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Abstract

Higher household debt is associated with lower future GDP growth in a broad set of 80 countries over the period 1950–2016. Several institutional factors, such as flexible exchange rates, capital account openness, higher financial development and inclusion, mitigate this negative relationship. Three mutually reinforcing mechanisms help explain this relationship. First, increases in household debt amplify the probability of future banking crises, which significantly disrupts financial intermediation. Second, crash risk may be systematically neglected due to investors' overoptimistic expectations associated with household debt booms. Third, debt overhang impairs household consumption when negative shocks hit.

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Recent academic studies report that increases in household debt are associated with lower output growth, higher unemployment, and greater probability of future banking crises (Mian et al. 2017; Jordà et al. 2016).[1] These relationships became particularly evident in the aftermath of the global financial crisis, where overborrowing by subprime households led to a rise in defaults and foreclosures, and triggered the collapse of the US housing market and the subsequent great recession (Sanders 2008; Mian and Sufi 2009, 2014a, 2014b). Theoretically, this relationship can be explained by the presence of aggregate demand externalities associated with high household debt, which may lead to a supply-constrained economy during recessions (see Eggertsson and Krugman 2012; Korinek and Simsek 2016). In addition, behavioral factors and heterogenous beliefs may also play an important role, as investors and households exhibit over-optimism during periods of housing booms (e.g., Cheng et al. 2014) or neglect crash risks due to over-optimism (Baron and Xiong 2017).

The renewed rise in household debt worldwide may be additional cause for concern, in that household debt has continued to grow significantly since 2008 across 80 countries (see Figure 1).[2] In advanced economies, the median debt ratio rose from 52 percent of gross domestic product (GDP) in 2008 to 63 percent in 2016. Among emerging market economies, the median debt ratio increased from 15 to 21 percent of GDP over the same period. Evidently, the global financial crisis does not seem to have deterred households from taking on more debt. While this may be optimal in a low interest rate environment, this may eventually come back to hurt households when they face a rising debt service once interest rates start rising and the credit boom ends (Drehman et al. 2017).

Figure 1 here

Conversely, higher household borrowing could also improve economic efficiency and enhance macro-financial stability. Households may borrow to smooth fluctuations in consumption (Hall 1978), and they may also borrow to invest in financial or non-financial assets, such that higher household borrowing today may be associated with higher future GDP growth (see, e.g., Beck and Levine 2004; Beck et al. 2000; Levine 1998). Yet the long-term positive effect on output growth may fade once private sector debt reaches a certain threshold, due to rising financial stability risks and misallocation of resources (Arcand et al. 2015; Sahay et al. 2015).

This chapter re-examines the relationship between household debt and future GDP growth for a much broader sample of countries than hitherto studied and explores several propagation mechanisms. In particular, we address the following questions:

(1) In a broad set of countries, is the intertemporal relationship between household debt and output growth heterogenous?

(2) Do certain institutional factors and financial frictions associated with household debt amplify the impact of negative shocks?

(3) What channels can explain the relationship between household debt and output growth?

Our main findings are several. First, the negative relationship between household debt growth and future GDP growth, documented in Mian et al. (2017) for 30 countries, is generalized to a much larger set of 80 advanced and emerging market and developing economies. This is a new result indicating that the negative relationship is not a phenomenon of advanced economies only. Second, the negative effects of household debt on future GDP depend on individual household level debt and country characteristics, including the exchange rate regime, capital account openness, financial development, and transparency indicators. This highlights the important role of institutional and financial frictions in amplifying negative shocks. Third, this

negative relationship can be attributed to three complementary mechanisms: (1) household credit booms are reflected in a higher future probability of banking crises; (2) rapid increases in household debt are associated with a neglect of crash risks; and (3) the macro effect of a debt overhang situation, which depends on differences in marginal propensities to consume across households. It is a surprising new finding that higher household debt growth is systematically associated with lower asset prices in the future, suggesting the role of sentiment that is uniquely associated with household credit. Together, these pieces of evidence suggest that household debt should be monitored vigilantly and incorporated into central banks' policy frameworks.

In the remainder of this chapter, we first review the role of household and corporate debt in macro-financial models. Next, we present new results on the negative relationship between household debt and future output growth for a large panel data set and examine the role of various institutional factors and distributional (micro-household level) characteristics. Then, we examine three complimentary mechanisms that help explain this negative relationship, including the effect of household debt on the probability of banking crises, neglected downside risks and debt overhang on household consumption. A final section concludes.

The Role of Debt in Macro-Financial Models

The impact of shocks on the macroeconomy can be amplified by financial frictions. Much existing literature focuses on the implications of productivity shocks on the supply side of the economy (see Bernanke and Gertler 1989; Kiyotaki and Moore 1997; Caballero and Krishnamurthy 2003; and Brunnermeier and Sannikov 2014). In these theoretical models, nonfinancial corporations face financial frictions such as collateral constraints. Positive productivity or monetary policy shocks that relax these constraints lead to increased borrowing

and investment and higher asset prices which may further relax the constraints. As a result, such shocks can amplify business cycle dynamics.

A recent strand of literature has emphasized a debt-driven demand channel of credit supply shocks for the business cycle. While the underlying borrowing constraint mechanism is the same as in earlier models, when credit supply tightens after a credit boom, nominal rigidities, monetary policy constraints, and other frictions may exacerbate the downward pressure on growth (see Eggertsson and Krugman 2012; Korinek and Simsek 2016, Farhi and Werning 2016). In these models, households increase borrowing to finance consumption when credit constraints are relaxed. But when credit constraints later tighten, borrowers must deliver by cutting back consumption. While borrowing decisions are optimal from the individual household perspective, they can be excessive relative to the social optimal level as monetary policy is unable to stimulate demand from savers due to monetary policy constraints and/or nominal rigidities such as fixed exchange rate regimes.

In such cases, a positive shock to the credit constraint of borrowers could have amplified effects on the macroeconomy. In the aggregate, there would be a decline in economic growth after household credit booms as in Mian et al. (2017) who were among the first to document the household debt cycle at the global level. In their study of 30 advanced economies, they emphasize a debt-driven 'consumption' channel in which households may rationally borrow more than the socially optimal level when their credit constraints are relaxed. They argue that the channel is a distinct one that has implications for policies, particularly macroprudential policies. Jorda and others (2016) found that large credit booms (and mortgage booms since WWII) led to deeper recessions and slower recoveries for 17 advanced economies since 1870. Brunnermeier et al. (2017) examined the relation between US household credit expansions, financial market stress,

output growth, and other macroeconomic aggregates over the period 1973-2015. They found that monetary policy was an important driver of the relationship between credit and output. By contrast, Dell'Ariccia et al. (2012) emphasize the role of macroprudential policies to contain credit booms, as capital flows and currency substitution limit the effectiveness of monetary policy in 170 countries to the 1960s.

Another strand of the literature finds that household borrowing may be subject to behavioral biases stemming from differences in household consumption patterns or mispricing of risk in financial markets. For example, the present bias of consumption and/or extrapolative expectations by households may lead to excessive borrowing when positive credit shocks hit the economy, but these could lead to a significant drop in consumption when credit constraints tighten (Laibson 1997; Cheng et al. 2014). Heterogeneous beliefs and/or the underestimation of risks associated with household debt can also lead to more pronounced leverage cycles and more volatile asset prices (Geanakoplos 2010; Baron and Xiong 2017).

More recently, several studies have shown that demographics and the distribution of income and debt matter. Younger households, which anticipate future income growth, could borrow more against their future incomes (Blundell et al. 1994). Rajan (2010) and Kumhof et al. (2015) argue that increased income and wealth inequality produced rapid growth in household debt in the United States and eventually to the financial crisis in 2008. Coibion et al. (2017) find that, over the period 2001–2012, income inequality may have indirectly operated as a screening device for banks, given that they loaned less to low-income households in high-inequality regions in the United States.

New Empirical Results on Household Debt and GDP

Next, we document the relationship between current increases in household debt and future GDP growth in a large set of 80 countries. Our goal is to examine the role of institutional factors and distributional characteristics.

Household debt and output growth in 80 countries. We document the relationship between current increases in household debt and future GDP growth in 80 countries, including 39 advanced economies and 41 emerging market economies, with data spanning the period 1950–2016.[3] The large size of the sample allows us to confirm prior findings and explore the role of cross-country differences. Following Mian et al. (2017), we first study a forecasting equation which examines the relationship between current changes in the household debt to GDP ratio and future real income growth, controlling for current changes in the non-financial corporate debt to GDP ratio, country and time fixed effects, and other variables such as the past level of household debt to GDP ratio. The equation is estimated as an unbalanced panel regression, with standard errors clustered by both year and country. The forecasting equation is as follows:

$$\Delta_3 y_{i,t+k} = \alpha_i + \beta^h \Delta_3 hhd_{i,t-1} + \beta^f \Delta_3 fd_{i,t-1} + \gamma X_{i,t} + \epsilon_{i,t+k}$$

where $\Delta_3 y_{i,t+k} \equiv \log\left(\frac{y_{i,t+k}}{y_{i,t+k-3}}\right)$, y is real GDP, $\Delta_3 hhd_{i,t-1} \equiv \left(\frac{HHDebt}{GDP}\right)_{i,t-1} - \left(\frac{HHDebt}{GDP}\right)_{i,t-4}$ is the past three-year change in the household debt ratio, $\Delta_3 fd_{i,t-1} \equiv \left(\frac{FirmDebt}{GDP}\right)_{i,t-1} - \left(\frac{FirmDebt}{GDP}\right)_{i,t-4}$ is the past three-year change in corporate debt ratio, and X includes control variables such as lagged GDP growth for the preceding two years and the past three-year change

in the government debt to GDP ratio. In this regression model, a negative estimate for β^h would indicate that household debt growth forecasts *lower* future income growth; a positive estimate for β^h would indicate the opposite. Country and year fixed effects are included to absorb the level effects of each country and year. Standard errors are dually clustered at the country-year level. We repeat this forecasting equation for varying horizons k from the current year (k = 0) to six years ahead (k = 6).

Table 1 provides summary statistics on household debt and the main variables used in this chapter. The mean household debt to GDP ratio across the sample was 35 percent, and the mean annual increase was about 1 percentage point. This compares to 60 percent for firm debt to GDP, increasing by slightly less than 1 percentage point per year, and the public debt to GDP ratio of 52 percent on average, rising by 2 percentage points per year. The data also exhibit considerable heterogeneity, with household debt to GDP ratios at the 10th and 90th percentiles, for example, ranging between 6 and 72 percent.

Table 1 here

Table 2 reports our regression results. In Panel A, the coefficients on the household debt to GDP ratio are strongly negative for forecasting horizons from current year to six years ahead.[4] In other words, current growth in household debt relative to GDP is associated with *lower* future income growth. Regression results are statistically significant at the 1 percent level. The negative effect is the strongest at the three to four-year horizon and diminishes as the horizon increases. Additional results (not reported here) show that the effects remain significant when the sample is split in several ways (before/after the year 2000, and before/after the global financial crisis).

Table 2 here

The effects are also economically significant. The three-year change in household debt to GDP ratio has a standard deviation of 5.89 percentage points, and a one standard deviation increase in the household debt ratio is associated with 1.2 percentage points lower GDP growth over a three-year horizon. Compared to the effect of corporate debt, household debt has a stronger negative effect on future GDP growth, and the effect lasts for much longer than corporate debt. The standard deviation for three-year change in the corporate debt to GDP ratio is 18.97 percentage points, three times that for household debt. Also, the coefficients on corporate debt are more than three times smaller than those for household debt, and negative and significant effects of corporate debt on future income are absent at forecasting horizons beyond four to five years. Hence, these results are broadly consistent with Mian et al. (2017) who study a sample of 30 mostly advanced economies. We also verify this relationship using a panel vector auto-regression (VAR) approach for a smaller set of countries but including house prices and short-term interest rates as additional factors.

In Panel B of Table 2, we further split the sample into advanced economies and emerging markets. Columns 1–4 present results for 39 advanced economies. The correlation between past growth in household debt and future income growth is negative and statistically significant, with a forecasting horizon of one to five years. The negative effect diminishes at the seven-year horizon. Columns 5–8 present the same regression results for emerging markets. The negative correlation is still present, although statistical significance is weak at the three- and five-year horizons due to the shorter data span for many emerging market economies. The results are robust to adding additional control variables to account for cyclical factors, such as the lagged unemployment rate, a short-term interest rate, and real effective exchange rates. Results (not reported here) remain both qualitatively and quantitatively similar.

What drives this negative relationship of household debt overhang on the macroeconomy? To date, empirical analysis using micro-level data has been performed for a few advanced economies, specifically the United States, where data quality permits such in-depth treatment (e.g., Mian and Sufi 2014a). Many prior papers focus on the deleverage episode after a large negative shock (such as a house price shock) and examine how households with different leverage ratios respond. These studies provide well-designed identification strategies, yet they can suffer from external validity problems. Below, we provide complementary evidence of such micro-level impacts on the macroeconomy using European data.

In our analysis, the cross-country setting provides a natural dimension of variation across countries and can potentially overcome external validity issues when considering macro-financial policies at the country level or across countries. Hence, we examine the role of institutional factors that may affect the relationship between household debt and GDP growth.

Institutional factors and distributional characteristics. Next, we examine the sensitivity of the household debt-GDP relationship to the role of the exchange rate regime, capital account openness, financial development, mortgage participation rates of low-income households, and the average debt-to-income (DTI) ratio of low-income households. These institutional factors and distributional characteristics capture the degree of institutional and financial frictions in the economy. Specifically, we conduct the following regression analysis:

$$\Delta_3 y_{i,t+5} = \alpha_i + \beta_1 \Delta_3 hhd_{i,t-1} + \beta_2 \cdot \Delta_3 hhd_{i,t-1} \times IF_i + \beta_3 X_{i,t-1} + \delta_t + u_{i,t+k} \,,$$

where IF_i is an indicator for an institutional factor or distributional characteristic of household debt. The forecasting horizon is fixed at five years for illustrative purposes, but qualitatively similar results are obtained when using different forecasting horizons (three or seven years). The

coefficient of interest is β_2. We are interested in examining whether certain institutional factors and distributional characteristics of household debt can mitigate or reinforce the effect of household debt.

Exchange rate regime and capital account openness. An increase in household debt corresponds to a transfer of funds from households that save to households that borrow. Household borrowers increase their leverage and pay down their debt over time, so a negative credit constraint shock to borrowers would lead to forced deleveraging by the borrowers who must cut back consumption (see Eggertsson and Krugman 2012). When this happens, and to avoid an aggregate decline in consumption, optimal monetary policy should lower interest rates to encourage consumption by savers in the economy.[5] Failure to raise consumption by savers would result in a decline in aggregate demand and economic recession.

Flexibility in monetary policy is essential in this situation. Constraints to monetary policy, such as the zero lower bound, can prevent a rise in consumption by savers sufficiently to fully offset the consumption drop by borrowers. A fixed exchange rate regime would also impose limitations on monetary policy. When monetary policy faces such constraints, one would expect that the negative effects of household debt growth on future income growth would be stronger. To examine this empirically, we use the IMF classification of exchange rate regimes for all 80 countries in our sample. The classification has six categories including fixed exchange rate regime, freely floating exchange rate regime, and categories in between. We generate an indicator variable for a fixed exchange rate regime, which takes value 1 if the country is classified as having a fixed exchange rate regime, and 0 otherwise.

Regression results are reported in the first two columns of Table 3. Column 1 shows results controlling for firm debt and lagged GDP growth. The interaction term between past household

debt growth and the indicator for fixed exchange rate regime is negative and highly significant, while household debt growth by itself becomes insignificant. This indicates that having a fixed exchange rate regime which limits monetary policy flexibility compounds the negative effect of household debt on future income, consistent with our hypothesis.[6]

Table 3 here

Columns 2 and 3 take into account the impact of high capital account openness, defined as having a capital account openness index above the median. Column 2 suggests that a higher reliance on external funding may amplify the negative effect of household debt on future GDP growth. Results for the fixed exchange rate regime and high capital account openness are rebust when both variables are included in the regression (Column 3). In both cases, there is a very significant interaction of these institutional factors with household debt growth, while household debt growth by itself is insignificant.

Financial development, transparency, and financial risk index. If a country has a better developed financial system, more transparent credit information about borrowers, and a better financial risk index, a rise in household debt is likely to be associated with a less negative impact on future growth. We use the Financial Development Index to capture how well the financial system can allocate credit in general: the high Financial Development Index takes the value of 1 if the Financial Development Index is within the top quartile of all countries in the sample as of 2014, and 0 otherwise. We also use the Transparency Index and Financial Risk Index to capture the degree of credit information transparency and financial risk, respectively.

Regression results are reported in Columns 4–6 of Table 3. In Column 4, we see that when the Financial Development Index is high (e.g., the indicator takes the value of 1, the negative effect of household debt is mitigated significantly. The magnitude of the coefficient on the interaction

term is the same as the coefficient on the household debt term, suggesting that the negative effects are concentrated in countries where the Financial Development Index is low. Similar effects are found for better transparency and better financial risk (Columns 5 and 6), although the coefficient on the interaction term is smaller in magnitude.

These results suggest that better and more efficient financial markets and institutions can help overcome the negative medium-term macro-financial effects associated with rising household debt. This may reflect the fact that credit growth is less risky in more financially developed countries because their financial systems are, on average, better able to assess credit risk and allocate credit, and to deal with the consequences.

Distributional characteristics. To further distinguish the effect of debt overhang, we explore the distributional characteristics of household debt. As shown in Figure 2, distributional characteristics of household debt can contain valuable information.[7] In the theoretical framework of Korinek and Simsek (2016), differences in marginal propensities to consume (MPCs) between borrowers and savers can generate negative aggregate effects stemming from debt overhang on consumption. In other words, aggregate debt concentrated in low-income households would likely have very different implications on the macroeconomy compared to the same level of aggregate household debt uniformly allocated across all income groups, because the average MPCs of borrowers and savers in these two cases are very different.

Figure 2 here

In addition, cross-sectional differences in the characteristics of household debt holders are empirically extremely important when analyzing the role of household debt. For example, Mian and Sufi (2009) show convincingly that a key driver of the US subprime crisis was the fast accumulation of household debt in US zip codes that had the lowest income growth. Mian and Sufi

(2014a) also contrast the negative outcomes during the Great Recession in US counties having high household leverage with those having low leverage. These studies highlight the importance of looking at distributional characteristics of household debt in addition to the information contained in the aggregate household debt.[8]

We focus here on two distributional characteristics of household debt are considered: (1) the mortgage participation rate of low-income households (i.e., the lowest two quintiles in the income distribution); and (2) the (weighted) average debt-to-income ratio of low-income households. We generate these measures based on the latest available micro-level data for 30 countries. The mortgage participation rate of low-income households is an indicator of an economy's degree of financial development since a higher mortgage participation rate for low-income households is likely associated with a banking sector that can efficiently screen borrowers based on relatively transparent information and determine their credit risk. In countries where mortgage participation rate is low for low-income households, such financial intermediation is likely less efficient.

We rank all countries by their mortgage participation rates for the low-income households (bottom two quintiles in income distribution) and generate an indicator *LowIncPart*. This indicator takes the value of 1 if the mortgage participation rate for the bottom 40 percent of households in the income distribution ranks highly (within the top quartile of countries; roughly above 20%), and 0 otherwise. Column 7 of Table 3 shows the regression results, which indicate that a high mortgage participation rate for low-income households mitigates the negative effects of household debt on future income growth. Qualitatively and quantitatively, this result is similar to that for the Financial Development Index, although the latter is estimated using the larger sample of 80 countries. Both

results show that financial development, including inclusive financial services, mitigates the negative impact of household debt overhang on the real economy.

The other indicator, *LowDTI*, captures the average debt-to-income ratio of low-income households (bottom 40% of income distribution) weighted by the share of debt held by these households as a percent of total outstanding household debt in the economy. *LowDTI* takes the value of 1 if the weighted DTI for these households is low (within the lowest quartile of all countries), and 0 otherwise. Columns 8–9 of Table 3 report regression results, which suggest that a low average DTI for low-income households reduces the negative impact of aggregate household debt on the economy, although statistical significance is weaker. This result remains when the interaction with emerging market (*EM)* indicator is controlled (Column 9). In other words, high indebtedness of low-income borrowers would likely worsen the negative impact. This is consistent with theoretical models by Korinek and Simsek (2016) and empirical evidence by Mian and Sufi (2014a).

In sum, debt participation and average DTI capture two distinct aspects of financial access by low-income households. The former is related to financial inclusion and financial development, while the latter points the potential danger of over-indebtedness of low-income households. They appear to have different implications for macroeconomic growth.

What Explains the Household Debt-Future GDP Relation?

This section evaluates the role of three complementary mechanisms through which increases in household debt may be associated with lower future output growth. More specifically, we examine whether household debt is associated with systemic banking crises and behavioral biases (mispricing in equities), and whether debt overhang affects consumption.

Household Credit Booms and Systemic Banking Crises. We examine whether household debt has distinct information value for predicting banking crises, and whether the level of debt plays a role. If so, we can establish that household credit growth plays a crucial role in the amplification and generation of macroeconomic shocks. This expands on Schularick and Taylor (2012) who found that total private credit helps predict financial crises in 14 advanced economies since the 1870s. Here, we decompose total private credit into household and nonfinancial corporate debt. We estimate a probabilistic model of systemic banking crises in country i and year t:

$$log\frac{P[S_{it}=1|X_{it}]}{P[S_{it}=0|X_{it}]} = \Psi_{0i} + \Psi_1 X_{it} + \Psi_2 X_{it} \text{ x I(Hi Debt)}_{it} + \epsilon_{it},$$

where the dependent variable is the log of the odds ratio, X_{it} refers to a vector of lagged changes and levels of household and corporate debt (scaled by GDP) ratios, and the third term of the regression refers to interactions between *X* and an indicator function I (Hi Debt). The latter takes value of 1 if country *i* experiences household or sovereign debt exceeding various thresholds.[9] Finally, Ψ_{0i} are country fixed effects (FE), to control for time-invariant country-specific characteristics. [10]

Past studies show that household debt can be a good early warning indicator for banking crises (Gourinchas and Obstfeld 2012; Drehmann and Tastaronis 2014; Jordà et al. 2016). Using a logit panel estimation covering 34 countries over the period 1970–2015, both household and corporate debt-to-GDP ratios are found to be positively associated with a greater probability of systemic banking crises in the future (see Table 4). Moreover, *changes* in household debt are found to be more important than *levels* (Column 3), while the effects of household debt seem to dominate those of corporate debt (Column 4).[11] The average marginal effect of changes in household debt is about 1 percentage point, almost double the effect of firm debt increases. When household debt

is high, the probability of systemic banking crises is boosted by another 80 basis points. In economic terms, these are important effects, given that the unconditional crisis probability is about 3.5 percent for the countries considered in this analysis. [12]

Table 4 here

We also find that the relation between increasing household debt and financial crises is more pronounced when the household debt level exceeds 65 percent of GDP (Column 5). This suggests that a given increase in debt of already highly-indebted households is likely to result in a debt overhang. In such situations, households must either drastically reduce consumption or default on their debt. Similarly, the probability of a banking crisis is larger when levels of sovereign debt are high (above 60% of GDP), suggesting that the probability of a systemic banking crisis increases when the government capacity to support banks is more constrained (Column 6).

Neglected downside risk. Next, we investigate whether behavioral biases may help explain the negative relationship between household debt and future GDP.13 For example, households and professional investors may have extrapolative expectations about future house prices, such as during the 2000s housing boom in the US (Cheng et al. 2014). Similarly, systematic mispricing of risks can happen when investors have a tendency to think that 'this time is different' (Reinhart and Rogoff 2014). This would be in line with the view that investor sentiment helps explain fluctuations in economic activities (López-Salido et al. 2017).

To empirically test for behavioral biases, we examine whether past growth in household debt is systematically associated with future lower banking equity returns, because banks are generally the most exposed to household debt. A negative correlation between past household credit growth and future equity returns would indicate that investors in financial markets are, on average, overly optimistic during household credit booms. As in the previous subsection, we

emphasize the role of household debt (as opposed to *total* debt) in mispricing of risk. Moreover, we test whether household debt can predict both bank stock excess returns as well as abnormal returns. The latter may tell whether, compared to the overall market, banking stocks are particularly affected by the neglect of crash risk associated with household credit. This finding may have significant policy relevance because mispricing of risk in the banking sector would suggest that the banking sector requires a larger capital buffer to sustain large negative shocks than implied by market prices and corresponding risk measures (e.g., those derived from value-at-risk models). It also provides a rationale for regulators to implement macroprudential policies, which are not based on current market prices but on systemic events including a sudden drop in asset prices.

Predictability of bank stock returns. Following Baron and Xiong (2017), we run the regression below:

$$r_{i,t+h} - r^f_{i,t+h} = \alpha_i + \beta \cdot \Delta_k hhd_{i,t-k} + \gamma \cdot X_{it} + \delta_t + \epsilon_{i,t+h}$$

where $r_{i,t+h} - r^f_{i,t+h}$ is the h-year ahead excess return (relative to the risk-free rate) for country i's banking sector index, $\Delta_k hhd_{i,t-k} \equiv \left(\frac{HHD}{GDP}\right)_{i,t} - \left(\frac{HHD}{GDP}\right)_{i,t-k}$ is the past k-year growth in the household debt to GDP ratio, and X_{it} includes a list of controls, such as, importantly, the past k-year growth in the corporate debt to GDP ratio. Note that the regressors are all variables known at time t, whereas the dependent variable measures the innovation in the equity index from time t to $t+h$. Predictability would suggest the existence of mispricing in the stock market, possibly a neglect of crash risk.

The dataset covers 70 countries between 1973 and 2016 where data on bank equity returns are available. Both country- and year-fixed effects are included in the regressions. To address the

potential issue that growth in the household debt ratio may differ across emerging and advanced economies, we follow Baron and Xiong (2017) and normalize this variable by the standard deviation of the annual changes in the ratio for each country. Thus, the coefficient β can be easily interpreted as the predicted *h*-year ahead excess return for each standard deviation increase in the household debt ratio. In the main specification, we choose h=1, 3, 5 and k=3. Standard errors are clustered at the country level. Results are very similar if standard errors are two-way clustered at the country-year level or bootstrapped.

Regression results are reported in in Panel A of Table 5, where Columns 1 and 2 show the regression coefficients for the forecasting horizon of k=1 year. The findings suggest that the past three-year change in the household debt ratio is negatively associated with one-year ahead bank equity returns. The relationship remains statistically significant after controlling for past changes in the corporate debt ratio, as well as past levels of the household debt and corporate debt ratios. In terms of magnitudes, the coefficient implies that a one standard deviation increase in the annual growth of the household debt ratio is associated with a lower equity return of 2 to 2.7 percent one year later.

Table 5 here

Columns 3–4 and 5–6 of Table 5 (Panel A) report the regression results that extend the forecasting horizons to three and five years, respectively. These results show that the relationship between past growth in the household debt ratio and future bank equity returns becomes strongly significant. This relationship is robust to the inclusion of past growth in the corporate debt ratio, which by itself also has statistically significant predictive power for (lower) future equity returns. In terms of the magnitude, a one standard deviation increase in the annual growth rate of the

household debt ratio is associated with lower equity returns of 12 to 15 percent at the three- and five-year horizons.[14]

Abnormal returns of bank stocks. Is the neglect of crash risk mainly a banking sector phenomenon? We conduct a two-stage analysis to test whether household debt may be more strongly associated with the performance of the banking sector than the market. In the first stage, we estimate the relative performance of banking sector stocks to the overall market. In the second stage, we examine whether past growth in household credit is associated with abnormal bank equity returns.[15]

Panel B of Table 5 reports the regression results of Stage 2, where the forecasting horizon *k* ranges from one to three years. Our results indicate that past three-year growth in the household debt ratio is associated with negative future abnormal returns for the banking sector. The relationship is statistically significant at the two- to three-year horizon. In Columns 2, 4, and 6, the past three-year change in the corporate debt ratio is included as a control variable, and the results remain unaltered. Note that our analysis is restricted to 30 countries only due to data availability. In this subsample of countries, the corporate debt ratio is also negatively (and slightly more strongly) correlated with future banking sector abnormal returns. Hence, these results suggest that neglect of crash risk associated with household debt is indeed a particular concern for the banking sector.

Debt overhang: micro-level evidence. Aggregate private consumption fell more in the aftermath of the crisis in countries which experienced a steeper increase in household debt before the Global Financial Crisis (GFC), while consumption increased modestly in countries with moderate household credit growth (see Figure 3). A similar picture is found in micro-level data (see Figure

4). This suggests that the rise in household debt can give rise to overleveraging and fragilities in the financial system.

Figures 3 here

Figure 4 here

To test whether household indebtedness helps explain the drop in consumption we estimate the following cross-sectional regression at the household level with changes in household food consumption (percent of income) as the dependent variable:

$$\Delta C_{i,2014} = \alpha_c + \beta_1 DTI_{i,2010} + \gamma Controls + \epsilon_i$$

where debt-to-income ratio ($DTI_{i,2010}$) is a proxy for past household indebtedness. Here, household characteristics (such as size of household main residence, employment, education, and age of the reference person) are considered as *Controls.* In addition, the model includes country fixed effects (α_c) and errors are clustered at the country level.[16]

The main finding of Table 6 is that higher indebtedness, proxied by debt-to-income or loan-to-value ratios, makes households more vulnerable to income shocks. This analysis takes into consideration the level of household indebtedness in 2010, right before the European sovereign debt crisis. The negative effects of an exogenous shock on household consumption are intensified when the level of indebtedness exceeds a certain threshold (e.g., total debt more than 300% of household disposable income). In other words, consumption declined more for the most indebted households, often perceived as more financially constrained. In terms of economic magnitude, a 100-percentage point increase DTI ratio translates into a 4 percentage points drop in consumption. However, this magnitude is much larger (about 7 percentage points) for households with total debt more than 300 percent of disposable income. Consistent with Mian et al. (2013), these results confirm the debt overhang channel for the European households in this analysis and support the

macro-level results presented above. Robustness checks reinforce our findings. Even when controlling for household characteristics such as age, size, education, employment and net wealth, and time-invariant country features, these results hold (see Table 6, Columns 5-7).

Table 6 here

Conclusion

This chapter presents evidence to suggest that high growth in household borrowing is negatively associated with economic growth over the medium term over the business cycle. Together, these findings suggest that household debt should be monitored vigilantly and incorporated into financial stability and macroeconomic policy frameworks.

Our results generalize the findings by Mian et al. (2017), who first documented a negative debt-GDP growth relationship for 30 advanced economies. Here we extend the analysis to 80 advanced and emerging market and developing economies spanning 65 years (1950–2016). In terms of the magnitude, a one standard deviation increase in the household debt ratio is, on average, associated with a 1.2 percentage point lower output growth in the following three years. This effect appears stronger for advanced economies than for emerging markets.

We also show that country characteristics such as flexible exchange rates, capital account openness, and higher financial development help mitigate the risks associated with increasing household debt. Our broad sample coverage of 80 countries allows for this in-depth analysis of the role played by institutional factors, relative to earlier studies that used smaller and more homogeneous country samples. We also examine the macro effects of household debt, conditional on micro-household level and country characteristics in a smaller sample. We find that higher participation by low-income households, suggestive of greater financial inclusion, appears to

reduce the negative effect of household debt on medium-term GDP growth, while a higher debt share, potentially reflecting a potential debt overhang effect, is associated with a more negative effect.

Last, we present evidence on three complementary mechanisms through which household indebtedness causes future growth to decline. A household debt increases the probability of banking crises and is associated with neglected crash risk, and distributional characteristics matter. The first mechanism—higher growth in household debt raising the probability of banking crises—is stronger when the level of household debt is above 65 percent of GDP. This proves that economic costs associated with increased household debt are higher in financial crises than during normal downturns. The second mechanism—household debt reflecting neglected crash risk—shows that household credit growth systematically predicts lower bank stock returns (as well as higher probability of bank stock crashes) in the next two to three years. Price corrections originating from such mispricing generally trigger sharp declines in asset prices, increases in risk premiums, and significant reallocation of resources in the economy. The third mechanism—on the importance of distributional characteristics of household debt—reveals differences in marginal propensities to consume across a large set of European households, whereby those with higher financial leverage are more exposed to negative income shocks.

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Endnotes

[1] Monetary policy may also play a role. See Brunnermeier et al. (2017) for US evidence.

[2] These stylized facts are consistent with IMF (2017).

[3] See Alter et al. (2018) for more detail of country coverage, data and sources.

[4] All regressions include lagged GDP growth for the preceding two years as controls. Results are also robust to including the past three-year change in the government debt to GDP ratio.

[5] Assuming the total supply of goods in the economy is determined by the total demand.

[6] We further confirm that this result is not driven by euro-area countries alone. Regression results remain statistically significant at the 10 percent level when the interaction of past household debt growth and the euro area dummy is also included as an additional control.

[7] For a discussion of the distributional aspects of household assets and liabilities in the international context, see Badarinza et al. (2016a, 2016b).

[8] For a different perspective regarding the distributional aspects of household debt, see also Foote et al. (2016) and Albanesi et al. (2017).

[9] For instance, the threshold for HI household debt is considered 65 percent of GDP which represents the top quintile of the country-time distribution of the set of countries included in the regression, and HI sovereign debt indicator takes value 1 when it exceeds 60 percent of GDP, which corresponds to the top-third of the distribution.

[10] As robustness checks, different estimation methods were performed, such as Firth logit, Poisson, and Panel logit, yielding very similar results.

[11] Given that we use models with country fixed effects, these results should be interpreted as deviations from the country averages.

[12] Another way to evaluate these relationships is to compare crisis predictability power, using the Area Under Curve (AUC) metric as in Jorda and Taylor (2011). See Alter et al. (2018) for these additional results.

[13] While we do not directly measure the behavioral bias of household borrowers, Cheng et al. (2014) show that such bias is prevalent even for experienced real estate investors.

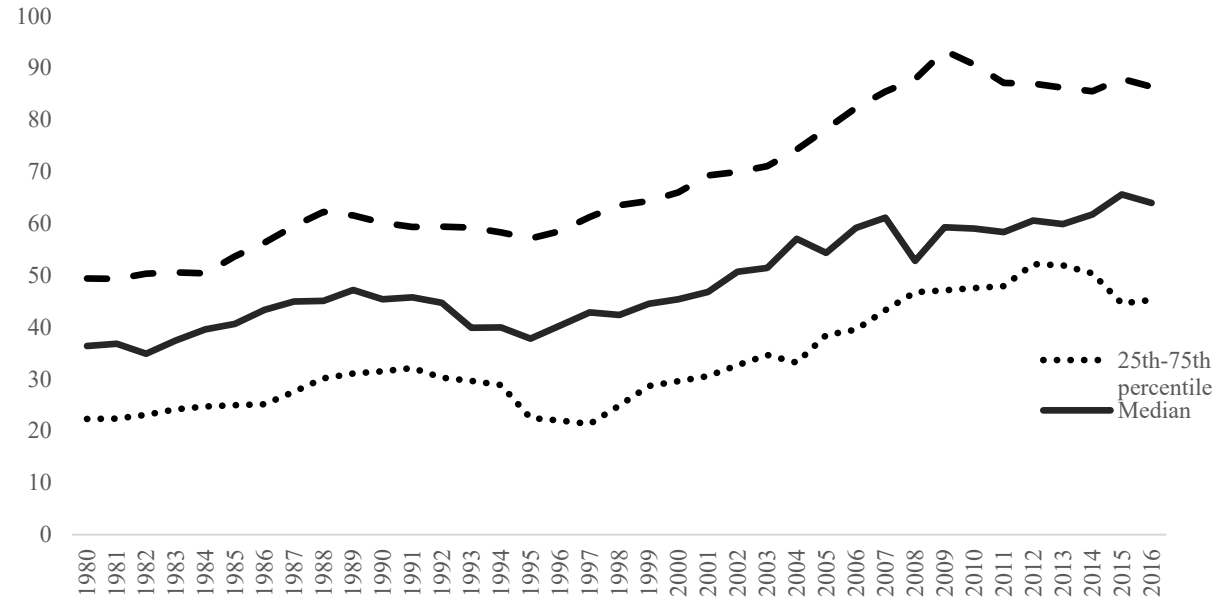
[14] Note that these negative correlations between past household debt ratio and future bank stock returns only consider the deviations from their country averages since country fixed effects are included in all regressions. The correct interpretation of the result is that, for countries that have similar average growth in stock prices and other conditions, the ones experiencing higher household credit growth on average have lower future equity returns than the other countries.

[15] Details of the two-stage regression setup are discussed in Alter et al. (2018).

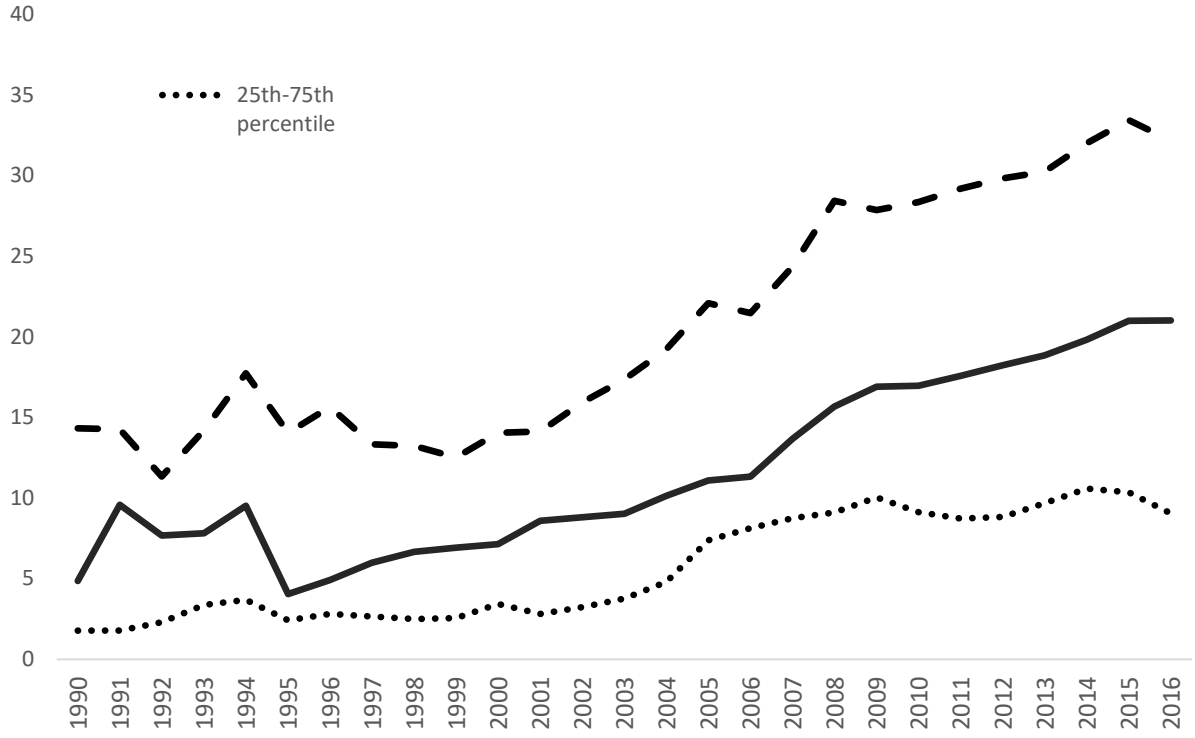
[16] Micro-level longitudinal data for five euro area countries (Belgium, Cyprus, Germany, Malta, the Netherlands) for two consecutive waves (2010 and 2014) with panel dimension are utilized; population weights are considered. There are about 3000 households with borrowing and consumption information.

Figure 1. Household debt: evidence from cross-country panel data (%, unless noted otherwise)

Panel 1: Advanced economies



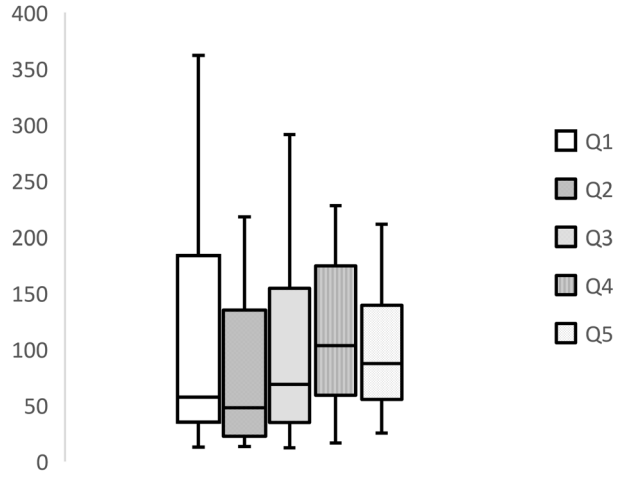
Panel 2: Emerging market economies



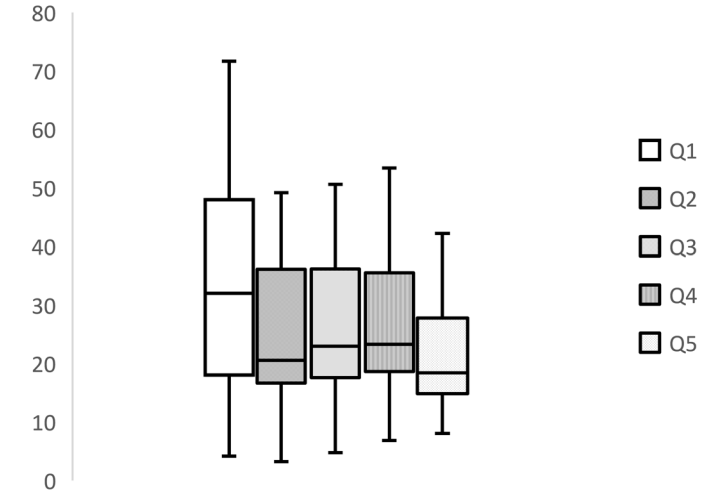
Note: Panels show the cross-country dispersion of household debt-to-GDP ratios.
Source: Authors' calculations based on IMF's October 2017 Global Financial Stability Report.

Figure 2. Household debt: evidence from cross-country micro-level data (% unless notes otherwise

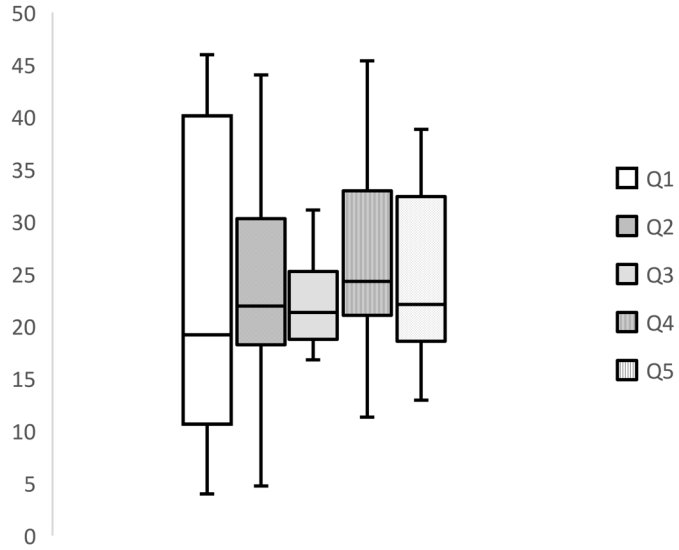
Panel 1: DTI, by income quintile (medians, all borrowers)



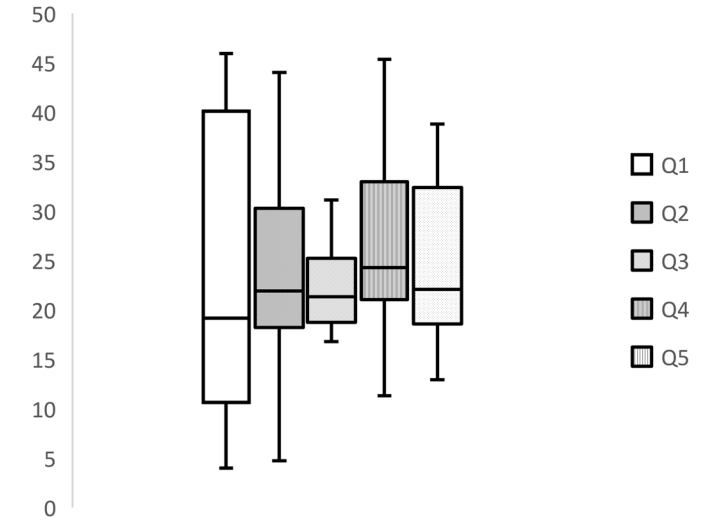
Panel 2: DTA, by income quintile (all borrowers, medians)



Panel 3: LTV, by income quintile (mortgages, medians)



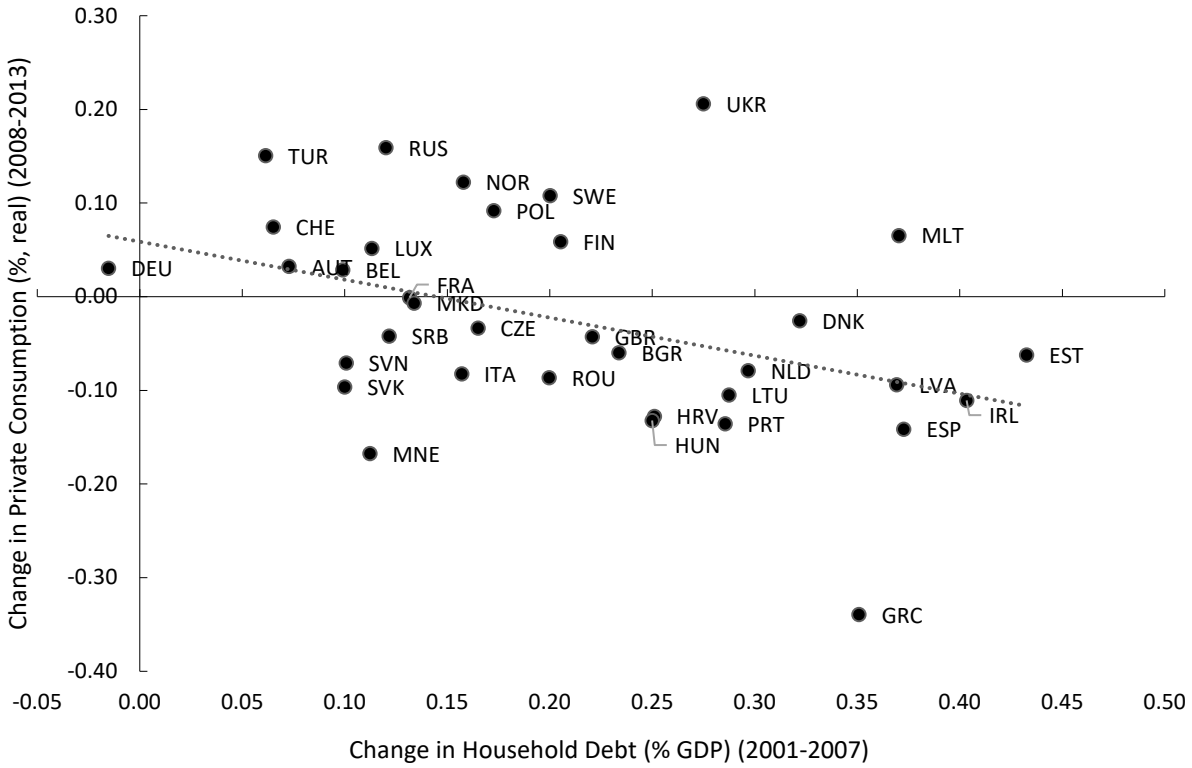
Panel 3: Mortgages (participation rate by income quintile)



Notes: Data refers to 2013 country level household surveys, or latest available. Panels 1-4 show the cross-country dispersion across income quantiles, evaluated at the median for mortgage borrowers (quintile 1 to quantile 5, from lowest to highest income).

Sources: Bank for International Settlements; country panel surveys; Euro Area Housing Finance Network; Luxembourg Wealth Study; Organisation for Economic Co-operation and Development (OECD); US Survey of Consumer Finance; and authors' calculations.

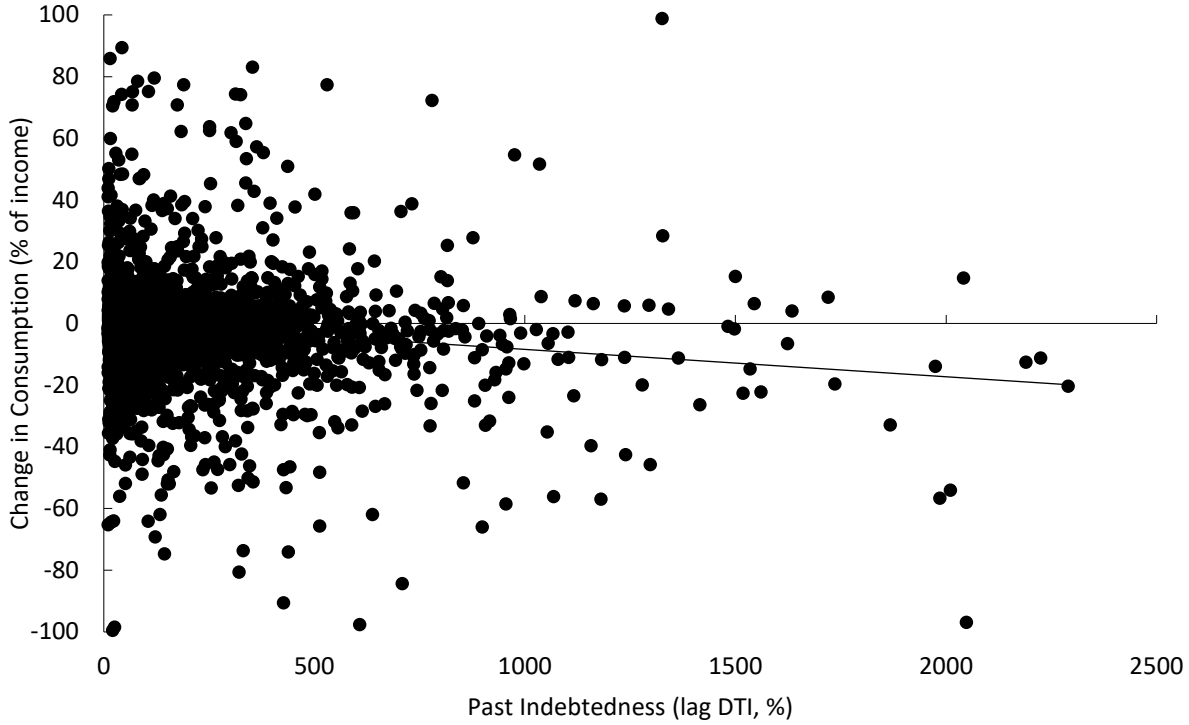
Figure 3. Europe: debt overhang and consumption (macro-level)



Note: This figure depicts the country-level relationship between change in real private consumption after the crisis (2008–2013) and change in household debt (percent of GDP) before the crisis (2001–2007.)

Source: Authors' calculations based on the IMF's October 2017 Global Financial Stability Report.

Figure 4. Euro Area Households: Debt Overhang and Consumption (Micro-level)



Note: This figure depicts the relationship between change in household consumption-to-income ratio and past indebtedness (DTI). Household survey data from euro area countries with a panel dimension (Belgium, Cyprus, Germany, Malta, the Netherlands) are considered. The change in consumption-to-income ratio is computed over 2010–2014. DTI = debt-to-income ratio.

Source: Authors' calculations based on the euro area Household Finance and Consumption Survey of 2010 and 2014.

Table 1. Summary statistics

	N	Mean	SD	p10	p25	p50	p75	p90
HHD/GDP	2299	35.4	27.4	6.02	13.4	30.0	51.0	72.4
Δ (HHD/GDP)	2184	1.02	2.56	-1.39	-0.22	0.84	2.19	3.94
Δ3 (HHD/GDP)	2024	3.22	5.89	-2.75	0.01	2.76	6.13	10.45
CD/GDP	2257	60.8	48.8	16.7	28.4	53.9	81.0	109.0
Δ (CD/GDP)	2142	0.97	9.51	-4.15	-1.20	0.75	3.00	5.96
Δ3 (CD/GDP)	1982	2.98	18.97	-7.46	-2.06	2.43	7.04	13.15
PD/GDP	2247	96.4	66.6	25.8	47.3	84.9	130.6	177.2
Δ (PD/GDP)	2167	1.99	10.22	-4.71	-0.99	1.77	4.53	8.79
GD/GDP	2807	51.9	90.7	15.0	26.8	42.1	65.1	89.4
Δ (GD/GDP)	2727	0.15	5.85	-5.90	-2.27	-0.04	2.65	6.19
Δ ln(RGDP)	4190	3.66	5.00	-0.75	1.83	3.96	6.12	8.39
Δ3 ln(RGDP)	4030	11.19	11.09	0.87	6.27	11.53	16.98	22.58
Δ ln(RPVC)	3347	3.42	6.39	-1.78	1.13	3.40	6.09	9.50
Δ (PVC/GDP)	3413	-0.48	9.14	-2.37	-0.97	-0.04	0.76	2.14
Δ ln (RHP)	1629	1.78	9.68	-8.08	-2.28	1.83	6.02	11.62
Δ3 UNEMP	2766	0.002	0.027	-0.025	-0.010	0.000	0.012	0.031
Δ3 INT	2278	-0.03	0.57	-0.07	-0.03	-0.01	0.01	0.03
Δ3 REER	2662	-0.00	0.20	-0.17	-0.07	0.00	0.08	0.15
INT, %	2501	15.70	54.63	4.21	6.08	9.20	14.81	25.80
KA OPEN	2983	0.47	1.58	-1.38	-1.19	0.13	2.39	2.39
FIN DEV	2755	0.39	0.24	0.11	0.21	0.35	0.55	0.74
FIN RISK	2455	35.91	10.24	25.5	33	38	42	46
TRANSPAR	127	0.8189	0.3866	0	1	1	1	1
INC HIGH 20	811	45.57	8.389	36.5	39.17	42.54	51.4	58.88
INC LOW 20	811	6.40	2.32	3.17	4.52	6.7	8.3	9.28
BNK CRISIS	5360	0.016	0.126	0	0	0	0	0
BNK RET 1YR	1768	6.20	43.82	-37.06	-12.65	6.13	27.43	49.66
BNK RET 3YR	1630	19.78	75.36	-56.56	-13.85	18.48	57.94	100.12
BNK RET 5YR	1492	32.05	101.29	-63.42	-12.40	34.55	81.38	134.11
AB RET 3YR	4095	-3.99	51.20	-57.47	-23.99	-0.33	22.52	48.16

Note: This table presents summary statistics of the variables used, following Alter et al. (2018). Log changes and ratios are reported in percentages or percentage points. Δ and Δ3 denote to one-year and three-year changes. The variables HHD/GDP, CD/GDP, PD/GDP, GD/GDP, RGDP, RPVC, PVC/GDP, RHP, UNEMP, INT, REER, KA OPEN, FIN DEV, FIN RISK, TRANSPAR, INC HIGH 20, INC LOW 20, BNK CRISIS, BNK RET 1YR, BNK RET 3YR, BNK RET 5YR and AB RET 3YR denote household debt to GDP, non-financial firm debt to GDP, government debt to GDP, real GDP, real private consumption, private consumption to GDP, real house prices, unemployment rate, short-term interest rates, real effective exchange rates, capital account openness, financial development, financial risk index, credit bureau availability, income share of the richest 20 percent, income share of the poorest 20 percent, systemic bank crisis

dummy, bank stock return one year ahead, bank stock return three years ahead, bank stock return five years ahead, and abnormal return three years ahead. N = number of observations; p10, p25, p75, p90 = 10th, 25th, 75th, and 90th percentile; p50 = median.

Source: Authors' Calculations

Table 2. Household debt and future GDP growth

Panel A. All countries in the analysis

	(1)	(2)	(3)	(4)	(5)	(6)	(7)
Dependent Variable:	$\Delta_3 y_{i,t}$	$\Delta_3 y_{i,t+1}$	$\Delta_3 y_{i,t+2}$	$\Delta_3 y_{i,t+3}$	$\Delta_3 y_{i,t+4}$	$\Delta_3 y_{i,t+5}$	$\Delta_3 y_{i,t+6}$
$\Delta_3 hhd_{i,t-1}$	-0.035**	-0.112***	-0.180***	-0.211***	-0.185***	-0.146***	-0.122***
	(0.016)	(0.039)	(0.053)	(0.058)	(0.055)	(0.045)	(0.044)
$\Delta_3 fd_{i,t-1}$	-0.010***	0.021***	-0.030***	-0.026***	-0.012	0.014	0.051*
	(0.002)	(0.004)	(0.007)	(0.008)	(0.011)	(0.018)	(0.026)
N	1,903	1,823	1,743	1,663	1,583	1,503	1,421
Number of Countries	80	80	80	80	80	80	78
Country Fixed Effects	Y	Y	Y	Y	Y	Y	Y
Year Fixed Effects	Y	Y	Y	Y	Y	Y	Y
R^2	0.88	0.65	0.42	0.41	0.40	0.41	0.42

Panel B. Advanced Economies and Emerging Markets

	(1)	(2)	(3)	(4)	(5)	(6)	(7)	(8)
	Advanced Economies				Emerging Markets			
Dependent Variable:	$\Delta_3 y_{i,t+1}$	$\Delta_3 y_{i,t+3}$	$\Delta_3 y_{i,t+5}$	$\Delta_3 y_{i,t+7}$	$\Delta_3 y_{i,t+1}$	$\Delta_3 y_{i,t+3}$	$\Delta_3 y_{i,t+5}$	$\Delta_3 y_{i,t+7}$
$\Delta_3 hhd_{i,t-1}$	-0.081**	-0.207***	-0.146***	-0.037	-0.156*	-0.111	-0.024	-0.249**
	(0.036)	(0.064)	(0.054)	(0.047)	(0.085)	(0.138)	(0.093)	(0.100)
$\Delta_3 fd_{i,t-1}$	-0.021***	-0.020***	0.026^{+}	0.054**	-0.087**	-0.064	-0.062	0.048
	(0.003)	(0.007)	(0.017)	(0.023)	(0.038)	(0.045)	(0.053)	(0.064)
N	1,203	1,125	1,047	969	620	538	456	374
Number of Countries	39	39	39	39	41	41	41	39
Country Fixed Effects	Y	Y	Y	Y	Y	Y	Y	Y
Year Fixed Effects	Y	Y	Y	Y	Y	Y	Y	Y
R^2	0.71	0.49	0.47	0.47	0.62	0.41	0.43	0.48

Note: This table presents results from estimating $\Delta_3 y_{i,t+k} = \alpha_i + \beta_1 \Delta_3 hhd_{i,t-1} + \beta_2 \Delta_3 fd_{i,t-1} + \delta_t + u_{i,t+k}$ for $k = 0, \ldots, 6$. All regressions control for country and time fixed effects, and lagged GDP growth for the preceding two years. Standard errors are dually clustered on country and year. ***, **, *, indicate statistical significance at the 1 percent, 5 percent, and 10 percent levels. Panel A

presents the results based on all countries analyzed. Panel B splits the sample into Advanced Economies and Emerging Markets. Sample is an unbalanced panel between 1950 and 2016 at an annual frequency.

Source: Authors' Calculations

Table 3. The role of institutional factors, policies, and household-level debt characteristics

	(1)	(2)	(3)	(4)	(5)	(6)	(7)	(8)	(9)
	Institutional Factors and Policies						Household-level Debt Characteristics		
$\Delta_3 hhd_{i,t-1}$	-0.058	0.029	0.056	-0.289***	-0.261*	-0.273***	-0.303***	-0.258**	-0.251**
	(0.043)	(0.073)	(0.076)	(0.074)	(0.150)	(0.067)	(0.088)	(0.106)	(0.117)
$\Delta_3 hhd_{i,t-1} \times FIXED$	-0.247**		-0.223**						
	(0.100)		(0.104)						
$\Delta_3 hhd_{i,t-1} \times KAOPEN$		-0.250**	-0.184*						
		(0.108)	(0.108)						
$\Delta_3 hhd_{i,t-1} \times FINDEV$				0.243**					
				(0.101)					
$\Delta_3 hhd_{i,t-1} \times TRANSPAR$					0.158^{+}				
					(0.102)				
$\Delta_3 hhd_{i,t-1} \times FINRISK$						0.122*			
						(0.074)			
$\Delta_3 hhd_{i,t-1} \times LowIncPart$							0.272***		
							(0.106)		
$\Delta_3 hhd_{i,t-1} \times LowDTI$								0.222	0.216
								(0.143)	(0.147)
$\Delta_3 hhd_{i,t-1} \times EM$									-0.086
									(0.170)
N	1,503	1,333	1,333	1,503	1,285	1,126	835	784	784
Number of Countries	80	77	77	80	68	76	30	25	25
R^2	0.42	0.36	0.37	0.42	0.42	0.37	0.53	0.54	0.54

Note: This table presents results from $\Delta_3 y_{i,t+5} = \alpha_i + \beta_1 \Delta_3 hhd_{i,t-1} + \beta_2 \cdot \Delta_3 hhd_{i,t-1} \times IF_i + \beta_3 X_{i,t-1} + \delta_t + u_{i,t+k}$ where IF_i is the dummy variable for institutional factors, including fixed exchange rate regime (*FIXED*), high capital account openness (*KAOPEN*), high financial development (*FINDEV*), transparency of consumer credit (*Transparency*), high low-income households mortgage participation (*LowIncPart*), low financial risk (*FINRISK*), low debt-to-income of low-income households (*LowDTI*), and emerging market economies (*EM*). *FIXED* = 1 if the country has a fixed exchange rate regime. *KAOPEN* = 1 if financial openness index is higher than the median. *FINDEV* = 1 if the Financial Development Index is within the top 25 percent of countries as of 2014. *Transparency* = 1 if consumer credit transparency index is 1. *LowIncPart* = 1 if the mortgage participation rate for the bottom 4 percent of households in the income distribution is within the top 25 percent of countries in the most recent year where data are available. *FINRISK* = 1 if financial risk rating is above the median (higher rating indicates less risk). *LowDTI* = 1 if the weighted debt-to-income ratio for the bottom 40 percent of households (mortgage borrowers) in the income distribution is within the lower 25 percent of countries in the most recent year where data are available. In the regressions for *FIXED* and *KAOPEN*, the indicator itself is included as a control variable. All regressions also

include past growth in non-financial corporate debt ($\Delta_3 fd_{i,t-1}$), country and time fixed effects, and lagged GDP growth for the preceding two years. Standard errors are dually clustered on country and year. ***, **, * indicate statistical significance at the 1 percent, 5 percent, and 10 percent levels.

Source: Authors' calculations.

Table 4. Probability of systemic banking crisis

Dependent variable:	(1)	(2)	(3)	(4)	(5)	(6)	(7)
	Systemic Banking Crises						
hhd	4.037***		2.501***	1.270	1.727	2.091	2.479
	(0.783)		(0.925)	(1.276)	(1.384)	(1.716)	(1.760)
Δ*hhd*		40.05***	35.01***	35.60***	31.25***	30.86***	26.47***
		(6.482)	(6.334)	(7.161)	(7.310)	(8.451)	(8.726)
fd				0.879	0.974	0.536	0.647
				(0.761)	(0.690)	(0.743)	(0.689)
Δfd				13.13***	12.64***	15.62***	15.33***
				(3.954)	(3.706)	(4.220)	(3.900)
Δ*hhd* x I(*Hi Gov Debt*)					22.62*		24.12*
					(12.49)		(12.44)
I(*Hi Gov Debt*)					-0.644		-0.739
					(0.602)		(0.669)
Δ*hhd* x I(*Hi hhd)*						24.41*	25.93*
						(14.11)	(13.43)
I(*Hi hhd*)						-1.355	-1.346
						(0.896)	(0.832)
Constant	-5.949***	-3.741***	-5.465***	-5.224***	-5.517***	-5.253***	-5.534***
	(0.594)	(0.150)	(0.681)	(0.732)	(0.800)	(0.902)	(0.944)
N	1,223	1,033	1,033	1,020	1,020	1,020	1,020
COU Cluster	Y	Y	Y	Y	Y	Y	Y
COU FE	Y	Y	Y	Y	Y	Y	Y
AUC	0.700	0.791	0.806	0.840	0.845	0.850	0.856
No of Crises	46	37	37	37	37	37	37
Countries	40	34	34	34	34	34	34
Preudo R^2	0.0612	0.142	0.153	0.204	0.212	0.218	0.228

Note: This table presents results from estimating a logit panel as follows: $log\frac{P[S_{it}=1|X_{it}]}{P[S_{it}=0|X_{it}]} = \Psi_{0i} + \Psi_1 X_{it} + \Psi_2 X_{it}$ x I(Hi Debt)$_{it} + \epsilon_{it}$; where S_{it} is the banking crisis dummy variable. hhd and Δhhd are level and first difference in household debt-to-gdp ratio. fd and Δfd are level and first difference in non-financial corporate debt-to-gdp ratio. High household debt I(Hi hhd) is a dummy variable which takes value 1 if level of household debt exceeds 65 percent of GDP, representing the top quintile of the distribution. High government debt I(Hi Gov Debt) is a dummy variable with threshold set at 60 percent of GDP, representing the top third of the distribution. All independent variables are lagged. The third lag of household debt change is utilized, based on explanatory power and robustness presented in Table 5a. Banking crises are taken from the updated database by Laeven and Valencia (2013). AUC stands for area under curve. Country fixed effects (COU FE) are considered. Errors are clustered at the country level. ***, **, *, indicate statistical significance at the 1 percent, 5 percent, and 10 percent levels.

Source: Authors' calculations.

Table 5. Bank equity returns and crashes

Panel A. Future Bank Stock Returns

	(1)	(2)	(3)	(4)	(5)	(6)
	$k = 1$		$k = 3$		$k = 5$	
$\Delta_3 hhd_{c,t}$	-0.020*	-0.027**	-0.120***	-0.113***	-0.159***	-0.123***
	(0.011)	(0.013)	(0.032)	(0.037)	(0.050)	(0.055)
$\Delta_3 fd_{c,t}$		-0.029		-0.106*		-0.183**
		(0.021)		(0.053)		(0.071)
$hhd_{c,t-3}$		-0.398**		-0.695		-0.640
		(0.189)		(0.433)		(0.669)
$fd_{c,t-3}$		-0.010		-0.117		-0.234
		(0.092)		(0.233)		(0.355)
COU FE	Y	Y	Y	Y	Y	Y
Year FE	Y	Y	Y	Y	Y	Y
N	1,488	1,319	1,348	1,319	1,208	1,179
Countries	70	70	70	70	70	70
R^2	0.27	0.36	0.34	0.36	0.36	0.37

Panel B. Abnormal Returns for Bank Stocks

	(1)	(2)	(3)	(4)	(5)	(6)
	$k = 1$		$k = 3$		$k = 5$	
$\Delta_3 hhd_{c,t}$	-0.049	0.003	-0.228***	-0.145*	-0.289*	-0.289***
	(0.063)	(0.069)	(0.079)	(0.083)	(0.090)	(0.097)
$\Delta_3 fd_{c,t}$		-0.198**		-0.401***		-0.479***
		(0.081)		(0.098)		(0.114)
$hhd_{c,t-3}$		-0.081		-0.503***		-0.723***
		(0.112)		(0.134)		(0.161)
$fd_{c,t-3}$		-0.130		-0.187		-0.239
		(0.104)		(0.125)		(0.151)
COU FE	Y	Y	Y	Y	Y	Y
N	723	723	722	722	693	693
Countries	30	30	30	30	30	30
R^2	0.00	0.02	0.02	0.08	0.04	0.11

Note: This table presents the relationship between past household debt growth and future bank stock returns (Panel A) and between past household debt growth and future abnormal returns for bank stocks (Panel B). Abnormal returns are defined as the Capital Asset Pricing Model (CAPM) residuals. Market betas are estimated for each country in each year based on past quarterly stock price data to avoid using unknown information at the time. Forecasting horizon *k* ranges from one to five years. Country fixed effects (COU FE) are considered in both panels, and year fixed effects in Panel A. Standard errors are clustered at the country level. ***, **, *, indicate statistical significance at the 1 percent, 5 percent, and 10 percent levels.

Source: Authors' Calculations

Table 6. Euro area: household debt overhang

Dependent Variable:	Change in Consumption to Income Ratio						
	(1)	(2)	(3)	(4)	(5)	(6)	(7)
DTI (lag)	-0.0396***		-0.0404***		-0.0401***		-0.0152*
	(0.00235)		(0.00183)		(0.00226)		(0.00619)
LTV (mortgages, lag)		-0.123***		-0.128**		-0.131***	
		(0.0218)		(0.0302)		(0.0154)	
DTI x I(DTI>300) (lag)							-0.0537***
							(0.00816)
I(DTI>300) (lag)							26.32***
							(2.010)
Size of household main residence					0.0294**	-0.0506*	0.0200*
					(0.00694)	(0.0173)	(0.00779)
Education of reference person					0.986***	0.557	0.721***
					(0.0584)	(2.923)	(0.108)
Age of reference person					0.110	0.116	0.132**
					(0.0469)	(0.0720)	(0.0264)
Unemployment					-4.096	10.59	-3.451
					(3.693)	(8.163)	(3.114)
Constant	0.840*	-3.417***	0.348	25.44**	-11.54**	21.59**	-13.32**
	(0.333)	(0.377)	(1.429)	(6.631)	(3.487)	(4.775)	(2.627)
N	2,925	699	2,925	699	2,744	656	2,744
R^2	0.102	0.059	0.103	0.113	0.109	0.133	0.142
COU FE	Y	Y	Y	Y	Y	Y	Y
Net Wealth dummy	Y	Y	Y	Y	Y	Y	Y
Cluster Country	Y	Y	Y	Y	Y	Y	Y

Note: This table presents the relationship between past household indebtedness and changes in consumption to income ratio in a cross-section of euro area households. DTI = debt-to-income ratio; LTV = loan-to-value ratio; I(DTI>300) is a dummy variable which takes value 1 if DTI exceeds 300 percent, and 0 otherwise. All regressions include country fixed effects (COU FE) and household net wealth dummies. Country-clustered robust errors in parentheses. ***, **, *, indicate statistical significance at the 1 percent, 5 percent, and 10 percent levels. Source: Authors' calculations.