COMENIUS UNIVERSITY IN BRATISLAVA
FACULTY OF MATHEMATICS, PHYSICS AND INFORMATICS

DETERMINANTS OF HOUSEHOLD LOANS

Diploma Thesis

Tomáš Molokáč

Bratislava 2012

COMENIUS UNIVERSITY IN BRATISLAVA
FACULTY OF MATHEMATICS, PHYSICS AND INFORMATICS

DETERMINANTS OF HOUSEHOLD LOANS

Diploma Thesis

TOMÁŠ MOLOKÁČ

Department of Applied Mathematics and Statistics
9.1.9 Applied Mathematics 1114
Mathematics of Economics and Finance

Supervisor:
Prof. Dr. Jarko Fidrmuc

Bratislava 2012

UNIVERZITA KOMENSKÉHO V BRATISLAVE
FAKULTA MATEMATIKY, FYZIKY A INFORMATIKY

DETERMINANTY ÚVEROV DOMÁCNOSTÍ

Diplomová práca

TOMÁŠ MOLOKÁČ

Katedra aplikovanej matematiky a štatistiky
9.1.9 Aplikovaná matematika 1114
Ekonomická a finančná matematika

Vedúci diplomovej práce:
Prof. Dr. Jarko Fidrmuc

Bratislava 2012

Univerzita Komenského v Bratislave
Fakulta matematiky, fyziky a informatiky

ZADANIE ZÁVEREČNEJ PRÁCE

Meno a priezvisko študenta: Bc. Tomáš Molokáč
Študijný program: ekonomická a finančná matematika (Jednoodborové štúdium, magisterský II. st., denná forma)
Študijný odbor: 9.1.9. aplikovaná matematika
Typ záverečnej práce: diplomová
Jazyk záverečnej práce: anglický
Sekundárny jazyk: slovenský

Názov: Determinants of Household Loans

Cieľ: Household loans were expanding before the global financial crisis in Slovakia and other new EU member countries. So far these developments have been analyzed mainly applying aggregate macroeconomic data. The diploma thesis should analyze the determinants of loans and interest rates according to data of household income and expenses in Slovakia.

Vedúci: doc. Ing. Jarko Fidrmuc, Dr.
Katedra: FMFI.KAMŠ - Katedra aplikovanej matematiky a štatistiky

Dátum zadania: 13.01.2011

Dátum schválenia: 14.01.2011

prof. RNDr. Daniel Ševčovič, CSc.
garant študijného programu

.....
študent

.....
vedúci práce

I declare that this thesis was written on my own, with the only help provided by my supervisor and the referred-to literature.

Tomáš Molokáč

Acknowledgement

I would like to express thanks to my supervisor Prof. Dr. Jarko Fidrmuc, for all of the support and guidance he offered throughout the elaboration of this thesis. I would also like to thank my family and friends for their support and love.

Abstract

We estimate determinants of arrears on mortgage loans in Central European and Eastern countries. We use microeconomic data from the EBRD Life in Transition 2 Survey (2010). We opt for empirical approach of the Heckman probit model with sample selection. We found out that payments to income ratio and down payment of a mortgage are very important determinants of arrears. Mortgages denominated in foreign currency lower the probability of arrears. Mortgages with variable rate increase the risk of arrears in countries with currency depreciation. Households with mortgages with capital repayment and interest payments have higher probability of arrears than households with interest only payments. The difference is larger in the case of currency depreciation. Another important factor is a shock of the economic crisis. We study also effects of morality to arrears. People, who think they live in an unfair environment, are more probably in arrears on mortgage loan payments.

Key words: mortgage, arrears, foreign currency, capital repayment, probit, sample selection, the economic crisis, moral

Abstrakt

Odhadujeme determinanty nedoplatkov na hypotekárnych úveroch v krajinách strednej a východnej Európy. Používame mikroekonomické dáta z prieskumu Európskej banky pre obnovu a rozvoj LiTS 2 (2010). Zvolili sme si empirický prístup Heckmanovho probit modelu s výberom vzorky. Zistili sme, že pomer platieb k príjmu a zálohová platba za hypotéku sú veľmi dôležité determinanty nedoplatkov. Hypotéky v cudzej mene znižujú pravdepodobnosť nedoplatkov. Hypotéky s variabilnou úrokovou sadzbou zvyšujú riziko nedoplatkov v krajinách so znehodnotením meny. Domácnosti, ktoré majú hypotéky so splácaním istiny a úrokov majú vyššiu pravdepodobnosť nedoplatkov než domácnosti s hypotékami s priebežným splácaním iba úrokových platieb. Rozdiel je väčší v prípade znehodnotenia meny. Ďalším dôležitým faktorom ovplyvňujúcim nedoplatky sú šoky hospodárskej krízy. Zaoberáme sa tiež vplyvom morálky na nedoplatky. Ľudia, ktorí si myslia, že žijú v nečestnom prostredí, sú pravdepodobnejšie v nedoplatkoch hypotekárnych platieb.

Kľúčové slová: hypotéka, nedoplatky, cudzia mena, splácanie istiny, probit, výber vzorky, ekonomická kríza, morálka

Contents

Appendix

Chapter 1

Introduction

In this diploma thesis, we will estimate the determinants of arrears on mortgage loan payments in Central European and Eastern countries from the microeconomic perspective. The impact of the global crisis is still present in many transition economies, even as a recovery took hold. We will explore determinants of arrears with the 2010 Life of Transition Survey of the European Bank for Reconstruction and Development. This source of data provides us base to study arrears in the post-crisis period, while the question on arrears in the survey is associated with current arrears at the time of the survey.

As Duygan-Bump and Grant (2009) mention, despite the lively debate on rising household debt and arrears, there is relatively little empirical evidence on the determinants of households' debt repayment behaviour, or on the incidence of arrears. We want to contribute to the literature by the exploring various candidates for determinants, starting with demographic and economic characteristics, then currency of a mortgage, type of a mortgage, a way of the repayment, payments to income, down payment of a mortgage, crisis shocks and finally, morality on personal level and level of morality within the country.

The diploma thesis is structured as follows. Chapter 2 presents a literature review on foreign currency mortgages and arrears. Chapter 3 summarizes the theory that leads to the use of Heckman sample selection model for estimations, Chapter 4 describes the EBRD LiTS data, which are used in Chapter 5 for the estimation of the probability of arrears on mortgage loans. Chapter 6 concludes.

Chapter 2

Literature review

There is a limited occurrence of literature on households' arrears. Presence of literature on households' arrears using microeconomic data is even scarcer. Useful reviews of the previous literature may be found in Beckmann, Fidrmuc, Stix (2012) and Duygan-Bump and Grant (2009).

Aron and Muellbauer (2010) present model for aggregate time-series United Kingdom data on mortgage possessions and mortgage arrears. They use an estimate of the proportion of mortgages in negative equity, based on an average debt to equity ratio, as one of the key drivers of possessions and arrears. Jointly estimating a three-equation system for the arrears and possessions rates, with cross equation restrictions, results in plausible magnitudes for the effects of policy shifts and lending quality. The long-run impact of four major drivers, house prices, interest rates, debt levels, income, is captured by just two coefficients: on the debt equity ratio and on the debt service ratio.

For comparison, in our diploma thesis with micro data from a survey we do not explore debt to equity ratio, but we include down payment (100 % - loan to value ratio) and also debt service ratio as one of the main assumed drivers of household arrears. A second conclusion of a mentioned paper is that lenders´ forbearance policy and the more generous government income support for those with mortgage payment difficulties appears to have had a notable effect in lowering mortgage possessions.

Bajari, Chu and Park (2008) quantify the relative importance of various drivers behind subprime mortgage borrowers' decision to default in the USA. In their econometric model, borrowers are allowed to default either because doing so increases their lifetime wealth or because of short-term budget constraints. According to their results, one of the main drivers of default is the nationwide decrease in home prices. The decline in home prices caused many borrowers' outstanding mortgage liability to exceed their home value, and for these borrowers default can increase their wealth. Our subjects of interest are mainly Central European and Eastern Countries (CEECs). As note Beckmann, Fidrmuc, Stix (2012), strategic

defaults are less important in the CEECs for several reasons: First, mortgages and consumption loans are subject to recourse also if the loan exceeds the loan value (no "walk-away" option). Second, migration within the EU is generally low and several CEECs have only restricted access to the labour markets of other EU countries.

Another important driver stated in Bajari, Chu and Park (2008) is deteriorating loan quality: The increase of borrowers with poor credit and high payment to income ratios elevates default rates in the subprime market (actually, debt service again; in our paper income is represented by the total expenses of a household).

Boeheim and Taylor (2010) investigate the incidence of housing finance problems, evictions and repossessions in the United Kingdom. Using panel data from last decade of 20th century, they show that previous experience of financial problems has a significant and positive association with the current financial situation, and that negative financial surprises are the main route into financial difficulties associated with housing costs, controlling for other changes such as divorce or loss of employment. We have cross-sectional data; however, we look on previous financial difficulties by using the variable crisis shock, which measure impact of the financial crisis on household arrears.

Boeheim and Taylor also confirm the importance of financial and personal factors in determining housing payment problems. Families with higher income, where the head is in work, and those with greater assets have a lower risk of experiencing problems of being in arrears.

Using household panel data, Duygan-Bump and Grant (2009) find that arrears are often precipitated by an adverse shock to the household's income or health, but that there are large differences between countries in how households react to these events. They also show that these differences can be partly explained by local financial and judicial institutions, as captured by contract enforcement and information sharing indicators. They show that while adverse shocks are highly important, the extent to which they affect repayment behaviour depends essentially on the penalty for defaulting. Hence, although repayment problems often arise from a genuine inability to repay, some households seem to behave strategically. As we mentioned above, in CEECs is strategic default less important, however we still are interested in a strategic part of being in arrears and tendency to not repay the debt in case of weak financial institutions. Thus in our thesis, we have defined variables which proxy these matters, e.g. trust in institutions as banks and courts.

Guiso, Sapienza and Zingales (2011) use survey data for the USA to measure households' propensity to default on mortgages even if they can afford to pay them (strategic default) when the value of the mortgage exceeds the value of the house, similarly to Bajari, Chu and Park (2008). Their evidence suggests that this willingness is affected both by financial and non-financial factors, such as views about fairness and morality. We also try

to explore effect of morality in our thesis. Trust in institutions mentioned above is proxy for country or regional part of fairness, whereas morality of an individual is personal part.

Guiso, Sapienza and Zingales also find that exposure to other people who strategically defaulted increases the propensity to default strategically because then they have important information about the probability of being sued.

Beckmann, Fidrmuc and Stix (2012) analyze household arrears on consumption and mortgage loans in local and foreign currency. Their results show that arrears are driven by several demographic factors and also households' financial situation. In countries, which experienced large depreciations of currency against the euro, the level of arrears is generally higher for both foreign and domestic currency loans. However, to have a mortgage in foreign currency increases risk of being in arrears more than mortgage in local currency. They also study impact of financial shocks on repayment of arrears. Instalment shocks after depreciations increase the probability of households' arrears on foreign currency loans whereas income shocks equally affect the repayment of both domestic and foreign currency loans. Findings on effect of income in euro are also very interesting: income in euro improves the financial position of domestic currency loan holders, but does not work in this way for foreign currency loans. We perform similar analysis of foreign and local currency loans and arrears, although we only have data about mortgages loans and their arrears available.

In EBRD Transition report (2011), effects of foreign versus local currency mortgages. Economic crisis impact and debt service burden on mortgages arrears are studied by using their own Life in Transition 2 survey, which is also base for our diploma thesis. They come with OLS regression, but we apply Heckman sample selection probit model on these data. They show that the recent economic crisis impact is much stronger in countries that experienced a large depreciation.

In contradiction with Beckmann, Fidrmuc and Stix (2012), foreign currency mortgagors tend to be better credit risks compared with local currency borrowers, in other words, they have lower probability to be in arrears. This result is driven by countries with no depreciation during the crisis. Moreover, even in countries that experienced a sharp depreciation, there was no general increase of arrears associated with mortgages in foreign currency. EBRD Transition report comes with OLS regression to analyse household arrears, but we apply Heckman sample selection probit model on these data. Foreign currency mortgages, as well as crisis impact are possible determinants explored also by our model.

Chapter 3

Theory

Our model belongs to qualitative response models. Dependent variable is not some quantitative measure, there is a binary outcome – whether a respondent´s household has a mortgage loan or not and whether a household is in arrears on a mortgage loan or not. For purpose of estimating the probability that a household has a mortgage loan and the probability that a household is in arrears, we employ two equation Heckman probit model with sample selection.

3.1 Probit

3.1.1 Introduction to probit

In the first stage, we estimate a probability that a household has a mortgage. There are only two possibilities: a household has a mortgage (Y=1) or not (Y=0). The former is the case if two conditions are satisfied: a household opts for a mortgage (demand side) and a bank grants a mortgage to it (supply side). Let us denote x vector of dependent variables that, as we believe, explain the possibility to take out a mortgage loan. The set of parameters, that reflects the impact of changes in x on the probability, is denotedβ, P stands for probability.

$$P(Y=1|x)=F(x,\beta)$$
$$P(Y=0|x)=1-F(x,\beta)$$

If we utilize the standard linear regression, $F(x,\beta)=x'\beta$ and we construct the regression model,

$$y = x'\beta + \varepsilon$$

As Greene (2010) mentions, there is a number of shortcomings, for example we cannot constrain $x'\beta$ to 0-1 interval, hence such a model produces nonsense probabilities and is not so appropriate as a model for binary choice. Our requirement, then, is a model that will produce predictions consistent with the probability theory. For a given regressor vector, we would expect

$$\lim_{x'\beta\to+\infty} P(Y=1|x) = 1$$

$$\lim_{x'\beta\to-\infty} P(Y=1|x) = 0$$

Any proper, continuous probability distribution defined over the real line will suffice. Commonly used is the logistic distribution, giving rise to the logit model. This distribution along with employing the model on real data is described in Molokáč (2010). Another often utilized distribution is the normal distribution, giving rise to the probit model

$$P(Y=1|x) = \int_{-\infty}^{x'\beta} \phi(t)\,dt = \Phi(x'\beta)$$

The function $\Phi(.)$ is a commonly used notation for the standard normal distribution, $\phi(.)$ is the corresponding density function.

3.1.2 Marginal effects

The probit model is a regression:

$$E(y|x) = 0 * [1 - \Phi(x'\beta)\,] + 1 * \Phi(x'\beta) = \Phi(x'\beta)$$

Marginal effects of a continuous independent variable are:

$$\frac{\partial E(y|x)}{\partial x} = \left\{\frac{d\Phi(x'\beta)}{dx}\right\} * \beta = \phi(x'\beta) * \beta$$

Normally these values will vary with the values of x. In interpreting the estimated

model, it will be useful to calculate this value at, say, the means of the independent variables and, where necessary, other pertinent values. In our model, we calculate marginal values only at means of the regressors in the probit regression in the first phase, when we estimate the mortgage equation.

Since the derivative is with respect to a small change, it is not appropriate to apply the preceding formula for the effect of a change in a dummy independent variable, which may have only two states – zero and one (true and false). The appropriate marginal effect for a binary independent variable, say *b*, is

$$M.E. = P(Y = 1|\bar{x}_b, b = 1) - P(Y = 1|\bar{x}_b, b = 0),$$

where $\bar{x}_b$ denotes the means of all the other variables in the model.

3.1.3 Maximum likelihood estimation

Estimation of binary choice models is usually based on the method of maximum likelihood. The probit model with success probability $\Phi(\mathrm{x}'\beta)$ and n independent observations leads to the joint probability or likelihood function

$$P\left(Y_1 = y_1, Y_2 = y_2, \dots, Y_n = y_n \middle| [x_i]_{i=1,\dots,n}\right) = \prod_{y_i=0} [1 - \Phi(x_i'\beta)] \prod_{y_i=1} [\Phi(x_i'\beta)]$$

Let us denote$\Phi(x_i'\beta) = \Phi_{\mathrm{i}}$. Log-likelihood function is

$$\ln L(\beta) = \sum_{i=1}^{n} \{y_i \ln \Phi_{\mathrm{i}} + (1 - y_i) \ln(1 - \Phi_{\mathrm{i}})\}$$

The first-order conditions for maximizing *L* are

$$\frac{\partial \ln L}{\partial \beta} = \sum_{y_i=0} \frac{-\phi_i}{1 - \Phi_{\mathrm{i}}} x_i + \sum_{y_i=1} \frac{\phi_i}{\Phi_i} x_i$$

It can be shown that this log-likelihood function is globally concave in β and therefore standard numerical algorithms for optimization will converge rapidly to the unique maximum. A more detailed explication can be found in Green (2010).

3.2 Probit model with sample selection

3.2.1 Sample selection

A truncation arises when one attempts to make inferences about a larger population from a sample that is drawn from a distinct subpopulation. Studies of some independent variable based on values of this variable above or below some poverty line may be of limited usefulness for inference about the whole population. Introduction to truncation and truncated normal distribution, incidental truncation and Heckman selection model can be found in Biroš (2011).

We will examine a form of truncation called the sample selection problem (or incidental truncation). Observational studies are rarely based on pure random samples. If instead a sample, intentionally or unintentionally, is based in part on values taken by a dependent variable, parameter estimates may be inconsistent unless corrective measures are taken. Such samples can be broadly defined as selected samples. [Cameron and Trivendi (2005)]

Selection may be due to self-selection, with the outcome of interest determined by individual choice of whether or not to participate in the activity of interest. It can also result from sample selection, with those who participate in the activity of interest deliberately oversampled. In either case, similar issues arise and selection models are usually called sample selection models. In our model, sample selection is based on choice of households which report they have a mortgage loan. It is a type of „self-selection“, although it rely not only on members of household decision whether to have a loan or not, but also banks play an important role there and may refuse to grant a loan to a household.

We estimate the probability of being in arrears on mortgages. For a household, it is possible to be in arrears associated with a mortgage, only if this household has a mortgage loan. However, the arrears of loan takers do not, in general, afford a reliable estimate of how people without a mortgage would be in arrears if they would have a mortgage loan. Thus taking into account only households with loan within an estimation process of arrears may provide biased results. For example, there are some factors influencing both being in arrears and having a mortgage. For a household that has no loan, these factors may change in the way that a household will then apply for a loan. If we would estimate only arrears equation, these relationships would be not captured. More detailed explanation of sample selection bias can be found in Heckman (1979).

3.2.2 Models with sample selection

Let y_a^* denote the outcome of interest (arrears in our model) and different latent variable, y_m^* (mortgage in our model). Outcome y_a^* is observed if $y_m^* > 0$.
The bivariate sample selection model comprises a participation (selection) equation that

$$y_m = \begin{cases} 1 & if\ y_m^* > 0 \\ 0 & if\ y_m^* \leq 0 \end{cases}$$

and a resultant outcome equation that

$$y_a = \begin{cases} y_a^* & if\ y_m^* > 0 \\ - & if\ y_m^* \leq 0 \end{cases}$$

Generally, model specifies that y_a is observed if $y_m^* > 0$, whereas y_a need not take on any meaningful value when $y_m^* \leq 0$. The standard model specifies a linear model with additive errors for the latent variables, so

$$y_m^* = x_m'\beta_m + \varepsilon_m$$
$$y_a^* = x_a'\beta_a + \varepsilon_a$$

Estimation by maximum likelihood is straightforward given the additional assumption that the correlated errors are joint normally distributed and homoskedastic, with

$$\begin{bmatrix} \varepsilon_m \\ \varepsilon_a \end{bmatrix} \sim \mathrm{N}\left(\begin{bmatrix} 0 \\ 0 \end{bmatrix}, \begin{bmatrix} 1 & \sigma_{\mathrm{ma}} \\ \sigma_{\mathrm{ma}} & \sigma_{\mathrm{a}}^2 \end{bmatrix} \right)$$

As for the probit model itself, normalization $\sigma_{\mathrm{m}}^2 = 1$ is used since only the sign of y_m^* is observed. [Cameron, Trivendi (2005)]

Heckman probit model with sample selection specifies a probit model in a selection equation and likewise in an outcome equation:

$$y_m^* = \Phi(x_m'\beta_m + \varepsilon_m)$$
$$y_a^* = \Phi(x_a'\beta_a + \varepsilon_a)$$

This implicate normalization $\sigma_{\mathrm{a}}^2 = 1$ and therefore $\varepsilon_m \sim N(0,1)$, $\varepsilon_a \sim N(0,1)$. Furthermore, error terms are correlated, $corr(\varepsilon_m, \varepsilon_a) = \rho$. It is worth noting that if $\rho \neq 0$, standard probit techniques applied to the first equation yield biased results. Heckman probit sample selection model provides consistent, asymptotically efficient estimates for all the parameters in such models.

For the model to be well identified, the selection equation should have at least one variable that is not in the probit equation. Otherwise, the model is identified only by functional form, and the coefficients have no structural interpretation.

3.2.3 Marginal effects

Conditional mean of a dependent variable in an outcome equation in bivariate model with sample selection is

$$E(y_a|y_a\ is\ observed) = E(y_a|y_m^* > 0) = x_a'\beta_a + \rho\sigma_a\lambda(\alpha_m),$$

where $\alpha_m = \frac{-x_m'\beta_m}{\sigma_m}$ and $\lambda(\alpha_m) = \frac{\phi(\alpha_m)}{\Phi(\alpha_m)}$.

Marginal effects of regressors on an outcome dependent variable y_a in a sample selection model consist of two effects. [Green (2010)]:

1. There is the direct effect on the mean of y_a , which is β_a.
2. For a particular independent variable, if it appears in the probability that dependent variable of participation equation y_m is positive, then it will influence y_a through its presence in λ. The full effect of changes in a regressor that appears in both x_a and x_m on y is

$$\frac{\partial E(y_a|y_m^* > 0)}{\partial x_{ak}} = \beta_{ak} - \beta_{mk}\left(\frac{\rho\sigma_a}{\sigma_m}\right)\delta(\alpha_m),$$

where $\delta = \lambda^2 - \alpha\lambda$.

Green (2010) notes, that if sample selection model is based on a probit model, selection variable y_m^* is not observed and we observe only its sign, $\sigma_m = 1$ and

$$E(y_a|y_a\ is\ observed) = E(y_a|y_m = 1) = x_a'\beta_a + \rho\sigma_a\lambda(x_m'\beta_m)$$

3.2.4 Estimations of a model

3.2.4.1 Maximum likelihood estimation

The parameters of the Heckman probit sample selection model can be estimated by maximum likelihood. The assumptions for error terms are $\varepsilon_m \sim N(0,1)$, $\varepsilon_a \sim N(0,1)$, $corr\ (\varepsilon_m, \varepsilon_a) = \varrho$. Let S denote the set of observations for which y_{ai} is observed, $\Phi_2(.)$ is the cumulative bivariate normal distribution function (with mean $[0 \quad 0]'$), $\Phi(.)$ is a standard cumulative normal and ψ is an offset variable. The formula from manual of the statistical software Stata is:

$$\begin{aligned}\ln L = \sum_{\substack{i\in S \\ y_{ai}\neq 0}} \ln\left[\Phi_2\left(x_{ai}\beta_a + \psi_i^{\beta_a}, x_{mi}\beta_m + \psi_i^{\beta_m}, \rho\right)\right] \\ + \sum_{\substack{i\in S \\ y_{ai}=0}} \ln\left[\Phi_2\left(-x_{ai}\beta_a + \psi_i^{\beta_a}, x_{mi}\beta_m + \psi_i^{\beta_m}, -\rho\right)\right] \\ + \sum_{i\notin S} \ln\left[1 - \Phi\left(x_{mi}\beta_m + \psi_i^{\beta_m}\right)\right]\end{aligned}$$

3.2.4.2 Two-step estimation

Although statistical software Stata utilize the maximum likelihood estimation, Green (2010) mention, that Heckman's (1979) two-step estimation procedure is usually used instead. Heckman's method is as follows:

1. Estimate the participation equation by maximum likelihood to obtain estimates of β_m. For each observation in the selected sample, compute $\hat{\lambda}_i = \frac{\phi(x'_{mi}\widehat{\beta}_m)}{\Phi(x'_{mi}\widehat{\beta}_m)}$ and $\hat{\delta}_i = \hat{\lambda}_i(\hat{\lambda}_i + x'_{mi}\hat{\beta}_m)$.
2. Estimate β and $\rho\sigma_a$ by least squares regression of y_a on x and $\hat{\lambda}$.

Chapter 4

Data description

Our individual data on arrears are obtained from a survey. Several papers built on survey data were published recently. The Business Environment and Enterprise Performance Survey is used in paper of Brown, Ongena, Popov, Yesin (2011) to look at debt overhang in emerging European countries and also in Hainz and Nabokin (2009) to study access of firms to external finance. Data set from the Euro Survey project of the Austrian Central Bank was utilized in both Fidrmuc, Hake, Stix (2011) and Beckmann, Fidrmuc, Stix (2012). The former work analyze determinants of households' plans to take out a loan and a foreign currency loan, the latter one look at foreign currency loans and loan arrears in CEECs from a perspective of households. Duygan-Bump and Grant (2009) employ the European Community Household Panel data set to discuss influence of institutions on arrears. Boeheim and Taylor (2010) investigate the incidence of evictions by the British Household Panel Survey. Guiso, Sapienza and Zingales (2012) use the Chicago Booth Kellogg School Financial Trust Index survey as their main data source to analyze the attitudes to strategic defaults of mortgages.

According to Duygan-Bump and Grant (2009), survey data allows us to ask about other attitudes and perceptions of the respondents that are not otherwise observable, and which can be used to disentangle where certain effects come from.

4.1 Data set

Our data come from comprehensive survey of The European Bank for Reconstruction and Development (EBRD), named Life in Transition Survey. The EBRD in collaboration with the World Bank has carried out this major reconnaissance of households and individuals across the Central/Eastern Europe and the Baltic states, South-eastern Europe, the

Commonwealth of Independent States (CIS) and Mongolia and, for comparison, in five western European countries. First round of the survey was conducted in 2006. The most recent round, launched in 2010, has an important benefit for us that, opposite the first round, provide data on mortgages and arrears of households.

As the report Life in Transition: After the Crisis (2011) mentions, the circumstances facing most people were significantly different between the first and second rounds. LiTS II took place in late 2010, at a time when most countries were still facing the aftershocks of a severe global economic crisis. Average GDP growth in 2009 was minus 5.2 per cent, and although most countries saw an upturn in 2010, the recovery has been patchy or negligible in many cases. The impact of crisis on mortgage arrears is one of our major subjects of interest.

Almost 39,000 households in 34 countries were surveyed to assess public attitudes, well-being and the impacts of economic and political change. In 25 transition countries, France, Germany, Italy and Sweden, the survey was conducted face-to-face in 1000 randomly chosen households. In six countries - Russia, Ukraine, Uzbekistan, Serbia, Poland and the United Kingdom there were 1500 household interviews. The questionnaire consists of eight sections: 1. Contact sheet, 2. Housing and expenses, 3. Attitudes and values, 4. Climate change, 5. Labour, education and entrepreneurial activity, 6. Governance, 7. Miscellaneous questions, 8. Impact of the crisis. We are focused on the section 2, where are questions on a mortgage and arrears. For construction of variables which are candidates for determinants of mortgage loans and arrears, we utilize almost all the sections, except the section 4.

All people, 18 years old or older, living under the same roof in the household and sharing their meals together were included in the roster for selection process of the principal respondent. Household members who were away for a period of one month or longer on work or study in another geographical location or country were excluded from the selection. A principal respondent answered questions in sections 3-7 of the questionnaire. Head of household or knowledgeable member then completed all sections (including section 2 - housing and expenses). In 61 per cent of cases, the head of the household and the major respondent were the same person.

It is worth noting, that from standard personal characteristics, head of household answered only questions on age and gender. Issues on marital and employment status and also education answered the principal respondent. This matter may weaken significance of these variables in our model in comparison with, for example, Beckmann, Fidrmuc, Stix (2012), where all the personal characteristics belongs to head of a household. This is also the reason, why we did not exclude students from our sample, whereas Beckmann, Fidrmuc and Stix did.

4.2 Country groups

To find out interesting relationships and comparisons between determinants of mortgages and arrears, we split countries into the comparable groups. For complete list of countries and country groups, see *Appendix 2*. Firstly, we divide countries into two groups: depreciation and non-depreciation countries. A depreciation is taken as a decline of a home currency against the euro. For this purpose, at the beginning we must exclude inappropriate states, for which the euro was the home currency in late 2010, at the time of the survey. Therefore, we disqualify western European countries included in the survey. Another reasons for this step are a) western European countries are not primarily subject of our interest, b) in the Western counties foreign currency mortgages were virtually absent and c) the level of arrears was significantly low at only 2 per cent. For similar reasons we eliminate also CIS countries (and Mongolia), except Ukraine. From the group Central/Eastern/Baltic countries we rule out Czech republic and Turkey (no foreign currency mortgages), Slovenia and Slovakia (the acceptance of the euro in 2007 and 2009 respectively) and Kosovo (no local currency, the euro instead). From the group Southern Europe we drop out Montenegro for the same reason as Kosovo.

Beckmann, Fidrmuc, Stix (2012) use a similar division into depreciation and non-depreciation countries and in the former group they opt for Hungary, Poland, Romania, Albania and Serbia, using their own calculations. In the EBRD Transition Report (2011), Box 2.1, the part concerning mortgage arrears, a currency depreciation of 30 per cent is taken as a cut-off point and as depreciation countries are identified Hungary, Poland and Ukraine. We label as depreciation countries all the marked states from both papers - Hungary, Poland, Ukraine, Romania, Albania and Serbia. The remaining not excluded countries are labelled as non depreciation: Bosnia, Bulgaria and three Baltic states (all five with currencies pegged to the euro, some with fluctuation bands around a central rate and others with no fluctuations allowed around the central rate), Macedonia and Croatia.

Subsequently, we depart from splitting into depreciation categories and thus we leave out foreign currency mortgage as the determinant of arrears. This allows us to start with new splitting into the regional groups of countries (see *Appendix 2*) and to examine influence of regional differences in the morality, attitude and values on arrears.

4.3 Mortgages

A mortgage loan is a loan secured by real property through the use of a mortgage note which evidences the existence of the loan and the encumbrance of that realty through

the granting of a mortgage which secures the loan. Features of mortgage loans such as the size of the loan, maturity of the loan, interest rate, method of paying off the loan, and other characteristics can vary considerably. Mortgage loans are normally higher burden for household as consumption loans with longer maturity of a higher amounts of money.

Dummy variable *mortgage* is based on the following question in the questionnaire of our survey: „Do you currently have a mortgage? " However, the question is asked only if a head of a household answered to the previous question „What is the type of ownership of this dwelling?" either „Owned" or „Other". Therefore we dropped out households, when the answer was „Rented".

Among all the households in the survey, only 7,2 per cent has a mortgage. Among those households which have reported type of dwelling another than rented, the share is 8,3 per cent. Descriptive statistics are taken after dropping out of households with rented dwelling. Those concerning the selection equation are in *Table A1*. If we take into consideration only depreciation and non-depreciation countries, Figure 1 shows that share of respondents with a mortgage differs widely across countries from 0,8% (Ukraine) to 16% (Hungary.) *Table A1* reveals that percentage of households is much higher in western comparator countries, on average 41 per cent. In the new EU countries share is 9%, whereas in Balkan, Eastern and Asian countries is considerably lower.

Figures 1 and *2* also display proportions of foreign and local currency mortgages on shares of total in depreciation and non-depreciation countries. *Table A2* shows descriptive statistics in the case, that people have a mortgage. As we may see here, portion of mortgages with foreign currency denomination in depreciation and non-depreciation countries is about 55 per cent, slightly higher in states with depreciation of currency. When we look at defences between regions, the highest share of mortgages denominated in foreign currency is in Balkan states (about 62 per cent) and the lowest in Asian countries (also in western European countries, but as is apparent from the answer in the survey, people here, households and survey takers, still do not regard the euro as their local currency, hence share of foreign currency mortgages in this case gives rise to confusion). Regarding the currency composition of foreign currency mortgages, prevailing currency is, naturally, euro. In Central and Southern Europe and Baltic states the second most used foreign currency is the Swiss franc, while in the Commonwealth of Independent States it is the American dollar.

Foreign currency mortgages enable lenders to lend in a stable foreign currency, whilst the borrower takes on the currency risk that the currency will depreciate and they will therefore need to convert higher amounts of the domestic currency to repay the loan. Then we may expect these borrowers more probably to be in arrears. On the other side, there could be an opposite effect. Banks know about this risk connected with mortgages in foreign currency and bankers may choose from applicants more carefully. If chosen households had a better repayment propensity (which bankers may have detected during the loan application), they might be better risks.

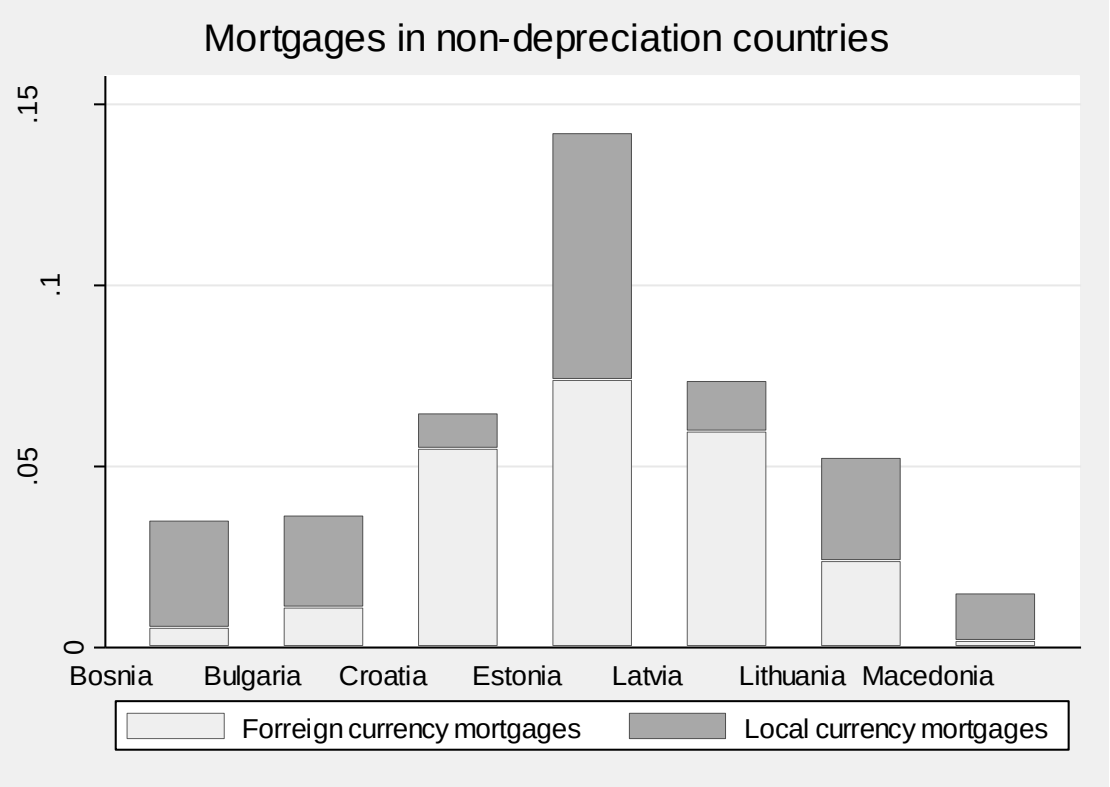

Figure 1

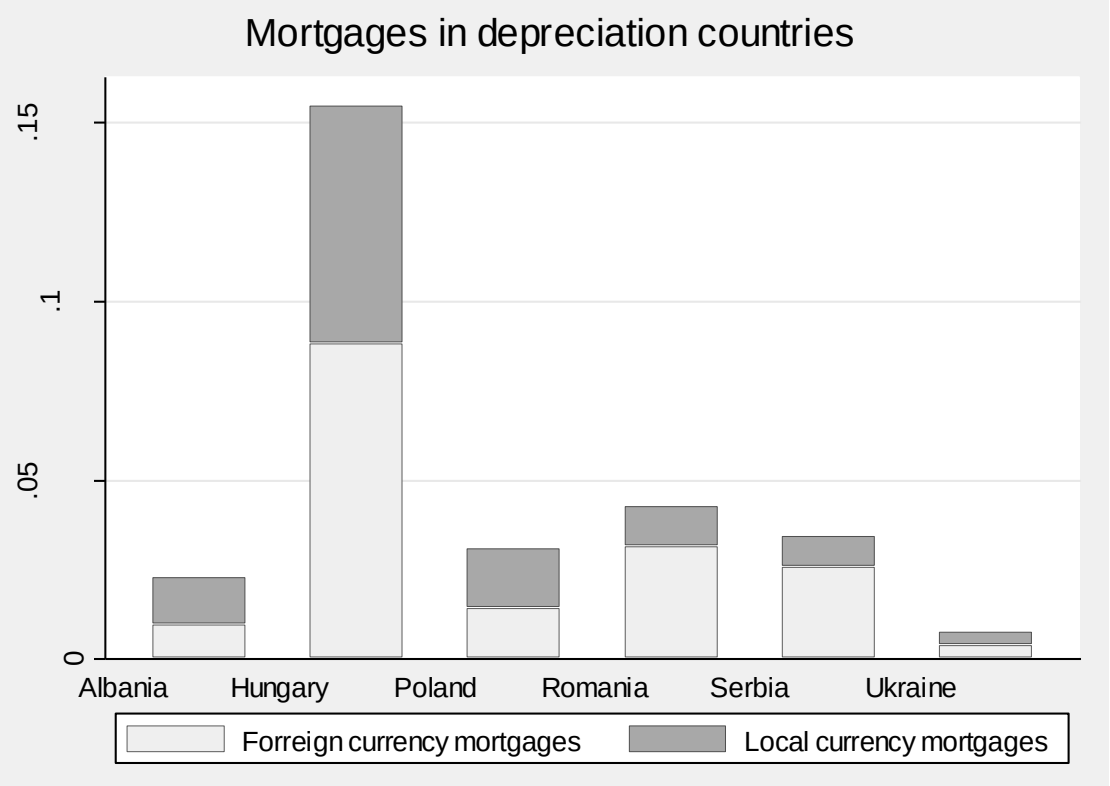

Figure 2

4.3.1 Repaying the mortgage

In the questionnaire of our survey there is the question: „Is your monthly payment interest only or does it also include capital repayment?“ Now, we want to explain what these terms mean. There are variations in how cost of a mortgage loan is paid, and how the loan itself is repaid (reference to [20]).

Capital repayment and interest payment - This is the old fashioned, traditional type of mortgage and remains the only way the property is actually guaranteed to be borrower´s at the end of the mortgage term - provided a borrower has repaid the loan. Mortgage debt is divided into capital repayments *(*i.e. repayment of the money borrowed) and interest payments (i.e. repayment of the interest a borrower is being charged for the loan). As a household pay off its mortgage every month it is paying off a bit of capital and a bit of interest until the full debt is repaid. People usually pay off mostly interest in the early years and then gradually more of the capital debt.

The interest-only mortgage - As the name suggests, with an interest-only mortgage, the monthly payment includes only this element of the debt. **The upside** of this is that **the monthly cost is considerably lower** than for a comparable repayment mortgage. **The downside** is that at the end of the mortgage term a **borrower still owes the original amount** borrowed. And if he cannot repay it, the mortgage lender is perfectly entitled to repossess his home. **This is the reason, if a household goes for this option, it need to organise an external way to repay the capital debt.** Unless there is a certainty of a sizeable inheritance or other windfall, this means saving money until the end of the mortgage term. There are various r**epayment vehicles for the capital debt.**

Opting for an interest-only mortgage involves accepting a significant degree of risk. **If a repayment vehicle doesn't perform well, borrower could be left without enough cash to clear a debt. However, this has no clear link with current arrears. Moreover, t**he majority of mortgage providers no longer ask for proof that borrower has set up a suitable savings or investment plan before agreeing to an interest-only mortgage. Thus, households with capital repayment mortgage are expected to be more in arrears because they are obliged to pay off more money every payment period.

Among all the households with a mortgage in our data set, 79 per cent of respondents have a mortgage with capital repayment and interest payments. 13 per cent have interest only mortgage, the rest of respondents doesn´t know or refused to answer. Share of capital repayment mortgages is sizeable in all country groups, as seen in *Table A2*. In depreciation countries this proportion is 78 percent, in non-depreciation countries even 7 percentage points more.

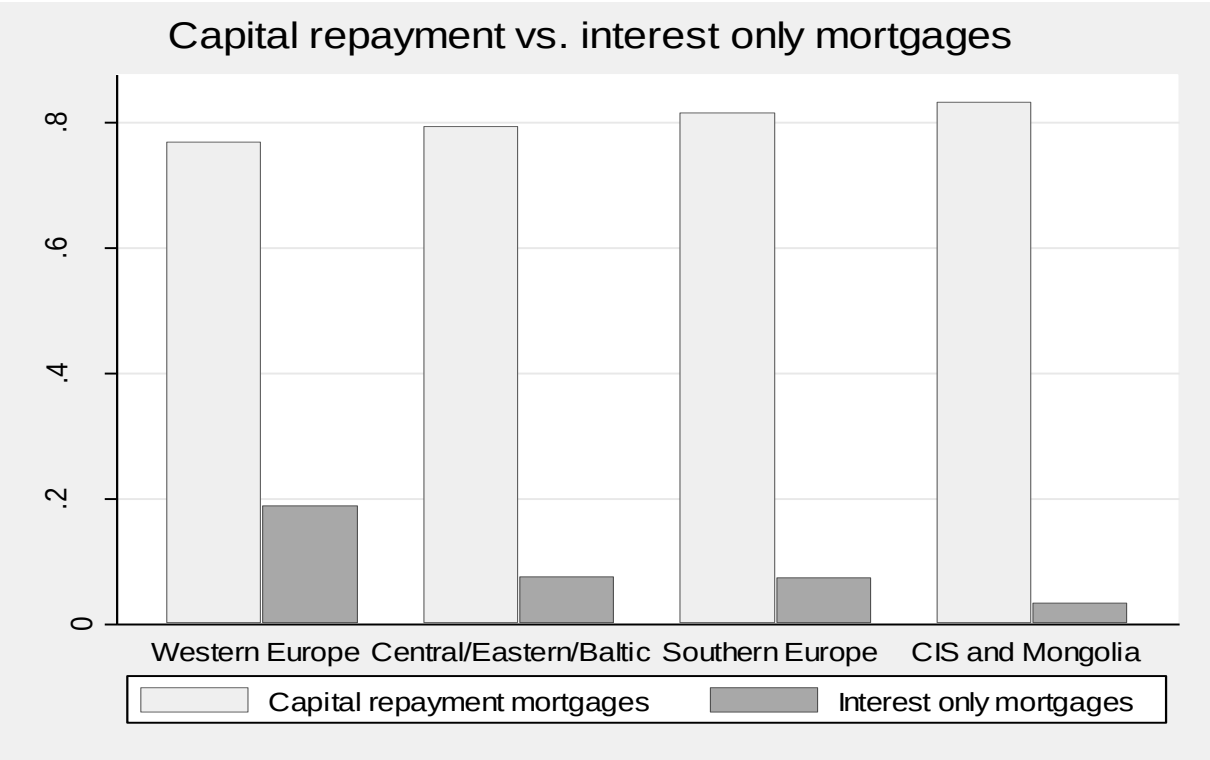

Figure 3

If we look at country groups (the default splitting by the EBRD survey), we found out that the more developed countries the higher proportion of modern interest only mortgages and the lower proportion of traditional capital repayment mortgages. *Figure 3* shows that share of interest only mortgages in Western Europe is almost twenty per cent, while in the former countries of Soviet Union is only 3,5 %.

4.3.2 Types of mortgage loans

The questionnaire includes one important question on type of mortgage interest rate. Possible answers are: „Fixed interest rate“, „Initial fixed-period rate“ and „Variable rate“ We describe various types of mortgages now. [20]

In a **fixed rate mortgage**, the interest rate, and hence periodic payment, remains fixed for the life (or term) of the loan. Therefore the payment is fixed, although ancillary costs (such as property taxes and insurance) can and do change. For a fixed rate mortgage, payments for principal and interest should not change over the life of the loan.

In an **variable rate mortgage** (also known as a floating rate or adjustable rate mortgage), the interest rate is generally fixed for a period of time, after which it will

periodically (for example, annually or monthly) adjust up or down to some market index. Adjustable rates transfer part of the interest rate risk from the lender to the borrower, and thus are widely used where fixed rate funding is difficult to obtain or prohibitively expensive. Since the risk is transferred to the borrower, the initial interest rate may be from 0.5% to 2% lower than the average 30-year fixed rate; the size of the price differential will be related to debt market conditions, including the yield curve

Initial fixed-period rate – is a combination of fixed and floating rate, whereby a mortgage loan will have a fixed rate for some period, typically one to five years, and vary after the end of that period.

Once again, changes in interest rates of variable rates mortgages are connected with some market index. This mean, when an economic situation improves and interest rates go down, to have variable rate mortgage is an advantage compared to fixed rate mortgage. However, Life in Transition Survey is an after-crisis survey, hence we may expect that households with variable rate mortgage are more likely in arrears. This effect can be more apparent in depreciation countries. According to Beckmann, Fidrmuc, Stix (2012), in addition to the exchange rate shock, interest rate may change as well. Domestic interest rates have remained high or even increased in the depreciation countries that they explored.

Among all the households with a mortgage, 51 per cent of respondents have a mortgage with fixed interest rate. 30 per cent have variable rate mortgage and 8 per cent initial fixed-period rate mortgage. The remaining households don´t know, do not stated or refused to answer. In depreciation countries share of variable rate mortgages is 39 per cent, in non-depreciation is lower, 31 percent. Distribution of types within depreciation and non-depreciation countries portrays *Figure 4*, distribution within different regions *Figure 5*.

4.3.3 Loan to value and loan to income ratios

Upon making a mortgage loan for the purchase of a property, lenders usually require that the borrower make a **down payment**; that is, contribute a portion of the cost of the property. [22] This down payment may be expressed as a portion of the value of the property. The **loan to value** is the size of the loan against the value of the property. Therefore, for example, a mortgage loan in which the purchaser has made a down payment of 25% has a loan to value ratio of 75%. For loans made against properties that the borrower already owns, the loan to value ratio will be imputed against the estimated value of the property. The higher the loan to value ratio, the higher is the risk that the value of the property (in case of foreclosure) will be insufficient to cover the remaining principal of the loan.

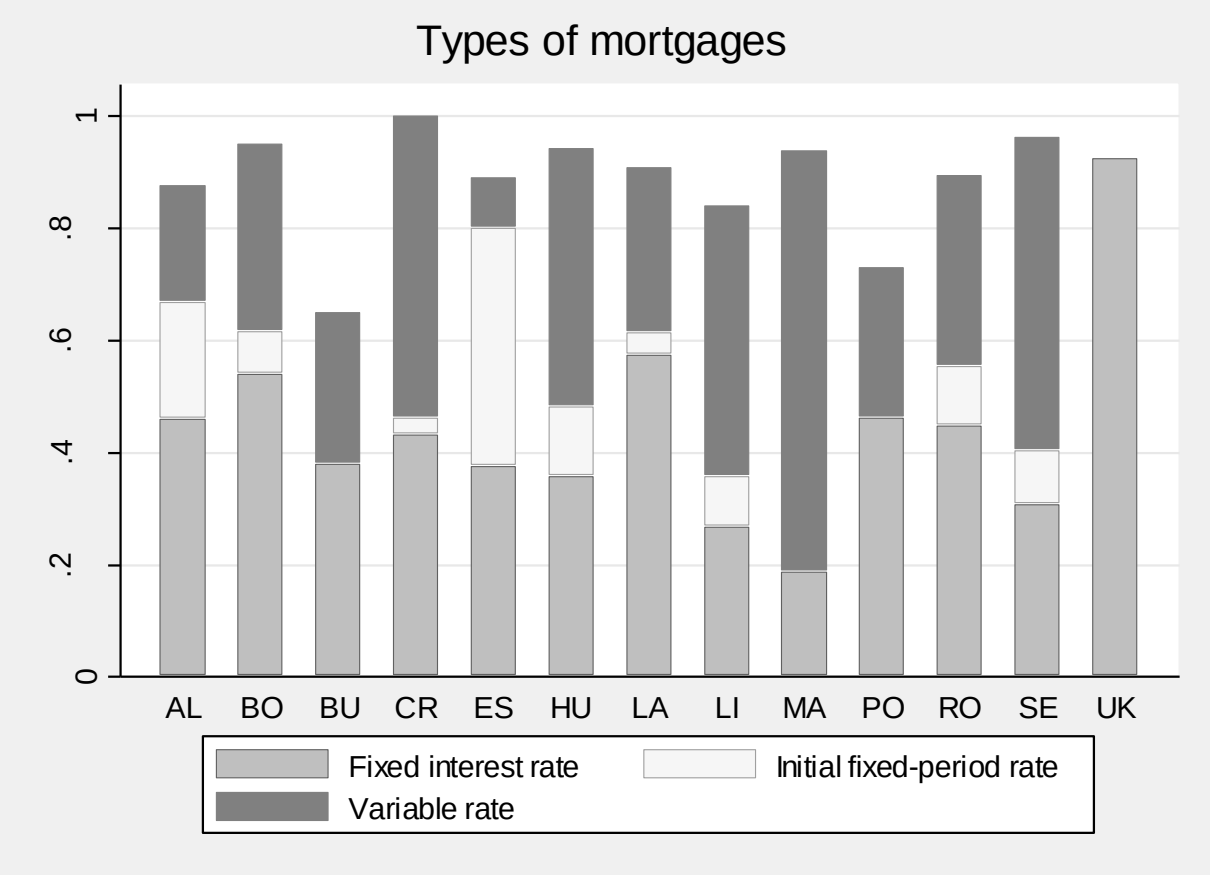

Figure 4. For the list of country abbreviations, see *Appendix 2*.

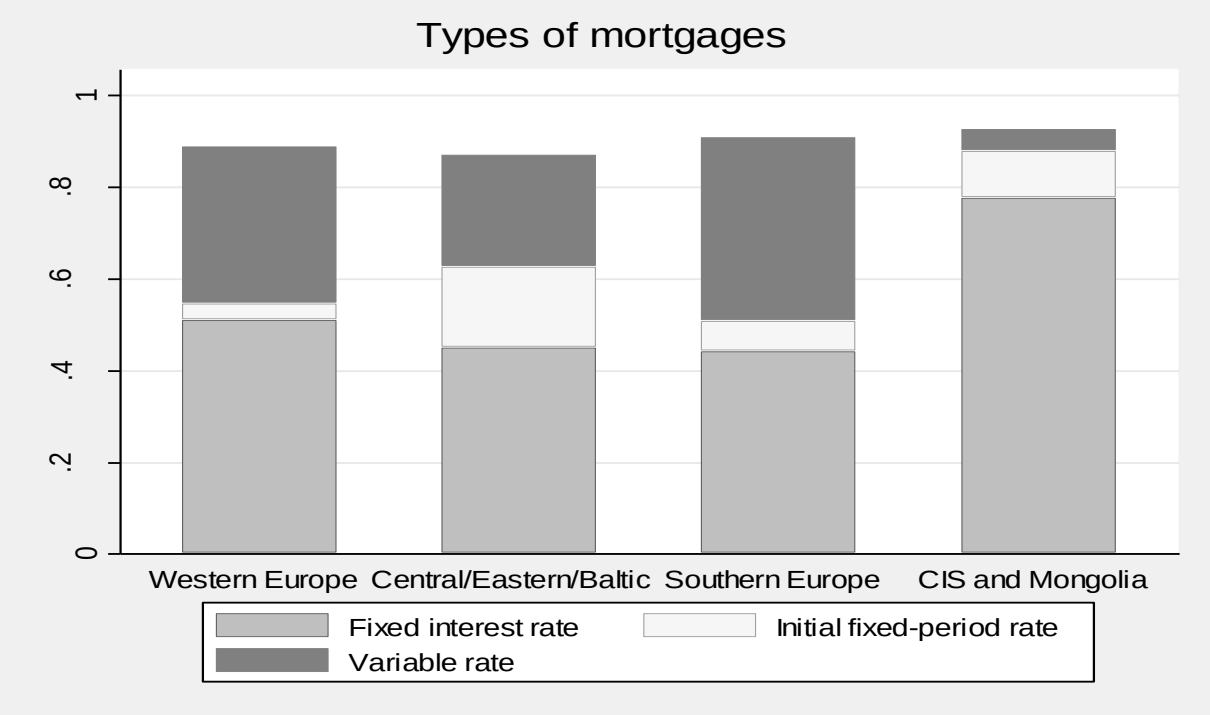

Figure 5

Loan to value ratio was found to be one of the important indicator of the riskiness of a mortgage loan in several papers, e.g. Aron and Muellbauer (2010). Variable *down payment*, used in our thesis, is expected to have an opposite effect on repayment (and arrears): the higher down payment the less risk of arrears. The construction of this independent variable from two questions of the survey is described in *Appendix 1*. According to our survey, average down payment in depreciation countries is about 6 per cent and in non-depreciation countries about 4 per cent. For comparison, in western European countries, average reported level of down payments is 10 per cent, whereas in new EU countries 5%.

Banks employ a number of standard measures of creditworthiness, e.g. payment to income (mortgage payments as a percentage of gross or net income), **debt to income** (all debt payments, including mortgage payments, as a percentage of income) and various net worth measures. We exploit variable called *debtservice*, which has actually the same meaning as payment to income measure. Variable was created by using of answer to question about monthly payments for mortgage and by counting of total expenses per month of household per month from several questions in Section 2 of the survey. Total expenses are proxy for income of household. Average reported debt service ratio in depreciation countries is 17 percent, in non-depreciation 22 percent and for comparison, in western countries is 27%. Debt to service ratio was used as a determinant of repayment problems, for example, in Bajari, Chu, Park (2008) and Aron and Muellbauer (2010).

4.3.4 Socio - demographic factors

Another option for bank to measure creditworthiness is to utilize credit scores, when a bank identifies various characteristics of a potential borrower. A elementary example of using credit scoring model concerning consumption, not mortagage loans may be found in Molokáč (2010). We try to carefully choose various demographic and financial variables which may proxy credit scoring. An advance of data from survey is, that we have also available data unobservable for a bank.

Demographic characteristics that, as we suppose, have influence on decision of person to opt for a mortgage loan and decision of financial institution to grant a mortgage for this person, are: type of settlement (urban, rural), size of a household, age and gender of a household head, education and employment status. Candidates for financial determinants that we include into selection equation, are income of a household, ownership of a car and savings of a household.

4.4 Arrears

Our main attention is focused on detection of determinants of arrears on mortgage loans of households. The variable *arrears* is based on answers on the question „Are you currently in arrears on this mortgage?“ If we look at *Table A2,* we could be surprised by the very low incidence of arrears among the mortgage borrowers. In both depreciation and non-depreciation countries, average proportion of arrears is 14 per cent, in depreciation countries 17 per cent and in non-depreciation 12 per cent. Shares of arrears in individual countries are imaged in *Figure 6* and *Figure 7.* For the list of country abbreviations on the figures, see *Appendix 2*. Among all these countries, the lowest levels of arrears are reported in Bosnia and Herzegovina, Poland and Estonia. We found out the highest levels in two depreciation countries - Albania and Hungary.

For regional comparison, in western European countries level of arrears resulting from our data is only two per cent, despite the fact that there is the highest share of mortgages (41%). The highest level of arrears is in Asian countries (63 per cent), but the share of admitted mortgages there is the lowest – only 2%.

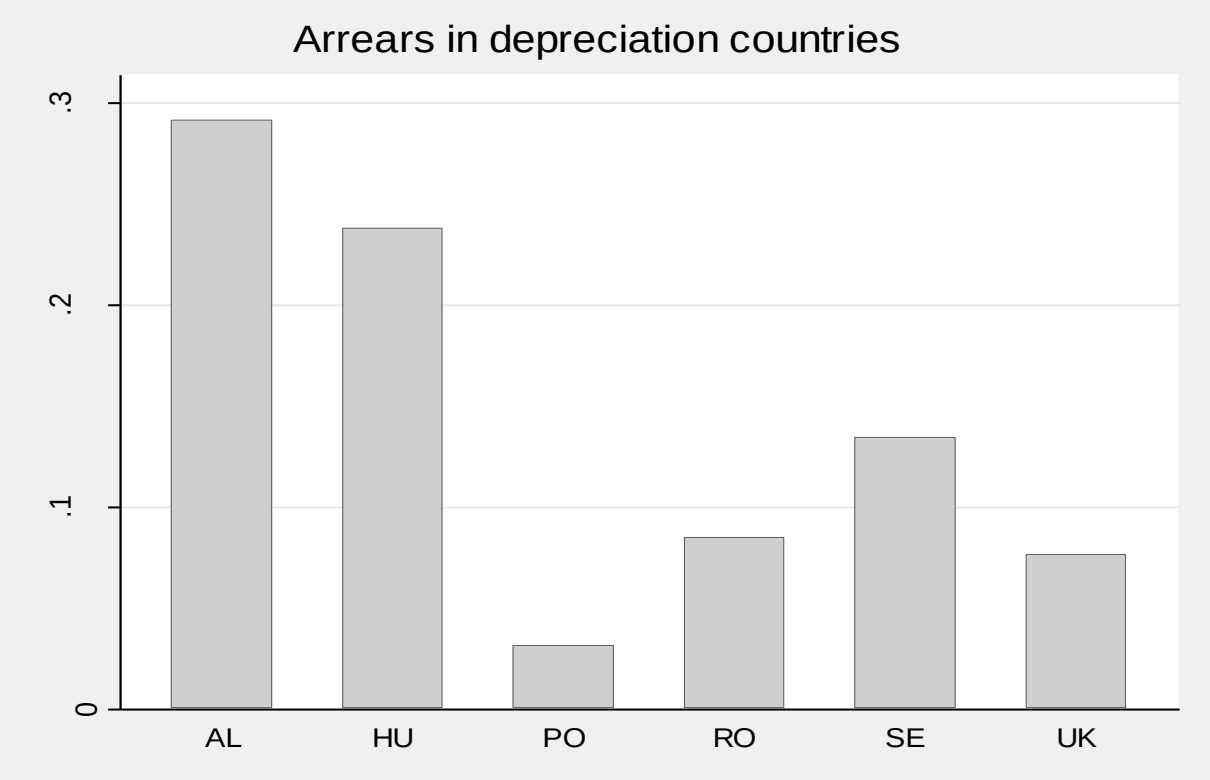

Figure 6

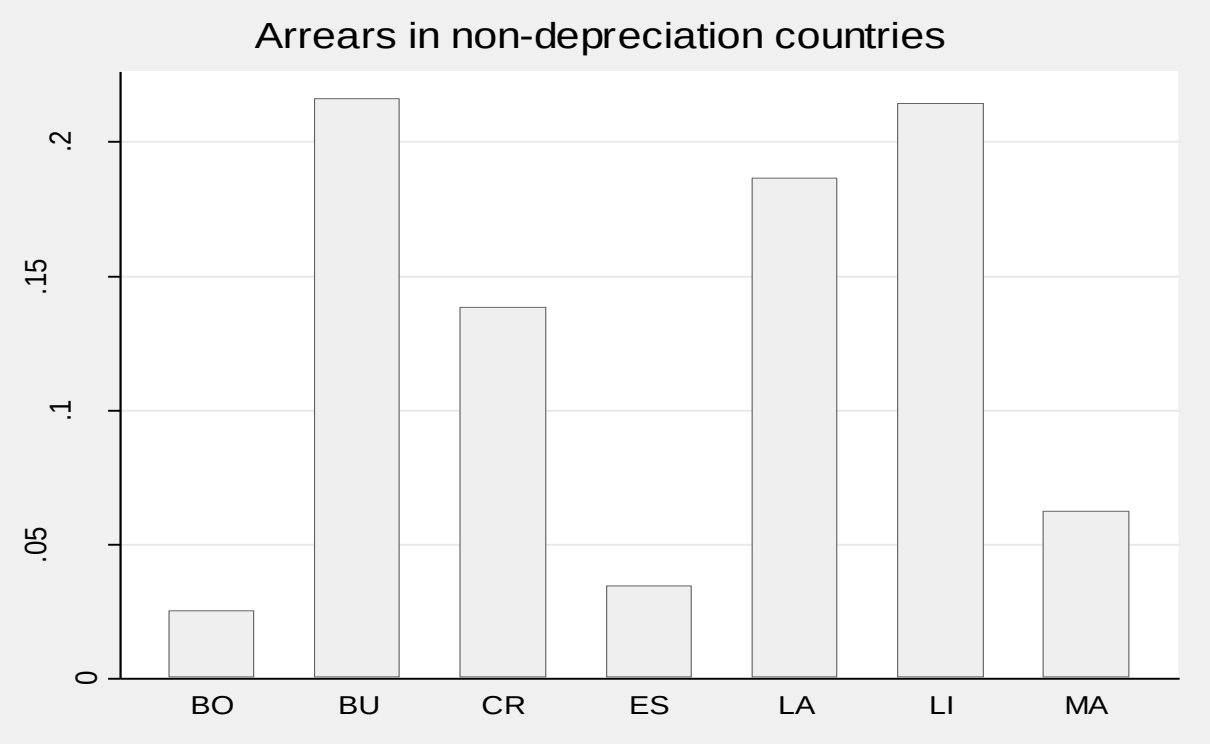

Figure 7

The interesting question, if reported levels of arrears are realistic, is arising now. The question on arrears refers to current arrears only. Consequently, households that were in arrears recently and now are no longer, are not captured by this question. In Beckmann, Fidrmuc, Stix (2012), average reported level of arrears was much higher, at 34 per cent, over two times more as it is in the EBRD survey. There was the question on arrears concerning on arrears in the past twelve months and this question was about consumption and mortgage loans together. Moreover, number of observations was higher there. Thus, we must face the problem of underreporting bias, which is discussed also in the paper quoted above. On the other side, among the people currently in arrears, there seems to be the higher probability that our question may capture people who are only few days late with payments better as the Bank of Austria survey question. Our question also does not contain amounts so that arrears on a loan of very various amounts are counted equally. The last two effects could mitigate the underreporting bias problem.

Figure 8 compare households from both depreciation and non-depreciation countries which are in arrears with those who have a mortgage but are not in arrears in characteristics described in previous chapters. We could see that among the households in arrears there are, as expected, higher proportions of variable rate mortgages and capital repayment mortgages, although the latter proportion is only slightly higher. In addition, there is the higher mean value of debt service burden and lower mean of down payments. Finally, among households in arrears we may observe lower share of foreign currency mortgages.

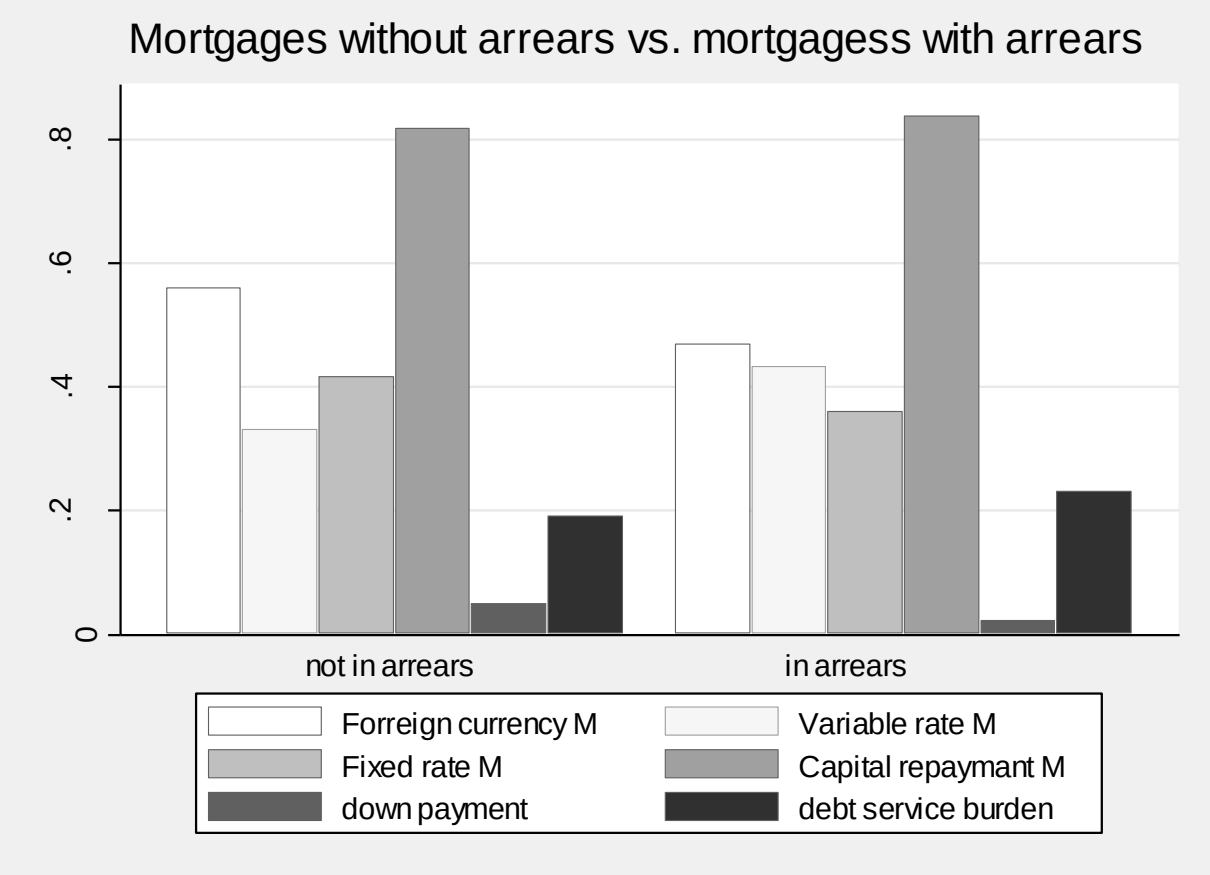

Figure 8

4.4.1 Impact of the crisis

For our estimations we have created the variable *crisisshock* from the answers to question, how much the economic crisis affected a household in the past two years. If an answer was „A great deal“ or „A fair amount“, *crisisshock* has the value of one. So the resulting effect is effect of the crisis in the past two years on current arrears. The crisis affected 66 per cent of households with mortgage in depreciation countries and 63 per cent in non-depreciation (see *Table A2*). Regarding the regional groups, the lowest influence was, not surprisingly, in western European states, while the highest one in the Balkan.

Further, we have generated the variables *jobloss, closebus, reducedh, lesswage, lesremit ,* that explain what was the affect of the crisis on households (loss of the job; family business closed; working hours reduced; less wage; less remittances respectively). For the detailed description, see *Appendix 1,* part Crisis variables. The highest proportion have decreased, delayed or suspended wages, 39 per cent in depreciation countries and even 61 per cent of households with mortgage in non-depreciation countries. Reduced flow of

remittances is much more obvious in depreciation countries (37 per cent against 16 per cent in non-depreciation). The loss of a job of some household member experienced 21 per cent households in depreciation countries and 26 per cent in non-depreciation states. Shares of reduced working hours and a closing of family business are lower. How is it in the regional groups? The loss of the job was the most frequent in new EU states – 23 per cent. Reduced wages were the most common in Balkan states – 54%. Reduced remittances were frequent mainly in both new EU and Balkan states.

From the point of view of households in arrears versus households not in arrears among both depreciation and non-depreciation countries, results of the crisis impacts are shown in *Figure 9*. It is apparent that households in arrears suffered from all the impacts of the economic crisis more than those not in arrears. 88 percent households in arrears felt any of crisis shocks, while this is the case for 60 per cent households with mortgage and not in arrears. Regarding the individual impacts, the biggest difference is in the job loss impact which is two times less frequent in favour of households without arrears.

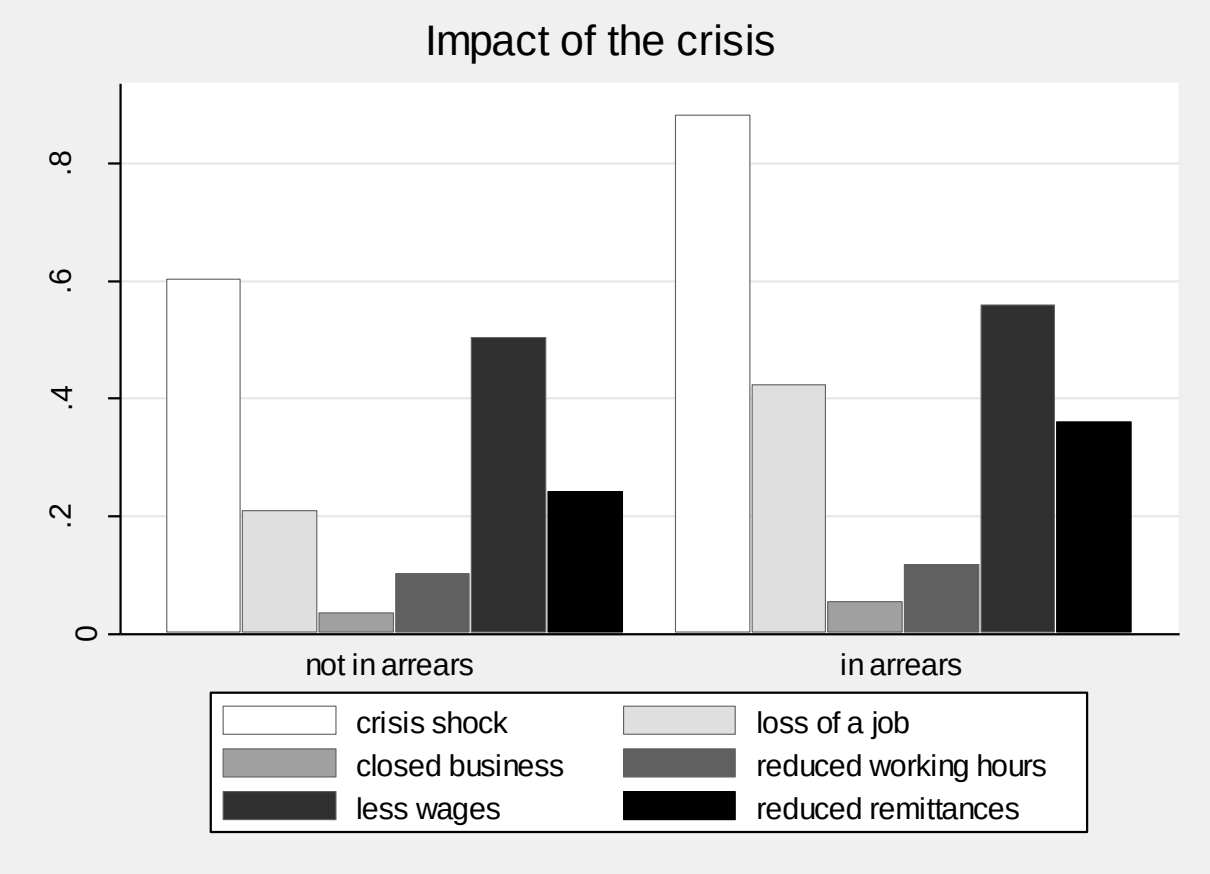

Figure 9

4.4.2 Attitudes, values and inside factors

We can split impact of moral values into two levels: country level and personal level.

Country level - contains personal evaluation of the morality and values in the country where a person lives. Here we examine affect of the variables such as trust in institutions (banks, a government, courts, police), *existlaw* and *unfair*. *Existlaw* is the categorical variable expressing to what extent a respondent agree the law and order exist in his country and answers are from „Strongly disagree" up to „Strongly agree". *Unfair* is the dummy variable talking about the respondent's opinion what is the most important factor to succeed in life in a respondent's country and if his/her answer is „Political connections" or „Breaking the law", unfair take the value of one. Other possible answers are „Effort and hard work" and „Intelligence and skills".

Institutions in a country can play an important role , as show, for example, Duygan-Bump and Grant (2009). Beckmann, Fidrmuc and Stix (2012) directly model effect of trust in institutions on probability to be in arrears. They detected trust in banks, governments, police and the EU decreases the probability to be in (consumptions and mortgage) arrears and that, according to their results, trust in banks and government are most important trust factors.

Regarding our descriptive statistics, level of trust in institutions is higher in non-depreciation opposite depreciation countries. The greatest differences are in trust in banks (two times more) and trust in police (15 percentage points more). Among the four institutions, the most unreliable are governments. This is observed also in regional groups. The most trustworthy in depreciation and non-depreciation countries is the police. This is the case also in western European region, the new EU member states and the Balkan. However in the post-soviet republics, banks enjoy the highest trust.

The level of unfairness is very similar in depreciation and non-depreciation countries. 35 percent of people having a mortgage think the unfair factors are more important for success in life in their countries. Though, we may observe large regional differences in *Table A2*. Only nine per cent of people in western countries believe unfair methods are the most important, whilst 30 per cent in new EU countries and even 46 per cent in Balkan states. People in non-depreciation countries believe more that the law exist in their countries than people in depreciation countries. According to our descriptive statistics, existence of law is more symptomatic for western European countries and the lowest level of belief in existence of law is in the former USSR.

Personal level – comprises of questions which evaluate an own, inner, morality of a person asked. There are the variables *moral* and *noobeylaw. Noobeylaw* measures people's opinion if to obey the law without exception or sometimes are good reasons to break the law. *Moral* is the intricately designed variable. We calculated the arithmetic mean of seven categorical sub-questions of the question how wrong a respondent consider to be some patterns of

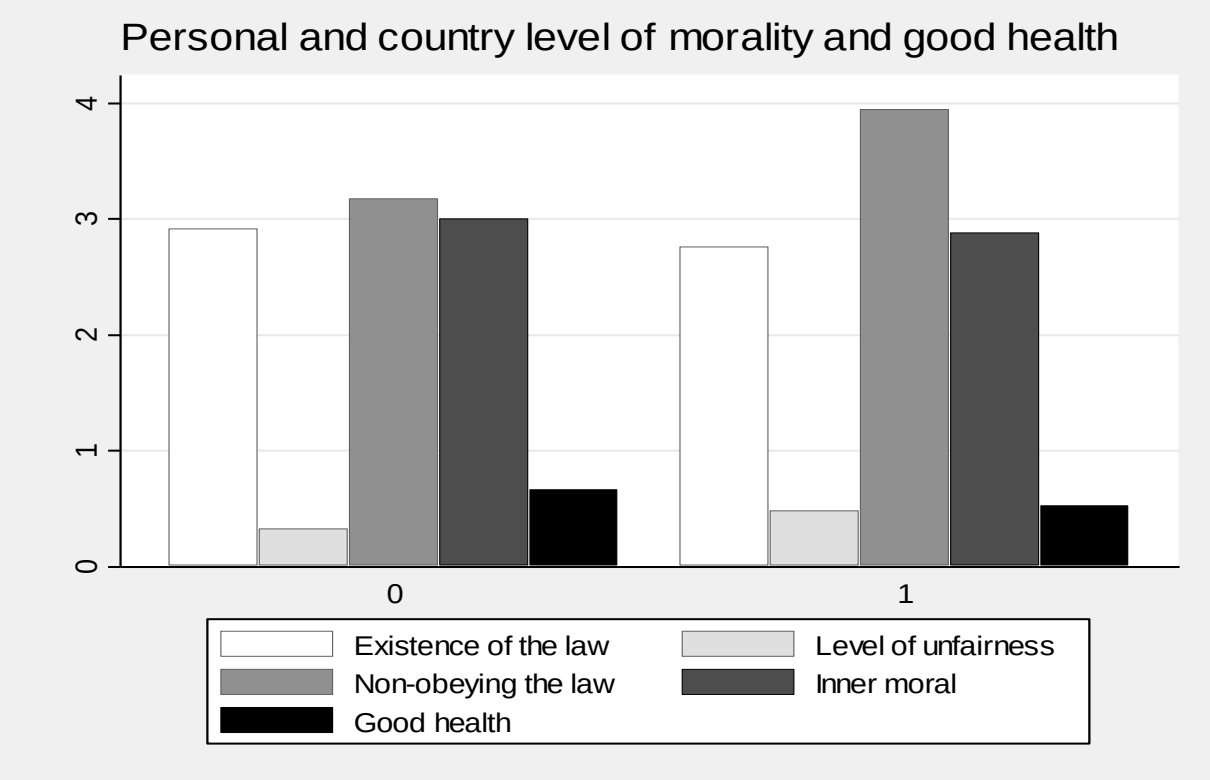

Figure 10, 1 stands for households in arrears, 0 for households without arrears

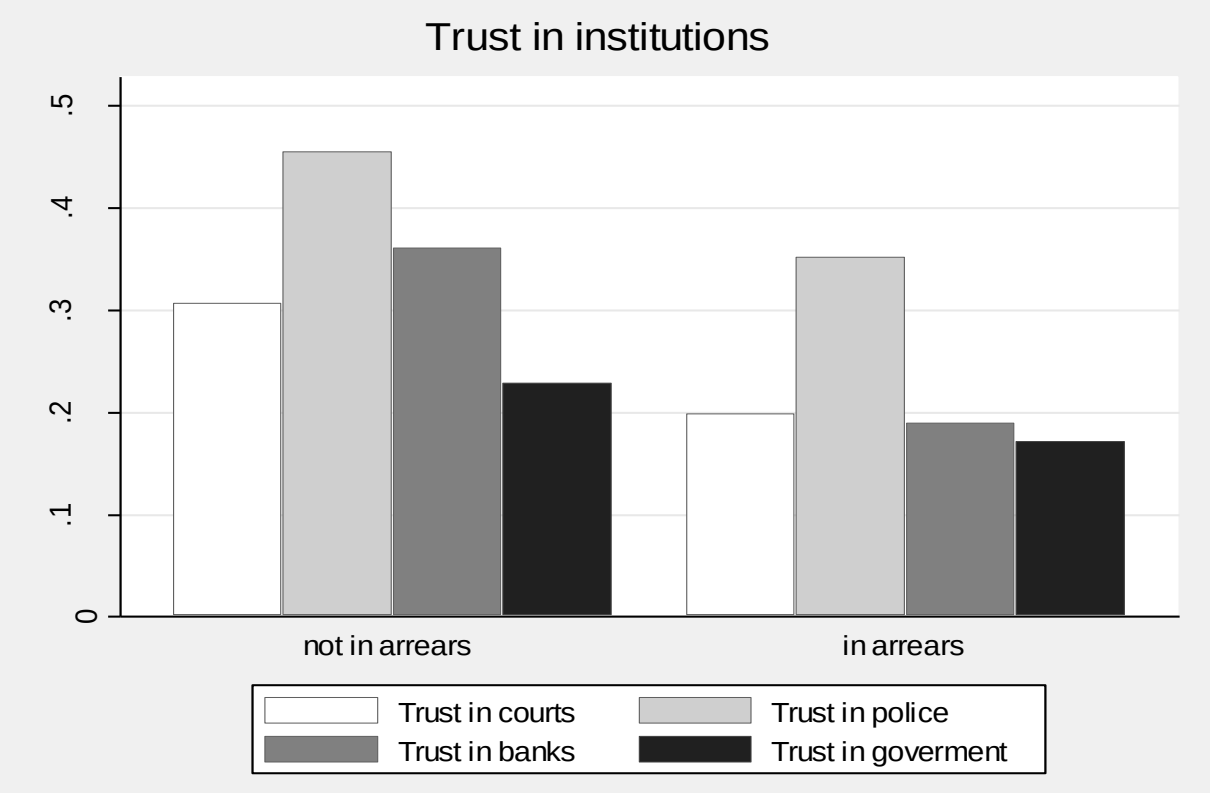

Figure 11

behaviours. Details on these sub-questions are in *Appendix 1*.

From descriptive statistics of the variable *noobeylaw* is seen, that in the non-depreciation countries people tend more to breaking the law in some situations, whilst in those with depreciation of currency is the higher propensity to comply with the law under any circumstances. This comparison is more interesting for country groups, where the western European respondents have higher propensity to break the law sometimes, whereas tendency to obey is the most apparent in Balkan states. It is essential to note, that the obeying of the law has not one-way relationship with morality. People obeying the law more may be more aware of institutions or less courageous than people which tend to break the law. Moreover, laws may be sometimes inconsistent with moral principles.

The variable *moral* could be more meaningful due to the way how is constructed. We observe the highest propensity to be moral in the western countries and the highest inclination to be immoral in the countries of Eastern Europe and Asia.

We mention in this chapter also the possible impact of good health to probability of arrears, because this candidate for determinant is difficultly observable by banks and we may mark it as an inside factor. We expect good health will decrease probability to be in mortgage arrears . We noticed there very large differences between the regions in respondents´ self-assessment of own health. In Western Europe and Balkan countries this self-assessment is the most positive, opposite to Eastern Europe.

In *Figures 10* and *11,* we look at all the variables specified here in this chapter from perspective of arrears, for comparison of these characteristics between households in arrears and those with mortgage but not in arrears. We can see that all the differences in proportions between people in arrears and those not in arrears are in expected direction.

4.4.3 Other possible determinants of arrears

Our data set provides a lot of interesting characteristics as candidates for determinants of arrears. In the questionnaire is the question for head of a household about his view of his households´ economic and financial position within the country in comparison with other households on ten-step ladder. We want to find out if country financial position has a higher impact on arrears in countries where social differences between people are larger.

In the crisis section of the survey is the question if a household delayed or defaulted on a loan instalment as a result of economic difficulties. It might be interesting to recognize whether people who were in consumption loan arrears have a higher probability to be in mortgage arrears. Boeheim and Taylor (2010) confirm that previous experience of financial problems have an association with the current financial situation. However, the question in our survey is defined broadly, it may concern not only consumption loans but also mortgage loans and thus there is a possible multicollinearity problem.

There are also questions about formal and informal borrowing and application for housing support and unemployment benefit. We want to explore whether an successful informal borrowing and acceptation of applications for housing support and unemployment benefit have a positive effect so that they lower the probability of arrears.

We also investigate how financial issues as income, no savings of a household or ownership of a car influence the probability of arrears. Ownership of a car is supposed to increase probability to receive a loan from the bank, as it is observable indicator of wealth. It may serve as collateral and may be considered as proxy for capital adequacy. (Biroš, 2011) Hence, we expect ownership of car to decrease the probability of arrears. Further, we identify influence of demographic variables from selection equation on arrears.

Chapter 5

Estimation results

In this section we study the determinants of arrears in CEECs. We divided countries into two groups: countries with currency depreciation as a consequence of the economic crisis and countries without depreciation. We present results for both groups together and for each group separately. Then we continue in an estimating of determinants of arrears for regional groups containing additional countries. We apply a two-stage Heckman probit model with sample selection which estimates the selection equation (mortgages) and the outcome equation (mortgage arrears). We start with the discussion of methodology. As far as we are not interested in demand for mortgages in detail, we discuss the selection equation only shortly. The major part of this section concentrates on different determinants of household arrears.

5.1 Empirical strategy

Our empirical strategy follows the approach proposed by Heckman (1979). Arrears are observed only if a respondent has a mortgage loan. Directly modelling the probability that a respondent is in arrears on mortgage loan repayments, hence neglecting the sample selectivity, would result in biased estimates. Therefore, we jointly estimate the probability of having a mortgage and the probability of arrears. This approach was used in the literature recently; see Beckmann, Fidrmuc and Stix (2012). In particular, the selection equation is defined as the probability *M* that a respondent has a mortgage,

$$P(M = 1) = \Phi(x_m^{'}\beta_m + \varepsilon_m)$$

In the second stage, we estimate a probit equation that the respondent is currently in arrears on mortgage loan repayments,

$$P(A = 1|M = 1) = \Phi(x_a'\beta_a + \varepsilon_a)$$

where the error terms are normally distributed, $\varepsilon_m \sim N(0,1)$, $\varepsilon_a \sim N(0,1)$. Furthermore, they are correlated, $corr(\varepsilon_m, \varepsilon_a) = \rho$. The selection equation has to include variables, which are used as the exclusion restriction. These variables have to be correlated with the probability that the respondent has a mortgage, but not with the probability of arrears.

We use information from the survey whether respondents have a bank account, which could be at a different bank to the one where they have a loan. Beckmann, Fidrmuc and Stix (2012) also use this variable for the exclusion restriction. As they mention, this variable is unobservable for the bank. In contrast to a bank, which will only have clients with a bank account applying for credit, we observe the entire sample of households with and without a bank account. As the second exclusion instrument, we use risk aversion. This categorical variable was created from answers to the question when the principal respondent was asked to rate his willingness to take risks. We are aware that these variables are not the strongest instruments imaginable, however in survey data studies, it is rather difficult to come up with very strong instruments. Finally, all estimations of selection and outcome equation include country effects, which are not reported. We report standard errors which are clustered at the country level.

5.2 Determinants of mortgages

We start our analysis with the discussion of mortgage determinants. We use nearly the same basic specification throughout the paper. To arrange the presentation of our results in a clear and a succinct way, we do not report the selection equation for all specifications. Accordingly, we start the discussion with marginal effects estimated for the selection equation (*Table 1*). For more simplified expression in the following chapter we mark depreciation and non-depreciation countries as „all countries“ if they are considered as one group. In the tables with estimation results they are labelled *denode.*

Our instrumental variables are both highly significant for all countries. Households with bank account have the higher probability to have a mortgage by 1 per cent. Risk averse households have, surprisingly, lower probability of a loan. The coefficient is only about 0,1 per cent in the case of all countries, but is strongly significant. This result indicates that banks should continually improve their scoring model to identify risk averse person. However, results for depreciation countries confirm supposition that we have not very strong instruments available, because no instrument is significant there.

According to the estimation results, people living in rural environment have a mortgage less likely. Life in rural environment means that a bank is not so easy accessible and thus there may be a distance barrier for rural people. As expected, young people have about 2 percent higher probability to have a mortgage than omitted category of middle-aged, simply because they need it more. On the other side, old people have a mortgage less probably. Households with at least three members have mortgages more likely than omitted category in this case, people living alone. Also marital status is important: never married and widowed people have significantly lower probability to have a mortgage than married (omitted). Higher education increases the probability too. Very significant and influential is an income effect – people with highest incomes have mortgages by 9 per cent more than people with low incomes. This effect very depend on country group – in depreciation countries it is 2 per cent, however, in non-depreciation states is incredible 32 per cent. People with medium income have the probability to have a mortgage loan higher by 5 percent in all countries in total. Interestingly, the impact of an ownership of a car is very limited. Finally, higher education increases probability to have a loan. For comparison, *Table 1* include also the results for western European countries, new EU countries and countries outside the EU.

5.3 Determinants of arrears

Table 2 presents affects of basic demographic variables to probability of arrears. Interestingly, there are only few significant variables. This may be consequence of the small number of observations of arrears and partly it is caused by the fact that some demographic characteristics do not belong to a head of a household, as is discussed in Chapter 4.1. Remarkable result is that income has no significant effect on arrears. As expected, households with no savings have more probably problems with arrears. A nice result is, for countries with currency depreciation savings do not decrease the probability of arrears. Very important here is the ownership of a car. People with a car are from 6 to 10 per cent less likely in repayment problems.

Very important for discussion is the top of the *Table 2*. We estimate effect of currency denomination of a mortgage loan to probability of arrears connected with this loan. In all countries in total, people with a mortgage denominated in a foreign currency have by 4,5 per cent lower probability to be in arrears. In non-depreciation countries the probability is by 3,8 per cent lower for foreign currency mortgages. Even in depreciation countries foreign currency denomination decreases the probability, but coefficient is not significant. This result may suggest, that banks know about risk connected with mortgages in foreign

currency, described in Chapter 4, and bankers have selected applicants carefully and that households with foreign currency mortgages have a better repayment propensity. This result is similar to what EBRD Transition Report (2011), Table 2.1.2 reveals and contradicts with Beckmann, Fidrmuc and Stix (2012). If we split households into the four categories by country group and currency of a mortgage, Specifications 10 and 11 in *Table 2* show that people in non-depreciation countries with a mortgage denominated in local currency are the worst risk takers and households with local currency mortgages in non-depreciation countries have the best propensity to repayment. The currency denomination in depreciation countries seems to be less important factor than in non-depreciation countries.

Table 3 illustrate the effect of a type of a mortgage on the probability of arrears. Type of a mortgage is not the strongest determinant, because coefficients of the dummy *var* which represents adjustable (variable) rate mortgage in Specifications 12-14 are not significant. Nevertheless, the result is instructive. Variable rate mortgage increases the probability of arrears in all countries in total by 3 per cent. Hence, is an advantage to have fixed interest rate mortgage in times of crisis when market interest rates are higher and accordingly, household has to pay more for variable rate mortgage. However, fixed interest rate is losing an advantage in good times. An option is, if household expect more difficult times than mortgage lender, to take a fixed-period rate mortgage. Positive effect of variable rate mortgage on probability of arrears is driven by depreciation countries. There is a clear link to an interaction between depreciation of a currency and growth of interest rates. In non-depreciation countries variable rate mortgage does not increase probability of arrears.

Further, as we may observe in Specification 12 of *Table 3,* households which have a mortgage with capital repayment are by 4 per cent more probably in arrears than households which pay only the interest to lender during the term of a mortgage. Again, the result is driven by depreciation countries. Mortgages with capital repayment and interest payments are in arrears by 9 per cent more likely than those with interest payments only. People paying only an interest may have financial troubles with repaying external source of future financing of a mortgage capital debt, but the variable *arrears* does not reflect these problems.

Specification 16 in *Table 3* shows that in depreciation countries capital repayment mortgage increases the probability of arrears either it is denominated in local currency or in foreign currency. Interest only mortgages in foreign currency in depreciation countries are five per cent less likely in arrears than interest only in local currency. In contrast, in non-depreciation countries, capital repayment mortgage increases the risk, only if it is denominated in local currency (Specification 17).

In *Table 4*, Specifications 18-20 confirm reducing effect of foreign currency denomination on the risk of arrears. Only in depreciation countries a foreign currency mortgage of variable rate takes the equal risk as a domestic, not variable rate mortgage. Specifications 21-23 show that the highest risk in crisis times is connected with variable rate

mortgage with capital repayment in a depreciation country. In the case of depreciation of currency, the safest option is non-variable rate mortgage with only interest payments. We are aware that lot of coefficients in *Tables 3* a *4* is not significant, but it is the cost for very detailed specifications and careful separation of effects with low number of observations.

Tables 3 a *4* also confirm securitizing effect of ownership of a car against arrears. Very important determinant revealed here is a down payment. This factor described in Chapter 3 decreases the probability of arrears largely. Since *down payment* is a continuous variable, marginal effect has the following interpretation: an increase in down payment by 1 percentage point cause a decline in probability of arrears of about 0,25 per cent. In depreciation countries this effect is lower, but more significant than in non-depreciation countries.

Table 5 discovers payment to income ratio stored in the variable *debtservice* as an influential determinant. If the ratio increases by 1 per cent, the probability of mortgage arrears is 0,05 per cent higher. In depreciation countries, the effect is stronger in comparison with countries without depreciation of currency.

Main goal of *Table 5* is to expose the impact of the economic crisis on probability of arrears. Households that suffered a crisis shock have the risk of arrears by 8 per cent higher. Impact of the crisis is not significant in depreciation countries (there are other stronger determinants). In non-depreciation countries effect of a crisis shock is more than 9 per cent. When we employ different types of shocks in Specifications 27-29 we may see low significance of individual effects. The most substantial seems to be loss of a job of a member of a household. Households where somebody lost a job are 5 per cent more likely in arrears. Effects of all the shocks are captured in *Table 5*.

Table 6 indicates how trust in institutions affects the risk of arrears. The impact of these variables in Specifications 30-34 is displayed not only for depreciation and non-depreciation countries, but for all the countries in the survey. According to the results, trust in banks is the most relevant. People who trust in banks are in arrears by five percent less likely. Trust in courts decreases the probability of arrears by 3 per cent but the coefficient is not significant. If we compare depreciation and non-depreciation countries, trust in banks lower the probability of arrears more in depreciation countries. Interesting result is that in depreciation and non-depreciation countries trust in government increases the risk of arrears. Because of missing significance of variable the result has limited interpretation.

We also explore effects of morality and values on arrears. There are variables that are proxy for personal and country level of morality, as it is explained in Chapter 4. Results in *Table 7* indicate that country level is more important than personal. People who think in their country unfair methods are the most important for success in life are more probably in arrears than people who consider hard work and education as the main factors of a success. In depreciation and non-depreciation countries, people who have the opinion that in their

country unfair methods are important for success are less likely in arrears by 4 - 6 per cent. In new EU states the effect is 3,3 per cent, in Balkan states 8 per cent, but not significant. In eastern European states - former USSR, there is an opposite effect. In other words, people who think in their country unfair methods are the most important for success in life are less likely in arrears. It is worth to note that in these countries the Corruption perceptions index, measured by the Transparency International, reaches the lowest levels among the countries in our survey. (Source: 25). In other words, corruption is perceived very amicably here**.** The variable *unfair* may express an opinion of people on strength of institutions and moral assessment of environment they live in and it can contribute to the probability of arrears in the way that when people think unfairness is common and tolerated, they may start to behave strategically and to decide for arrears intentionally.

Regarding the personal level of morality, captured by variable *moral,* high morality of person decreases significantly probability of arrears in depreciation and new EU countries. We may observe opposite and significant effect in eastern countries. Remember, the mean of *moral* is the lowest in eastern countries (see *Table A2*). Generally, high morality is an important determinant in country groups where average levels of morality are higher.

Other measures of morality are variables *existlaw* and *noobeylaw.* People from new EU countries who think in their country the law exist, are less likely in arrears by 1 per cent. An opposite effect is in Balkan countries. In eastern countries, this variable is irrelevant. Effects of variable which express opinion that sometimes, breaking the law is a good way are very little.

Further, from *Table 7* is apparent that good health has an expected, negative impact on probability of arrears.

In *Table 8* we explore economic position within a country and informal borrowing and financial help from institutions as possible determinants of arrears. Self-assessed country financial position is partly significant only in depreciation and non-depreciation countries in total and in the group of new EU states. As expected, the higher country financial position, the lower probability of arrears.

Among an informal borrowing and financial help from institutions, the most important is an informal borrowing (*sucinf*). Households who succeed in informal borrowing from friends or relatives have, at first sight surprisingly, higher probability of arrears. The effect can be explained by the opposite direction of consequences: people were first in arrears and then they asked relatives for help. Nevertheless, the question about arrears is concerning only current arrears and the question about borrowing falls into the past two years. A more acceptable explanation is that people asking relatives or friends for financial help are less responsible, they cannot handle and save money and therefore are more financially vulnerable with higher propensity to arrears. Interestingly, coefficient of variable is not significant and it is almost zero in depreciation countries. It suggests that a large depreciation suppresses the importance of financial responsibility and on the other hand, makes the sources from informal borrowing less prone to wasting.

Impact of a financial help from institutions on probability of arrears is low.

In this chapter, we revealed determinants of arrears in depreciation and non-depreciation countries. Now, we present the impact of the selected determinants on arrears for regional groups in *Table 9.* We did not select the foreign currency mortgage as the determinant of arrears in regional groups, since there are mixed countries with euro as domestic currency with countries with own local currency. Next, we did not opt for capital repayment mortgage as the determinant considering it is correlated with high debt to income ratio which we include hence we want to avoid the multicollinearity problem.

What is seen at a glance in *Table 9*, almost all coefficients of variables are not significant in the group of Balkan and eastern European states. This is obviously the fault of low number of observations of arrears in these groups (see *N-uncens* in *Table 9)*. We focus on new EU members which is not regional group actually. Specification 52 confirms importance of selected determinants which are mostly significant and they have expected signs. Remarkable is an effect of trust in banks to probability of arrears in new EU countries – 9 per cent.

Chapter 6

Conclusion

We estimated determinants of arrears on mortgage loan payments in CEECs. We applied a two-stage Heckman probit model with sample selection which estimates the selection equation (the probability that a household has a mortgage) and the outcome equation (the probability that household is in arrears on mortgage loan payments). This approach was employed to avoid problems with sample selection bias.

We use data set the EBRD Life in Transition 2 Survey. It is an extensive survey with a wide range of questions about the behaviour of households. It allowed us to examine many variables as candidates for determinants of arrears. An advantage is, in the survey is lot of issues otherwise unobservable.

In the first phase we estimated determinants of mortgage loans. We used bank account and risk aversion as the exclusion restriction. According to our findings, households with bank account and surprisingly, those favouring the risk have the higher probability to have a mortgage. The result for risk aversion is supposedly more associated with a demand side of a mortgage. Effects of demographic characteristics to probability of having a mortgage have expected signs. The most important determinant is an income of household.

When we estimate determinants of arrears, we are limited by low number of observations of arrears. Nevertheless, we show several interesting findings.

People with a mortgage denominated in a foreign currency have by 4,5 per cent lower probability to be in arrears. Even in depreciation countries foreign currency denomination decreases the probability. Borrower in these countries dealt with the currency depreciation well. The result suggests that banks selected applicants carefully and households with foreign currency mortgages have a better repayment propensity.

Variable rate mortgage increases the probability of arrears in depreciation countries because depreciation of the currency is associated with higher interest rates. In non-depreciation countries variable rate mortgage does not increase probability of arrears.

Mortgages with capital repayment are by 4 per cent more probably in arrears than interest only mortgages. In depreciation countries, the risk is higher - 9 per cent. In non-depreciation countries foreign currency denomination eliminate the risk associated with depreciation. The highest risk in crisis times is connected with variable rate mortgage with capital repayment in a depreciation country.

Ownership of a car operates as a hedging factor against the risk of arrears. Very strong determinant is a down payment of a mortgage. An increase in down payment by 1 percentage point cause a decline in probability of arrears of about 0,25 per cent. Another determinant which confirms the results of previous literature is payments to income ratio. If it increases by 1 per cent, the probability of mortgage arrears is about 0,05 per cent higher. Households that suffered a crisis shock have the risk of arrears by 8 per cent higher. The most substantial shock is loss of a job of a member of a household.

People who trust in banks are less likely in arrears. Level of morality in the country has higher impact on the probability of arrears than personal level. People who have the opinion that in their country unfair methods are important for success are less likely in arrears. When people think unfairness is tolerated in their country, they may tend to behave strategically and to decide for arrears intentionally. Good health has an expected, negative impact on probability of arrears.

Finally, households who succeed in informal borrowing from friends or relatives have higher probability of arrears. This effect might be the proxy for financial irresponsibility and inability to save and is apparent in non-depreciation countries. A large depreciation suppresses the importance of financial responsibility.

Bibliography

1. Aron, J., Muellbauer, J., 2010. Modelling and Forecasting UK Mortgage Arrears and Possessions. *Economics Series Working Papers No. 499, University of Oxford.*

2. Bajari, P., Chu, C. S., Park, M., 2008. An Empirical Model of Subprime Mortgage Default From 2000 to 2007. *Working Paper No. 14625, National Bureau of Economic Research, Cambridge.*

3. Beckmann, E., Fidrmuc, J., Stix, H., 2012 Foreign currency loans and loan arrears of households in CEECs. *CESinfo Area Conference on Macro, Money and International Finance*

4. Biroš, A., 2011. Credit Burden of Households in Slovakia. Diploma Thesis. *Comenius University in Bratislava Faculty of Mathematics, Physics and Informatics* http://www.iam.fmph.uniba.sk/studium/efm/diplomovky/2011/biros/diplomovka.pdf

5. Boheim, R., Taylor, M. P., 2000. My home was my castle: Evictions and repossessions in Britain. *Journal of Housing Economics* 9(4), 287-319.

6. Brown, M., Ongena, S., Popov, A, Yeşin, P., 2011. Who needs credit and who gets credit in Eastern Europe? *Economic Policy* 26, 93-130.

7. Cameron, C., Trivendi, P. (2005). Microeconometrics Methods and Applications. *Cambridge University Press*

8. Duygan-Bump, B., Grant, C. 2009. Household debt repayment behaviour: what role do institutions play? *Economic Policy 24 (57), 107–140.*

9. EBRD 2010. Life in Transition Survey II. Questionnaire http://www.ebrd.com/downloads/research/surveys/lits2questions.pdf

10. EBRD 2011. Life in Transition: After the Crisis.
http://www.ebrd.com/downloads/research/surveys/LiTS2e_web.pdf

11. EBRD 2011. Crisis and Transition: The People´s Perspective. Transition Report 2011.
http://www.ebrd.com/downloads/research/transition/tr11.pdf

12. Fidrmuc, J., Hake, M., Stix, H. 2011. Households' Foreign Currency Borrowing in Central and Eastern Europe. *Working Papers 171, Oesterreichische Nationalbank, Vienna.*

13. Greene, W. (2010). Econometric Analysis. *New Jersey: Prentice Hall.*

14. Guiso, L., Sapienza, P. and Zingales, L., 2012. The Determinants of Attitudes towards Strategic Default on Mortgages. *Journal of Finance*.

15. Hainz, C., Nabokin, T., 2009. Access to versus use of loans: What are the true determinants of access? *Proceedings of the German Development Economics Conference, Frankfurt a. M. 2009, 12, Verein für Socialpolitik, Research Committee Development Economics.*

16. Heckman, J., 1979. Sample selection bias as a specification error. *Econometrica* 47, 153–61.

17. Introduction to Heckman probit with examples *(from the Stata manual)*
http://www.stata.com/features/heckman-probit/

18. Johnston, J., DiNardo, J., (2006) Econometrics Methods. *McGraw-Hill/Irwin*

19. Molokáč, T. (2010) Modely s binárnou závislou premennou. Bakalárska práca. *Univerzita Komenského v Bratislave. Fakulta matematiky, fyziky a informatiky*

20. Mortgage Sorter: What are Repayment Mortgages *(*aka Capital and Interest Mortgages), Interest-only mortgages
http://www.mortgagesorter.co.uk/types_uk_mortgages_deals_repayments.html
http://www.mortgagesorter.co.uk/types_mortgages_interest_only.html

21. Van de Ven, W., Van Praag, B. The Demand for Deductibles in Private Health Insurance. A Probit Model with Sample Selection**.** *Journal of Econometrics 17 (1981) 229-252. North-Holland Publishing Company*

22. Wikipedia, the free encyclopedia, 2012. Mortgage loan http://en.wikipedia.org/wiki/Mortgage_loan

23. Wooldridge, J. (2002). Econometric Analysis of Cross Section and Panel Data. *Cambridge: MIT Press.*

24. Wooldridge, J. (2002). Introductory Econometric A Modern Approach. *South-Western College Pub*

25. Corruption Perceptions Index 2011, http://cpi.transparency.org/cpi2011/results/

Table 1: Determinants of mortgages

	1	2	3	4	5	6
	denode	depr	nodepr	west	neweu	noeu
bankaccount	0.012***	0.012	0.002	0.141***	0.015	0.008**
	(0.004)	(0.007)	(0.005)	(0.025)	(0.012)	(0.003)
riskaver	-0.001***	-0.001	-0.003***	-0.005**	-0.003***	-0.000
	(0.000)	(0.001)	(0.001)	(0.002)	(0.001)	(0.000)
rural	-0.006***	-0.004	-0.014**	0.001	-0.013*	-0.004**
	(0.002)	(0.004)	(0.006)	(0.020)	(0.008)	(0.002)
size2	0.000	0.009*	-0.003	-0.044	-0.000	0.006**
	(0.003)	(0.005)	(0.005)	(0.035)	(0.008)	(0.003)
size3	0.010***	0.019**	0.008	0.051	0.012	0.007***
	(0.004)	(0.008)	(0.006)	(0.040)	(0.011)	(0.002)
age18_34	0.015***	0.015***	0.023***	0.096	0.043***	0.003**
	(0.003)	(0.005)	(0.005)	(0.063)	(0.004)	(0.002)
age55_	-0.025***	-0.013***	-0.041***	-0.251***	-0.048***	-0.007***
	(0.003)	(0.002)	(0.006)	(0.059)	(0.007)	(0.002)
female	0.001	0.006***	-0.000	-0.032*	-0.002	0.005***
	(0.002)	(0.002)	(0.005)	(0.019)	(0.004)	(0.001)
educmed	0.006**	0.010*	0.007	0.004	0.018**	0.001
	(0.003)	(0.005)	(0.006)	(0.028)	(0.008)	(0.002)
educhigh	0.014***	0.019***	0.019*	-0.002	0.033***	0.010**
	(0.004)	(0.006)	(0.010)	(0.023)	(0.007)	(0.004)
unemployed	-0.008***	-0.005	-0.007	-0.084***	-0.002	-0.005***
	(0.002)	(0.006)	(0.004)	(0.009)	(0.006)	(0.001)
retired	-0.025***	-0.015***	-0.017**	-0.267***	-0.025***	-0.007***
	(0.003)	(0.003)	(0.007)	(0.043)	(0.006)	(0.002)
nevermarried	-0.011***	-0.005	-0.012***	-0.091***	-0.027***	-0.004**
	(0.002)	(0.004)	(0.004)	(0.027)	(0.003)	(0.002)
divorced	-0.002	-0.003	-0.003	0.044	-0.009	-0.005***
	(0.003)	(0.003)	(0.009)	(0.068)	(0.006)	(0.002)
widowed	-0.014***	-0.009**	-0.011	-0.211***	-0.021**	-0.006***
	(0.003)	(0.004)	(0.008)	(0.052)	(0.008)	(0.002)
highincome	0.092***	0.029*	0.321***	0.339***	0.173**	0.041***
	(0.019)	(0.017)	(0.104)	(0.053)	(0.076)	(0.014)
medincome	0.048***	0.029***	0.053***	0.237***	0.059***	0.027**
	(0.006)	(0.007)	(0.012)	(0.028)	(0.012)	(0.014)
car	0.005	0.001	0.009	0.069***	0.015**	0.002
	(0.004)	(0.004)	(0.006)	(0.022)	(0.007)	(0.002)
Country effects	Yes	Yes	Yes	Yes	Yes	Yes
Observations	13685	7272	6413	3599	9497	20693
Log-L	-2382	-1133	-1250	-1588	-2243	-2066
PseudoR2	0.218	0.221	0.210	0.348	0.196	0.126

The dependent variable is the probability that a household has a mortgage loan. Coefficient for the variable report the marginal effect at means of all other dependent variables. Standard errors are adjusted for clustering at the country level and presented in parentheses below coefficients, ***, **, and * denote significance at the 1%, 5%, and 10% level. List of the abbreviations of country groups is in Appendix 2

Table 2: Determinants of arrears - Currency, economic and demographic factors

	7	8	9	10	11
	denode	depr	nodepr	denode	denode
fx	-0.045*	-0.029	-0.038***		
	(0.025)	(0.039)	(0.012)		
lc*depr				-0.037	-0.027
				(0.067)	(0.050)
lc*nodepr					0.110**
					(0.049)
fx*depr				-0.061	-0.043
				(0.062)	(0.046)
fx*nodepr				-0.071***	
				(0.027)	
nosavings	0.056**	0.000	0.078***	0.047*	0.061**
	(0.027)	(0.049)	(0.018)	(0.025)	(0.030)
car	-0.083**	-0.072**	-0.077	-0.061***	-0.099***
	(0.036)	(0.030)	(0.060)	(0.016)	(0.034)
highincome	0.002	0.072	0.015	0.031	0.021
	(0.067)	(0.062)	(0.110)	(0.029)	(0.083)
medincome	0.030	0.107	0.014	-0.006	0.042
	(0.049)	(0.099)	(0.045)	(0.028)	(0.058)
rural	0.030	-0.028	0.047	0.011	0.042
	(0.034)	(0.029)	(0.043)	(0.016)	(0.033)
size2	-0.013	-0.041	0.036	-0.001	-0.018
	(0.037)	(0.047)	(0.042)	(0.023)	(0.040)
size3	0.010	-0.052	0.080***	0.014	0.015
	(0.034)	(0.048)	(0.021)	(0.028)	(0.041)
age18_34	0.007	0.049	-0.010	0.014	0.006
	(0.027)	(0.051)	(0.026)	(0.022)	(0.026)
age55_	-0.006	0.026	-0.021	-0.006	-0.004
	(0.020)	(0.044)	(0.018)	(0.017)	(0.026)
female	-0.002	-0.014	-0.001	0.007	0.003
	(0.023)	(0.032)	(0.030)	(0.019)	(0.030)
educmed	0.033	-0.027	0.052	0.023	0.036
	(0.020)	(0.032)	(0.032)	(0.016)	(0.027)
educhigh	0.010	-0.009	0.027	0.002	0.014
	(0.031)	(0.047)	(0.051)	(0.025)	(0.036)
unemployed	0.072*	0.032*	0.072	0.043*	0.079**
	(0.041)	(0.018)	(0.060)	(0.023)	(0.040)
retired	-0.008	-0.088	0.064	-0.001	-0.016
	(0.055)	(0.074)	(0.043)	(0.046)	(0.067)
divorced	0.076*	0.038	0.087	0.046	0.090*
	(0.045)	(0.086)	(0.062)	(0.042)	(0.047)
widowed	-0.031	0.030	-0.051	-0.031	-0.036
	(0.045)	(0.089)	(0.036)	(0.036)	(0.055)
Country effects	Yes	Yes	Yes	Yes	Yes
Observations	13685	7272	6413	13685	13685
N_uncens	799	367	432	799	799
Log-L	-2644	-1260	-1344	-2924	-2647
Rho	0.817	0,881	0.786	0.489	0.767

The dependent dummy variable is arrears on mortgage loan repayments. Coefficient for the variable report the marginal effect at means of all other dependent variables. The reported coefficients are based on a Heckman sample selection probit model, where the selection is whether respondents have a mortgage. We employ risk aversion and ownership of a bank account for identification. "Observations" is the number of observations for the selection equation, "N-uncens" for the outcome equation. Only the outcome equation is reported. Standard errors are adjusted for clustering at the country level and presented in parentheses below coefficients; ***, **, and * denote significance at the 1%, 5%, and 10% level; Rho denotes the correlation of first and second stage errors. List of the abbreviations of country groups is in Appendix 2.

Table 3: Determinants of arrears - Currency, repayment, types of mortgages, down payment

	12	13	14	15	16	17
	denode	depr	nodepr	denode	depr	nodepr
fx	-0.044**	-0.031	-0.050***			
	(0.019)	(0.027)	(0.008)			
var	0.030	0.083	-0.009			
	(0.025)	(0.074)	(0.019)			
cr	0.044*	0.093**	0.022			
	(0.025)	(0.047)	(0.038)			
fx*no cr				-0.033	-0.056	0.059
				(0.045)	(0.037)	(0.101)
fx*cr				-0.006	0.034	-0.007
				(0.031)	(0.068)	(0.012)
lc*cr				0.057	0.060	0.076***
				(0.041)	(0.069)	(0.023)
downpay	-0.253***	-0.139***	-0.304	-0.258***	-0.219***	-0.171
	(0.077)	(0.036)	(0.235)	(0.076)	(0.064)	(0.119)
car	-0.101***	-0.072***	-0.115**	-0.101***	-0.102***	-0.071
	(0.019)	(0.015)	(0.050)	(0.034)	(0.021)	(0.051)
Other variables	Yes	Yes	Yes	Yes	Yes	Yes
Country effects	Yes	Yes	Yes	Yes	Yes	Yes
Observations	13685	7272	6413	13685	7272	6413
N_uncens	799	367	432	799	367	432
Log-L	-2644	-1258	-1346	-2645	-1260	-1343
Rho	-0.401	0.390	-0.561	-0.444	0.130	-0.547

The dependent dummy variable is arrears on mortgage loan repayments. Coefficient for the variable report the marginal effect at means of all other dependent variables. The reported coefficients are based on a Heckman sample selection probit model, where the selection is whether respondents have a mortgage. We employ risk aversion and ownership of a bank account for identification. "Observations" is the number of observations for the selection equation, "N-uncens" for the outcome equation. Only the outcome equation is reported. Standard errors are adjusted for clustering at the country level and presented in parentheses below coefficients; ***, **, and * denote significance at the 1%, 5%, and 10% level; Rho denotes the correlation of first and second stage errors. List of the abbreviations of country groups is in Appendix 2.

Table 4: Determinants of arrears - Currency, repayment, types of mortgages, down payment

	18	19	20	21	22	23
	denode	depr	nodepr	denode	depr	nodepr
fx				-0.051**	-0.023	-0.065***
				(0.023)	(0.023)	(0.014)
fx*no var	-0.043**	-0.044	-0.050***			
	(0.022)	(0.050)	(0.013)			
fx*var	-0.038**	0.001	-0.060***			
	(0.017)	(0.019)	(0.013)			
lc*var	0.072	0.202	0.007			
	(0.055)	(0.153)	(0.050)			
varcr				0.079	0.255	-0.007
				(0.055)	(0.165)	(0.054)
novarcr				0.026	0.115*	-0.022
				(0.040)	(0.070)	(0.046)
varnocr				-0.012	0.129	-0.111**
				(0.049)	(0.126)	(0.054)
downpay	-0.286***	-0.206***	-0.330	-0.282***	-0.108*	-0.373
	(0.086)	(0.077)	(0.233)	(0.095)	(0.057)	(0.273)
car	-0.119***	-0.115***	-0.124*	-0.113***	-0.055*	-0.131**
	(0.030)	(0.040)	(0.065)	(0.027)	(0.029)	(0.056)
Other variables	Yes	Yes	Yes	Yes	Yes	Yes
Country effects	Yes	Yes	Yes	Yes	Yes	Yes
Observations	13685	7272	6413	13685	7272	6413
N_uncens	799	367	432	799	367	432
Log-L	-2645	-1261	-1346	-2644	-1258	-1343
Rho	-0.471	0.0392	-0.565	-0.420	0.440	-0.583

The dependent dummy variable is arrears on mortgage loan repayments. Coefficient for the variable report the marginal effect at means of all other dependent variables. The reported coefficients are based on a Heckman sample selection probit model, where the selection is whether respondents have a mortgage. We employ risk aversion and ownership of a bank account for identification. "Observations" is the number of observations for the selection equation, "N-uncens" for the outcome equation. Only the outcome equation is reported. Standard errors are adjusted for clustering at the country level and presented in parentheses below coefficients; ***, **, and * denote significance at the 1%, 5%, and 10% level; Rho denotes the correlation of first and second stage errors. List of the abbreviations of country groups is in Appendix 2.

Table 5: Determinants of arrears - Impact of the crisis, Debt service burden

	24	25	26	27	28	29
	denode	depr	nodepr	denode	depr	nodepr
fx	-0.038**	-0.029	-0.033***	-0.036**	-0.024	-0.021**
	(0.016)	(0.023)	(0.007)	(0.015)	(0.027)	(0.008)
debtservice	0.049**	0.064*	0.038*	0.050**	0.063	0.037*
	(0.023)	(0.039)	(0.022)	(0.023)	(0.041)	(0.021)
crisis shock	0.079**	0.039	0.093**			
	(0.031)	(0.040)	(0.037)			
jobloss				0.053*	0.041	0.036
				(0.028)	(0.042)	(0.034)
closebus				0.037	0.056	-0.008
				(0.063)	(0.092)	(0.032)
reducedh				0.027	0.043	0.005
				(0.036)	(0.060)	(0.023)
lesswage				0.017	0.005	0.009
				(0.020)	(0.020)	(0.016)
lessremit				0.013	-0.008	0.024
				(0.019)	(0.016)	(0.032)
Other variables	Yes	Yes	Yes	Yes	Yes	Yes
Country effects	Yes	Yes	Yes	Yes	Yes	Yes
Observations	13685	7272	6413	13685	7272	6413
N_uncens	799	367	432	799	367	432
Log-L	-2637	-1257	-1339	-2630	-1257	-1330
Rho	-0.272	0.588	-0.426	-0.233	0.312	-0.461

The dependent dummy variable is arrears on mortgage loan repayments. Coefficient for the variable report the marginal effect at means of all other dependent variables. The reported coefficients are based on a Heckman sample selection probit model, where the selection is whether respondents have a mortgage. We employ risk aversion and ownership of a bank account for identification. “Observations” is the number of observations for the selection equation, “N-uncens” for the outcome equation. Only the outcome equation is reported. Standard errors are adjusted for clustering at the country level and presented in parentheses below coefficients; ***, **, and * denote significance at the 1%, 5%, and 10% level; Rho denotes the correlation of first and second stage errors. List of the abbreviations of country groups is in Appendix 2.

Table 6: Determinants of arrears - Trust in institutions

	30	31	32	33	34	35	36
	all	all	all	all	all	depr	nodepr
courts	-0.037	-0.033				-0.032	-0.024
	(0.027)	(0.022)				(0.026)	(0.016)
police	0.037		0.011			-0.004	0.015
	(0.028)		(0.024)			(0.026)	(0.015)
gov	-0.003			-0.014		0.019	0.056
	(0.029)			(0.026)		(0.033)	(0.056)
banks	-0.053**				-0.051*	-0.033	-0.016
	(0.027)				(0.027)	(0.022)	(0.013)
Other variables	Yes	Yes	Yes	Yes	Yes	Yes	Yes
Country effects	Yes	Yes	Yes	Yes	Yes	Yes	Yes
Observations	33789	33790	33791	33792	33793	7272	6413
N_uncens	2798	2798	2798	2798	2798	367	432
Log-L	-6503	-6505	-6506	-6506	-6504	-1259	-1330
Rho	-0.153	-0.143	-0.165	-0.168	-0.152	0.362	-0.510

The dependent dummy variable is arrears on mortgage loan repayments. Coefficient for the variable report the marginal effect at means of all other dependent variables. The reported coefficients are based on a Heckman sample selection probit model, where the selection is whether respondents have a mortgage. We employ risk aversion and ownership of a bank account for identification. "Observations" is the number of observations for the selection equation, "N-uncens" for the outcome equation. Only the outcome equation is reported. Standard errors are adjusted for clustering at the country level and presented in parentheses below coefficients; ***, **, and * denote significance at the 1%, 5%, and 10% level; Rho denotes the correlation of first and second stage errors. List of the abbreviations of country groups is in Appendix 2.

Table 7: Determinants of arrears - Personal and country levels of morality and health

	37	38	39	40	41	42	43	44	45
	denode	depr	nodepr	neweu	balkan	east	neweu	balkan	east
unfair	0.061***	0.047**	0.042**	0.033**	0.083	-0.025			
	(0.019)	(0.022)	(0.020)	(0.013)	(0.030)	(0.026)			
moral	-0.028	-0.052*	0.010	-0.027**	0.032	0.092**			
	(0.029)	(0.030)	(0.023)	(0.012)	(0.059)	(0.042)			
existlaw							-0.013**	0.052***	0.003
							(0.006)	(0.017)	(0.010)
noobeylaw							0.007***	0.006*	-0.007
							(0.002)	(0.004)	(0.009)
goodhealth	-0.043**	-0.060	-0.014	-0.020*	-0.042	0.008			
	(0.021)	(0.044)	(0.016)	(0.011)	(0.033)	(0.021)			
Other variables	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes
Country effects	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes
Observations	13685	7272	6413	9497	7858	7605	9497	7858	7605
N_cens	12886								
N_uncens	799	367	432	819	274	134	819	274	134
Log-L	-2631	-1256	-1334	-2422	-1134	-630.2	-2433	-1128	530.8
Rho	-0.397	-0.0531	-0.363	-0.364	-0.963	0.744	0.493	0.587	0.624

The dependent dummy variable is arrears on mortgage loan repayments. Coefficient for the variable report the marginal effect at means of all other dependent variables. The reported coefficients are based on a Heckman sample selection probit model, where the selection is whether respondents have a mortgage. We employ risk aversion and ownership of a bank account for identification. "Observations" is the number of observations for the selection equation, "N-uncens" for the outcome equation. Only the outcome equation is reported. Standard errors are adjusted for clustering at the country level and presented in parentheses below coefficients; ***, **, and * denote significance at the 1%, 5%, and 10% level; Rho denotes the correlation of first and second stage errors. List of the abbreviations of country groups is in Appendix 2.

Table 8: Determinants of arrears - Informal borrowing and financial help from institutions; economic position within a country

	46	47	48	49	50	51
	denode	depr	nodepr	neweu	balkan	east
sucinf	0.055**	-0.003	0.083**	0.047**	0.013	0.089
	(0.027)	(0.010)	(0.034)	(0.022)	(0.056)	(0.135)
suchous	0.019	0.026	0.023	0.015	0.001	0.018
	(0.036)	(0.065)	(0.033)	(0.033)	(0.006)	(0.086)
sucunem	0.032	0.003	0.020	0.045*	-0.003**	0.026
	(0.024)	(0.018)	(0.017)	(0.020)	(0.001)	(0.064)
countryfinpos	-0.029*	-0.016	-0.018	-0.009*	-0.054	-0.007
	(0.018)	(0.024)	(0.020)	(0.005)	(0.047)	(0.013)
Other variables	Yes	Yes	Yes	Yes	Yes	Yes
Country effects	Yes	Yes	Yes	Yes	Yes	Yes
Observations	13685	7272	6413	9497	7858	7605
N_uncens	799	367	432	819	274	134
Log-L	-2621	-1249	-1329	-2422	-1134	-630.2
Rho	-0.153	0.877	-0.599	-0.354	-0.563	0.743

The dependent dummy variable is arrears on mortgage loan repayments. Coefficient for the variable report the marginal effect at means of all other dependent variables. The reported coefficients are based on a Heckman sample selection probit model, where the selection is whether respondents have a mortgage. We employ risk aversion and ownership of a bank account for identification. "Observations" is the number of observations for the selection equation, "N-uncens" for the outcome equation. Only the outcome equation is reported. Standard errors are adjusted for clustering at the country level and presented in parentheses below coefficients; ***, **, and * denote significance at the 1%, 5%, and 10% level; Rho denotes the correlation of first and second stage errors. List of the abbreviations of country groups is in Appendix 2.

Table 9: Determinants of arrears - Chosen characteristics for regional groups

	52	53	54
	neweu	balkan	east
var	0.0569**	-0.0409	0.0981
	(0.0265)	(0.0442)	(0.161)
debtservice	0.041*	-0.007	0.091
	(0.023)	(0.058)	(0.205)
crisis shock	0.057***	0.106	0.044
	(0.018)	(0.073)	(0.082)
downpay	-0.127*	0.156	-0.056
	(0.072)	(0.165)	(0.382)
car	-0.092***	-0.008	-0.125***
	(0.031)	(0.036)	(0.046)
banks	-0.0910***	0.0112	0.0140
	(0.0211)	(0.0496)	(0.0669)
courts	-0.0151	-0.0432	-0.0705
	(0.0235)	(0.0526)	(0.0649)
Other variables	Yes	Yes	Yes
Country effects	Yes	Yes	Yes
Observations	9497	7858	7605
N_uncens	819	274	134
Log-L	-2332	-1112	-595
Rho	-0.352	-0.483	0.615

The dependent dummy variable is arrears on mortgage loan repayments. Coefficient for the variable report the marginal effect at means of all other dependent variables. The reported coefficients are based on a Heckman sample selection probit model, where the selection is whether respondents have a mortgage. We employ risk aversion and ownership of a bank account for identification. "Observations" is the number of observations for the selection equation, "N-uncens" for the outcome equation. Only the outcome equation is reported. Standard errors are adjusted for clustering at the country level and presented in parentheses below coefficients; ***, **, and * denote significance at the 1%, 5%, and 10% level; Rho denotes the correlation of first and second stage errors. List of the abbreviations of country groups is in Appendix 2.

Appendix 1
List of variables

Dependent variables

mortgage	Dummy variable derived from answers to the question: "Do you currently have a mortgage?" Variable coded as one if answer is "Yes", else coded as zero.
arrears	Dummy variable derived from answers to the question: "Are you currently in arrears on this mortgage?" Variable coded as one if answer is "Yes", else coded as zero.

Instrumental variables in the selection equation

bank account	Dummy variable coded as one, if any household member has a bank account
risk aversion (1/10)	Categorical variable ranging from 1 to 10 derived from answers to the question "Please, rate your willingness to take risks, in general, on a scale from 1 to 10, where 1 means that you are not willing to take risks at all, and 10 and means that you are very much willing to take risks"

Demographic variables in the selection equation

rural	Dummy variable coded as one, if type of settlement of a household is rural
size2	Dummy variable coded as one, if number of members of a household is two
size3	Dummy variable coded as one, if number of members of a household is tree or more. Omitted category is one-sized household.
age18_34	Dummy variable coded as one, if age of household head is 18-34 years
age55_	Dummy variable coded as one, if age of household head is at least 55. Omitted category are people aged 35-54
female	Dummy variable coded as one, if household head is a woman
educmed	Dummy variable coded as one, if person selected to answer the questions have either upper secondary or post-secondary education as the highest level of education
educhigh	Dummy variable coded as one, if person selected to answer the questions have bachelor's, master's or PhD degree as the highest level of education.

unemployed	Dummy variable coded as one, if person selected to answer the questions is unemployed
retired	Dummy variable coded as one, if person selected to answer the questions is retired
nevermarried	Dummy variable coded as one, if marital status of the selected person is never married
divorced	Dummy variable coded as one, if marital status of the selected person is divorced
widowed	Dummy variable coded as one, if marital status of the selected person is widowed

Financial variables in the selection equation

highincome	Dummy variable which takes value one for the highest household income tercile. Household income per month is represented by total expenses of a household per one month.
medincome	Dummy variable which takes value one for the middle household income tercile. Omitted category is low income.
nosavings	Dummy variable derived from the question "Approximately how much does your household save in a typical month?". Coded as one if the answer is 0.
car	Dummy variable which takes value one if anyone in a household owns a car.

Other financial and economic variables

debtservice	Relative mortgage debt service burden, continuous variable from 0 to 1, answer to the question "How much does your household pay for mortgage per month (include interest)?" divided by total income per month proxied by total monthly expenses of a household.
countryfinpos (1/10)	Categorical variable derived from the question "Please imagine a ten-step ladder where on the bottom, the first step, stand the poorest 10% people in our country, and on the highest step, the tenth, stand the richest 10% of people in our country. On which step of the ten is your household today?" If the answer is refused or don't know, coded as 0.
downpay	Relative down payment of a mortgage, continuous variable from 0 to 1, answer to the question "What was your down payment?" divided by answer to the question "How much did you borrow?"
sucinf	Dummy which takes the value of one if any household member succeed in informal borrowing of money from relative, friend or other person
suchous	Dummy which takes the value of one if any household member succeed in application for housing support

sucunem	Dummy which takes the value of one if any household member succeed in application for unemployment benefit

Mortgage characteristics

fx	Dummy variable which takes value one for mortgages denominated in foreign currency
var	Dummy variable which takes value one if type of mortgage interest rate is variable rate
cr	Dummy variable derived from the question "Is your monthly payment interest only or does it also include capital repayment?" Coded as one if the answer is "capital repayment and interest payment"

Crisis variables

crisisshock	Dummy variables derived from the question "How much an economic crisis affected your household in the past two years?". Coded as one if the answer is "A great deal" or "A fair amount"
jobloss	Dummy variable derived from the question: "How has this economic crisis affected your household in the past two years?". Coded as one if the answer is "Head of household lost job" or "Other household member lost job" or both
closebus	Dummy variable derived from the question: "How has this economic crisis affected your household in the past two years?". Coded as one if the answer is "Family business closed"
reducedh	Dummy variable derived from the question: "How has this economic crisis affected your household in the past two years?". Coded as one if the answer is "Working hours reduced"
lesswage	Dummy variable derived from the question: "How has this economic crisis affected your household in the past two years?". Coded as one if the answer is "Wages delay or suspended" or "Wages reduced" or both
lessremit	Dummy variable derived from the question: "How has this economic crisis affected your household in the past two years?". Coded as one if the answer is "Reduced flow of remittances" or "Family members returned home from abroad" or both

Trust variables

courts, police, gov, banks	Dummy variables derived from the question "To what extent do you trust the following institutions?" Variables coded as one if the answer is "some trust" or "complete trust"

Moral and inside variables

exist law (1/5)	Categorical variable derived from the question "To what extent do you agree that the law and order exist in your country?" Answers from "Strongly disagree" (1) to "Strongly agree" (5)
unfair	Dummy variable derived from the question "In your opinion, which of the following factors is the most important to succeed in life in your country now?". Coded as one if the answer is "By political connections" or "By breaking the law" and zero if the answer is "Effort and hard work" or Intelligence and skills"
noobeylaw (1/10)	Categorical variable derived from the question of preference about obeying the law, where the lowest category 1 means "People should obey the law without exception and the highest category 10 means "There are times when people have good reasons to break the law"
moral	Continuous variable from 0 to 4, derived from the question "How wrong, if at all, do you consider the following behaviours to be?" (Speeding to take somebody to the hospital in an emergency, A public official asking for a favour or gift in return of services, Buying a university degree that one has not earned, Paying cash with no receipts to avoid paying VAT or other taxes, Selling something second hand without mentioning all of its defects, Making an exaggerated insurance claim, Keeping an accidental overpayment from an employer) Answers to these seven questions are categorical from 1 (Not wrong at all) to 4 (Seriously wrong), if refused to answer, we use zero. Variable moral is arithmetic mean of seven answers of one person.
goodhealth	Dummy variables derived from the question "How would you assess your health?". Coded as one if the answer is "Very good" or "Good"

Appendix 2
List of countries and country groups

A2.1 Original groups of countries (regions) in the data set

Western Europe:	France, Germany, Great Britain, Italy, Sweden
Central/Eastern/Baltic:	Czech Republic, Hungary, Poland, Slovakia, Estonia, Latvia, Lithuania, Slovenia, Turkey, Kosovo[1]
Southern Europe:	Albania, Bosnia and Herzegovina, Bulgaria, Croatia, Macedonia, Montenegro, Romania, Serbia
CIS and Mongolia:	Armenia, Azerbaijan, Belarus, Georgia, Kazakhstan, Kyrgyzstan, Moldova, Mongolia, Russia, Tajikistan, Ukraine, Uzbekistan

A2.2 Country groups created by us

depr	**Depreciation countries:** Albania, Hungary, Poland, Romania, Serbia, Ukraine
nodepr	**Non-depreciation countries:** Bosnia and Herzegovina, Bulgaria, Croatia, Estonia, Latvia, Lithuania, Macedonia
denode	*depr* + *nodepr*
west	Western Europe, see above
neweu	**New member states of the European Union**: Czech Republic, Hungary, Poland, Slovakia, Slovenia, Bulgaria, Romania, Estonia, Latvia, Lithuania
eu	**the EU members:** *west* + *neweu*
balkan	Albania, Bosnia and Herzegovina, Croatia, Kosovo, Macedonia, Montenegro, Serbia, Turkey
east	Armenia, Azerbaijan, Belarus, Georgia, Moldova, Russia, Ukraine
asia	Kazakhstan, Kyrgyzstan, Mongolia, Tajikistan, Uzbekistan
noeu	**Non EU countries:** *balkan* + *east* + *asia*

Country abbreviations: AL - Albania, AR - Armenia, AZ - Azerbaijan, BE - Belarus, BO - Bosnia, BU - Bulgaria, CR - Croatia, CZ - Czech Republic, ES - Estonia, FR - France, GE - Georgia, DE - Germany, GR - Great Britain, HU - Hungary, IT - Italy, KA - Kazakhstan, KO - Kosovo, KY - Kyrgyzstan, LA - Latvia, LI - Lithuania, MA - Macedonia, MD - Moldova, MN - Mongolia, MT - Montenegro, PO - Poland, RO - Romania, RU - Russia, SE - Serbia, SK - Slovakia, SL - Slovenia, SW - Sweden, TA - Tajikistan, TU - Turkey, UK - Ukraine, UZ – Uzbekistan

[1] In the report Life in Transition: after the crisis, Kosovo is not considered as an independent state, however, in the data set is an independent unit

Table A1. Descriptive statistics for the variables in the selection equation

Variable	min/max	denode	depr	nodepr	all	west	neweu	balkan	east	asia
mortgage	0/1	0.06	0.05	0.07	0.08	0.41	0.09	0.03	0.02	0.02
		(0.23)	(0.22)	(0.25)	(0.28)	(0.49)	(0.28)	(0.18)	(0.13)	(0.13)
bankaccount	0/1	0.54	0.45	0.64	0.47	0.97	0.69	0.57	0.10	0.10
		(0.50)	(0.50)	(0.48)	(0.50)	(0.18)	(0.46)	(0.50)	(0.30)	(0.31)
riskaver	0/10	6.21	6.21	6.21	6.14	6.09	6.42	5.79	6.19	6.09
		(2.73)	(2.70)	(2.76)	(2.81)	(2.43)	(2.63)	(2.77)	(2.91)	(3.18)
rural	0/1	0.41	0.42	0.39	0.43	0.33	0.39	0.44	0.38	0.61
		(0.49)	(0.49)	(0.49)	(0.49)	(0.47)	(0.49)	(0.50)	(0.49)	(0.49)
size2	0/1	0.30	0.30	0.30	0.27	0.38	0.33	0.22	0.26	0.15
		(0.46)	(0.46)	(0.46)	(0.44)	(0.49)	(0.47)	(0.42)	(0.44)	(0.36)
size3	0/1	0.48	0.49	0.48	0.57	0.37	0.43	0.66	0.57	0.80
		(0.50)	(0.50)	(0.50)	(0.50)	(0.48)	(0.50)	(0.47)	(0.49)	(0.40)
age18_34	0/1	0.14	0.15	0.12	0.16	0.09	0.17	0.14	0.20	0.16
		(0.34)	(0.36)	(0.32)	(0.37)	(0.29)	(0.37)	(0.35)	(0.40)	(0.37)
age55_	0/1	0.49	0.47	0.51	0.42	0.49	0.46	0.44	0.41	0.33
		(0.50)	(0.50)	(0.50)	(0.49)	(0.50)	(0.50)	(0.50)	(0.49)	(0.47)
female	0/1	0.44	0.46	0.43	0.45	0.47	0.52	0.32	0.57	0.34
		(0.50)	(0.50)	(0.49)	(0.50)	(0.50)	(0.50)	(0.47)	(0.50)	(0.48)
educmed	0/1	0.45	0.43	0.48	0.49	0.38	0.45	0.46	0.52	0.64
		(0.50)	(0.50)	(0.50)	(0.50)	(0.48)	(0.50)	(0.50)	(0.50)	(0.48)
educhigh	0/1	0.18	0.19	0.18	0.20	0.30	0.18	0.12	0.27	0.21
		(0.39)	(0.39)	(0.39)	(0.40)	(0.46)	(0.38)	(0.33)	(0.44)	(0.41)
unemployed	0/1	0.24	0.22	0.27	0.27	0.14	0.17	0.38	0.29	0.38
		(0.43)	(0.41)	(0.44)	(0.45)	(0.34)	(0.38)	(0.49)	(0.45)	(0.48)
retired	0/1	0.30	0.32	0.29	0.24	0.30	0.33	0.17	0.24	0.13
		(0.46)	(0.47)	(0.45)	(0.43)	(0.46)	(0.47)	(0.38)	(0.43)	(0.33)
nevermarried	0/1	0.16	0.14	0.17	0.17	0.19	0.17	0.21	0.14	0.15
		(0.36)	(0.35)	(0.38)	(0.38)	(0.39)	(0.38)	(0.41)	(0.35)	(0.35)
divorced	0/1	0.07	0.08	0.07	0.07	0.08	0.09	0.03	0.08	0.05
		(0.26)	(0.27)	(0.25)	(0.25)	(0.27)	(0.29)	(0.17)	(0.28)	(0.21)
widowed	0/1	0.16	0.16	0.17	0.13	0.09	0.16	0.10	0.16	0.09
		(0.37)	(0.36)	(0.37)	(0.33)	(0.29)	(0.36)	(0.30)	(0.37)	(0.28)
highincome	0/1	0.24	0.37	0.10	0.26	0.06	0.12	0.30	0.27	0.60
		(0.43)	(0.48)	(0.30)	(0.44)	(0.24)	(0.32)	(0.46)	(0.44)	(0.49)
medincome	0/1	0.32	0.27	0.36	0.27	0.36	0.26	0.23	0.33	0.20
		(0.46)	(0.45)	(0.48)	(0.44)	(0.48)	(0.44)	(0.42)	(0.47)	(0.40)
nosavings	0/1	0.65	0.62	0.69	0.62	0.31	0.54	0.73	0.67	0.73
		(0.48)	(0.49)	(0.46)	(0.49)	(0.46)	(0.50)	(0.44)	(0.47)	(0.45)
car	0/1	0.50	0.44	0.57	0.52	0.90	0.58	0.59	0.31	0.33
		(0.50)	(0.50)	(0.50)	(0.50)	(0.30)	(0.49)	(0.49)	(0.46)	(0.47)
Observations	33789	13685	7272	6413	33789	3599	9497	7858	7605	5230

Table A2. Descriptive statistics for the variables in the outcome equation

Variable	min/max	denode	depr	nodepr	all	west	neweu	balkan	east	asia
arrears	0/1	0.14	0.17	0.12	0.09	0.02	0.11	0.15	0.17	0.63
		(0.35)	(0.37)	(0.32)	(0.28)	(0.14)	(0.32)	(0.36)	(0.38)	(0.49)
fx	0/1	0.55	0.56	0.54	0.40	0.36	0.43	0.62	0.41	0.06
		(0.50)	(0.50)	(0.50)	(0.49)	(0.48)	(0.50)	(0.49)	(0.49)	(0.25)
var	0/1	0.35	0.39	0.31	0.30	0.34	0.26	0.36	0.06	0.03
		(0.48)	(0.49)	(0.46)	(0.46)	(0.47)	(0.44)	(0.48)	(0.24)	(0.18)
cr	0/1	0.82	0.78	0.85	0.79	0.77	0.79	0.82	0.87	0.79
		(0.38)	(0.42)	(0.35)	(0.41)	(0.42)	(0.40)	(0.38)	(0.34)	(0.41)
debtservice	0/1	0.20	0.17	0.22	0.25	0.27	0.22	0.16	0.24	0.55
		(0.19)	(0.20)	(0.18)	(0.21)	(0.16)	(0.20)	(0.19)	(0.22)	(0.43)
countryfinpos	0/10	4.45	4.33	4.55	4.97	5.35	4.56	4.77	4.14	4.41
		(1.75)	(1.76)	(1.73)	(1.73)	(1.62)	(1.74)	(1.76)	(1.70)	(1.83)
downpay	0/1	0.05	0.06	0.04	0.08	0.10	0.05	0.05	0.05	0.08
		(0.14)	(0.17)	(0.10)	(0.19)	(0.22)	(0.14)	(0.16)	(0.12)	(0.17)
crisisshock	0/1	0.64	0.66	0.63	0.42	0.31	0.54	0.61	0.53	0.41
		(0.48)	(0.48)	(0.48)	(0.49)	(0.46)	(0.50)	(0.49)	(0.50)	(0.50)
jobloss	0/1	0.24	0.21	0.26	0.16	0.11	0.23	0.18	0.21	0.15
		(0.43)	(0.41)	(0.44)	(0.36)	(0.31)	(0.42)	(0.39)	(0.41)	(0.36)
closebus	0/1	0.04	0.04	0.04	0.02	0.01	0.03	0.05	0.03	0.04
		(0.19)	(0.19)	(0.19)	(0.14)	(0.08)	(0.17)	(0.21)	(0.17)	(0.20)
reducedh	0/1	0.11	0.09	0.12	0.11	0.11	0.10	0.13	0.06	0.06
		(0.31)	(0.28)	(0.33)	(0.31)	(0.32)	(0.31)	(0.33)	(0.24)	(0.25)
lesswage	0/1	0.51	0.39	0.61	0.32	0.19	0.48	0.54	0.38	0.31
		(0.50)	(0.49)	(0.49)	(0.47)	(0.39)	(0.50)	(0.50)	(0.49)	(0.46)
lessremit	0/1	0.26	0.37	0.16	0.13	0.05	0.23	0.22	0.10	0.15
		(0.44)	(0.48)	(0.37)	(0.33)	(0.22)	(0.42)	(0.41)	(0.31)	(0.36)
highincome	0/1	0.33	0.62	0.08	0.24	0.12	0.28	0.31	0.63	0.89
		(0.47)	(0.49)	(0.27)	(0.43)	(0.33)	(0.45)	(0.46)	(0.48)	(0.31)
medincome	0/1	0.41	0.25	0.55	0.44	0.55	0.36	0.34	0.19	0.06
		(0.49)	(0.43)	(0.50)	(0.50)	(0.50)	(0.48)	(0.47)	(0.40)	(0.25)
nosavings	0/1	0.71	0.71	0.72	0.47	0.31	0.60	0.81	0.70	0.72
		(0.45)	(0.46)	(0.45)	(0.50)	(0.46)	(0.49)	(0.39)	(0.46)	(0.45)
car	0/1	0.71	0.65	0.77	0.82	0.92	0.77	0.73	0.50	0.44
		(0.45)	(0.48)	(0.42)	(0.38)	(0.27)	(0.42)	(0.45)	(0.50)	(0.50)
goodhealth	0/1	0.64	0.64	0.64	0.73	0.81	0.66	0.77	0.35	0.49
		(0.48)	(0.48)	(0.48)	(0.44)	(0.39)	(0.47)	(0.42)	(0.48)	(0.50)
sucinf	0/1	0.25	0.22	0.28	0.17	0.09	0.22	0.27	0.53	0.18
		(0.43)	(0.41)	(0.45)	(0.37)	(0.28)	(0.42)	(0.44)	(0.50)	(0.39)
suchous	0/1	0.03	0.04	0.02	0.02	0.02	0.04	0.00	0.04	0.03
		(0.17)	(0.20)	(0.14)	(0.16)	(0.14)	(0.19)	(0.00)	(0.19)	(0.18)
sucunem	0/1	0.09	0.08	0.10	0.07	0.06	0.10	0.04	0.01	0.01
		(0.29)	(0.28)	(0.30)	(0.25)	(0.24)	(0.30)	(0.19)	(0.09)	(0.10)
courts	0/1	0.29	0.27	0.31	0.44	0.57	0.32	0.20	0.40	0.32
		(0.45)	(0.44)	(0.46)	(0.50)	(0.49)	(0.47)	(0.40)	(0.49)	(0.47)

Table A2. Descriptive statistics for the variables in the outcome equation

Variable	min/max	denode	depr	nodepr	all	west	neweu	balkan	east	asia
police	0/1	0.44	0.36	0.51	0.57	0.70	0.42	0.47	0.46	0.37
		(0.50)	(0.48)	(0.50)	(0.49)	(0.46)	(0.49)	(0.50)	(0.50)	(0.49)
gov	0/1	0.22	0.22	0.22	0.30	0.33	0.23	0.25	0.38	0.37
		(0.41)	(0.42)	(0.41)	(0.46)	(0.47)	(0.42)	(0.43)	(0.49)	(0.49)
banks	0/1	0.34	0.22	0.43	0.34	0.28	0.38	0.33	0.61	0.60
		(0.47)	(0.42)	(0.50)	(0.47)	(0.45)	(0.49)	(0.47)	(0.49)	(0.49)
moral	0/4	2.98	3.02	2.95	3.03	3.11	2.96	3.03	2.75	2.79
		(0.58)	(0.66)	(0.51)	(0.53)	(0.43)	(0.59)	(0.58)	(0.71)	(0.60)
existlaw	0/5	2.89	2.80	2.97	3.42	3.87	2.98	2.87	2.79	2.86
		(1.16)	(1.19)	(1.12)	(1.17)	(0.96)	(1.13)	(1.24)	(1.24)	(1.30)
noobeylaw	0/10	3.28	3.01	3.51	3.77	4.08	3.41	3.17	3.59	3.99
		(2.64)	(2.58)	(2.66)	(2.66)	(2.58)	(2.63)	(2.64)	(3.10)	(2.80)
unfair	0/1	0.35	0.35	0.35	0.20	0.09	0.30	0.46	0.19	0.17
		(0.48)	(0.48)	(0.48)	(0.40)	(0.28)	(0.46)	(0.50)	(0.39)	(0.38)
rural	0/1	0.30	0.34	0.28	0.28	0.26	0.30	0.31	0.25	0.52
		(0.46)	(0.47)	(0.45)	(0.45)	(0.44)	(0.46)	(0.46)	(0.43)	(0.50)
size2	0/1	0.24	0.23	0.24	0.27	0.30	0.25	0.18	0.22	0.24
		(0.43)	(0.42)	(0.43)	(0.44)	(0.46)	(0.43)	(0.39)	(0.41)	(0.43)
size3	0/1	0.64	0.66	0.63	0.58	0.50	0.63	0.76	0.76	0.70
		(0.48)	(0.48)	(0.48)	(0.49)	(0.50)	(0.48)	(0.43)	(0.43)	(0.46)
age18_34	0/1	0.31	0.33	0.30	0.23	0.14	0.38	0.20	0.34	0.34
		(0.46)	(0.47)	(0.46)	(0.42)	(0.35)	(0.49)	(0.40)	(0.48)	(0.48)
age55_	0/1	0.17	0.19	0.16	0.21	0.25	0.13	0.23	0.22	0.13
		(0.38)	(0.40)	(0.36)	(0.40)	(0.43)	(0.34)	(0.42)	(0.42)	(0.34)
female	0/1	0.47	0.52	0.43	0.47	0.46	0.49	0.38	0.57	0.48
		(0.50)	(0.50)	(0.50)	(0.50)	(0.50)	(0.50)	(0.49)	(0.50)	(0.50)
educmed	0/1	0.49	0.44	0.53	0.43	0.38	0.49	0.51	0.45	0.51
		(0.50)	(0.50)	(0.50)	(0.50)	(0.48)	(0.50)	(0.50)	(0.50)	(0.50)
educhigh	0/1	0.30	0.28	0.31	0.36	0.41	0.29	0.25	0.44	0.38
		(0.46)	(0.45)	(0.46)	(0.48)	(0.49)	(0.45)	(0.43)	(0.50)	(0.49)
unemployed	0/1	0.21	0.20	0.21	0.16	0.11	0.19	0.23	0.26	0.37
		(0.40)	(0.40)	(0.41)	(0.37)	(0.31)	(0.39)	(0.42)	(0.44)	(0.49)
retired	0/1	0.10	0.11	0.08	0.09	0.10	0.08	0.09	0.04	0.04
		(0.29)	(0.31)	(0.28)	(0.28)	(0.29)	(0.27)	(0.28)	(0.21)	(0.20)
nevermarried	0/1	0.19	0.18	0.19	0.19	0.20	0.17	0.22	0.08	0.22
		(0.39)	(0.39)	(0.40)	(0.39)	(0.40)	(0.38)	(0.42)	(0.28)	(0.42)
divorced	0/1	0.08	0.08	0.08	0.09	0.10	0.10	0.03	0.05	0.04
		(0.28)	(0.28)	(0.28)	(0.28)	(0.29)	(0.30)	(0.17)	(0.22)	(0.20)
widowed	0/1	0.05	0.04	0.05	0.03	0.01	0.04	0.03	0.05	0.06
		(0.21)	(0.20)	(0.22)	(0.16)	(0.12)	(0.19)	(0.17)	(0.22)	(0.25)
Observations	2798	799	367	432	2798	1477	819	274	134	94