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The determinants of household debt: a cross-country analysis

by Massimo Coletta, Riccardo De Bonis and Stefano Piermattei

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# THE DETERMINANTS OF HOUSEHOLD DEBT: A CROSS-COUNTRY ANALYSIS

by Massimo Coletta\*, Riccardo De Bonis\* and Stefano Piermattei\*

## Abstract

In most countries household debt increased from the 1990s until the crisis of 2007-2008 before stabilizing due to recession and deleveraging. However, there are national differences in household debt/GDP ratios. This paper studies the determinants of household debt, using a 32-country dataset and taking both demand-side and supply-side factors into account. The econometric exercises, covering the period 1995-2011, yield two main results. First, debt is greater in countries with higher per capita GDP and household wealth. Second, the efficacy of bankruptcy laws is correlated with the level of household debt, while a longer time to resolve insolvencies is associated with lower debt. These two institutional variables are linked to household debt more robustly than is the quality of credit registers.

**JEL Classification:** E21, G21, P5.

**Keywords:** household debt, income, wealth.

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\* Bank of Italy, Directorate General for Economics, Statistics and Research.



## 1. Introduction and motivation<sup>1</sup>

In many countries households' financial debt – loans from banks and other intermediaries – has reached unprecedented levels. At the end of 2011 household debt exceeded 130 per cent of GDP in Cyprus and Denmark, 120 per cent in the Netherlands, 110 per cent in Ireland and 105 in Australia. It was between 100 and 90 per cent of GDP in New Zealand, Portugal, the UK, and Canada and between 90 and 80 per cent in the US, South Korea, Spain and Sweden. The level was lower in France, Austria and Italy.

In most of countries, the ratio to GDP was higher in 2011 than in 1995 (Figure 1); the very few exceptions include Germany and Japan, where household debt has been sluggish in the last years. Household debt increased from the end of the 1990s until the outbreak of the financial crisis in 2007-08. In many cases the subsequent Great Recession resulted in the stabilization or the reduction of indebtedness. The dispersion of household debt across countries increased substantially between 1995 and 2011 (Figure 2; on debt variance see Bertola and Hochguertel, 2007).

Before the subprime crisis and the subsequent financial turmoil, economists had looked on household debt with benign neglect or seen it as an instrument to smooth the inter-temporal allocation of consumers' resources. Until the financial crisis of 2007-2008 the growth of household debt was an important component of the "Great Moderation" interpretation of the course of many economies. Financial innovation played a key role, extending the range of loan contracts. Probably the main financial innovation influencing mortgages was the mortgage equity withdrawal mechanism (see Bank of England, 2003; Greenspan, 2005; and Greenspan and Kennedy, 2007). The sub-prime crisis in the US, with the attendant macroeconomic instability induced in part by the high household indebtedness in many countries, implied abandoning the thesis of positive correlation between economic growth and household debt. Mian and Sufi (2014) think that household debt was the main cause of the Great Recession in the US. Cyprus, Greece, the Netherlands, Portugal, Ireland, and Spain - the countries where household debt increased the most beginning in the later 1990s - were severely hit by the financial crisis in the wake of the Lehman Brothers collapse in September 2008 and by the euro-area sovereign debt crisis started in 2009-2010.

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<sup>1</sup> We thank three anonymous referees, Luigi Cannari, Marco Marinucci, Andrea Mercatanti, and participants at seminars held at the ECB, the 21<sup>st</sup> Input-Output Conference, and the OECD for useful suggestions on an earlier version.

In recent years both academic analysts and international organisations began to point out the risks of excessive private debt. Household debt has become a policy issue. Koo (2011 and 2012) observes that the world economy is in a balance-sheet recession analogous to that of Japan in the 1990s: in the years to come, despite very low interest rates, the private sector will continue to minimize debt. The IMF noted that, historically, the growth of household debt in the run-up to a bust corresponds to weak growth in the years that follow (IMF, 2012). Moreover, when private debt levels are high, recessions are typically longer and deeper; the large costs associated with high-debt recessions make policies to prevent excessive debt build-up advisable (OECD, 2012). In October 2014 the IMF's World Economic Outlook also observed that the world recovery remains weak because of the negative legacy of a high household debt overhang.

Central banks and international organizations have put strict monitoring of household (and corporate) debt onto the policy agenda. Private debt is among the indicators monitored by the European Commission Macroeconomic Imbalances Procedure (European Commission, 2011 and 2012). There are many government policies to deal with private debt distress (see European Commission, 2008, L'Observatoire du Cr dit et de l'Endettement, 2011, and Liu and Rosenberg, 2013). The most extreme academic positions treat debt in the same way as pollution. That is, it imposes costs on other agents that the borrowers themselves fail to take into account (Jeanne and Korinek, 2010), while a tax on debt would produce better allocation of resources (Bianchi and Mendoza, 2010). Although we do not share this extreme, negative view, we do think that studying the determinants of household debt will prove fruitful.

There are many national analyses on the recent evolution of household debt.<sup>2</sup> According to our knowledge this paper is the first to study its determinants at the macro level for a large sample of countries (32) and for a long time span (from 1995 to 2011). The paper that is the nearest to ours is that by Isaksen et al. (2011): these scholars studied the factors influencing household debt for a panel of 17 countries for the period 1995-2010. In comparison with Zinni (2012), we include in the regressions a wider set of possible determinants of household debt.

After this introduction, Section 2 debates the main variables that may affect household debt, Section 3 describes our statistics, Section 4 presents the econometric analysis, and Section 5 includes some robustness checks. Section 6 concludes.

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<sup>2</sup> A very incomplete list includes Dynan and Kohn (2007), Kennickell (2012) and Brown et al. (2013) on the US; Crawford and Faruqui (2012) on Canada; JP Morgan (2013) on Spain; Magri and Pico (2012) on Italy. Debelle (2004) presents a cross-country analysis.



## 2. On the possible determinants of household debt

Contributions on the factors that may influence household indebtedness may be classified in two main areas: works that look at demand factors and papers that emphasise the role of supply forces (see Djankov et al., 2003; Shleifer, 2008).

Starting with demand factors, household debt may be driven by the objective of smoothing consumption through consumer credit and investing in houses through mortgages, taking into account income, wealth, and saving.<sup>3</sup> In addition, producer households and sole proprietorships need credit to finance business activity.

Higher per capita GDP – facilitating the repayment of debt and perhaps suggesting a more sophisticated financial education - might imply higher household debt. In contrast, the effect of real GDP growth on debt is more uncertain. One might suppose that both the demand for and the supply of loans are greater when GDP growth is high, but one may also hypothesize that households will demand more credit in the negative phase of the business cycle, in order to smooth consumption. Households' debt may be affected not only by flow indicators like income, but also by stock measures like household financial and real wealth (in a similar way Brandolini et al., 2010, study poverty analysing financial and real asset holdings). Surveys on the individual behaviour of households often show a positive linkage between debt and wealth.

Demand factors include demography. In this sense the effect of life expectancy on debt is *a priori* ambiguous (see Davies et al., 2010). On the one hand, longer life expectancy might be associated with greater debt if banks are more willing to lend when people live more. On the other hand, a longer life expectancy could imply an older population, hence lower debt, in that the elderly are less likely to want credit.

A plausible thesis is that countries with a high household saving rate are likely to have low indebtedness and vice versa, as in the UK and the US. Yet this is not always so, as in Spain, where indebtedness and the propensity to save are both high (see JP Morgan, 2013). In the last 15 years the saving/GDP ratio has declined in many countries because of population ageing, realized and unrealized capital gains (wealth effects), slower growth of disposable income, and interest rates lower by comparison with the 1970s and 1980s (see de Serres and Pelgrin, 2003, on the

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<sup>3</sup> Demand factors may be rationalized using the life cycle hypothesis (see Modigliani, 1986 for a summary). Although life cycle theory was developed to explain individual saving and consumption, this framework may also help in analyzing the variables that affect household debt at the macro level. However Deaton and Muellbauer (1980) underline that “It is neither necessary, nor necessarily desirable, that macroeconomic relations should replicate their microeconomic foundations so that exact aggregation is possible” (p.148).

determinants of saving in OECD countries; Lusardi, Skinner and Venti, 2001, on the US; Bassanetti, Rondinelli and Scoccianti, 2012, on Italy). Of course there are also questions of reverse causality and endogeneity: after the financial crisis of 2007-2008 saving rebounded in the countries, such as the US and Spain, where household debt was particularly high (on the US recent experience, see Kennickell, 2012). In general, borrowing constraints and capital market imperfections may induce a higher household saving ratio (Guiso, Jappelli and Terlizzese, 1992). We deal with this reverse causality issue in Section 5.

While these variables capture demand side factors, there are features capable of influencing household debt on the supply side, i.e. by affecting the behaviour of financial intermediaries. We focus on four variables. The first is countries' legal origin (see La Porta, Lopez de Silanes, Shleifer and Vishny, 1997), on the supposition that the protection of investors and creditors – one of the determinants of finance – differs according to type of legal system and helps to determine the propensity for private debt. Djankov et al. (2007) found an association between credit to the private sector and the Anglo-Saxon legal origin in a cross-section on a large number of nations.<sup>4</sup>

Second, the strength of legal rights – the degree to which collateral and bankruptcy laws protect borrowers and lenders – may facilitate lending. Traditionally bankruptcy laws aim to manage the defaults of non financial corporations. More recently many European countries, such as France, Germany and the UK, have introduced judicial debt settlement procedures for households. Also Italy has enacted a consumer bankruptcy law in 2012.<sup>5</sup>

A third factor is the quality of credit information available through public or private credit registers. Jappelli, Pagano and di Maggio (2013) observe that financial intermediaries share information on the creditworthiness of their borrowers and find a positive effect of private and public registry coverage on the household debt-to-GDP ratio.

Fourth, inefficient recovery procedures in the event of debtor insolvency may make banks more reluctant to lend. Judicial efficiency differs across countries and may impact on access to credit. Considering the significant differences in this parameter across Italian regions, Casolaro,

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<sup>4</sup> There is a large consensus on the fact that institutions are among the main factors that determine the different models of capitalism (North, 1990, Djankov et al., 2003).

<sup>5</sup> D'Alessio and Iezzi (2013) discuss the methodological issues affecting the definition and measurement of over-indebtedness in Italy. In South Korea, which has one of the highest household debt ratios of any OECD country, in March 2013 the government launched a "National Happiness Fund" to reduce and to restructure the outstanding debt of delinquent borrowers.

Gambacorta and Guiso (2005) show that lengthier trials – and limited informal enforcement through social trust – can constrain the supply of loans to households.<sup>6</sup>

To sum up, we expect that debt should be positively linked to per capita GDP and wealth and negatively linked to household saving. The impact of GDP growth and life expectancy on debt is not easy to determine *ex ante*. Turning to supply side, the Anglo-Saxon legal system should be associated with a higher ratio of household debt to GDP. We also expect a positive correlation between household debt and the quality of credit registers and bankruptcy law, while lengthier insolvency resolution procedures should diminish the household debt ratio.

In the following Section we summarise the statistics used in the econometric exercises.

### **3. The data**

Our sample consists of 32 countries: 26 members of the European Union plus Japan, South Korea, Canada, Australia, New Zealand and the US over the period 1995 to 2011. We start from 1995 as harmonized data on household debt are available for many countries only since that year (for instance following the introduction of the European System of Accounts).

In the econometric exercises the dependent variable is the ratio of households' financial debt (loans from banks and other financial intermediaries) to GDP. Loans include mortgages, consumer credit and other loans, such as leasing and factoring, and credit to sole proprietorships. Households' other liabilities, mostly trade debts, are not considered as their determinants are different from those of financial debt and their measurement varies from country to country. The data on financial debt are taken from the annual flow-of-funds (i.e. financial accounts). Data are available from 1995 on for the entire sample with the exception of Bulgaria (2000), Ireland (2001), Latvia (1996), Luxembourg (2006), Malta (2004), Romania (1998), Slovenia (2001) and South Korea (2002). For robustness, we also run regressions in which the dependent variable is the ratio of household debt to disposable income.

Turning to independent variables, other covariates include per capita GDP and the real GDP growth rate. The numerator for the saving/GDP ratio is gross saving (with the exception of

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<sup>6</sup> Religious, cultural and social norms may also influence individual attitudes to debt (Guiso, Sapienza and Zingales, 2003). Also, fiscal factors may come into play, as through substantial tax deductibility of interest payments (in the Netherlands household debt reached around 130 per cent of GDP because interest payments on mortgages are fully deductible). Unfortunately we were not able to find international time series on the tax treatment of interests on mortgages.

Canada).<sup>7</sup> We also take life expectancy at birth into account. The sources of the national accounts data and of life expectancy are the online Eurostat database for the 26 European countries and the online OECD statistical database (*OECD.Stat*) for the non-European nations. Household financial assets are also taken from the flow-of-funds data.

Among the countless other factors that might influence household debt, we consider four supply side variables: origin of the legal system, quality of credit registers, quality of bankruptcy laws and time to resolve insolvencies. The legal origin dummy takes the value 1 in the case of Anglo-Saxon legal systems, 0 otherwise (that is, we aggregate the French, German and Scandinavian variants together). Seven sample countries have systems of Anglo-Saxon origin (the US, Canada, Australia, New Zealand, the UK, Ireland, and Cyprus). Second, the availability of more credit information, from either a public registry or a private bureau, might positively influence debt by facilitating lending decisions: the index ranges from 6 – a high quality of credit registers – to 0. The third variable is the quality of bankruptcy law. In this case the range is from 10 – a very good bankruptcy law, protecting the rights of borrowers and lenders and thus facilitating lending – to 0. The fourth factor is the time to resolve insolvencies: the number of years required to recover debt. The World Bank is the source of the data on quality of credit registers, quality of bankruptcy laws and time to resolve insolvencies (<http://data.worldbank.org/indicator>; these indicators are available since 2004).

Our panel is unbalanced, in that neither the dependent nor the independent variables are available uniformly for the entire period 1995-2011. Table 1 presents the summary statistics. As the minimum and maximum values show, there are pronounced differences across countries and years both for the household debt ratio and for the explanatory variables. As already said, the highest household debt to GDP ratios are found in Denmark, the Netherlands, Cyprus and Ireland, that also registered the strongest increases in the ratios in the last 15 or 10 years; remarkable increases took place also in Portugal and Spain. The lowest ratios of household debt to GDP are common in Central and East European countries such as Bulgaria, Romania, Lithuania, Slovakia, Slovenia, Czech Republic, Hungary and Poland.

Table 2 gives the correlation matrix. Household debt is correlated positively with per capita GDP and negatively with GDP growth rate. Life expectancy shows a positive correlation, as do

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<sup>7</sup> This is preferable for international comparisons in that for some countries estimates for depreciation, in order to compute net saving, are not available. Data coverage on gross saving is not homogeneous: for 21 countries they are available for the entire period 1995-2011, but for others they cover a shorter time span.

legal origin, quality of credit registers and quality of bankruptcy laws, while length of time to resolve insolvencies is negatively correlated.

Now let us turn to multivariate analysis.

#### **4. The econometric results**

In order to ensure robustness of the results we use different econometric methods to study the determinants of the household debt to GDP ratio: the simple OLS method, the random effects estimator (RE), the fixed effects estimator (FE), the Hausman-Taylor estimator (HT) and the Arellano-Bond estimator.<sup>8</sup>

Table 3 presents the baseline results. We start focusing on demand factors, as these variables are often available since 1995, and controlling for the effect of legal origin, as the other supply side variables are available only since 2004. At this stage of the analysis we do not insert saving among the regressors for the risks of endogeneity with the dependent variable. The signs of the estimated coefficients turned out to be coherent in most of the specifications. The level of per capita GDP has a positive influence on debt; that is, in richer countries households are more prone to take on debt. Davies et al. (2010) got the same result in a cross-section on 38 countries proxying per capita GDP with real consumption per capita. Jappelli et al. (2013) also found a positive coefficient for per capita GNP in a cross-section for 45 countries. The positive correlation between debt and income reappears in household-level data as well (see ECB, 2013; of course the trends of disposable income may differ from those of per capita GDP).<sup>9</sup> The persistence of household debt is confirmed by the positive coefficient of its lagged value in the AB estimation.

The coefficient of the GDP growth rate is negative and statistically significant, implying that households increase their debt during cyclical downturns; a negative coefficient is also reported by Davies et al. (2010) even if their coefficient is not significant.

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<sup>8</sup> Let us briefly recite the pros and cons of each. The OLS method does not take into account the presence of country fixed effects. The RE model assumes that the individual country-specific effect is uncorrelated with the independent variables, while the FE approach posits a correlation between the country effect and the regressors. If the country-specific effect is correlated with the independent variables, the FE and the Hausman-Taylor estimator (HT) overcome this problem of the RE estimator. Compared to the RE and FE estimators, the instrumental variable Hausman-Taylor procedure copes with the problem of inconsistency of estimates generated by measurement errors, omitted variables and possible endogeneity of the regressors (which is a relevant issue here in that saving is one of our covariates). Moreover, since household debt is characterized by high persistence we included the lagged level of the household debt ratio as an independent variable using the instrumental variable Arellano-Bond (AB) estimator. See Greene (2002), Chapter 13, for a complete treatment.

<sup>9</sup> However, in our dataset the correlation between GDP and household disposable income is very high.

Life expectancy has mainly a positive effect on the household debt ratio. This is consistent with the idea that people have more incentives for debt if they expect to live longer, again in line with the life-cycle model (for a similar approach see Davies et al., 2010, and Zinni, 2012). Also, banks may be more inclined to grant credit if people live longer. However, the coefficient turns negative when we include the autoregressive value of the household debt/GDP ratio among the regressors.<sup>10</sup>

A good many scholars claim that countries with Anglo-Saxon legal origins tend to have larger financial – and credit – systems (La Porta et al., 1997). In our regressions the coefficients of the legal origin variable are indeed positive and statistically significant. This evidence is consistent with the results obtained in a cross-country regression by Jappelli et al., 2013.

Specification tests such as the Hausman and Lagrange multiplier suggest the presence of country-specific effects and hence suggest the use of a panel specification rather than a mere pooled OLS estimation. Specification tests bring out some inconsistencies in the RE and the FE estimators that are dealt with by the Arellano-Bond estimator. In this sense, the AB estimation of the baseline regression is the most reliable one.

As noted in Section 2, household debt may be affected by a number of variables that influence the supply of credit. Efficient collection of information on the borrowers, effective judicial enforcement, and the rapidity of legal proceedings may enhance the screening capability of lenders, reduce the cost of credit recovery in default, and even diminish the probability of insolvency itself. Table 4 reports the results of the panel regression including three indicators as additional regressors: the quality of credit registers, the quality of bankruptcy law and the average time to resolve insolvencies. Since these indicators are available only from 2004, the regression is for 2004-2011. We do not use legal origin as independent variable now, as its effect is approximated by the other supply side indicators (in particular by the strength of legal rights).

The quality of credit registers is correlated positively with the household debt ratio: household debt tends to be high in the countries with top-quality credit registers, i.e. Britain, Japan, South Korea, and the US. The coefficients of credit registers quality are significant in two out of our four regressions. Further investigation is needed, as household debt is also very high in Denmark and the Netherlands, where the quality of the credit registers is somewhat lower, and even in Cyprus, where it is among the lowest.

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<sup>10</sup> Following Davies et al. (2010), Zinni (2012) and Jappelli et al. (2013) we originally included the population growth rate in the regressions. The coefficient of this variable was rarely significant and therefore we present here the regressions without the population growth rate (the previous results are available from the authors).

The quality of bankruptcy laws too has a positive effect on household debt and this link is more robust than the influence of the quality of credit registers, as the coefficients are statistically significant in three out of our four regressions. Such countries as Italy, Malta, Slovenia, and Greece have poor-quality bankruptcy laws by international standards and also low levels of household debt.

The length of time to resolution of insolvencies correlates negatively with the level of household debt in all the regressions: the higher the number of years to resolution, the lower the ratio of debt to GDP. Again, the result is intuitive. Household debt is low in countries such as Bulgaria, the Czech Republic, Estonia, Romania and Slovakia, where it takes three years or more to resolve insolvencies; it is high in countries like Cyprus, Denmark, the Netherlands, and the UK, where insolvencies are settled within a year. Our result tallies with the argument of Casolaro, Gambacorta and Guiso (2005), who observed that the length of trials has a stronger effect on bank credit to household than the strength of lenders' legal protection. Also Djankov et al. (2007) found a negative coefficient regressing private credit on the contract enforcement days (the number of days to resolve a payment dispute through courts).

As mentioned, the indicators that work better within the supply side variables are the quality of bankruptcy laws and the number of years to resolve insolvencies: the coefficients of these variables are statistically significant in three out of our four regressions. Moreover, the results of Table 4 are consistent with those of Table 3. In other words the inclusion of supply side variables does not change the behaviour of demand side indicators.

## **5. Robustness checks**

Wealthier households may have an incentive to take out more debt, as emerges from surveys on individual budgets. We accordingly included the ratio of household financial assets to GDP as an additional independent variable (Table 5). In the Hausman-Taylor and Arellano-Bond estimates, wealth is treated as endogenous and so instrumented using its lagged value. Financial wealth turns out to have a positive and statistically significant correlation with household debt in all the five regressions. The signs and the statistical significance of the other variables are similar to those obtained in Tables 3 and 4.

Naturally, household debt is often connected with house purchases. A correlation between debt and total wealth is found in surveys with information on individual households. For a few countries we have time-series on non-financial assets from 1995 to 2010 and so we can calculate the ratio of total household wealth to GDP. Table 6 presents five regressions where we added

household total assets as possible determinant of debt. The exercise is not trivial as household debt includes both collateralized and uncollateralized debt: for instance, in the euro area collateralized mortgages and consumer credit are around 60 per cent of the total stocks of these types of debt.<sup>11</sup>

We found that total wealth is indeed positively associated with household debt in all five regressions (Table 6). The effect of real assets must be interpreted with caution, as the data cover only eight countries.<sup>12</sup> Whereas the previous regressions had around 400 or 300 observations, in those including real assets only about 100 are available.<sup>13</sup>

Household debt is often expressed as a ratio to disposable income. We accordingly run the previous regressions with the debt-to-disposable income ratio as dependent variable. The results confirm our earlier findings (Table 7). The quality of bankruptcy laws maintains its positive relationship with household debt, while the time to resolve insolvencies confirms its negative association with household debt.

In the previous regressions saving was not included among the independent variables because of the risks of endogeneity with the level of debt. Taking into account this issue in Table 8 we present some results including saving as further independent variable. The first three regressions of Table 8 use the contemporary level of saving; to allow for the possibility that the causal nexus could instead run from debt to saving, in the HT and AB regressions saving is instrumented using its lagged value. As expected, the saving/GDP ratio is negatively associated with household debt, in all five regressions. Coefficients are statistically significant in three, notably in the Arellano-Bond regression that is our preferred choice. Saving preserves the negative association with household debt also in other regressions where we followed the specifications already presented in tables 4-7, for instance including supply side indicators as independent variables (results are available from the authors).

In all the previous regressions we used as control variable the GDP growth rate to take into account the role of the business cycle. This variable directly affects the denominator of our dependent variable and therefore may influence the overall results. Therefore we run the previous regressions erasing the GDP growth rate from the independent variables. The results are quite similar to those already presented. The institutional variables confirm their association with

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<sup>11</sup> The flow-of-funds data do not allow to split mortgages from other types of household debt.

<sup>12</sup> See De Bonis, Fano and Sbrana (2013) for a comment on recent trends in real household wealth.

<sup>13</sup> We were not able to use the homeownership rates as time series are not available. International organizations publish these rates for some countries and only for a few years (see ECB, 2003, OECD, 2011 and ECB, 2013). As a consequence, we might run a regression only with a very low number of observations.



household debt, while in some cases the effects of GDP per capita are less robust (results are available from the authors upon request).

## 6. Conclusion

In the years leading up to the Great Recession household debt soared while since the financial crisis debt levels have fallen. According to many scholars household debt has been at the root of both the global financial crisis and the debt sovereign crisis in the euro area. In comparison with previous work the novelty of this paper is to study the determinants of the household debt/GDP ratio examining a larger sample of countries (32), analysing a longer period (1995-2011), taking into account a greater number of independent variables, and using many econometric methods. The paper gets two main results, that refer respectively to the role of demand side and supply side indicators.

First, indebtedness is greater in countries where per capita GDP is greater and where the ratio of household financial and total assets to GDP is higher. This result is intuitive and jibes with the results generally found by household-level surveys.

Second, considering supply side variables that are able to influence the supply of credit, the quality of bankruptcy law is positively correlated with the volume of household debt. Moreover, the length of time required to resolve insolvencies has a negative relation with debt. These two indicators are the institutional variables that perform better in the regressions. On the contrary, the quality of credit registers has a weaker link with household debt. Also the countries' legal origin - type of legal system - is not always statistically significant in explaining the ratio of household debt to GDP.

Our evidence is robust to the use of different econometric methods and independent variables. Life expectancy and population growth are not robustly linked to household debt and their inclusion in the regressions do not affect the significance of the other factors. Moreover, the Arellano-Bond estimates show a strong persistence of household debt. We also found a negative association between saving and household debt. Indeed in the last 30 years saving propensities decreased in most of countries, while household debt increased. One of our regression would also suggest a causality link going from low saving to higher debt.<sup>14</sup> However we are conscious that after the

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<sup>14</sup>For a similar interpretation of the US experience see Schularick and Wachtel (2014): “*Against a background of record low active saving rates, households started to borrow strongly after 1998 ...*”.

financial crisis of 2007-2008 the necessity of household to deleverage implied a higher saving in some countries (the US are again a paradigmatic case).

We have provided *prima facie* evidence, rather than uncontroversial causality. Further research is needed to scrutinise the connections between household debt and other variables. We plan to extend the analysis to pursue the endogenous links across variables and to consider the effect of house price increases, debt maturity, and the role of banking competition.

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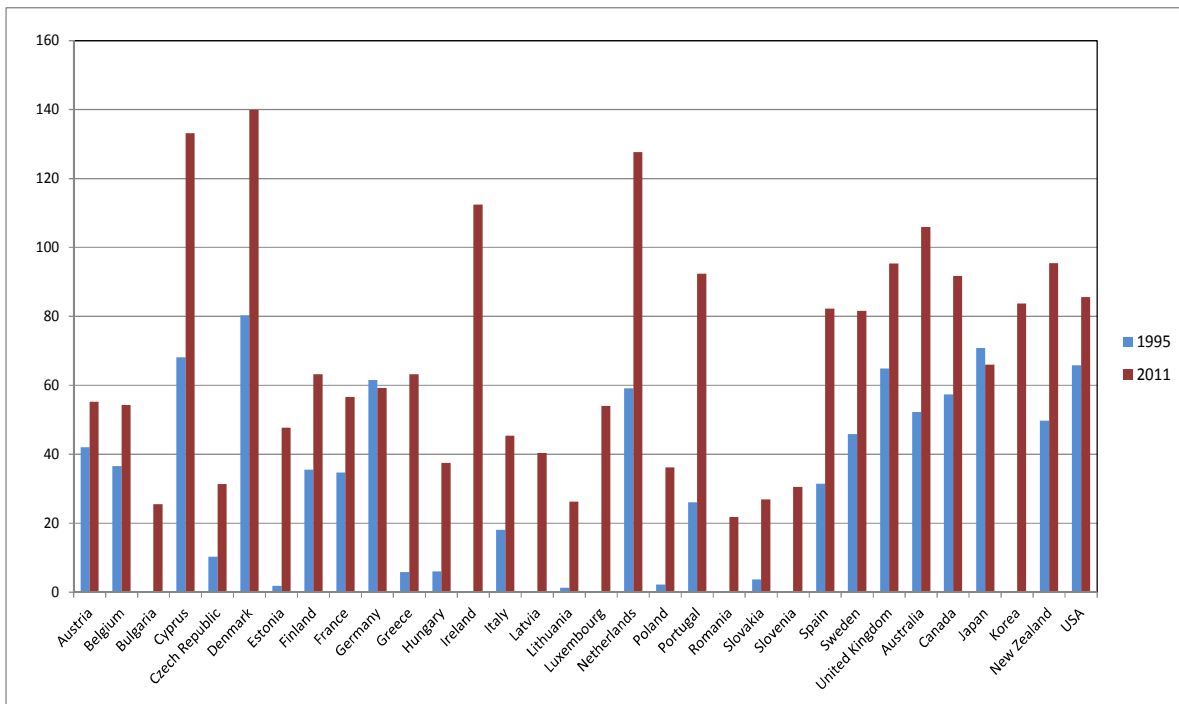
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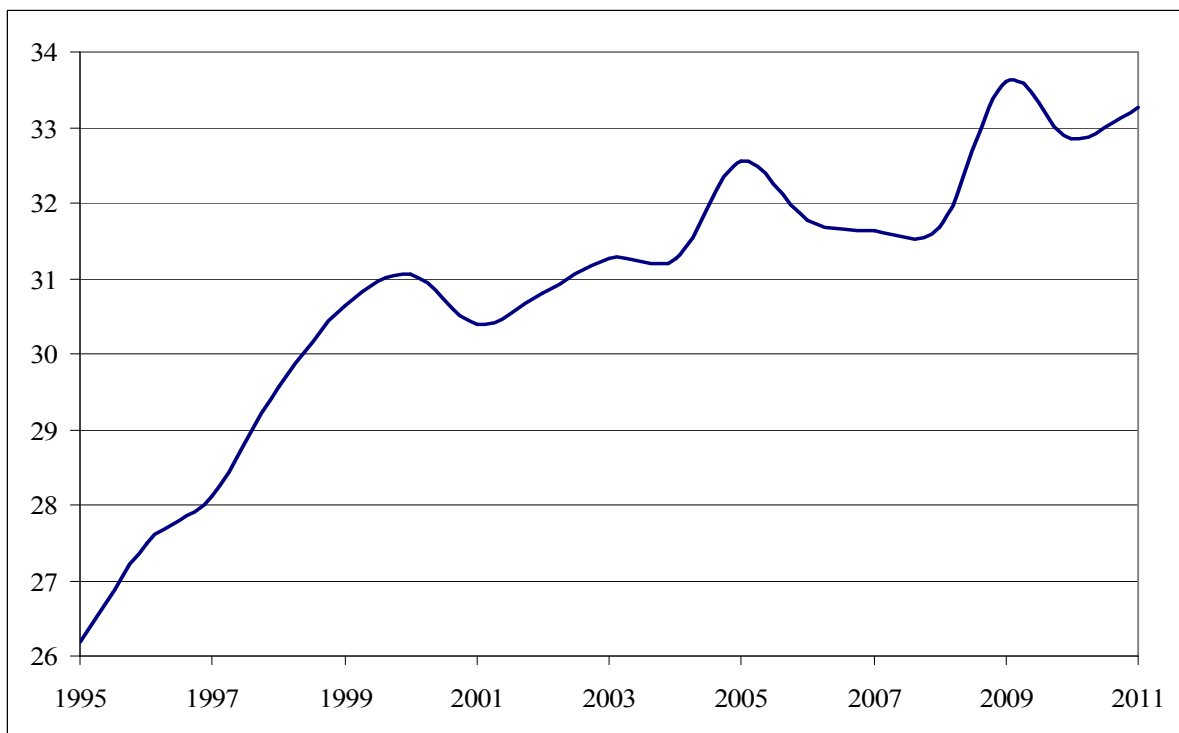
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## Tables and figures

**Figure 1. Household financial debt to GDP ratio (percentages)**



**Figure 2. Standard deviation of household financial debt to GDP ratio between countries**



**Table 1 Summary statistics.** Data refer to the period 1995-2011. Financial debt is made up of loans granted by banks and other financial intermediaries to households. Loans include mortgages, consumer credit and other loans to households, e.g. leasing, factoring and credit to sole proprietorships. Life expectancy is at birth. The saving-to-GDP ratio takes into account gross saving as numerator. Household financial assets take into account all the financial wealth according to flow-of-funds definition. Legal origin is a dummy which takes value 1 if the country is characterized by an English legal system. The quality of credit registers and the quality of bankruptcy laws are indexes that range, respectively, from 1 to 6 and from 1 to 10. Time to resolve insolvencies is the number of years required to recover debt. For the list of sources see Section 3. Standard deviation within is defined in terms of deviations of observations from their specific group mean ( $y_{it} - \bar{y}_i$ ). Standard deviation between is defined in terms of deviation of specific group mean from the overall mean ( $\bar{y}_i - \bar{y}$ ).

Variable		Mean	Std. Dev.	Min.	Max.	N
Household Financial Debt (millions of national currency over GDP in national currency)	overall	51.98	33.09	0.83	145.51	N=504
	between		29.99	10.60	109.11	n=32
	within		14.58	9.28	90.42	T-bar = 15.75
GDP Growth Rate (% change)	overall	2.86	3.40	-17.70	11.70	N=539
	between		1.18	0.80	5.12	n=32
	within		3.19	-19.08	9.81	T-bar = 16.84
GDP per Capita (US\$ at constant PPPs)	overall	25465.94	11101.70	6182.01	73912.59	N=544
	between		10806.77	8771.15	62557.01	n=32
	within		3146.85	11248.91	36821.52	T-bar = 17.00
Life Expectancy (years)	overall	77.29	3.25	67.69	83.00	N=525
	between		3.02	71.60	81.60	n=32
	within		1.38	72.91	81.72	T-bar = 16.40
Gross Saving Rate (millions of national currency over GDP in national currency)	overall	5.75	4.45	-16.89	18.50	N=487
	between		4.27	-8.16	11.63	n=32
	within		2.19	-2.96	18.56	T-bar = 15.21
Household Financial Assets (millions of national currency over GDP in national currency)	overall	164.42	84.44	27.80	374.45	N=505
	between		81.48	49.56	334.72	n=32
	within		20.58	102.19	243.39	T-bar = 15.78
Legal origin (dummy variable)	overall	0.21	0.41	0.00	1.00	N=544
	between		0.42	0.00	1.00	n=32
	within		0.00	0.21	0.21	T-bar = 17.00
Quality of credit registers (index)	overall	4.73	1.24	0.00	6.00	N=250
	between		1.32	0.00	6.00	n=32
	within		0.44	2.11	5.73	T-bar = 7.81
Quality of bankruptcy laws (index)	overall	7.13	1.94	3.00	10.00	N=250
	between		1.94	3.00	10.00	n=32
	within		0.34	5.01	8.01	T-bar = 7.81
Time to resolve insolvencies (years)	overall	2.00	1.35	0.00	9.00	N=250
	between		1.27	0.00	6.75	n=32
	within		0.47	-1.74	4.25	T-bar = 7.81

**Table 2 Correlation matrix.** Data refer to the period 1995-2011. For a description of the variables see Table 1. For the list of sources see Section 3. Correlation is defined in terms of deviations of observations from the overall mean  $(y_{it} - \bar{y})(x_{it} - \bar{x})$ .

	(1)	(2)	(3)	(4)	(5)	(6)	(7)	(8)	(9)	(10)
(1) Household Financial Debt	1.00									
(2) GDP Growth Rate	-0.25	1.00								
(3) GDP per Capita	0.53	-0.12	1.00							
(4) Life Expectancy	0.59	-0.28	0.68	1.00						
(5) Gross Saving Rate	0.19	-0.26	0.42	0.57	1.00					
(6) Household Financial Assets	0.69	-0.20	0.59	0.66	0.38	1.00				
(7) Legal origin	0.54	-0.03	0.34	0.26	-0.03	0.38	1.00			
(8) Quality of credit registers	0.07	-0.09	-0.18	0.00	-0.05	0.20	0.13	1.00		
(9) Quality of bankruptcy laws	0.26	0.10	-0.02	-0.16	-0.27	-0.05	0.49	0.06	1.00	
(10) Time to resolve insolvencies	-0.56	0.19	-0.48	-0.53	-0.28	-0.50	-0.36	-0.13	-0.03	1.00



**Table 3 Baseline specification.** Data refer to the period 1995-2011. The dependent variable is the household debt-to-GDP ratio. RE denotes Random effects estimator. FE denotes Fixed effects estimator. For the definition of the independent variables and the list of sources see Table 1 and Section 3 above.

	(1)	(2)	(3)	(4)
	OLS	RE	FE	Arellano-Bond
GDP Growth Rate	-1.187*** (0.000)	-0.728*** (0.000)	-0.762*** (0.000)	-0.276*** (0.000)
GDP per Capita	0.000762*** (0.000)	0.00126*** (0.000)	0.00171*** (0.000)	0.000963*** (0.000)
Life Expectancy	3.831*** (0.000)	6.460*** (0.000)	5.939*** (0.000)	-0.388*** (0.000)
Legal origin	26.62*** (0.000)	18.66** (0.039)	omitted	omitted
Household Financial Debt <sub>(t-1)</sub>				0.824*** (0.000)
Constant	-266.5*** (0.000)	-483.5*** (0.000)	-449.2*** (0.000)	17.16** (0.025)
$\sigma$ fixed effect		20.46	28.51	
$\sigma$ random effect		7.771	7.771	
$\rho$		0.874	0.931	
LM test for H <sub>0</sub> :OLS, H <sub>1</sub> :RE		(0.000)		
Hausman test for H <sub>0</sub> :RE, H <sub>1</sub> :OLS		(0.000)		
Hausman test for H <sub>0</sub> :RE, H <sub>1</sub> :FE			(0.000)	
Arellano-Bond AR(1) test				(0.132)
Arellano-Bond AR(2) test				(0.493)
Sargan J test				(1.000)
$R^2$ within		0.727	0.729	
$R^2$ between		0.502	0.393	
$R^2$	0.597	0.568	0.495	
Observations	485	485	485	425

*p*-values in parentheses

\* *p* < 0.10, \*\* *p* < 0.05, \*\*\* *p* < 0.01

**Table 4 Do supply side factors matter?** Data refer to the period 2004-2011. The dependent variable is the household debt-to-GDP ratio. RE denotes Random effects estimator. FE denotes Fixed effects estimator. For the definition of the independent variables and the list of sources see Table 1 and Section 3 above.

	(1) OLS	(2) RE	(3) FE	(4) Arellano-Bond
GDP Growth Rate	-0.901** (0.015)	-0.511*** (0.000)	-0.520*** (0.000)	-0.350*** (0.000)
GDP per Capita	0.000429** (0.029)	0.000745*** (0.003)	0.000899*** (0.005)	0.000618*** (0.000)
Life Expectancy	4.217*** (0.000)	4.538*** (0.000)	4.550*** (0.000)	-1.629*** (0.000)
Quality of credit registers	1.505 (0.233)	2.300*** (0.002)	2.183*** (0.006)	0.498 (0.189)
Quality of bankruptcy laws	5.668*** (0.000)	3.972*** (0.000)	3.460*** (0.000)	0.735 (0.119)
Time to resolve insolvencies	-6.199*** (0.000)	-1.676** (0.013)	-1.423** (0.038)	-0.505 (0.137)
Household Financial Debt <sub>(t-1)</sub>				0.764*** (0.000)
Constant	-313.9*** (0.000)	-349.0*** (0.000)	-350.9*** (0.000)	121.0*** (0.000)
$\sigma$ fixed effect		22.47	23.79	
$\sigma$ random effect		4.856	4.856	
$\rho$		0.955	0.960	
LM test for H <sub>0</sub> :OLS, H <sub>1</sub> :RE		(0.000)		
Hausman test for H <sub>0</sub> :RE, H <sub>1</sub> :OLS		(0.025)		
Hausman test for H <sub>0</sub> :RE, H <sub>1</sub> :FE			(0.297)	
Arellano-Bond AR(1) test				(0.041)
Arellano-Bond AR(2) test				(0.218)
Sargan J test				(1.000)
$R^2$ within		0.628	0.629	
$R^2$ between		0.513	0.488	
$R^2$	0.574	0.537	0.519	
Observations	241	241	241	208

*p*-values in parentheses

\*  $p < 0.10$ , \*\*  $p < 0.05$ , \*\*\*  $p < 0.01$

**Table 5 Regressions with household financial assets.** Data refer to the period 1995-2011. The dependent variable is the household debt-to-GDP ratio. RE denotes Random effects estimator. FE denotes Fixed effects estimator. In the Hausman-Taylor and the Arellano-Bond estimation the household financial assets are treated as endogenous. For the definition of the independent variables and the list of sources see Table 1 and Section 3 above.

	(1) OLS	(2) RE	(3) FE	(4) Hausman-Taylor	(5) Arellano-Bond
GDP Growth Rate	-1.082*** (0.000)	-0.761*** (0.000)	-0.797*** (0.000)	-0.760*** (0.000)	-0.310*** (0.000)
GDP per Capita	0.000497*** (0.001)	0.00115*** (0.000)	0.00164*** (0.000)	0.00131*** (0.000)	0.00104*** (0.000)
Life Expectancy	2.714*** (0.000)	5.967*** (0.000)	5.421*** (0.000)	5.914*** (0.000)	-1.108*** (0.000)
Household Financial Assets	0.113*** (0.000)	0.0664*** (0.001)	0.0660*** (0.002)	0.0598*** (0.004)	0.0312*** (0.000)
Legal origin	21.79*** (0.000)	15.11* (0.076)	omitted	14.43 (0.181)	omitted
Household Financial Debt <sub>(t-1)</sub>					0.857*** (0.000)
Constant	-191.1*** (0.000)	-452.2*** (0.000)	-418.2*** (0.000)	-451.2*** (0.000)	64.92*** (0.000)
$\sigma$ fixed effect		18.96	27.89	24.59	
$\sigma$ random effect		7.694	7.694	7.660	
$\rho$		0.859	0.929	0.912	
LM test for H <sub>0</sub> :OLS, H <sub>1</sub> :RE		(0.000)			
Hausman test for H <sub>0</sub> :RE, H <sub>1</sub> :OLS		(0.000)			
Hausman test for H <sub>0</sub> :RE, H <sub>1</sub> :FE			(0.000)		
Hausman test for H <sub>0</sub> :HT, H <sub>1</sub> :RE				(0.647)	
Arellano-Bond AR(1) test					
Arellano-Bond AR(2) test					
Sargan J test					
$R^2$ within		0.732	0.735		
$R^2$ between		0.537	0.446		
$R^2$	0.637	0.592	0.533		
Observations	485	485	485	485	425

*p*-values in parentheses

\* *p* < 0.10, \*\* *p* < 0.05, \*\*\* *p* < 0.01

**Table 6 Regressions with household total assets.** Data refer to the period 1995-2010. The dependent variable is the household debt-to-GDP ratio. Household total assets include both financial and real wealth. FE denotes Fixed Effects estimator. In the Hausman-Taylor and the Arellano-Bond estimation the household total assets are treated as endogenous. For the definition of the independent variables and the list of sources see Table 1 and Section 3 above.

	(1)	(2)	(3)	(4)	(5)
	OLS	RE	FE	Hausman-Taylor	Arellano-Bond
GDP Growth Rate	-1.144* (0.094)	-1.468*** (0.000)	-1.467*** (0.000)	-1.472*** (0.000)	-0.541*** (0.000)
GDP per Capita	0.00187*** (0.000)	0.00174*** (0.000)	0.00172*** (0.000)	0.00175*** (0.000)	0.000634** (0.045)
Life Expectancy	0.871 (0.456)	-1.077 (0.233)	-1.086 (0.243)	-1.152 (0.206)	1.845 (0.277)
Household Total Assets	0.0418** (0.018)	0.108*** (0.000)	0.109*** (0.000)	0.109*** (0.000)	0.0426*** (0.000)
Legal origin	17.65*** (0.000)	16.92 (0.337)	omitted	16.53 (0.136)	omitted
Household Financial Debt <sub>(t-1)</sub>					0.280 (0.336)
Constant	-88.93 (0.318)	37.33 (0.561)	44.45 (0.488)	42.52 (0.509)	
$\sigma$ fixed effect		24.00	17.21	14.05	
$\sigma$ random effect		5.321	5.321	5.226	
$\rho$		0.953	0.913	0.878	
LM test for H <sub>0</sub> :OLS, H <sub>1</sub> :RE		(0.000)			
Hausman test for H <sub>0</sub> :RE, H <sub>1</sub> :OLS			(0.000)		
Hausman test for H <sub>0</sub> :RE, H <sub>1</sub> :FE			(0.998)		
Hausman test for H <sub>0</sub> :HT, H <sub>1</sub> :RE				(0.941)	
Arellano-Bond AR(1) test					
Arellano-Bond AR(2) test					
Sargan J test					
$R^2$ within		0.794	0.794		
$R^2$ between		0.391	0.141		
$R^2$	0.541	0.494	0.327		
Observations	122	122	122	122	108

*p*-values in parentheses

\*  $p < 0.10$ , \*\*  $p < 0.05$ , \*\*\*  $p < 0.01$

**Table 7 Regressions with the debt-to-household disposable income ratio.** Data refer to the period 2004-2011. The dependent variable is the household debt-to-disposable income ratio. RE denotes random effects estimator, FE denotes Fixed effects estimator. For the definition of the independent variables and the list of sources see Table 1 and Section 3 above.

	(1) OLS	(2) RE	(3) FE	(4) Arellano-Bond
GDP Growth Rate	-1.225 (0.113)	-0.584*** (0.001)	-0.604*** (0.001)	0.0125 (0.688)
GDP per Capita	0.00177*** (0.000)	0.00252*** (0.000)	0.00292*** (0.000)	0.001000*** (0.000)
Life Expectancy	4.690*** (0.002)	6.250*** (0.000)	6.364*** (0.000)	-3.389*** (0.000)
Quality of credit registers	-0.824 (0.758)	3.586*** (0.010)	3.180** (0.033)	1.507*** (0.006)
Quality of bankruptcy laws	10.08*** (0.000)	6.507*** (0.000)	5.777*** (0.000)	0.356 (0.429)
Time to resolve insolvencies	-10.87*** (0.000)	-3.269*** (0.005)	-2.934** (0.014)	-0.852 (0.177)
Household Financial Debt <sub>(t-1)</sub>				0.832*** (0.000)
Constant	-355.5*** (0.002)	-511.2*** (0.000)	-523.6*** (0.000)	250.1*** (0.000)
$\sigma$ fixed effect		47.59	48.27	
$\sigma$ random effect		8.369	8.369	
$\rho$		0.970	0.971	
LM test for H <sub>0</sub> :OLS, H <sub>1</sub> :RE		(0.000)		
Hausman test for H <sub>0</sub> :RE, H <sub>1</sub> :OLS		(0.000)		
Hausman test for H <sub>0</sub> :RE, H <sub>1</sub> :FE			(0.608)	
Arellano-Bond AR(1) test				(0.000)
Arellano-Bond AR(2) test				(0.517)
Sargan J test				(1.000)
$R^2$ within		0.585	0.586	
$R^2$ between		0.435	0.417	
$R^2$	0.492	0.450	0.438	
Observations	229	229	229	196

*p*-values in parentheses

\*  $p < 0.10$ , \*\*  $p < 0.05$ , \*\*\*  $p < 0.01$

**Table 8 Baseline specification with saving rate.** Data refer to the period 1995-2011. The dependent variable is the household debt-to-GDP ratio. RE denotes Random effects estimator. FE denotes Fixed effects estimator. In the Hausman-Taylor and the Arellano-Bond estimation the saving rate is treated as endogenous. For the definition of the independent variables and the list of sources see Table 1 and Section 3 above.

	(1) OLS	(2) RE	(3) FE	(4) Hausman-Taylor	(5) Arellano-Bond
GDP Growth Rate	-1.286*** (0.000)	-0.741*** (0.000)	-0.735*** (0.000)	-0.719*** (0.000)	-0.302*** (0.000)
GDP per Capita	0.000940*** (0.000)	0.000980*** (0.000)	0.00140*** (0.000)	0.00108*** (0.000)	0.000961*** (0.000)
Life Expectancy	4.128*** (0.000)	6.798*** (0.000)	6.409*** (0.000)	6.801*** (0.000)	-0.799*** (0.000)
Gross Saving Rate	-1.101*** (0.000)	-0.366* (0.070)	-0.174 (0.404)	-0.271 (0.185)	-0.304*** (0.000)
Legal origin	23.32*** (0.000)	20.01** (0.028)	omitted	18.86* (0.070)	omitted
Household Financial Debt <sub>(t-1)</sub>					0.861*** (0.000)
Constant	-286.3*** (0.000)	-500.6*** (0.000)	-476.4*** (0.000)	-503.7*** (0.000)	49.46*** (0.000)
$\sigma$ fixed effect		20.75	27.10	23.86	
$\sigma$ random effect		7.592	7.592	7.556	
$\rho$		0.882	0.927	0.909	
LM test for H <sub>0</sub> :OLS, H <sub>1</sub> :RE		(0.000)			
Hausman test for H <sub>0</sub> :RE, H <sub>1</sub> :OLS		(0.000)			
Hausman test for H <sub>0</sub> :RE, H <sub>1</sub> :FE			(0.005)		
Hausman test for H <sub>0</sub> :HT, H <sub>1</sub> :RE				(0.053)	
Arellano-Bond AR(1) test					(0.129)
Arellano-Bond AR(2) test					(0.388)
Sargan J test					(1.000)
$R^2$ within		0.719	0.721		
$R^2$ between		0.512	0.390		
$R^2$	0.608	0.577	0.496		
Observations	452	452	452	452	399

*p*-values in parentheses

\* *p* < 0.10, \*\* *p* < 0.05, \*\*\* *p* < 0.01

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