

How financially vulnerable are CESEE households?

An Austrian perspective on its neighbors

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We employ newly available microdata to analyze household indebtedness and financial vulnerability in selected CESEE countries. The new 2014/15 wave of the Household Finance and Consumption Survey (HFCS) covers Slovenia, Estonia, Hungary, Latvia, Poland and Slovakia. Austrian banks have significant exposure to households in many CESEE countries, and the number of nonperforming loans is rather high in some of them. Our goal is to provide a clear picture of household vulnerability and its potential impact on financial stability and thus to allow for thinking in evidence-based scenarios. We focus on the joint distribution of debt and collateral and add several measures of financial vulnerability, such as loan-to-value, debt-to-income and debt service-to-income ratios. In addition, we employ econometric methods from the decomposition and policy evaluation literature to decompose differences in vulnerability measures between countries into two parts: one that is attributable to different borrower characteristics and another that is down to other external factors, such as differences in banks' behavior across countries. Our results show that households are particularly vulnerable in Latvia and Hungary and that variations in household composition have different effects on vulnerability across the countries covered.

JEL classification: C81, D31, E21, E31, G21, O52, R31

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Credit risk is one of the most important factors for determining a bank's solvency. It is shaped by the default risk of the bank's different borrowers (companies, other banks, governments and households). Referring to households, credit risk typically includes the risk of increasing collection costs, unforeseen changes in cash flow, and partial or full loss of the principal and interest. In some countries, political credit risk is also rather high in that the government may change the contractual terms between the bank as a lender and its borrowers. In recent years, the assessment of banks' credit risks stemming from the household sector has been increasingly based on household-level microdata collected via surveys. One reason for the emergence of this kind of literature is data availability. The Household Finance and Consumption Survey (HFCS), conducted by individual central banks in Europe and compiled by the European Central Bank (ECB), is a novel dataset that provides harmonized data on household balance sheet items, including all assets and liabilities, but also a trove of information on sociodemographic variables, income and consumption. The second wave of HFCS data, which were released at the end of 2016, allow us to analyze, for the first time, assets and liabilities for several Central, Eastern and Southeastern European (CESEE) countries based on a priori harmonized data.

The literature on household vulnerability examines households' vulnerability and risk-bearing capacity, i.e. it takes the borrowers' perspective to assess risks stemming from the household sector. In its handbook, the European Systemic

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Risk Board (ESRB) repeatedly underlines the importance of an individual debtor perspective (ESRB, 2014). The key tools for macroprudential risk management are debtor-level indicators: debt service-to-income (DSTI), debt-to-income (DTI), debt-to-asset (DTA) and loan-to-value (LTV) ratios as well as exposure at default (EAD) and loss given default (LGD). The availability of such risk indicators at the debtor level is a crucial precondition for supervisors when analyzing the financial stability of the household sector and performing (targeted) macroprudential interventions (Albacete and Lindner, 2013 and 2015; Albacete et al., 2014).

A household's level of indebtedness and wealth and the prevalence of vulnerability are likely influenced by characteristics such as household size as well as age, education and employment status of the reference person², among other things. Such household characteristics, however, vary notably across our set of countries (see annex). To be able to make a meaningful comparison of vulnerability levels, we need to address these differences first. Fessler, Lindner and Segalla (2014) studied the link between household characteristics and differences in the wealth distribution across countries using the HFCS data. They find significant effects stemming from differences in household characteristics, which makes filtering out those differences important for a cross-country analysis of wealth. In this paper, we analyze household vulnerability in Slovenia, Estonia, Hungary, Latvia, Poland and Slovakia and try to derive some of the sources of risk for financial stability in these countries and for Austria, whose banking sector is exposed to CESEE economies. In addition, we identify vulnerable households under a counterfactual distribution in order to analyze the extent to which differences in the level of vulnerability can be explained by differences in household characteristics. Of course, there are other factors than household characteristics that affect vulnerability. Bover et al. (2016), who analyzed the role of economic institutions in the holding of debt and debt levels, found that the length of asset repossession periods accounts best for differences in the distribution of debt across countries. However, we focus on households' contribution to differences in vulnerability, whereas other potential factors are included in the remaining difference.

The remainder of this paper is organized as follows. In section 1 we give an overview of Austrian banks' exposure in the countries covered. Section 2 examines debt holdings across these countries along intensive and extensive margins. Section 3 introduces our measures of vulnerability and delivers a descriptive cross-country analysis. We focus not only on the means and medians but also on the overall distribution of risk-bearing capacity. In section 4, we employ econometric methods from the decomposition and policy evaluation literature to decompose cross-country differences in vulnerability to filter out the part attributable to different household characteristics across countries.

1 Austrian banks and house prices in the countries covered

The lending activity of Austrian banks in CESEE is important for both the Austrian banking system and CESEE economic growth. Taken together, the six economies analyzed (Slovenia, Estonia, Hungary, Latvia, Poland and Slovakia) account for over 20% of Austrian bank lending activities abroad (Bank for International Settlements (BIS) consolidated banking statistics 2016, own calculations). The largest

² The reference person is defined according to the standard Canberra definition.

share of foreign lending goes to the private sector, usually followed by the public sector and banks. In those countries where Austrian banks are less active (Estonia, Slovenia), exposure is almost fully concentrated on the private sector, while it is more diversified in Slovakia, Poland and Hungary.

With regard to geographical distribution, Austria seems to have a much closer relationship with its immediate neighbors (Slovakia, Slovenia, Hungary) and Poland than with the other countries covered. Austrian banks have by far the highest exposure toward Slovakia, which accounts for 9%–10% of total foreign claims, whereas lending activity in the Baltics is only marginal. Cross-border banking activity has decreased overall, most notably in Hungary and Slovenia, while remaining stable in Slovakia and Poland (see chart 1).

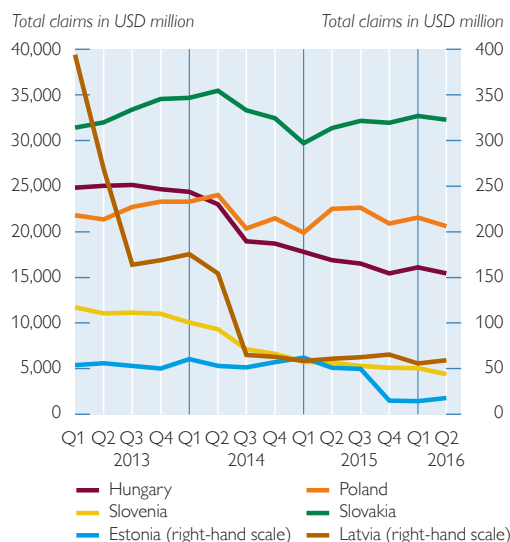
As we will discuss in detail in section 2, mortgages linked to the household main residence (HMR) are by far the most important liabilities of households in terms of extensive and intensive margins. Therefore, house prices can have a direct impact on LTV ratios as well as LGD.

However, it is crucial to understand that house price developments will become a risk to financial stability only once households' debt-servicing capacity decreases and households default, i.e. as long as a household is able to service its debt, actual house prices do not matter with respect to financial stability. They do matter to buyers who purchase houses in a booming market, though (as observed particularly in CESEE (OECD, 2016)). These borrowers may be granted higher mortgage loans in absolute terms, as the value of the house they purchase is considered higher, even though the buyers' LTV ratios might be similar to those during less overheated periods.

In a crisis, which might reveal vulnerabilities due to rising unemployment, stagnating wages and other adverse economic developments, the share of vulnerable households is also likely to increase. This, however, is not a result of changing

Chart 1

Austrian banks' claims

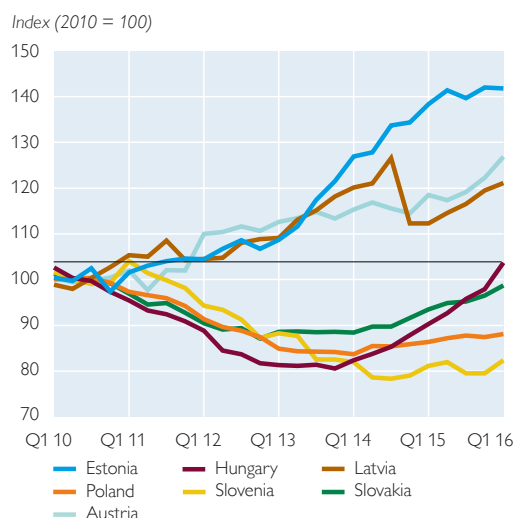


Source: BIS.

Note: Austrian consolidated foreign claims on domestic banks (excluding domestic positions), ultimate risk basis.

Chart 2

Nominal residential property prices



Source: BIS.

house prices, which mainly affect financial stability with regard to the EAD and LGD of already vulnerable households (Albacete, Fessler and Lindner, 2016).

Chart 2 shows the development of property price indices in the selected CESEE countries as well as Austria. Such data, at best, describe price developments of the housing stock at the mean. In many cases, however, they mostly capture property transactions using hedonic methods. Either way, even though they do not show a precise picture of house price developments for median and specifically vulnerable households, they still give us an idea of the general direction of house price developments. Chart 2 shows that there are three basic groups of countries. In Latvia and Estonia as well as in Austria, prices increased between 2010 and the first quarter of 2016. In Hungary and Slovakia, they decreased between 2010 and 2013 but then recovered to reach and exceed the 2010 level, while in Slovenia and Poland, prices decreased until 2013 and have more or less stagnated since. Note again that these price developments do not tell us anything about the implications for the median or the vulnerable property holder. Price developments in different segments of the property market (e.g. high-end vs. low-end, urban vs. rural, or rent vs. property) can be heterogeneous (see Albacete, Fessler and Lindner, 2016, for the case of Austria).

2 Indebted households and their debt

Aggregate debt developments within countries do not tell us much about credit risk. For an assessment of credit risk it is essential to know two things about a borrower: first, their probability of default in a given time period, and second, the LGD, which is the amount of debt that is irrecoverable. Usually, it is a fraction of the outstanding debt or exposure at default. Once these two things are known for all borrowers, we can assess the distribution of expected losses and model different scenarios affecting the probability of default (e.g. income or interest rate shocks) or the LGD (e.g. house price changes, which directly affect the recovery rate of banks). Naturally, it is rather difficult to assess the probability of default for each and every borrower. Markets are not perfect, and therefore the probability of default is not perfectly captured by the interest rate. That is why we use a set of measures to assess vulnerability, such as high DSTI and DTI ratios or financial margins. Nevertheless, these are just crude measures of the likelihood of actual default. The LGD is easier to approximate as it is basically the difference between a household's current value of liabilities and certain realizable assets it holds. Table 1 shows the prevalence, i.e. extensive margins, of selected household assets and liabilities across countries.

The countries covered here are characterized by high homeownership rates. All our HFCS-based results are produced taking into account complex survey weights as well as multiple imputations (for a detailed explanation, see ECB, 2016). A vast majority of households own their primary residence, ranging from about 74% of households in Slovenia to above 85% in Slovakia. These numbers are rather large compared to the about 48% of owner-occupiers in Austria or 44% in Germany (or about 64% in the United States). Financial asset holdings are not too common in the countries analyzed except in Estonia (99%): Whereas almost every household in Austria has one or more deposits with a bank, deposits are less widespread in Hungary (81%), Latvia (78%) and Poland (82%). Higher-risk assets, such as mutual fund shares, bonds and/or stocks, are not very common in CESEE coun-

Vulnerability measures			
Measure	Notation	Description	Threshold
DTA	$DA_i = \frac{D_i}{W_i} * 100$	D _i is the household's total liabilities and W _i is the household's total gross wealth. 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.	≥ 75%
DTI	$DTI_i = \frac{D_i}{I_i}$	D _i is the household's total liabilities and I _i is the household's gross annual income. This ratio provides information about the share of debt that can be paid back in terms of annual income. This indicator, however does not account for maturity.	≥ 3
DSTI	$DSTI_i = \frac{DS_i}{I_i} * 100$	DS _i are a household's total monthly debt payments and I _i is the household's gross monthly income (gross yearly income divided by 12). This ratio provides an indicator of the burden that debt holdings represent for current income and, more than the other ratios, reflects the significance of short-term commitments.	≥ 40%
LTV	$LTV_i = \frac{DHMR_i}{VHMR_i} * 100$	DHMR is the household's outstanding mortgage debt with respect to the HMR, and VHMR _i is the respective current value of the HMR. This indicator provides information about total credit risk in relation to the pledged assets.	≥ 75%

Source: Albacete and Lindner, 2013; Albacete and Fessler, 2010; ECB, 2013a.

tries compared with Austria (about 13%, which is already rather low), either. Given the large number of owner-occupiers, one would expect a rather high prevalence of mortgage debt. While debt related to the HMR is especially common in Estonia and Hungary (both about 19%), it is less common in Slovenia or Poland (about 8% and 12%, respectively), countries which have the highest prevalence of non-mortgage debt (both over 23%). Overdraft seems to be a very common form of debt in Slovenia (22%). The high level of homeownership and comparatively low prevalence of debt related to the HMR can, to some extent, be explained by the privat-

Table 1

Assets and liabilities: extensive margins

	Slovenia	Estonia	Hungary	Latvia	Poland	Slovakia	Austria
% of households							
Real assets	91.5	87.1	90.4	86.7	88.8	93.7	84.5
Household main residence	73.7	76.5	84.2	76.0	77.4	85.4	47.7
Financial assets	94.6	98.8	82.8	80.2	88.9	88.7	99.8
Deposits	93.3	98.6	81.1	78.5	82.8	88.2	99.7
Mutual fund shares, bonds, stocks	6.4	6.1	11.2	1.3	5.3	5.3	12.8
Debt	38.6	36.8	36.9	33.5	37.0	36.7	34.4
Mortgage debt	9.1	20.7	20.1	17.0	13.4	16.2	16.7
Household main residence	8.2	18.7	18.8	13.5	12.0	15.2	15.5
Other real estate	1.2	2.7	1.8	3.8	1.6	1.4	1.5
Non-mortgage debt	34.8	25.1	25.5	23.0	28.4	25.3	20.6
Overdraft	22.1	9.6	11.5	5.7	6.1	6.1	12.3
Credit card	1.9	8.4	3.9	3.1	5.3	4.2	1.4
Non-mortgage loans	23.4	13.2	17.6	17.8	23.5	20.3	11.7
Private loans	2.3	–	9.8	5.6	–	4.9	4.8
Net wealth	100.0	100.0	100.0	100.0	100.0	100.0	100.0
Net sample size	2,553	2,220	6,207	1,202	3,483	2,136	2,997

Source: HFCS 2014, ECB, OeNB.

ization of the housing market during the post-communist transition period. This is why housing credit is a fairly new tool and mostly used by the younger generation (see Meriküll and Rõõm, 2016; OECD, 2016).

The *extensive margins* tell us which assets and liabilities are important in terms of the share of the household population holding them and which households we need to focus on when we analyze credit risk stemming from the household sector. While small changes in the assets or liabilities aggregates might be due to large changes with respect to a few specific household types, large changes in the aggregates might be marginal from a borrower perspective if they stem from a large share of the household population.

As a next step, we analyze the *intensive margins*, i.e. the conditional medians of the debt of those households that actually hold debt. Aggregates are comparable to unconditional means and understate the true weight of debt at the household level. A comparatively large unconditional mean might result from many households holding relatively small amounts of debt, while a small unconditional mean might stem from a few heavily indebted households. The latter situation could be much more problematic from a financial stability perspective, but comparing aggregates (unconditional means) might misleadingly tell the opposite story.

Table 2 shows the intensive margins in EUR thousand. Note that we do not adjust for purchasing power parities. We think it does not make much sense with regard to assets and liabilities, especially as the link to consumption is not clear and the assumption of common consumption baskets across countries is rather strong, especially given the subgroups of the household population presented in table 2. Note also that especially financial assets tend to be underestimated in surveys. This is partly due to the underrepresentation of wealthy households and partly due to misreporting. While the former does not matter in terms of financial stability, as the wealthiest households tend to be not financially vulnerable, the latter might be important for such analyses. However, three of the four measures we use do not include financial assets.

Median values of real assets as well as financial assets are markedly smaller in the countries under investigation than in Austria. While the median value of the HMR is EUR 250,000 in Austria, it ranges from EUR 15,000 (Latvia) to about EUR 88,000 (Slovenia) in the other countries of our sample. In all countries but Hungary, median deposit values are below EUR 2,000, while they are at almost EUR 12,000 in Austria.

Interestingly, mortgage debt is comparatively large in the CESEE countries analyzed. The median mortgage on the HMR is between roughly EUR 11,000 (Hungary) and EUR 30,000 (Slovenia), while it is about EUR 60,000 in Austria. Put differently, the conditional median value of the main residence is 3 to 17 times larger in Austria, while the conditional median mortgage on the main residence is only about 2 to 5 times larger in Austria than in the other countries analyzed. This is a first indication of possibly higher LTV ratios in the CESEE countries. However, one has to take into account that mortgage loans in different countries might differ systematically in how recently they were granted on average. Likewise, households that hold debt might differ systematically in terms of size, education, age and income, and the characteristics of the main residences themselves might differ, too. Even though LTV ratios might be rather large given the low property values, DSTI and DTI ratios could be rather small given the low debt levels.

Table 2

Assets and liabilities: intensive margins

	Slovenia	Estonia	Hungary	Latvia	Poland	Slovakia	Austria
<i>Conditional medians in EUR thousand</i>							
Real assets	89.3	52.0	30.1	20.0	70.1	54.8	139.7
Household main residence	87.8	44.9	26.1	15.1	64.4	50.0	250.0
Financial assets	1.1	2.1	3.4	0.4	2.0	2.6	15.4
Deposits	0.6	1.2	2.8	0.3	1.1	1.8	11.9
Mutual fund shares, bonds, stocks	2.9	1.8	9.8	8.0	2.4	1.9	15.9
Debt	5.0	6.4	6.2	7.2	2.4	6.0	12.4
Mortgage debt	30.0	27.0	11.4	26.0	24.2	21.4	60.4
Household main residence	30.4	27.6	10.8	21.0	24.0	21.0	59.9
Other real estate	29.0	21.8	14.7	31.5	24.3	37.5	53.0
Non-mortgage debt	2.5	0.7	1.6	1.0	1.0	1.6	2.9
Overdraft	0.9	0.0	0.6	0.5	0.5	0.4	1.0
Credit card	0.3	0.4	0.6	0.3	0.4	0.3	1.3
Non-mortgage loans	4.4	1.4	3.2	1.2	1.1	2.4	6.2
Private loans	2.0	–	3.2	0.7	–	2.0	2.9
Net wealth	80.4	43.5	26.2	14.2	57.1	50.3	85.9

Source: HFCS 2014, ECB, OeNB.

To analyze these issues further, we have to link assets and liabilities as well as liabilities and income at the household (borrower) level, and analyze the distribution of the resulting measures (see section 3). With regard to non-mortgage debt, one can clearly see that while it might pose a threat to the households themselves, it is hardly a problem for overall financial stability given its low levels. Only Slovenia shows a combination of rather large extensive and intensive margins of non-mortgage debt compared to mortgage debt. Almost one-fifth of Slovenian households hold non-mortgage loans of about EUR 4,500 at the median.

3 Household vulnerability across countries

In this section we jointly analyze assets and liabilities and income and liabilities at the household level and calculate vulnerability measures.

Table 3 shows median household gross income, median household net wealth, the most common vulnerability measures as well as typical maturities for main residence mortgages across countries. In terms of median income and median wealth, Estonia, Hungary and Latvia are at the bottom and Slovenia is at the top of the countries in our sample. While some cross-country correlation exists between income and wealth, the variation of median income is much smaller than that of median wealth.

DTA ratios are highest in Latvia (about 28%) and Hungary (20%) and particularly low in Slovenia (9%) and Poland (7%). One reason behind this is that many households in Slovenia and Poland hold non-mortgage debt that is used for consumption rather than purchasing actual assets but no mortgage debt. The DTI ratio is rather high in Hungary (about 60%), Latvia (about 43%) and Slovakia (42%). Slovakia, however, has a particularly low DTA ratio (13%). The ratio of median DSTI is also highest in Hungary (16%), and also rather high in Slovenia (13%). Actual median LTV ratios – of owner-occupiers with a mortgage – are highest in Latvia (about 58%) and Estonia (about 44%).

While actual LTV ratios of the main residence seem to be really somewhat larger in CESEE than in Austria, this is not true for DTA ratios (including all

indebted households) or DTI ratios. This might result from the fact that median housing assets (main residences) are still significantly cheaper in those countries (see table 2), and rental markets are far less developed. The data also seem to reveal that the ratio of housing value to income is somewhat inversely related to the LTV ratio: While in Austria (which has a rather low LTV ratio), the value of the HMR is seven times higher than a median household's gross yearly income, this ratio is roughly 2 for Latvia, which has the highest LTV ratio in our sample. That supports the line of thought that, in some of the countries in our sample, households are able to take on relatively more debt (in terms of LTV ratios) than in other countries since they find it relatively easier to pay back their debt using income-generated savings. Thus, households can afford high LTV ratios, while their debt is still comparatively small with regard to their income. This effect is especially pronounced as many lower-wealth households with potentially larger LTV ratios (required to buy housing at all) are able to enter the housing market in those countries, whereas in Austria or Germany, this segment typically turns to the rental market.

From this first step of vulnerability analysis, households in Hungary and Latvia potentially appear to be the most vulnerable, as they show rather high values in many median vulnerability measures. The rather high DTI and DSTI ratios in Hungary are contrasted by rather low median initial maturities (15 years), which in Latvia are 5 years longer. However, one has to take into account (1) other mitigating factors, like maturity and type of loan, (2) the full distributions instead of only the median (see below), (3) the EAD and LGD values implied (see below) as well as (4) differences in household characteristics across countries (see section 4). Even though the median is a robust statistic and much better suited than the mean to get an idea of typical levels given the skewness of the distributions at hand, it still only gives information about a certain part of the distribution. Identifying potentially risky pockets is important, as only a few households might pose a risk to financial stability if their configuration of debt, assets and income is problematic. That is why it is important to look at the full distributions of vulnerability measures.

Table 3

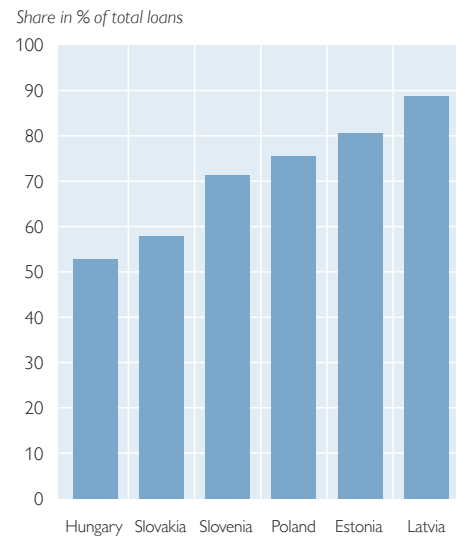
Medians of income and wealth and related vulnerability measures

	Slovenia	Estonia	Hungary	Latvia	Poland	Slovakia	Austria
<i>EUR thousand</i>							
Gross income	14.9	11.1	7.9	8.7	13.4	13.1	35.7
Net wealth	80.4	43.5	26.2	14.2	57.1	50.3	85.9
<i>%</i>							
Debt-to-asset ratio, all indebted households	8.6	15.3	20.2	28.2	6.8	12.6	20.1
Debt-to-income ratio, all indebted households	24.9	38.3	60.3	42.8	15.2	42.0	32.7
Debt service-to-income ratio, households with debt payment	12.6	9.7	16.4	11.4	9.9	11.1	5.8
Loan-to-value ratio of main residence	32.7	44.0	40.0	57.7	33.2	34.6	24.8
<i>Years</i>							
Initial maturity of the highest main residence loan	15.0	20.0	15.0	20.0	24.0	24.4	25.0

Source: HFCS 2014, ECB, OeNB.

Chart 3

Adjustable loans



Source: HFCS 2014, ESCB.

Another important issue is the share of adjustable mortgage loans, which is particularly low in Hungary (see chart 3). Generally, adjustable mortgage loans are much more common in CESEE, ranging from a little above 50% (Hungary) to almost 90% (Latvia) of mortgage loans for the household main residence. Banks can (and hopefully do) use different types of swaps to hedge against this type of interest rate risk. However, adjustable mortgage loans also imply a certain credit risk, such as cash flow restrictions resulting from early debt repayments due to interest rate changes, or defaults or necessary changes in maturity when households are unable to meet their debt settlement schedule given higher interest rates.

Table 4 gives information about potentially vulnerable households, i.e. the share of households which exceed a certain vulnerability threshold. The thresholds were chosen in line with usual ECB thresholds (see box 1). With regard to the DTI ratio, Latvia and Hungary show the highest share of households above a threshold of 3. In terms of DSTI ratios (for indebted households), Hungary and Latvia again seem to have the most vulnerable households. In terms of LTV ratios, it is mainly Latvia, with over 40% of households above an LTV ratio of 75%, which might be linked to the 2014 collapse of house prices (see chart 2). Thus, a look at the top of the vulnerability measure distributions further indicates potential financial fragility stemming from the household sector in Hungary and Latvia.

Chart 4 shows the full distribution of LTV, DTA, DTI and DSTI ratios for the countries in our sample. The values recorded for Latvia (green line) clearly lie above those of all other countries across the full distribution of LTV and DTA ratios; they are also highest for the DTI measure (surpassing Hungary, red line) and the DSTI measure (together with Hungary). In an area where DTI values are still relevant (far from zero percent of households), the lines seem to cross particularly often, indicating uneven vulnerability characteristics across households.

Table 4

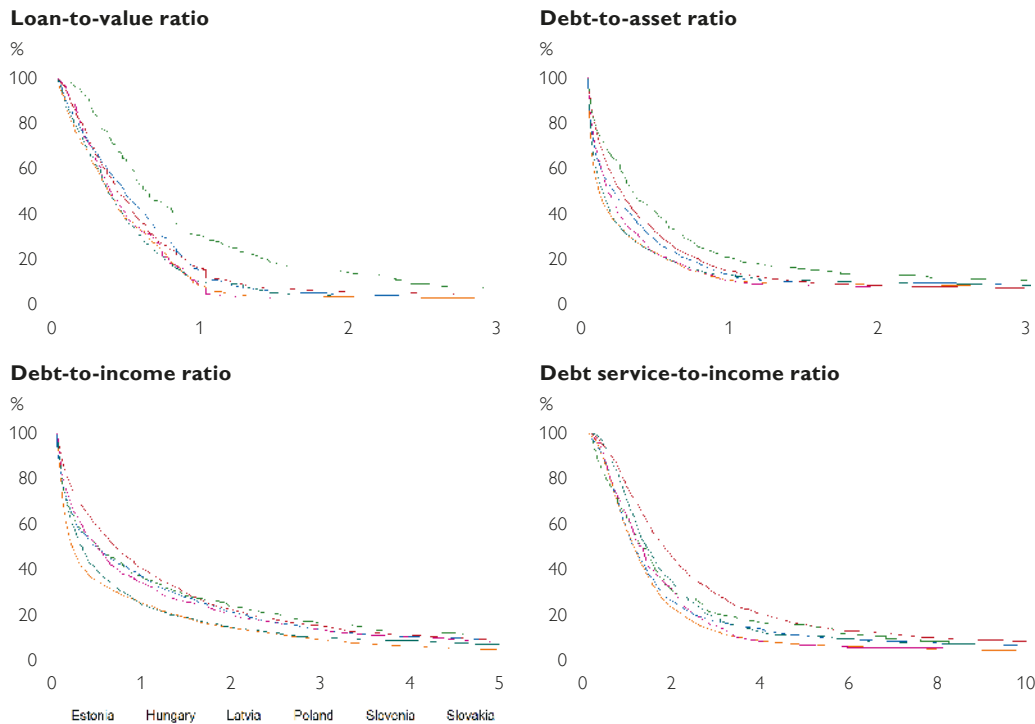
Potentially vulnerable households according to different measures

	Slovenia	Estonia	Hungary	Latvia	Poland	Slovakia	Austria
Debt-to-income ratio ≥ 3	0.07	0.10	0.12	0.13	0.06	0.10	0.10
Debt service-to-income ratio $\geq 40\%$	0.07	0.08	0.13	0.11	0.05	0.04	0.02
Debt service-to-income ratio $\geq 40\%$, with debt payments	0.09	0.10	0.17	0.14	0.05	0.05	0.02
Loan-to-value ratio $\geq 75\%$	0.17	0.26	0.24	0.41	0.18	0.17	0.09

Source: HFCS 2014, ECB, OeNB.

Chart 4

Share of indebted households whose ratios exceed the threshold



Source: HFCS 2014, ESCB.

Table 5 shows the share of debt that remains when we subtract different assets at the household level from total debt. Such measures of debt coverage give us information on the extent to which households are able to sell assets in order to meet their debt obligations in case of liquidity constraints or potential default. Therefore, they refer to households' LGD. Among the CESEE countries in our sample, the share of household debt covered by the most liquid financial assets is largest in Hungary: After subtracting financial assets from total debt, only 63% of debt is left. In contrast, about 85% of household debt remains in Latvia (table 5, third

Table 5

Potentially vulnerable households according to different measures

	Slovenia		Estonia		Hungary		Latvia		Poland		Slovakia		Austria	
	hh	debt	hh	debt	hh	debt	hh	debt	hh	debt	hh	debt	hh	debt
Debt	38.6	100.0	36.8	100.0	36.8	100.0	33.5	100.0	37.0	100.0	36.6	100.0	34.4	100.0
Debt minus deposits	28.2	81.8	28.6	89.6	24.6	74.5	27.4	88.1	24.1	80.3	25.6	84.5	21.4	73.4
Debt minus financial assets	25.9	76.0	26.5	82.3	21.7	63.4	25.3	85.0	20.4	76.3	23.4	78.7	19.0	65.6
Debt minus financial assets and other real estate	21.6	59.5	19.0	52.2	21.2	56.1	20.1	61.8	18.6	57.1	22.9	64.6	17.2	55.3
Debt minus financial assets and other real estate and household main residence	5.9	6.3	4.7	3.1	4.7	10.3	7.4	16.1	3.6	1.8	3.6	3.4	7.4	8.9
Debt minus gross wealth	3.6	4.7	3.4	2.0	4.1	8.7	5.6	13.9	2.7	1.3	2.5	2.7	5.6	6.9

Source: HFCS 2014, ECB, OeNB.

Note: This table shows the percentage share of households holding positive debt after deducting certain assets (hh) as well as the share of this debt in total debt (debt).

line), where liquidity-constrained households are only able to cover about 15% of their debt by selling the financial assets they hold. Including real estate property other than the main residence (table 5, fourth line) – something households might also realize before they sell their main residence – the share of remaining debt is lowest in Estonia (about 52%) and highest in Slovakia (about 65%). Looking at debt minus gross wealth, Latvian (14%) and Hungarian (9%) households hold the highest shares of total debt not covered by any asset. In Poland, household debt is virtually fully covered by total assets. As mentioned in section 2, Hungary and Latvia struggled with declining property values. While Latvia faced a sharp reduction in property prices in 2014 from which it has slowly recovered, house prices in Hungary have only recently returned to the 2010 values, but were notably lower at the time of the survey. All other countries show substantially lower levels of uncovered debt, which are also lower than the Austrian value of 7%. Depending on a country's bankruptcy and insolvency regulations, these figures are particularly crucial to banks in the case of (systemic) default, since these are rough estimates of what each bank has to be able to cover.

In section 4 we turn to analyzing which share of the cross-country differences we observed so far might just be down to differences in household characteristics and which is due to differences in vulnerability given the same household characteristics, i.e. stemming from diverging developments since the loans were taken out or from differences in banks' assessment of a household's situation and its future payment and risk-bearing capacities across similar households in different countries.

4 What drives the difference? Filtering out household characteristics

In this section we use methods from the economic decomposition literature to decompose the differences in indebtedness and vulnerability measures M across countries $c \in C$ into a part that is explainable by observable household characteristics and an unobservable part. This way we can produce a set of counterfactual measures M_{rew}^c , which is based on a comparison of households that are similar in their characteristics X , as opposed to the original set M^c , where differences between measures are due to differences within similar households as well as differences in the share of different households according to their characteristics X .

Suppose we observe a cross-section with independent and identically distributed draws from the distribution P of variables (Y, C, X) , where Y is a set of variables used to calculate risk measures M^c , C is a set of dummies identifying countries c , and X is a set of limited but important household characteristics (household size as well as age, education and employment status of the household's reference person). Note that especially education is a good predictor of lifetime income and social status and networks. Note also that this is drawn over all of the countries $c \in C$ and not for each country separately. Our HFCS subset using adequate weighting represents such a draw, where countries can be interpreted as a stratification dimension of the survey.

We denote $P^c(Y|X)$ as the conditional distribution of Y given X for country $C=c$, and define

$$P_{rew}^c(Y) := \int_X P^c(Y|X) dP(X). \quad (1)$$

The distribution defined in equation (1) is the distribution of Y given X for the subpopulation in country $C=c$, but averaged over the full population distribution (X including all countries). That is why this distribution is a counterfactual distribution for each country $c \in C$, in which household characteristics are identical across households and match the overall distribution of X across all countries considered. Note that using this overall distribution minimizes the need of reweighting to achieve the new distribution of X for all countries.

Such approaches have been around since the seminal contribution of Rosenbaum and Rubin (1983) and have become popular in economics after the contribution of DiNardo, Fortin and Lemieux (1996). A fairly recent review of decomposition methods can be found in Firpo, Fortin and Lemieux (2011). While most applications in the literature – especially in policy evaluation – use these methods with additional assumptions to retrieve causal effects, we use them to filter out differences due to household characteristics to be able to basically compare apples to apples when comparing across countries, i.e. take into account that households are systematically different in different countries, and identify remaining differences between similar households across countries.

To practically create the counterfactual distributions defined in (1), we need to calculate the reweighting factors for each country Ψ^c , which is given by

$$\Psi^c(X) := \frac{P(X)}{P^c(X)} = \frac{\mathbb{1}(C = c)}{P(C = c|X)} \quad (2)$$

where $\mathbb{1}(\cdot)$ is the indicator function and $P(C=c|X)$ is the probability that a household lives in country c given its characteristics X . As we are not observing (1) we have to construct it by using Ψ^c , as we can rewrite (1) to

$$P_{rew}^c(Y) := \int_X P^c(Y|X) \Psi^c dP^c(X). \quad (3)$$

However, this requires the estimation of Ψ^c . In principle we could use different parametric, semiparametric and nonparametric methods to estimate $P(C=c|X)$. We keep it simple and use a logit regression for every country c :

$$\hat{P}(C = c|X) = \frac{\exp(X \cdot \beta^c)}{1 + \exp(X \cdot \beta^c)} \quad (4)$$

Once the data are reweighted using Ψ^c , we can decompose the differences between any country measure M^c and the overall measure M (its difference to the average) into a part which is explained by different household characteristics X , namely

$$M - M^c = (M - M_{rew}^c) + (M_{rew}^c - M^c) \quad (5)$$

where $M_{rew}^c(P_{rew}^c(Y))$ are measures calculated on reweighted counterfactual data, and therefore the first term reflects the remaining differences and the second term the differences due to household characteristics. Note in particular that we can also decompose any distributional statistic of all household-level measures, such as quantiles.

Chart A1 in the annex shows the distributions of the estimated propensity scores for all countries. As expected, given the limited household characteristics we wish to rebalance, the overlap in all cases is rather large. However, table A1 (original data) and table A2 (reweighted data) in the annex show that the amount of rebalancing is still rather substantial for many household characteristics. Note that full rebalancing is not feasible as we use a semiparametric procedure to rebalance, and continuous covariates cannot be rebalanced completely. Still, a large part of the variation in household characteristics between countries is eliminated by the procedure.

As mentioned in the introduction, household characteristics vary across countries (see annex, tables A1 and A2): Larger households (four or more persons) are more common in Poland and Slovakia, smaller ones (one or two persons) in Estonia, Hungary and Latvia. While the chosen reference person is likely to be middle-aged in Slovenia, Poland and Slovakia, reference persons were more often on the upper and lower edges of the age distribution in Estonia, Hungary and Latvia. Also with respect to education and employment, characteristics are heterogeneous. Note that the aim of this paper is not to harmonize vulnerability measures, hence we do not claim that the reweighted measures are in any way better suited to assessing vulnerability. We rather seek to analyze the degree to which differences are down to household structure in order to better understand how this might influence vulnerability analyses when comparing countries. If the reweighted figures are larger than the original, the country's specific household structure has a dampening effect on household vulnerability. Here, other factors (likely stemming from the macroeconomic environment, the banking sector or the regulatory environment) might contribute to financial vulnerability. If the reweighted figures are smaller than the original, the country's household characteristics could be considered a factor contributing to vulnerability.

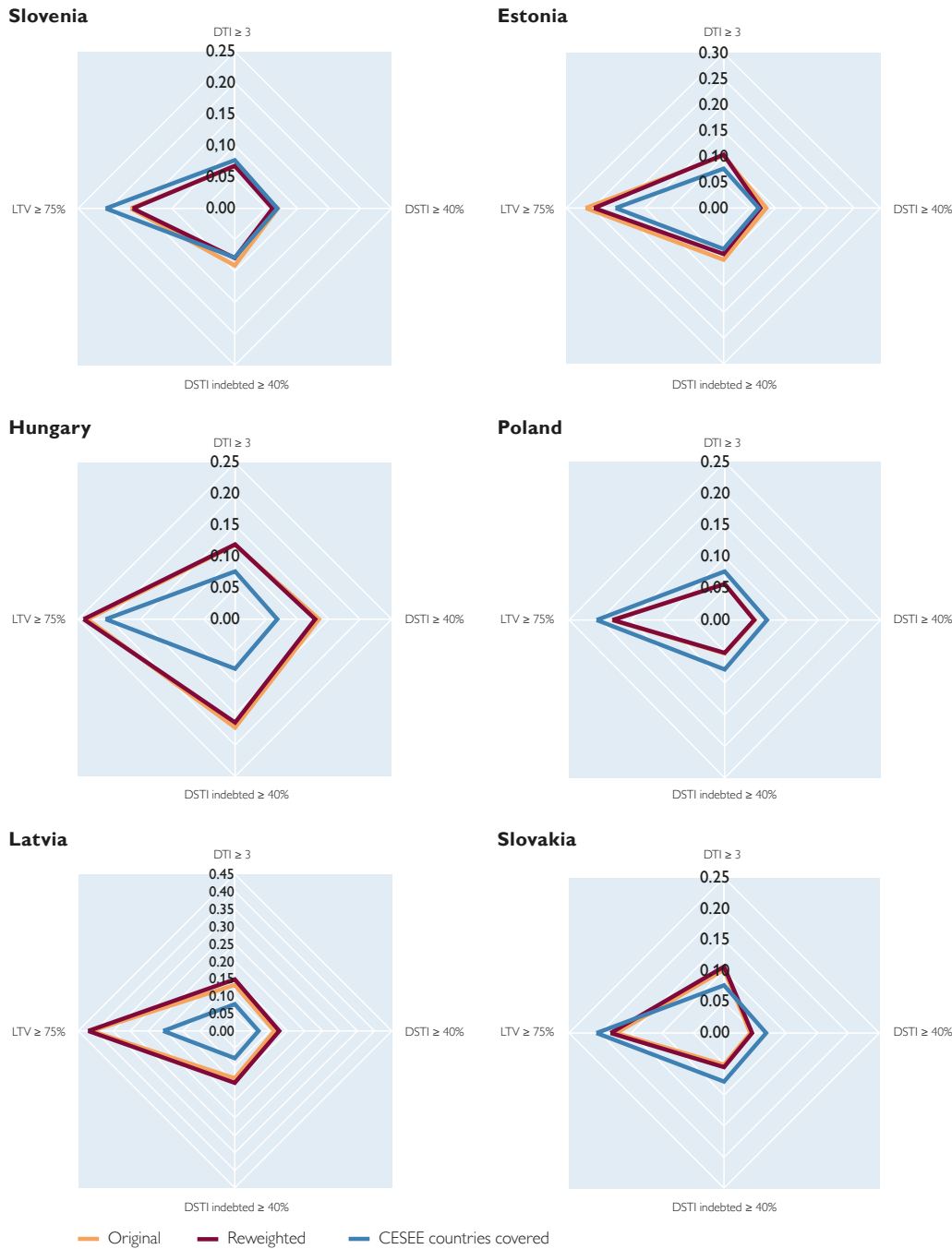
Chart 5 shows the share of vulnerable households for the aggregate of all six countries (CESEE), the observed shares (original) as well as the reweighted shares for all countries (reweighted) in net charts. The underlying data can be found in the annex (table A3). Figures inside the CESEE aggregate in the net chart mean that the country has fewer vulnerable households with regard to this measure than the aggregate region, figures outside mean that more vulnerable households exist in the respective country.

After implying a common household structure for the countries under investigation, the shares of households with an above-threshold DTI ratio are again largest (and by far larger than in the CESEE aggregate) in Latvia and Hungary. While the share remains de facto the same in Hungary, the changes are comparatively substantial and positive in Latvia (+12%) and Slovakia (+5%). The shares remain broadly unchanged for the other countries in our sample.

The changes observed for the DSTI measure are generally larger than for the other measures, which likely stems from the fact that it takes into account the maturity of the loan and that household characteristics, such as employment status or household size, have the biggest impact on a household's debt-paying capacity. Looking at the DSTI ratio (for households with debt payments), we find that the biggest share of vulnerable households can (still) be found in Hungary and Latvia. The shares decreased by 1 percentage point in half the countries, namely Slovenia, Estonia and also Hungary, but increased in Slovakia and particularly Latvia. In the latter

Chart 5

Potentially vulnerable households according to different measures



Source: HFCS 2014, ECB, OeNB.

Note: DTI stands for debt-to-income ratio, DSTI for debt service-to-income ratio and LTV for loan-to-value ratio.

countries, the household configuration contributes positively to household vulnerability compared with the average.

As regards the LTV ratio, the share of households above a 75% threshold increased by 1 percentage point to 42% in Latvia, where it remains highest. Estonia, where the

share dropped by 1 percentage point, has the second-highest value (25%), followed closely by Hungary (24%) (see table A3).

While the actual changes seem to be rather small, an increase by 1 percentage point in the vulnerable household population should not be underestimated. In addition, the direction of change (increase/decrease) provides us with information on the role of household characteristics for being vulnerable. As concerns the decomposition exercise, the households of larger countries (Poland, Hungary) have more weight in the aggregate (CESEE) so that their figures are likely to be more stable than those of smaller countries.

Chart 6 delivers all reweighted figures in one net graph, i.e. comparable shares of vulnerable households when imposing a common household structure with regard to household size, age, education and employment status. All remaining differences are therefore not due to differences in these characteristics.

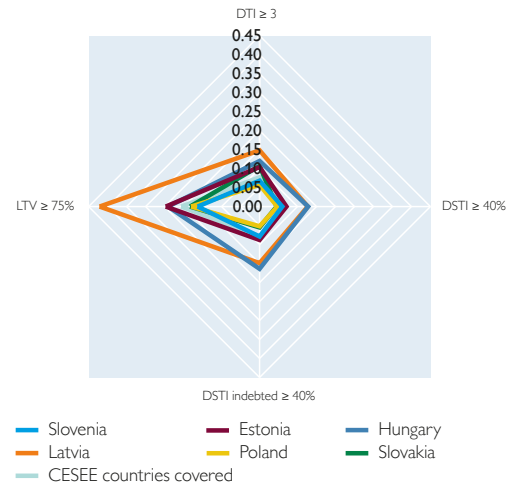
Chart 6 illustrates that comparable households seem to be least vulnerable in Poland, Slovakia and Slovenia while there are markedly more vulnerable households in Hungary and Latvia. Many households in Latvia and Hungary hold high amounts of debt relative to their income, and their debt servicing payments are also higher than those of comparable households in other countries. Given that a large fraction of households in these two countries has also notably higher LTV ratios, the exposure at default might be higher and a cause of concern for the banking sector. What we can take from the decomposition analysis is that household vulnerability in the different countries may stem from different sources: For Slovakia and Latvia, we observe an increase in the share of vulnerable households for all measures, reflecting the fact that the current household configuration is dampening overall vulnerability and that other factors, such as diverging developments since the households took out the loans or differences in bank assessment and future payment and risk-bearing capacities, etc., may give rise to differences in the vulnerability level. A look at the data for Estonia and Slovenia shows that, relative to other countries, vulnerability may be driven to a larger extent by differences in household characteristics (as the above-threshold shares of vulnerable households decrease), i.e. these countries have more households of the kind that is deemed typically vulnerable across all countries.

When we turn to the share of debt covered by different assets after eliminating differences due to household characteristics (table 6), the changes are particularly large in Hungary and Latvia.

While Hungary still posts the smallest share of debt not covered by financial assets, the share of debt not covered by financial assets, other real estate and the

Chart 6

Different measures of household vulnerability based on a common household structure



Source: HFCS 2014, ECB, OeNB.

Table 6

Coverage of debt by household assets after adjusting for household characteristics

	Slovenia		Estonia		Hungary		Latvia		Poland		Slovakia	
	hh	debt	hh	debt	hh	debt	hh	debt	hh	debt	hh	debt
Debt	39.7	100.0	39.2	100.0	38.4	100.0	36.0	100.0	36.5	100.0	35.3	100.0
Percentage change through reweighting	2.8	0.0	6.6	0.0	4.2	0.0	7.3	0.0	-1.4	0.0	-3.6	0.0
Debt minus financial assets	26.7	75.7	27.2	82.4	22.8	67.1	28.0	86.3	20.0	76.2	23.2	78.8
Percentage change through reweighting	3.3	-0.5	2.6	0.1	4.7	5.7	10.9	1.5	-2.0	-0.2	-0.8	0.0
Debt minus financial assets and other real estate and household main residence	5.9	6.2	4.1	2.8	5.0	18.4	9.1	17.7	3.5	1.8	3.9	2.9
Percentage change through reweighting	-0.7	-1.4	-13.4	-10.6	6.1	78.0	22.6	10.2	-2.6	-0.1	9.4	-15.5
Debt minus gross wealth	3.5	4.6	2.8	1.7	4.4	16.8	7.0	15.3	2.6	1.3	2.9	2.2
Percentage change through reweighting	-1.0	-2.0	-15.6	-14.7	7.0	93.4	25.0	10.1	-4.3	-0.4	15.2	-16.2

Source: HFCS 2014, ECB, OeNB.

Note: This table shows the percentage share of households holding positive debt after deducting certain assets (hh) as well as the share of this debt in total debt (debt).

HMR increases noticeably to 18% of debt not covered, up from 9%. Interestingly, while the remaining debt burden increases sharply, the share of households that have to bear this burden remains the same. The pattern observed in Hungary becomes even more pronounced when we look at debt minus gross wealth: The remaining debt almost doubles, while the share of indebted households increases only slightly, leaving some 4% of households with almost 17% of debt not covered. In Latvia, the opposite effect can be observed, albeit on a smaller scale. After deducting financial assets as well as gross wealth, the remaining burden increases modestly (by about 10%), while the share of households affected increases by more than twice as much (about 25%). In both countries, debt is concentrated on a comparatively small share of households. Again, household characteristics seem to ease credit fragility and the concentration of debt in these two countries. Some of the households affected could be those that borrowed excessively during the boom (Latvia) or those that used foreign currency loans, which led to an increase in their outstanding debt (Hungary). A further observation³ is that while similar household characteristics are observed in the two Baltic countries covered (Estonia and Latvia), the effects of the reweighting procedure are divergent. This suggests that vulnerable households across countries do not necessarily share the same characteristics, i.e. there is no typical set of household characteristics that would classify a vulnerable household.

In all other countries in our sample, imposing similar household characteristics leads to a marginal decrease in the share of households and debt (debt minus gross wealth), with only Slovakia posting a notable decrease in the debt share (3%) and at the same time an increase in the share of households affected (2%).

For one, our results confirm that comparable households are more exposed in Latvia and Hungary than in the other countries in our sample. For another, the results indicate that country-specific household characteristics may contribute to financial vulnerability e.g. in Estonia or Slovenia. Countries where the imposition of a common household structure leads to an increase in the share of vulnerable

³ This observation was kindly pointed out by one of the anonymous referees.

households may be more exposed to external factors than the other countries. Such factors may stem from the banks themselves, i.e. eligibility regulations, or from the type of loan granted. In the case of Hungary, Poland and Latvia, many foreign exchange loans were granted prior to the crisis, and the associated costs increased dramatically once currency risk materialized. In Hungary, foreign currency loans were fully transformed to local currency loans based on a preferential exchange rate, but this happened after this wave of the HFCS was conducted (for a detailed description of different measures taken with respect to foreign currency lending across CESEE, see Beckmann, 2017).

5 Summary and conclusions

In this study, we employ newly available microdata to analyze and assess household indebtedness and financial vulnerability in selected CESEE countries. The 2014/15 wave of the Household Finance and Consumption Survey (HFCS) covers Slovenia, Estonia, Hungary, Latvia, Poland and Slovakia. The stock-taking exercise of extensive and intensive margins of all measures considered revealed some peculiarities with respect to households' balance sheet characteristics in each country. While home ownership is markedly higher in the CESEE countries than e.g. in Austria or Germany, the value of real estate property is significantly lower. Given these low values and the relatively high levels of debt, LTV ratios are higher in the CESEE countries.

Central to this analysis is the usage of different vulnerability measures such as DTI, DSTI and LTV ratios, and the identification of those households that exceed certain vulnerability thresholds. The distribution of these measures reveals that households in Latvia and Hungary are particularly vulnerable. These two countries also have the highest median LGD, which is crucial to the banking sector. This could be a repercussion of the financial crisis: a relatively high prevalence of foreign currency loans, unsustainable loans granted during the boom and a collapse of property prices, which affected Latvia in particular.

We employed a procedure that decomposes differences in the level of household financial vulnerability into a part that is due to household characteristics and another that results from other external factors. Our analysis of the drivers of the differences in household vulnerability across countries helped interpret the results further. The analysis shows that household characteristics explain a small but important part of the differences in household vulnerability across countries. What is most interesting is that the direction of the effects stemming from differences in household characteristics varies across countries: When we look at vulnerability measures (DTI, DSTI and LTV ratios), differences in household composition have a dampening effect on overall vulnerability in Latvia and Slovakia, an enhancing effect in Estonia and Slovenia and a mixed effect in Hungary. When we consider debt coverage, the household structure of Latvia and Hungary has a dampening effect. Also, differences in unobserved external factors (i.e. differences due to the banking sector, etc.) might weigh on household financial health in Hungary and Latvia more than in the other countries. Households in these two countries were identified as the most vulnerable: Not only is the remaining debt burden (debt minus gross wealth) highest (as a share of total debt), but debt is also the most concentrated on a small share of households. In Estonia and Slovenia, household vulnerability is enhanced by the countries' household structure.

The different directions of the effects indicate that there is no typical household structure that suggests a high level of vulnerability as different types of households are vulnerable across countries.

Turning to the implications for the Austrian banking sector, we note that household debt in the countries in our sample is rather small compared to Austria. Whereas the financial position of households in Slovakia, Poland and Slovenia seems to be fairly sound, households in Latvia and Hungary are, financially, the most fragile. For Austrian banks, the risk stemming from Latvian households would be small, while that stemming from Hungarian households would be somewhat more pronounced. In Hungary, however, foreign currency loans (a type of debt which potentially increased due to currency depreciation) were transformed into local currency loans based on a favorable exchange rate during and after the HFCS survey wave. As a result, some of the risks we found have likely become less significant in the meantime.

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Annex

Table A1

Household characteristics

	Slovenia	Estonia	Hungary	Latvia	Poland	Slovakia	CESEE
Household size							
One household member	32.6	35.8	33.4	31.7	24.0	25.7	26.9
Two household members	25.1	29.8	29.6	30.3	25.7	21.9	26.4
Three household members	18.6	16.3	17.2	18.2	20.2	19.5	19.3
Four household members	11.7	12.7	12.7	12.3	16.2	18.7	15.4
Five or more household members	12.0	5.4	7.1	7.5	13.9	14.3	12.1
Age of reference person							
Age 16 to 24	1.2	3.7	1.8	2.4	1.4	0.6	1.5
Age 25 to 34	10.0	16.3	11.2	12.7	14.8	9.2	13.4
Age 35 to 44	16.3	17.6	19.8	17.7	19.6	24.7	19.8
Age 45 to 54	20.8	18.0	18.7	19.0	20.3	20.1	19.8
Age 55 to 64	23.0	17.5	20.7	19.8	21.9	21.8	21.5
Age 65 to 74	14.7	13.5	16.4	14.0	12.3	14.8	13.5
Age 74+	13.9	13.5	11.5	14.4	9.8	8.7	10.4
Highest level of education of reference person							
Primary education	5.0	2.6	1.5	2.2	14.2	1.2	9.6
Secondary education	73.6	63.4	68.2	65.3	61.2	79.3	64.8
Tertiary education	21.5	34.0	30.3	32.4	24.6	19.5	25.7
Employment situation of reference person							
Employed	43.7	57.4	50.9	52.2	51.3	51.4	51.1
Self-employed	6.4	5.1	6.4	6.6	11.2	12.3	9.8
Unemployed	6.5	4.7	4.1	5.9	3.4	4.3	3.9
Retired	41.6	26.8	34.2	31.1	26.4	28.7	28.8
Other	1.8	5.9	4.4	4.3	7.8	3.3	6.4

Source: HFCS 2014, ECB, OeNB.

Note: The household reference person is chosen according to the international standards of the Canberra Group, which uses the following sequential steps to determine the unique reference person per household: 1) household type determined by a) one of the partners in a registered or de facto marriage, with dependent children, b) one of the partners in a registered or de facto marriage, without dependent children, and c) a lone parent with dependent children, 2) the person with the highest income, 3) the eldest person.

Table A2

Household characteristics reweighted

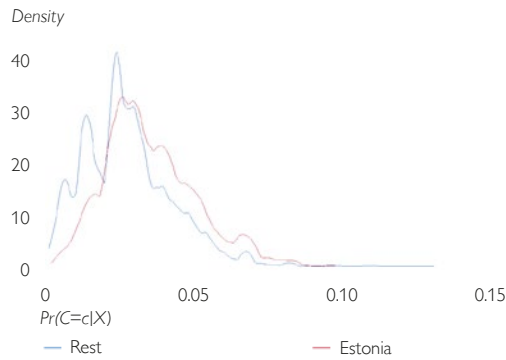
	Slovenia	Estonia	Hungary	Latvia	Poland	Slovakia
Household size						
One household member	27.8	28.1	26.4	26.2	26.6	26.1
Two household members	25.5	25.8	26.5	27.6	26.4	25.0
Three household members	18.5	19.4	19.0	19.2	19.4	19.9
Four household members	15.7	14.7	14.9	14.9	15.4	16.0
Five or more household members	12.5	11.9	13.2	12.1	12.2	13.0
Age of reference person						
Age 16 to 24	2.6	2.5	1.8	3.1	1.4	0.9
Age 25 to 34	12.7	13.9	12.3	12.8	14.4	11.2
Age 35 to 44	19.5	21.2	22.6	21.3	18.6	26.5
Age 45 to 54	24.2	19.8	20.9	20.0	19.8	19.7
Age 55 to 64	18.5	17.2	19.1	17.9	22.5	18.9
Age 65 to 74	10.5	14.6	12.5	12.1	12.9	12.5
Age 74+	12.1	10.8	10.9	12.8	10.4	10.3
Highest level of education of reference person						
Primary education	8.9	9.6	9.6	7.5	9.5	10.7
Secondary education	64.8	63.1	63.8	64.5	64.5	64.8
Tertiary education	26.4	27.3	26.6	28.0	26.0	24.6
Employment situation of reference person						
Employed	51.0	50.3	52.9	50.2	51.3	50.5
Self-employed	9.6	9.4	8.9	9.9	9.9	9.9
Unemployed	4.0	3.7	3.7	3.8	3.9	4.5
Retired	28.7	28.8	28.1	29.4	28.5	27.4
Other	6.7	7.8	6.4	6.7	6.4	7.7

Source: HFCS 2014, ECB, OeNB.

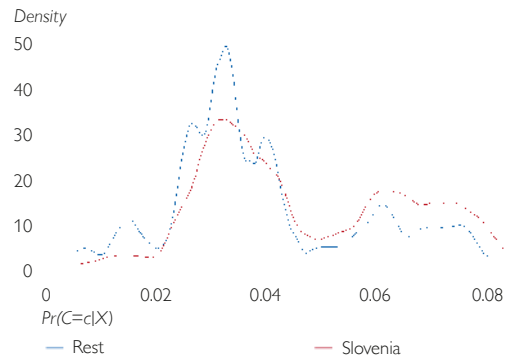
Note: The household reference person is chosen according to the international standards of the Canberra Group, which uses the following sequential steps to determine the unique reference person per household: 1) household type determined by a) one of the partners in a registered or de facto marriage, with dependent children, b) one of the partners in a registered or de facto marriage, without dependent children, and c) a lone parent with dependent children, 2) the person with the highest income, 3) the eldest person.

Kernel density estimates of propensity scores

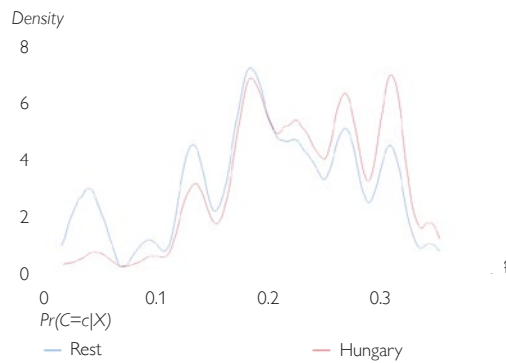
Estonia



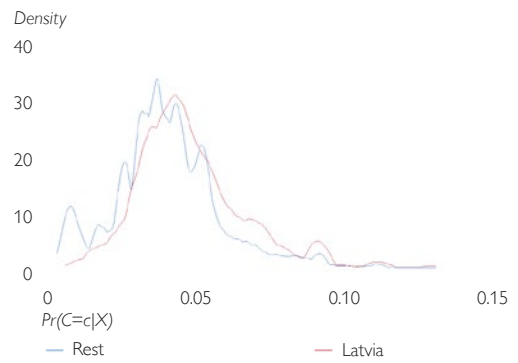
Slovenia



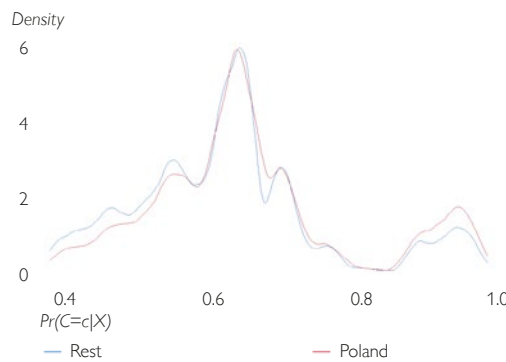
Hungary



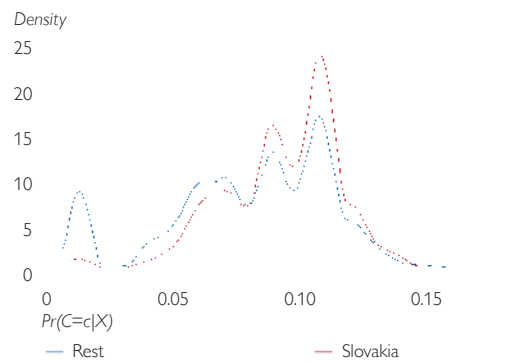
Latvia



Poland



Slovakia



Source: HFCS 2014, ECB, OeNB.

Table A3

Effects of imposing a common household structure on vulnerability measures

	Slovenia	Estonia	Hungary	Latvia	Poland	Slovakia
Debt-to-income ratio ≥ 3	0.07	0.10	0.12	0.15	0.06	0.11
Percentage change through reweighting	1.5	2.0	0.8	12.1	0.0	4.9
Debt service-to-income ratio $\geq 40\%$	0.06	0.07	0.13	0.13	0.05	0.05
Percentage change through reweighting	-11.8	-13.4	-4.5	12.4	-2.1	7.1
Debt service-to-income ratio $\geq 40\%$ with debt payment	0.08	0.09	0.16	0.15	0.05	0.06
Percentage change through reweighting	-13.2	-11.1	-4.7	9.6	-1.9	7.8
Loan-to-value ratio $\geq 75\%$	0.16	0.25	0.24	0.42	0.18	0.18
Percentage change through reweighting	-1.81	-6.08	2.55	2.18	-0.55	5.17

Source: HFCS 2014, ECB, OeNB.