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(doi: 10.12831/73631)

Journal of Financial Management, Markets and Institutions (ISSN 2282-717X)

Fascicolo 1, gennaio-giugno 2013

Ente di afferenza:

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Households' Indebtedness and Financial Fragility



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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 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 household lending and arrears; and (iii) time series data for household lending and insolvencies in the UK, the USA and Germany. Overall, the analysis underscores the importance of institutional arrangements in determining the size and fragility of household credit markets.

Keywords: Household Debt, Financial Fragility, Arrears, Insolvency, Bankruptcy Law.

JEL classification numbers: D14, G21, G28, G33.

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 in the pre-crisis period lending to households increased strongly in the United States, it grew even more rapidly in other developed countries and several emerging economies, where it was the fastest growing segment of total credit (IMF, 2006). The crisis shows that understanding the determinants of

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lending to households and of their solvency is of great importance not only to market practitioners, but also to regulators and policy makers.

In the last two decades the household credit buildup in the US has been accompanied by rising insolvencies. It is natural to ask whether this correlation is specific to the US 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 individual countries, to inquire whether the correlation between lending and defaults observed in the US 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 data for the US and the UK.

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 judicial enforcement 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 for the US and Germany 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 time series evidence for Germany, the UK, and the US. 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 judicial enforcement and information sharing arrangements among lenders; *(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. The role played by these factors

has been highlighted in previous research on the international differences in household debt (Jappelli and Pagano, 1989; and various essays in Bertola, Disney and Grant, 2006) and saving patterns (Banks, Blundell and Smith, 2003; Hurd and Kapteyn, 2003; and Börsch-Supan and Lusardi, 2003).

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 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 *Bankruptcy Regulation 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. Bankruptcy 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 and the origin of the legal system. 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 US. 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.

These country-level studies on the institutional determinants of household debt have recently been complemented by the cross-country study of Beck, Buyukkarabacak, Rioja and Valev (2012), who 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. Our paper, instead, concerns the effect of institutional factors on the size of household credit (rather than on its share in total credit) and on households' default rates, as well as the interaction between the two.

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.

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. More

recently, in their study of credit market performance and institutional arrangements in 129 countries for the period 1978-2003, Djankov *et al.* (2007) confirm that private sector credit relative to GDP is positively correlated with information sharing. 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 (2009) (based on the EBRD/World Bank Business Environment and Enterprise Performance Survey). Finally, the experimental study by Brown and Zehnder (2010) 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 UK 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.¹

¹ 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

2.3 Supply-Side Factors

The traditional wisdom in industrial organization is that greater competition between banks fosters greater loan availability, cheaper credit and entry by new borrowers. Indeed many studies have documented that credit supply increases in the wake of banking deregulations, such as the removal of regulatory constraints on multi-state branching in the US (see for instance Cetorelli and Strahan, 2006) or the 1985 banking liberalization in France (Bertrand, Schoar and Thesmar, 2007). By opening credit access to lower grade borrowers, stronger banking competition may also lead to an increase in the average insolvency rate: for instance, Dick and Lehnert (2010) show that the increased banking competition due to the relaxation of US entry restrictions induced banks to extend more credit to existing customers and previously excluded households, and that this credit expansion explains at least one tenth of the rise in the US personal bankruptcy 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 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. We rely on a comprehensive measure of debt that includes mortgage debt, and secured and unsecured consumer credit. In principle, secured and unsecured

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.

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

	Debt/ GDP	GDP per capita	Duration	Concentration ratio	Gini index	Private credit bureau	Public credit register	English origin
Mean	0.33	11,881	263.00	0.64	0.35	0.39	0.08	0.20
Standard deviation	0.27	11,084	209.23	0.19	0.09	0.37	0.16	0.41
Minimum	0.02	440	39.00	0.26	0.24	0.00	0.00	0.00
Maximum	1.91	42,930	1,003.00	0.99	0.59	1.00	0.72	1.00
	Debt/ GDP	Log GDP	Log duration	Concentration ratio	Gini index	Private credit bureau	Public credit register	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	
English origin	0.3837	0.0966	-0.3720	-0.2551	-0.0080	0.4387	-0.2303	1.0000

debt may respond to different incentives and a different regulatory environment. However, in practice the distinction between the various forms of household debt is blurred by the fact that to a certain extent the two forms of debt are substitutes (households may rely less on consumer credit if they are able to borrow more in the mortgage market). Furthermore, the distinction between the forms of household debt varies considerably across countries, reflecting different definitions and legal arrangements. Finally, the institutional determinants of household debt that we consider in the empirical analysis affect both mortgage and consumer credit markets.

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, the Netherlands, New Zealand, US and UK, 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 percentage of individuals covered by 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. Since La Porta *et al.* (1998) have shown that investors' protection differs systematically between civil and common law countries, 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

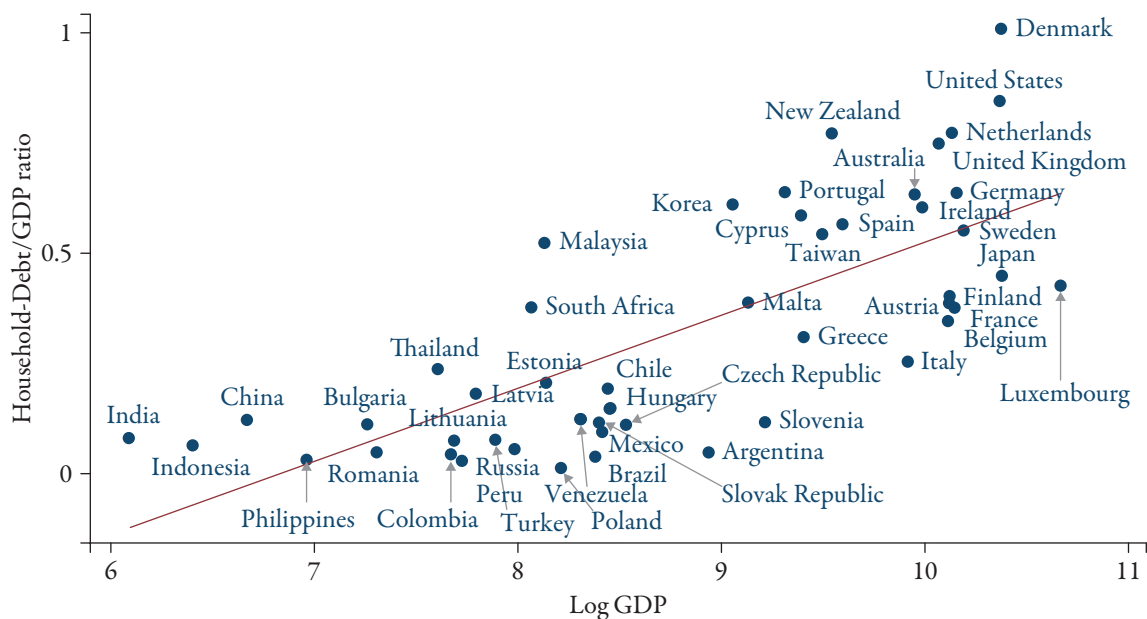


Figure 1: Total household liabilities and GDP per capita.

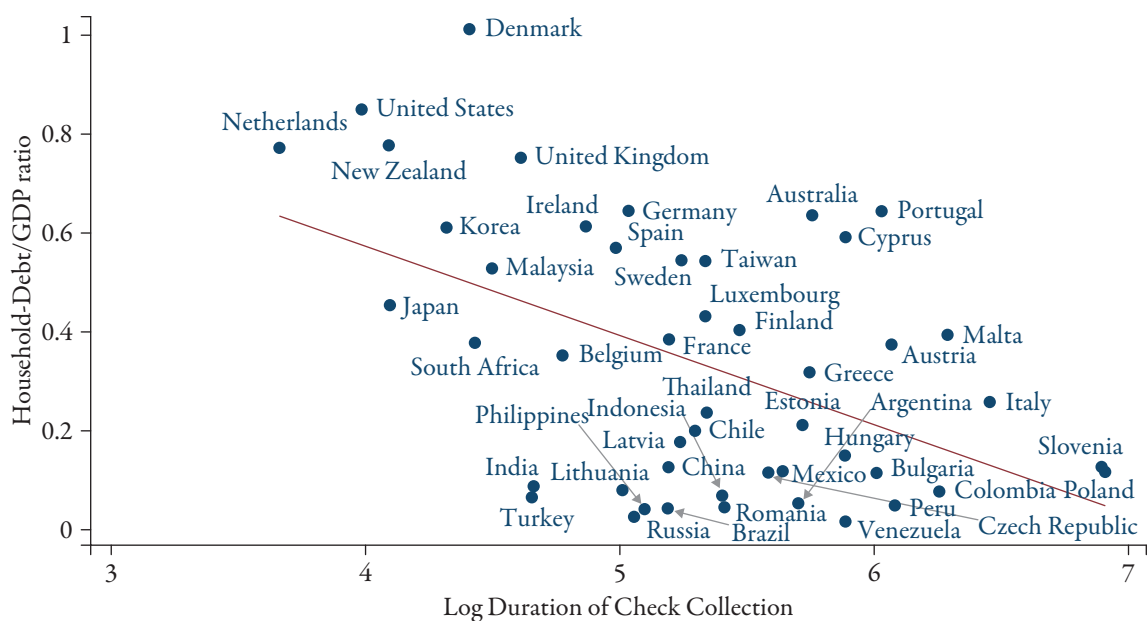


Figure 2: Total household liabilities and duration of judicial procedures.

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 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

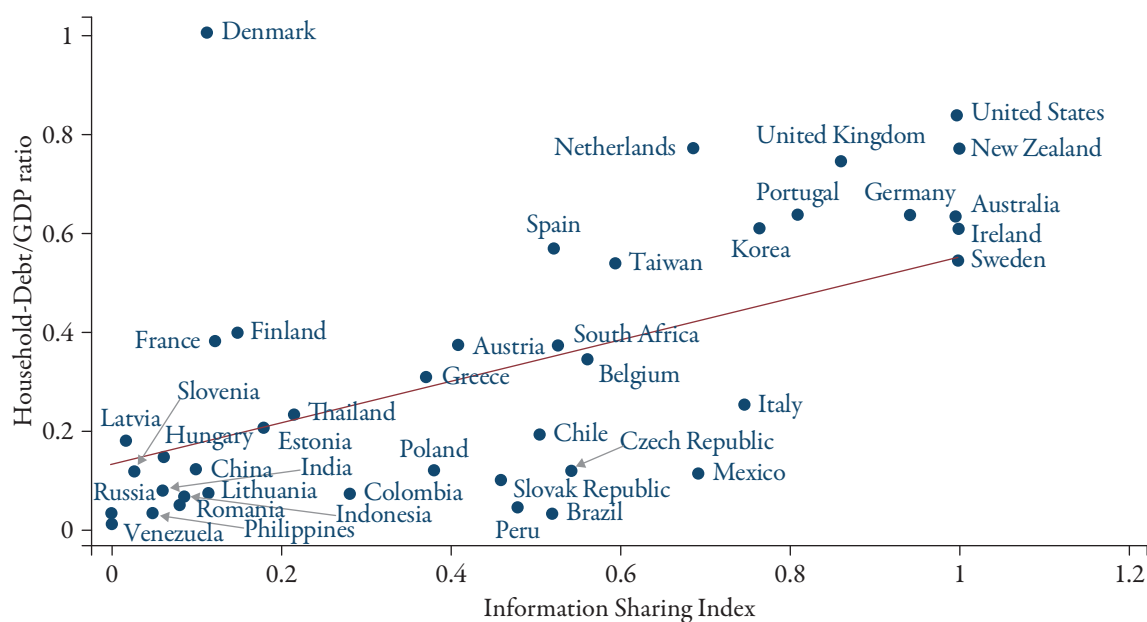


Figure 3: Total household liabilities and information sharing.

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 log GDP per capita in all specifications.

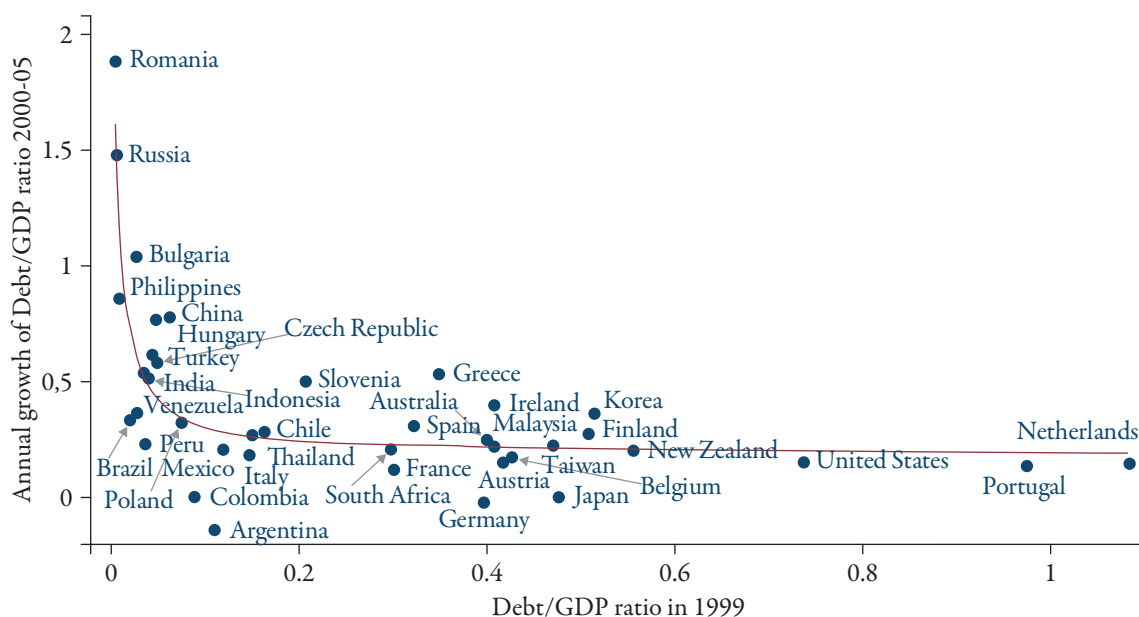
To understand the implications of our estimates for the explanation of the determinants of household debt, consider the case of Italy, which features a relatively low Debt/GDP ratio (25 percent) and a relatively high GDP per capita, compared with the sample average (\$20,170). Figure 1 and the regression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

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*** (0.018)	0.108*** (0.023)
Population growth	0.033 (0.046)	-0.019 (0.031)	-0.009 (0.028)
Gini coefficient	-0.118 (0.469)	0.181 (0.307)	-0.355 (0.316)
Banks' concentration rate	0.097 (0.180)	0.243* (0.122)	0.116 (0.122)
English origin		0.339*** (0.058)	0.160** (0.062)
Log duration of check collection			-0.125*** (0.027)
Private registry coverage			0.150* (0.074)
Public registry coverage			0.466*** (0.134)
Constant	-1.078*** (0.377)	-1.206*** (0.247)	-0.023 (0.320)
Observations	45	45	39
R-squared	0.49	0.74	0.87

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 at the 10 percent. Robust standard errors are reported in parenthesis.

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

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 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 exists 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 (separately on mortgage loans and consumer credit) in the last 12 months. We aggregate individual responses to this question by country and year, so as to obtain nationally representative and comparable data for 11 EU countries (121 year-country observations)². We define the fraction of arrears as the ratio between households in arrears and the number of indebted households in each country and year.

As shown by Figure 5, the fraction of arrears varies substantially across countries, ranging from values between 2 and 8 percent in Finland to less than 10 percent in Italy, the Netherlands, Portugal, and Spain. In several countries (France, Greece, Ireland, and Austria), the fraction of arrears has a U-shaped pattern over time: it falls in the expansionary period of the late 1990s and increases in the wake of the 2001 recession. In most countries the time series is rather smooth, with a steep increase in consumer credit and mortgage arrears in the later part of the sample only for France and Italy. Within individual countries, there is a strong correlation between arrears on mortgage and non-mortgage loans, with the exception of Belgium in the final part of the sample. We therefore expect them to exhibit a similar response to our cyclical and institutional indicators.

In Table 3 the average fraction of households in arrears is regressed on total household debt, unemployment rate and the real lending rate³. The estimates in columns 1 to 3 refer to arrears in the consumer credit and those in columns 4 to 6 to the mortgage market. 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 larger 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.

² The countries are: Austria, Belgium, Denmark, Finland, France, Greece, Ireland, Italy, the Netherlands, Portugal, and Spain.

³ See Appendix A for the procedure employed to calculate the real interest rate for each country.

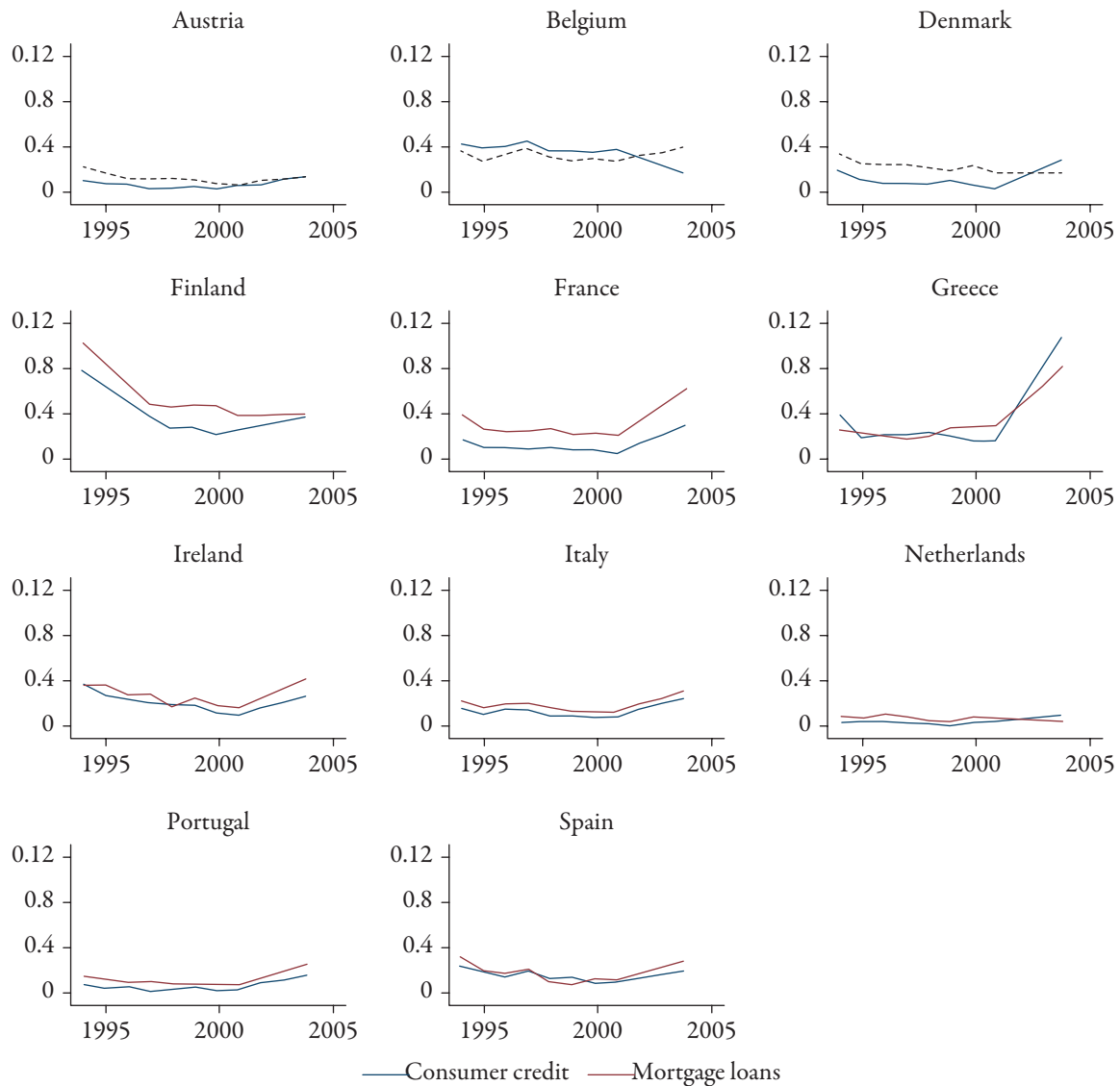


Figure 5: Fraction of household arrears in selected EU countries.

Sources: ECHP and SILC.

Column 1 of the table shows that the coefficients of household debt and of unemployment rate are both positive and statistically different from zero at the 1 percent level, in line with our hypotheses. In particular, arrears in the consumer credit market increase by 0.19 percentage points for each 1-point increase in the unemployment rate, and by 6.4 points for each 10-point increase in the household Debt/GDP ratio. Instead, the coefficient of the real interest rate is imprecisely estimated⁴. In column 2 we expand the specification to include the log of GDP as a further control for the business cycle, but its coefficient is not statistically different from zero. In all the specifications, the country fixed effects are jointly different from zero at the 1-percent confidence level.

In column 3 of Table 3 we test whether financial fragility is affected by the institutional

⁴ The coefficient of the Herfindhal index in the banking industry (available after 1998) is not statistically different from zero either.

Table 3: Determinants of the fraction of household arrears. Fixed effects estimation

	Consumer credit			Mortgage loans		
	(1)	(2)	(3)	(4)	(5)	(6)
Unemployment rate	0.192*** (0.055)	0.261** (0.114)	-0.834* (0.413)	0.186 (0.109)	0.298* (0.137)	-1.21*** (0.192)
Real interest rate	0.005 (0.048)	0.018 (0.046)	-0.028 (0.049)	-0.011 (0.050)	0.009 (0.045)	-0.072 (0.054)
Debt/GDP ratio	0.064** (0.029)	0.059* (0.028)	0.086** (0.033)	0.049 (0.030)	0.040 (0.031)	-0.053 (0.038)
Log GDP		0.017 (0.026)			0.028 (0.026)	
Debt/GDP × information sharing			-0.172** (0.061)			-0.036 (0.062)
Debt/GDP × time to collect checks			-0.007 (0.008)			-0.008 (0.006)
Debt/GDP × unemployment			1.975* (0.957)			2.567*** (0.441)
Unempl. × information sharing			-0.175* (0.080)			-0.365** (0.120)
Unempl. × time to collect checks			0.072*** (0.020)			0.128*** (0.027)
Constant	-0.025 (0.016)	-0.244 (0.333)	0.014 (0.021)	-0.011 (0.020)	-0.366 (0.335)	0.050*** (0.012)
Observations	121	121	116	121	121	116
R-squared	0.66	0.66	0.76	0.69	0.70	0.83

Note: In columns (1)-(3) the dependent variable is the fraction of households in each year and country reporting to have been unable to pay hire purchase installments or other loan repayments during the past 12 months. In columns (4)-(6) 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. All variables are lagged one period. One asterisk denotes significance at the 10 percent level; two asterisks at the 5 percent; three asterisks at the 1 percent. Standard errors adjusted for clustering at the country-level are reported in parenthesis.

framework: that is, whether the fraction of arrears is 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 in Table 2, that is, information sharing and check collection time⁵. Our hypothesis is that, insofar as a better contracting environment or enforcement system raises the perceived cost of default, the same increase in unemployment and/or household indebtedness should be associated with a smaller increase in our proxy for the default rate. Since these institutional variables are time-invariant, their effect is absorbed by the fixed effects.

The results suggest that the sensitivity of the frequency of arrears to unemployment 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 between the unemployment rate and information sharing is negative (-0.175) and statistically different from zero at the 5 percent level, implying that the effect of unemployment on consumer credit 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 0.7 percentage points larger in countries where information sharing covers 40 percent of the population (as in

⁵ Since these variables are time-invariant, their levels are not entered separately in the specification, because their coefficients are absorbed by the country fixed effects.

Austria) than in countries where information sharing covers 70 to 80 percent (as in the Netherlands or Italy). The coefficient of the interaction term between debt and information sharing is also negative (-0.172), and statistically different from zero at the 5 percent level. To illustrate, a 10 percentage point increase in the household Debt/GDP ratio is associated with an increase in arrears that is 0.6 percentage points larger in countries where information sharing covers 40 percent of the population than in countries where information sharing covers 70 to 80 percent (as in the Netherlands or Italy).

The interaction effect of the time to collect check and unemployment is positive (0.072) and significant. That is, a 1-point increase in unemployment rate is associated with an increase in arrears that is 0.2 percentage points larger in countries where duration is 180 days (as in France) than in countries where duration is 680 days (as in Italy). The interaction between household debt and time to collect checks, instead, is not statistically different from zero. Finally, the interaction between debt and unemployment has a positive and precisely estimated coefficient. This finding may be interpreted as a symptom that for highly indebted households, becoming unemployed tends to reduce the probability of repayment. In the aggregate, this is associated with an increased fraction of borrowers in arrears.

Columns 4 to 6 of Table 3 repeat the estimation for households' arrears regarding mortgage loans. In the specification shown in column 4, the unemployment coefficient is positive and precisely estimated, while the debt coefficient is not. The estimates in column 6 confirm that unemployment has a larger effect in countries with less information sharing, and relatively longer check collection.

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

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

The time series behaviour of household default rates within individual countries can usefully complement the evidence described so far, for three distinct reasons. First, time series data for the same country are 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 1978 reform of the US Personal Bankruptcy code, and the 2000 reform of German bankruptcy procedures. Third, they can throw light on the interactions between household indebtedness, insolvencies and macroeconomic variables such as the unemployment rate and the real interest rate. However, extended time series for household debt and defaults exist only for very few countries.

In this section, we focus on the UK, Germany and the US. The insolvency rate is defined as the ratio of borrowers in default to the total number of borrowers. For the US, we estimate the number of borrowers from the Survey of Consumer Finances (interpolating values between survey years). For the UK and Germany, we could not find comparable

data, so that insolvencies are scaled by the total population. The Appendix describes the variables used in the estimation for each country.

The US 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 1978, 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 in order 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-\$ 3,500⁶.

As shown in Figure 6, since 1980 there have been remarkable changes in the number of personal bankruptcy filings. After the 1978 pro-debtor reform, there has been a large trend increase in both the bankruptcy rate and the household Debt/GDP ratio, while after the 2005 pro-creditor reform bankruptcies plummeted from about 2 million to 600,000 in a single year, back to the same level prevailing in the mid-1980s. Various factors beside bankruptcy regulation may have contributed to the rise in defaults between 1980 and 2005: the decline in the social stigma associated with bankruptcy, the increase in the supply of mortgage credit and the decline in banks' lending standards. The literature has not reached a consensus on the relative importance of each of these factors in the change in US households' default rates⁷. Figure 6 shows that before the 2005 reform increases in household debt tend to be associated with subsequent increases in insolvencies. The relation breaks down in the years immediately after the reform, but seems to re-emerge after the Lehman Brothers collapse in 2008: the reduction of household debt in 2010 is followed by a reduction of insolvencies.

Figure 7 shows that also in the UK per capita insolvencies increased significantly over the last three decades, first peaking in 1993 and then rising steeply after 2001: while only approximately 6 households in 10,000 defaulted in 2001, five years later 20 did. As in the US, also in the UK there is clear pattern of time precedence, with changes in household

⁶ As explained by Li, White and Zhu (2011), in the US filing for bankruptcy under Chapter 7 entitles individual to obtain most unsecured debts to be discharged, and their future earnings to be entirely exempt. If instead an individual files under Chapter 13, debtors' assets are completely exempt, but some of the individual'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, most borrowers preferred Chapter 7. The 2005 bankruptcy reform forced debtors with relatively high income to file for bankruptcy under Chapter 13 and repay more with the subsequent earnings. Li, White and Zhu (2011) show that one unintended consequence of the 2005 reform was to induce an increase in the number of insolvencies that did not lead to subsequent bankruptcy filings.

⁷ Gross and Souleles (2002) attribute the increase in defaults 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 (2009) 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 US mortgage defaults. A related research by Dell'Ariccia, Deniz and Laeven (2012) documents that the relation between the recent boom and current delinquencies in the US subprime mortgage can be explained by a decrease in lending standards that is unrelated to improvements in underlying economic fundamentals. Dick and Lehnert (2010) find that the increased competitive pressure following banking deregulation induced banks to expand lending to riskier borrowers.

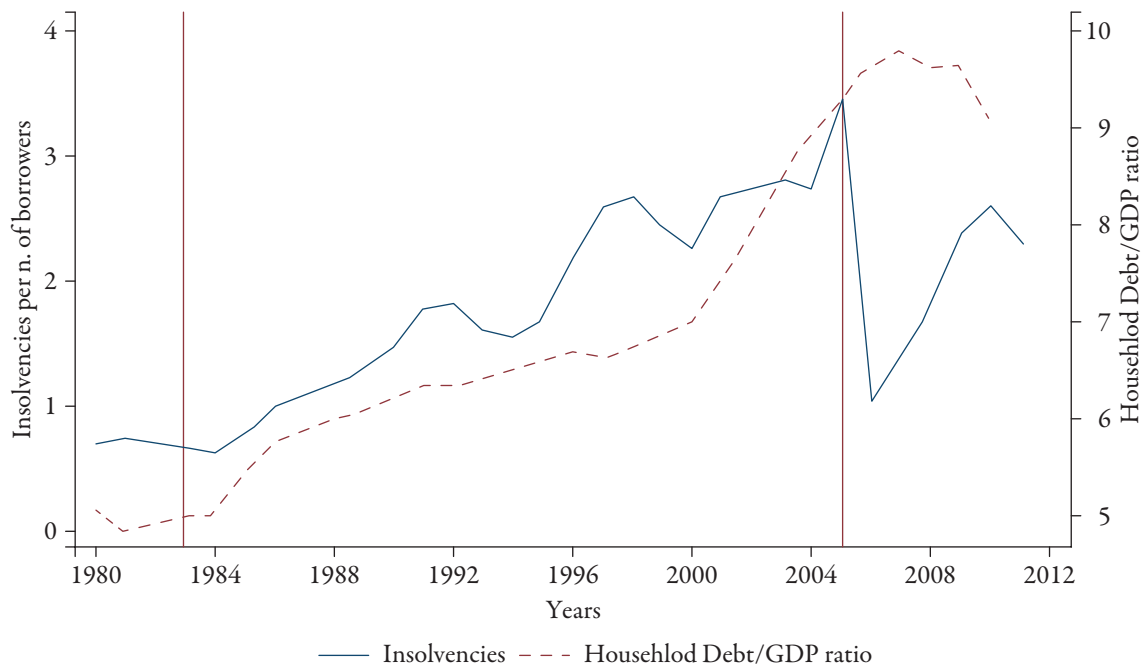


Figure 6: Household debt and insolvency rate in the US.

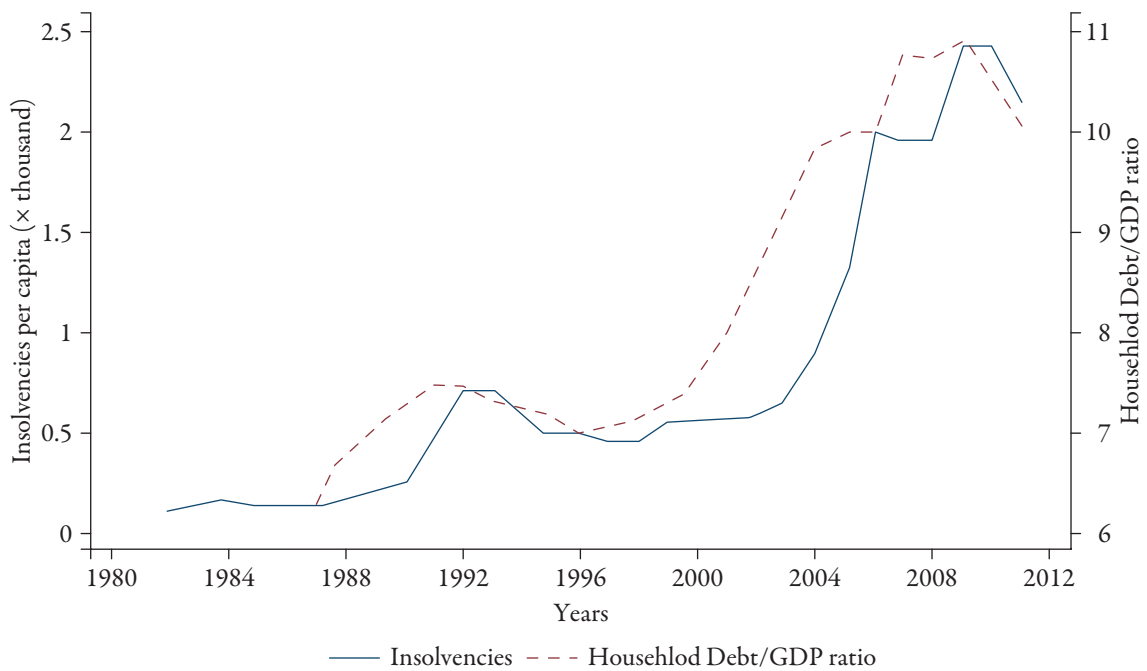


Figure 7: Household debt and insolvency rate in the UK.

debt followed by changes in insolvencies in the same direction. The increased insolvency rate of the early 1990s was also associated with an increase in the unemployment rate⁸. The post-2000 buildup in household credit and insolvencies was associated with fall-

⁸ See Fernandez-Corugedo and Muellbauer (2006) for an analysis of mortgage credit liberalization in the UK.

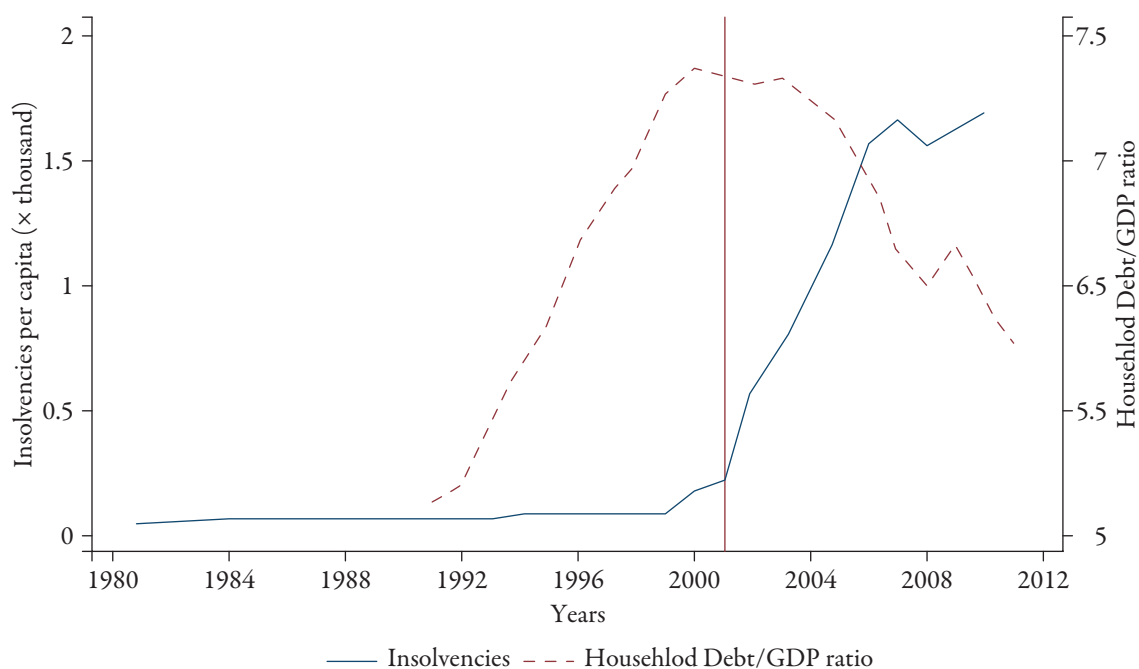


Figure 8: Household debt and insolvency rate in Germany.

ing interest rates: the real lending rate declined from 4.5 percent in the third quarter of 1997 to 1.85 percent in the third quarter of 2005. A possible interpretation is that the low interest rates of the early 2000s contributed to the debt buildup, and thereby raised subsequent insolvencies – thus contributing to British households' financial fragility.

The evidence from Germany underscores the importance of changes in bankruptcy law on household insolvencies, a relation that emerges also from the US sequence of reforms. 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 127,293 individual insolvencies were reported in 2006, corresponding to 1.5 households per thousand, a nine-fold increase compared to 2000, as show in Figure 8. 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).

Before the reform, the increase in the household Debt/GDP ratio was accompanied by a slight increase in insolvencies. In contrast, after the reform the household debt decreases considerably, possibly reflecting a reduced willingness by banks to offer loans to households that – in the new legal regime – are expected to be less likely to repay.

Altogether, time series data for the US, UK and Germany suggest two main conclusions. First, defaults increase after periods of rapid debt accumulation, 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 US surveyed in White (2006).

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 to understand 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 judicial enforcement and information sharing arrangements between lenders.

The evidence suggests that insolvencies tend to be associated with greater households' indebtedness, consistently with the financial fragility hypothesis: our panel analysis of insolvencies shows that European countries that experienced relatively fast debt growth, also featured larger increases in insolvency rates. The analysis for the UK and the US 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 judicial enforcement 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 evidence for the US and Germany, where pro-debtor reforms (such as the 1983 US and the 2001 German reforms) are followed by increases in insolvencies, while pro-creditor reforms (such as the 2005 US reform) are followed by the opposite outcome.

Even though most of our data stop short of the sub-prime loan crisis period, our findings help explain a key feature of the crisis, namely that even moderate shocks can precipitate a large 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.

7 Appendix. Definition of variables and data sources

A1 Cross-country data

Debt/GDP ratio. Total household debt (sum of mortgage debt, secured and unsecured consumer credit) 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*.

Table A1: Main variables used in the cross-country analysis

	Debt/ GDP	GDP per capita	Duration	Concentration ratio	Gini index	Private credit bureau	Public credit register	English origin
Argentina	0.05	7,550	300.00	0.41	0.51	1.00	0.25	0.00
Australia	0.63	20,950	319.50	0.63	0.32	1.00	0.00	1.00
Austria	0.37	25,429	434.00	0.71	0.28	0.40	0.01	0.00
Belgium	0.35	24,649	120.00	0.86	0.26	0.00	0.56	0.00
Brazil	0.04	4,350	180.00	0.43	0.59	0.43	0.09	0.00
Bulgaria	0.12	1,410	410.00	0.64	0.28	n.a.	0.21	0.00
Chile	0.20	4,630	200.00	0.55	0.51	0.19	0.31	0.00
China	0.12	780	180.00	0.77	0.45	0.00	0.10	0.00
Colombia	0.08	2,170	527.00	0.40	0.54	0.28	0.00	0.00
Cyprus	0.59	11,950	360.00	0.89	n.a.	n.a.	n.a.	1.00
Czech Republic	0.12	5,020	270.00	0.69	0.25	0.51	0.04	0.00
Denmark	1.01	32,049	83.00	0.79	0.27	0.12	0.00	0.00
Estonia	0.21	3,400	305.00	0.98	0.32	0.18	0.00	0.00
Finland	0.40	24,729	240.00	0.99	0.25	0.15	0.00	0.00
France	0.39	24,790	181.00	0.56	0.31	0.00	0.12	0.00
Germany	0.64	25,620	154.00	0.66	0.28	0.94	0.00	0.00
Greece	0.31	12,110	315.00	0.82	0.36	0.38	0.00	0.00
Hungary	0.15	4,640	365.00	0.63	0.24	0.06	0.00	0.00
India	0.08	440	106.00	0.37	0.33	0.06	0.00	1.00
Indonesia	0.07	600	225.00	0.61	0.34	0.00	0.08	0.00
Ireland	0.61	21,470	130.00	0.64	0.31	1.00	0.00	1.00
Italy	0.25	20,170	645.00	0.42	0.31	0.68	0.07	0.00
Japan	0.45	32,030	60.00	0.46	0.25	n.a.	0.00	0.00
Korea	0.61	8,490	75.00	0.49	0.32	0.77	0.00	0.00
Latvia	0.18	2,430	188.50	0.54	0.34	0.00	0.02	0.00
Lithuania	0.08	2,640	150.00	0.86	0.29	0.07	0.04	0.00
Luxembourg	0.43	42,930	210.00	0.26	0.29	n.a.	n.a.	0.00
Malaysia	0.53	3,390	90.00	0.47	0.49	n.a.	0.42	1.00
Malta	0.39	9,210	545.00	0.89	n.a.	n.a.	n.a.	0.00
Mexico	0.12	4,440	283.00	0.68	0.49	0.69	0.00	0.00
Netherlands	0.77	25,140	39.00	0.75	0.29	0.69	0.00	0.00
New Zealand	0.77	13,990	60.00	0.79	0.37	1.00	0.00	1.00
Peru	0.05	2,130	441.00	0.73	0.48	0.29	0.19	0.00
Philippines	0.04	1,050	164.00	0.62	0.46	0.05	0.00	0.00
Poland	0.12	4,070	1000.00	0.54	0.31	0.38	0.00	0.00
Portugal	0.64	11,030	420.00	0.90	0.39	0.09	0.72	0.00
Romania	0.05	1,470	225.00	0.83	0.28	0.05	0.03	0.00
Russia	0.03	2,250	160.00	0.38	0.32	0.00	0.00	0.00
Slovak Republic	0.10	4,491	n.a.	0.71	0.26	0.45	0.01	0.00
Slovenia	0.12	9,999	1003.00	0.64	0.28	0.00	0.03	0.00
South Africa	0.38	3,170	84.00	0.92	n.a.	0.53	0.00	1.00
Spain	0.57	14,800	147.00	0.86	0.35	0.07	0.45	0.00
Sweden	0.55	26,750	190.00	0.98	0.25	1.00	0.00	0.00
Taiwan	0.54	13,310	210.00	0.31	0.24	0.60	0.00	0.00
Thailand	0.24	2,010	210.00	0.53	0.40	0.22	0.00	1.00
Turkey	0.06	2,900	105.00	0.66	0.37	n.a.	0.07	0.00
United Kingdom	0.75	23,590	101.00	0.47	0.34	0.86	0.00	1.00
United States	0.85	31,910	54.00	0.30	0.38	1.00	0.00	1.00
Venezuela	0.02	3,680	360.00	0.52	0.42	0.00	0.00	0.00
Total	0.33	11,881.88	263.00	0.64	0.35	0.39	0.08	0.20

Log per capita GDP. Definition: log of per capita GDP in thousands of US 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 stand-

ing 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 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.

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 installments 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 minus the consumer price index. Source: OECD.

Debt/GDP ratio. For each country, we 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 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 UK, the statistics refer to total quarterly insolvent individuals in England and Wales and 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, insolvency registrations are reported on annual and monthly basis. We chose the annual series for comparability. Source: DESTA-TIS (<http://www.destatis.de>). In the United States, individual insolvencies are annual data. Source: American Bankruptcy Institute (<http://www.abiworld.org>).

Household Debt/GDP ratio. We consider data about total financial liabilities of households in all three countries. For the UK, the data about household debt and Gross Domestic Product are published by the National Statistics (<http://www.statistics.gov.uk/>). For 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.

Acknowledgments

We thank for helpful comments Enrica Detragiache and participants to the Macro-Financial Linkages – IMF Ninth Jacques Polak Annual Research Conference, and the Unicredit Group for financial support. Giuseppe Rossitti provided valuable research assistance.

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