6.9%	54.2%	6.4%
		2014	14.3%	3.6%	30.8%	4.7%	10.2%	2.9%	12.4%	4.2%	10.8%	4.7%	50.8%	5.3%
	2 members	2010	10.3%	3.2%	15.2%	3.7%	6.2%	2.7%	9.0%	4.0%	18.4%	6.0%	47.5%	6.8%
		2014	8.6%	2.5%	21.5%	3.4%	9.4%	2.4%	11.7%	3.5%	24.2%	5.2%	50.2%	4.1%
	3 members	2010	8.3%	3.0%	16.4%	4.2%	4.4%	2.3%	2.8%	2.0%	10.9%	4.6%	56.6%	5.9%
		2014	11.9%	3.1%	24.2%	3.8%	5.9%	2.5%	5.7%	3.1%	9.7%	3.6%	63.3%	4.1%
	4 members	2010	14.2%	3.5%	25.1%	4.1%	6.9%	2.5%	3.1%	2.2%	12.6%	4.1%	62.3%	4.8%
		2014	11.6%	2.6%	27.6%	3.5%	6.9%	1.9%	7.4%	2.4%	9.7%	2.6%	55.9%	3.8%
	5+ members	2010	14.1%	4.8%	22.3%	5.4%	8.5%	4.0%	8.6%	4.9%	11.3%	5.4%	60.0%	6.6%
		2014	15.6%	4.0%	23.4%	4.3%	13.6%	3.7%	16.9%	5.0%	13.0%	4.7%	64.5%	5.7%
Number of dependent children	no children	2010	11.5%	2.3%	17.8%	2.9%	6.8%	1.9%	8.5%	2.7%	19.0%	4.0%	51.7%	4.6%
		2014	10.2%	1.9%	22.9%	2.6%	8.7%	1.7%	11.0%	2.5%	15.8%	3.3%	51.7%	3.0%
	1 child	2010	11.1%	3.5%	20.7%	4.7%	5.9%	3.0%	4.0%	3.3%	13.2%	5.0%	60.4%	6.1%
		2014	14.2%	3.5%	31.9%	4.2%	9.0%	3.0%	9.2%	3.5%	11.4%	3.6%	61.4%	4.1%
	2 children	2010	16.5%	3.9%	24.0%	4.3%	6.3%	2.5%	2.0%	2.1%	14.3%	4.6%	61.4%	5.8%
		2014	10.9%	2.7%	27.6%	3.6%	7.6%	2.2%	7.3%	2.4%	8.7%	2.6%	56.7%	4.1%
	3+ children	2010	15.2%	6.0%	28.4%	6.7%	12.2%	4.7%	13.2%	5.6%	11.4%	6.5%	55.3%	7.3%
		2014	21.1%	5.1%	26.1%	5.2%	12.9%	4.2%	16.0%	5.5%	18.3%	6.0%	65.7%	5.7%
Marital status*	Single	2010	21.0%	4.1%	22.7%	4.3%	11.4%	3.3%	13.4%	4.6%	25.6%	6.2%	54.9%	5.7%
		2014	13.3%	3.3%	32.1%	4.2%	9.7%	3.0%	13.3%	4.2%	16.9%	4.6%	59.2%	4.3%
	Couple	2010	9.5%	1.8%	21.8%	2.5%	5.3%	1.4%	3.9%	1.4%	15.3%	2.9%	53.6%	2.9%
		2014	11.1%	1.8%	24.1%	2.3%	8.1%	1.5%	9.1%	1.9%	13.1%	2.4%	54.1%	2.5%
	Divorced	2010	11.4%	4.7%	14.9%	5.5%	7.2%	3.5%	9.7%	5.3%	4.2%	3.6%	63.9%	7.0%
		2014	14.0%	4.0%	25.5%	4.6%	10.7%	3.3%	11.4%	3.9%	10.0%	4.1%	58.8%	5.4%
	Widowed	2010	15.7%	15.5%	0.0%	0.0%	0.0%	0.0%	0.0%	0.0%	0.0%	0.0%	57.5%	19.4%
		2014	8.5%	5.9%	7.5%	7.2%	7.5%	7.2%	0.0%	0.0%	0.0%	0.0%	43.4%	13.0%
Education level*	Low (ISCED=0,1,2)	2010	17.7%	3.4%	17.1%	3.4%	5.7%	2.1%	4.5%	2.5%	11.9%	4.3%	79.1%	4.0%
		2014	14.7%	3.2%	24.1%	3.9%	11.4%	2.9%	9.7%	3.3%	14.6%	4.1%	74.5%	4.1%
	Middle (ISCED=3,4)	2010	11.1%	2.6%	24.5%	3.4%	9.2%	2.5%	10.0%	3.2%	14.0%	3.8%	50.2%	4.1%
		2014	12.6%	2.3%	24.1%	2.7%	9.3%	1.9%	13.3%	2.8%	14.1%	3.0%	56.9%	3.1%
	High (ISCED=5,6)	2010	9.9%	2.7%	19.3%	3.4%	5.8%	2.0%	5.1%	2.2%	21.2%	4.5%	37.8%	4.5%
		2014	9.8%	2.2%	28.7%	3.1%	6.9%	1.9%	7.9%	2.3%	12.1%	2.9%	42.9%	3.4%

Continued Table		Year	Debt-to-asset ratio ≥ 75%		Debt-to-income ratio ≥ 3		Debt service-to-income ratio ≥ 40%		Mortgage debt service-to-income ratio ≥ 40%		Outstanding loan-to-value ratio of HMR (stock) ≥ 75%		Net liquid assets < 2 months income	
			Mean	Std. err.	Mean	Std. err.	Mean	Std. err.	Mean	Std. err.	Mean	Std. err.	Mean	Std. err.
Employment status*	Employed	2010	15.3%	2.1%	24.4%	2.4%	7.0%	1.6%	6.1%	1.8%	18.2%	2.8%	55.4%	3.0%
		2014	13.8%	1.8%	29.7%	2.2%	8.2%	1.4%	8.3%	1.8%	15.2%	2.2%	55.8%	2.4%
	Self-Employed	2010	7.0%	3.4%	20.3%	5.4%	14.1%	5.0%	18.6%	6.5%	20.4%	9.2%	49.0%	7.8%
		2014	2.4%	1.9%	31.5%	6.8%	19.4%	5.7%	24.1%	6.9%	4.6%	3.3%	51.0%	8.3%
	Unemployed	2010	20.1%	13.4%	13.8%	13.3%	9.3%	9.9%	2.7%	†	0.0%	0.0%	72.3%	15.7%
		2014	5.9%	4.5%	7.1%	7.3%	5.1%	†	9.8%	†	2.2%	†	70.2%	12.2%
	Retired	2010	3.8%	2.9%	7.8%	4.1%	5.3%	3.9%	5.1%	5.2%	3.1%	5.3%	41.6%	9.4%
		2014	3.4%	2.1%	12.7%	4.1%	8.2%	3.4%	14.3%	6.5%	1.6%	†	49.7%	5.8%
	Other	2010	8.0%	4.4%	9.1%	4.4%	3.7%	3.3%	3.1%	4.4%	7.1%	5.7%	73.5%	8.3%
		2014	22.4%	6.7%	17.7%	6.1%	11.4%	5.6%	18.5%	9.9%	20.6%	10.7%	65.6%	8.1%
Housing status	Owner-outright	2010	0.7%	0.7%	6.2%	2.6%	3.8%	2.0%					45.4%	6.2%
		2014	0.4%	0.4%	7.8%	2.5%	4.3%	2.0%					48.3%	4.5%
	Owner-with mortgage	2010	9.0%	1.8%	31.0%	2.9%	8.7%	1.9%					50.5%	3.6%
		2014	8.4%	1.6%	41.1%	2.6%	12.0%	1.8%					51.8%	2.7%
	Renter or other	2010	29.0%	4.8%	7.9%	2.6%	5.7%	2.3%					72.8%	4.8%
		2014	28.7%	3.9%	8.8%	2.5%	6.0%	2.3%					69.6%	3.9%
Total gross income	Quintile 1	2010	22.4%	6.9%	22.7%	6.8%	20.5%	5.9%	35.2%	13.1%	4.0%	†	74.2%	7.4%
		2014	20.3%	5.5%	23.8%	6.0%	28.3%	6.2%	41.8%	10.5%	19.9%	11.0%	66.5%	7.6%
	Quintile 2	2010	31.7%	6.5%	30.7%	6.5%	9.4%	3.9%	14.5%	6.6%	32.1%	10.3%	62.7%	6.8%
		2014	18.7%	4.7%	38.8%	5.5%	13.0%	3.9%	18.5%	5.9%	21.8%	6.3%	65.0%	5.4%
	Quintile 3	2010	6.0%	2.9%	22.6%	5.6%	6.4%	2.6%	5.0%	2.9%	13.9%	6.1%	62.6%	6.2%
		2014	18.9%	3.6%	29.5%	4.2%	5.5%	2.3%	7.7%	3.2%	14.5%	3.9%	62.8%	4.2%
	Quintile 4	2010	8.0%	3.1%	21.3%	4.3%	4.6%	2.2%	3.5%	2.2%	17.8%	5.4%	48.6%	5.1%
		2014	6.1%	2.0%	26.1%	3.6%	5.6%	1.9%	6.6%	2.5%	10.5%	3.6%	52.3%	4.3%
	Quintile 5	2010	4.4%	2.0%	9.9%	2.5%	0.8%	0.6%	0.8%	0.7%	8.9%	3.9%	40.9%	4.6%
		2014	2.6%	1.1%	13.9%	2.6%	3.4%	1.3%	3.7%	1.4%	8.8%	2.5%	40.9%	3.5%
Total net wealth	Quintile 1	2010	52.7%	7.1%	15.4%	4.6%	9.8%	4.1%	23.3%	14.1%	68.6%	25.0%	85.5%	5.3%
		2014	57.2%	5.5%	15.6%	4.3%	12.8%	4.0%	56.8%	14.4%	98.1%	2.5%	89.1%	4.1%
	Quintile 2	2010	18.1%	4.3%	43.0%	5.2%	8.8%	3.1%	6.8%	3.4%	40.7%	6.5%	59.6%	5.4%
		2014	12.8%	3.1%	46.2%	4.7%	11.4%	3.0%	11.0%	3.5%	25.3%	4.8%	65.5%	4.9%
	Quintile 3	2010	0.0%	0.0%	18.0%	4.0%	3.3%	2.9%	3.8%	2.9%	5.3%	2.9%	59.6%	5.5%
		2014	0.1%	†	25.1%	4.4%	6.2%	2.4%	3.9%	2.6%	6.0%	2.9%	53.6%	4.6%
	Quintile 4	2010	0.0%	0.0%	8.6%	4.5%	5.9%	3.0%	4.5%	3.0%	4.2%	2.9%	43.2%	5.9%
		2014	0.0%	0.0%	20.4%	4.2%	5.7%	2.2%	8.1%	3.1%	4.4%	3.0%	46.4%	5.1%
	Quintile 5	2010	0.0%	0.0%	11.6%	3.5%	8.4%	3.5%	9.8%	4.6%	5.9%	3.7%	29.8%	4.8%
		2014	0.0%	0.0%	13.9%	3.1%	8.7%	2.4%	11.4%	3.1%	2.0%	1.5%	27.4%	3.9%

Source: Own calculations based on the 1st and 2nd wave of the LU-HFCS; data are multiply imputed and weighted; variance estimation based on 1000 replicate weights. † Omitted terms vary: There is at least one estimate for the std. err. missing for one implicate as no household is vulnerable in this group.

Figure 11: Share of households with Debt-to-Assets ratio ≥ 75% by household characteristics
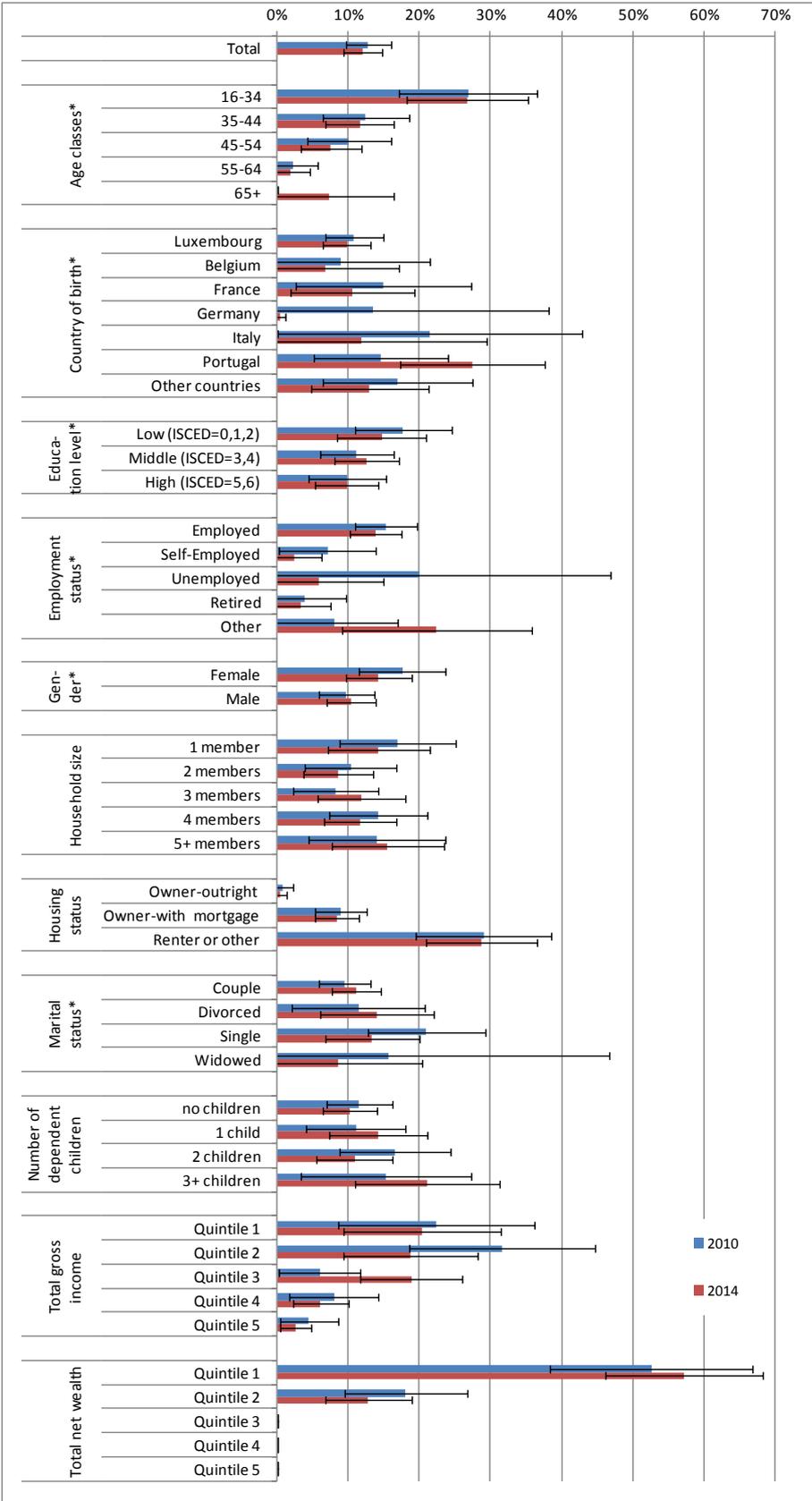
Source: Own calculations based on the 1st and 2nd wave of the LU-HFCS; data are multiply imputed and weighted; variance estimation based on 1000 replicate weights. Brackets indicate the 90% confidence interval.

Figure 12: Share of households with Debt-to-Income ratio ≥ 300% by household characteristics
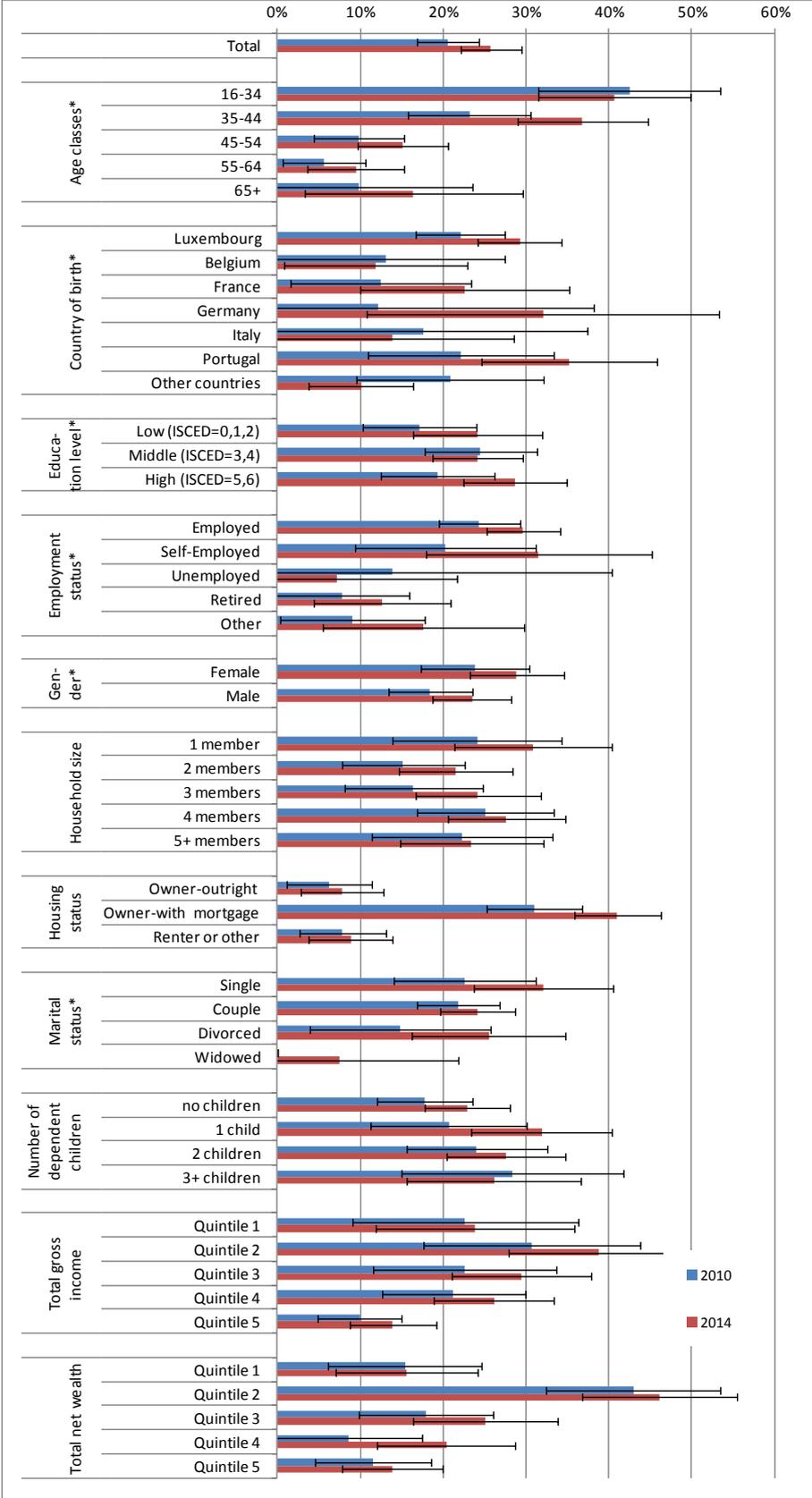
Source: Own calculations based on the 1st and 2nd wave of the LU-HFCS; data are multiply imputed and weighted; variance estimation based on 1000 replicate weights. Brackets indicate the 90% confidence interval.

Figure 13: Share of households with Debt Service-to-Income ratio ≥ 40% by household characteristics
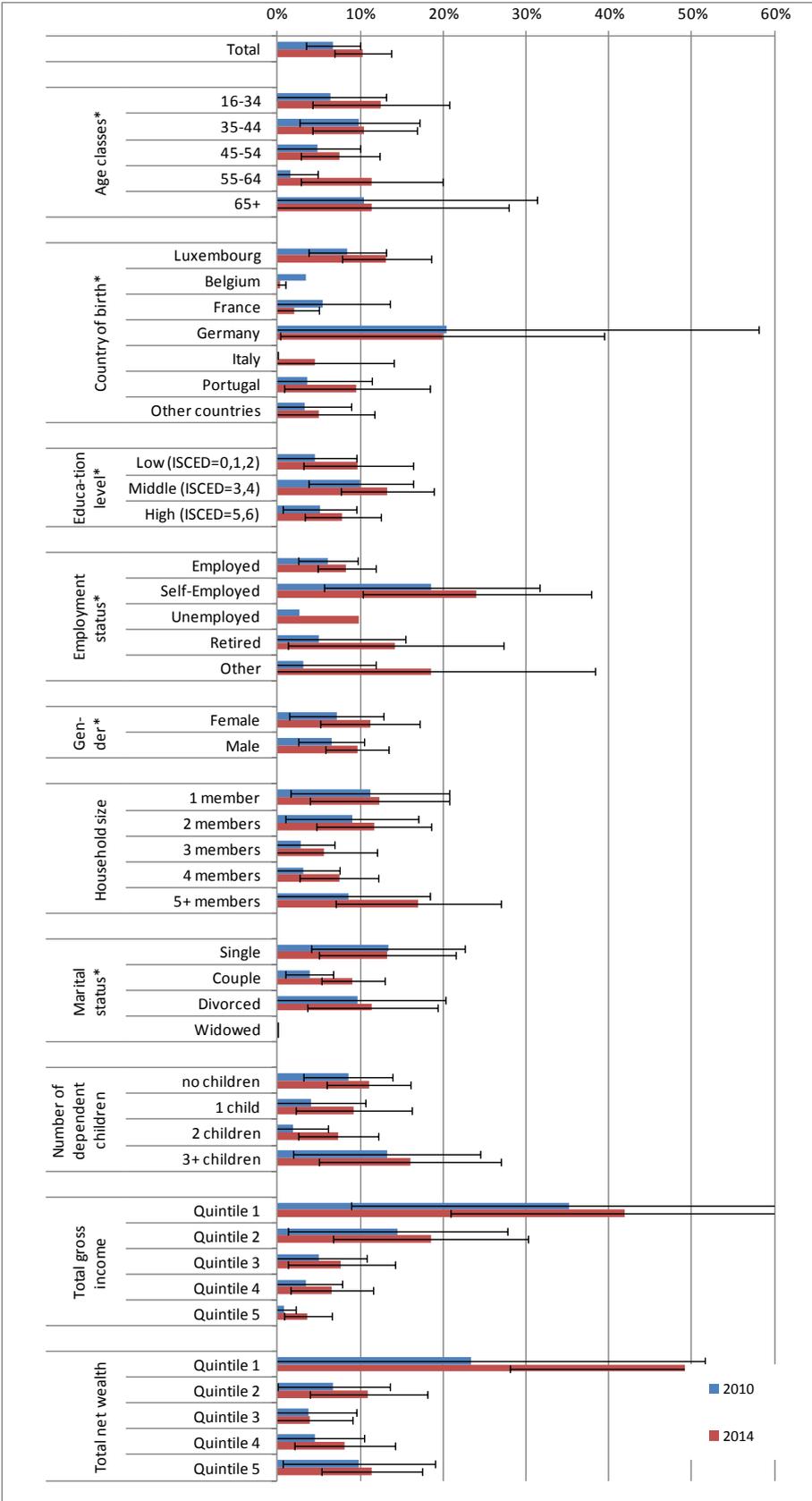
Source: Own calculations based on the 1ˢᵗ and 2ⁿᵈ wave of the LU-HFCS; data are multiply imputed and weighted; variance estimation based on 1000 replicate weights. Brackets indicate the 90% confidence interval.

Figure 14: Share of households with Mortgage Debt Service-to-Income ratio ≥ 40% by household characteristics
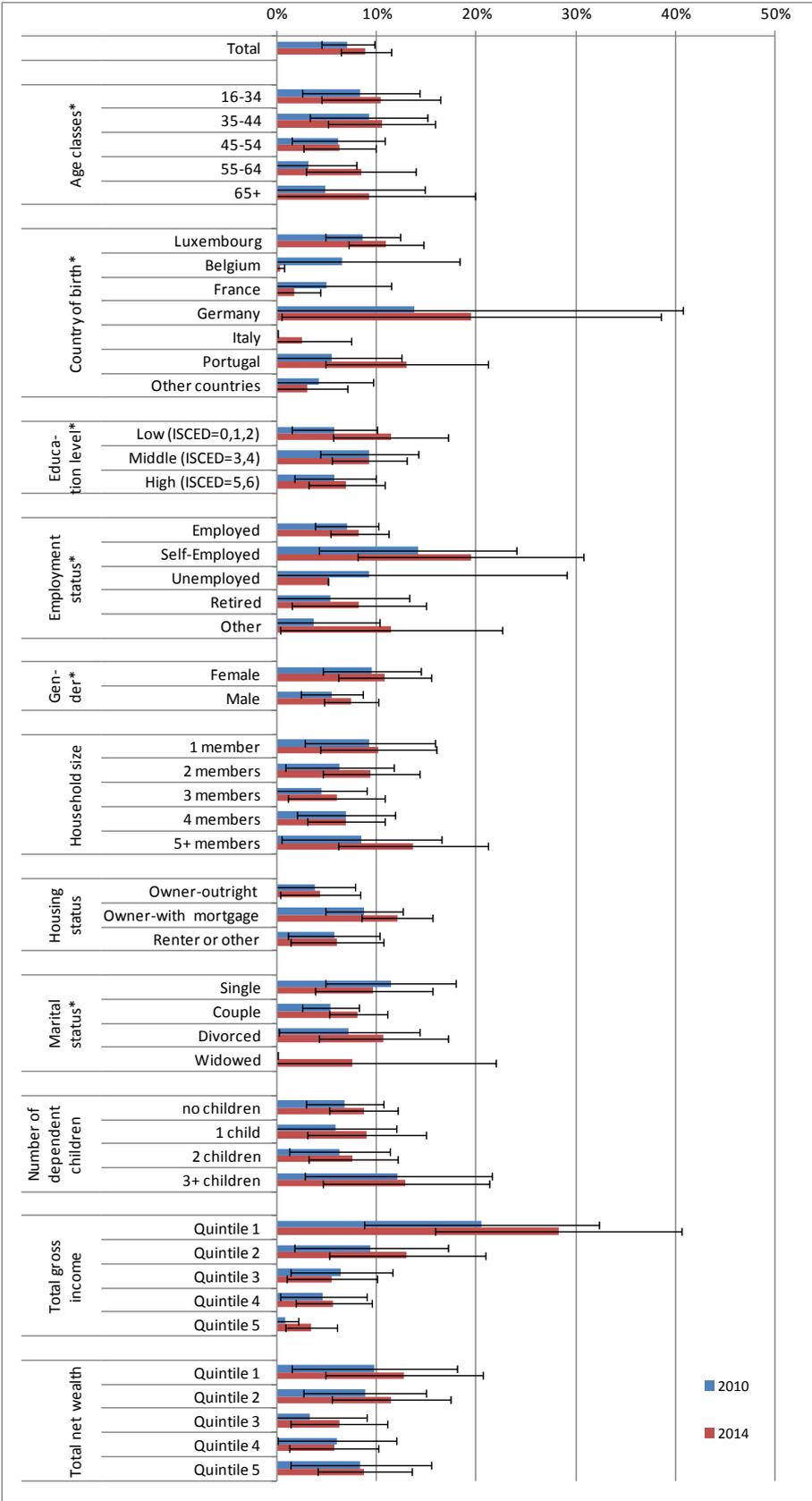
Source: Own calculations based on the 1st and 2nd wave of the LU-HFCS; data are multiply imputed and weighted; variance estimation based on 1000 replicate weights. Brackets indicate the 90% confidence interval.

Figure 15: Share of households with outstanding main residence Loan-to-Value ratio (stock) ≥ 75% by household characteristics
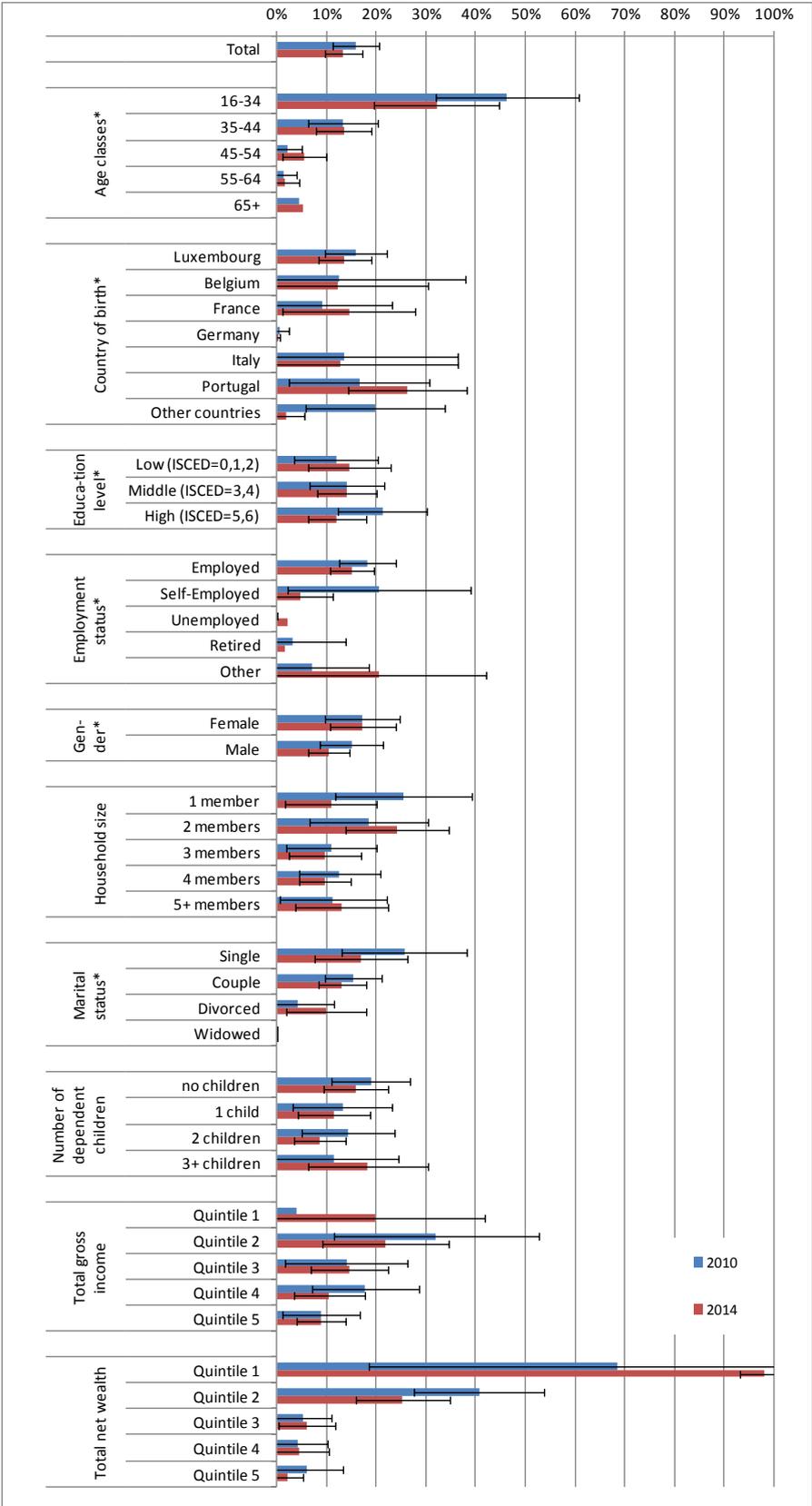
Source: Own calculations based on the 1st and 2nd wave of the LU-HFCS; data are multiply imputed and weighted; variance estimation based on 1000 replicate weights. Brackets indicate the 90% confidence interval.

Figure 16: Share of households with net liquid assets < 2 months income by household characteristics
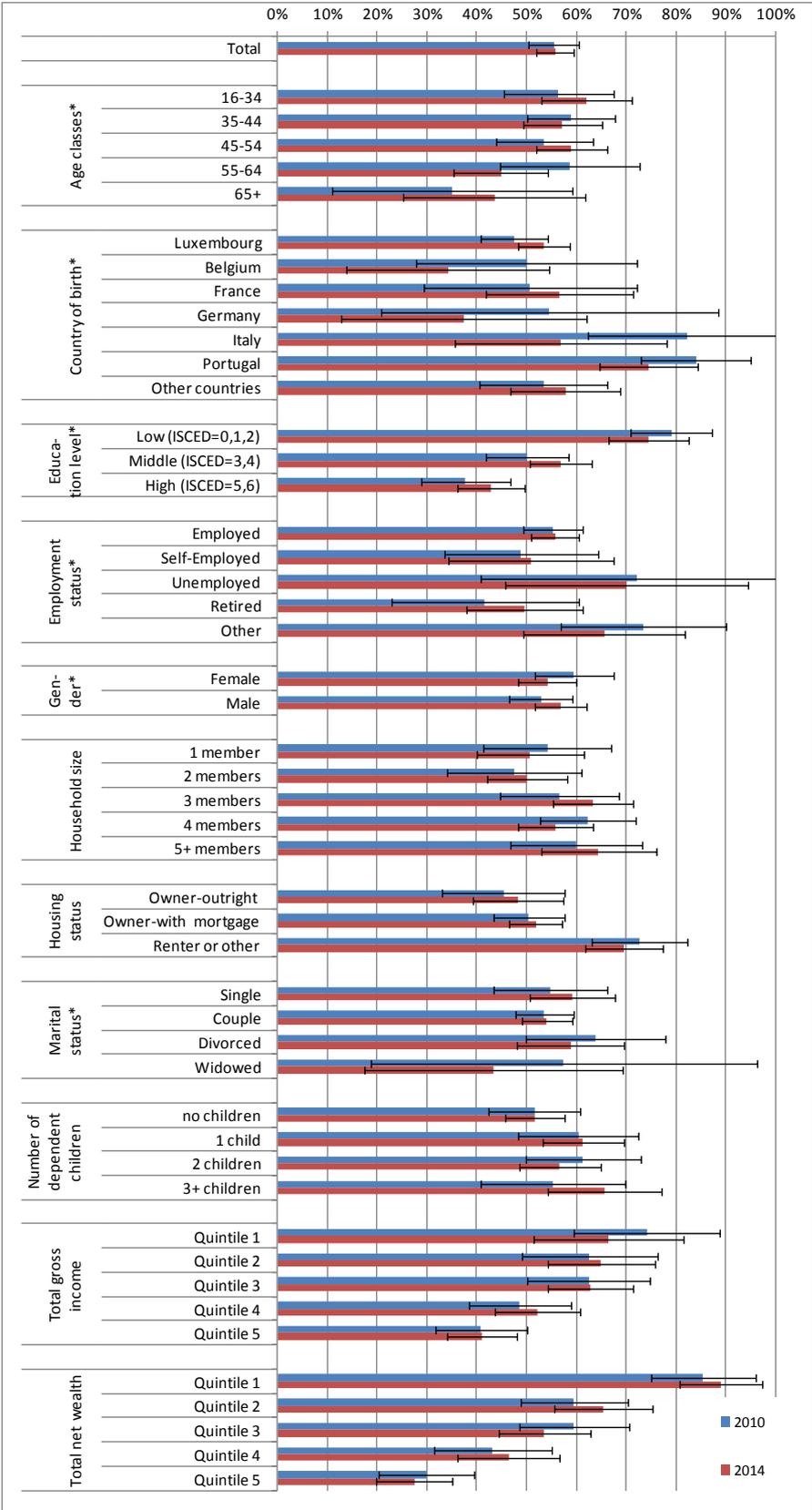
Source: Own calculations based on the 1st and 2nd wave of the LU-HFCS; data are multiply imputed and weighted; variance estimation based on 1000 replicate weights. Brackets indicate the 90% confidence interval.

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