

Household Vulnerability in Austria – A Microeconomic Analysis Based on the Household Finance and Consumption Survey

This study analyzes the indebtedness and vulnerability of households in Austria using data from the Household Finance and Consumption Survey (HFCS), a new source of microdata. The HFCS allows us to investigate potential risks household debt may pose to financial stability. Following the recent literature on indebtedness, we look first at the intensive as well as extensive margin of credit. The data show that debt participation and the level of debt in general increases with wealth and income, which points toward a relatively low risk to the financial sector. Additionally, our analysis identifies vulnerable households and estimates the financial sector's potential exposure at default and loss given default. We find that the estimates for loss given default range from 0.2% to 10% and are in line with similar studies for other countries. Combining these estimates with important other financial stability indicators, such as the development of initial loan-to-value ratios, we are able to conclude that at present, the risk to financial stability stemming from households in Austria is relatively low.

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As we have seen at the beginning of the Great Recession, the household sector of an economy played a central role in the financial (in)stability that developed after the bust of the housing bubble in the U.S.A. (see e.g. Acharya et al., 2009; Claessens et al., 2010). DeBelle (2004) had already pointed out that it is the distribution of debt that needs to be analyzed to investigate the effects on the macroeconomy. Aggregate data on the level of debt, income and wealth do not provide sufficient information to analyze exhaustively the vulnerability of households and, hence, the potential risk to the financial sector. This information has to be supplemented with findings on the distribution of debt and the identification of potentially vulnerable households. The Household Finance and Consumption Survey (HFCS) is the first source to provide in-depth information including both the liability and asset side of households' balance sheets in Austria. On the asset side, recent housing price dynamics show relatively

strong increases in housing prices in Austria – especially since mid-2010 – compared to other European countries (see OeNB, 2013). On the liability side, the aggregate debt burden (both mortgage and nonmortgage liabilities) in Austria has been modest compared to the euro area (see OeNB, 2012). Over the last ten years consumer credit relative to disposable national income has actually decreased while loans for house purchases have increased substantially.

The study at hand provides a deeper investigation of the various groups holding debt and estimates the exposure of banks to potentially vulnerable households. Drawing on the methods applied in the literature, we describe first the characteristics of the median debt holder before identifying potentially vulnerable households and the risk they pose to the financial sector. In other words, we look at household vulnerability from the perspective of the banking sector and not from the perspective of the household itself.

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This approach is in line with, for example, Costa and Farinha (2012), who recently analyzed the indebtedness of households in Portugal. In both a univariate and multivariate analysis the authors find the usual patterns of debt participation and level, e.g. higher income households are more likely to have debt and have higher median debt, and debt levels decrease over the life cycle. Although Costa and Farinha (2012) discuss indicators of household vulnerability, they do not estimate potential exposures or loss given default for the financial system. We go this step further, estimating these two measures for the banking sector vis-à-vis households in order to assess the potential impact of household debt on financial stability in Austria. This is also done in a recent IMF (2012) country report on Spain, in which microdata are used to assess the vulnerability of households. For Austria, Beer and Schürz (2007) use mostly microdata from the Household Survey on Financial Wealth (2004) for a characterization of indebted households. They find that more affluent households in terms of income and wealth are more likely to hold debt and that debt rises with income, concluding that there are no risks to financial stability from the household sector. More recently, Albacete and Fessler (2010)² stress-test households in Austria. Based on different sources of microdata (most prominently the Household Survey on Housing Wealth 2008), the authors estimate the impact of adverse shocks on the estimates of exposure at default and loss given default. In the baseline, using the definition of financial margin, they report about 9% of indebted households as vulnerable. The

exposure of the financial sector to these vulnerable households is estimated at around 14% of total credit and loss given default at around 2.5%. In Austria foreign currency loans have long been under close scrutiny. Albacete et al. (2012b) take a closer look at foreign currency mortgage holders.³ Using inference on counterfactual distributions to analyze the differences between the two groups of foreign and domestic currency debt holders, Albacete et al. (2012b) conclude that over the whole distribution foreign currency debt holders have a higher risk buffer in terms of income, housing wealth level and potential rental income (see p. 70 in Albacete et al., 2012b). Thus, they are better endowed to absorb the additional risks (exchange rate, valuation of repayment vehicle, etc.) of their debt obligation and seem to be able (at least in the present moment) to carry that risk; therefore these debt holders do not pose a serious threat to financial stability.

This paper is organized as follows. First, we introduce the data and shortly discuss the technical specifics of the complex survey data, followed by a univariate analysis of indebted households in Austria. After discussing the basic results about debt in Austria, we look at household debt statistics in more detail, e.g. the loan-to-value ratio for mortgage loans. The next section provides the identification and description of potentially vulnerable households. Finally, we describe the estimation and analysis of financial stability risk channels and key figures, such as exposure at default (EAD) and loss given default (LGD).⁴ Section 4 concludes.

² This study also includes an extended literature review, which is not repeated here.

³ See also Beer et al. (2010).

⁴ Both are defined in detail below.

1 Data and Methodological Background

This study uses data from the HFCS in Austria,⁵ which is part of a euro area-wide effort to gather household level microdata. The HFCS is a representative household-level survey covering the whole balance sheet of households. In particular, it includes various types of loans, i.e. mortgage loans collateralized by the households' main residence and other real estate (separately) and all types of nonmortgage loans, as well as all types of households' real and financial assets. In addition, sociodemographic information about the households allows us to get a deeper understanding of the background of households with debt.

A total of 2,380 households successfully participated in the HFCS in Austria, which translates into a response rate of around 58%. Based on a two-stage stratified probability sample, the survey reaches a representative sample of all noninstitutionalized households. As in all analyses using survey data, household survey weights are applied to account for unequal sampling probability and different probabilities of participation across households. The survey was conducted in the period from the third quarter of 2010 to the second quarter of 2011. The stock values reference time is the date of the interviews, i.e. the time of the field phase of the HFCS in Austria. For questions on income, however, the 2009 calendar year is the reference period, i.e. the last full calendar year before the start of the field period.

Partial response refusal is corrected using a Bayesian-based multiple imputation procedure with chained equations.

This technique achieves consistent estimates taking into account the uncertainty of imputations. Thus, the results in this study are based on all five implicates of the imputations: Following the literature (see e.g. Rubin, 2004), we calculate a statistic (e.g. proportion, median, etc. denoted S_i) separately for each implicate $i=1, \dots, 5$ and take the average so that the final estimate S is given by

$$S = \frac{1}{5} \sum_{i=1}^5 S_i .$$

Given the available data, one appropriate way to calculate the standard errors is given by the use of replicate weights $r=1, \dots, R$ (see e.g. Rao et al., 1992). This bootstrap procedure also has to take into account the uncertainty of imputed values such that total variance is given by

$$T = W + (1 + \frac{1}{5})B$$

where W is the within variance in a given implicate averaged over the implicates, i.e.⁶

$$W = \frac{1}{5} \sum_{i=1}^5 \frac{1}{R} \sum_{r=1}^R (S_{ir} - \tilde{S}_{iR})^2 ,$$

and B is the variance between implicates, i.e.

$$B = \frac{1}{5-1} \sum_{i=1}^5 (S_i - S)^2 .$$

For the socioeconomic characteristics of the households such as age or employment status, we use those that apply to the household head. The definition of the household head is based on the households' choice; that is the households who were required to

⁵ The full methodological documentation of this newly developed survey in Austria can be found in Albacete et al. (2012a). A complete methodological overview of the HFCS in the whole euro area can be found in ECB (2013).

⁶ \tilde{S}_{iR} is the average of a given statistic over R replicate weights in one implicate, whereas S_{ir} is the statistic in one implicate using one replicate weight r .

select the financially knowledgeable person, i.e. the person best informed about the household’s wealth situation, income and consumption expenditure decisions. This person is used as the reference person (which makes the results comparable to Fessler et al., 2012).

2 Debt Market Participation and Household Indebtedness

Before starting with the analysis of the vulnerability of households, we have to discuss the underlying structure of debt holdings. Chart 1 (left-hand side) shows that the majority of Austrian households does not participate in the debt market. 64% have neither mortgage nor nonmortgage debt. Only about one-third (36%) of households participates in the credit market. The majority of indebted households holds nonmortgage debt⁷ like credit line/overdraft debt, credit card debt, or noncollateralized loans, so that 17% hold exclusively nonmortgage debt and another 4% of all households have both mortgage and nonmortgage debt. The remaining 14% of households in Austria hold exclu-

sively mortgage debt. However, when looking at debt volumes, chart 1 (right-hand side) shows that the aggregate total debt of households to a very large extent consists of mortgages (84%). Only 16% of the aggregate total household debt consist of nonmortgage debt.

Chart 2 shows debt participation and debt levels by mortgage and nonmortgage debt across gross wealth and income distributions.

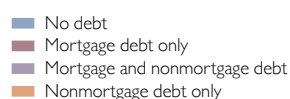
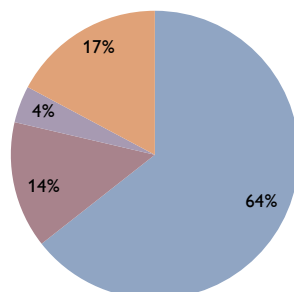
In general, mortgage debt participation and levels increase both with gross wealth and income. In the first gross wealth quintile, households do not own their main residence and hence do not hold mortgage debt at all. In the highest gross wealth quintile, households generally already own their real estate outright and have thus (at least partially) repaid the mortgage(s) used to finance this investment. Although one can see a decreasing trend in nonmortgage debt participation over wealth quintiles, it remains relatively stable over the income distribution. We also see a stark difference between the levels of mortgage and nonmortgage debt. As mortgage

Chart 1

Household Debt Participation and Shares of Debt Types

Debt Participation

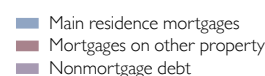
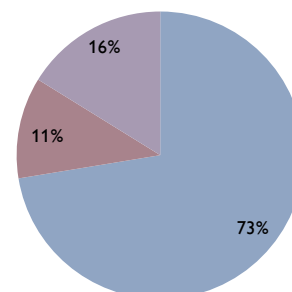
As a percentage of all Austrian households



Source: HFCS Austria 2010, OeNB.

Shares of Debt Types

As a percentage of aggregated total debt

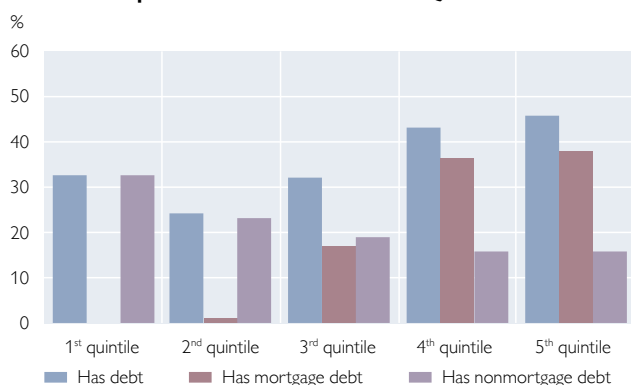


⁷ Leasing contracts are not included.

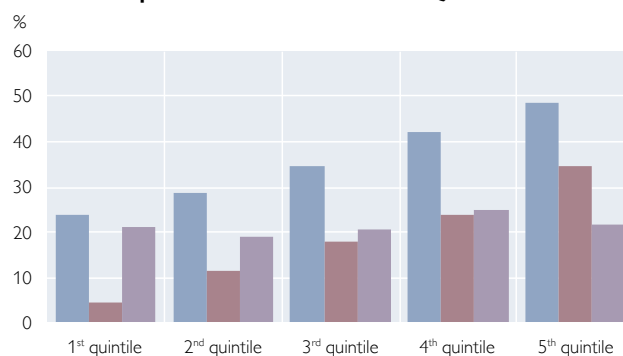
Chart 2

Debt Participation and Debt Level across Gross Wealth and Income Distributions

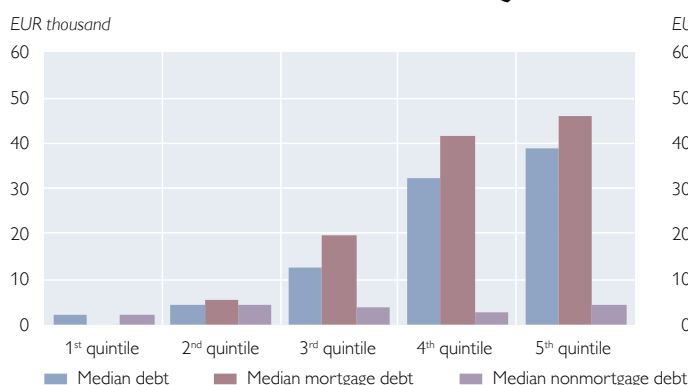
Debt Participation across Gross Wealth Quintiles



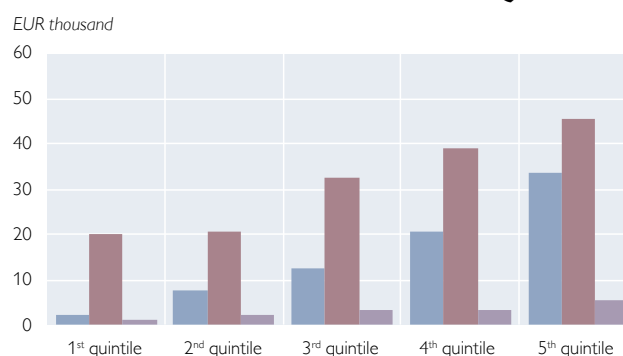
Debt Participation across Gross Income Quintiles



Conditional Median Debt across Gross Wealth Quintiles



Conditional Median Debt across Gross Income Quintiles



Source: HFCS Austria 2010, OeNB.

debt is used to finance housing wealth as opposed to smaller purchases funded by noncollateralized debt, the level of the former is higher by far, e.g. it is higher by a factor of more than 15 for the third gross wealth quintile. These two findings point toward the banking sector being successful in screening loan applicants and thus facilitating credit market participation for customers that are able to repay the funds they receive. Most of these results are comparable with similar estimates for Portugal (see Costa and Farinha, 2012), where, e.g., total debt participation is reported to be at 37.7%, and the pattern over the income distribution is similar to the one shown in chart 2; in Portugal, however, the majority of

indebted households holds mortgage loans.

The median debt level of the 36% of households in Austria that hold debt is EUR 13,777 (see table 1). Breaking this amount down by collateralized and noncollateralized debt, we see that mortgage holders' median debt is EUR 35,546 whereas nonmortgage debt holders' median debt is EUR 3,016. These results show that high levels of debt are usually incurred due to investments in real estate. This can also be observed across household sizes and age groups for debt levels and debt participation. Table 1 shows for households with a relatively younger reference person a high level of debt and increasing participation in the credit market for

Table 1

Debt Participation and Debt Level across Household Characteristics

Variables	Share of population	Total debt participation	Mortgage debt participation	Nonmortgage debt participation	Conditional median total debt	Conditional median mortgage debt	Conditional median nonmortgage debt
	%	%				EUR	
All	100.0	35.6	18.4	21.4	13,777	37,546	3,016
1 household member	38.7	26.4	7.5	20.4	3,842	23,008	2,000
2 household members	34.7	30.7	15.9	18.3	13,360	27,519	4,000
3 household members	11.3	49.3	33.1	23.6	24,963	40,007	3,295
4 household members	8.9	59.9	39.6	27.1	40,636	69,719	5,340
5+ household members	6.5	59.7	42.1	31.9	24,966	41,612	3,638
Age 16 to 24	4.9	30.8	12.3	19.8	13,566	63,414	1,002
Age 25 to 34	14.3	44.8	16.9	32.1	10,525	62,912	2,361
Age 35 to 44	18.2	55.7	32.7	30.5	28,841	64,000	3,581
Age 45 to 54	19.9	42.0	22.8	25.1	12,429	28,761	4,100
Age 55 to 64	19.2	29.0	15.4	16.1	9,325	16,240	2,567
Age 65 to 74	14.3	20.3	11.4	11.4	11,534	18,846	1,389
Age 75+	9.1	7.4	2.7	5.3	3,600	9,643	2,215
Employed	43.2	46.8	25.5	26.9	17,318	40,807	3,634
Self-employed	9.6	46.2	30.9	23.2	39,988	62,000	5,000
Unemployed	4.9	42.5	9.3	36.7	3,711	50,503	1,880
Retired	35.5	18.7	8.1	12.3	6,808	19,420	1,948
Other	6.8	32.9	15.5	19.9	8,160	23,048	3,400
Primary education only or no formal education	0.4	74.6	36.7	67.0	4,700	151,083	1,600
Secondary education	71.4	35.6	17.2	22.6	11,653	31,106	3,065
Tertiary education	28.2	35.0	21.2	17.5	22,732	58,379	3,170
Owners – outright	30.4	9.5	0.0	9.5	4,625	.	4,625
Owners – with mortgage	17.3	100.0	100.0	21.8	39,183	37,472	2,121
Renters/other	52.3	29.4	2.0	28.1	3,581	44,273	3,096
Eastern Austria	43.4	34.8	14.3	24.1	12,213	33,960	3,662
Southern Austria	22.2	35.6	20.1	19.5	12,961	37,447	3,090
Western Austria	34.4	36.6	22.5	19.1	17,553	41,024	2,471
Indebted and has foreign currency loan	10.5	100.0	97.0	34.2	80,384	80,480	5,000
Indebted but has no foreign currency loan	89.5	100.0	46.3	63.0	10,840	30,322	2,970

Source: HFCS Austria 2010, OeNB.

Notes: The regions in Austria are based on the NUTS-1-level codes. Eastern Austria: Burgenland, Lower Austria and Vienna. Southern Austria: Carinthia and Styria. Western Austria: Upper Austria, Salzburg, Tyrol and Vorarlberg. Cells that cannot be estimated because of no observations in some of the multiple imputation implicates are marked with ".".

mortgage loans mostly in order to finance the purchase of the primary residence. Later in life the debt is paid back so that both debt level and participation decrease again. Bigger households in terms of household members are more likely to take out mortgage loans. Looking at the employment status, we can see that households with a self-employed reference person have the highest share of mortgage debt

holders. While there are very few households with a reference person that is unemployed, these households' median level of mortgage debt is substantial. Most of these households, however, only hold nonmortgage debt at a much lower level. It should be noted that households with a reference person with a low level of education have a very high debt participation rate, especially for nonmortgage debt with a rather low

median level of debt. This indicates that these households are more likely to need some sort of credit for relatively small purchases compared to other education groups. The overall level of debt, however, increases with education, as is expected since income streams generally increase with education as well. The very high median for mortgage loan holders with no formal education is an outlier that is due to the very low number of observations. By definition, outright owners of their main residence do not have mortgage debt for their main residence and also do not have other debt collateralized by other real estate. Almost the entire share of mortgage debt is held by households that have a mortgage for their main residence. Regional differences are rather small, in particular when taking into account that the discrepancy in mortgage debt participation between eastern Austria on the one hand and western and southern Austria on the other hand is driven solely by the capital city Vienna, where mortgage participation is very low at 8% (not shown in the table). As regards mortgage loans, one can see that the median outstanding value for foreign currency loan holders is considerably higher than for euro loan holders. This is due to the fact that almost all foreign currency loans in Austria are bullet loans (the principal is repaid at the end of maturity in a final bullet). As Albacete et al. (2012) pointed out, these households are likely to be able to bear the additional risk of such loans.

3 Systemic Risk Analysis

3.1 Debt Burden

Whether and to what amount a household is indebted does not say much about the debt-bearing capacity of that household. In order to say whether a household has a low or a high debt burden it is necessary to compare the amount of debt with the resources households have at their disposal to carry that debt. In the literature (see e.g. ECB, 2013) there are several indicators that try to measure households' debt burden. For our analysis we use two of them: the debt-to-asset ratio and the debt service-to-income ratio.⁸

The debt-to-asset ratio (DA_i) is defined for every indebted household i as

$$DA_i = \frac{D_i}{W_i} \times 100$$

where D_i is the household's total liabilities and W_i is the household's total gross wealth⁹ (excluding public and occupational pension plans). This ratio provides information about the extent to which debt can be paid back from the total stock of assets. It is an indicator of a household's potential need to deleverage in the medium to long run.

The debt service-to-income ratio (DSI_i) is defined for every indebted household i that holds not only credit line/overdraft debt or credit card debt (as for these debt types no debt service information is collected) as

$$DSI_i = \frac{DS_i}{I_i} \times 100$$

where DS_i are the household's total monthly debt payments¹⁰ and I_i is the household's gross monthly income¹¹

⁸ We have also performed the analysis using the debt-to-income ratio, but this indicator is not presented here due to space constraints.

⁹ Zero total gross wealth is bottom coded at EUR 1.

¹⁰ Regular payments into the repayment vehicle, in case of bullet loans, are included. Lease payments are not included.

¹¹ Zero gross monthly income is bottom coded at EUR 1 per month (which is the case for just three households).

(gross yearly income divided by 12). This ratio provides an indicator of the burden that debt holdings represent to current income and reflects more the significance of short-term commitments. One advantage of the debt service-to-income ratio over the debt-to-asset ratio is that the former also reflects loan maturities and interest rate levels: Longer maturities or lower interest rates reduce debt service to income, but do not influence the debt-to-asset ratio.

Chart 3 shows the distribution of each ratio across percentiles. We can see that in general the median debt burden is low for indebted Austrian households. For example, the median debt-to-asset ratio among indebted households is around 17%. Measured in debt service to income, the median household needs less than 6% of its current gross income for debt servicing.

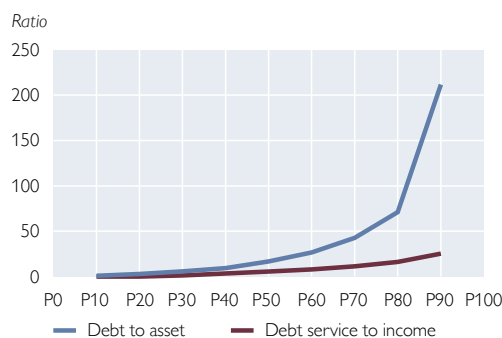
However, chart 3 also shows that there are some households that have to carry a very large debt burden. For example, about 18% of indebted households report negative wealth (i.e. $DA_i > 100$). Furthermore, about 10% of indebted households need at least 25% of their gross income to service their debt. Of course, in terms of net income,

the debt service-to-income ratio would be considerably higher.

Before looking at these households more closely, it is interesting to find out how the median debt burden of households has developed in the past decades in Austria. Unfortunately, only one wave of the HFCS has taken place so far; therefore, we construct a time series for an estimate of the initial loan-to-value (LTV) ratio of the household's main residence at the time when the mortgage was taken out or refinanced by using some retrospective information included in the first wave of the HFCS. This retrospective information consists of the year of acquisition of the household's main residence, its value at the time of acquisition, the year when the mortgage was taken out or refinanced and the initial amount borrowed. Combining these variables, we construct for each household an estimate of the initial LTV ratio, then we group households by the year when the mortgage was taken out or refinanced, calculate the median initial LTV ratio for each one of these groups, and plot them across the years as moving averages (see chart 4). Given data limitations (e.g. few observations in early

Chart 3

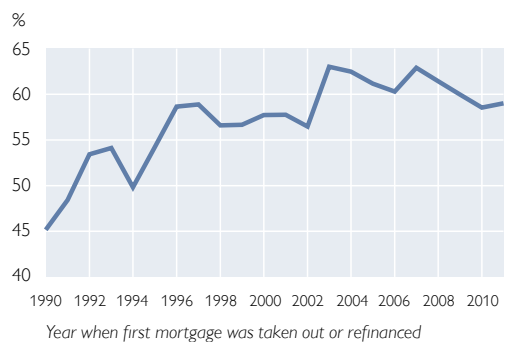
Distribution of Debt Burden Measures across Percentiles



Source: HFCS Austria 2010, OeNB.

Chart 4

Development of the Median Initial LTV Ratio during the Past Decades



Source: HFCS Austria 2010, OeNB.

Note: Ratios are eight-year moving averages.

year brackets, exclusion of mortgages that are no longer outstanding, etc.), these estimates are the best possible approximation of the initial LTV ratio. Chart 4 shows that this estimate of the households' debt burden has increased during the past few decades. The median initial LTV ratios rose from a range of 40% to 50% in the 1990s to around 60% in the past few years. Furthermore, they show a cyclical pattern with ups and downs around this trend. Since the financial crisis, which broke out in 2008, for example, the median initial LTVs have declined somewhat.

Despite this increasing tendency of median LTV ratios in Austria, the levels are still low compared to the U.K., for example. May et al. (2004) report for the U.K. a mean initial LTV ratio of 83% in 2004.

3.2 Identification of Potentially Vulnerable Households

3.2.1 Measures of Vulnerability

Chart 3 shows that most households have a relatively small debt burden, but still there are some with relatively large debt ratios at the right tail of the ratio distributions. For the rest of the paper we want to focus on these potentially vulnerable households and see whether they can pose a threat to the stability of the Austrian financial market. Therefore, in the following section we first define what a vulnerable household is and check what its characteristics are. Then we highlight the risk channels through which vulnerable households could pose a threat to financial stability and, finally, we quantify the aggregated risk to the Austrian financial market stemming from these households via the exposure-at-default and loss-given-default measures.

In order to identify potentially vulnerable households we use the two debt burden ratios from the previous section

and set thresholds which are commonly used in the literature (see e.g. ECB, 2013). If a household has a debt burden ratio above this threshold it is defined as potentially vulnerable according to that measure. The thresholds are as follows:

- $DA_i \geq 75$: The debt-to-asset ratio indicates how easily a household can pay its debt from the total stock of its assets; households above the 75% threshold might need to deleverage in the medium to long run in order not to run into financial difficulties. This is especially the case for households that have debt-to-asset ratios above 100% (negative wealth) because their assets are not large enough to offset the total debt level. The definition of vulnerable households using this indicator does not imply that households are in payment difficulties at present, therefore it is thought of as an upper bound for the estimates of the aggregated risk.
- $DSI_i \geq 40$: The debt service-to-income ratio provides information about how easily households can pay back their debt from their income. For households with a debt service-to-income ratio above 40% an unexpected income shock might trigger problems in the repayment schedule; therefore these households are classified as vulnerable. Again it must be noted, however, that households with a ratio close to 40% are not necessarily in default at present.

Additionally, we introduce another vulnerability measure, which is based on the subjective assessment of the household itself. In the HFCS all households were asked to state whether (in the 12 months preceding the interview) the household's income was higher or lower than, or equal to, their expenses (excluding purchases of assets). If the income was lower and if the household holds debt at the time of the interview, we define the household as potentially

vulnerable according to this measure.¹² This measure is also closely connected to the widely used indicator of whether a household is able to service its debt and to finance its basic consumption needs from its current income (financial margin).

In the rest of the paper we use these three vulnerability measures in order to identify vulnerable households, analyze the channels through which they can pose a threat to financial stability and estimate the exposure and loss given default if all these households would actually default on their debts. This static analysis allows us to identify problematic groups of households from the perspective of a bank and also potential risks to financial stability.

3.2.2 Determinants of Vulnerability

We first perform a univariate analysis by estimating the frequency of vulnerable households across different household characteristics. The results are shown in table 2.

Overall, about 19% of indebted households are vulnerable according to the debt-to-asset $\geq 75\%$ measure and the expenses-above-income vulnerability measures. The debt service-to-income $\geq 40\%$ vulnerability measure seems to be more restrictive and delivers only 5% vulnerable households.

These proportions seem to be in line with those found in other countries described in the literature. In Canada, Djoudad (2012) estimates the share of vulnerable households in indebted households at 5.7% using the debt service-to-income $\geq 40\%$ vulnerability measure. In Spain, IMF (2012) estimates this share at 16.5% for 2008.¹³ Using a similar measure, Fuenzalida and Ruiz-

Table 2

Vulnerability Measures across Household Groups

Variables	Debt to asset $\geq 75\%$	Debt service to income $\geq 40\%$	Expenses above income
All	18.8	5.0	18.9
1–20 gross income pct	40.1	20.2	27.2
21–40 gross income pct	22.4	3.8	21.9
41–60 gross income pct	20.0	6.1	13.7
61–80 gross income pct	14.2	2.5	21.4
81–100 gross income pct	9.3	1.9	14.5
1–20 gross wealth pct	60.2	8.5	26.4
21–40 gross wealth pct	25.2	..	20.5
41–60 gross wealth pct	10.4	4.2	17.8
61–80 gross wealth pct	6.6	4.7	17.4
81–100 gross wealth pct	3.2	5.6	14.9
1 household member	27.2	7.7	20.2
2 household members	13.4	4.0	20.3
3 household members	13.8	..	14.0
4 household members	19.5	6.4	18.5
5+ household members	17.5	4.6	19.2
Age 16 to 24	41.1	9.2	16.8
Age 25 to 34	26.5	5.9	15.0
Age 35 to 44	19.9	5.5	18.3
Age 45 to 54	13.6	3.9	16.5
Age 55 to 64	16.5	3.4	22.1
Age 65 to 74	7.7	6.3	29.0
Age 75+	10.3	..	29.2
Owners - outright	1.9	..	22.1
Owners - with mortgage	6.5	5.2	13.9
Renters/other	35.9	5.0	24.0
Eastern Austria	23.6	5.2	20.1
Southern Austria	19.1	4.6	17.4
Western Austria	12.9	5.1	18.5
Employed	18.6	3.7	16.4
Self-employed	7.1	7.7	8.7
Unemployed	51.2	11.7	35.8
Retired	14.9	5.3	28.8
Other	25.3	..	16.8
Primary education only or no formal education	69.1
Secondary education	22.0	5.5	19.4
Tertiary education	10.9	2.9	16.1
No nonmortgage debt	6.1	4.2	11.8
Has nonmortgage debt	27.3	5.7	23.6
Has foreign currency loan	12.2	4.4	11.7
No foreign currency loan	19.6	5.1	19.8

Source: HFCS Austria 2010, OeNB.

Note: Cells that cannot be estimated because of no observations in some of the multiple imputation implicates are marked with ".."; pct = percentile.

¹² Note that this is the only measure that could be easily extended to be observed also among households without debt. We mention and make use of this extension of the measure in section 3.3.1.

¹³ However, IMF (2012) uses disposable income instead of gross income.

Tagle (2009) find that in Chile, 13.6% of indebted households were vulnerable in 2007. Using a vulnerability measure called negative financial margin, which is comparable to our expenses-above-income vulnerability measure, Sugawara and Zaldueño (2011) estimate the range of vulnerable households in Croatia to be between 13.5% and 22.4% of indebted households. Vatne (2006) estimates the share of vulnerable households in Norway to be 19% in 2004. In Sweden, Johansson and Persson (2007) estimate that the share of vulnerable households was only 6.3% in 2004. Using a similar method, Herrala and Kauko (2007) find that in Finland about 13% to 19% of households were vulnerable between 2000 and 2004. The latter three studies also use the concept of negative financial margin.

When looking at household characteristics in table 2, we see that vulnerable households are concentrated in the lowest income and lowest wealth categories. Single person households and renters are also more often vulnerable than the average; the same is true for households living in eastern Austria. Households whose reference person is unemployed are extremely often identified as vulnerable.¹⁴ Looking at households' debt properties, we can observe peaks of vulnerability among nonmortgage debt holders, non-foreign currency debt holders,¹⁵ and households with fixed interest rate mortgage debt (the latter ones are not shown in the table).

We also perform a multivariate analysis to find possible sources of vulnerability. Therefore, we run logit regressions where y is the vulnerability indicator, which equals 1 if the indebted household is vulnerable and 0 otherwise, and x is a vector of independent variables that include household characteristics (gross income, gross wealth,

Table 3

Regressing Household Characteristics on Vulnerability Measures

Variables	Debt to asset ≥75%	Debt service to income ≥40%	Expenses above income
Gross income	-8.57e-07 (8.33e-07)		-3.05e-07 (4.67e-07)
Gross wealth		4.84e-09 (1.87e-08)	-1.91e-08 (3.00e-08)
Household size	0.00838 (0.00977)	-0.00543 (0.00873)	0.015 (0.0131)
Age of reference person	-0.0026 (0.00161)	-0.000613 (0.00115)	0.00251 * (0.00137)
Eastern Austria	0.0468 * (0.0273)	0.00635 (0.0227)	-0.000297 (0.0320)
Unemployed reference person	0.0860 ** (0.0425)	0.0287 (0.0452)	0.101 * (0.0573)
Reference person has tertiary education	-0.0576 (0.0384)	-0.0277 (0.0357)	-0.000441 (0.0349)
Food expenditure	-8.18e-06 * (4.76e-06)	7.15e-07 (3.13e-06)	-3.77e-06 (5.25e-06)
Has nonmortgage debt	0.109 *** (0.0328)	0.0143 (0.0264)	0.104 *** (0.0241)
Has foreign currency loan	0.0402 (0.0619)	-0.0119 (0.0526)	-0.0468 (0.0600)
Has adjustable interest rate mortgage debt	-0.0500 (0.0420)	0.0151 (0.0324)	0.0276 (0.0352)
Observations	803	639	803

Source: HFCS Austria 2010, OeNB.

Note: Marginal effects are reported, standard errors are in parentheses (calculated with bootstrap, 1,000 replications). Due to endogeneity problems, gross wealth is not a regressor in the debt-to-asset ≥75% regression and gross income is not a regressor in the debt service-to-income ≥40% regression. *** $p < 0.01$, ** $p < 0.05$, * $p < 0.1$

¹⁴ Note that the age profiles of vulnerable households differ across the three measures. While the first two identify predominantly households with a relatively young reference person, the third measure to a larger extent identifies elderly households as potentially vulnerable. This might be due to a life savings pattern according to which the latter group draws on their savings later in life (see also table 5). For the analysis below, we restrict this group even further by using the additional vulnerability measure “unable to meet expenses.” We thank the referee for pointing out this issue.

¹⁵ This result is in line with the findings of Albacete et al. (2012) that financial sector institutions have been successfully monitoring the selection of foreign currency borrowers as they are less likely to be vulnerable than euro loan holders.

size, food expenditure, region dummy, nonmortgage debt holding dummy, foreign currency loan holding dummy) and characteristics of the household's reference person (age, age squared, tertiary education dummy, unemployment dummy). The corresponding average marginal effects are reported in table 3.

On the one hand, the results show that being unemployed or having non-mortgage debt are strong determinants that significantly increase the probability of a household's vulnerability by about 10% (in two of three vulnerability measures). On the other hand, a determinant that decreases the household's probability of being vulnerable (in all vulnerability measures, but not significantly) is tertiary education (by 3% to 6%).

3.3 Risk Channels

Before quantifying the aggregated risk to financial stability in Austria stemming from household debt, we will highlight three channels through which vulnerable households can directly influence this risk: debt market participation, indebtedness, and negative wealth.

3.3.1 Debt Market Participation of Vulnerable Households

Using an extended expenses-above-income vulnerability measure that also

includes households without debt (not included in table 4, see footnote 12) indicates that most vulnerable households (61%) participate in the debt market. It seems that debt holding is an important source of household vulnerability.

Furthermore, and going back to our vulnerability definitions according to table 4, among vulnerable households holding debt, the majority participates in the nonmortgage debt market. The share ranges from 61% to 88%, depending on the vulnerability measure. Vulnerable households seem to use nonmortgage debt as a substitute for income or wealth.

3.3.2 Indebtedness of Vulnerable Households

The pattern seen in table 1 and chart 1 (right-hand side) that among indebted households, the level of nonmortgage debt is much lower than the level of mortgage debt does not change in the sample of vulnerable households shown in table 4: The median mortgage debt of vulnerable households is at least about 10 times higher (according to the expenses-above-income vulnerability measure) than the median nonmortgage debt of vulnerable households. This general pattern together with the fact that the majority of vulnerable households hold nonmortgage debt

Table 4

Debt Holding, Indebtedness and Negative Wealth of Vulnerable Households

Vulnerability measure	Participation (%)		Indebtedness (EUR)			Has Negative Net Wealth (%)		
	Has mortgage debt	Has nonmortgage debt	Median debt	Median mortgage debt	Median nonmortgage debt	All debt holders	Mortgage debt holders	Nonmortgage debt holders
Debt to asset $\geq 75\%$	18.8	87.6	18,400	220,565	9,232	78.9	42.9	83.2
Debt service to income $\geq 40\%$	58.7	61.4	51,301	89,434	4,195	29.7	..	39.2
Expenses above income	39.0	75.0	13,473	32,223	3,794	22.7	2.2	29.8

Source: HFCS Austria 2010, OeNB.

Note: Cells that cannot be estimated because of no observations in some of the multiple imputation imputates are marked with "..".

suggest that the aggregate risks stemming from vulnerable households are limited, as we will also see when we estimate the exposure-at-default and loss-given-default measures.

3.3.3 Negative Net Wealth of Vulnerable Households

In order to appropriately assess the risks to the financial market, it is necessary to consider not only the liability side but also the asset side of households' balance sheets. Especially relevant for financial stability is the information whether vulnerable households have negative net wealth or not, i.e. whether their assets do not suffice to offset their total debt level or whether their assets are high enough. If the latter applies, these households' debt poses a relatively low risk to financial stability, given that Austrian debtors are fully liable for their debt (all their assets and even future income can be used to cover the debt). But if the assets do not suffice to offset the debt, banks will incur losses on the default of the vulnerable household; this increases the risk to financial stability.

Table 4 shows that according to most vulnerability measures (debt service to income $\geq 40\%$, expenses above income), the proportion of vulnerable households with negative net wealth ranges between 23% and 30%. The debt-to-asset ratio $\geq 75\%$ vulnerability measure is the only one that identifies a majority of vulnerable households to have negative net wealth. This is not surprising, as this measure selects specifically households with a high debt-to-asset ratio, including those with a ratio larger than 100%. This measure therefore much more often than other indicators identifies new real estate buyers that started to pay off debt only recently to be vulnerable, although such households probably do not have

payment difficulties at the moment. Thus, especially when interpreting the link between negative wealth and financial stability one should be very cautious when using this vulnerability measure.

Finally, we can see that the occurrence of negative net wealth among vulnerable households is concentrated in the nonmortgage debt market, even according to the debt-to-asset $\geq 75\%$ vulnerability measure: While the proportion of vulnerable households with negative net wealth ranges between 2.2% and 43% in the mortgage debt market, these proportions increase in the nonmortgage debt market to between 30% and 83%. This also suggests that vulnerable households use nonmortgage debt as a substitute for wealth.

3.4 Aggregated Risk

After identifying vulnerable households and after analyzing the channels through which they can pose a threat to financial stability in Austria, we can now estimate the potential range of the financial sector's exposure to vulnerable households in Austria using the exposure-at-default and loss-given-default measures. However, it is worth noting that these measures do not imply a default of households. The HFCS does not allow us to measure actual defaults of households on their debt; it only yields indicators of households' vulnerability.

3.4.1 From Vulnerability to Default

The difference between vulnerability and default is shown in the upper part of table 5: It provides the answers of vulnerable households (according to the expenses-above-income vulnerability measure) to the question about their sources of extra income to meet their expenses. The most common answer to this question – given by 66% of

vulnerable households – is spending savings or selling assets. Further common options to meet expenses are getting another loan (27.9%), getting help from relatives or friends (26%), or incurring credit card debt or an overdraft (22.3%). The least common source of extra income is leaving some bills unpaid (5%). This option is the most critical one in terms of how vulnerable a household is, and only a very small share of households uses it. It gives however a good indicator of the share of vulnerable households that are unable to meet their expenses and that may be close to default. Therefore, when estimating the potential range of the financial sector’s exposure to vulnerable households in Austria in the next section (table 6), we will use this indicator to get a lower bound of this exposure.

The bottom part of table 5 shows that most vulnerable households (60.5%) had unusually high expenses in the last 12 months, while only 6.8% had unusually low expenses. The rest (32.7%) had expenses just about average. Furthermore, a majority of vulnerable

households (52%) would be able to get EUR 5,000 from friends or relatives in case they needed financial assistance.

3.4.2 Exposure at Default and Loss Given Default

The standard measures of the risk to financial stability are exposure at default (EAD) and loss given default (LGD). We define them as follows:

$$EAD = \frac{\sum_{i=1}^N PD_i \times D_i}{\sum_{i=1}^N D_i} \times 100$$

where PD_i is the probability of default of household i , which we assume to equal one if the household is vulnerable and zero otherwise, D_i is the total debt of household i and N is the total number of households in the sample;

$$LGD = \frac{\sum_{i=1}^N PD_i \times (D_i - W_i) \times NW_i}{\sum_{i=1}^N D_i} \times 100$$

where NW_i is an indicator variable which equals 1 if household i has negative net wealth and zero otherwise. As before, W_i denotes gross wealth of household i .

Table 6 shows the EAD and LGD measures for each vulnerability definition including the “unable to meet expenses” definition introduced in the previous section. Furthermore, the EAD and LGD measures are split into mortgage and nonmortgage debt to highlight the differences between the two debt markets.

We can see that the proportion of total debt held by vulnerable households (EAD) ranges between 0.8% and 29%, depending on the vulnerability measure. When taking into account each vulnerable household’s wealth, the proportion of total debt held by vulnerable households which is not covered by their assets (LGD) ranges between 0.2% and 10%. The debt-to-

Table 5

How Vulnerable Households Avoid Default

	%
Source of extra income to meet expenses	
Savings, assets	65.5
Credit card debt/overdraft	22.3
Another loan	27.9
Help from relatives/friends	26.0
Leaving bills unpaid	5.0
Other	6.0
Comparison of past 12 months' expenses with average expenses	
Expenses higher than average	60.5
Expenses lower than average	6.8
Expenses just about average	32.7
Ability to get financial assistance from friends or relatives	
Able to get EUR 5,000 from friends	51.5

Source: HFCS Austria 2010, OeNB.

Notes: Vulnerable households are defined according to the expenses-above-income vulnerability measure.

Table 6

Exposure at Default and Loss Given Default according to Vulnerability Measures

Vulnerability measure	Exposure at default (EAD)			Loss given default (LGD)		
	Any debt	Mortgage debt	Nonmortgage debt	Any debt	Mortgage debt	Nonmortgage debt
	%					
Debt to asset $\geq 75\%$	29.3	24.0	54.7	10.2	6.4	26.1
Debt service to income $\geq 40\%$	11.9	9.5	22.4	2.8	..	4.1
Expenses above income	16.5	14.6	25.9	2.2	..	10.3
Inability to meet expenses	0.8	0.8	1.1	0.2	..	0.3

Source: HFCS Austria 2010, OeNB.

Notes: Cells that cannot be estimated because of no observations in some of the multiple imputation imputates are marked with "..".

asset $\geq 75\%$ vulnerability measure can be thought of as an upper bound for the risk to financial stability, because it identifies new real estate buyers that started to pay off debt only recently as vulnerable more often than other vulnerability measures, although such households probably do not have payment difficulties at the moment (see also section 3.3.3). Furthermore, the inability-to-meet-expenses vulnerability measure can be thought of as a lower bound for the risk to financial stability because it only identifies those households as vulnerable that may be closest to default (see 3.4.1).

The above figures are in line with the results for other countries. In Spain, the IMF (2012) estimates¹⁶ an EAD of 46% and an LGD of 1% for 2008 (and projects 40% and 2% respectively for 2011) using the debt service-to-income $\geq 40\%$ vulnerability measure. This compares to our estimates of 11.9% and 2.8%. In Canada, Djoudad (2012) estimates an EAD of 10.63%. In Chile, using a similar measure, Fuenzalida and Ruiz-Tagle (2009) estimate an EAD of 20%. Using the negative financial margin as the vulnerability measure, which is comparable to our

expenses-above-income vulnerability measure, Sugawara and Zalduendo (2011) estimate an EAD of 27.1% to 31.3% and an LGD of 5.4% to 6.3% for Croatia. This compares to our estimates of 16.5% and 2.2%. Using the same measure, Vatne (2006) estimates an EAD of 16% for Norway in 2004; Holló and Papp (2007) estimate an EAD of 7.1% to 22% for Hungary in 2007. In Sweden, Johansson and Persson (2007), using the same measure, estimate an EAD of only 5.6% and an LGD of 0.9% for 2004.

Table 6 also shows that in the nonmortgage debt market, EAD and LGD are much higher than in the mortgage debt market. We know from section 3.3.1 that this is due to the fact that the majority of vulnerable households participates in the nonmortgage debt market, which is where negative net wealth occurs more often. It seems that vulnerable households use nonmortgage debt as a substitute for income and wealth. Moreover, this low risk is not strongly concentrated on certain regions or bank sectors, as further calculations done by the authors show (not presented in this paper).

¹⁶ The results for different countries might not be fully comparable due to time differences and differences in data and definitions; they are provided as up-to-date reference indicators.

4 Conclusions

The debt burden of some groups of Austrian households is quite large. Households with low income and low wealth, or households with an unemployed reference person are found to be particularly vulnerable. Additionally, the median indebted household's loan-to-value ratio at the time the mortgage was taken out or refinanced seems to have increased during the past decades.

However, the risk to financial stability stemming from the debt of vulnerable households seems to be relatively low. First, most vulnerable households hold nonmortgage debt, which tends to be much lower than mortgage debt. Second, most vulnerable households have positive net wealth. Third, most vulnerable households have extra sources of income to meet their expenses. Fourth, there is no height-

ened concentration of risk in terms of LGD in certain regions or bank sectors. Fifth, the comparison of loan-to-value ratios, the proportion of vulnerable households, and the EAD and/or LGD risk measures with those of other countries shows that in Austria these indicators are in line with what is found in the literature.

However, a qualification to this analysis is that it is based on current income, wealth and debt figures, which may change with economic conditions. Especially in Austria, where adjustable interest rate loans are more common than fixed ones, or where foreign currency loans are (very) popular among indebted households, the debt burden may be quite sensitive to changes in interest rates, exchange rates, or stock markets. Therefore, a dynamic vulnerability analysis is left for future research.

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