



WORKING PAPER NO. 208

Households' Indebtedness and Financial Fragility

Tullio Jappelli, Marco Pagano and Marco di Maggio

September 2008



University of Naples Federico II



University of Salerno



Bocconi

Bocconi University, Milan



WORKING PAPER NO. 208

Households' Indebtedness and Financial Fragility

Tullio Jappelli[♥], Marco Pagano[♥] and Marco di Maggio[♦]

Abstract

The paper studies the determinants of international differences in household indebtedness, and inquires whether indebtedness is associated with increased “financial fragility”, as measured by the sensitivity of household arrears and insolvencies to the amount of lending and to macroeconomic shocks. It also investigates whether financial fragility is affected by institutional factors, such as information sharing arrangements, judicial efficiency and individual bankruptcy regulation. We address these issues by tapping three data sets: (i) cross-country data on household indebtedness; (ii) European panel data for households lending and arrears; and (iii) time series data for household lending and insolvencies in the U.K., the U.S.A. and Germany. Overall, the analysis underscores the importance of institutional arrangements in determining the size and fragility of household credit markets.

JEL classification: D14, G21, G28, G33.

Keywords: household debt, financial fragility, arrears, insolvency, information sharing, judicial efficiency, bankruptcy law.

Acknowledgements: We thank the Unicredit Group for financial support.

[♥] University of Naples Federico II, CSEF and CEPR.

[♦] MIT

Table of contents

1. *Introduction*

2. *Determinants of Household Debt and Insolvency*

2.1. Institutional Factors

2.2. Demand-Side Factors

2.3. Supply-Side Factors

3. *Determinants of Household Debt: Cross-country Analysis*

4. *Determinants of Household Arrears: Panel Data Analysis*

5. *Determinants of Household Defaults in the UK, Germany and the US*

5.1. United Kingdom

5.2. Germany

5.3. United States

6. *Conclusions*

References

Appendix. Definition of variables and data sources

1. Introduction

Research on credit markets typically focuses on lending to firms, while households are mainly viewed as suppliers of funds, rather than as debtors. Yet, recent events show that lending to households has taken a central role in the balance sheets of banks and other financial intermediaries, as well as in the functioning of financial markets and of the real economy. The ongoing sub-prime lending crisis underscores the central importance of the household credit market in determining both the stability of the financial system and the level of economic activity. While lending to households has become particularly prominent in the United States, it has grown even more rapidly in other developed countries and in several emerging economies, where household debt has been the fastest growing segment of total credit. Accordingly, understanding the determinants of lending to households and of their solvency has become of great importance to market practitioners, and also an increasing concern of regulators and policy makers.

In the U.S. the household credit buildup has been accompanied by an increase in insolvencies. It is natural to ask whether this correlation between household indebtedness and growth in defaults is specific to the U.S. recent experience or applies to other countries and periods as well. In other words, are highly indebted households more “financially fragile”, that is, more likely to default, especially when hit by adverse shocks, such as unemployment or interest rates increases? And, if so, does their financial fragility vary across countries, as a function of institutional variables, such as bankruptcy law provisions or judicial efficiency?

In this paper, we try to get a handle on these issues by drawing on a variety of data and sources. First, we rely on cross-country data to study the international determinants of household credit. Second, we merge panel data on household arrears for 11 European countries with macroeconomic data on lending to households, interest rates, cyclical indicators and institutional variables. Finally, we turn to the analysis of longer time series for the U.S., the U.K. and Germany, to inquire whether the correlation between lending and defaults observed in the U.S. is also present elsewhere, and how institutional changes affect household insolvencies.

On the whole, the evidence suggests that insolvencies tend to be associated with greater households’ indebtedness, supporting the financial fragility hypothesis. The panel data on insolvencies show that European countries that experienced relatively fast debt growth also

featured larger increases in insolvency rates. This is confirmed by time series evidence for Germany, the U.K. and the U.S.

We also find that institutions are powerful determinants of households' debt and defaults. Cross-country regressions show that the size of the household credit market is associated with better enforcement of creditor rights and information sharing arrangements, while panel regressions suggest that institutional arrangements affect the sensitivity of insolvencies to household debt, as well as their sensitivity to economic shocks. Finally, our time series data indicate that pro-debtor reforms are followed by increases in insolvency rates, while the opposite applies to pro-creditor reforms.

The paper proceeds as follows. Section 2 reviews the main factors that affect household debt and insolvencies, and shape their relationship. Sections 3, 4 and 5 present, respectively, the international cross-country analysis, the European panel data estimates and the time series analysis for Germany, the U.K. and the U.S. Section 6 summarizes the main findings.

2. Determinants of Household Debt and Insolvency

In this section we provide a brief overview of the main factors that may affect the indebtedness of households and their default rates: (i) institutional features that shape the market's contracting environment, such as the degree of creditor rights protection, the effectiveness of their judicial enforcement, and the information sharing arrangements among lenders;¹ (ii) demand-side factors, such as the age structure of the population and the degree of income inequality; and (iii) supply-side factors, such as the competitive structure of the credit market.

2.1. Institutional Factors

The problems arising from informational asymmetries and poor enforcement of contracts may hinder the efficient provision of credit to households. The severity of these problems depends on the quality of the institutional framework: better institutions may

¹ The importance of institutional factors has been highlighted in previous research on the international differences in saving patterns (Banks, Blundell and Smith, 2003; Hurd and Kapteyn, 2003; and Börsch-Supan and Lusardi, 2003). Similarly, the role of the legal environment in shaping financial markets is the subject of the burgeoning literature on law and finance pioneered by La Porta, López-de-Silanes, Shleifer and Vishny (1997 and 1998).

facilitate the collection of credit-relevant information by banks and therefore their screening of credit applicants, or may mitigate their recovery costs in case of default, as well as reduce the likelihood of default itself. In our analysis, we shall explore the role of institutions in shaping the international differences in household lending and defaults. We shall also explore whether institutions may affect the financial fragility of households, in the sense of changing the sensitivity of default rates to income shocks, as well as their sensitivity to accumulated debt. Specifically, we wish to identify the institutional settings that make households more willing to repay even in the presence of adverse shocks or when they are highly indebted.

2.1.1. Creditor Rights and Judicial Enforcement

A borrower is willing to repay debt if the gain from defaulting is lower than the perceived cost of the expected sanctions. This does not only depend on the lenders' willingness to inflict such sanctions, but on the entire set of institutional arrangements governing the credit market. The law and its enforcement by the judiciary are central to these arrangements, and therefore affect the supply of loans. The more efficient the judicial system, the greater the supply.

Historically, countries have developed different legal systems, featuring different degrees of protection to creditors. This is documented in La Porta et al. (1997, 1998), who find that the breadth of credit markets is correlated with their measure of creditor right protection. The most important set of rules determining creditor rights is bankruptcy regulation, which determines the assets to be used for repayment and their division among creditors. Bankruptcy regulation varies substantially across countries. For instance, Italian bankruptcy law does not have formal discharge provisions for individuals (as opposed to firms), while in Germany discharge from bankruptcy for individuals is possible since 2001, conditional on agreeing to a court-approved repayment plan.

Most of the empirical research on personal bankruptcy relies on the variation in exemption levels across different states in the U.S. Gropp, Scholz and White (1997) find that households living in states with comparatively high exemptions are more likely to be turned down for credit, borrow less, and pay higher interest rates. They interpret this result as reflecting the negative effect of debtor-friendly regulation on the supply of loans. This is confirmed by White (2006), who finds that debt forgiveness in bankruptcy harms future borrowers by reducing credit availability and raising interest rates.

The enforcement of creditor rights is no less important than the formal entitlement to such rights. International differences in the efficiency and honesty of the judiciary may result in different effective degrees of creditor protection. Djankov, La Porta, Lopez-de-Silanes and Shleifer (2003) report that the duration of dispute resolution for two clinical court cases (the collection of a bounced check and the eviction of a delinquent tenant) varies substantially across countries: for instance, Italy features very long foreclosure mortgage proceedings and low judicial efficiency, while the reverse is true in Scandinavian and Anglo-Saxon countries. Even within the same country, the efficiency of courts can vary a great deal and affect the availability of household credit. Using Italian survey data on households and indicators of judicial efficiency, Fabbri and Padula (2004) document that judicial enforcement is important to the amount of credit extended to households.

Summing up, there is extensive evidence that creditor rights correlate positively with total lending, and also some country studies showing that bankruptcy laws and judicial efficiency affect household credit and insolvencies. But, to our knowledge, no cross-country study investigates how household credit and defaults correlate with creditor rights and judicial efficiency.²

2.1.2. Information Sharing among Lenders

In many countries, lenders routinely share information on the creditworthiness of their borrowers, either on a voluntary basis (through credit bureaus) or on a mandatory basis (through public credit registers operated by central banks). Information sharing about borrowers' characteristics and their indebtedness can have important effects in household credit markets. First, it improves the banks' knowledge of applicants' characteristics and permits a more accurate prediction of their repayment probabilities. Second, it reduces the informational rents that banks could otherwise extract from their customers. Third, it can operate as a borrower discipline device. Finally, it reduces borrowers' incentives to become over-indebted by drawing credit simultaneously from several banks without any of them realizing.

² In related work, Beck et al. (2008) investigate the determinants and effects of household credit as a *share of total credit* (including enterprise credit) in 45 developed and developing countries. They find that countries with better developed institutions and less effective contract enforcement feature a larger share of household credit in total credit. In contrast, the evidence of our paper concerns the effect of institutions on the *size* of household credit scaled by GDP, rather than on its weight in the composition of total credit. Furthermore, we investigate also the effect of institutions on households' default rates.

Jappelli and Pagano (2002) show that the extent of credit information sharing differs widely across countries: for instance, the number of credit reports is on average 2.3 per capita in the United States, 0.6 in the Netherlands, and only 0.05 in Italy. The breadth of credit markets is also associated with information sharing: total bank lending to the private sector scaled by GNP is indeed larger in countries where information sharing is more solidly established and extensive, even after controlling for other economic and institutional determinants of bank lending, such as the protection of creditor rights. The more recent study by Djankov et al. (2007) confirms that private sector credit relative to GDP is positively correlated with information sharing in their recent study of credit market performance and institutional arrangements in 129 countries for the period 1978-2003. This conclusion is also supported by the firm-level evidence provided by Love and Mylenko (2003) (based on data from the 1999 World Business Environment Survey) and Brown, Jappelli and Pagano (2008) (based on the EBRD/World Bank Business Environment and Enterprise Performance Survey). Finally, the experimental study by Brown and Zehnder (2007) suggests that the introduction of information sharing among lenders also affect default rates, by motivating borrowers to repay loans, when they would otherwise default. However, so far there is no evidence concerning the effects of information sharing mechanisms on the availability of credit to households and their propensity to default.

2.2. Demand-Side Factors

According to the life-cycle model, households borrow in anticipation of future income growth or to buy expensive indivisible goods such as durables and housing. Typically, this situation is predominant among young households. Therefore, in a cross-section of countries one should expect countries with higher population growth, and therefore a larger proportion of young households, to exhibit a higher ratio of household debt to GDP.

Households also borrow to smooth transitory income fluctuations. The household credit market transfers resources from households in temporary surplus to those in temporary deficit. To the extent that income inequality arises from temporary income shocks, one should observe a positive correlation between measures of inequality and the size of the household credit market. Empirically, of course, a large component of inequality is due to household

characteristics or permanent income shocks, so that measures of income inequality (such as the Gini index) are at best imperfect proxies for the inequality induced by transitory shocks.

Another variable that may affect households' demand for credit is the incentive provided by the favorable tax treatment of debt financing. For instance, in many countries the tax code gives preferential treatment to mortgages, as part of broader government intervention to encourage homeownership. Unfortunately, it is difficult to provide internationally comparable measures of tax incentives to household borrowing, due to the complexity of the different tax codes: some countries (such as the United States, the Netherlands, and France), allow very generous deductions for mortgage interests, while others (e.g. Italy) allows mortgage interests deductions for first-time homeowners only (see Poterba, 2002). Furthermore, tax legislation varies considerably over time, which makes it even more difficult to construct an accurate measure of tax incentives to borrow: for instance, the very generous MIRAS (Mortgage Interest Relief at Source) program in the U.K. was phased out in 2000, so that a country with very generous tax incentives to borrow has turned into one where no such incentives exist.³

2.3. Supply-Side Factors

The traditional wisdom in industrial organization is that greater competition between firms fosters greater loan availability and cheaper credit. Insofar as stronger competition opens credit access to lower grade borrowers, this can also be expected to lead to an increase in the average insolvency rate. The literature on relationship lending has pointed to a potentially offsetting effect of an increase in banking competition: lending might fall and interest rates may rise if competition by outside banks destroys exclusive relationships with pre-existing lenders, thereby eliminating the informational advantages stemming from such relationships. Petersen and Rajan (1995) were the first to propose a model showing that loan market competition reduces lenders' incentives to invest in relationship building. Creditors are more likely to finance credit-constrained firms when credit markets are concentrated

³ Under MIRAS, a borrower paid the interest less the tax relief, initially equal to the marginal tax rate. Moreover, it applied to loans below £30,000 on single mortgagors rather than the property, so married people could each receive relief on loans up to £30,000. The MIRAS scheme was criticized as a strongly distortionary measure introducing a bias in favor of owner-occupation and in favor of higher income households. Moreover, the relief was believed to result in higher house prices, which prevented new homebuyers from gaining fully from it. This led to several reductions in the relief rate that culminated with the phasing out of MIRAS in April 2000.

because it is easier for them to internalize the benefits of assisting the firms. Their study offers evidence from small business data in support of this hypothesis: young firms have easier access to credit in more concentrated credit markets, a finding that has been only partially confirmed by subsequent studies on firm-level data. Here we shall explore whether banking concentration also affects lending to households, an issue much less explored in the literature.

3. Determinants of Household Debt: Cross-country Analysis

We start our analysis by relating cross-country differences in household debt to institutional and macroeconomic variables, relying on international data on household debt. Since internationally comparable data on household debt exist for only a small set of countries, the construction of such a data set is in itself a useful contribution: the data set is reported in Table A1 of the Appendix. The variables used in the estimation refer to 2005 (or closest available date) and cover 45 countries.

Household debt-GDP ratios are constructed merging data from the International Monetary Fund (IMF) and European Credit Institute (ECRI) and in many cases are available since 2000. Household debt varies dramatically across countries: it is low in developing countries (generally less than 10 percent), intermediate in Eastern Europe (generally between 10 and 20 percent), and relatively high in developed countries. But even among OECD economies there is considerable variation, from the peaks of Denmark, Netherlands, New Zealand, U.S. and U.K., to the minimum of Italy and Greece.

We explore how these large cross-country differences in the magnitude of household lending relate to country-level institutional variables. As discussed in Section 2, we view legal protection of creditors, judicial efficiency and information sharing among lenders as the most promising determinants of the availability of credit. We measure *court efficiency* by the duration of the procedure to collect a bounced check provided by Djankov et al. (2003); other measures of court efficiency deliver similar results. As for *information sharing among lenders*, we use the scores available in the World Bank Doing Business database, which are based on the coverage of the information sharing system, the type of information collected (positive or negative), and the number of years since inception. These scores are separately

available for private credit bureaus and public credit registers. Following La Porta et al. (1998), we use a single index to measure a country's overall degree of *creditor right protection*. Since some aspects of the legal system may be unaccounted for by this indicator, we also control for the legal origin of the country. As a proxy for economic development, we use the log of per-capita GDP. As demand-side variables, we include the population growth rate and the Gini income inequality index. On the supply side, we rely on the concentration ratio as an inverse measure of competition.

Before presenting regression results, in Table 1 we report sample statistics and correlations between these variables. The first column of the correlation matrix shows that household debt is positively correlated with GDP, the presence of private and public information sharing arrangements, creditor rights and English legal origin, while it is negatively correlated with the duration of enforcement procedures and the Gini index.

Figures 1, 2 and 3 plot the ratio of household debt to GDP against, respectively, log per capita GDP, duration of enforcement procedures and a summary indicator of the extent of private and public information sharing arrangements. The graphs indicate that household debt correlates positively with GDP and information sharing, and is negatively associated with duration of enforcement, while highlighting considerable dispersion in the level of household debt and in each of the indicators considered.

The regression analysis confirms some but not all of the pairwise correlations suggested by Figures 1 to 3. All three specifications reported in Table 2 show that institutional variables matter: lending to households is positively associated with the presence of information sharing arrangements (especially public ones) and negatively correlated with the length of judicial procedures. Lending correlates positively with the English legal origin of the country (column 2), but the effect of this variable is much attenuated when one controls for information sharing and judicial efficiency (column 3). Instead, indebtedness is not significantly related to demand or supply-side indicators (the Gini index and the bank concentration ratio, respectively), while it is strongly correlated with per capita log GDP in all specifications.

To understand the implications of our estimates for the explanation of the determinants of household debt, consider the case of Italy, which features a relatively low debt-GDP ratio (25 percent) and a relatively high GDP per capita, compared with the sample average (\$20,170). Figure 1 and the regression results indicate that the Italian household credit market

is relatively underdeveloped: countries with comparable GDP per capita (such as Germany) feature debt-GDP ratios in the order of 60 percent. Furthermore, the relatively long enforcement Italian procedures (645 days, against a sample average of 263 days) fall short of explaining the gap between its debt-GDP ratio and the one predicted by the regression line. On the other hand, Figure 3 shows that Italy features relatively well in terms of information sharing coverage (both private credit bureaus and public information sharing achieve above-average values).

An important issue is whether the large cross-country differences in household debt are persistent, or there is “convergence” over time. To shed light on this issue, we plot in Figure 4 the relation between the debt-GDP ratio in 1999 and the subsequent growth in 2000-05. The figure shows that the relation is negative and highly non-linear: countries with low levels of initial debt-GDP ratios (such as the Hungary, the Philippines or Russia) featured annual growth rates of this ratio above 5 percentage points. In contrast, in more mature markets (such as Germany, Japan, the Netherlands and the United States) the annual growth rate was less than 2-percentage points per year. This indicates that convergence is indeed taking place to some extent.

4. Determinants of Household Arrears: Panel Data Analysis

The previous section has shown that in cross-country data, the size of the household debt market is correlated with institutional characteristics such as the efficiency of judicial enforcement and the development of information sharing mechanisms. This raises the question of whether the same variables also affect the financial fragility of households, as measured by the sensitivity of their default rates to their indebtedness. Analyzing this issue with cross-country data is very difficult due to the scarcity of internationally comparable data on household default rates. To our knowledge, the only internationally comparable data that exist in this area is the self-reported information on payment arrears available in micro surveys for several European countries: the European Community Household Panel (ECHP) and the EU Survey of Income and Labor Conditions (SILC). The ECHP was collected each year between 1994 and 2001, while SILC was collected only in 2004. In both surveys households are asked whether they have been unable to make scheduled loan payments (on

mortgage loans and consumer credit) in the last 12 months. We aggregate individual responses to this question by countries and years, so as to obtain nationally representative and comparable data for 11 EU countries.⁴

As shown by Figure 3, the fraction of households that report arrears varies substantially across countries, ranging from values between 5 and 10 percent in Belgium and Finland to less than 4 percent in Italy, Netherlands, Portugal and Spain. Almost everywhere, the time-series pattern of arrears is U-shaped, falling in the expansionary period of the late 1990s and increasing in the wake of the 2001 recession. In most countries the time series is rather smooth, with the visible exception of France and Greece, where there is a steep increase in arrears in the later part of the sample. Within individual countries, there is a strong correlation between arrears on mortgage and non-mortgage loans; we therefore expect them to exhibit a similar response to our cyclical and institutional indicators.

We analyze first total arrears, and then explore if the results are different for mortgage payments arrears and arrears on hire purchase and other loans. In our regressions we relate the average fraction of households in arrears to household debt (the sum of mortgage loans and non-housing loans), unemployment rate and the real lending rate.⁵ Since the survey question refers to arrears in the previous 12 months, the explanatory variables are lagged by one year. Our hypothesis is that each of these three variables should be associated with greater arrear probability: greater indebtedness should make a household more vulnerable to adverse income shocks; unemployment captures the frequency of such adverse shocks in the population, and the lending rate affects the burden of debt service. The panel nature of the data allows us to use fixed effects to control for unobserved differences among countries in repayment probabilities.

Column 1 of Table 3 shows that the coefficients of household debt and of the unemployment rate are both positive and statistically different from zero at the 1 percent level, in line with our hypotheses. In particular, arrears increase by 0.37 percentage points for each point increase in the unemployment rate, and by 1.5 points for each 10-point increase in the debt-GDP ratio. Instead, the coefficient of the real interest rate is imprecisely estimated. In columns 2 and 3 we also experiment with additional regressors, such as the level and

⁴ The countries are: Austria, Belgium, Denmark, Finland, France, Greece, Ireland, Italy, Netherlands, Portugal, Spain.

⁵ See Appendix A for the procedure employed to calculate the real interest rate for each country.

growth rate of GDP, but the coefficients of these variables are not precisely estimated.⁶ In each of the specifications, the country fixed effects are jointly different from zero at the 1 percent confidence level.

In column 4 of Table 3 we test the financial fragility hypothesis: that arrears are more sensitive to indebtedness and unemployment in countries with poor contracting environment and worse enforcement systems. We do so by interacting lagged indebtedness and unemployment with the institutional variables found to be important in the cross-country regressions for household debt of Section 3, that is, information sharing and check collection time. Our hypothesis is that, insofar as a better contracting environment or enforcement system raises the perceived cost of default, the same increase in household indebtedness and/or in the frequency of unemployment should be associated with a smaller increase in the default probability.

The results suggest that the sensitivity of the frequency of arrears to household indebtedness is lower in countries with better information sharing arrangements, as measured by the proportion of the population covered by private credit bureaus or public credit registers: the coefficient of the interaction term between debt and information sharing is negative (-0.192), and statistically different from zero at the 10 percent level. To illustrate, a 10 percentage point increase in the household debt-GDP ratio is associated with an increase in arrears that is 1 percentage points larger in countries where information sharing covers 40 percent of the population (as in Austria) than in countries where information sharing covers 70 to 80 percent (as in the Netherlands or Italy).

Similarly, the coefficient of the interaction between the unemployment rate and information sharing is negative (-0.548) and statistically different from zero at the 5 percent level, implying that the effect of unemployment on arrears is larger in countries with less developed information sharing. For instance, an increase in the unemployment rate of 1 percentage point is associated with an increase in arrears that is 2.4 percentage points larger in countries where information sharing covers 40 percent of the population than in countries where it covers 70 to 80 percent.

The interaction effect of the time to collect check and unemployment is positive and significant. That is, a 1-point increase in unemployment rate is associated with an increase in

⁶ Also the coefficient of the Herfindhal index in the banking industry (which is available after 1998) is not statistically different from zero.

arrears that is 2.1 percentage points larger in countries where duration is 180 days (as in France) than where duration is 680 days (as in Italy). On the other hand, the interaction term between debt and time to collect checks is not statistically different from zero.

Finally, the interaction term between debt and unemployment is positive and precisely estimated. A possible interpretation of this finding is that when households have accumulated a large stock of debt, becoming unemployed is more likely to reduce the probability of repayment. In the aggregate, this is associated with an increased fraction of households in arrears.

Tables 4 and 5 repeat the estimation separately for households' arrears regarding mortgage loans and consumer credit (plus other household loans), i.e. the two components of household liabilities. If one focuses on the specifications reported in columns 1 to 3, the main differences are that the effects of both the unemployment rate and the debt-GDP ratio on arrears are precisely estimated only in the regression for consumer credit arrears, even though they are positive in both cases. However, the estimates appear more similar across Tables 4 and 5 (and well-aligned with those in Table 3) when once focuses on the less restrictive specification reported in column 4. For this specification, actually most coefficients appear larger in absolute value and more precisely estimated for arrears on mortgage loans, with the exception of that of the direct effect of the debt-GDP ratio.

Overall, these results support the hypothesis that the financial fragility of households is affected both by institutional variables and by the level of indebtedness itself: while information sharing and judicial efficiency attenuate the impact of economic shocks and high debt on arrears, a greater indebtedness is associated with a stronger response of arrears to adverse shocks.

5. Determinants of Household Defaults in the UK, Germany and the US

The time series behavior of household default rates within individual countries can usefully complement the evidence described so far, for three distinct reasons. First, time series data that refer to the same country are obviously immune from the problem of international data comparability. Second, they enable us to get evidence on the changes in indebtedness and insolvencies after major bankruptcy law reforms, such as the 1973 and 1979 reforms of the U.S. Personal Bankruptcy code, and the 2000 reform of German bankruptcy procedures.

Third, they can throw light on the dynamic interactions between household indebtedness, insolvencies and macroeconomic variables such as the unemployment rate and the real interest rate. Extended time series for household debt and defaults exist only for very few countries. In this section, we focus on the U.K., Germany and the U.S. For each of them, we estimate simple vector autoregressions (VAR) and rely on impulse response functions to describe how household insolvencies respond to shocks in macroeconomic variables. The sample interval is determined by data availability. The Appendix describes the key variables used in the estimation for each country.

5.1. United Kingdom

Figure 6 shows that in the U.K. per capita insolvencies increased significantly over the last three decades, first peaking in 1993 and then rising steeply after 2001: while only 5 households in 10,000 defaulted in 2001, five years later 18 did. The increased insolvency rate of the early 1990s was associated with an increase in the unemployment rate. However, unemployment does not invariably correlate with defaults: the high unemployment of the early 1980s was associated with a low insolvency rate.⁷ The changing relationship between defaults and unemployment might be due to the different level of household indebtedness: in the 1990s household debt was much higher than in the 1980s, as shown in the bottom graph of Figure 6. This suggests that highly indebted households are more fragile, in the sense that they are more likely to default when hit by unemployment, in line with our findings in the panel data analysis of the previous section.

The recent buildup in household credit and insolvencies was associated with falling interest rates: the real lending rate declined from 4.3 percent in the third quarter of 1997 to 1.85 percent in the third quarter of 2005. Thus, interest rates are negatively correlated with insolvencies over the last decade: a possible interpretation is that the low interest rates of this decade contributed to the debt buildup, and thereby raised subsequent insolvencies – thus contributing to British households' financial fragility.

To investigate the effect of households' indebtedness on insolvencies, we estimate a VAR with four-variables: the number of insolvencies per capita, the unemployment rate, the real interest rate, the household debt-GDP ratio and a time trend. The model includes two lags

⁷ See Fernandez-Corugedo and Muellbauer (2006) for an analysis of mortgage credit liberalization in the UK.

for each of these variables and is estimated for the sample period running from 1987 to 2007.⁸ A Granger causality test suggests that the hypothesis that household debt does not Granger-cause insolvencies is rejected, while the hypothesis that insolvencies do not Granger-cause debt cannot be rejected at the 1 percent confidence level. Figure 7 plots the impulse response functions of insolvencies to an increase in unemployment, indebtedness and real interest rates. The response functions show that indeed an increase in household debt is followed by greater insolvencies, with the effect becoming statistically significant two to four years later. Instead, the confidence bounds of the responses to the unemployment and interest rates are large, preventing reliable inference.

5.2. United States

The U.S. offers a valuable source of evidence to study how institutional changes affect household propensity to default and its relationship with indebtedness. In the past three decades, there have been two such changes: a pro-debtor reform in 1983, which simplified consumers' bankruptcy procedures, followed by a significant increase of individual insolvencies; and a pro-creditor reform (the Bankruptcy Abuse Prevention and Consumer Protection Act) in 2005, whereby Congress cracked down on individuals who filed for bankruptcy so as to avoid debt repayment. More specifically, the 2005 reform abolished consumers' right to choose between Chapter 7 and Chapter 13, and raised the cost of filing to \$2,500-\$3,500.⁹

The two reforms were associated with remarkable changes in the number of personal bankruptcy filings. The pro-debtor reform of 1983 was followed by a fivefold increase in insolvencies over the subsequent two decades, while in the wake of the 2005 pro-creditor

⁸ The choice of the number of lags was mainly due to the availability of data. However, to check for robustness we used also one and three-lags specifications.

⁹ In the U.S., if an individual files for bankruptcy under Chapter 7, most unsecured debts are discharged. Debtors are obliged to use their non-exempt assets to repay debt, but their future earnings are entirely exempt. If instead an individual files under Chapter 13, debtors' assets are completely exempt, but some of the debtor's future earnings must be used to repay debt. Until the 2005 reform, debtors could choose between the two procedures and, since most debtors have few non-exempt assets, Chapter 7 was almost always preferred. The 2005 bankruptcy reform forced debtors with relatively high income to file for bankruptcy under Chapter 13 and repay more with the subsequent earnings.

reform insolvencies plummeted from about 2 million to 600,000 in a single year, back to the same level prevailing in mid-1980s.¹⁰

As observed before for U.K, insolvencies are strongly correlated with the stock of debt: both of them constantly increased after the 1983 reform (see bottom-left panel in Figure 8). The increase in the stock of debt was favored by the protracted low-interest rate policy pursued by the Fed in the last twenty years: as illustrated in the upper-right panel of Figure 8, the real interest rate decreased from 8 percent in 1983 to almost zero in 2005. The comovement between unemployment and insolvencies changes over time: from negative in the 1980s, it turns positive in the 1990s. This again accords with the pattern observed for the U.K.: insolvencies appear to rise with unemployment in periods of high households indebtedness.

To summarize the empirical correlations, we estimate also for the U.S. a four-variables VAR model with one lag. Since the 1983 and 2005 reform are likely to have marked a structural break in the relationship between the series, we add to the VAR as exogenous variables two dummies for the post-1983 and post-2005 periods and a time trend. The impulse response functions reported in Figure 9 show that an increase in household debt is followed by a higher insolvency rate, with the response becoming statistically significant in the first year. As for the U.K., the Granger causality test suggests that household debt Granger-causes the insolvency rate. Increases in unemployment and interest rates are also associated with a higher insolvency rate, even though the confidence bands are so large that the responses are not statistically different from zero.

¹⁰ The empirical literature has not reached a consensus on the likely reasons for the changes in U.S. households' default rates. Gross and Souleles (2002) conclude that the increase in defaults is due to an increase in borrowers' willingness to default due to declines in the social, informational and legal costs rather than to a deterioration in the risk composition of the pool of borrowers. More recent studies instead point to explanations based on the lending policies of banks. Mian and Sufi (2008) identify shifts in the supply of mortgage credit by exploiting within-county variation across zip codes that differed in latent demand for mortgages in the mid 1990s. Their estimates show that a rapid expansion in the supply of mortgage loans driven by disintermediation is a main culprit for the sharp rise in U.S. mortgage defaults. Related research by Dell'Ariccia, Deniz and Laeven (2008) documents that the relation between the recent boom and current delinquencies in the U.S. subprime mortgage can be explained by a decrease in lending standards that is unrelated to improvements in underlying economic fundamentals. Dick and Lehnert (2007) find that the increased competitive pressure following banking deregulation induced banks to expand lending to riskier borrowers.

5.3. Germany

As in the case of the U.S., also the evidence from Germany is interesting to understand the effects of changes in bankruptcy law on household insolvencies. Indeed, in 2001 the Bundestag introduced a new Bankruptcy Law that lowered the cost of filing for bankruptcy, which increased dramatically the incentives to default. The annual compound growth rate of consumer insolvencies between 2001 and 2005 exceeded 40 percent, and 161,430 individual insolvencies were reported in 2006, corresponding to 1.7 households per thousand, an eightfold increase compared to 2000 (Figure 10). This is unlikely to be due to worsening economic conditions, since in the same period business insolvencies declined. According to Zywicki (2005), after the reform German consumers “increasingly appear to be choosing to file for bankruptcy as a response to financial distress, rather than reducing spending or tapping savings to avoid bankruptcy” (p. 2).

The unprecedented steep increase in insolvencies after the reform cannot be explained by rising unemployment, rising interest rates or greater indebtedness. If anything, insolvencies comove with unemployment only after the 2001 reform, possibly as a result of the increased indebtedness of German households due to the accumulation of debt in the 1990s (bottom-left panel in Figure 10). This parallels the pattern already noticed for the United Kingdom: an increase in unemployment is associated with an increase in insolvencies only if households are sufficiently indebted.

Before the reform, the increase in the household debt-GDP ratio was accompanied by falling interest rates (top-right panel), as in the U.K. After the reform, the ratio decreases considerably, possibly reflecting a reduced willingness by banks to offer loans to households that are now seen as less likely to repay.

To describe the main correlations among the series, for Germany we rely on a four-variables VAR including a time trend and a dummy for the post-2001 period. Due to the short sample period (1992-2007), the impulse response functions displayed in Figure 11 show that insolvencies do not react appreciably to unemployment or to interest rate shocks. Even though the confidence bands are larger than in the case of the U.K. and the U.S., an increase in household debt is followed by an increase in insolvencies.

Altogether, the time series data for the U.K., the U.S. and Germany suggest two main conclusions. First, defaults increase after periods of rapid debt accumulation in each of the three countries, which can be interpreted as support for the financial fragility hypothesis.

Secondly, pro-debtor bankruptcy reforms tend to be associated with a subsequent increase in insolvencies, while the opposite applies to pro-creditor reforms, in line with the empirical studies for the U.S. surveyed in White (2006). Finally, the descriptive analysis suggests that insolvencies are positively correlated with unemployment in periods of high indebtedness. However, the paucity of observations does not allow a formal statistical test of this claim.

6. Conclusions

Household debt and insolvencies are increasingly central to the working of the economic system and the concerns of policy makers. In particular, a key issue is understanding the drivers of households' propensity to default and how it changes when credit access expands and the legal environment changes. In this paper we make an effort to pool different datasets and sources to investigate two related issues: (i) whether insolvencies tend to increase and become more sensitive to adverse shocks when households are heavily indebted – which we label the financial fragility hypothesis; (ii) whether the relation between insolvencies and debt is affected by the quality of institutions, and specifically by contract rights, judicial enforcement and information sharing arrangements between lenders.

The evidence suggests that insolvencies tend to be associated with greater households' indebtedness, supporting the financial fragility hypothesis. This is witnessed by our panel analysis of insolvencies, which shows that European countries that experienced relatively fast debt growth, also featured larger increases in insolvency rates. The VAR analysis for the U.K., the U.S. and Germany confirms that insolvencies increase in the wake of large household debt accumulation.

We also find that institutions are powerful determinants of household debt and defaults. The cross-country estimates show that debt is associated with better enforcement of creditor rights and information sharing arrangements. The panel regressions for European countries suggest that contract enforcement and information sharing arrangements reduce the sensitivity of insolvencies to household debt, as well as their sensitivity to economic shocks, such as increases in unemployment. Finally, the importance of credit market regulation is borne out by the time series evidence for the U.S. and Germany, where pro-debtor reforms (such as the 1983 U.S. and the 2001 German reforms) are followed by increases in insolvencies, while pro-creditor reforms (such as the 2005 U.S. reform) are followed by the opposite outcome.

Even though our data stop short of the sub-prime loan crisis period, our findings help explaining a key feature of the crisis, namely that even moderate shocks can precipitate a huge wave of household defaults, in a situation where households are already heavily indebted. Our evidence also suggests that the financial fragility of households can be mitigated by the design of institutions that reduce the propensity to default, such as improvements in judicial efficiency, bankruptcy regulation and information sharing arrangements.

References

- Banks, James, Richard Blundell and James P. Smith (2003), "Understanding the Differences in Household Financial Wealth between the United States and Great Britain," *Journal of Human Resources*, 38, 241-279.
- Beck, Thorsten, Berrak Buyukkarabacak, Felix Rioja, and Neven Valev (2008), "Who Gets the Credit? Household vs. Firm Lending Across Countries", World Bank, Policy Research Working Paper, No. 4661.
- Börsch-Supan, Axel and Anna Maria Lusardi (2003), "Saving: A Cross-National Perspective," in A. Börsch-Supan (ed.), *Life-Cycle Savings and Public Policy: A Cross-National Study in Six Countries*, Academic Press, 1-31.
- Brown, Martin, Tullio Jappelli and Marco Pagano (2008), "Information Sharing and Credit: Firm-Level Evidence from Transition Countries," *Journal of Financial Intermediation* (forthcoming).
- Brown, Martin, and Christian Zehnder (2007), "The Emergence of Information Sharing in Credit Markets," University of Zurich, IEEER Working Paper No. 317.
- Deininger, Klaus and Lyn Squire (1996), "A New Data Set Measuring Income Inequality," *World Economic Bank Review*, 10(3), pp. 565-591.
- Dell'Ariccia, Giovanni, Deniz Igan, and Luc Laeven (2008), "Credit Booms and Lending Standards: Evidence from the Subprime Mortgage Market," CEPR Discussion Paper No. 6683.
- Dick, Astrid and Andreas Lehnert (2007), "Personal Bankruptcy and Credit Market Competition," Federal Reserve Bank of New York Staff Reports No. 272.
- Djankov, Simeon, Rafael La Porta, Florencio Lopez-de-Silanes, and Andrei Shleifer (2003), "Courts: The Lex Mundi Project," *Quarterly Journal of Economics* 118, 453-517.
- Djankov, Simeon, Caralee McLiesh, and Andrei Shleifer (2007), "Private Credit in 129 Countries," *Journal of Financial Economics* 84, 299-329.
- ECRI (2007), "Consumer Credit and Lending to Households in Europe: Statistical Package." Bruxelles: European Credit Research Institute.
- Fabbri, Daniela and Mario Padula (2004), "Does Poor Legal Enforcement Make Households Credit Constrained?" *Journal of Banking and Finance*, 28(10), 2369-2397.
- Fernandez-Corugedo, Emilio and John Muellbauer (2006), "Consumer Credit Conditions in the United Kingdom," Bank of England Working Paper No. 314.

- Gross, D., Souleles, N., (2002), “An Empirical Analysis of Personal Bankruptcy and Delinquency”, *Review of Financial Studies* 15, 319–347.
- Gropp, Reint, and John Karl Scholz, and Michelle J. White (1997), “Personal Bankruptcy and Credit Supply and Demand,” *Quarterly Journal of Economics* 112, 217-251.
- Hurd, Michael, and Arie Kapteyn (2003), “Health, Wealth, and the Role of Institutions,” *Journal of Human Resources*, 38, 386-415.
- IMF (2006), “Household Credit Growth in Emerging Market Countries,” Chapter 2 in *Global Financial Stability Report: Market Development and Issues*. Washington: International Monetary Fund.
- Jappelli, Tullio, and Marco Pagano (2002), “Information Sharing, Lending, and Defaults: Cross-country Evidence,” *Journal of Banking and Finance* 26, 2017-2045.
- La Porta, Rafael, Florencio Lopez-de-Silanes, Andrei Shleifer and R. Vishny (1997), “Legal Determinants of External Finance,” *Journal of Finance* 52, 1131-1150.
- La Porta, Rafael, Florencio Lopez-de-Silanes, Andrei Shleifer and R. Vishny (1998), “Law and Finance,” *Journal of Political Economy* 106, 1113-55.
- Love Inessa, and Natalia Mylenko (2003), “Credit Reporting and Financing Constraints,” World Bank Policy Research Working Paper 3142.
- Mian, Atif, and Amir Sufi (2008), “The Consequences of Mortgage Credit Expansion: Evidence from the 2007 Mortgage Default Crisis,” NBER Working Paper No. 13936.
- Petersen, M. A. and R.G. Rajan. (1995), “The Effect of Credit Market Competition on Lending Relationships,” *Quarterly Journal of Economics* 110, 407-443.
- Poterba, J., S. Venti and D. Wise (1994), “Targeted Retirement Saving and the Net Worth of Elderly Americans,” *American Economic Review* 84, 180-185.
- Poterba, James (2002), “Taxation and Portfolio Structure: Issues and Implications,” in *Household Portfolios*, Luigi Guiso, Tullio Jappelli and Michalis Haliassos eds. Cambridge: MIT Press.
- White, Michelle J. (2006), “Bankruptcy and Consumer Behavior: Theory and US Evidence,” in *The Economics of Consumer Credit*, Giuseppe Bertola, Richard Disney, and Charles Grant eds. Cambridge: MIT Press.
- Zywicki, Todd J. (2005), “Institutions, Incentives and Consumer Bankruptcy Reform,” Law and Economics Working Paper Series No. 05-7, George Mason University Law School.

Appendix. Definition of variables and data sources

A1. Cross-country data

Debt-GDP ratio. Total household debt as percentage of GDP in 2005. Sources: IMF (2006) and ECRI (2007 Edition, Table 1c). We replace ECRI variables with IMF variables when ECRI data is missing.

Time to collect check. Djankov et al. (2003), database for the paper *Courts: The Lex Mundi Project*.

Log Per capita GDP. Definition: log of per capita GDP in thousands of U.S. dollars in 2000. Djankov et al. (2003), database for the paper *Courts: The Lex Mundi Project*.

Information sharing indicators. The two variables measure the percentage of the population covered by private credit bureaus and public credit registers. A public registry is defined as a database owned by public authorities that collects information on the standing of borrowers in the financial system and makes it available to financial institutions. A private bureau is defined as a private commercial firm or non-profit organization that maintains a database on the standing of borrowers in the financial system, and its primary role is to facilitate exchange of information amongst banks and financial institutions. The variables refer to 2003. Source: World Bank, Doing Business Project.

Gini index. The index is an updated version of the data described in Deininger and Squire (1996). They collected 682 observations for 108 countries, of which 65 percent are based on national statistics agencies or compilations by international agencies and for the remaining 35 percent are based on primary sources such as household surveys.

Concentration ratio. The index drawn from the database by Levine and Demirguc-Kunt, 2006 edition. It equals the share of assets of the three largest banks in total banking system assets. It is defined using the Bankscope database compiled by Fitch-IBCA, which reports bank balance sheet data since 1988.

Creditor rights. We use the index of creditor rights based on methodology of La Porta et al. (1998). A score of one is assigned when each of the following rights of secured lenders are defined in laws and regulations. First, there are restrictions, such as creditor consent or minimum dividends, for a debtor to file for reorganization. Second, secured creditors are able to seize their collateral after the reorganization petition is approved. Third, secured creditors are paid first out of the proceeds of liquidating a bankrupt firm. Fourth, if management does not retain administration of its property pending the resolution of the reorganization. We use 2003 values. Source: Djankov et al. (2007).

Population growth rate: Average Population growth in 2000-2005. Source: Earth-trends, http://earthtrends.wri.org/searchable_db/index.php?theme=4

Legal origin. Identifies the legal origin of the company law or commercial code of each country. Source: La Porta et al. (1999).

A2. Panel data

Percentage of the population in arrears. The variable is based on replies to the following questions contained in the ECHP (1996-2001) and in the SILC (2004):

- “Has the household been unable to make scheduled mortgage payments during the past 12 months?”
- “Has the household been unable to pay hire purchase instalments or other loan repayments during the past 12 months?”

The variables are aggregated by country and year using sample weights. Data non available for 2002 and 2003 are interpolated.

Real interest rate. In all countries, this is defined as the nominal lending rate less the inflation rate. We have considered the long term interest rate, defined as the rate on 10-years government bonds, less the consumer price index. Source: OECD.

Debt-GDP ratio. For each country, we have considered data on loans to households from national central banks, OECD and ECB defining the debt-GDP ratio with data on GDP from OECD. Then, we have compared the values obtained with those available from ECRI and IMF, keeping only the most similar series.

Unemployment rate. Standardized rate of unemployment. Source: OECD.

Information sharing. Defined as the percentage of the population covered by private credit bureaus or public credit registers. A public registry is defined as a database owned by public authorities that collects information on the standing of borrowers in the financial system and makes it available to financial institutions. A private bureau is defined as a private commercial firm or non-profit organization that maintains a database on the standing of borrowers in the financial system, and its primary role is to facilitate exchange of information amongst banks and financial institutions. The variables refer to 2003. Source: World Bank, Doing Business Project.

Time to collect check. Djankov et al (2003), database for the paper *Courts: The Lex Mundi Project*.

A3. Individual country time series

Individual insolvencies. For the U.K., the statistics refer to total quarterly insolvent individuals in England and Wales, are derived from administrative records of the Department for Business, Enterprise and Regulatory Reform (BERR). For comparability with the other countries, quarterly data are annualized. Source: The Insolvency Institute (<http://www.insolvency.gov.uk/>). For Germany, monthly insolvency registrations are aggregated on a quarterly basis and annualized for comparability with the other countries. Source: DESTATIS (<http://www.destatis.de>). In the United States, individual insolvencies are annual data. Source: American Bankruptcy Institute (<http://www.abiworld.org>).

Real interest rate. For the U.K. the lending rate refers to quarterly data about nominal zero coupon yields on ten years government bonds since 1982. Source: National Statistics (<http://www.statistics.gov.uk/>). For Germany, monthly interest rates for loans for house purchase are aggregated on a quarterly basis from 1975 to 2002. In 2003 this series has been discontinued and the Bundesbank provides a different series, which covers 2003-2007. Since there may be some inconsistencies between the two series, we have also linearly interpolated the former series to cover the years 2003-2007. Source: Bundesbank (<http://www.bundesbank.de/>). In the United States, the

statistics refer to the interest rate on ten years government bonds. Source: The Federal Reserve (<http://www.federalreserve.gov/Releases/>). For all three countries, we have considered the Consumer Price Index provided by the main price indexes section of the OECD Department of Statistics, in order to obtain the real lending rates.

Unemployment rate. For the U.K., the statistics refer to total unemployment rate over the period 1971-2007. Source: National Statistics (<http://www.statistics.gov.uk/>). For Germany, we have collected quarterly data since 1992. Source: Bundesbank (<http://www.bundesbank.de/>). We have considered yearly data about unemployment rate in the United States. Source: OECD (<http://www.oecd.org/statistics/>).

Household debt/GDP ratio. We consider data about total financial liabilities of households in all three countries. For the U.K., the data about household debt and Gross Domestic Product are published by the National Statistics (<http://www.statistics.gov.uk/>). For the Germany, the source for both series is the Bundesbank. In the United States, we have collected the data about household debt provided by the Federal Reserve, while the GDP is published by the OECD. Then, we have calculated the ratio and we have compared our data with other series available at ECRI and Hypostat, in order to confirm that we got consistent measure of household debt.

Table 1
Sample statistics and correlation matrix of the variables used
in the cross-country analysis

	<i>Debt-GDP</i>	<i>GDP per capita</i>	<i>Duration</i>	<i>Concentration ratio</i>	<i>Gini index</i>	<i>Private credit bureau</i>	<i>Public credit register</i>	<i>Creditor rights</i>	<i>English origin</i>
Mean	0.33	11881	263.00	0.64	0.35	0.39	0.08	1.91	0.20
Standard deviation	0.27	11084	209.23	0.19	0.09	0.37	0.16	1.04	0.41
Minimum	0.02	440	39.00	0.26	0.24	0.00	0.00	0.00	0.00
Maximum	1.01	42930	1003.00	0.99	0.59	1.00	0.72	4.00	1.00

	Debt-GDP	Log GDP	Log duration	Concentration ratio	Gini index	Private credit bureau	Public credit register	Creditor rights	English origin
Debt-GDP	1.0000								
Log GDP	0.7662	1.0000							
Log duration	-0.5623	-0.1855	1.0000						
Concentration ratio	0.1905	0.2169	-0.0260	1.0000					
Gini index	-0.3717	-0.3993	0.1051	-0.3073	1.0000				
Priv. credit bureau	0.5189	0.5304	-0.2542	-0.1593	-0.0020	1.0000			
Pub. credit register	0.0385	0.0991	0.0805	0.3004	0.1767	-0.2616	1.0000		
Creditor rights	0.3787	0.2044	-0.3214	-0.0097	-0.3667	0.1497	-0.1670	1.0000	
English origin	0.3837	0.0966	-0.3720	-0.2551	-0.0080	0.4387	-0.2303	0.2534	1.0000

Table 2
Cross-country regressions for household Debt-GDP ratio

	(1)	(2)	(3)
Log of per capita GNP in 1999	0.153*** (0.028)	0.140*** (0.021)	0.101*** (0.022)
Population growth	0.033 (0.046)	-0.017 (0.038)	0.004 (0.029)
Gini coefficient	-0.118 (0.469)	0.262 (0.359)	-0.396 (0.317)
Banks' concentration rate	0.097 (0.180)	0.294* (0.158)	0.060 (0.129)
Creditors' rights		0.027 (0.025)	0.018 (0.019)
English origin		0.307*** (0.071)	0.124* (0.061)
Log duration of check collection			-0.119*** (0.027)
Private registry coverage			0.193** (0.072)
Public registry coverage			0.545*** (0.132)
Constant	-1.078*** (0.377)	-1.303*** (0.282)	0.008 (0.324)
Observations	45	43	38
R-squared	0.49	0.72	0.89

Note. The dependent variable is the household debt-GDP ratio. One asterisk denotes significance at the 10 percent level; two asterisks at the 5 percent; three asterisks a the 10 percent. Robust standard errors are reported in parenthesis.

Table 3
Determinants of households' total arrears.
Fixed effects estimation

	(1)	(2)	(3)	(4)
Unemployment rate	0.372** (0.165)	0.512 (0.315)	0.403** (0.165)	-1.866*** (0.396)
Real interest rate	0.007 (0.092)	0.015 (0.086)	0.007 (0.096)	-0.089 (0.085)
Debt-GDP ratio	0.109* (0.054)	0.100 (0.056)	0.100 (0.055)	0.037 (0.062)
Log GDP		0.033 (0.071)		
GDP growth rate			-0.166 (0.144)	
Unemployment × information sharing				-0.548** (0.178)
Unemployment × time to collect check				0.191*** (0.050)
Debt-GDP × information sharing				-0.192* (0.103)
Debt-GDP × time to collect check				-0.014 (0.011)
Debt-GDP × unemployment				4.193*** (1.005)
Constant	-0.035 (0.035)	-0.468 (0.918)	-0.029 (0.036)	0.057** (0.024)
Observations	116	116	116	116
R-squared	0.72	0.72	0.72	0.83

Note. The dependent variable is the fraction of households in each year and country reporting to have been unable to make scheduled mortgage payments, pay hire purchase instalments or other loan repayments during the past 12 months. One asterisk denotes significance at the 10 percent level; two asterisks at the 5 percent; three asterisks at the 1 percent. Robust standard errors are reported in parenthesis.

Table 4
Determinants of households' arrears: mortgages.
Fixed effects estimation

	(1)	(2)	(3)	(5)
Unemployment rate	0.181 (0.112)	0.273 (0.183)	0.196 (0.111)	-1.214*** (0.192)
Real interest rate	-0.003 (0.054)	0.002 (0.048)	-0.004 (0.058)	-0.072 (0.054)
Debt-GDP ratio	0.047 (0.029)	0.042 (0.031)	0.043 (0.030)	-0.053 (0.038)
Log GDP		0.022 (0.040)		
GDP growth rate			-0.084 (0.079)	
Unemployment × information sharing				-0.365** (0.120)
Unemployment × duration				0.128*** (0.027)
Debt-GDP × information sharing				-0.036 (0.062)
Debt-GDP × duration				-0.008 (0.006)
Debt-GDP × unemployment				2.567*** (0.441)
Constant	-0.010 (0.020)	-0.298 (0.513)	-0.007 (0.021)	0.050*** (0.012)
Observations	116	116	116	116
R-squared	0.69	0.70	0.70	0.83

Note. The dependent variable is the fraction of households in each year and country reporting to have been unable to make scheduled mortgage payments during the past 12 months. One asterisk denotes significance at the 10 percent level; two asterisks at the 5 percent; three asterisks at the 1 percent. Robust standard errors are reported in parenthesis.

Table 5
Determinants of households' arrears: consumer credit and other household loans.
Fixed effects estimation

	(1)	(2)	(3)	(4)
Unemployment rate	0.194*** (0.055)	0.280 (0.175)	0.205*** (0.058)	-0.834* (0.413)
Real interest rate	0.003 (0.052)	0.008 (0.051)	0.003 (0.052)	-0.028 (0.049)
Debt-GDP ratio	0.064* (0.029)	0.059* (0.029)	0.061* (0.030)	0.086** (0.033)
Log GDP		0.021 (0.041)		
GDP growth rate			-0.059 (0.091)	
Unemployment × information sharing				-0.175* (0.080)
Unemployment × time to collect checks				0.072*** (0.020)
Debt-GDP × information sharing				-0.172** (0.061)
Debt-GDP × time to collect checks				-0.007 (0.008)
Debt-GDP × unemployment				1.975* (0.957)
Constant	-0.026 (0.016)	-0.295 (0.532)	-0.023 (0.017)	0.014 (0.021)
Observations	116	116	116	116
R-squared	0.65	0.66	0.66	0.76

Note. The dependent variable is the fraction of households in each year and country reporting to have been unable to pay hire purchase instalments or other loan repayments during the past 12 months. One asterisk denotes significance at the 10 percent level; two asterisks at the 5 percent; three asterisks at the 1 percent. Robust standard errors are reported in parenthesis.

Table A1
Main variables used in the cross-country analysis

	<i>Debt- GDP</i>	<i>GDP per capita</i>	<i>Duration</i>	<i>Concentration ratio</i>	<i>Gini index</i>	<i>Private credit bureau</i>	<i>Public credit register</i>	<i>Creditor rights</i>	<i>English origin</i>
Argentina	0.05	7550	300.00	0.41	0.51	1.00	0.25	1.00	0.00
Australia	0.63	20950	319.50	0.63	0.32	1.00	0.00	3.00	1.00
Austria	0.37	25429	434.00	0.71	0.28	0.40	0.01	3.00	0.00
Belgium	0.35	24649	120.00	0.86	0.26	0.00	0.56	2.00	0.00
Brazil	0.04	4350	180.00	0.43	0.59	0.43	0.09	1.00	0.00
Bulgaria	0.12	1410	410.00	0.64	0.28	.	0.21	2.00	0.00
Chile	0.20	4630	200.00	0.55	0.51	0.19	0.31	2.00	0.00
China	0.12	780	180.00	0.77	0.45	0.00	0.10	2.00	0.00
Colombia	0.08	2170	527.00	0.40	0.54	0.28	0.00	0.00	0.00
Cyprus	0.59	11950	360.00	0.89	.	.	.	.	1.00
Czech Republic	0.12	5020	270.00	0.69	0.25	0.51	0.04	3.00	0.00
Denmark	1.01	32049	83.00	0.79	0.27	0.12	0.00	3.00	0.00
Estonia	0.21	3400	305.00	0.98	0.32	0.18	0.00	.	0.00
Finland	0.40	24729	240.00	0.99	0.25	0.15	0.00	1.00	0.00
France	0.39	24790	181.00	0.56	0.31	0.00	0.12	0.00	0.00
Germany	0.64	25620	154.00	0.66	0.28	0.94	0.00	3.00	0.00
Greece	0.31	12110	315.00	0.82	0.36	0.38	0.00	1.00	0.00
Hungary	0.15	4640	365.00	0.63	0.24	0.06	0.00	1.00	0.00
India	0.08	440	106.00	0.37	0.33	0.06	0.00	2.00	1.00
Indonesia	0.07	600	225.00	0.61	0.34	0.00	0.08	2.00	0.00
Ireland	0.61	21470	130.00	0.64	0.31	1.00	0.00	1.00	1.00
Italy	0.25	20170	645.00	0.42	0.31	0.68	0.07	2.00	0.00
Japan	0.45	32030	60.00	0.46	0.25	.	0.00	2.00	0.00
Korea	0.61	8490	75.00	0.49	0.32	0.77	0.00	3.00	0.00
Latvia	0.18	2430	188.50	0.54	0.34	0.00	0.02	3.00	0.00
Lithuania	0.08	2640	150.00	0.86	0.29	0.07	0.04	2.00	0.00
Luxembourg	0.43	42930	210.00	0.26	0.29	.	.	.	0.00
Malaysia	0.53	3390	90.00	0.47	0.49	.	0.42	3.00	1.00
Malta	0.39	9210	545.00	0.89	.	.	.	.	0.00
Mexico	0.12	4440	283.00	0.68	0.49	0.69	0.00	0.00	0.00
Netherlands	0.77	25140	39.00	0.75	0.29	0.69	0.00	3.00	0.00
New Zealand	0.77	13990	60.00	0.79	0.37	1.00	0.00	4.00	1.00
Peru	0.05	2130	441.00	0.73	0.48	0.29	0.19	0.00	0.00
Philippines	0.04	1050	164.00	0.62	0.46	0.05	0.00	1.00	0.00
Poland	0.12	4070	1000.00	0.54	0.31	0.38	0.00	1.00	0.00
Portugal	0.64	11030	420.00	0.90	0.39	0.09	0.72	1.00	0.00
Romania	0.05	1470	225.00	0.83	0.28	0.05	0.03	1.00	0.00
Russia	0.03	2250	160.00	0.38	0.32	0.00	0.00	2.00	0.00
Slovak Republic	0.10	4491	.	0.71	0.26	0.45	0.01	2.00	0.00
Slovenia	0.12	9999	1003.00	0.64	0.28	0.00	0.03	3.00	0.00
South Africa	0.38	3170	84.00	0.92	.	0.53	0.00	3.00	1.00
Spain	0.57	14800	147.00	0.86	0.35	0.07	0.45	2.00	0.00
Sweden	0.55	26750	190.00	0.98	0.25	1.00	0.00	1.00	0.00
Taiwan	0.54	13310	210.00	0.31	0.24	0.60	0.00	2.00	0.00
Thailand	0.24	2010	210.00	0.53	0.40	0.22	0.00	2.00	1.00
Turkey	0.06	2900	105.00	0.66	0.37	.	0.07	2.00	0.00
United Kingdom	0.75	23590	101.00	0.47	0.34	0.86	0.00	4.00	1.00
United States	0.85	31910	54.00	0.30	0.38	1.00	0.00	1.00	1.00
Venezuela	0.02	3680	360.00	0.52	0.42	0.00	0.00	3.00	0.00
Total	0.33	11881.88	263.00	0.64	0.35	0.39	0.08	1.91	0.20

Figure 1
Total household liabilities and GDP per capita

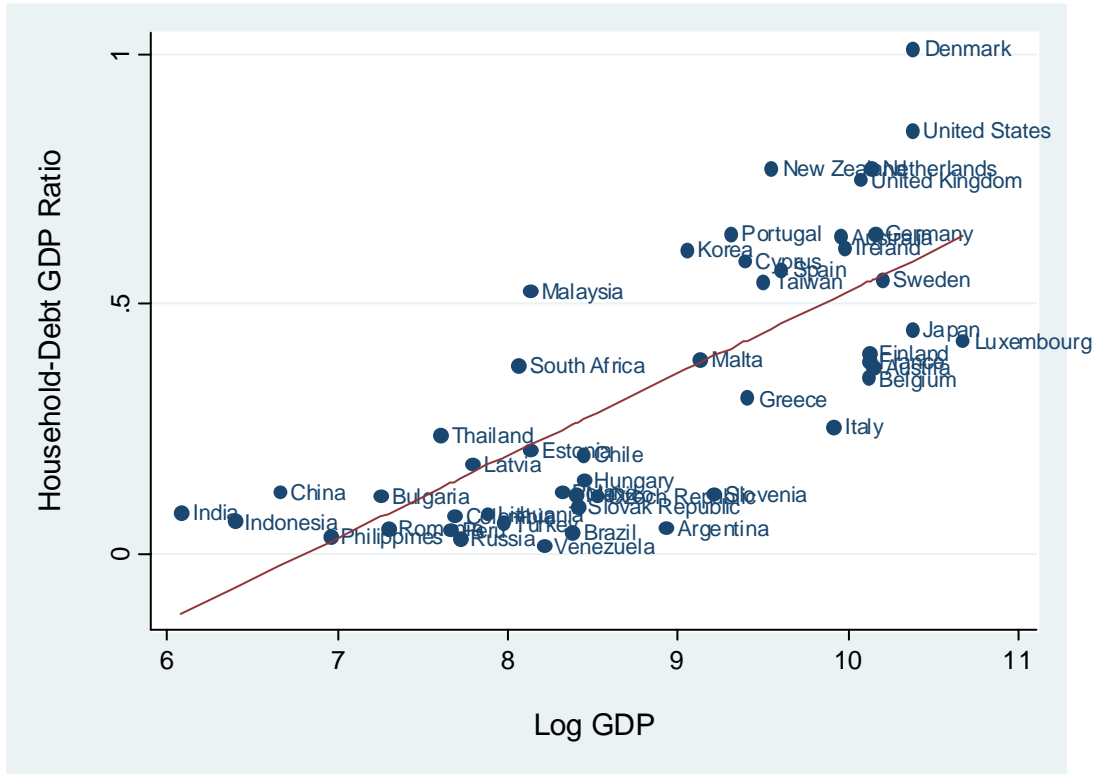


Figure 2
Total household liabilities and duration of judicial procedures

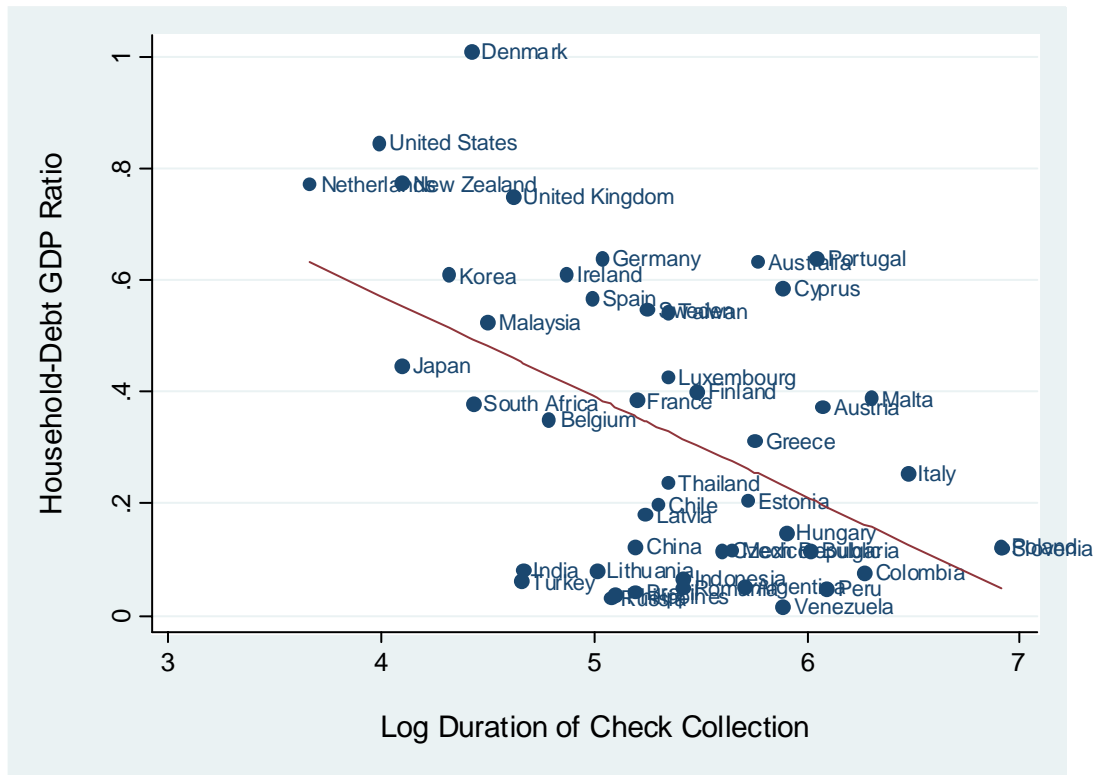


Figure 3
Total household liabilities and information sharing

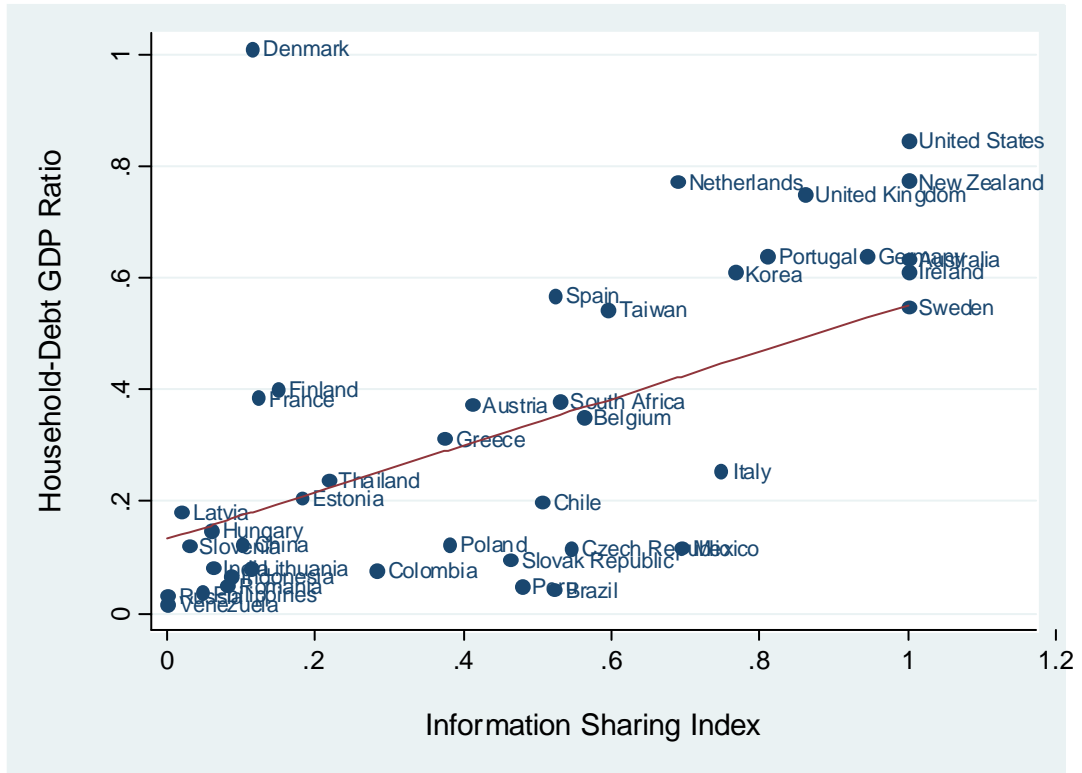


Figure 4
Cross-country regressions for growth of total household liabilities over GDP

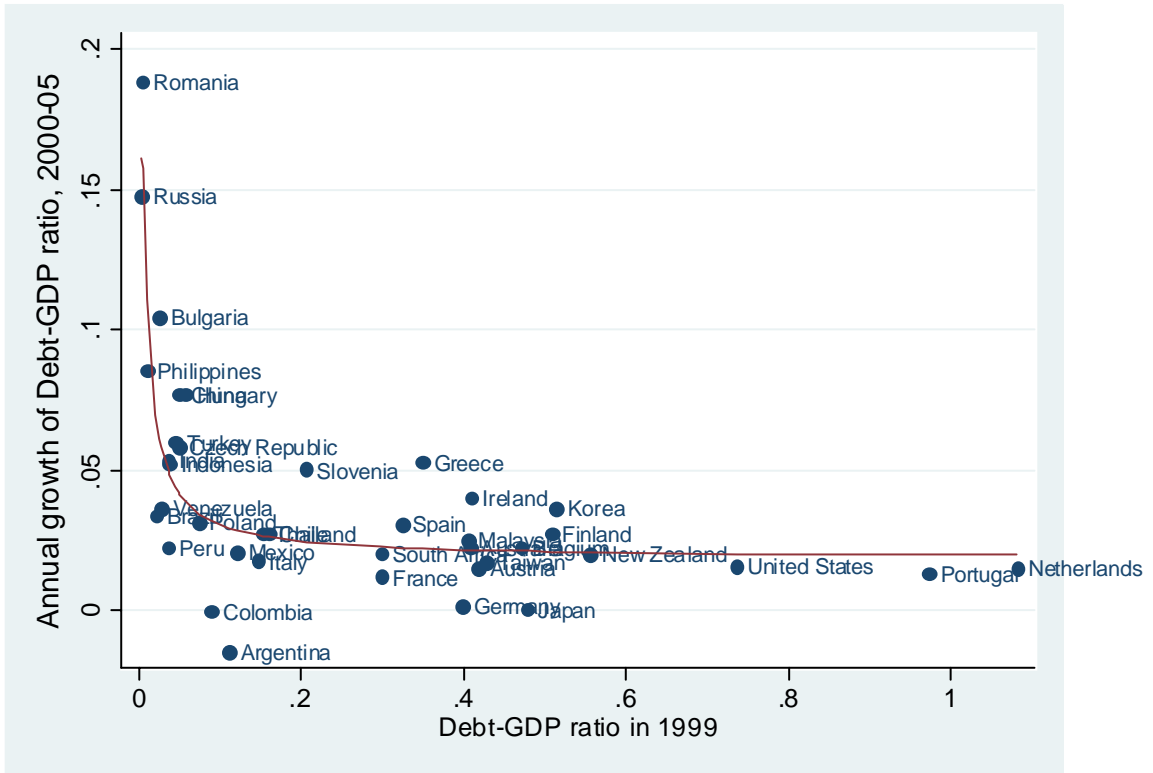


Figure 5
Household arrears in selected EU countries
 (source: ECHP and SILC)

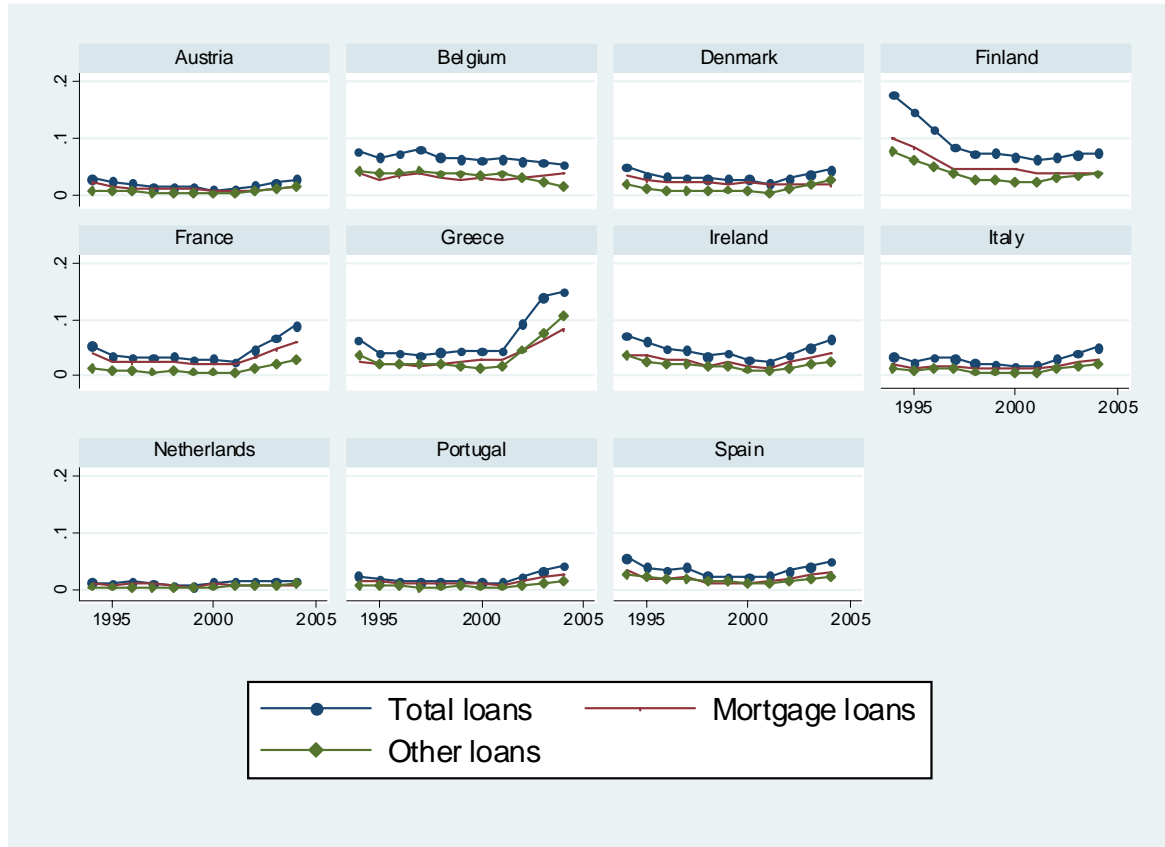


Figure 6
Household debt, insolvencies, unemployment and interest rates in the U.K.

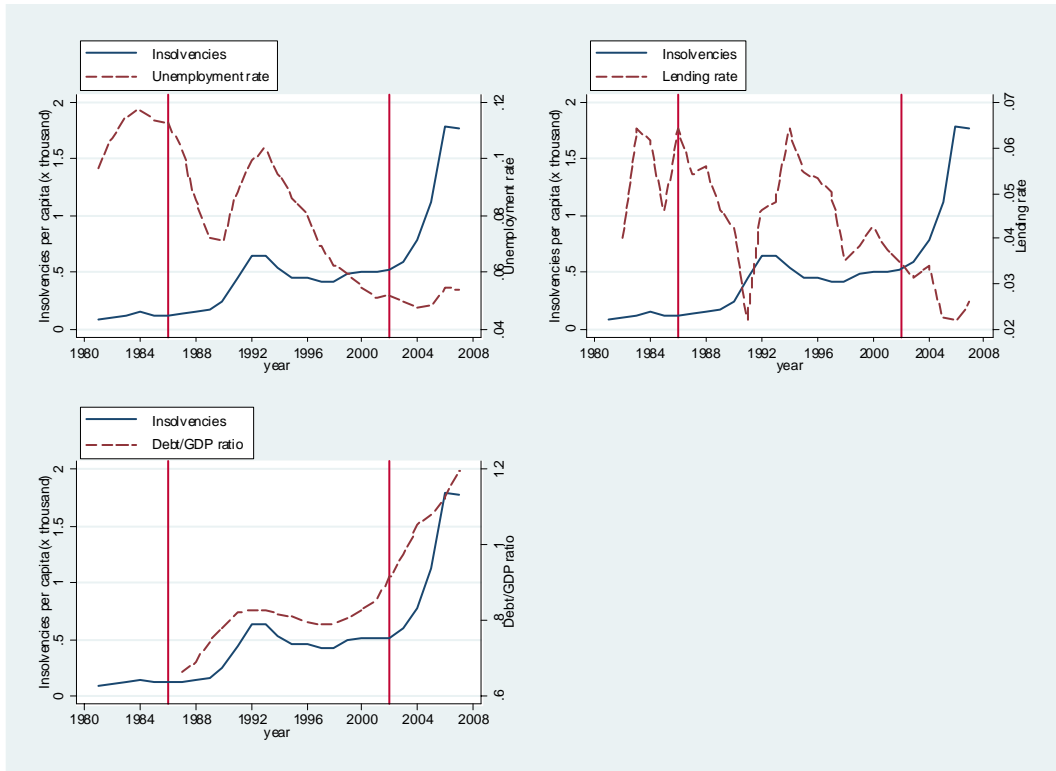


Figure 7
Impulse response functions from VAR estimates for the United Kingdom

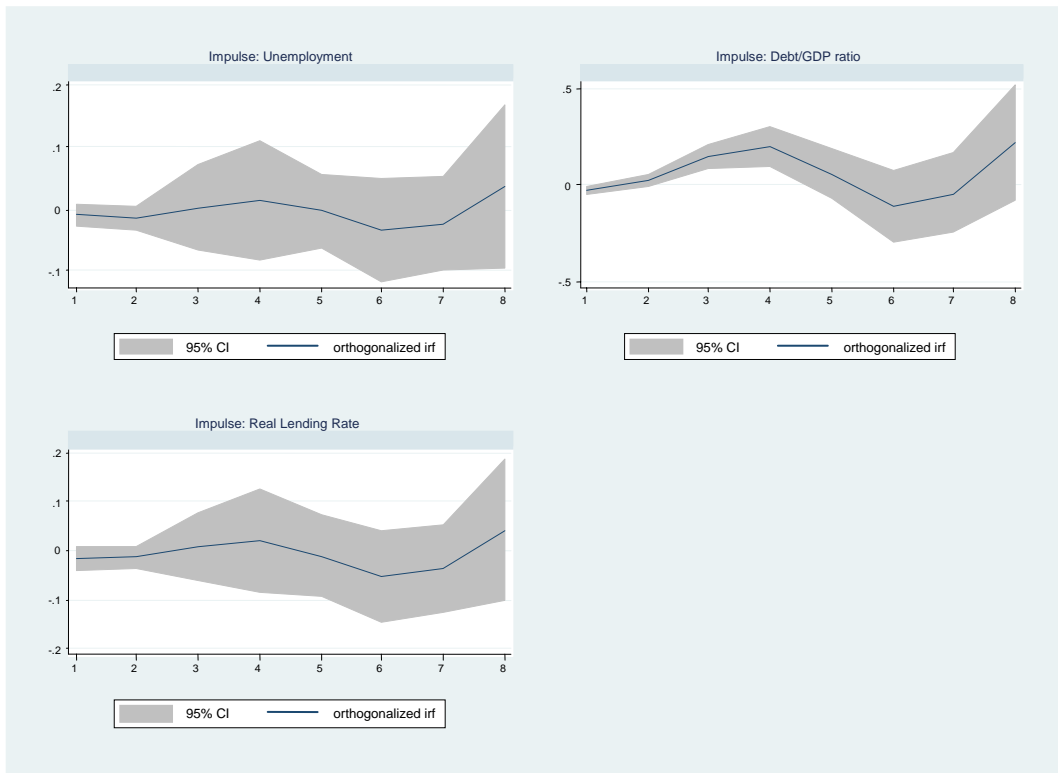


Figure 8
Household debt, insolvencies, unemployment and interest rates in the U.S.



Figure 9
Impulse response functions from VAR estimates for the United States

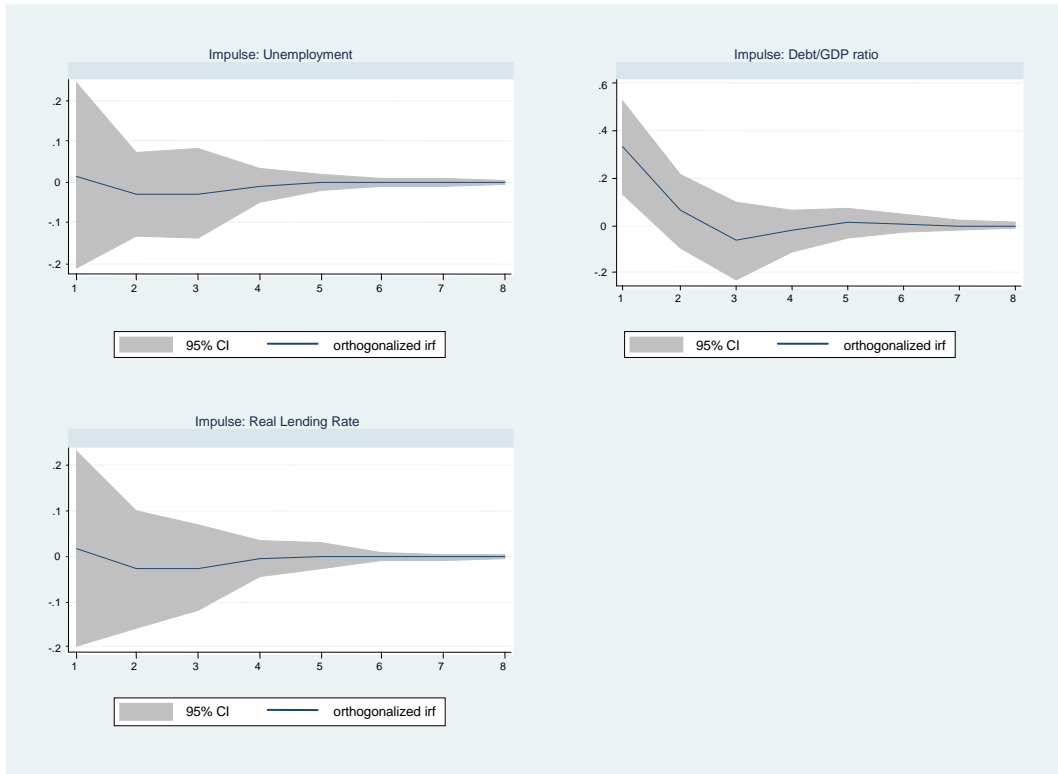


Figure 10
Household debt, insolvencies, unemployment and interest rates in Germany

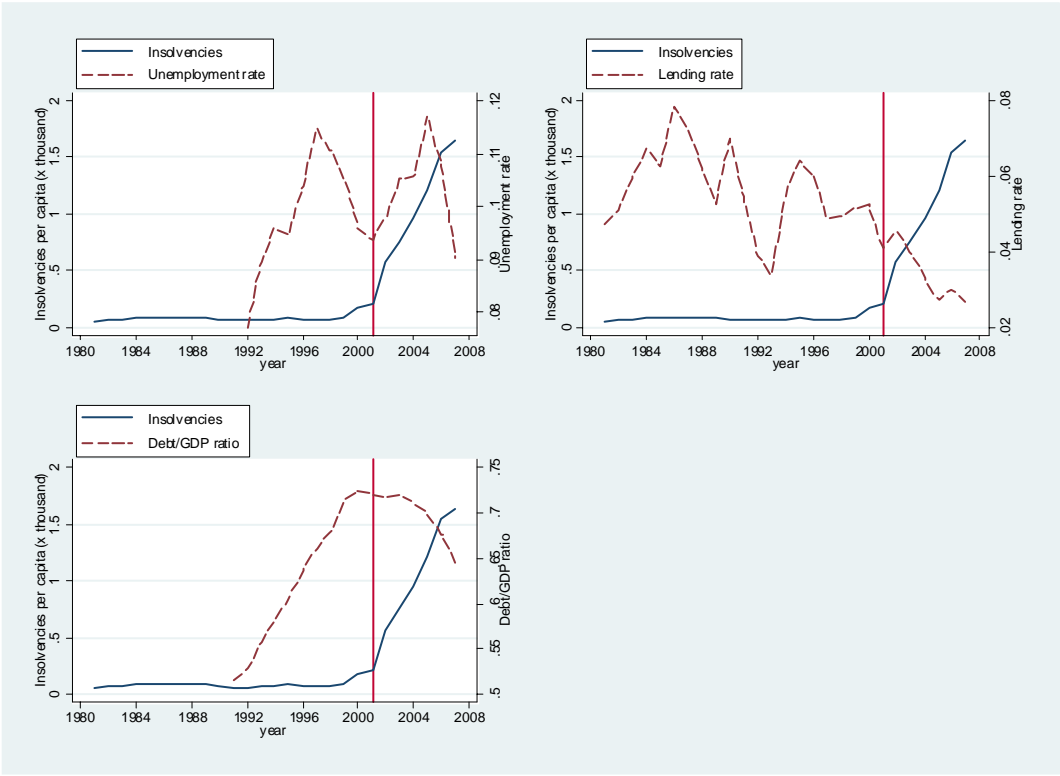


Figure 11
Impulse response functions from VAR estimates for Germany

