Summary

Although finance is generally believed to contribute to long-term economic growth, recent studies have shown that the growth benefits start declining when aggregate leverage is high. At business cycle frequencies, new empirical studies—as well as the recent experience from the global financial crisis—have shown that increases in private sector credit, including household debt, may raise the likelihood of a financial crisis and could lead to lower growth.

Globally, household debt has continued to grow in the past decade. This chapter takes a comprehensive look at the relationship between household debt, growth, and financial stability across a sample of 80 advanced and emerging market economies. Besides aggregate macro-level analysis, the chapter also delves into micro-level data on individual household borrowing to shed additional light on how household indebtedness affects growth and stability at the aggregate level.

The chapter finds that there is a trade-off between the short-term benefits of rising household debt to growth and its medium-term costs to macroeconomic and financial stability. In the short term, an increase in the household debt-to-GDP ratio is typically associated with higher economic growth and lower unemployment, but the effects are reversed in three to five years. Moreover, higher growth in household debt is associated with a greater probability of banking crises. These adverse effects are stronger when household debt is higher and are therefore more pronounced for advanced than for emerging market economies, where household debt and credit market participation are lower.

However, country characteristics and institutions can mitigate the risks associated with rising household debt. Even in countries where household debt is high, the growth-stability trade-off can be significantly mitigated through a combination of sound institutions, regulations, and policies. For example, better financial regulation and supervision, less dependence on external financing, flexible exchange rates, and lower income inequality would attenuate the impact of rising household debt on risks to growth.

Overall, policymakers should carefully balance the benefits and risks of household debt over various time horizons while harnessing the benefits of financial inclusion and development.

Introduction

Considerable attention has been paid to household debt since the global financial crisis as it has continued to grow in a wide range of countries (Figure 2.1). The median household debt-to-GDP ratio among emerging market economies increased from 15 percent in 2008 to 21 percent in 2016, and among advanced economies it increased from 52 percent to 63 percent over the same period. At the same time, in the highest quartile, the household debt-to-GDP ratio fell only slightly from 88 percent to 86 percent in advanced economies and continued to rise from 28 percent to 32 percent in emerging market economies. While this increase reflects to some extent the intended effects of expansionary monetary policy, central banks in various advanced and emerging market economies have recently warned against the financial stability risks of high household debt and high debt-to-income ratios when inflation and wage growth are low (see, for example, Reserve Bank of Australia 2017, Bank of Canada 2017, Bank of England 2017, South African Reserve Bank 2017, and Banco Central de Chile 2017).

Household debt and access to credit can help boost demand and build personal wealth, but high indebtedness can also be a source of financial vulnerability. According to the permanent income hypothesis, higher debt indicates higher expected income. It also allows households to make large investments in housing and education and helps smooth consumption over time. In other words, debt allows households to acquire goods and services now and repay gradually, through higher (anticipated) income. In the long term, higher private sector credit supports economic growth (Beck, Levine, and Loayza 2000) although the precise link between growth and household debt is more elusive (Beck and others 2012). Nonetheless, even if positive in the long term, high household indebtedness can cause significant debt overhang problems when a country unexpectedly faces extreme negative shocks. The experience of the global financial crisis suggests that high household debt can be a source of financial vulnerability and lead to prolonged recessions (Mian and Sufi 2011). Broader cross-country studies also indicate that increases in

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Figure 2.1. Household Debt-to-GDP Ratio in Advanced and Emerging Market Economies
(Percent)
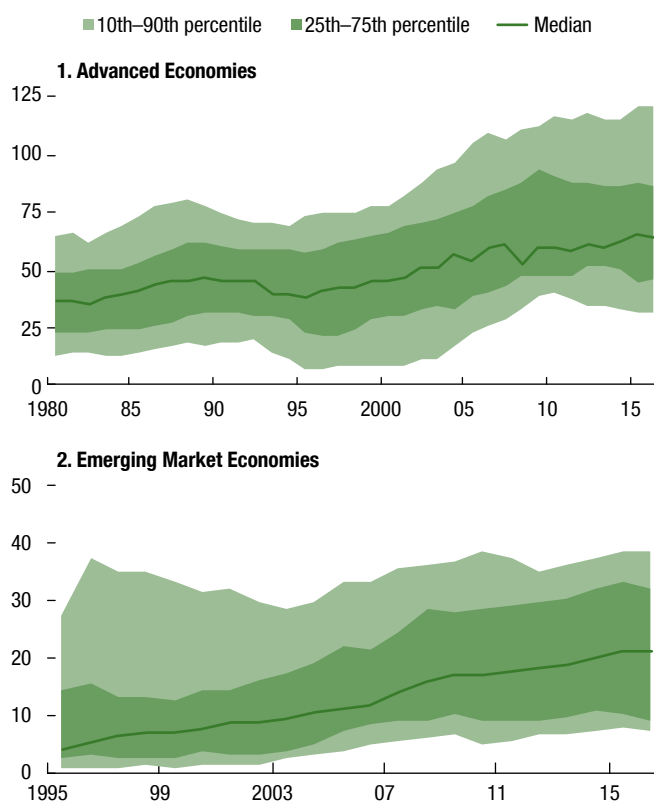
Source: IMF staff calculations.
Note: Panels show the cross-country dispersion of household debt-to-GDP ratios. See Annex 2.1 for sample coverage.

household debt may predict lower future income growth and financial crises in the medium term (Mian, Sufi, and Verner, forthcoming; Jordà, Schularick, and Taylor 2016). As household borrowing increases the economy grows quickly in the short term but becomes highly leveraged. In this situation, a macroeconomic shock may increase unemployment and reduce output in the medium term because of financial disruptions or nominal rigidities (for example, downward wage rigidity, a zero lower bound on interest rates, or fixed exchange rates) that may prevent full adjustment to the shock.

The macroeconomic and financial risks arising from increasing household debt may not be equally important across countries at different stages of development and with different financial and institutional characteristics. Emerging market economies may be less prepared to deal with the consequences of a household deleveraging process because of limited institutional capacity. For exam-

ple, lack of effective personal bankruptcy regimes may prevent households and lenders from efficiently dealing with debt overhang. On the other hand, household debt is lower in emerging market economies than in advanced economies reflecting a higher prevalence of financial frictions that reduce households' access to debt. The balance between more financially and institutionally developed economies' ability to deal with the consequences of higher household debt and the higher debt resulting from those very characteristics will likely determine the effect of household debt on economic growth and financial stability immediately and over the medium term.

This chapter takes a comprehensive look at the relationship between household debt, macroeconomic performance, and financial stability across a broad sample of countries. It largely abstracts from the long-term considerations related to financial inclusion and financial access and focuses instead on the short- to medium-term consequences of household debt increases. It does so using a larger sample of advanced and emerging market economies than hitherto investigated to shed new light on the conditions under which household debt increases are more likely to predict subpar macroeconomic performance, large economic downturns, and financial crises.[1] Furthermore, it also explores micro-level data based on national surveys for selected countries to document a series of stylized facts and the underlying mechanisms behind the aggregate results. Specifically, the chapter aims to answer the following questions:

- How strongly is household debt aligned with future GDP growth and consumption? Does the pattern differ between advanced and emerging market economies? Does the relationship depend on the institutional context, such as the terms of household debt contracts and various institutional factors?
- At the individual household level, what role do income differences play in household borrowing and consumption decisions? Is the household debt-to-income ratio very different across income groups and countries?
- How strongly is an increase in household debt associated with the probability of financial crises? Does household debt represent a neglected crash risk?
- What are the implications for macroprudential and other policies?

[1]See Chapter 3 of the April 2012 *World Economic Outlook* for an earlier analysis of household debt, Chapter 3 of the April 2011 *Global Financial Stability Report* for an analysis of housing finance and financial stability, and the October 2016 *Fiscal Monitor* for an analysis of private versus public sector debt.

The main findings are as follows:
- *On average, an increase in household debt boosts growth in the short term but may give rise to macroeconomic and financial stability risks in the medium term.* Real GDP initially reacts positively to increases in household debt, as do consumption, employment, and house and bank equity prices. However, after one or two years, the dynamic relationship between debt, GDP, consumption, employment, housing, and bank equity prices turns negative. Higher household debt is associated with a greater probability of a banking crisis, especially when debt is already high, and with greater risk of declines in bank equity prices.
- *But the negative medium-term consequences of increases in household debt are more pronounced for advanced than for emerging market economies.* In the latter, the short-term positive relationships between household debt and GDP growth, consumption, and employment are stronger and the negative medium-term association with these variables is weaker. These relationships are explained by the lower average household debt and credit market participation in emerging markets, which may mean narrower and less costly deleveraging from a macro perspective. Or it may imply less room for overborrowing at the aggregate level in countries where other financial frictions constrain access to debt for a larger share of the population.
- *Country characteristics and the institutional setting play an important role.* These negative medium-term effects are reinforced when household debt is high in countries with more open capital accounts and fixed exchange rates, whose financial systems are less developed, and where transparency and consumer financial protection regulation is absent, quality of supervision is lower, and income inequality is larger. While these characteristics are more prevalent in emerging market economies, the lower initial levels of household debt in this group compensate for their amplifying effect for the average emerging market economy in the sample. Nonetheless, these results show that the overall consequences of household debt increases may vary importantly across countries and can be beneficial, even at high levels of debt, when the right mix of policies and institutions is in place.
- *Lower-income groups tend to be more vulnerable.* Household surveys confirm that, within countries, the share of lower-income households in total debt has grown. These households typically have higher

debt-to-income, higher debt-service-to-income, and higher debt-to-assets ratios, which makes them more vulnerable to adverse shocks than higher-income households.

- *Macroprudential tools are useful.* Macroprudential tools that target credit demand, such as restrictions on loan-to-value and debt-to-income ratios, seem to help constrain the growth in household credit.

The remainder of the chapter is organized as follows: The chapter first lays out a conceptual framework for household debt and macro-financial stability. It then describes some general developments in household debt, both from a macro and a micro (disaggregated) perspective. Next, it turns to empirical analysis of financial stability risks posed by household debt and the comovement between household debt, income, and consumption for both advanced and emerging market economies. The findings of the chapter lead to questions about the regulatory framework that influences household debt decisions and risk taking, which are addressed subsequently. The last section concludes and presents relevant policy implications.

How Does Household Debt Affect Macroeconomic and Financial Stability?

This section discusses some of the key models and mechanisms through which changes in household debt affect the macroeconomy and financial stability. First, it reviews some long-term relationships between household debt and growth. Next, it discusses the permanent income theory and some alternative models that yield different effects.

Higher financial inclusion and financial development can have positive effects on long-term growth, but the relationship between household debt and long-term growth is more elusive. Extensive literature has documented that financial development and the corresponding increase in private credit by both firms and households lead to higher growth (Levine 1998; Beck and Levine 2004, among others). However, the link between household debt and long-term growth has been more elusive, with earlier papers arguing that the growth consequences of household debt depend on the use of borrowed resources, and more recent evidence finding a weak relationship between household debt and GDP growth.[2]

More recently, Arcand, Berkes, and Panizza (2015) and Sahay and others (2015b) find that when private sector debt reaches a certain level, the positive effects on per capita growth start to decline, which they relate to the diversion of resources from productive sectors and to rising financial stability risks when the economy becomes highly leveraged (see Box 2.1 for further discussion and a direct analysis of the long-term relationship between household debt and growth).

At the business cycle frequency, the permanent income theory argues that household debt has beneficial effects on the macroeconomy and on financial stability. Households that anticipate an increase in future income will increase their debt to smooth their consumption or make large investments in nonfinancial assets or education (Friedman 1957; Hall 1978).[3] A smoother intertemporal consumption pattern improves household welfare and contributes to macroeconomic stability, while credit and asset markets accommodate the financing needs of households (Uribe and Schmitt-Grohé 2017). As such, household debt also enhances financial stability.
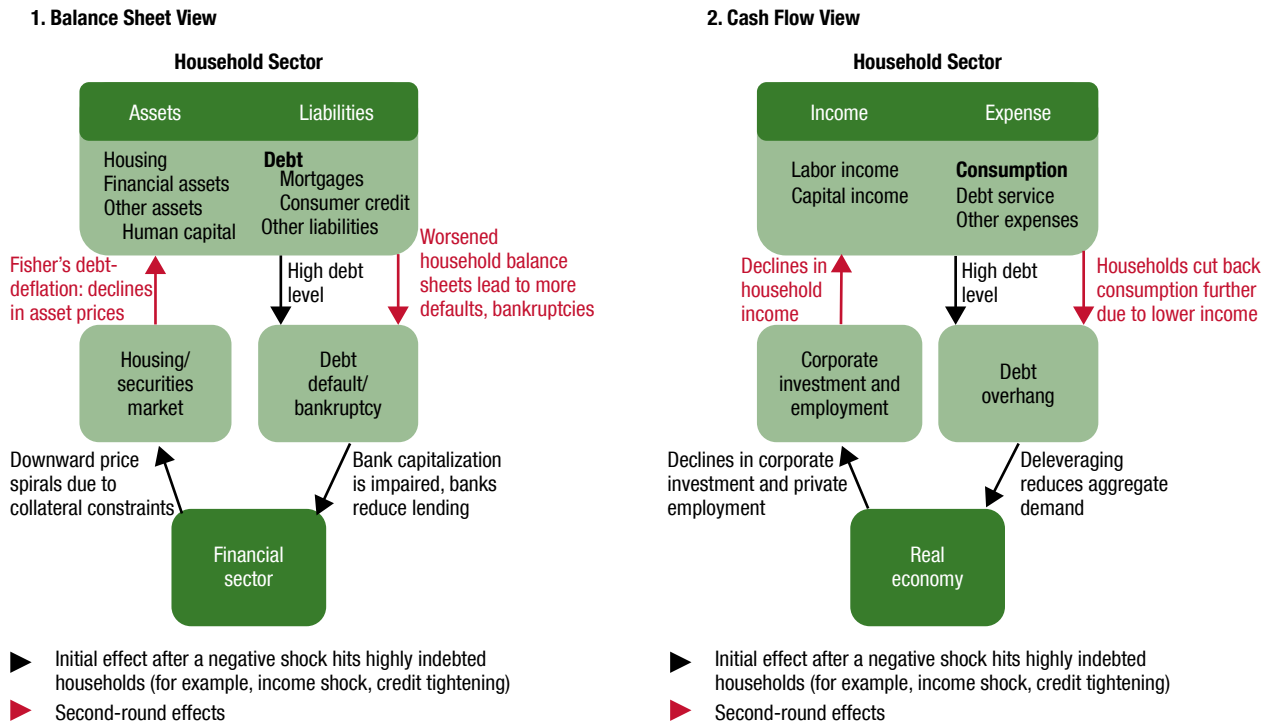
But newer theories and empirical evidence show that the relationship between household debt and macro-financial stability can also be negative. More recent consumption and debt theories relax some of the assumptions of the permanent income model and consider the consequences of borrowing constraints, negative externalities, and behavioral biases.[4] These

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[2]For the earlier papers on the conditional relationship between some proxies of household debt and growth, see Jappelli and Pagano 1994 and De Gregorio 1996. For recent analyses that directly

consider measures of household debt finding statistically insignificant relationships to long-term growth, see Beck and others 2012; Angeles 2015; and Sahay and others 2015a.

[3]In this context, demographics and the distribution of income and debt matter. Younger households that anticipate future income growth would borrow more against their future income (Blundell, Browning, and Meghir 1994). Rajan (2010) and Kumhof, Rancière, and Winant (2015) have argued that increased income and wealth inequality led to the rapid growth of household debt in the United States and eventually to the financial crisis in 2008. Coibion and others (2017) find that, over the period 2001–12, income inequality may have indirectly operated as a screening device for banks, given that they lend less to low-income households in high-inequality regions in the United States.

[4]Market incompleteness may also play a role in households' borrowing and saving decisions. Sheedy (2014) argues that financial contracts are typically not contingent on all possible future events. Because households do not have access to insurance against future risks that could affect their ability to repay debt, the bundling together of borrowing and a transfer of risk are inefficient. In the same vein, Deaton (1991), Carroll (1992), and Aiyagari (1994) argue that households may maintain a "buffer stock" of precautionary savings to smooth out future consumption. This suggests that debt may have a more limited role for macro-financial stability.

Figure 2.2. First- and Second-Round Effects of the Buildup of Household Debt on Financial Stability

1. Balance Sheet View

Household Sector

Assets	Liabilities
Housing Financial assets Other assets Human capital	**Debt** Mortgages Consumer credit Other liabilities

Fisher's debt-deflation: declines in asset prices

High debt level

Worsened household balance sheets lead to more defaults, bankruptcies

Housing/ securities market

Debt default/ bankruptcy

Downward price spirals due to collateral constraints

Bank capitalization is impaired, banks reduce lending

Financial sector

▶ Initial effect after a negative shock hits highly indebted households (for example, income shock, credit tightening)

▶ Second-round effects

2. Cash Flow View

Household Sector

Income	Expense
Labor income Capital income	**Consumption** Debt service Other expenses

Declines in household income

High debt level

Households cut back consumption further due to lower income

Corporate investment and employment

Debt overhang

Declines in corporate investment and private employment

Deleveraging reduces aggregate demand

Real economy

▶ Initial effect after a negative shock hits highly indebted households (for example, income shock, credit tightening)

▶ Second-round effects

Source: IMF staff.
Note: This figure depicts the interactions between household debt, the financial sector, and the real economy. The balance sheet view (panel 1) shows assets and liabilities (debt) at the household level, whereas the cash flow view (panel 2) shows household income and expenses in the form of consumption and debt service. The two main channels through which household debt and consumption interact are deleveraging and debt overhang. Debt overhang may adversely affect aggregate demand through deleveraging or a crowding out of consumption by the debt service burden. Deleveraging can occur through forced or accelerated repayment of debt, reduction in new credit, and increased defaults or personal bankruptcies. From a legal standpoint, default follows from a situation in which assets and income are insufficient to cover debt-servicing costs, and bankruptcy from lack of sufficient assets and income to repay the debt. There may be second-round effects, such as Fisher-type debt-deflation dynamics, that may be caused by downward asset price spirals.

market imperfections may result in household debt becoming a source of vulnerability, with consequent risks for macro-financial stability. Some of the effects are illustrated in Figure 2.2. More specifically:

- *Borrowing constraints, leverage, and aggregate demand:* If aggregate demand determines the level of output, a contraction in demand by highly indebted households will not always be compensated for by an increase in demand by those that are less indebted, which may lead to a recession (Eggertsson and Krugman 2012; Korinek and Simsek 2016). In this type of model, adverse shocks to highly indebted households, such as a reduction in the value of collateral, trigger borrowing constraints that lead to a deleveraging process that may further reduce the value of collateral. The presence of nominal rigidities, such as a zero lower bound for nominal interest rates or nominal wages that can-

not adjust downward, amplifies the consequences of these shocks.[5] For instance, adverse shocks to house prices (or stock prices) reduce homeowners' equity in their housing assets (or households' net wealth, respectively). If sufficiently large, this reduction could trigger large debt defaults and impose further downward pressure on house prices (or stock prices, respectively), leading to a debt deflation spiral (Fisher 1933), as illustrated in Figure 2.2.[6] This sequence

[5]A broad set of macroeconomic models with financial frictions predict that high leverage reduces borrowing capacity and amplifies the impact of negative macroeconomic shocks (Kiyotaki and Moore 1997; Bernanke, Gertler, and Gilchrist 1999; Brunnermeier and Sannikov 2014, among others). Although these models focus on firms instead of household debt, the mechanism applies more broadly and is incorporated into newer studies described in this section.

[6]Note, however, that household debt defaults can also facilitate adjustment to lower debt levels, because it increases the resources

generates negative spillovers. It can cause stress to bank capital and balance sheets and thereby harm the rest of the economy and compromise financial stability. Since, when taking on debt, households do not internalize the potential impact of their decisions on aggregate demand and other households, they borrow too much from a social perspective. Hence, better outcomes could be achieved by ex ante policies that reduce the debt level, or constrain its increases (Korinek and Simsek 2016).

• *Behavioral biases:* Short-sighted households may strongly prefer current consumption over future consumption, or neglect crash risk. Households that value too much current consumption (hyperbolic discounting) tend to postpone saving decisions indefinitely and to contract an excessive amount of revolving debt (Laibson 1997). Overoptimism may also lead households to borrow too much, resulting, for instance, in higher credit card debt (Meier and Sprenger 2010). Consistent with the idea of overoptimism, not only among households but also among market participants, recent evidence shows that credit expansions forecast equity crashes (Baron and Xiong 2017). Households that base their expectations solely on extrapolations from past events, when house prices have been growing, may increase their borrowing during housing booms because they expect their home equity to continue growing (Fuster, Laibson, and Mendel 2010; Shiller 2005).[7] Alternatively, households may neglect certain low-probability risks, such as potentially large defaults on mortgages affecting AAA-rated securities exposed to these defaults (Gennaioli, Shleifer, and Vishny 2012). Or they may vary in their optimism about returns on risky assets (Geanakoplos 2010), with optimistic agents borrowing from pessimistic ones to purchase assets that serve as collateral. This process may amplify asset prices and leverage cycles and impair financial stability. Finally, tax treatment (interest deductibility) may also play a role in explaining a bias toward debt financing for households, much as it does for firms (IMF 2016b).

To summarize, the exact nature of the relationship between household debt and future growth and financial stability may depend on several factors. The relationship may be positive if agents behave in a rational, forward-looking manner and contract debt solely with an eye on future income growth and returns to capital in the absence of financial frictions and binding borrowing constraints. However, the relationship between household debt and macro-financial stability may turn negative for the reasons described above. The negative relationship may be more likely when households borrow primarily for nonproductive purposes or experience inadequate returns on their investment. High debt may bring about sharp adjustments in their consumption pattern—through deleveraging—and affect other parts of the economy. Depending on how well a country can absorb macro-financial stress or on the policies and institutions in place—such as the monetary stance, fiscal space, quality of regulation and supervision, capital account openness, and the degree of foreign-currency-denominated loans—some episodes of debt overhang and deleveraging may be absorbed more easily than others, in response to exogenous shocks affecting households.

Developments in Household Debt around the World

This section shows that household debt levels are higher in advanced economies than in emerging market economies and mainly comprise mortgage debt, while household debt has grown substantially in emerging market economies. Micro-level evidence indicates that lower-income households are less likely to borrow, but those that do tend to have riskier borrowing profiles.

Household debt to GDP is higher in advanced economies than in emerging market economies, but there is considerable heterogeneity within each group. On average, in 2016, the household debt-to-GDP ratio reached 63 percent in advanced economies and 21 percent in emerging market economies, reflecting differences in financial depth and inclusion across these groups of countries.[8] But even in advanced economies, it ranges from about 30 percent of GDP in Latvia to more than 100 percent of GDP in Australia, Cyprus, Denmark, Switzerland, and the Netherlands (Figure 2.3, panel 1). In some emerging market economies, house-

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households have at their disposal to cover non-debt-related expenses and maintain their consumption levels (Elul 2008). Such a financial decelerator mechanism may explain why debt overhang is more costly (as measured by consumption loss) in countries where the cost of debt default is very high.

[7]Cheng, Raina, and Xiong (2014) find that even real estate professionals (midlevel managers in securitized finance) had overly optimistic beliefs about house prices.

[8]In this chapter, household debt comprises loans by households from banks and other financial institutions. In some countries, this also includes nonprofit institutions serving households.

hold debt remained very low, at less than 10 percent of GDP in 2016, in Argentina, Bangladesh, Egypt, Ghana, Pakistan, the Philippines, and Ukraine, while in others, such as Malaysia, South Africa, and Thailand, it exceeded 50 percent of GDP. More broadly, the cross-country distribution of the household debt-to-GDP ratio is positively correlated with differences in financial development (Figure 2.3, panel 2).

Mortgage debt makes up the bulk of household debt in advanced economies, but less so in emerging market economies. It accounts for more than 50 percent of total household debt in most advanced economies, whereas among emerging market economies it captures one-third or less of total household debt (Figure 2.3, panel 3). Indeed, differences in mortgage debt explain a large fraction of the difference in household debt between emerging market and advanced economies. Although the characteristics of mortgages vary widely across countries and jurisdictions, a survey of IMF country desks finds that most mortgages are recourse loans: after a default the lender can try to seize additional household assets to cover the debt if the market value of the house is insufficient (see Annex Figure 2.1.1). Other debt consists primarily of consumer credit, which is typically used to smooth out short-term fluctuations in consumption and income but can also be used to finance microenterprises.[9]

Household debt has grown substantially in many countries over the past decade and has kept growing in recent years, especially among emerging market economies. Household debt-to-GDP levels fell in the United States and the United Kingdom after the global financial crisis of 2007–08 and in various European countries—most notably, Iceland, Ireland, Portugal, Spain, and the Baltics—in the wake of the European sovereign debt crisis (Figure 2.3, panel 1). In Germany, household debt has fallen as a percentage of GDP since 2000. Notwithstanding these recent declines, the level of household debt to GDP remains high by historical standards in most of these countries and has kept growing in other advanced economies, such as Australia and Canada (Figure 2.3, panel 5). In a number of emerging market economies—most notably Chile, China, Malaysia, Thailand, Paraguay, Poland, and some central and southeastern European countries, household debt to GDP expanded rapidly over a short time, from as low

as 10 percent of GDP in 2005 to more than 60 percent of GDP in some cases. This is also reflected in the rapid rise of median household debt-to-GDP ratios in emerging market regions: from between 5 percent and 10 percent in 2000 to between 17 percent and 22 percent in 2016 (Figure 2.3, panels 5 and 6).
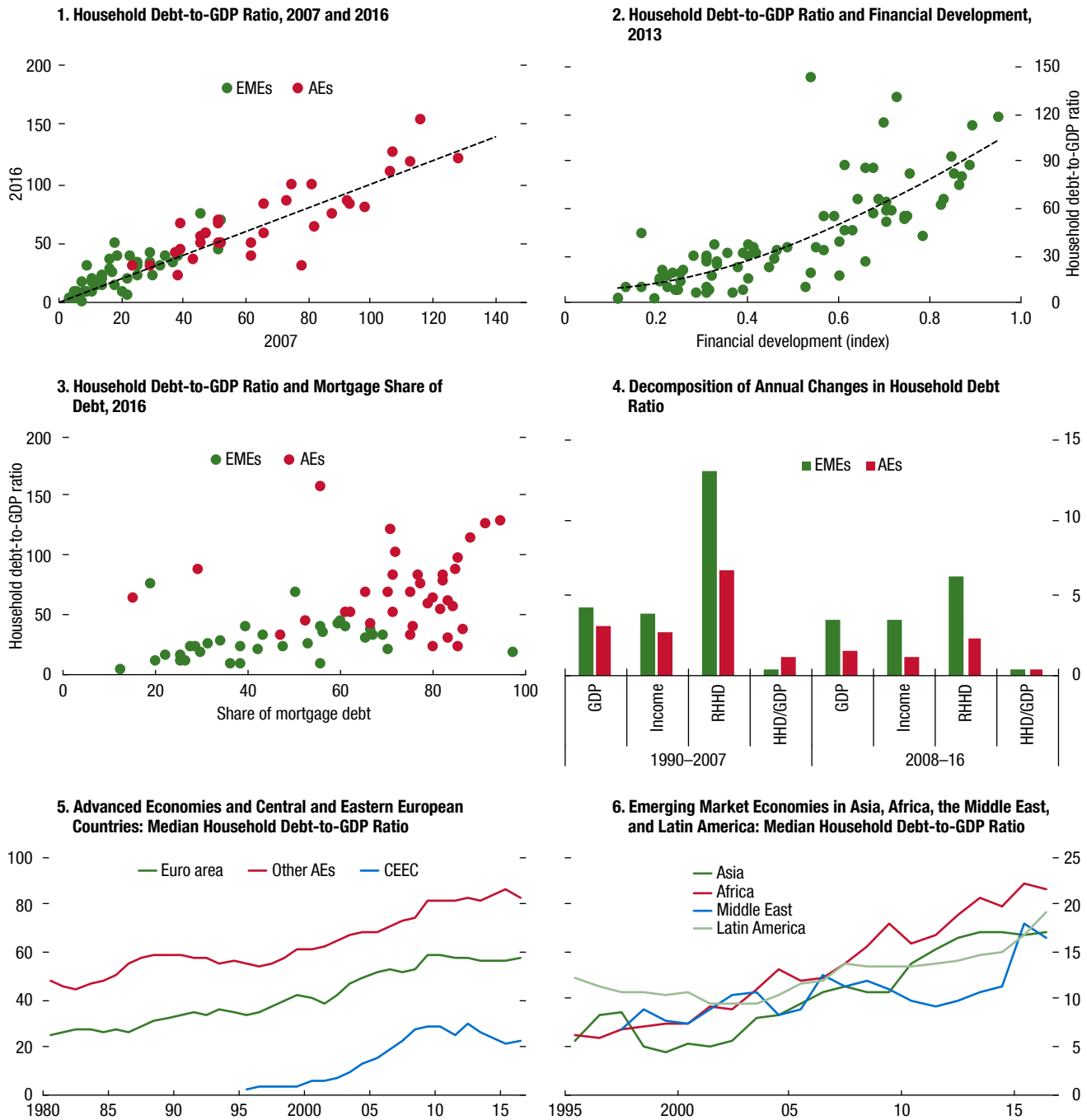
Changes in household debt ratios are driven mainly by debt increases rather than low or negative income growth. In theory, the household debt-to-GDP ratio may go up if debt increases more, or declines less, than GDP does. The rapid rise in the household debt-to-GDP ratio from 1990 to 2007 is due mainly to rapid increases in inflation-adjusted household debt, in both advanced and emerging market economies, amounting to 6.7 percent and 13.4 percent a year, respectively—far exceeding the growth of real GDP and real disposable income (Figure 2.3, panel 4). This rise was facilitated by the sharp decline in interest rates and easier and more widespread access to credit. Hence, debt servicing may not have risen that much. During this period, net wealth also rose on account of strong real house price increases. After 2008, the growth in household debt slowed to 2 percent a year in advanced economies, reflecting a retrenchment of households in the wake of the global financial crisis, and to 6.6 percent a year in emerging market economies. In both cases, debt continued to exceed the rate of GDP growth, leading to increases in the ratio of household debt to GDP.

The overall trend in household debt to GDP is very similar to that of the debt-to-assets ratio. For a subsample of 18 Organisation for Economic Co-operation and Development countries, increases in household debt to assets are highly correlated with household debt-to-GDP ratios (Figure 2.4, panel 6). Thus, increases in debt are usually accompanied by rising leverage, meaning that a focus on net wealth may mask underlying vulnerabilities that arise from procyclical asset values. The trend is most notable for mortgage debt—which constitutes the bulk of household debt in many countries—for which there is large comovement with the housing market cycle. As a result, households are less able to tap into their housing wealth to smooth consumption after a shock. Therefore, following the recent empirical literature and without losing much generality, the rest of the empirical analysis focuses on the debt-to-GDP ratio.[10]

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[9]For instance, urban Indian households report about one-fifth of their debt to be for business-related purposes. In addition, rural households use two-fifths of their debt for productive purposes, with the highest share among the wealthier households (see Badarinza, Balasubramaniam, and Ramadorai 2016).

[10]In the ensuing analysis, using the debt-to-assets ratio instead of the debt-to-GDP ratio for a subset of 26 Organisation for Economic Co-operation and Development countries for which such data are available yields qualitatively the same results (see Figure 2.6, panel 2).
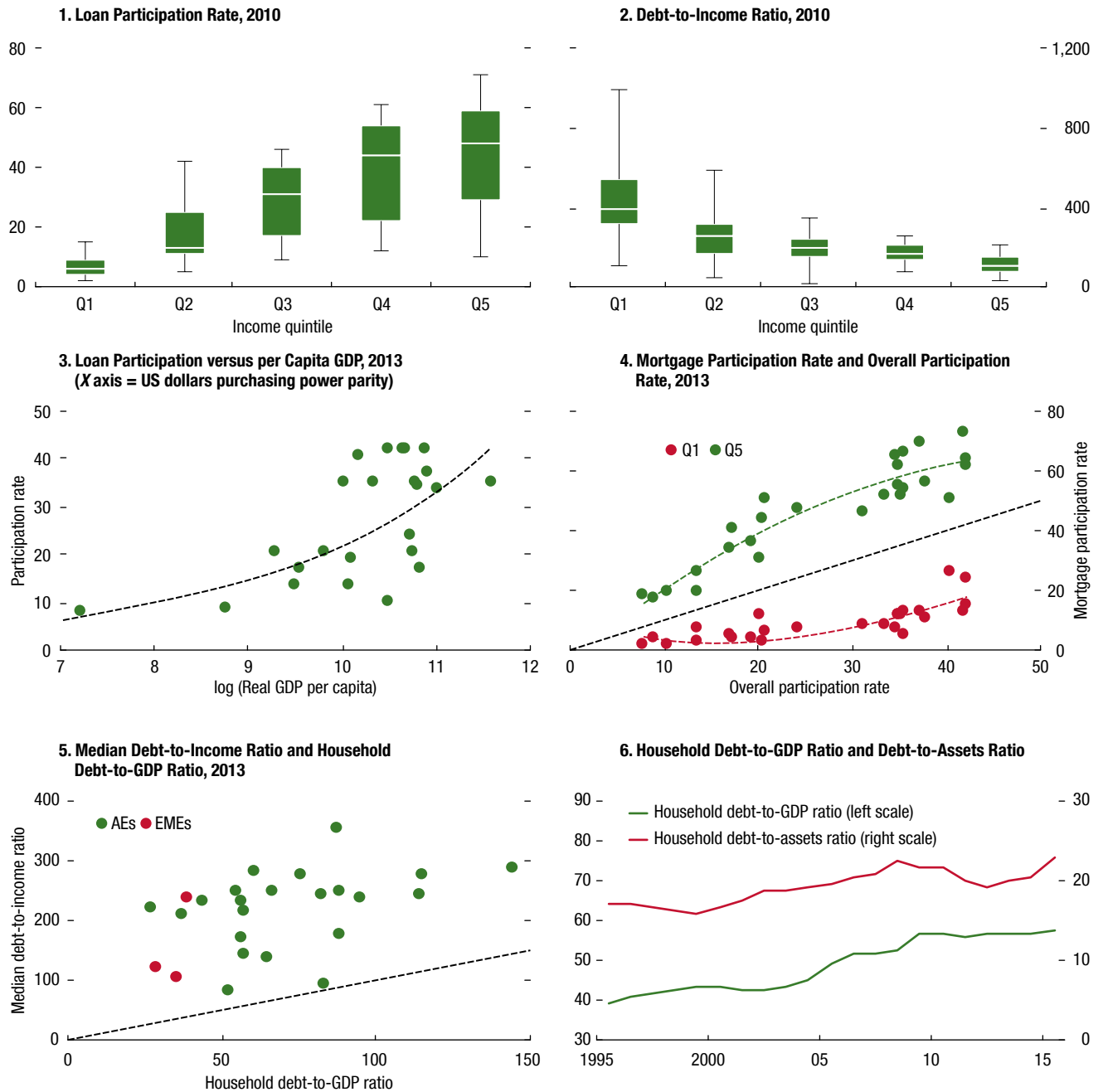
Figure 2.3. Growth and Composition of Household Debt by Region
(Percent)

1. Household Debt-to-GDP Ratio, 2007 and 2016

2. Household Debt-to-GDP Ratio and Financial Development, 2013

3. Household Debt-to-GDP Ratio and Mortgage Share of Debt, 2016

4. Decomposition of Annual Changes in Household Debt Ratio

5. Advanced Economies and Central and Eastern European Countries: Median Household Debt-to-GDP Ratio

6. Emerging Market Economies in Asia, Africa, the Middle East, and Latin America: Median Household Debt-to-GDP Ratio

Sources: Bank for International Settlements; CEIC Data Co. Ltd.; Economic Cycle Research Institute; Haver Analytics; IMF, International Financial Statistics, Monetary and Financial Statistics, and World Economic Outlook databases; Jordà-Schularick-Taylor Macrohistory Database; Svirydzenka 2016; Thomson Reuters Datastream; and IMF staff calculations.
Note: For countries included in regional breakdowns, see Annex 2.1. In panel 2, financial development is the index taken from Svirydzenka 2016. Panel 4 reports median annual growth rates for each country group and period for real GDP, real disposable household income, real household debt (RHHD), and household debt-to-GDP ratio (HHD/GDP). Dashed line in panel 1 denotes the 45-degree line. AEs = advanced economies; CEEC = Central and Eastern European countries; EMEs = emerging market economies; income = real disposable household income.

Figure 2.4. Household Debt: Evidence from Cross-Country Panel Data
(Percent, unless noted otherwise)

1. Loan Participation Rate, 2010

2. Debt-to-Income Ratio, 2010

3. Loan Participation versus per Capita GDP, 2013
(*X* axis = US dollars purchasing power parity)

4. Mortgage Participation Rate and Overall Participation Rate, 2013

5. Median Debt-to-Income Ratio and Household Debt-to-GDP Ratio, 2013

6. Household Debt-to-GDP Ratio and Debt-to-Assets Ratio

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 IMF staff calculations.
Note: Panels 1 and 2 show the cross-country dispersion across income quintiles, evaluated at the median for mortgage borrowers (quintile 1 to quintile 5, from lowest to highest income). Dashed lines in panels 4 and 5 denote the 45-degree line. For country coverage, see Annex 2.1. Panel 6 shows debt, asset, and wealth ratios for a subsample of 18 OECD countries for which such data are available since 1995. AEs = advanced economies; EMEs = emerging market economies.

Lower-income groups typically participate less in credit markets, and their credit profiles are weaker. Household survey data from 25 countries show that households in the lowest income quintiles participate much less in mortgage (and overall) credit markets (Figure 2.4, panel 1). Those that do, however, have, on average, higher risk profiles, with higher debt-to-assets and debt-to-income ratios as well as higher debt service ratios (defined as total debt repayment as a percentage of total income) (Figure 2.4, panel 2). This suggests that lower-income households are most vulnerable to cyclical fluctuations in income and are less likely to benefit from positive wealth effects, given their relatively low net asset holdings. From a bank's perspective, these customers generally represent a higher credit risk, which, in turn, may explain the relatively low participation rate, indicating the presence of credit constraints.

Differences in participation across countries explain part of the differences in debt ratios between advanced and emerging market economies. As with other measures of financial inclusion, household credit participation increases with economic development, as measured by real GDP per capita (Figure 2.4, panel 3).[11] As credit participation increases, it initially covers mainly high-income families and then moves more aggressively toward easing access for lower-income families, as reflected by the curvature of the respective income groups' lines (Figure 2.4, panel 4). Thus, high credit participation by low-income families is mainly an advanced economy phenomenon; lower-income countries grant access to credit mainly to higher-income households. Since not all households have debt and since debt-to-income ratios vary significantly across households, macro-level measures of household debt (such as debt-to-GDP and debt-to-net-wealth ratios) underestimate the true burden of indebted households (Figure 2.4, panel 5).[12] This underestimation could be especially relevant for emerging market economies where participation rates are low and where low macro-level indebtedness may coexist with significant micro-level household indebtedness (see Box 2.2 for an analysis of Chinese households).

The dynamics of household debt are linked to the evolution of house prices. For example, household debt in Canada and the United States evolved very similarly until the global financial crisis (Box 2.3). After the crisis, household debt continued to rise in Canada but fell in the United States as house prices followed different paths: declining in the United States while continuing to appreciate in Canada. As a result, US households' leverage for mortgage holders, reflected in the debt-to-income ratio, remained broadly constant, while Canadian mortgage borrowers' debt to income increased across all income groups and is now much higher than for US households. These patterns suggest that household debt and housing prices have common dynamics (Box 2.4). Similarly, in China, where house prices rose by 16 percent in real terms, the debt-to-income ratio increased across most income groups between 2011 and 2015, and especially for lower-income households (Box 2.2).

Financial Stability Risks of Household Debt: Empirical Analysis

Increases in household debt have a positive short-term but a negative medium-term relationship to macroeconomic aggregates such as GDP growth, consumption, and employment. They also predict downside risks to GDP growth and a higher probability of a banking crisis. However, the strength of the negative association depends on the level of household debt to GDP, getting stronger when this level exceeds certain thresholds. The short-term positive effects are generally stronger and the medium-term negative effects are consistently weaker for emerging market economies.

Household Debt and Growth, Consumption, and Employment

When household debt increases, future GDP growth and consumption decline and unemployment rises relative to their average values. Changes in household debt have a positive contemporaneous relationship to real GDP growth and a negative association with future real GDP growth, in line with various recent empirical studies.[13] Specifically, a 5 percent increase in household debt to GDP over a three-year period forecasts a 1¼ percent decline in real GDP growth three years ahead (Figure 2.5, panel 1).[14] These results do not seem to be

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[11]See also Demirgüç-Kunt and Klapper (2012), who find that account penetration is higher in economies with higher national income, as measured by GDP per capita.

[12]The aggregate measures of household indebtedness correspond to an income-weighted average of individual household debt ratios. Households with no debt but positive income, as well as differences in indebtedness across households, lead to differences between aggregate and micro-level measures.

[13]See, for instance, Mian, Sufi, and Verner, forthcoming; Jordà, Schularick, and Taylor 2016; and Lombardi, Mohanty, and Shim 2017.

[14]The empirical model includes country fixed effects, so that all variables can be interpreted as deviations from their sample averages.

driven by potential endogeneity concerns.[15] A further breakdown shows that household debt is correlated with future declines in private consumption (Figure 2.5, panel 2) but less so with government consumption and investment. It is also negatively correlated with the current account deficit. These findings suggests that household debt booms finance consumption expansions, often through current account deficits that revert later when consumption and GDP growth also decline. Increases in household debt are also associated with significantly higher unemployment up to four years in the future (Figure 2.5, panel 3).

The short-term positive association between changes in household debt and GDP growth is stronger and the medium-term negative relationship weaker for emerging market economies than for advanced economies (Figure 2.5, panel 1). On the other hand, consumption expands less in the short term and declines less in the medium term after household debt increases in emerging market economies (Figure 2.5, panel 2), while the results for unemployment follow a similar pattern as those for GDP (Figure 2.5, panel 3). This suggests that the trade-off between the benefits of increased household participation in credit markets and the risks to macroeconomic stability is less striking for these countries, most likely because of lower average household debt, although institutions and policies may also play an important role, as discussed later. Moreover, the evidence on long-term growth reviewed in Box 2.1 suggests that, in the long term, increases in household debt appear positively related to growth up to a certain level.[16]

Increases in household debt are associated with heightened downside risks to future GDP growth for all countries, but in emerging market economies they also predict higher upside risks. Quantile regression results show that changes in household debt have important implications for movements in the distribution of future GDP growth (Figure 2.5, panel 4). Initially, household debt is associated with strong positive output growth (the right tail of the distribution), especially among emerging market economies. But three to five years ahead, increases in household debt seem to have a clearer association with below-average movements of future growth (the left tail of the distribution of future real GDP growth).[17] This pattern is consistent with the deleveraging and aggregate demand externalities that arise after a period of rapid growth in household debt, resulting in a volume of borrowing above the socially optimal level that leads to important corrections after a shock. It is interesting to note that, among emerging market economies, increases in household debt are associated with worse negative and stronger positive future growth outcomes compared with advanced economies. This finding may reflect the more extreme historical experiences in this group of countries; they benefit more from financial development and improved access to finance but also suffer more strongly during episodes of debt overhang and financial crises.

Supply-driven increases in household debt are more damaging to future growth. Using changes in financial conditions to identify supply- and demand-driven increases in household debt, similar to Mian, Sufi, and Verner, forthcoming, shows that the supply-driven component of household debt has a stronger impact on future GDP growth than the demand component (Figure 2.5, panel 5). Similarly, a monetary policy loosening (negative Taylor rule residuals) reinforces the negative relationship between household debt and future economic activity.
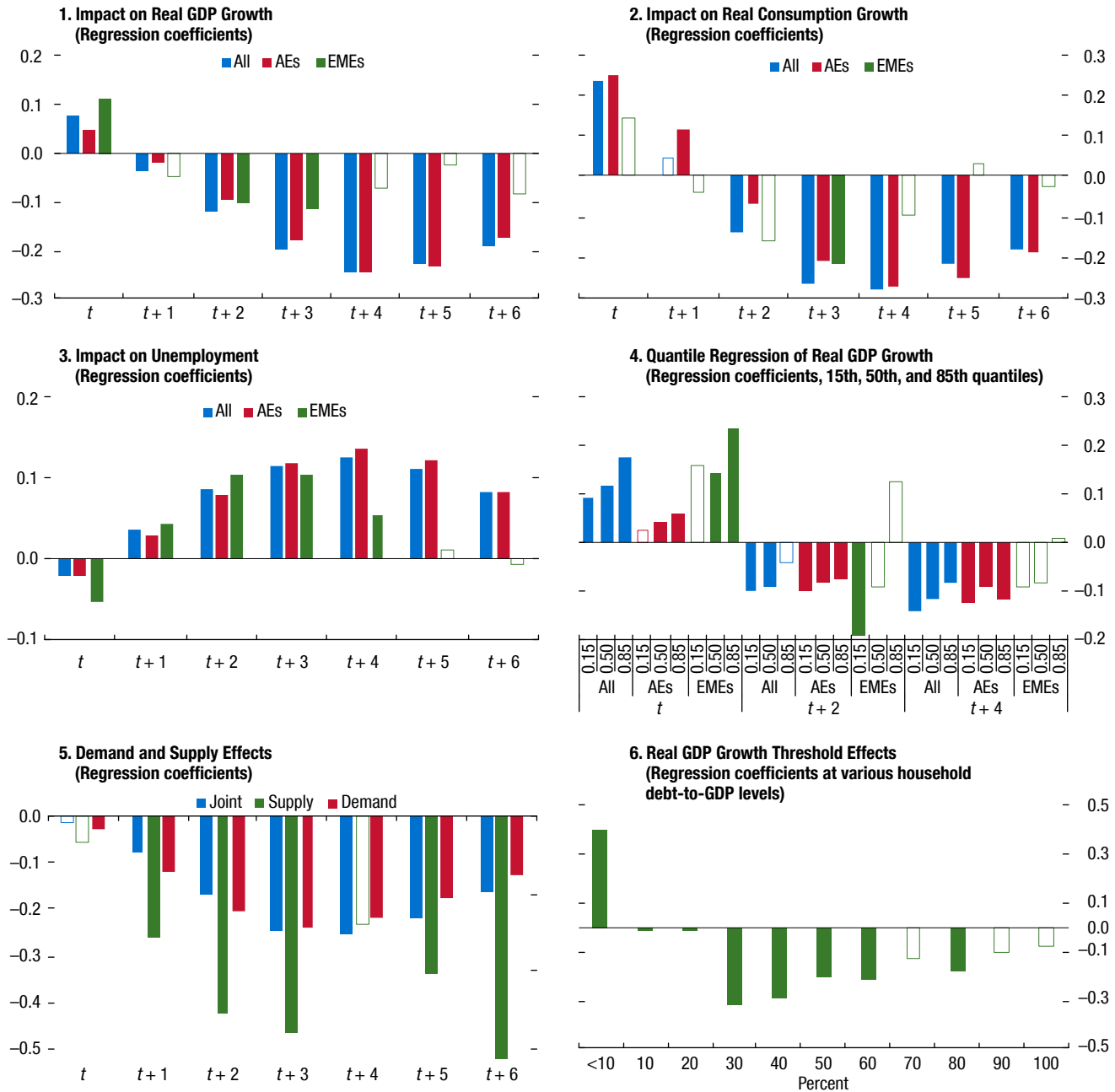
The negative medium-term association between GDP growth and growing household debt is largely absent at low levels of debt to GDP. At very low levels of household debt to GDP, below 10 percent, the association between increases in debt and future real GDP growth is positive; it turns negative when household indebtedness exceeds 30 percent of GDP (Figure 2.5, panel 6). Beyond that point, the correlation declines slightly, but it maintains its negative sign. The presence of this nonlinearity is consistent with recent findings of a bell-shaped

[15]Results obtained using instrumental variables yield qualitatively similar and quantitatively larger estimates than those obtained through ordinary least squares. In these estimations, changes in household and firm debt-to-GDP ratios were instrumented by the interaction between a country's degree of capital account openness and US financial conditions and global liquidity (broad money). Micro-level regressions discussed below—which are much less likely to be affected by potential endogeneity—provide additional support for the causal interpretation of these results.

[16]The cumulative effect of an increase in household debt on growth, consumption, and employment, inferred from Figure 2.5, is negative in advanced economies and neutral to marginally negative in emerging market economies. However, such an exercise implicitly relates changes in household debt to longer-term growth outcomes, which is more adequately addressed in the framework reviewed in Box 2.1. According to those results, an increase in the household debt-to-GDP ratio raises long-term growth as long as the final ratio is below a threshold between 36 and 70 percent of GDP (corresponding to a 90 percent confidence interval).

[17]In advanced economies, an increase in household debt is negative for medium-term GDP growth across the entire distribution of future GDP growth (all quantiles), whereas in emerging market economies, the impact of household debt on future GDP growth is negative only in the left tail of the distribution (when future growth is below average).

Figure 2.5. Effects of Household Debt on GDP Growth and Consumption

1. Impact on Real GDP Growth
(Regression coefficients)

Legend: All, AEs, EMEs

x-axis: t, t + 1, t + 2, t + 3, t + 4, t + 5, t + 6

y-axis: 0.2, 0.1, 0.0, −0.1, −0.2, −0.3

2. Impact on Real Consumption Growth
(Regression coefficients)

Legend: All, AEs, EMEs

x-axis: t, t + 1, t + 2, t + 3, t + 4, t + 5, t + 6

y-axis: 0.3, 0.2, 0.1, 0.0, −0.1, −0.2, −0.3

3. Impact on Unemployment
(Regression coefficients)

Legend: All, AEs, EMEs

x-axis: t, t + 1, t + 2, t + 3, t + 4, t + 5, t + 6

y-axis: 0.2, 0.1, 0.0, −0.1

4. Quantile Regression of Real GDP Growth
(Regression coefficients, 15th, 50th, and 85th quantiles)

x-axis groups (0.15, 0.50, 0.85) for All, AEs, EMEs under t, t + 2, t + 4

y-axis: 0.3, 0.2, 0.1, 0.0, −0.1, −0.2

5. Demand and Supply Effects
(Regression coefficients)

Legend: Joint, Supply, Demand

x-axis: t, t + 1, t + 2, t + 3, t + 4, t + 5, t + 6

y-axis: 0.0, −0.1, −0.2, −0.3, −0.4, −0.5

6. Real GDP Growth Threshold Effects
(Regression coefficients at various household debt-to-GDP levels)

x-axis: <10, 10, 20, 30, 40, 50, 60, 70, 80, 90, 100 (Percent)

y-axis: 0.5, 0.3, 0.1, 0.0, −0.1, −0.3, −0.5

Sources: Bank for International Settlements; CEIC Data Co. Ltd.; Economic Cycle Research Institute; Haver Analytics; IMF, World Economic Outlook database; Jordà-Schularick-Taylor Macrohistory Database; Penn World Table; and IMF staff calculations.

Note: Panels 1, 2, and 3 are from panel regressions of rolling three-year real GDP growth (consumption and unemployment, respectively) up to six years ahead, on lagged changes in household and corporate debt-to-GDP ratios (over a three-year period), controlling for lags of the dependent variable, and country and time fixed effects. Panel 4 shows quantile regression coefficient estimates for changes in the household debt ratio, using the same specification as the panel regression model. Panel 5 breaks down changes in household debt-to-GDP ratios into supply and demand factors, where local financial conditions are assumed to signal supply-side factors, and the residual to reflect other (demand) factors. Panel 6 shows coefficient estimates from a panel regression estimation, conditioning the effect on changes in household debt, and interacted with various debt thresholds. Colored bars indicate that the effects are statistically significant at the 10 percent level or higher. See Annex 2.2 for details of the estimation methodology. AEs = advanced economies; EMEs = emerging market economies.

relationship between financial deepening and long-term growth (Sahay and others 2015b) and studies relating this to increased financial risks (see also Box 2.1). While the threshold above which increases in household debt more strongly signal risks to real activity is low, it is generally above the levels reached by emerging markets in this sample. This finding may partly explain the milder association estimated for this group of countries.

The relationship between future GDP growth and household debt is driven mostly by mortgage debt. The finding that the mortgage debt component is statistically significant and the nonmortgage component is not (Figure 2.6, panel 1) goes somewhat against the argument that increases in debt accompanied by a simultaneous accumulation of assets are less risky, because households may be able to tap into these assets when facing shocks. This could be due to the procyclicality of home equity lines or—more generally—to wealth effects that lead households to cut consumption when the value of their housing assets decline.[18] Further evidence confirms that the accumulation of assets does not dampen the consequences of increased indebtedness. Changes in the household debt-to-total-assets ratio are associated with growth declines only at horizons beyond five years ahead, with increases in household debt to GDP remaining significant at shorter horizons (Figure 2.6, panel 2). These results suggest that, at business cycle frequencies, it is primarily households' debt service capacity, approximated by a higher debt-to-GDP ratio, that signals vulnerabilities rather than their solvency position.

Similar results are found in micro-level data: high debt-to-income ratios make households more vulnerable to income shocks. Micro longitudinal data for five euro area countries show that high household indebtedness in 2010, right before the European sovereign debt crisis, caused a significant reduction in consumption between 2010 and 2014 (Figure 2.7, panel 1).[19] Furthermore, consumption declined more for the most indebted

[18]Boom-bust cycles in housing prices that accompany increases in household debt could be driving the results reported above, but further analysis shows that lagged house price growth is not very significant in growth forecasting regressions. Additional evidence from dynamic panel vector autoregression techniques shows that house price shocks are associated with a gradual rise in household debt, whereas household debt shocks lead to significant increases in house prices in the short term, up to two to three years, but are followed by a fall in house prices afterward (Box 2.5).

[19]The macroeconomic and unexpected nature of the shock makes it unlikely that the results are driven by the reverse causality argument that individual households borrowed preemptively to hoard liquidity and smooth consumption.
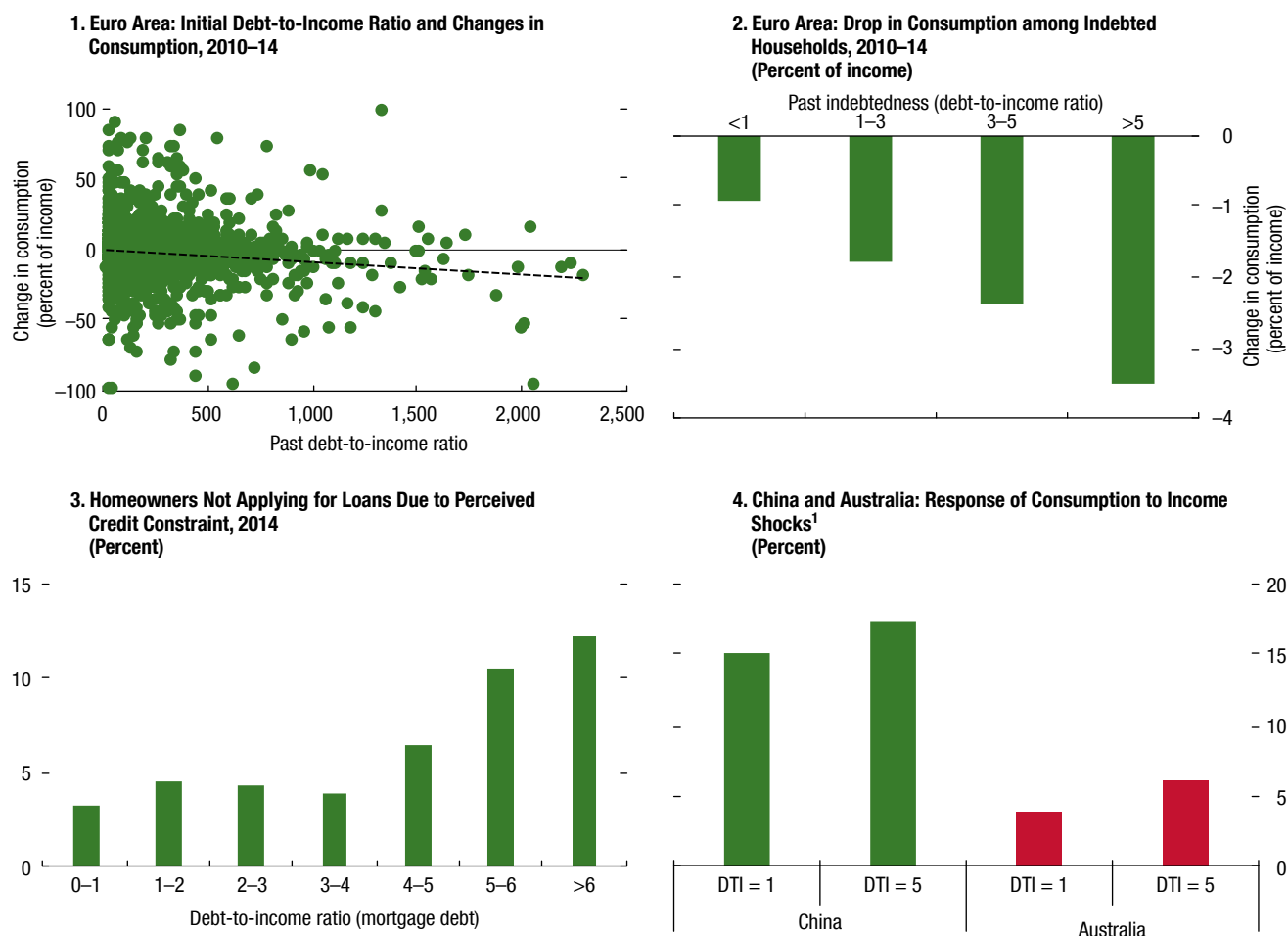
Figure 2.6. Effects of Household Debt on GDP Growth: Robustness Tests
(Regression coefficients)
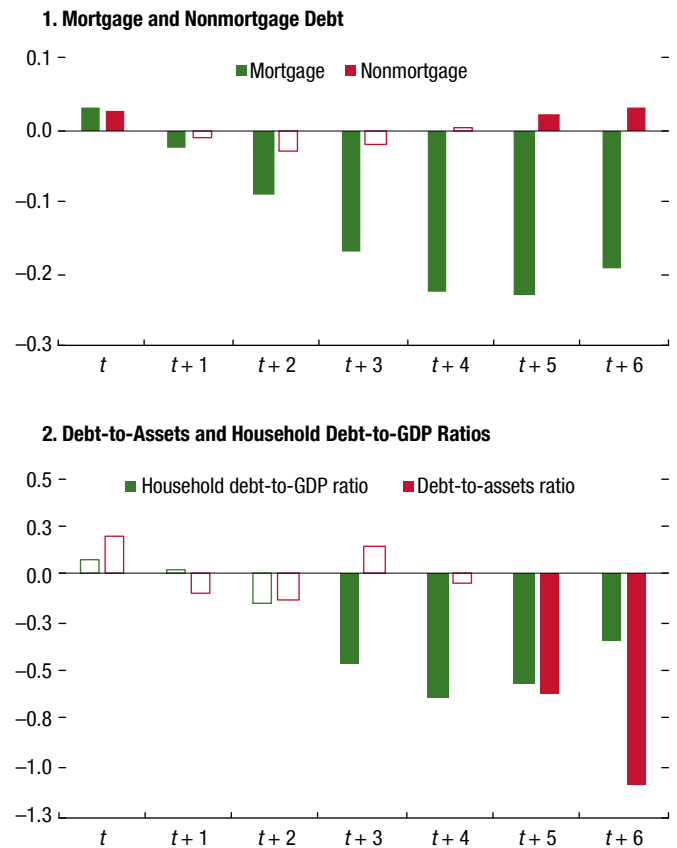
1. Mortgage and Nonmortgage Debt

2. Debt-to-Assets and Household Debt-to-GDP Ratios

Sources: Bank for International Settlements; CEIC Data Co. Ltd.; Economic Cycle Research Institute; Haver Analytics; IMF, World Economic Outlook database; Jordà-Schularick-Taylor Macrohistory Database; Penn World Table; and IMF staff calculations.
Note: This figure shows coefficients of household debt variables in panel regressions of real GDP growth, one to six years ahead, on lagged changes in household and corporate debt-to-GDP ratios (over a three-year period), controlling for lags of the dependent variable, and country and time fixed effects. Panel 1 splits household debt into mortgage and nonmortgage debt-to-GDP ratio. Panel 2 includes changes in the household debt-to-GDP ratio and changes in the household debt-to-assets ratio in the panel regression. Estimations are performed over subsamples for which data are available compared with analysis in Figure 2.5. Colored bars indicate that the effects are statistically significant at the 10 percent level or higher.

Figure 2.7. Micro-Level Evidence Corroborating the Macro Impact

1. Euro Area: Initial Debt-to-Income Ratio and Changes in Consumption, 2010–14

2. Euro Area: Drop in Consumption among Indebted Households, 2010–14
(Percent of income)

3. Homeowners Not Applying for Loans Due to Perceived Credit Constraint, 2014
(Percent)

4. China and Australia: Response of Consumption to Income Shocks[1]
(Percent)

Sources: European Central Bank Household Finance and Consumption Survey; Household, Income and Labour Dynamics in Australia Survey; China Household Finance Survey; and IMF staff calculations.
Note: Panels 1–3 present data from euro area countries with a panel dimension (Belgium, Cyprus, Germany, Malta, Netherlands). The change in consumption-to-income ratio is computed over 2010–14. For panel 4, see Boxes 2.2 and 2.4 for additional information. DTI = debt-to-income ratio.
[1]In panel 4, results are based on data for households tracked between 2013 and 2015 for China, and between 2006 and 2015 for Australia.

households (Figure 2.7, panel 2), which also perceived themselves to be the most financially constrained (Figure 2.7, panel 3). The larger reduction in consumption by highly indebted households at the micro level and the corresponding decline in aggregate consumption observed in macro data are consistent with the effects of aggregate demand externalities arising from deleveraging. Evidence for China also shows that consumption of households with high debt-to-income ratios responds more strongly to income shocks (Figure 2.7, panel 4 and Box 2.2). Hence, highly indebted households' higher marginal propensity to consume may amplify the effect of negative income or credit shocks on China's economy, in line with evidence in advanced economies (for

example, Mian, Rao, and Sufi 2013). Similar results are found for advanced economies, such as Australia, although they are less pronounced.

Financial Stability Risks and Neglected Crash Risk

Increases in household debt are also good early warning indicators for banking crises.[20] A simple look at the data shows that increases in household debt peak about three years before the onset of a banking crisis (Figure 2.8, panel 1). Formal evidence from a logit
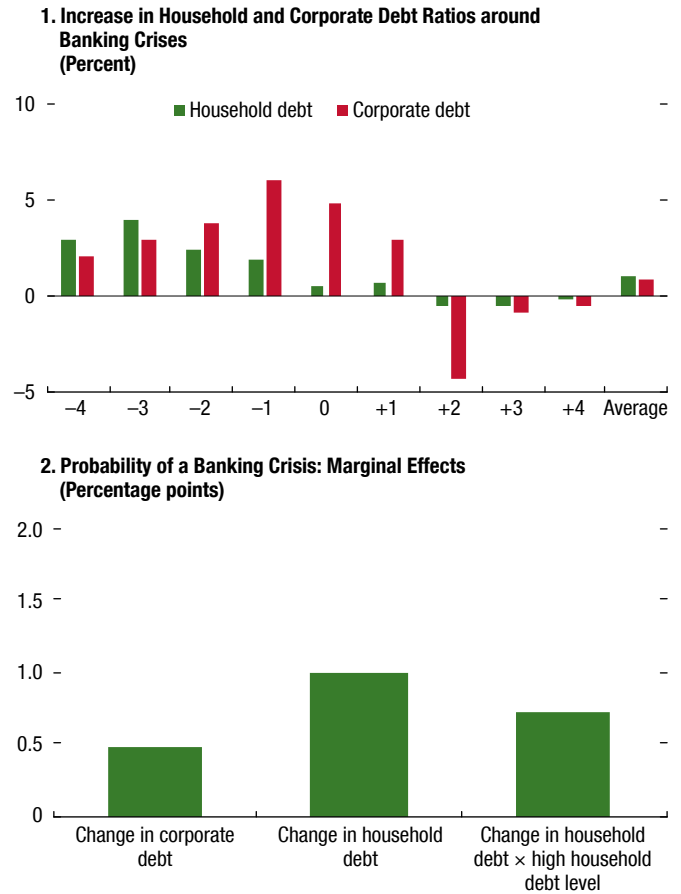
[20]Previous research documenting similar findings includes Gourinchas and Obstfeld 2012; Drehmann and Tsatsaronis 2014; and Jordà, Schularick, and Taylor 2016.

panel data model shows that a rise in the household debt-to-GDP ratio contributes to a greater probability of banking crises three years ahead (Figure 2.8, panel 2). The marginal effect, at about 1 percent, is economically significant, since the unconditional crisis probability is about 3.5 percent for the countries under examination. The relationship between increasing household debt and financial crises is more pronounced when household debt is high (65 percent of GDP). This is broadly consistent with the nonlinear effects found for the relationship between household debt and GDP growth, with the higher threshold resulting from the extreme nature of crises as compared with episodes of growth declines. The existence of nonlinear effects suggests that debt increases in already highly indebted households may be hard to sustain when facing a negative income shock, leading them to drastically reduce consumption and default on their debts.

Increases in the household debt ratio predict negative equity excess returns (over the risk-free rate), especially for the banking sector. Such predictability is present for both the banking sector and the overall stock market index (Figure 2.9, panel 1). This negative correlation may reflect investor overoptimism and a systematic neglect of the risk of equity crashes (so-called neglected crash risk) during periods of high growth in household debt (Figure 2.9, panel 2). Further analysis with quantile regressions shows that the negative association between increases in household debt and future equity returns is stronger in the lower tail of the return distribution than in the upper tail, confirming that investors appear to systematically neglect the risk of equity crashes. Although the neglected crash risk affects all sectors, predictability is stronger for bank stock returns, suggesting that rising household debt is often associated with neglected banking sector vulnerabilities.[21] As discussed later in the chapter and shown earlier, these vulnerabilities may arise both from the ensuing decline in growth associated with the deleveraging process or from higher debt defaults from overindebted households. The predicted decline in overall stock market returns suggests that growth contractions explain part of these results. But consistent with a simultaneous role for
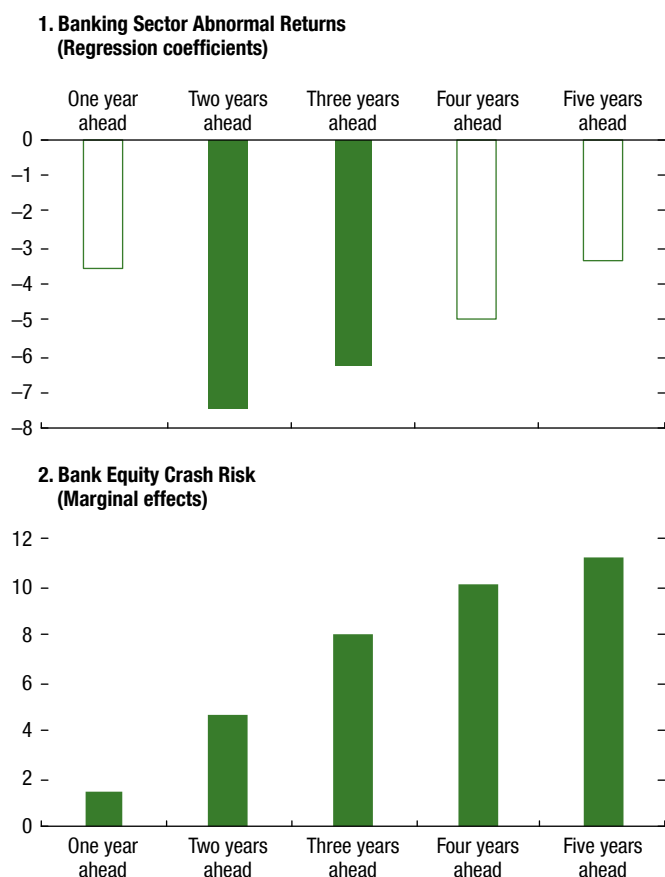
[21]Risk-adjusted abnormal returns of the banking sector are computed to measure the performance of bank stocks relative to market returns. Abnormal returns are defined as the capital asset pricing model regression residuals with quarterly data. For each country, the coefficient on market excess return, that is, the market beta, is estimated in each year based on past return data to avoid using future information that is unknown in that year.

Figure 2.8. Banking Crises and the Role of Household Debt

1. Increase in Household and Corporate Debt Ratios around Banking Crises
(Percent)

2. Probability of a Banking Crisis: Marginal Effects
(Percentage points)

Sources: Bank for International Settlements; CEIC Data Co. Ltd.; Economic Cycle Research Institute; Haver Analytics; IMF, International Financial Statistics, and Monetary and Financial Statistics databases; Jordà-Schularick-Taylor Macrohistory Database; Laeven and Valencia 2013; Thomson Reuters Datastream; and IMF staff calculations.
Note: Panel 1 shows the average growth in ratios of household and nonfinancial corporate debt to GDP before and after a banking crisis, as well as the unconditional average growth rate. Panel 2 shows the marginal effects of a panel logit model for banking crises for 34 countries, with country fixed effects, levels, and changes in ratios of household and nonfinancial corporate debt to GDP. It also shows the interaction effect with a high household debt dummy variable, set at 65 percent of GDP, representing the top quintile of the distribution. The effects are significant at the 10 percent confidence level. Banking crises are taken from the updated database by Laeven and Valencia (2013).

Figure 2.9. Bank Equity Returns and Household Debt

1. Banking Sector Abnormal Returns
(Regression coefficients)

2. Bank Equity Crash Risk
(Marginal effects)

Source: IMF staff calculations.
Note: Panel 1 shows coefficients from regressions of future bank equity risk-adjusted abnormal returns, one to five years ahead, using past three-year changes in the household debt-to-GDP ratio as independent variables. Panel 2 shows the marginal effect of the change in the household debt ratio (normalized by the standard deviation) on the probability of equity crashes in the next one to five years. Bank equity crashes are defined as annual bank equity returns lower than one standard deviation below the mean, as in Cheng, Raina, and Xiong 2014; and Baron and Xiong 2017. Solid bars mean that the response is statistically significant using 95 percent confidence intervals.

rising defaults, increases in the household debt ratio are often associated with higher growth of nonperforming loans in the country's banking sector three years later, confirming that rapid growth in household debt is associated with greater banking stress in the future.

When Is Household Debt More Likely to Predict Low GDP Growth?

The consequences of an increase in household debt for future growth differ substantially across countries. The estimated debt-to-GDP-growth relationship exhibits substantial heterogeneity within both advanced and

emerging market economies (Figure 2.10, panel 1). The median coefficient for the three-year-ahead impact of an increase in debt on GDP growth is −0.5 for advanced economies and −0.13 for emerging market economies. Within each group of countries, the dispersion of the estimated coefficients is large, although more so for emerging market economies, which also have a larger share of positive country-level coefficients. This dispersion suggests that, in addition to the initial level of household debt documented earlier, country-specific and institutional factors may play a role in mediating the relationship between rising household debt and future economic activity. To investigate the role of various leading factors, separate panel regressions add interactions between household debt and a number of institutional and country-specific characteristics to the panel regression between changes in household debt and three-year-ahead GDP growth (Figure 2.10, panel 2).[22]

Having an open capital account and a fixed exchange rate regime increases the risks associated with rising household debt. An open capital account has multiple benefits for financial integration and access to foreign capital (Mussa and others 1998; Stulz 1999), but it also exposes countries experiencing large capital inflows to sudden stops (Calvo and Reinhart 2000). In this sample, a more open capital account results in a stronger negative association between increases in household debt and future GDP growth.[23] This result might arise from the accumulation of foreign-currency-denominated debt, similar to findings by Mian, Sufi, and Verner (forthcoming). As noted in the literature, capital flows that sustain episodes of foreign debt accumulation are frequently followed by sudden stops that force strong corrections in consumption, particularly in emerging markets. This pattern is consistent with a larger differential effect of capital account openness in this group of economies. Along similar lines, having a fixed exchange rate regime reduces an economy's flexibility to accommodate external shocks, resulting in a larger contraction in aggregate demand, especially in the presence of nominal wage rigidities (Schmitt-Grohé and Uribe 2016). Interestingly,

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[22]Additional analysis also attempted to relate the effect of household debt on banking crises documented earlier to institutional and country-specific variables, but no significant interaction effects were detected, probably because of the relatively smaller coverage, over time, and number of countries and crises observations, relative to the panel data growth regression analysis.

[23]In this analysis, capital account openness is measured as de jure openness. The results do not change when using de facto measures such as capital flows as a percentage of GDP.
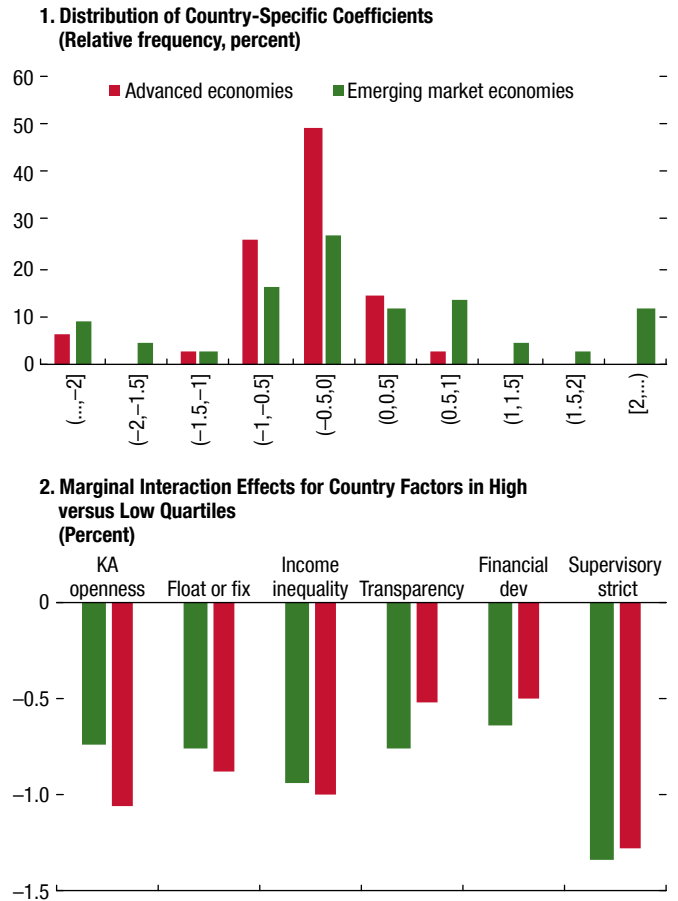
this analysis shows that it is the combination of a fixed exchange rate regime and capital account openness that magnifies the risks associated with increasing household debt. This finding is consistent with the limitations that such a regime poses for accommodating the consequences of large changes in capital inflows (IMF 2016a).

Financial development and the quality of bank supervision seem to mitigate the medium-term negative relationship between increases in household debt and GDP growth. Credit expansion in a more financially developed environment entails lower risks because the financial system is better able to assess credit risk and allocate credit and is better prepared to deal with their consequences. Moreover, countries where banking supervision is more stringent and capital requirements are stricter appear able to reduce the negative effect of household debt on GDP growth. The same effect is found for banking systems that have higher capital ratios or a larger distance to default. All these measures directly or indirectly reflect the quality and conservatism of the banking supervision—supervisors may stop banks from paying out high dividends to shareholders and instead require them to retain higher capital buffers, thereby limiting, to some extent, the bank lending channel.

Among institutional variables, the existence of credit registries significantly reduces the risks signaled by rising household debt. Having access to broad information on individuals' levels of debt and payment histories (both positive and negative) reduces the possibility of overborrowing, improves origination standards, and reduces borrowing costs for good creditors. In addition, characteristics of the debt frameworks—such as protection against predatory lending—temper the negative association with future GDP growth, but are not robustly significant. Other aspects of the institutional framework, such as various characteristics of the household credit market obtained through a survey of country desks, do not appear to have a significant effect in reducing the risks signaled by household credit expansion.[24]

The effect of household debt on GDP is somewhat larger in more unequal societies. The role of inequality is not obvious because of two countervailing forces (Figure 2.10). On one hand, richer households tend to have lower debt-to-income (DTI) ratios and higher participation (Figure 2.4). A higher level of inequality

[24]For the list of housing market characteristics see Annex Figure 2.1.1. The lack of significance for several of these and other institutional measures may result from the reduced samples for which they are available or the limited time variation of the data (some being available for a single year).

Figure 2.10. The Impact of Household Debt by Country and Institutional Factors

1. **Distribution of Country-Specific Coefficients**
   (Relative frequency, percent)

2. **Marginal Interaction Effects for Country Factors in High versus Low Quartiles**
   (Percent)

Source: IMF staff calculations.
Note: Panel 1 shows country-level coefficients of changes in household debt in ordinary least squares regressions of three-year-ahead real GDP growth on changes in household and firm debt. Panel 2 shows the marginal effect of changes in household debt on GDP growth three years ahead, from panel regressions with institutional factors, evaluated at the 25th and 75th percentiles. Effects are statistically significant at the 10 percent level or higher. See also Figure 2.8 and Annex 2.2. Financial dev = financial development index from Svirydzenka 2016; Float or fix = exchange rate regime (floating, the green bar, versus fixed, the red bar); Income inequality = income inequality measures, the difference between the income share of the top 20 and bottom 20 percent income groups; KA openness = capital account openness index from the Chinn-Ito Index; Supervisory strict = measure of overall bank capital stringency from Barth, Caprio, and Levine 2013; Transparency = dummy variable indicating whether a credit registry or other form of borrower information data transparency exists.

means that the share of income of the richest households increases and the macro-level DTI ratio declines.[25] On the other hand, higher-income households may decide to borrow more as a response to their relatively higher income, leading to an increase in macro-level DTI. Thus, the relationship between macro-level household debt and inequality is ambiguous. In this sample, higher inequality is associated with a slightly higher impact of changes in household debt on future growth.[26] Other explanations center on behavior, arguing that higher inequality results in more people with less financial education who are more vulnerable to overlending and predatory practices.[27]

These results suggest that the level of household debt at which further increases are detrimental is country specific and higher for countries with better institutions. The negative effects of increases in the household debt-to-GDP ratio on future GDP growth differ by country and depend on the initial level of indebtedness and country characteristics, as outlined earlier. This means that countries can attenuate the negative effects of increased household debt that arise at high initial levels of indebtedness if they are more financially developed and have higher standards of financial information transparency (credit registries) and consumer finance protection, better regulation and supervision, less inequality, and more flexible exchange rate regimes.[28] In effect, the impact on growth of a rising household debt-to-GDP ratio appears to be positive in the medium term when institutions and policies are the most effective, and appears to be negative when institutions and policies are the least effective, regardless of the initial level of household debt.

Conclusions and Policy Implications

The econometric analysis clearly shows that household debt has different effects on economic growth and financial stability depending on the horizon. At business cycle frequency, high growth in household lending appears to foster above-average growth and employ-

ment at first, but tends to be followed by a period of instability and subpar GDP growth and employment. This finding is consistent with the presence of a policy trade-off between short-term and medium-term growth and financial instability. While this forecasting trade-off is a robust pattern of the data, it is stronger for advanced economies than for emerging market economies, with increases in household debt consistently signaling higher risks when initial debt levels are already high. Nonetheless, the results indicate that the threshold levels for household debt increases being associated with negative macro outcomes start relatively low, at about 30 percent of GDP. Therefore, although emerging market economies have some space to take advantage of the positive effects of expanding households' access to credit—in both the short and long term—with low medium-term risks, such space may be limited. Furthermore, even in countries with low macro levels of household debt, a rapid expansion in credit may lead to an increasing fraction of highly leveraged households that may be vulnerable to shocks. Finally, existing studies suggest that household debt appears positive for growth across medium- to long-term horizons, although the relationship weakens at high levels of indebtedness.

A country's characteristics, institutions, and policies can mitigate the risks associated with increasing household debt. The negative effects are weaker in countries with less external financing and floating exchange rates, that are financially more developed, that have better financial sector regulations and policies, and that have lower income inequality. Thus, even in countries where the level of household debt to GDP is high, the stability-growth trade-off can be attenuated by a combination of good policies, institutions, and regulations. On the other hand, in countries where the low initial level of household debt mitigates some of the risks, the wrong combination of institutional characteristics and policies may offset the effect of a low debt level. This indicates that the point at which further increases in household debt pose risks to future economic performance is country specific; various factors should be evaluated by country authorities to assess vulnerabilities arising from household leverage.

Policy action will need to calibrate the short-, medium-, and long-term benefits and risks. Policies need to carefully balance minimizing the medium-term risks of growth in household credit for financial stability without harming the potential long-term benefits of inclusion and development. Moreover, policy

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[25]The macro-level DTI is the weighted average of household-level DTIs, with weights by income share.

[26]However, the significance of this effect varies, depending on the exact model specification.

[27]Along these lines, Rajan (2010) argues that household debt among lower-income households was encouraged by the political system in the United States as an easier (but riskier) way to deal with income inequality.

[28]While capital openness may also strengthen the association between household debt and future growth decelerations, it does so mainly in combination with less flexible exchange rate regimes.

action must overcome the inaction bias and political pressure generated by the very short-term positive impact of household credit on GDP growth versus the medium-term negative impact.

In any event, certain policy changes can help reduce the impact of aggregate demand externalities and behavioral biases. Some of the drag household debt places on GDP can be reduced by moving away from fixed exchange rates; introducing financial sector policies that promote financial institutions and market depth, access, and efficiency; and advancing policies that help reduce income inequality. For the most part, these policy changes may also have long-term positive effects on growth. For example, as noted by Coibion and others (2017), lower inequality may enhance lower-income households' access to credit and their ability to smooth consumption and make long-term investments (for example, sending children to college and retraining for different careers) that benefit society. Furthermore, the reliance on foreign debt and the role of capital flows may need further attention because they expose countries to sudden stops or destabilizing capital outflows (see also IMF 2014).

Macroprudential policy can help curb household leverage. Macroprudential policies can help internalize the externality that the borrowing by each household imposes on the rest of the financial system, given that large increases in household debt are associated with a greater likelihood of financial crises and recessions. The design of targeted macroprudential measures may need to take distributional aspects into account, since certain characteristics of households are associated with a greater misalignment of debt and future income. Detailed panel regression analysis shows that various macroprudential measures can significantly reduce real household credit growth, both in advanced economies and in emerging market economies (Box 2.5). Demand-side measures, such as limits on the debt-service-to-income ratio and loan-to-value ratio, seem highly effective. Supply-side measures targeted at loans, such as limits on bank credit growth, loan contract restrictions, and loan loss provisions, are equally effective. However, these policies would require careful calibration to maintain the balance between the short-, medium-, and long-term effects discussed.

There is also a role for policymakers to further strengthen the protection of consumer finance. The

empirical analysis found that credit registries reduce the negative effects on growth in the medium term. The development of credit registries will help improve the welfare of households vulnerable to overborrowing. Consumer financial protection not only helps unsophisticated consumers make wiser finance decisions, it also helps enhance overall financial stability, as shown in the empirical analysis. Measures could include increasing the transparency of financial contracts, financial education, prohibition of predatory lending, and regulation of certain financial innovation products.

Similarly, good microprudential supervision can mitigate the negative effects of household debt. As amply demonstrated during the global financial crisis, differences in the quality and depth of banking supervision helped explain why some countries escaped the negative externalities associated with the large increase in household debt during the preceding decade. This may reflect stronger supervisory powers or more stringent capital regulation frameworks that allowed supervisors to diminish the negative effect of household debt increases on future GDP.

Market solutions may also help mitigate the economic consequences of household debt in financial recessions. For example, risk sharing between mortgage lenders and borrowers could be increased, which is the aim of the shared appreciation design of mortgage contracts advocated by Shiller (2014) and Mian and Sufi (2014). In this more equity-like design of mortgage contracts, the principal is automatically written down if the local house price index falls below a specified threshold; increases in property value are shared between the homeowner and the lender. This type of mortgage loan can help price in the associated crash risk before lenders extend credit and reduce the debt overhang problem of households when house prices fall. In theory, this approach would reduce the blow to the macroeconomy of housing busts during episodes of household deleveraging. It would thus enhance financial stability much as nonfinancial firms or banks benefit from bail-in debt with loss-absorbing capacity vis-à-vis bondholders (see Chapter 3 of the October 2013 *Global Financial Stability Report*). However, more work is needed on the conditions and pricing that would entice banks to offer such contracts and to get a full understanding of the potential effects on financial stability (including banks' ability to absorb associated losses).

Box 2.1. Long-Term Growth and Household Debt

In the long term, higher levels of credit to GDP are generally associated with higher economic growth. Financial development, including better institutions and easier access to credit by households, has been shown to be beneficial to economic growth in the long term (Levine 1998; Beck and Levine 2004). As the financial sector develops, growth-enhancing investments can be more easily financed. Nonetheless, the relationship between household debt and growth is more elusive (Jappelli and Pagano 1994; De Gregorio 1996; Beck and others 2012; Sahay and others 2015a).

Recent studies have found that economies may reach a point of "too much finance." Arcand, Berkes, and Panizza (2015) and Sahay and others (2015b) found that financial depth begins to dampen output growth when credit to the private sector reaches between 80 percent and 100 percent of GDP. Too much finance may increase the frequency of booms and busts because of greater risk taking and leverage, and may leave countries ultimately worse off and with lower real GDP growth. Another argument is that too much finance leads to a diversion of talent and human capital away from productive sectors and toward the financial sector (Shiller 2005).

A more detailed analysis with household credit suggests the existence of a tipping point. An empirical exercise conducted for the countries covered in the chapter finds that household debt increases long-term real GDP per capita growth, but the effects weaken at higher levels of household debt and eventually become negative. The maximum positive impact in this exercise is found when household debt is between 36 percent and 70 percent of GDP (Figure 2.1.1, panel 1). In addition, there does not appear to be an effect specific to emerging market economies, but a financial crisis seems to result in permanently lower per capita GDP growth (Figure 2.1.1, panel 2).

Box prepared by Adrian Alter and Nico Valckx.

Figure 2.1.1. Long-Term per Capita GDP Growth and Household Debt

1. Effect of Household Debt on per Capita GDP Growth
(Percent)
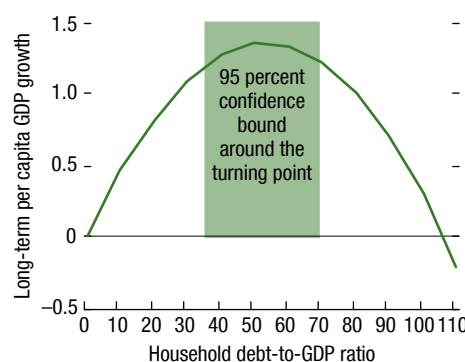
2. Panel Regression of per Capita GDP Growth and Household Debt, 1970–2010[1]

Variables	(1) Per Capita GDP Growth	(2) Per Capita GDP Growth	(3) Per Capita GDP Growth
HHD	0.051*	0.007	0.021
	(1.726)	(0.346)	(0.762)
HHD^2	−0.048**	−0.024	−0.051**
	(−1.980)	(−1.494)	(−2.057)
Crisis		−0.017***	−0.015***
		(−6.319)	(−4.688)
EME × HHD			−0.000
			(−0.015)
Education	0.028	0.018*	0.017
	(1.117)	(1.818)	(1.576)
Initial per capita GDP	−0.012**	−0.004	−0.000
	(−1.973)	(−1.227)	(−0.078)
Constant	−0.035	−0.038	−0.066
	(−0.353)	(−0.933)	(−1.507)
Observations	278	278	278
Number of countries	73	73	73
AR^2	0.0186	0.137	0.185
Hansen	0.253	0.797	0.361
Instruments	55	73	68

Source: IMF staff calculations.
Note: Figure shows nonlinear effect of household debt on long-term per capita GDP growth at various levels of household debt, based on a long-term panel regression. It uses the Arellano-Bover general method of moments estimator of five-year average per capita GDP growth (shown in panel 2) on household debt to GDP (HHD), the squared ratio of household debt to GDP (HHD^2), initial per capita GDP, secondary education enrollment, dummies for banking crises (Crisis), and emerging market economies' household debt-to-GDP ratio (EME × HHD).
*** $p < 0.01$; ** $p < 0.05$; * $p < 0.1$.
[1]Z-statistics in parentheses.

Box 2.2. Distributional Aspects of Household Debt in China

Housing assets and mortgages are important components of the balance sheets of Chinese households. High levels of ownership (about 90 percent of the population own a property) make housing the largest asset of Chinese households: more than two-thirds of their total assets (Figure 2.2.1, panels 1 and 2). On

the liability side, urban households in China have increased their borrowing. Mortgage loans from banks account for the largest share of their debt. Consistent with the life-cycle theory of debt, participation rates among urban Chinese households across age groups follow a hump shape and are highest for younger

Figure 2.2.1. Characteristics of China's Household Debt
(Percent)
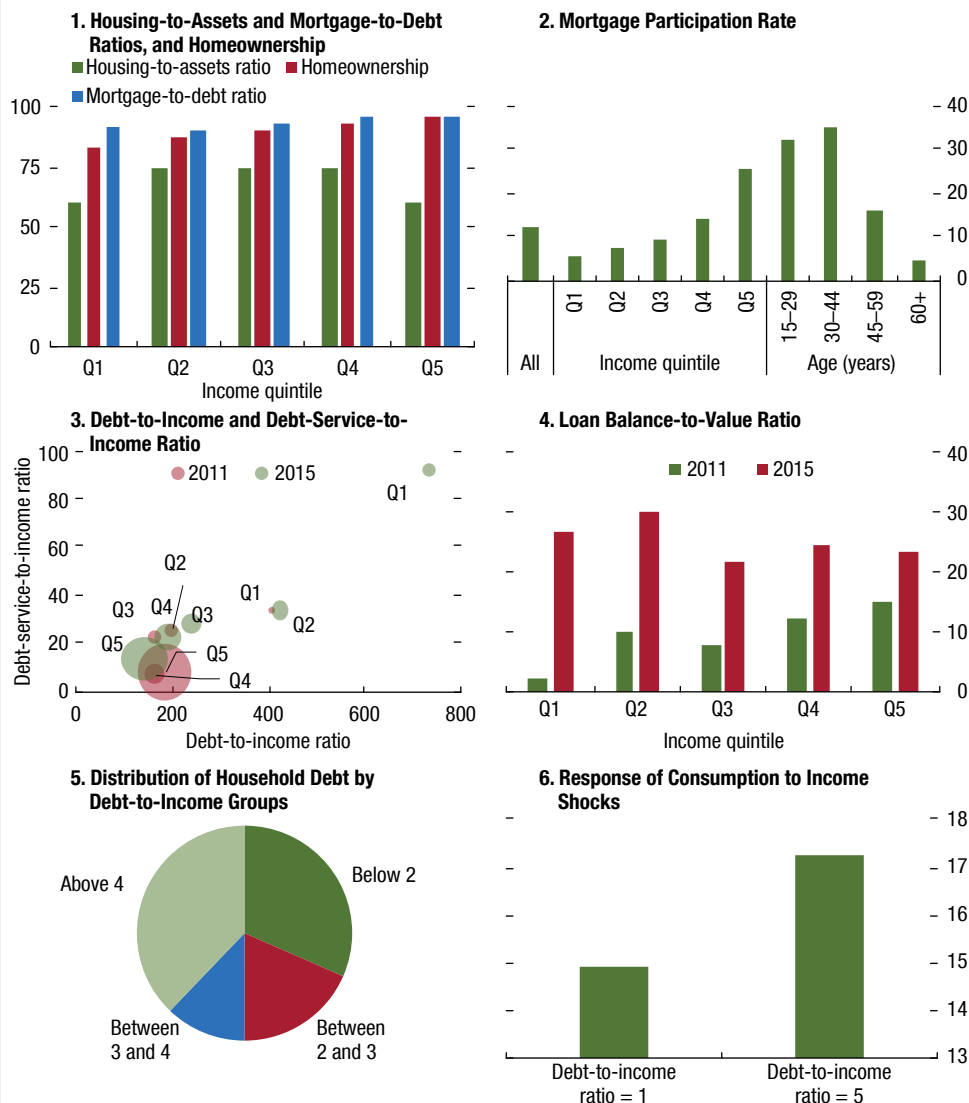
Sources: IMF staff calculations, based on China Household Finance Survey; see Gan and others 2013 for details.
Note: Data shown are mainly for urban households from different income quintiles (Q1 to Q5, lowest to highest). The housing-to-assets ratio is defined as the ratio of housing assets to total assets. The mortgage-to-debt ratio is defined as the ratio of mortgage debt to total debt. The mortgage debt participation rate is computed across age groups. Debt-to-income (multiple) and debt-service-to-income (percentage) ratios by income quintiles are scaled by the share of each household quintile in total debt. The response of consumption-to-income shocks is the coefficient in the cross-sectional regressions of the percentage change in consumption on the percentage change in income between 2013 and 2015 among households that were tracked in the survey. In panel 2, "age" refers to the age of the head of household. For panel 5, a ratio above 4 indicates a highly indebted household.

Box 2.2 *(continued)*

households.[1] Household debt has become an increasingly important component of credit in China. As the household debt-to-GDP ratio rose from 18.7 percent to about 38 percent from 2007 to 2016, loans to households as a percentage of total loans issued by financial institutions increased from 19.4 percent to 31.3 percent over the same period.[2]

The debt burden of mortgage borrowers in urban areas has increased in recent years, although mortgage participation rates are still relatively low compared with advanced economies. The debt-to-income ratio increased across most income groups, especially for lower-income households. The debt service ratio, defined as total debt repayment as a percentage of total income, also increased for all income groups but especially for lower-income households (Figure 2.2.1, panel 3). The loan balance-to-value ratio, defined as the remaining loan balance as a percentage of self-reported housing value, also increased over time (Figure 2.2.1, panel 4). On the other hand, mortgage loan participation rates, especially for low-income households, are still low, which is consistent with China's economic and financial development level.

The increased household debt could amplify the macroeconomic consequences of negative shocks. Although household debt is about 38 percent of GDP in China, more than one-third of it is held by highly indebted households, defined as those with a debt-to-income ratio greater than 4 (Figure 2.2.1, panel 5). This means that deterioration in the balance sheets of these households could have an amplified negative impact on the banking sector as well as on the macroeconomy, even though loans to households, including home mortgages, in China are still a smaller fraction of banks' total assets than in advanced economies. In addition, empirical evidence based on tracked samples of Chinese households between 2013 and 2015 shows that consumption of households with high debt to income responds more strongly to income shocks (Figure 2.2.1, panel 6). This suggests that negative shocks to household balance sheets may amplify the effect on China's economy because of highly indebted households' higher marginal propensity to consume—a pattern consistent with evidence in advanced economies (for example, Mian, Rao, and Sufi 2013).

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[1]Note that not many households of those ages 45–59 borrow for mortgages because a large share of today's housing stock still originates from the planned-economy period during which the government or state-owned enterprises distributed housing.

[2]Only domestic-currency (renminbi) loans are included. Data on total loans and loans to households are based on *Sources and Uses of Funds of Financial Institutions* published by the People's Bank of China.

Box prepared by Alan Xiaochen Feng, in collaboration with Feng Li and Xiaomeng Lu from the Survey and Research Center for China Household Finance at Southwestern University of Finance and Economics.

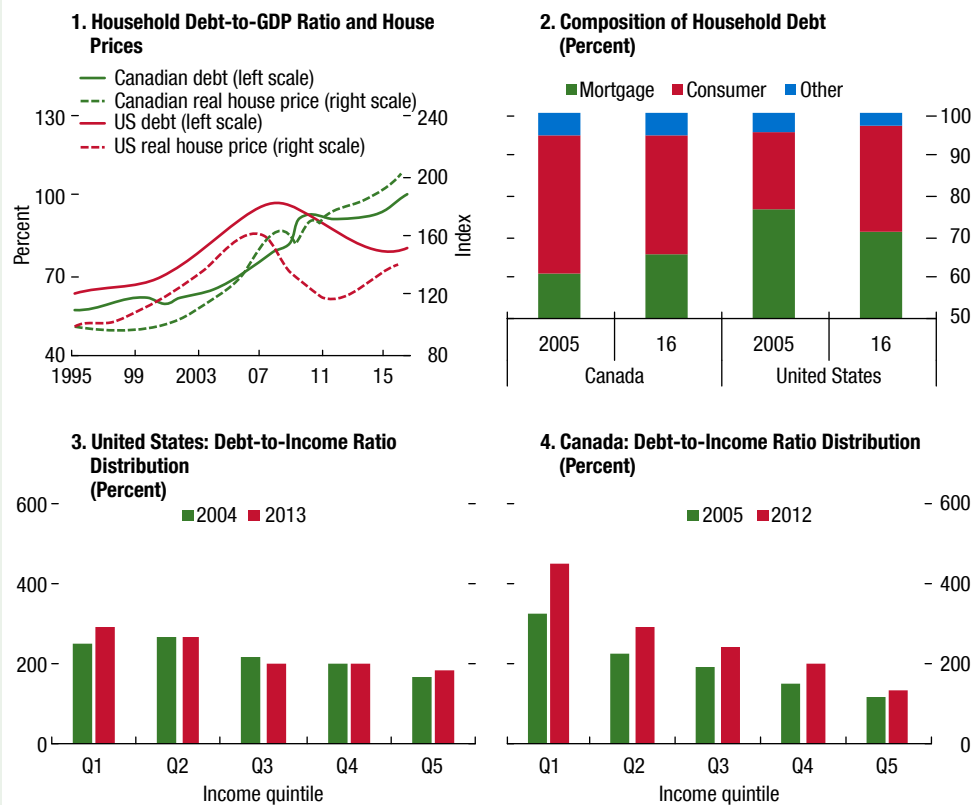## Box 2.3. A Comparison of US and Canadian Household Debt

Until the global financial crisis, household debt levels evolved very similarly in the United States and Canada. US household debt increased from 56 percent in 1995 to nearly 100 percent of GDP in the first quarter of 2008 and from 62 percent to 80 percent in Canada (Figure 2.3.1, panel 1). Afterward, US household debt fell to below 80 percent by early 2017, whereas in Canada, it continued to rise to more than 100 percent. This reflects different house price and unemployment trends, as well as difference in the evolution of net wealth, which left Canadian households relatively better off than their US counterparts.

The composition of household debt has changed in both countries. In response to continuously rising house prices, Canadian household debt became more tilted toward mortgage debt, which increased from 61 percent of total debt in 2005 to 66 percent of total debt in 2016 (Figure 2.3.1, panel 2). In the United States, where house prices fell by 40 percent from their peak in 2008, households' share of mortgage debt decreased, while consumer debt increased substantially, mainly because of increased student loan debt.

Leverage is very different across households. US households' leverage (as given by the debt-to-income ratio) remained broadly constant, except for the poorest income group, whose leverage increased slightly. In Canada, on the other hand, debt-to-income

Box prepared by Adrian Alter, Alan Xiaochen Feng, and Nico Valckx.

Figure 2.3.1. US and Canadian Household Debt Developments and Characteristics

1. Household Debt-to-GDP Ratio and House Prices

- Canadian debt (left scale)
- Canadian real house price (right scale)
- US debt (left scale)
- US real house price (right scale)

2. Composition of Household Debt (Percent)

■ Mortgage ■ Consumer ■ Other

3. United States: Debt-to-Income Ratio Distribution (Percent)

■ 2004 ■ 2013

4. Canada: Debt-to-Income Ratio Distribution (Percent)

■ 2005 ■ 2012

Source: IMF staff calculations, based on the Luxembourg Wealth Study, US Survey of Consumer Finances, and the Canadian Survey of Financial Security.
Note: Panels 3 and 4 refer to the median debt-to-income levels by income quintiles for mortgage borrowers.

Box 2.3 *(continued)*

ratios increased across all income groups, resulting in an average ratio almost 50 percent higher than in the United States (Figure 2.3.1, panels 3 and 4). Moreover, highly indebted households (those with debt-to-income ratios above 350 percent) held more than Can$400 billion, or 21 percent of the total household debt in Canada at the end of 2014, up from 13 percent before the crisis (Bank of Canada 2015).

High leverage may expose households to potentially adverse income shocks. The past recession in the United States showed that highly indebted households substantially reduced spending, which contributed to a significant decline in aggregate demand (Mian and Sufi 2011). Results reported in this chapter are in line with analysis by the Bank of Canada, which in its latest Financial System Review highlighted high household indebtedness and imbalances in the Canadian housing market as its two most important vulnerabilities; accordingly, it has implemented several macroprudential measures to mitigate these problems (IMF 2017).

Box 2.4. The Nexus between Household Debt, House Prices, and Output

Household debt leads to higher house prices and more debt in the future, likely through reinforcing feedback effects. Dynamic panel vector autoregression analysis confirms that household debt has a short-term positive effect on real house prices and output.[1] A one standard deviation shock to household debt initially leads to higher real house prices and output, but over the medium term (after about three to five years) results
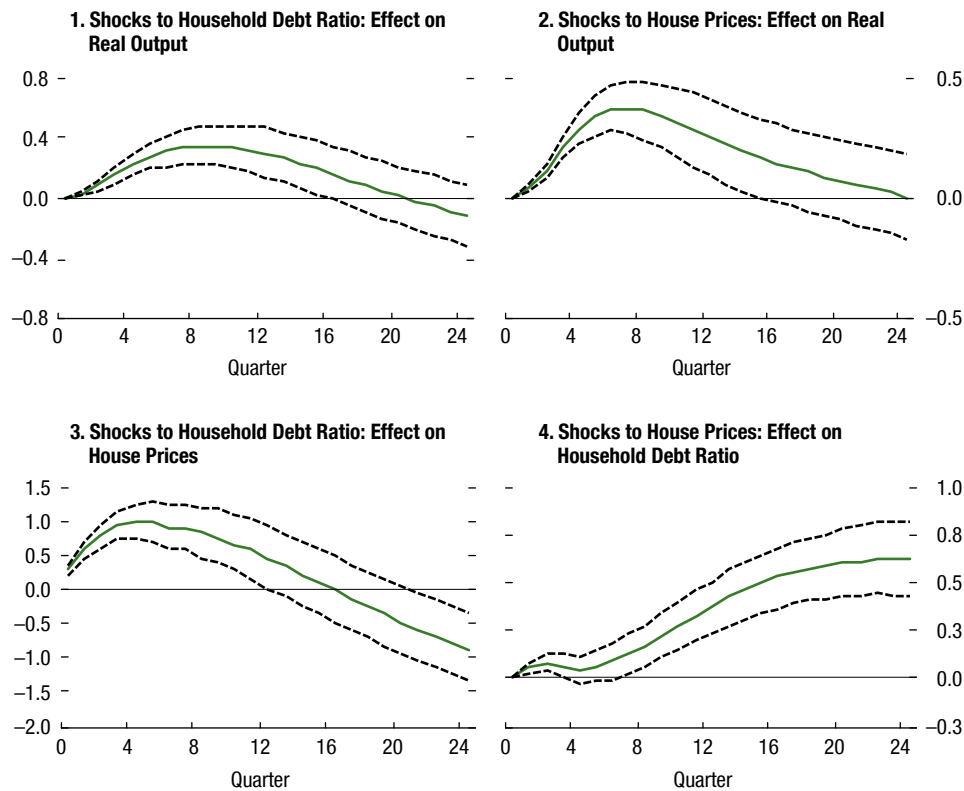
in a decline (Figure 2.4.1, panels 1 and 3).[2] Higher house prices are positively associated with output in the short and medium term, but negatively in the long term (Figure 2.4.2). In response to a positive shock to house prices, household debt increases steadily over the short and medium term, while reverting to its long-term mean thereafter (Figure 2.4.1, panel 4).

Box prepared by Adrian Alter and Alan Xiaochen Feng.
[1]The panel vector autoregression model was conducted with a set of 27 countries with quarterly data available starting in 1998.

[2]These findings are consistent with Lombardi, Mohanty, and Shim 2017. See also Mian, Sufi, and Verner, forthcoming; Calza, Monacelli, and Stracca 2013; and Brunnermeier and others 2017.

Figure 2.4.1. Panel Vector Autoregression Dynamic Analysis
(Percentage points)

1. Shocks to Household Debt Ratio: Effect on Real Output

2. Shocks to House Prices: Effect on Real Output

3. Shocks to Household Debt Ratio: Effect on House Prices

4. Shocks to House Prices: Effect on Household Debt Ratio
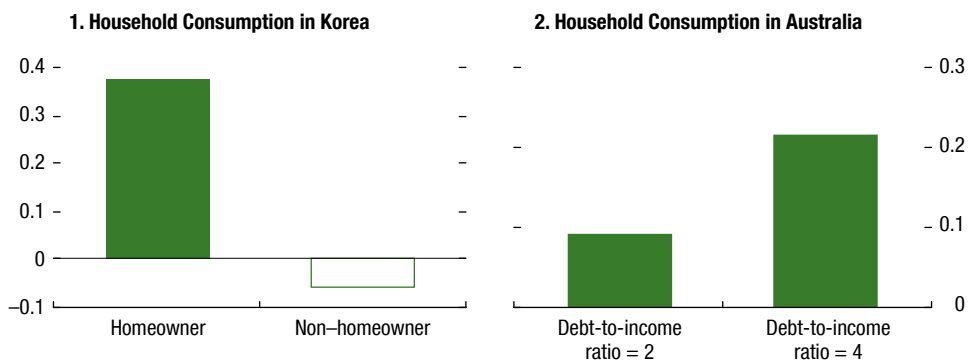
Source: IMF staff calculations.
Note: The figure presents impulse responses from a five-variable recursive panel vector autoregression with eight lags using quarterly data from 1998:Q1 to 2015:Q4, which includes country and time fixed effects. Shocks are identified using a Cholesky decomposition with the following order: log real GDP, corporate debt, household debt, log real house prices, and short-term interest rates. Household debt and corporate debt were scaled by GDP. The results are robust to a Nickell bias correction (using panel general method of moments techniques) and other specifications (for example, ordering, number of lags, changes instead of levels). Dashed lines represent 90 percent confidence intervals, computed using 500 Monte Carlo simulations.

Box 2.4 *(continued)*

Figure 2.4.2. Consumption Response to House Prices
(Percent)

Sources: Australian Bureau of Statistics; Household, Income and Labour Dynamics in Australia; Korean Labor and Income Panel Study; Statistics Korea; and IMF staff calculations.
Note: For households in Korea, regression coefficients are obtained by regressing the percentage change in consumption on changes in the local house price index between 2008 and 2014. For households in Australia, regression coefficients are obtained by regressing the percentage change in consumption on changes in the local house price index between 2012 and 2015. In both analyses, controls include the percentage change in household income, debt, and other demographic information, as well as state-level changes in income over the same period. Samples of households in both countries are restricted to those tracked over the period covered. Low leverage corresponds to a debt-to-income ratio of 2 and high leverage corresponds to a debt-to-income ratio of 4. Standard errors are clustered at the state or province level.

Micro-level panel survey data analysis confirms the impact of house prices on consumption and the role of debt. In Korea, the rise in the local house price index between 2008 and 2014 had a positive effect on household consumption, which is consistent with the initial positive response of GDP to house price shocks shown in the panel vector autoregression analysis.[3]

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[3]This empirical exercise uses tracked samples of households between 2008 and 2014 and controls for changes in household income, demographic information, and city-level aggregates.

Such an effect is present only for homeowners, suggesting that the increase in house prices raises collateral value as well as perceived wealth for these households (Figure 2.4.2, panel 1). Similarly, in Australia, homeowners increased consumption in response to higher local house prices between 2012 and 2015, and the effect was stronger for households with high financial leverage. This finding indicates that higher household debt reinforces the impact of house prices on the real economy (Figure 2.4.2, panel 2).

Box 2.5. The Impact of Macroprudential Policies on Household Credit

This box finds that macroprudential loan-targeted measures successfully reduce the growth of real household credit in both advanced economies and emerging market economies.
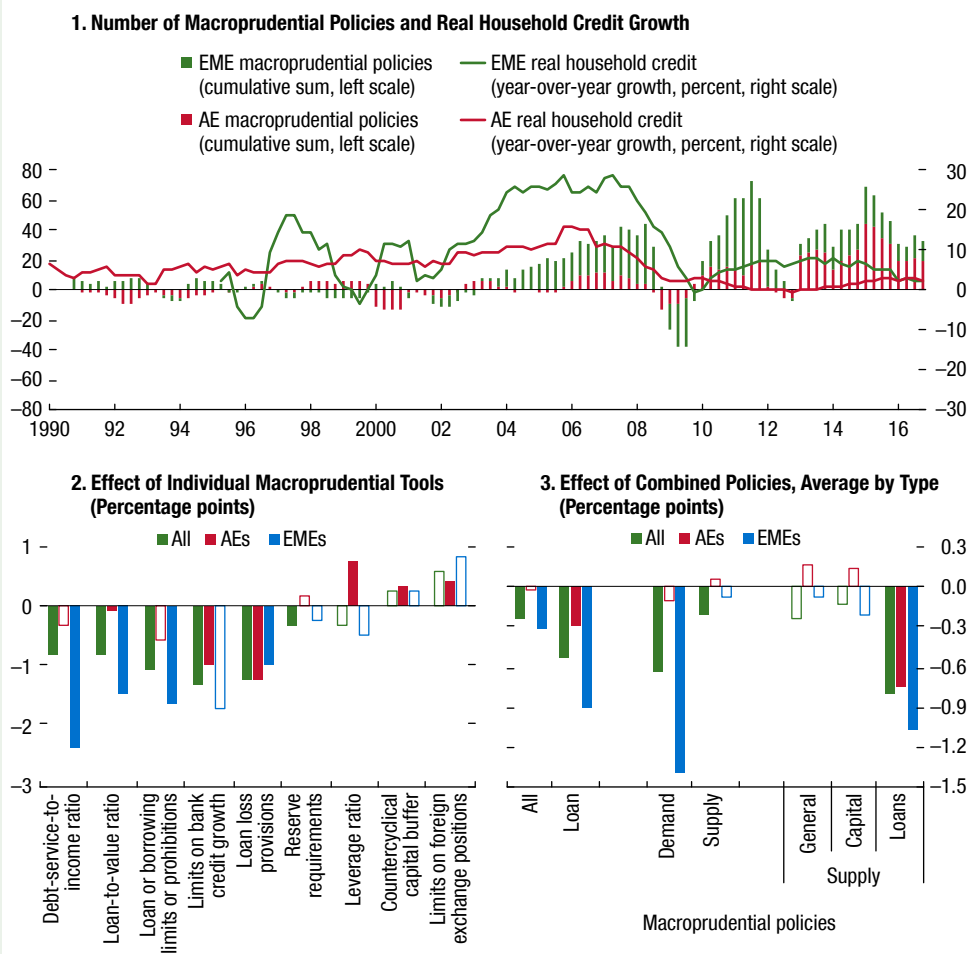
Many countries introduced or tightened macroprudential policy measures to limit systemic risk in the aftermath of the large credit boom that preceded the

Box prepared by Adrian Alter and Machiko Narita.

global financial crisis (Figure 2.5.1, panel 1). In theory, macroprudential policies reduce systemic risk by correcting externalities operating through the financial system. Such externalities include aggregate demand externalities and strategic complementarities among financial institutions, which amplify credit and asset price cycles.[1]

[1]See, for example, Hanson, Kashyap, and Stein 2011; De Nicolò, Favara, and Ratnovski 2012; and IMF 2013.

Figure 2.5.1. Macroprudential Policy Tools and Household Credit Growth

1. Number of Macroprudential Policies and Real Household Credit Growth

2. Effect of Individual Macroprudential Tools
(Percentage points)

3. Effect of Combined Policies, Average by Type
(Percentage points)

Source: IMF staff calculations.
Note: In panel 1, the macroprudential policies show the cumulative sum of tightening (+) and loosening (–) policies. Panel 2 shows the estimated average effects on real household credit growth of one tightening event for each macroprudential measure, one at a time, in a panel regression of 62 countries (32 advanced economies and 30 emerging market economies). In panel 3, All comprises all 14 measures considered. Loan consists of demand-side and supply-side loans. Demand includes debt-service-to-income ratios and loan-to-value ratios. Supply measures are classified into General, Capital, and Loans. Supply (General) consists of reserve requirements, liquidity requirements, limits on foreign exchange positions, and taxes on financial institutions. Supply (Capital) consists of capital requirements, conservation buffers, the leverage ratio, and the countercyclical capital buffer. Supply (Loans) consists of limits on bank credit growth, loan loss provisions, loan restrictions, and limits on foreign currency loans. Shaded bars depict significant effects at the 10 percent confidence levels. See Annex 2.2 for estimation details. AEs = advanced economies; EMEs = emerging market economies.

Box 2.5 *(continued)*

In both advanced and emerging market economies, targeted macroprudential measures successfully reduce real household credit growth. From a set of 14 measures, 5 measures related to credit have robust negative effects (Figure 2.5.1, panel 2). These measures are limits on the debt-service-to-income (DSTI) ratio, limits on the loan-to-value (LTV) ratio, loan contract restrictions, limits on bank credit growth, and loan loss provisions. On average, a tightening of these measures leads to a 1 to 3 percentage point decline in real household credit growth, similar to Kuttner and Shim's (2016) results for LTV and DSTI ratio limits.[2] The effects are generally stronger in emerging market economies, corroborating the findings of Cerutti and others (2017).[3]

On the other hand, measures that are not targeted to loans do not exhibit strong effects in contracting household credit. Reserve requirements also tend to have negative effects, but they are smaller and less significant than targeted measures.[4] Leverage limits, conservation buffers, and limits on foreign exchange positions are positively associated with subsequent growth in household credit. Other measures, such as capital requirements and taxes on financial intermediaries, do not have significant effects. However, a tightening of general supply measures should increase the resilience of the financial system to aggregate shocks by building buffers. Previous studies also find weaker effects of nontargeted and capital measures and may explain their lack of effectiveness, including leakages. For example, tightening capital requirements may have little effect when banks hold ample capital. When examining the effects of measures by type, demand-side measures (DSTI and LTV) as well as loan-targeted supply-side measures (on domestic credit growth and loan loss provisions) are found to be effective (Figure 2.5.1, panel 3).[5]

[2]Other studies, using different data and methodologies, also show that tighter LTV and DSTI ratios reduce household credit growth. See Lim and others 2011; Arregui and others 2013; Crowe and others 2013; Krznar and Morsink 2014; and Jácome and Mitra 2015.

[3]Loan restrictions and limits on credit growth also appear to effectively contain corporate credit growth, to the tune of 2 to 3 percentage points, while other measures have a weak or insignificant impact. The latter could reflect firms' better access to (international) debt markets than households.

[4]See Arregui and others 2013; Crowe and others 2013; Vandenbussche, Vogel, and Detragiache 2015; and Kuttner and Shim 2016.

[5]Combining same-type measures allows the effects of multiple measures adjusted at the same time to be controlled for. For example, Kuttner and Shim (2016) report that changes in DSTI and LTV ratio limits are often coordinated.

Annex 2.1. Data Sources

Annex Table 2.1.1. Countries Included in the Sample for Household Debt and Data Sources

| Country	Source	Start Year	Country	Source	Start Year
Advanced Economies			**Emerging Market Economies**		
Australia	BIS; JST	1952	Argentina	BIS	1994
Austria	BIS	1995	Bangladesh	Haver	2004
Belgium	BIS; JST	1950	Bolivia	Central Bank of Bolivia	1992
Canada	BIS; JST	1956	Botswana	IMF, MFS	2001
Cyprus	CEIC	1995	Brazil	BIS	1994
Czech Republic	BIS	1995	Bulgaria	ECRI	1995
Denmark	BIS; JST	1951	Chile	BIS; Central Bank of Chile	1983
Estonia	Haver; Bank of Estonia	1993	China	BIS	2006
Finland	BIS; JST	1950	Colombia	BIS	1996
France	BIS; JST	1958	Costa Rica	Central Bank of Costa Rica	1997
Germany	BIS; JST	1950	Croatia	Croatian National Bank	1993
Greece	Haver	1980	Egypt	Central Bank of Egypt	2002
Hong Kong SAR	CEIC	1982	FYR Macedonia	National Bank of the Republic of Macedonia	1995
Iceland	Haver; IMF, MFS	1995	Georgia	IMF, MFS	2001
Ireland	ECRI	1998	Ghana	IMF Bridge Data; IMF, MFS	2001
Israel	BIS	1992	Hungary	BIS	1989
Italy	BIS	1950	India	CEIC	1998
Japan	BIS; JST	1950	Indonesia	BIS	2001
Korea	BIS	1962	Jordan	Central Bank of Jordan	1993
Latvia	Haver	2003	Kazakhstan	Haver	1996
Lithuania	Haver	1993	Kenya	IMF, MFS	2001
Luxembourg	Haver	1992	Kuwait	CEIC	1997
Malta	ECRI	1995	Malaysia	IMF, MFS	2001
Netherlands	BIS	1990	Mauritius	IMF, MFS	2001
New Zealand	BIS	1990	Mexico	BIS	1994
Norway	BIS	1975	Mongolia	IMF, MFS	2001
Portugal	BIS	1979	Montenegro	ECRI	1995
Singapore	BIS	1991	Morocco	IMF, MFS	2001
Slovak Republic	National Bank of Slovakia	1993	Namibia	IMF, MFS	2001
Slovenia	Haver; IMF, MFS	2004	Nigeria	IMF, MFS	2001
Spain	BIS; JST	1950	Pakistan	IMF, MFS	2006
Sweden	BIS; JST	1975	Panama	IMF, MFS	2002
Switzerland	BIS; JST	1950	Paraguay	Central Bank of Paraguay; IMF, MFS	1990
United Kingdom	BIS; JST	1950	Philippines	Central Bank of the Philippines	1999
United States	BIS; JST; CEIC	1950	Poland	BIS	1995
			Romania	ECRI	1996
			Russia	BIS	1995
			Saudi Arabia	BIS; CEIC	1995
			Serbia	IMF, MFS	2003
			South Africa	Haver	1969
			Thailand	BIS	1991
			Turkey	BIS	1986
			Ukraine	IMF, MFS	2001
			Uruguay	BIS	2001
			Venezuela	BIS	2001

Sources: IMF staff.
Note: BIS = Bank for International Settlements; CEIC = CEIC Data Co. Ltd.; ECRI = Economic Cycle Research Institute; Haver = Haver Analytics; IMF, MFS = Monetary and Financial Statistics database; JST = Jordà-Schularick-Taylor Macrohistory Database.

Annex Table 2.1.2. Household Survey Data Sources

Country	Name of Survey
Advanced Economies	
Australia	Household, Income and Labour Dynamics in Australia Survey
Canada	Luxembourg Wealth Study, Survey of Financial Security
Euro Area	European Central Bank's Household Finance and Consumption Survey; Luxembourg Income Study (LIS); Luxembourg Wealth Study (LWS)
Japan	Keio Household Panel Survey
Korea	Korean Labor and Income Panel Study; Korean Statistical Information Service
Netherlands	DNB Household Survey
United Kingdom	British Household Panel Survey
United States	Luxembourg Wealth Study, Survey of Consumer Finances
Emerging Market Economies	
China	China Household Finance Survey

Source: IMF staff.

Annex Figure 2.1.1. Loan Characteristics, Rules, and Regulations
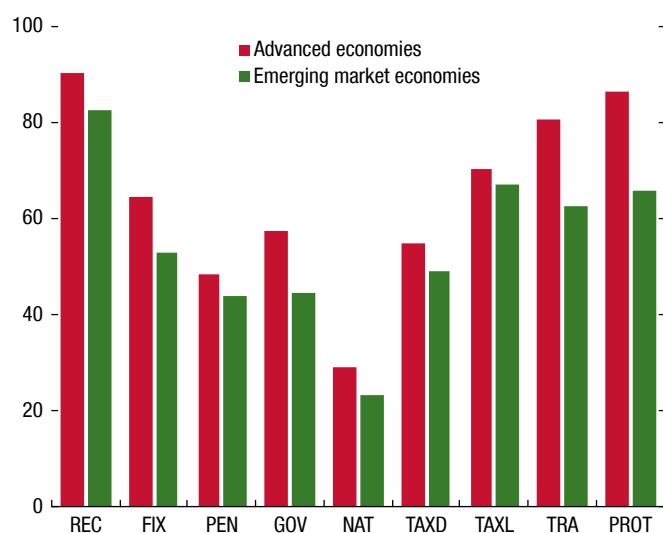
Source: IMF staff calculations.
Note: Figure is based on an IMF desk survey of the prevalence of certain debt characteristics in 80 countries. The desk survey reveals that a majority of countries have financial protection regulations (against predatory lending practices) and loan transparency rules and regulations (through credit registries or credit bureaus). In 80 percent of the sample, recourse is commonplace in loan agreements, whereas early prepayment restrictions feature in about 40 percent of the countries surveyed. Tax deductibility is common in half of the sample, with limitations on how much debt (or interest payments) households can deduct from their taxes. Fixed-rate mortgages (with the initial rate fixed for 10 or more years) are offered in most countries. Administrative restrictions on land supply are more prevalent in advanced economies (about 60 percent) than in emerging market economies (44 percent), whereas natural restrictions exist in about 30 percent of the countries surveyed (related to size of the country, livable land area, population density, and the like). FIX = fixed rates are offered; GOV = administrative restrictions on land supply; NAT= natural restrictions on density of development, such as topography and geography; PEN = restrictions on early payment; PROT = consumer financial protection legislation in place; REC = mortgage loans are full recourse; TAXD = debt or interest payments are tax deductible; TAXL = limits on TAXD exist; TRA = credit registry.

Annex Table 2.1.3. Description of Explanatory Variables Used in the Chapter

Variables	Description	Source
Macro-level Variables		
Nominal GDP	Gross domestic product, current prices, national currency	Jordà-Schularick-Taylor Macrohistory database; Penn World Table; IMF, World Economic Outlook database
Real GDP	Gross domestic product, constant prices, national currency	IMF, World Economic Outlook database
Real Private Consumption	Private final consumption, constant prices, national currency	IMF, World Economic Outlook database
Consumer Price Index	Consumer prices, period average, index	IMF, International Financial Statistics database
Population	Population, in millions of persons	IMF, World Economic Outlook database
Unemployment	Unemployment rate (percent)	IMF, World Economic Outlook database
Interest Rate	Three-month Treasury bill rate, money market rate, interbank market rate (percent)	Bloomberg Finance L.P.; IMF, International Financial Statistics database; Thomson Reuters Datastream
Bank Equity Index	Equity price index of the banking sector (or financial sector if banking sector price index not available)	Bloomberg Finance L.P.; Thomson Reuters Datastream
Stock Market Index	Overall stock price index	Bloomberg Finance L.P.; IMF, Global Data Source database; Thomson Reuters Datastream
Banking Crisis	Systemic banking crisis defined as (1) significant signs of financial distress in the banking system (as indicated by significant bank runs, losses in the banking system, and/or bank liquidations); (2) significant banking policy intervention measures in response to significant losses in the banking system	Laeven and Valencia 2013
Real House Price Index	House price index deflated by consumer price index	Jordà-Schularick-Taylor Macrohistory database; OECD, Global Property Guide; and IMF staff calculations
Exchange Rate	National currency units per US dollar, period average	Thomson Reuters Datastream
Real Effective Exchange Rate	Real effective exchange rate, based on consumer price index	IMF, Monetary and Financial Statistics database
Exchange Rate Regime	De facto exchange rate arrangement of the country	Ilzetzki, Reinhart, and Rogoff 2017 data set
Institutional Variables		
Financial Risk Index	Measure of a country's ability to pay its way by financing its official, commercial, and trade debt obligations; index ranges from 50 (least risk) to a low of 0 (highest risk)	International Country Risk Guide, PRS Group
Financial Development Index	Overall financial development index	Svirydzenka 2016
Capital Account Openness Index (Chinn-Ito Index)	An index measuring a country's degree of capital account openness	Chinn and Ito 2006 data set (updated)
Official Supervisory Power	Whether the supervisory authorities have the authority to take specific actions to prevent and correct problems; index ranges from 0 (no powers) to 14 (most powers)	Barth, Caprio, and Levine 2013
Overall Capital Stringency	Whether the capital requirement reflects certain risk elements and deducts certain market value losses from capital before minimum capital adequacy is determined; index ranges from 0 (least stringent) to 7 (most stringent)	Barth, Caprio, and Levine 2013
Income Share Held by Highest 20 Percent	Percentage share of income or consumption is the share that accrues to subgroups of the population indicated by deciles or quintiles	World Bank, World Development Indicators
Income Share Held by Lowest 20 Percent	Percentage share of income or consumption is the share that accrues to subgroups of the population indicated by deciles or quintiles	World Bank, World Development Indicators

Source: IMF staff.
Note: OECD = Organisation for Economic Co-operation and Development.

Annex 2.2. Methodology

This annex provides a general overview of the methodologies behind the various econometric exercises performed in this chapter.

Logit Analysis

The logit model analyzes how levels and changes in household debt affect financial stability. The model is given by

$$log \frac{P[S_{it} = 1|X_{it}]}{P[S_{it} = 0|X_{it}]} = \Psi_{0i} + \Psi_1 X_{it}$$
$$+ \Psi_2 X_{it} I(\text{HiDebt})_{it} + \epsilon_{it}, \quad (A2.2.1)$$

in which X_{it} refers to a vector of lagged changes and levels of household and corporate debt-to-GDP ratios, while the third term refers to interactions with an indicator I (HiDebt). The latter takes the value of one if country i experiences household debt exceeding 65 percent of GDP. Country fixed effects (Ψ_{0i}) were included in the estimation. The main metric to compare model performance is the area under curve. Annex Table 2.2.1 contains the underlying estimates.

Household Debt and Bank Equity Returns

This exercise provides an alternative measure of banking stress and assesses the role of household debt for future bank equity returns. According to the efficient market hypothesis, past household credit growth should not be correlated with future bank stock returns if investors correctly price the risks associated with the rise in household debt to the banking sector. However, downside risks may be neglected by investors during credit booms when market sentiments are high (for example, Cheng, Raina, and Xiong 2014; Baron and Xiong 2017), leading to systematic predictability of bank stock declines following increases in household debt. Following Baron and Xiong (2017), the empirical specification is given by

$$r_{c,t+k} - r^f_{c,t+k} = \alpha_c + \gamma_t + \beta_h \Delta \left(\frac{HHD}{GDP}\right)_{c,t}$$
$$+ \beta_f \Delta \left(\frac{NFCD}{GDP}\right)_{c,t} + \beta_d$$
$$\times DivYld_{c,t} + X_{c,t}\delta + \epsilon_{c,t}, \quad (A2.2.2)$$

in which $r_{c,t+k}$ is the return in year k of the banking sector index in country c; is government bond

Annex Table 2.2.1. Logit Analysis: Probability of Systemic Banking Crisis

Variables	(1)	(2)	(3)	(4)	(5)
	Dependent Variable: Systemic Banking Crises				
Household Debt	4.037***		2.501***	1.270	2.091
	(0.783)		(0.925)	(1.276)	(1.716)
Δ Household Debt		40.05***	35.01***	35.60***	30.86***
		(6.482)	(6.334)	(7.161)	(8.451)
Corporate Debt				0.879	0.536
				(0.761)	(0.743)
Δ Corporate Debt				13.13***	15.62***
				(3.954)	(4.220)
Δ Household Debt × High HH Debt					24.41*
					(14.11)
High HH Debt					−1.355
					(0.896)
Constant	−5.949***	−3.741***	−5.465***	−5.224***	−5.253***
	(0.594)	(0.150)	(0.681)	(0.732)	(0.902)
Observations	1,223	1,033	1,033	1,020	1,020
Country Cluster	Yes	Yes	Yes	Yes	Yes
Country Fixed Effect	Yes	Yes	Yes	Yes	Yes
Area under Curve	0.700	0.791	0.806	0.840	0.850
Number of Crises	46	37	37	37	37
Number of Clusters	40	34	34	34	34
Pseudo R^2	0.0612	0.142	0.153	0.204	0.218

Source: IMF staff calculations.
Note: Robust standard errors in parentheses. All regressors are lagged. The third lag of household debt change was used based on significance. High household debt (High HH Debt) dummy variable is set at 65 percent of GDP, representing the top quintile of the distribution. Banking crises are taken from the updated database by Laeven and Valencia (2013).
*** $p < 0.01$; ** $p < 0.05$; * $p < 0.1$.

yield, and $DivYld_{c,t}$ is the dividend yield of the banking sector,

$$\Delta \left(\frac{HHD}{GDP} \right)_{c,t} = \left(\frac{HHD}{GDP} \right)_{c,t} - \left(\frac{HHD}{GDP} \right)_{c,t-1}$$

and

$$\Delta \left(\frac{NFCD}{GDP} \right)_{c,t} = \left(\frac{NFCD}{GDP} \right)_{c,t} - \left(\frac{NFCD}{GDP} \right)_{c,t-1} \quad \text{(A2.2.3)}$$

normalized by the standard deviation of each variable for each country, and $X_{c,t}$ includes control variables such as the past levels of household debt and corporate debt ratios.

The baseline model is estimated using the specification above. Two similar models are also estimated using probit analysis and quantile regressions. The probit analysis examines the relationship between past increases in the household debt ratio and the probability of bank equity crashes occurring in the next one to five years. Bank equity crashes are defined as having an annual stock return below the mean return by at least one standard deviation. In the quantile regressions, the relationship between past increases in the household debt ratio and future bank equity returns at different quantiles is examined.

Time Series Analysis of Household Debt, Income, and Consumption

Panel regressions are estimated following Mian, Sufi, and Verner, forthcoming, estimating future real GDP growth on changes in household debt and corporate debt ratios and lagged GDP growth rates. Different specifications are estimated, with changes in the debt ratio calculated over the past three years. In addition, level effects, thresholds, and nonlinearities are tested. Regression estimates are further differentiated by various groupings: advanced and emerging market economies, various institutional factors, and loan terms. Estimations are also performed over different time periods (before and after the global financial crisis) and were qualitatively very similar.

Specifically, the following general equation was estimated:

$$\Delta_h y_{i,t+h} = \alpha_i^h + \beta_{HH}^h \Delta_3 d_{i,t-1}^{HH}$$
$$+ \beta_F^h \Delta_3 d_{i,t-1}^F + X_{i,t-1} \Gamma^h + \epsilon_{it}^h \quad \text{(A2.2.4)}$$

in which α_i^h are country fixed effects, Δ_3 refers to three-year differences, $d_{i,t}^{HH}$ and $d_{i,t}^F$ are the household debt-to-GDP ratio and nonfinancial firm debt-to-GDP

ratio, and $h = 0, \ldots, 6$ is the forecast horizon. The matrix X_{it} includes higher-order lags of the dependent variable as additional controls. Right-hand variables are lagged by one year. Annex Table 2.2.2. provides a summary of the major panel regression estimates.

Micro Data Analysis

Euro area panel data allow the effects of household leverage on consumption, using a longitudinal household panel, to be tested. Specifically, from a broader euro area household finance and consumption survey of 15 to 20 countries for 2010 and 2014, data for Belgium, Cyprus, Germany, Malta, and the Netherlands allow testing for the effects of initial household debt-to-income and loan-to-value ratios on changes in the consumption-to-income ratio.

The following cross-sectional regression is estimated, at the household level, with change in household food consumption (percent of income) as the dependent variable:

$$\Delta C_{i,2014} = \alpha_c + \beta_1 DTI_{i,2010}$$
$$+ \gamma Controls + \epsilon_i, \quad \text{(A2.2.5)}$$

in which debt-to-income ratio ($DTI_{i,2010}$) is a proxy for past household indebtedness; household characteristics (such as employment, education, age of the household head, household's net wealth and size) are considered *Controls*. In addition, the model includes country fixed effects (α_c).

Macroprudential Policies and Household Credit Growth

Analysis in Box 2.5 gauged the effectiveness of macroprudential tools for reducing household credit growth. More specifically, the following panel regression equation was estimated:

$$C_{i,t} = \rho C_{i,t-1} + \beta MaPP_{i,t-1}$$
$$+ \gamma X_{i,t-1} + \alpha_i + \mu_t + \epsilon_{i,t}, \quad \text{(A2.2.6)}$$

in which α_i and μ_t denote country and year fixed effects, i denotes country, and t the time period (quarter). The dependent variable, $C_{i,t}$, refers to year-over-year growth rate of real household credit. The main independent variable, MaPP, is the policy change indicator (that is, tightening or loosening) compiled by IMF staff for each of the 14 macroprudential tools (that is, limits on the debt-service-to-income ratio, loan-to-value ratio, loan restrictions, limits on bank

Annex Table 2.2.2. Panel Regression Estimates for Three-Year-Ahead Growth Regression on Household Debt and Policy Interaction Variables

	(1)	(2)	(3)	(4)	(5)	(6)	(7)	(8)	(9)
Change HHD/GDP	0.104	0.141***	-0.588*	-0.062	-0.241*	-0.109	0.015	-0.758**	-0.796*
Change FirmD/GDP	-0.036*	-0.037*	-0.028*	-0.034*	-0.037*	-0.035*	-0.012*	-0.032*	-0.031*
HHD30 × ΔHHD	-0.261*	-0.367*	-0.373*	-0.360*	-0.280*	-0.435*	-0.080*	-0.310*	-0.304*
Financial Openness Index × ΔHHD	-0.120*							-0.123*	-0.093*
Fixed FX × ΔHHD		-0.301*						-0.113***	0.032
Financial Risk Index × ΔHHD			0.016*					0.020*	0.019*
Income Inequality × ΔHHD				0.002				-0.006***	-0.004*
Transparency × ΔHHD					0.285*			0.246*	0.202*
Financial Development Index × ΔHHD						0.369*		0.394***	0.445**
Financial Openness Index × Fixed FX							0.03		-0.588
Financial Openness Index × Fixed FX × ΔHHD							-0.058*		-0.090**
R^2 Adjusted	0.581	0.572	0.575	0.56	0.57	0.568	0.585	0.616	0.618
Observations	1,002	1,002	1,002	1,002	1,002	1,002	1,002	1,002	1,002
Number of Countries	57	57	57	57	57	57	57	57	57
Akaike Information Criterion	6.16	6.18	6.17	6.2	6.18	6.19	3.95	6.08	6.07
F-statistic	16.1	15.6	15.7	14.8	15.4	15.3	16.4	16.7	16.6
Log Likelihood	-2,991	-3,001	-2,998	-3,015	-3,004	-3,006	-1,885	-2,942	-2,938

Source: IMF staff estimates.
Note: All panel estimations include country fixed effects, time fixed effects, and base effects. Estimations are performed over a constant sample (for which data on all variables are available). Standard errors are robust estimators. Fixed FX = fixed exchange rate regime dummy; HHD = household debt; HHD30 = dummy if household debt-to-GDP ratio exceeds 30 percent; income inequality = difference between income share of top 20 percent and the bottom 20 percent income groups; transparency = a dummy variable, whether a credit registry or other form of borrower information data transparency exists.
*** $p < 0.01$; ** $p < 0.05$; * $p < 0.1$.

credit growth, loan loss provisions, reserve requirements, liquidity requirements, limits on foreign exchange positions, capital requirements, conservation buffers, leverage ratio, countercyclical capital buffer, limits on foreign currency loans, and taxes on financial institutions) or macroprudential group indices (that is, all MaPPs, loan MaPPs, demand, supply, supply [general], supply [capital], and supply loans). MaPPs are the cumulative sum of the number of policy changes over the past year (that is, the past four quarters) to reflect the potential delayed effects. A vector of control variables, $X_{i,t}$, such as real output growth and domestic interest rates, is also included. The model is estimated with quarterly data from 62 countries (32 advanced economies and 30 emerging market economies) from the first quarter of 1990 to the fourth quarter of 2015, using both panel fixed effects and the system generalized method of moments technique as outlined by Arellano and Bover (1995).

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