

Discussion Paper

Deutsche Bundesbank
No 55/2018

**Revisiting the finance and growth nexus –
A deeper look at sectors and instruments**

Robert Unger

Editorial Board:

Daniel Foos
Thomas Kick
Malte Knüppel
Vivien Lewis
Jochen Mankart
Christoph Memmel
Panagiota Tzamourani

Deutsche Bundesbank, Wilhelm-Epstein-Straße 14, 60431 Frankfurt am Main,
Postfach 10 06 02, 60006 Frankfurt am Main

Tel +49 69 9566-0

Please address all orders in writing to: Deutsche Bundesbank,
Press and Public Relations Division, at the above address or via fax +49 69 9566-3077

Internet <http://www.bundesbank.de>

Reproduction permitted only if source is stated.

ISBN 978-3-95729-538-5 (Printversion)

ISBN 978-3-95729-539-2 (Internetversion)

Non-technical summary

Research Question

In the light of the global financial crisis, the relation between finance and economic growth has been re-evaluated from a variety of angles. First, several recent contributions have investigated whether the relation between financing of the non-financial private sector and growth is non-linear and takes the form of an inverted u-shape. Second, a number of studies have started to distinguish between financing provided to private households and to non-financial corporations. Third, the decade-old debate on the relative merits of bank-based and market-based financing has been re-opened. This paper combines all three strands of the finance and growth nexus and analyzes them within one comprehensive empirical framework.

Contribution

Based on financial accounts data I construct a novel panel data set for 34 high income countries over the time period from 1995 to 2014. The data set permits distinguishing between financing provided to non-financial corporations and to private households. It also allows differentiating between a variety of instruments such as loans, debt securities, trade credit, listed shares and other equity. I estimate the relation between different types of financing and economic growth based on panel data models. They include a linear and quadratic term of the level of financing to capture a potential non-linearity, the financing structure as well as the standard set of control variables from the existing literature.

Results

For the household sector I find an inverted u-shaped relation that indicates that high levels of financing are negatively related to economic growth. In contrast, financing of corporates is largely neutral. Furthermore, when controlling for the sectoral allocation of financing, no specific instrument – e.g. bank credit or market financing, debt or equity financing – seems to be particularly harmful or beneficial for growth.

Nichttechnische Zusammenfassung

Fragestellung

Im Zusammenhang mit der globalen Finanzkrise wurde die Beziehung zwischen Finanzierung und Wirtschaftswachstum aus verschiedenen Blickwinkeln neu beleuchtet. Erstens wurde in einigen aktuellen Beiträgen untersucht, ob die Beziehung zwischen Finanzierung des nichtfinanziellen Privatsektors und Wachstum nicht-linear ist und eine umgekehrte U-Form aufweist. Zweitens wurde in verschiedenen Studien damit begonnen, zwischen Finanzierung für private Haushalte und nichtfinanzielle Unternehmen zu unterscheiden. Drittens wurde die jahrzehntealte Debatte über die relativen Vorzüge einer Finanzierung über Banken oder Märkte wieder eröffnet. Dieses Papier kombiniert alle drei Stränge des Finanzierung-Wachstum-Nexus und untersucht sie in einem übergreifenden empirischen Analyserahmen.

Beitrag

Ich konstruiere einen neuen Paneldatensatz für 34 Industrieländer über den Zeitraum 1995 bis 2014 basierend auf Daten der Finanzierungsrechnung. Der Datensatz erlaubt es, zwischen der Finanzierung von nichtfinanziellen Unternehmen und privaten Haushalten sowie einer Vielzahl an Finanzierungsinstrumenten wie Krediten, Schuldverschreibungen, Handelskrediten, Aktien und sonstigen Anteilsrechten zu unterscheiden. Ich schätze die Beziehung zwischen Finanzierung und Wirtschaftswachstum anhand von Paneldatenmodellen. Diese beinhalten das Finanzierungsvolumen in linearer und quadratischer Form, um eine mögliche Nicht-Linearität zu erfassen, die Finanzierungsstruktur sowie die üblicherweise in der Literatur verwendeten Kontrollvariablen.

Ergebnisse

Für den Haushaltssektor finde ich einen umgekehrt u-förmigen Zusammenhang, der darauf hindeutet, dass ein hohes Finanzierungsvolumen mit geringem Wirtschaftswachstum einhergeht. Im Gegensatz hierzu ist die Finanzierung von nichtfinanziellen Unternehmen weitestgehend wachstumsneutral. Zudem scheint nach Kontrolle der sektoralen Allokation von Finanzierung kein spezifisches Finanzierungsinstrument – z.B. Bankkredite oder Marktfinanzierung, Schulden- oder Eigenkapitalfinanzierung – besonders schädlich oder zuträglich für das Wachstum zu sein.

Revisiting the finance and growth nexus – A deeper look at sectors and instruments*

Robert Unger

Deutsche Bundesbank

Abstract

This paper investigates empirically whether the relation between finance and growth depends on a specific type of financing. I construct a novel panel data set for 34 high income countries over the time period from 1995 to 2014 based on financial accounts data. It allows distinguishing between the sectors that receive financing – households and corporates – as well as a variety of different financial instruments. For the household sector I find an inverted u-shaped relation that indicates that high levels of finance are negatively related to economic growth. In contrast, financing of corporates is largely neutral. Furthermore, when controlling for the sectoral allocation of financing, no specific instrument – e.g. bank credit or market financing, debt or equity financing – seems to be particularly harmful or beneficial for growth.

Keywords: banks, debt, economic growth, equity, finance, markets

JEL classification: C23, G10, G21, O11, O47

*Contact address: Deutsche Bundesbank, Wilhelm-Epstein-Strasse 14, 60431 Frankfurt am Main, Germany. Phone: +49 69 9566 7409. E-mail: robert.unger@bundesbank.de. I am grateful to Peter Egger for various helpful conversations and suggestions and Thorsten Beck for detailed comments on a previous draft. I thank Alain de Serres, Alexander Erler, Falko Fecht, Felix Geiger, Rafael Gerke, Boris Hofmann, Stephan Kohns, Philipp Marek, Klaus Masuch, Joachim Winter, Andreas Worms, participants at internal seminars at the Deutsche Bundesbank and the 10th ECB Surveillance Workshop: Correcting and preventing macroeconomic imbalances (2018) for their helpful comments. Any remaining errors or omissions are my own responsibility. The opinions expressed in this paper are those of the author and do not necessarily reflect the views of the Deutsche Bundesbank or the Eurosystem.

1 Introduction

In the light of the global financial crisis, the relation between finance and economic growth has been re-evaluated from various angles. Until the mid-2000s, financial development was estimated to have a clear positive influence on economic growth (King and Levine, 1993; Levine, 2002, 2005). However, more recent contributions find that financing provided to the non-financial private sector has a non-linear (inverted u-shaped) impact on economic growth. More specifically, the relation is estimated to be positive at low, but negative at high levels of financial development (Cecchetti and Kharroubi, 2012; Beck, Georgiadis, and Straub, 2014; Gambacorta, Yang, and Tsatsaronis, 2014; Law and Singh, 2014; Arcand, Berkes, and Panizza, 2015a).

Parallel to this, a number of authors have started to distinguish between financing provided to private households and non-financial corporations. Beck, Büyükkarabacak, Rioja, and Valev (2012) document that corporate credit is positively related to economic growth while household credit is not. Angeles (2015) finds that financing to non-financial corporations is positively, financing to private households negatively associated with growth. Furthermore, Cournède and Denk (2015) show that financing both to corporates and households are negatively related to growth.

Finally, the decade-old debate on the relative merits of banks and markets has been re-opened. Before the crisis, a long-established finding in the literature was that the extent to which the economy is financed by banks or (equity) markets has no impact on economic growth (Levine, 2002; Beck and Levine, 2004). More recently, Demirgüç-Kunt, Feyen, and Levine (2013) established that security markets have a greater positive impact than banks in highly developed countries. Gambacorta et al. (2014) document an inverted u-shaped relation between both bank and equity finance and economic growth. Cournède and Denk (2015) show that non-bank credit has a weaker negative effect on growth than bank credit. Langfield and Pagano (2016) argue that Europe's large banking sector is hurting growth.

Common to all three strands of the literature is that they discuss only one or two aspects of the finance and growth nexus – linear versus non-linear relation, corporates versus households, and banks versus markets – in isolation.¹ Against this background, the main contribution of this paper is to analyze all the facets of the finance and growth literature within one comprehensive empirical framework. To this end I construct a novel panel data set for 34 high income countries over the time period from 1995 to 2014 based on financial accounts data. The data set permits to distinguish between financing provided to non-financial corporations and private households. It also allows to differentiate between a variety of financing instruments such as loans, debt securities, trade credit, listed shares and other equity. I estimate the relation between different types of financing and economic growth based on panel fixed effects models. These include a linear and quadratic term of the level of financing to capture a potential non-linearity, shares of various financing instruments in total financing – the financing structure – as well as the standard set of

¹Most closely related to my analysis is the paper by Cecchetti, Mohanty, and Zampolli (2011). They also use a broader definition of debt (total liabilities minus equity) and differentiate between economic sectors. Their threshold regressions produce somewhat ambiguous results for both non-financial corporations and private households. Furthermore, they do not discriminate between different debt instruments and nor do they include equity.

control variables from the literature cited above.

The paper has two main findings. First, financing provided to private households is likely to be responsible for the negative growth effects of “too much finance” (Arcand et al., 2015a). More specifically, I confirm the inverted u-shaped relation between financing provided to the non-financial private sector as a whole and changes in real GDP per capita as found in the literature cited above. However, when I individually include financing of non-financial corporations and private households, this relation can only be found for the latter. Furthermore, I establish that the share of financing of private households in total liabilities of the non-financial private sector is negatively associated with economic growth. This finding implies that not only the sectoral level of financing is related to real activity, but also the relative allocation within the private sector.

Second, the relation between different financing instruments and economic growth is somewhat less clear-cut. When controlling for the sectoral allocation of financing, neither bank credit nor market financing seems to be a clearly superior funding source. The share of debt financing in total liabilities is mostly negatively linked to economic growth, but the estimates are often not statistically significant. Inference is complicated by the fact that households finance themselves exclusively with debt, especially bank loans. It is thus difficult to establish whether the negative relation between financing of households and economic growth can be traced to the particular usage of household financing or the intrinsic nature of (bank) debt financing.

The level of financing of private households in most countries currently exceeds the estimated threshold of around 42% at which the impact of finance on growth turns negative. A reduction to the threshold would be associated with an increase of annual real GDP growth of 0.1, 0.3 and 0.9 percentage point respectively for the country at the median, 75th percentile and the maximum of the distribution of values observed for 2014. Whereas these figures are non-negligible from an economic perspective, they are considerably lower than in most previous studies. Furthermore, a decrease of the share of financing of private households in total liabilities of the non-financial private sector by one average within country standard deviation (3.2 percentage points) would go hand in hand with an increase in economic growth of around 0.8 percentage point.

The article relates to two further strands of research. First, various papers have shown empirically that the household sector seems to be an important driver of economic fluctuations along the business cycle both at the country (Jordà, Schularick, and Taylor, 2013, 2016; Lombardi, Mohanty, and Shim, 2017; Mian, Sufi, and Verner, 2017; Alter, Feng, and Valckx, 2018; Drehmann, Juselius, and Korinek, 2018) and at the U.S. county (Mian and Sufi, 2010; Mian, Rao, and Sufi, 2013; Mian and Sufi, 2014) level. My results show that household sector leverage also has a long-term impact on economic growth.

Second, from a theoretical perspective my findings can be regarded as supportive of recent contributions that explicitly model the impact of leverage on the consumption decisions of private households (Eggertsson and Krugman, 2012; Korinek and Simsek, 2016; Guerrieri and Lorenzoni, 2017). In these models, too much financing provided in the form of credit can lead to the accumulation of a debt overhang. When the borrowing constraints of economic agents tighten, they are forced to deleverage, depressing aggregate demand and economic growth.

On a more general level, my findings are also in accordance with the idea that the positive impact of finance on economic growth derives from a “mobilization of saving”. By

overcoming transaction costs and informational asymmetries, financial intermediation enables capital formation of non-financial corporations in need of external financing (Levine, 2005).² Given that the recourse to internal financing (free cash-flow) has expanded considerably over the last years (Chen, Karabarbounis, and Neiman, 2017), firms' investment decisions have become less dependent on access to external financing. Consequently, this might explain why financing of non-financial corporations is not positively associated with economic growth in my sample using more recent data.

The rest of the paper is structured as follows. Section 2 introduces the financial accounts dataset. Section 3 presents the empirical approach, the main results and various robustness checks. Finally, Section 4 summarizes the findings and draws policy conclusions.

2 The financing of corporates and households

The most commonly used dataset in the literature on the relation between finance and growth is the Global Financial Development Database of the World Bank. This database provides various indicators of financial development for a broad range of countries over a long time period. Most of the studies cited in the introduction use the measure “private credit by deposit money banks and other financial institutions” as their proxy for financial development. This variable corresponds to the amount of credit that banks and other financial institutions provide to the non-financial private sector (hereafter private sector). However, since claims of other financial institutions are reported as zero for most of the countries, the variable essentially captures private credit by deposit money banks only.³ This proxy for financial development is available for a large number of countries, but has two important limitations. First, as the data are aggregated, one cannot test whether the impact of finance on growth differs for private households (including non-profit institutions serving households, hereafter households) and non-financial corporations (hereafter corporations or corporates). Second, financing can be provided by creditors other than banks and also in the form of equity.

A data source that covers both corporations and households individually and differentiates between a variety of financing instruments are the financial accounts data as provided by Eurostat and the OECD.⁴ Both datasets are compiled based on the System of National Accounts 2008 (SNA2008) and have a huge overlap of countries. By merging the two data sources, I cover as many countries as possible. Ultimately, my dataset consists of all 28 member states of the European Union as well as Canada, Chile, Japan,

²Other avenues through which financial development might impact positively on economic growth are the production of information and allocation of capital, the monitoring of investment projects and the amelioration of risks (Levine, 2005).

³In my sample, claims of other financial institutions are non-zero for only 121 out of 674 annual observations (18%). Given that the availability of these data is presumably better in high income countries, one can assume that the coverage is worse in the samples used in the papers cited above, which include low and medium income countries as well.

⁴More recently, the Bank for International Settlements and the International Monetary Fund have started to disseminate data for credit provided to the non-financial private sector broken down into credit to households and corporations. Whereas the country coverage is somewhat broader than for the financial accounts data, both sources lack a detailed breakdown at the instrument level.

Norway, Switzerland and the United States for a total of 34 high income countries.⁵ Data are available from 1995 to 2014, amounting to a total of 20 annual observations.⁶ Figure 1 compares the amount of financing provided to the private sector at the end of 2014 according to the World Bank dataset (WB) and the financial accounts data (FA).

For illustrative purposes, I choose two countries that are commonly perceived to be at opposite ends of the financing spectrum: the United States, a market-based financial system, and Germany, a bank-based financial system. More detailed descriptive statistics regarding the instrumental composition of financing for all of the countries covered in this analysis are provided in Table 7 in the appendix. The bars for the World Bank dataset show the amount of bank credit provided to the private sector. The bars for the financial account dataset divide total liabilities of the private sector into bank credit as obtained from the World Bank, non-bank debt (total liabilities minus equity minus bank credit), listed shares as well as other equity (equity minus listed shares). All of the financing variables are expressed as a percentage of GDP.

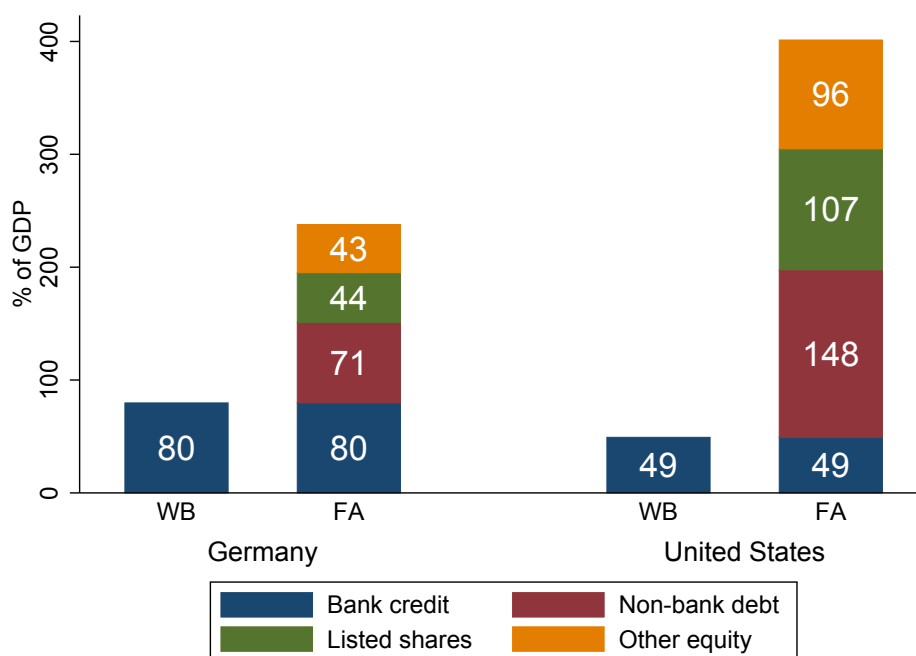


Figure 1: Comparison of World Bank and Financial Accounts data for 2014 (Sources: Eurostat, OECD, World Bank and own calculations. Notes: WB=World Bank, FA=Financial Accounts. All variables refer to the non-financial private sector as a whole. Bank credit as obtained from the World Bank. All other variables obtained or derived from the financial accounts. Other equity is calculated as the difference between equity and listed shares. Non-bank debt equals total liabilities minus equity minus bank credit.)

⁵Of the 34 countries considered here, only Bulgaria and Romania are categorized as (upper) middle income countries according to the World Bank classification. All other countries are high income countries.

⁶In principle, the financing variables are available up to 2016. However, the sample for the dependent and control variables ends already in 2014. I only include countries for which at least ten years of data of the financing variables are available. This allows to construct at least two five-year averages that are used later on in the regressions. The countries omitted due to an insufficient amount of data are Iceland, Israel, Korea, Mexico, New Zealand and Turkey. For some countries, data are only available for less than 20 years: Chile (2003-2014), Croatia, Ireland and Slovenia (2001-2014), Luxembourg and Switzerland (1999-2014), Malta (2004-2014).

The comparison highlights the fact that even for a financial system that is commonly perceived to be bank-based, such as Germany, the total amount of financing provided to the private sector according to the financial accounts data is almost three times as large as the 80% of GDP of bank credit according to the World Bank data. More specifically, besides listed shares amounting to 44% of GDP, financing provided in the form of other types of equity represents an additional 43% of GDP. On top of this, creditors other than banks provide financing worth 71% of GDP. The gap between the two datasets is even more striking for the United States. Here, total liabilities according to the financial accounts are more than eight times the figure for bank credit, at 49% of GDP as captured by the World Bank data. Besides non-bank debt amounting to 148% of GDP, the private sector obtains financing worth 107% and 96% from listed shares and other equity sources respectively. Figure 2 shows a further breakdown of the non-bank sources of debt financing.

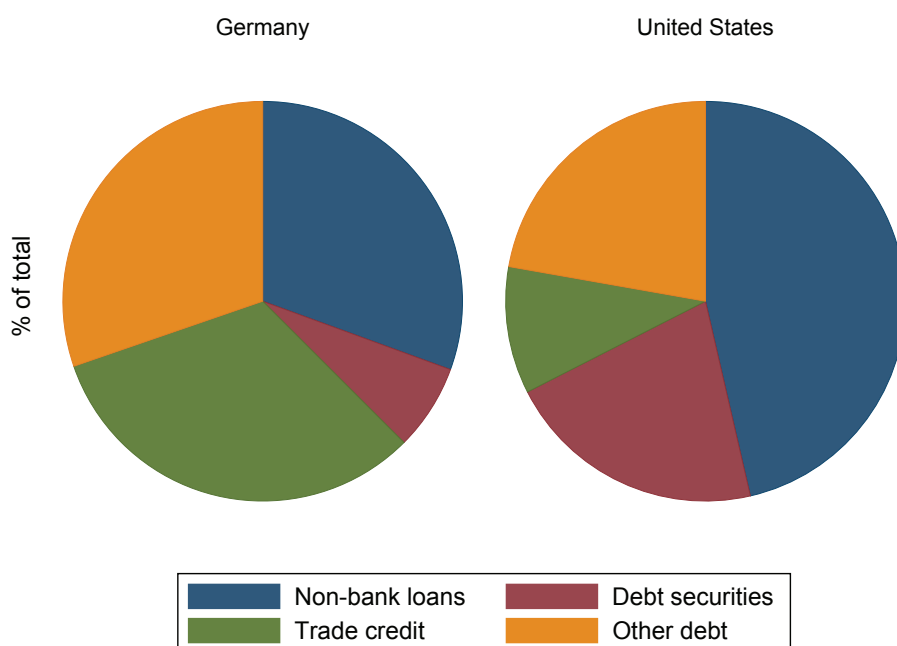


Figure 2: Non-bank debt (Sources: Eurostat, OECD and own calculations. Notes: All variables refer to the non-financial private sector as a whole. Non-bank loans calculated as the difference between loans from the Financial Accounts and bank loans from the World Bank data. Other debt includes derivatives, pension liabilities and other accounts payable (excluding trade credits and advances).)

In Germany, trade credit – financial claims arising from the direct extension of credit by the suppliers of goods and services to their customers – plays an important role in alternative debt financing. Furthermore, loans from non-banks, especially other non-financial corporations, are also important. Pension liabilities make up the largest part in the residual category other debt.⁷ In contrast, the issuance of debt securities plays a rather small role. In the United States, loans from non-banks are by far the most important alternative debt financing source. One important factor in this respect is the financing provided by the shadow banking system, including government-sponsored

⁷Other debt includes derivatives, pension liabilities and other accounts payable (excluding trade credits and advances).

enterprises (GSEs), to private households. Furthermore, non-financial corporations issue a significant amount of debt securities. Unlike in Germany, trade credit plays only a minor role.

Figure 3 presents the sectoral dimension of the dataset by dividing total liabilities of the private sector at the end of 2014 into financing of corporates and households. In all countries, financing provided to corporations outweighs household financing. The highest of the values for corporate financing (relative to GDP) can be found for smaller countries that host large multinational corporations such as Cyprus, Ireland and Luxembourg. In general, the level of financial deepening differs quite substantially across countries. In 2014, total liabilities ranged from 192% of GDP in Greece to 1,057% in Luxembourg. Furthermore, financing has been on the rise in most countries. Whereas the mean of total liabilities amounted to 245% of GDP in 1995, it stood at 355% in 2014. Figure 5 and Table 8 in the appendix depict the evolution of total liabilities over time and provide a detailed overview on a country-by-country basis.

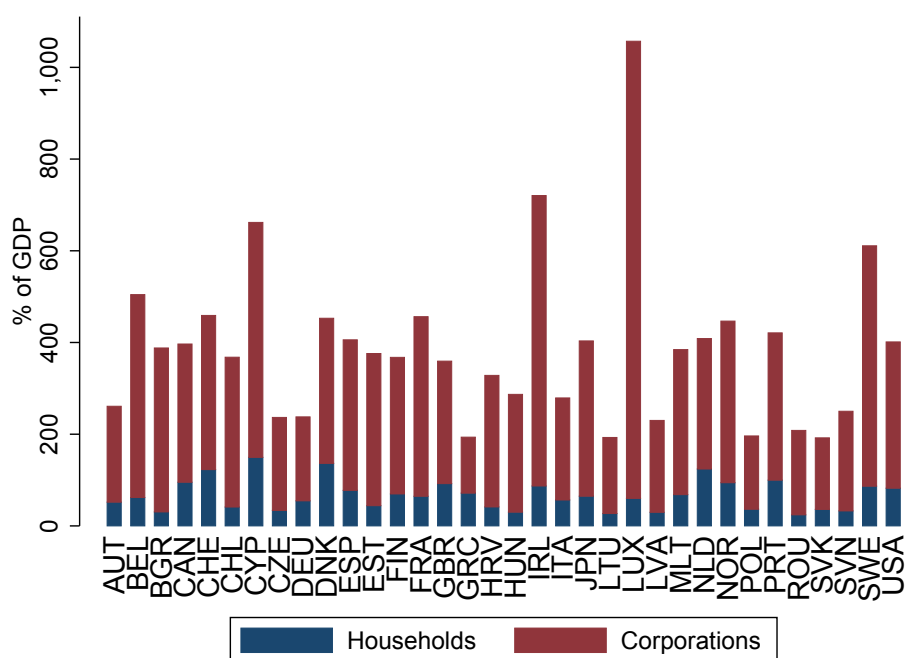


Figure 3: Total liabilities of households and corporates for 2014 (Sources: Eurostat, OECD and own calculations.)

Taken together, the financial accounts data provide a comprehensive picture that encompasses all sources of external financing provided to the non-financial private sector as a whole as well as its two constituent parts, corporations and households. It thus naturally captures the shift from bank finance to other sources of financing that occurred over the last few decades. Furthermore, it includes both equity and debt financing, each of which can be further broken down at the instrument level. This level of detail allows to specifically test whether there are differences in the relation between finance and growth across alternative financing instruments.

Before I turn to the estimation results, a short note on my proxies for financial development is in order. Theoretical models suggest that banks (or financial intermediaries

in general) and markets foster economic growth by improving the allocation of resources (see [Levine \(2005\)](#) for a comprehensive overview). Accordingly, the quality of the financial system, not its sheer size, should be related to economic growth. However, as qualitative indicators of financial development are hard to find, it is common practice to use the level of bank credit or more broader definitions of debt financing as proxies for financial development. In contrast, for stock market development it is quite customary to use the liquidity of the stock market, as measured by the turnover ratio ([Beck and Levine, 2004](#); [Demirgüç-Kunt et al., 2013](#); [Gambacorta et al., 2014](#)).

In this paper, I follow [Arestis, Demetriades, and Luintel \(2001\)](#) and use the volume of listed shares (i.e. stock market capitalization) and other equity sources as a percentage of GDP. By doing so, I remain consistent with the commonly practiced inclusion of the level of debt financing as a percentage of GDP. One advantage of my measure of stock market capitalization is that it only includes listed shares of non-financial corporations. In contrast, stock market capitalization used in previous studies also includes listed shares of financial corporations. One potential caveat of using stock market capitalization is that due to the forward-looking nature of stock prices, future economic growth might already be anticipated in today's valuations. To address this concern, I also provide estimates that use so-called notional stocks of financing that exclude valuation changes.⁸

3 Revisiting the finance and growth nexus

3.1 Empirical approach

To estimate the relation between different financing instruments and economic growth, I use a country fixed effects estimator including time dummies:

$$\Delta RGD_{i,t} = \alpha + \beta_1 Finance_{i,t} + \beta_2 Finance_{i,t}^2 + \beta_3 Finance Share_{i,t} + X'_{i,t}\gamma + \mu_t + u_{i,t}$$

The dependent variable ΔRGD is annual GDP growth measured by the first difference of the log of real GDP per capita.⁹ To capture a potential non-linear relation between finance and growth, the logged financing variables enter both in linear – *Finance* – and in quadratic terms – *Finance*². Finding significantly positive and negative coefficients for the linear (β_1) and quadratic (β_2) term can be seen as indicative of an inverted u-shaped association between finance and economic growth. The shares of specific financing instruments in a larger supercategory – *Finance Share* – are also included. These indicators capture whether the sectoral or instrumental distribution of financing is related to economic growth.

I ensure comparability to the existing literature by using the standard set of control variables X : initial GDP (*rgdp_ppp*) to capture (conditional) convergence, a proxy for human capital (*hum*), the share of government consumption in GDP (*gov*), a proxy for

⁸A notional stock adds the cumulative financing flows to the respective stock of financing in the initial period. As financing flows capture only changes in the stock of financing that are due to voluntary transactions, valuation effects are excluded by construction.

⁹In extensions to the baseline models, I also consider different measures of productivity growth as the dependent variable.

the degree of openness of the economy (*open*) and the inflation rate of the economy (*inf*). All control variables enter as logs and are, together with the dependent variable(s), mostly obtained from the Penn World Tables database (Feenstra, Inklaar, and Timmer, 2015). A detailed account of the data sources and transformations can be found in Table 9 in the appendix. Descriptive statistics are summarized in Table 10 in the appendix. Finally, the inclusion of country fixed effects as well as time dummies control for factors that are invariant across the country and time dimension respectively.

Given the small number of observations, the models are estimated with OLS. In order to concentrate on the long-term impact of finance on growth, I follow the papers cited above as well as the broader literature on the finance and growth nexus and use five-year non-overlapping averages and obtain the following four time spells: 1995-1999, 2000-2004, 2005-2009 and 2010-2014. Removing fluctuations at the business cycle frequency should also reduce potential estimation bias due to reverse causality. However, the usual caveats regarding endogeneity have to be kept in mind when interpreting the results. As initial GDP is intended to capture a convergence process, it is included as the value for the first period of the respective five-year average.

3.2 Main results

Table 1 below presents the first set of findings. To keep the tables at a reasonable size, I omit the results for the control variables in the main text. Full tables can be found in Appendix C. As a starting point, models A-1 and A-2 use bank credit to the private sector as provided by the World Bank database as the measure of financing for the same country sample that I subsequently apply for the estimates using the financial accounts data. In model A-1 the linear term is significantly negatively related to growth. In model A-2 the linear term is significantly positive and the quadratic term significantly negative. This result confirms the finding in the recent literature that bank credit has an inverted u-shaped relation to economic growth. A likelihood ratio test as well as information criteria suggest that the non-linear model is the statistically preferred specification. The threshold at which the association between finance and growth turns negative is estimated to be at around 28%. This figure is considerably lower than the threshold found by Cecchetti and Kharroubi (2012); Beck et al. (2014); Arcand et al. (2015a). However, it is quite close to the one estimated by Gambacorta et al. (2014), who also use a panel that includes mostly high income countries and the financing variables in logs. I provide a more detailed analysis of my findings in comparison to the existing literature in Section 3.3, where I discuss the economic significance of my results.

Models A-3 and A-4 mimic the previous two regressions but instead use the financial accounts data. To come as close as possible to the World Bank data in terms of instruments, I use loans (from banks and non-banks) only. The estimates confirm the previous results: The linear term is significantly negative, whereas in the non-linear specification the linear term is significantly positive and the quadratic term is significantly negative. Again, likelihood ratio test and information criteria identify the non-linear specification as the superior model. The threshold level is estimated at around 35%. Given that the credit definition is somewhat broader than in the World Bank data set, this result is consistent with the previous assessment. In models A-5 and A-6 I account for potential differences between corporate and household financing by including the share of loans

to households in loans to the private sector as a whole, labeled ph/nfp . Once more, the linear term of the level of financing is significantly positive and the quadratic term significantly negative, with the non-linear model representing the statistically superior specification. The estimated threshold is somewhat higher, at around 41%. The share of household loans enters negatively and statistically significant in the non-linear model, giving a first indication that the allocation of finance within the private sector might matter. Taken together, I can confirm the inverted u-shaped relation between financing of the non-financial private sector and economic growth documented in the recent literature also in my country sample and using the financial accounts data.

Variable	World Bank		Financial Accounts			
	A-1	A-2	A-3	A-4	A-5	A-6
$loans_nfp$	-1.115** (0.459)	6.387** (2.408)	-1.453*** (0.780)	7.968* (4.248)	-1.544*** (0.704)	12.610*** (4.293)
$loans_nfp^2$		-0.964*** (0.332)		-1.121** (0.505)		-1.695** (0.499)
ph/nfp					-0.043 (0.027)	-0.087*** (0.031)
<i>Threshold</i>		28%		35%		41%
<i>LR test</i>		17.17*** (0.000)		8.23*** (0.004)		16.52*** (0.000)
<i>BIC</i>	411.6	399.3	370.5	367.1	372.3	360.6
<i>AIC</i>	382.6	367.4	342.3	336.1	341.3	326.8
R^2 (within)	0.663	0.704	0.646	0.669	0.654	0.698
<i>Observations</i>	134	134	124	124	124	124
<i>Countries</i>	34	34	34	34	34	34

Table 1: Functional form (Notes: The dependent variable is the annual change in real GDP per capita. nfp and ph are the non-financial private sector and private households. Loans refers to the log of private credit by deposit money banks to GDP according to the World Bank in models A-1 to A-2 and to the log of loans to GDP according to the financial accounts in models A-3 to A-6. ph/nfp is the percentage share of loans of ph in loans of nfp . All models include a set of control variables (not shown). See Table 14 in the appendix for the results. For definitions of the control variables, see Table 9. All variables except $rgdp_ppp$ enter as non-overlapping five-year averages. $rgdp_ppp$ enters as the value of the first period of the respective five-year time spell. *Threshold* is the level of financing to GDP at which the relation between finance and growth turns from positive to negative. *LR test* are the results of an exclusion test of the quadratic financing term. All models include country and time fixed effects. Robust standard errors clustered at the country level in parenthesis. ***, ** and * denote significance at the 1%, 5% and 10% level.)

In the next step, I examine whether the previous results also hold for a broader definition of financing and whether there are differences for non-financial corporations and private households. Table 2 below presents the second set of results. Model B-1 uses total liabilities for the private sector as a whole. This measure includes both equity and debt and can be seen as the most comprehensive proxy of financing. The model accounts for potential differences between corporate and household financing by including the share of total liabilities of households in total liabilities of the private sector, labeled ph/nfp . As in the case for the model including only loans, the linear term of the level of financing is significantly positive and the quadratic term significantly negative. This result again confirms the finding in the recent literature that financing provided to the private sector has an inverted u-shaped relation to economic growth. The threshold at which the association between finance and growth turns negative is now estimated to be at around 176%. As this measure of financing is much more comprehensive than the one used in

the existing literature, the value is now considerably larger than the threshold of around 100% found in previous research. The share of household financing in total liabilities of the private sector is negative and statistically significant, again suggesting that not only the level of financing might play a role, but also its allocation within the private sector.

Model						
Variable	B-1	B-2	B-3	B-4	B-5	B-6
<i>liabilities_nfp</i>	25.315*			26.246*		
	(12.864)			(13.435)		
<i>liabilities_nfp</i> ²	-2.449**			-2.522**		
	(1.151)			(1.195)		
<i>liabilities_nfc</i>		10.087	2.760		11.066	2.657
		(11.205)	(10.295)		(11.663)	(10.044)
<i>liabilities_nfc</i> ²		-1.177	-0.482		-1.229	-0.480
		(1.002)	(1.082)		(1.041)	(1.031)
<i>equity_nfc</i>			7.614			7.667
			(6.475)			(7.994)
<i>equity_nfc</i> ²			-0.820			-0.817
			(0.651)			(0.681)
<i>liabilities_ph</i>		4.365***	4.649***		4.668***	4.641***
		(1.252)	(1.285)		(1.207)	(1.476)
<i>liabilities_ph</i> ²		-0.585**	-0.716***		-0.673**	-0.714*
		(0.234)	(0.285)		(0.252)	(0.367)
<i>ph/nfp</i>	-0.258***	-0.276***	-0.196	-0.238***	-0.210*	-0.197
	(0.068)	(0.079)	(0.120)	(0.082)	(0.108)	(0.248)
<i>debt/liabilities</i>				-0.020	-0.041	0.004
				(0.044)	(0.044)	(0.355)
<i>Threshold</i>	176% ^{nfp}	42% ^{ph}	26% ^{ph}	182% ^{nfp}	32% ^{ph}	26% ^{ph}
<i>LR test</i>	8.45***	8.72**	13.71***	8.64***	9.94***	10.36**
	(0.004)	(0.013)	(0.003)	(0.003)	(0.007)	(0.016)
<i>R</i> ² (within)	0.730	0.762	0.764	0.728	0.763	0.764
<i>Observations</i>	124	122	122	124	122	122
<i>Countries</i>	34	34	34	34	34	34

Table 2: Sectoral decomposition (Notes: The dependent variable is the annual change in real GDP per capita. *nfp*, *nfc* and *ph* are the non-financial private sector, non-financial corporations and private households respectively. *liabilities* refers for *nfp* and *ph* to the log of total liabilities to GDP. For *nfc* it refers to the log of total liabilities to GDP in models A-1, A-2, A-4 and A-5 and to the log of debt (total liabilities minus equity) to GDP in models A-3 and A-6. *ph/nfp* is the percentage share of total liabilities of *ph* in total liabilities of *nfp*. *debt/liabilities* is the percentage share of debt (total liabilities minus equity) in total liabilities of *nfp*. All models include a set of control variables (not shown). See Table 15 in the appendix for the results. For definitions of the control variables, see Table 9. All variables except *rgdp_ppp* enter as non-overlapping five-year averages. *rgdp_ppp* enters as the value of the first period of the respective five-year time spell. *Threshold* is the level of financing to GDP at which the relation between finance and growth turns from positive to negative. *LR test* are the results of an exclusion test of the quadratic financing term. All models include country and time fixed effects. Robust standard errors clustered at the country level in parenthesis. ***, ** and * denote significance at the 1%, 5% and 10% level.)

In model B-2, I split financing of the private sector into financing of corporates and of households. For both sectors I again use total liabilities as my measure of finance. For corporates, none of the coefficients is statistically significant. In contrast, for households I find statistically significant positive linear and negative quadratic terms, indicating an inverted u-shaped relation between financing of households and growth. The threshold is estimated at around 42%. The share of household financing is again significantly negative. In model B-3, I separate equity and debt financing of corporations. The estimates confirm the previous results: financing provided to households has an inverted u-shaped relation

to changes in real GDP per capita. The calculated threshold is somewhat lower, at 26%. In contrast, financing to corporates, be it in the form of debt or equity, is not significantly linked to economic growth.

Models B-4 to B-6 take a first step towards investigating the role of different financing instruments by additionally including the share of debt financing in total liabilities of the private sector, labeled *debt/liabilities*. Whereas all previous results are confirmed, the share of debt financing does not enter in a statistically significant way in any of the specifications. This finding suggests that the relative extent to which the private sector finances itself with debt or equity has no clear relation to economic growth. Likelihood ratio tests and information criteria once more indicate that the non-linear specifications are the preferable models. Of the additional control variables, only initial GDP (*rgdp_ppp*) and the inflation rate (*inf*) are consistently linked to changes in real GDP per capita (see the full tables in [Appendix C](#)). In both cases the relation is, as expected, negative. This indicates that countries' growth rates decline as they develop and high inflation, which serves as a proxy for macroeconomic instability, is associated with lower growth.

In a final step, I analyze in detail how specific financing instruments are related to economic growth. In all models the level of financing for corporations and households is again measured by total liabilities. The variables *instrument/equity* and *instrument/debt* measure the ratio of the financing instrument indicated in the column header to the respective denominator. As financing instruments I include the most important components: listed shares – my measure of equity market financing – shares (listed and unlisted shares), debt securities – my measure of debt market financing – loans, bank loans and trade credit. For example, *instrument/equity* in model C-1 measures the ratio of listed shares to total equity. Given that I already control for the level of total financing and the share of debt financing in total financing, these variables capture whether or not a specific equity or debt instrument has a distinct relation with economic growth compared to all other equity or debt instruments or not. Amongst other things, these estimations help to inform the debate on the relative merits of bank and market financing - both in the form of equity (listed shares) and debt (debt securities).¹⁰ The results are displayed in [Table 3](#) below.

The estimates affirm for all six models the inverted u-shaped relation between household financing and growth. The threshold varies between 25% and 36% of GDP. In none of the specifications is the level of financing of corporations significantly associated with economic growth. The share of household financing in total liabilities is statistically significantly negatively associated with changes in real GDP per capita in four out of six models, whereas the share of debt financing in total financing is consistently negative, but statistically insignificant. Finally, none of the instrument shares is statistically significantly linked to growth. This indicates that no instrument within the debt and equity financing categories has a “special” association with changes in real GDP per capita. The estimates become even more insignificant when valuation effects for equity financing are controlled for (see [Table 11](#) in the appendix).

My results re-confirm a once long-established finding in the literature, namely that the extent to which the economy is financed by banks or markets (here approximated by listed shares and debt securities) has no impact on economic growth ([Levine, 2002](#); [Beck and](#)

¹⁰Theoretically, an alternative approach to testing the relation of specific financing instruments and economic growth would be to include the level of all financing instruments (and their respective squared terms) separately. However, given the small number of observations, this strategy is practically infeasible.

Levine, 2004). They are also in principle in accordance with the results of Cournède and Denk (2015), who show that non-bank credit has a weaker negative effect on growth than bank credit, albeit not in a statistically significant way.¹¹ However, they are in contrast to a recent study that argues that Europe’s large banking sector is hurting growth (Langfield and Pagano, 2016). Put in the context of the current debate on the relative merits of banks and markets, the results imply that it is important to distinguish between financing provide to households, which mainly consists of bank credit, and corporates. When doing so, banks can no longer be identified as being especially harmful for growth. In turn, market financing, whether in the form of equity or debt, does not seem to be particularly beneficial for growth.

Instrument/Model	Listed shares	Shares	Debt securities	Loans	Bank loans	Trade credit
Variable	C-1	C-2	C-3	C-4	C-5	C-6
<i>liabilities_nfc</i>	5.088 (10.518)	13.541 (12.807)	10.214 (10.726)	11.174 (11.341)	11.281 (11.947)	8.473 (11.874)
<i>liabilities_nfc</i> ²	-0.658 (0.918)	-1.436 (1.142)	-1.128 (0.928)	-1.287 (1.014)	-1.239 (1.075)	-1.015 (1.068)
<i>liabilities_ph</i>	4.306*** (1.326)	3.390*** (1.003)	4.600*** (1.252)	4.453* (0.986)	4.656*** (1.249)	4.371*** (1.282)
<i>liabilities_ph</i> ²	-0.638** (0.276)	-0.485* (0.282)	-0.712*** (0.220)	-0.621** (0.226)	-0.703** (0.253)	-0.682** (0.280)
<i>ph/nfp</i>	-0.197* (0.110)	-0.211 (0.138)	-0.180** (0.087)	-0.252*** (0.092)	-0.202* (0.103)	-0.195 (0.124)
<i>debt/liabilities</i>	-0.036 (0.043)	-0.048 (0.054)	-0.046 (0.044)	-0.036 (0.039)	-0.040 (0.044)	-0.035 (0.044)
<i>instrument/equity</i>	0.048 (0.029)	0.023 (0.017)				
<i>instrument/debt</i>			0.117 (0.217)	0.040 (0.035)	-0.004 (0.017)	-0.034 (0.058)
<i>Threshold</i>	29% ^{ph}	33% ^{ph}	25% ^{ph}	36% ^{ph}	27% ^{ph}	25% ^{ph}
<i>R</i> ² (within)	0.777	0.767	0.764	0.768	0.768	0.773
<i>Observations</i>	118	114	122	122	120	117
<i>Countries</i>	33	32	34	34	34	32

Table 3: Instrumental decomposition (Notes: The dependent variable is the annual change in real GDP per capita. *nfp*, *nfc* and *ph* are the non-financial private sector, non-financial corporations and private households. *liabilities* refers to the log of total liabilities to GDP. *ph/nfp* is the percentage share of total liabilities of *ph* in total liabilities of *nfp*. *debt/liabilities* is the percentage share of debt financing in total liabilities of *nfp*. *instrument/equity* and *instrument/debt* refer to the percentage share of the respective instrument indicated in the column header in equity or debt financing of *nfp*. All models include a set of control variables (not shown). See Table 16 in the appendix for the results. For definitions of the control variables, see Table 9. All variables except *rgdp_ppp* enter as non-overlapping five-year averages. *rgdp_ppp* enters as the value of the first period of the respective five-year time spell. *Threshold* is the level of financing to GDP at which the relation between finance and growth turns from positive to negative. All models include country and time fixed effects. Robust standard errors clustered at the country level in parenthesis. ***, ** and * denote significance at the 1%, 5% and 10% level.)

To sum up, the results interpreted in their entirety lead to the following conclusions. First, too much financing provided to households is likely to be responsible for the inverted u-shaped relation between finance and growth found for the private sector as a whole in the recent literature. Given that the household financing to GDP ratios in most countries in my sample are above the threshold, this finding is generally in line with the results in

¹¹Note that the authors nevertheless interpret their results as being supportive of the idea that a shift of financing from banks to markets would be beneficial in terms of growth.

Angeles (2015) and Cournède and Denk (2015), who estimate a negative linear relation between financing of households and economic growth.¹² Second, the relation between different financing instruments and economic growth is somewhat less clear-cut. The share of debt financing in total liabilities is mostly negatively linked to economic growth, but the estimates are not statistically significant. Furthermore, no particular financing instrument within the larger categories of debt and equity financing seems to have a distinct relation to changes in real GDP per capita. At first sight this suggests that who gets the credit – corporates or households – seems to be of primary importance for the relation between finance and growth. In contrast, the particular instrument through which financing is obtained – bank credit or market financing, equity or debt financing – seems to be less relevant. However, inference is complicated by the fact that households finance themselves exclusively with debt, especially bank loans. It is thus difficult to establish whether the negative relation between financing of households can be traced to characteristics of the sector itself or the intrinsic nature of (bank) debt financing (as opposed to equity financing). One interpretation of my findings could be that the negative relation between bank credit and economic growth found in recent contributions comes about because bank credit is to a large extent provided to households. An alternative reading would be that the negative relation arises because it is financing in the form of inflexible (non-state contingent) debt.

3.3 Quantifying the impact of finance on growth

Before showing the robustness of my main results, I use the estimates to give an idea of the quantitative magnitudes of the relation between finance and growth. The empirical investigation led to two main results. First, with regard to the level of financing, there exists an inverted u-shaped association between economic growth and financing of households and the private sector respectively. Figure 4 below shows the non-linear relation between financing of households and growth based on the coefficient estimates from model B-2. For illustrative purposes I transform the log levels back into financing-to-GDP ratios. The point estimates indicate that the maximum of the curve is reached at around 42% of GDP. The threshold lies between the value for the 25th percentile and the median of the distribution of values observed for 2014, which amount to 36% and 63% respectively. Note that this is an average threshold for the whole country sample that does not take into account country-specific features that might lead to different estimates for individual countries. The following calculations that relate changes in economic growth rates to adjustments of country-specific financing-to-GDP ratios to this threshold should thus be taken with a grain of salt and seen as indicative rather than precise numerical values.

The graph indicates that, starting from very low values, an increase in the amount of financing provided to households is associated with substantially higher growth rates. Current values for household financing-to-GDP ratios for most of the high income countries in this sample are to the right of the threshold. This suggests that a reduction in the level of financing in these countries should go hand in hand with higher growth. To give a numerical example, imagine that the countries at the 75th percentile (Ireland) and the maximum (Cyprus) of the distribution of values observed for 2014 lowered their household financing-to-GDP ratios to the threshold value. In the case of Ireland this would amount

¹²In contrast, Beck et al. (2012) find that household credit has no significant link to economic growth.

to a decrease of 45 percentage points, for Cyprus of 108 percentage points. These reductions would be associated with an increase in the annual change of real GDP per capita of 0.3 and 0.9 percentage point respectively. For the countries around the median, the increase would be only around 0.1 percentage point. Figure 6 in the appendix provides estimates for all countries covered in my analysis.

To put these numbers into perspective: the average growth rate of real GDP per capita over the whole sample is around 2.2%. Whereas these figures are thus non-negligible from an economic perspective, they are (considerably) smaller than in most previous studies. Applying the same reduction in financing-to-GDP ratios (45/108 percentage points) to the estimates in Cecchetti and Kharroubi (2012, hereafter *CK*) and Arcand et al. (2015a, hereafter *ABP*), yields increases in growth of respectively 0.4/2.2 and 0.4/2.8 percentage points. An exception are the estimates of Gambacorta et al. (2014), who produce an identical increase in economic growth of 0.3 and 0.9 percentage points.¹³

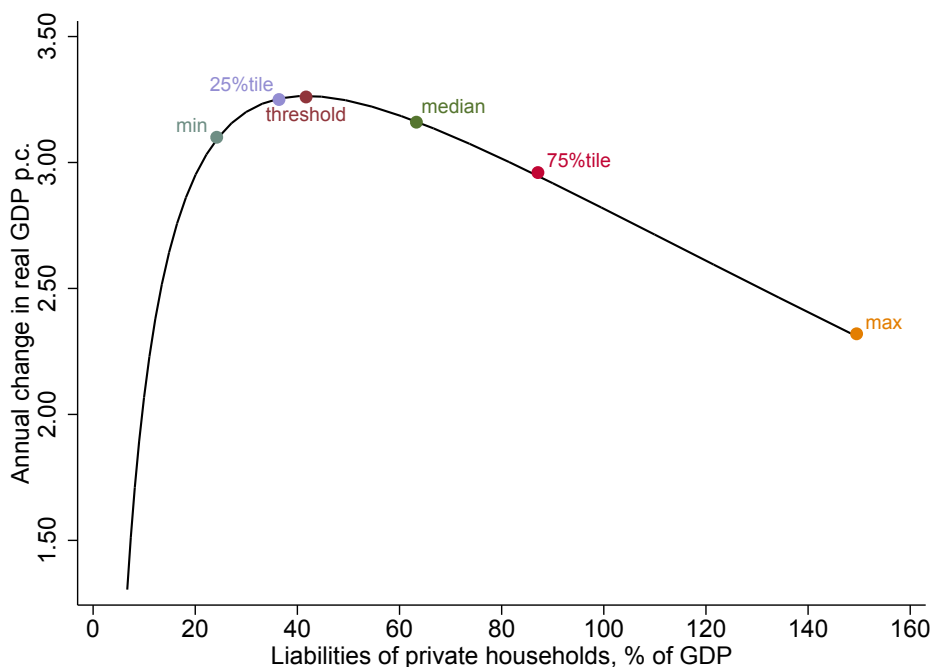


Figure 4: Relation between financing of households and economic growth (*Notes:* The relation is estimated based on the coefficients for *liabilities_ph* and *liabilities_ph*² from model B-2 in Table 2. Values for all other explanatory variables are set to their mean over the whole sample. Threshold is the level of financing at which the relation between financing and growth turns from positive to negative. Min, 25%tile, median, 75%tile and max refer to the distribution of total liabilities of private households for 2014.)

From a statistical point of view, one reason for these different findings might be that both *CK* and *ABP* include the financing variables in levels instead of in logs. When the financing variables are included in levels and the threshold in the log specification is below the median, the right-hand part of the curve derived from a model estimated in levels is by necessity steeper than in a model estimated in logs and then re-transformed into levels. Accordingly, reductions in the level of financing that lie beyond the threshold

¹³I use the average values provided on page 4 of *CK* and the coefficients of Table 6, column 4 of *ABP*. The estimates for Gambacorta et al. (2014) are based on Table 1, column 2. For all calculations the reduction of 45/108 percentage points is relative to the respective threshold value derived by the authors.

will have a bigger positive impact on economic growth, and this effect becomes more and more important as one moves away from the threshold. To check this possibility I re-estimate the models and include the financing variables in levels instead of in log levels (see Table 12 and Table 13 in the appendix). When doing so, the inverted u-shaped relation can no longer be found in any of the models, irrespective of whether the private sector as a whole or households and corporates individually are included. Accordingly, estimating the relation in log levels seems to be necessary to accommodate the fact that in the group of highly developed countries only slightly different growth rates coexist with a huge bandwidth of financing-to-GDP ratios.¹⁴

To some extent this finding is reminiscent of the debate between Arcand, Berkes, and Panizza (2015b) on the one hand and Cline (2015a,b) on the other hand. Cline argues that the large welfare gains of deleveraging found in *CK* and especially in *ABP* derive from a failure to adequately control for the convergence of economic growth rates. Whereas this debate has not been finally settled, my results, together with the findings of the papers cited above, clearly suggest that data sets that include low and middle income countries will produce larger gains in economic growth from a reduction in debt.¹⁵ Taken together, the choice of the country sample seems to have a decisive influence on the estimated impact of finance and growth and should be subject to further investigation.¹⁶

Second, another factor that was consistently related to economic growth was the ratio of financing of households to total liabilities of the private sector as a whole. In model B-2 the coefficient estimate is -0.276. Lowering the share of household financing by one average within country standard deviation (3.2 percentage points) would be associated with an increase in economic growth of around 0.8 percentage points.

3.4 Robustness

To check the robustness of my main results, I re-estimate the models from tables 2 and 3 with some minor modifications. In order to keep the paper at a reasonable length I do not include the re-estimated tables. All results are available upon request. First, given that a large part of the control variables are insignificant, I re-estimate the models including only the two consistently significant control variables initial GDP (*rgd_ppp*) and inflation rate (*inf*). Second, instead of time dummies I include a dummy variable that is one for

¹⁴Another approach to test for an inverted u-shaped relation is the so-called U test of Lind and Mehlum (2010). It estimates the joint significance of the slopes at the minimum and maximum of the observed data range. When applied to model B-2, only the slope at the minimum is significantly positive. In contrast, the slope at the maximum as well as the joint test are rejected with a p-value of 0.23. In line with the results discussed above, this implies that high levels of financing are negatively related to economic growth, but the association is quantitatively small.

¹⁵The lowest gains can be found in my sample and in Gambacorta et al. (2014). They include 34 and 41 high (and upper middle) income countries respectively. Considerably larger welfare gains are found in Cecchetti and Kharroubi (2012), who cover 50 high and middle income countries, whereby the relative weight of middle income countries is greater than in Gambacorta et al. (2014). Finally, the biggest gains are estimated by Arcand et al. (2015a) who include up to 133 countries ranging from low to high income.

¹⁶In a related literature that estimates the impact of public debt on economic growth, Chudik, Mohades, Pesaran, and Raissi (2017) show that when taking country heterogeneity into account, no clear-cut debt threshold can be estimated. This contrasts with the finding in Reinhart and Rogoff (2010), who establish a threshold of 90% of GDP, after which economic growth falls substantially for a panel of middle and high income countries.

the two five-year averages around and after the Global Financial Crisis. By doing so, I intend to address the concern that the crisis effectively constituted a structural break that has permanently lowered growth. Third, I re-estimate the models without time dummies. Fourth, I calculate the instrument financing shares in models C-1 to C-6 for corporates only. Fifth, I drop the variable *debt/liabilities* in models C-1 to C-6 and compute the instrument shares as a ratio of the respective instrument to total liabilities of the private sector. All modifications confirm the previous results.

Sixth, instead of using total liabilities for corporates and households individually, I include total liabilities of the private sector as a whole in models C-1 to C-6. In this case the inverted u-shaped relation between financing of the private sector and changes in real GDP per capita can be found in four out of six models. Seventh, I separate equity and debt financing of corporates in models C-1 to C-6. Here, financing of corporates in the form of both debt and equity, is still unrelated to economic growth. Furthermore, the inverted u-shaped relation between household financing and changes in real GDP per capita can once more be confirmed. However, the share of household financing in total liabilities of the private sector is no longer significant in any of the models.

Eighth, I re-estimate models B-4 to B-6 and C-1 to C-6 without the share of household financing in total liabilities of the private sector. In this case, the share of debt financing in total liabilities turns statistically significantly negative in all models. This finding again highlights the difficulties in estimating empirically whether a high share of household financing is linked to lower growth rates because it is inherently “unproductive”, as it is used for consumption smoothing or the purchase of (existing) housing or because it is financing in the form of debt. The inverted u-shaped relation is once more confirmed for households. In contrast, both coefficients turn insignificant for the level of financing of the private sector as a whole. Ninth, I replace the instrument shares in models C-1 to C-6 with the respective levels of the financing instruments. Doing so confirms that no specific instrument is significantly related to economic growth. The inverted u-shaped relation can be found in three of the six models for the household sector.

Finally, I check whether the results are robust to the exclusion of outliers. Since the financing variables are naturally scaled at zero, the focus is on countries with high levels. More specifically, I drop Cyprus, Ireland and Luxembourg from the data set, where the presence of many multinational corporations artificially inflates the level of corporate financing relative to (national) GDP.¹⁷ In this case, the inverted u-shaped relation between household financing and economic growth can be found in eight out of ten models. Furthermore, the share of household financing in total financing of the private sector turns insignificant in most models. All in all, the main results seem to be robust to a variety of modifications.

3.5 Model extensions

In a final step, I investigate through which channel(s) finance is related to growth. One reason for the negative relation between economic growth and financing of households might be that too much credit to households leads to a real estate bubble that eventually

¹⁷Total liabilities of corporations in Cyprus, Ireland Luxembourg amounted to 512%, 633% and 857% of GDP in 2014. The average across all other countries is 320%, with a (cross-country) standard deviation of 163%. The differences for households are much smaller.

ends in a financial crisis (Jordà, Schularick, and Taylor, 2011; Schularick and Taylor, 2012). To control for this confounding factor, I follow the existing literature and estimate a set of models that include the Valencia and Laeven (2012) (annual) crisis dummy.¹⁸ Given that the data enter as five-year averages, I use several crisis definitions. Definition *I* classifies a five-year period as a crisis if the indicator signals a crisis in any one of the five years. Definition *II* uses a weighted average of the number of years in crisis. Finally, definition *III* classifies a five-year period as a crisis if the crisis started in one of the five years. I focus on models B-1 and B-2, as likelihood ratio tests and information criteria indicate that they are preferable to the models including additional financing variables. The results are shown in Table 4 below.

Variable	Crisis definition <i>I</i>		Crisis definition <i>II</i>		Crisis definition <i>III</i>	
	D-1	D-2	D-3	D-4	D-5	D-6
<i>liabilities.nfp</i>	25.788*** (13.032)		25.959** (13.108)		25.284* (12.856)	
<i>liabilities.nfp</i> ²	-2.476*** (1.168)		-2.482*** (1.172)		-2.436** (1.153)	
<i>liabilities.nfc</i>		10.559 (11.125)		10.892 (11.167)		10.212 (11.087)
<i>liabilities.nfc</i> ²		-1.210 (0.994)		-1.231 (0.992)		-1.186 (0.990)
<i>liabilities.ph</i>		4.279*** (1.326)		4.229*** (1.313)		4.326** (1.426)
<i>liabilities.ph</i> ²		-0.577*** (0.248)		-0.569** (0.258)		-0.581*** (0.239)
<i>ph/nfp</i>	-0.257*** (0.066)	-0.272*** (0.079)	-0.254*** (0.065)	-0.269*** (0.076)	-0.256*** (0.067)	-0.275* (0.084)
<i>crisis</i>	-0.279 (0.285)	-0.118 (0.288)	-0.648 (0.556)	-0.395 (0.565)	-0.401 (0.381)	-0.033 (0.421)
<i>Threshold</i>	183% ^{nfp}	41% ^{ph}	187% ^{nfp}	41% ^{ph}	179% ^{nfp}	41% ^{ph}
<i>R</i> ² (within)	0.779	0.758	0.794	0.769	0.744	0.764
<i>Observations</i>	124	124	124	122	122	124
<i>Countries</i>	34	34	34	34	34	34

Table 4: Controlling for financial crises (Notes: The dependent variable is the annual change in real GDP per capita. *nfp*, *nfc* and *ph* are the non-financial private sector, non-financial corporations and private households. *crisis* is a dummy variable that equals one if a country experiences a financial crisis and is based on Valencia and Laeven (2012). Definition *I* classifies a five-year period as a crisis if the indicator signals a crisis in any one of the five years. Definition *II* uses a weighted average of the number of years in crisis. Definition *III* classifies a five-year period as a crisis if the crisis started in one of the five years. *liabilities* refers to the log of total liabilities to GDP. *ph/nfp* is the percentage share of total liabilities of private households in total liabilities of the non-financial private sector. All models include a set of control variables (not shown). For definitions of these variables, see Table 9. All variables except *rgdp.ppp* enter as non-overlapping five-year averages. *rgdp.ppp* enters as the value of the first period of the respective five-year time spell. *Threshold* is the level of financing to GDP at which the relation between finance and growth turns from positive to negative. All models include country and time fixed effects. Robust standard errors clustered at the country level in parenthesis. ***, ** and * denote significance at the 1%, 5% and 10% level.)

Whereas the coefficient for the crisis dummy is, as expected, negative in all specifications, it is never significant. The inverted u-shaped relation between finance and growth can be found in all three models for both households and the private sector as a whole.

¹⁸Before the Global Financial Crisis, which according to the Valencia/Laeven crisis indicator took hold in 19 of the 34 countries in the sample, financial crises were quite rare. The only incidences were Bulgaria 1996-1997, Czech Republic 1996-2000, Finland 1995, Croatia 1998-1999, Hungary 1995, Japan 1997-2001, Lithuania and Latvia 1995-1996 and Slovakia 1999-2002.

Also, the results for the share of household financing in total liabilities of the private sector are confirmed in all models. The findings are in line with the results in [Arcand et al. \(2015a\)](#), who also find that the inverted u-shaped relation between financing of the private sector and growth holds independent of the occurrence of financial crises. Furthermore, in his linear setup, [Angeles \(2015\)](#) also confirms the negative impact of household finance on growth when controlling for financial crises.¹⁹

Last of all, I explore whether the relation between finance and growth works through productivity growth or through headline real GDP growth. To do so, I replace the annual change in real GDP per capita by various measures of productivity growth. Models E-1 and E-2 use the annual change in real GDP per worker, models E-3 and E-4 the annual change in GDP per hour worked and models E-5 and E-6 the annual change in total factor productivity. The results are shown in [Table 5](#) below.

Variable	Real GDP per worker		Real GDP per hour worked		Total factor productivity	
	E-1	E-2	E-3	E-4	E-5	E-6
<i>liabilities.nfp</i>	4.183 (8.239)		2.338 (7.362)		4.397 (7.687)	
<i>liabilities.nfp</i> ²	-0.433 (0.745)		-0.151 (0.654)		-0.477 (0.699)	
<i>liabilities.ph</i>		0.372 (1.313)		-1.297 (1.440)		-0.243 (1.261)
<i>liabilities.ph</i> ²		-0.049 (0.326)		0.385 (0.245)		0.143 (0.204)
<i>liabilities.nfc</i>		4.500 (8.867)		11.046 (6.706)		9.482 (8.235)
<i>liabilities.nfc</i> ²		-0.474 (0.811)		-1.019* (0.584)		-0.989 (0.747)
<i>ph/nfp</i>	-0.062 (0.048)	-0.070 (0.083)	-0.035 (0.048)	-0.112 (0.075)	-0.120** (0.047)	-0.176** (0.083)
<i>R</i> ² (within)	0.713	0.714	0.608	0.620	0.676	0.656
Observations	124	124	122	122	124	124
Countries	34	34	33	33	34	34

Table 5: Productivity growth as dependent variable (*Notes:* The dependent variable is indicated in the column header. *nfp*, *nfc* and *ph* are the non-financial private sector, non-financial corporations and private households. *liabilities* refers to the log of total liabilities to GDP. *ph/nfp* is the percentage share of total liabilities of *ph* in total liabilities of *nfp*. All models include a set of control variables (not shown). For definitions of these variables, see [Table 9](#). All variables except *rgdp.ppp* enter as non-overlapping five-year averages. *rgdp.ppp* enters as the value of the first period of the respective five-year time spell. All models include country and time fixed effects. Robust standard errors clustered at the country level in parenthesis. ***, ** and * denote significance at the 1%, 5% and 10% level.)

Neither for households nor for the private sector as a whole can an inverted u-shaped relation be found in any of the specifications. These results suggest that the link between economic growth and the level of financing does not seem to work mainly through productivity growth. They are in principle in line with a recently popularized notion that suggests that too much financing in the form of debt can lead to the accumulation of a debt overhang. When the borrowing constraints of economic agents tighten, they

¹⁹[Breitenlechner, Gächter, and Sindermann \(2015\)](#) find an inverted u-shaped relation between financing of the private sector and growth during normal (non-crisis) times that turns monotonically negative during times of crises. When I include interactions of the crisis dummy and the financial variables, the interaction terms are mostly insignificant, suggesting that the relation between finance and growth does not depend on the economy being in a crisis or not.

are forced to deleverage by repaying debt, depressing aggregate demand and economic growth (Eggertsson and Krugman, 2012; Korinek and Simsek, 2016; Guerrieri and Lorenzoni, 2017). Furthermore, the share of household financing in total liabilities of the private sector is only negatively associated with changes in total productivity growth. This negative link could be evidence for a crowding out of corporate credit by household credit (Chakraborty, Goldstein, and MacKinlay, 2018).

4 Conclusions

This paper set out to investigate empirically whether the relation between finance and growth depends on a specific type of financing. It builds on a newly constructed data set for 34 high income countries that allows to distinguish between the borrowing sector – households and corporates – as well as a variety of different financial instruments. The paper has two main findings. First, financing of households is likely to be responsible for the negative relation between high levels of financing and economic growth documented for the private sector as a whole in a variety of recent contributions (Cecchetti and Kharroubi, 2012; Beck et al., 2014; Gambacorta et al., 2014; Law and Singh, 2014; Arcand et al., 2015a). Second, when controlling for the sectoral allocation of financing, no specific financing instrument – e.g. bank credit or market financing, debt or equity financing – seems to be particularly harmful or beneficial for economic growth.

Bearing the caveats regarding causality in mind, the analysis leads to two policy conclusions. First, the bulk of the literature finds that the private sector in most developed economies has reached levels of financing that are above the threshold at which the impact of finance on growth is maximized. Accordingly, a broad-based deleveraging process is advised. The results of this paper add a twist to this argument and suggest that it is first and foremost household financing that should be reduced. Second, more research has to be done before we can safely conclude that market financing is a better financing source than bank credit in terms of promoting long-term growth. More specifically, my findings are in line with the idea that the negative relation between bank credit and economic growth found in recent contributions comes about because bank credit is to a large extent provided to households. This would warrant shifting financing from households to corporates rather than replacing bank financing by market financing. Alternatively, the negative relation could be the result of households obtaining financing exclusively in the form of inflexible (non-state contingent) debt. This would indicate that debt financing should be replaced by equity financing. Clearly disentangling these different hypotheses seems to be an important avenue for future research.

References

- Alter, A., A. X. Feng, and N. Valckx (2018, April). Understanding the Macro-Financial Effects of Household Debt: A Global Perspective. IMF Working Papers 18/76, International Monetary Fund.
- Angeles, L. (2015, September). Credit expansion and the economy. *Applied Economics Letters* 22(13), 1064–1072.
- Arcand, J., E. Berkes, and U. Panizza (2015a, June). Too much finance? *Journal of Economic Growth* 20(2), 105–148.
- Arcand, J. L., E. Berkes, and U. Panizza (2015b, June). Too Much Finance or Statistical Illusion: A Comment. IHEID Working Papers 12-2015, Economics Section, The Graduate Institute of International Studies.
- Arestis, P., P. O. Demetriades, and K. B. Luintel (2001, February). Financial Development and Economic Growth: The Role of Stock Markets. *Journal of Money, Credit and Banking* 33(1), 16–41.
- Beck, R., G. Georgiadis, and R. Straub (2014). The finance and growth nexus revisited. *Economics Letters* 124(3), 382–385.
- Beck, T., B. Büyükkarabacak, F. K. Rioja, and N. T. Valev (2012, March). Who Gets the Credit? And Does It Matter? Household vs. Firm Lending Across Countries. *The B.E. Journal of Macroeconomics* 12(1), 1–46.
- Beck, T. and R. Levine (2004, March). Stock markets, banks, and growth: Panel evidence. *Journal of Banking & Finance* 28(3), 423–442.
- Breitenlechner, M., M. Gächter, and F. Sindermann (2015). The finance-growth nexus in crisis. *Economics Letters* 132(C), 31–33.
- Cecchetti, S. and E. Kharroubi (2012, July). Reassessing the impact of finance on growth. BIS Working Papers 381, Bank for International Settlements.
- Cecchetti, S., M. Mohanty, and F. Zampolli (2011, September). The real effects of debt. BIS Working Papers 352, Bank for International Settlements.
- Chakraborty, I., I. Goldstein, and A. MacKinlay (2018). Housing price booms and crowding-out effects in bank lending. *The Review of Financial Studies* 31(7), 2806–2853.
- Chen, P., L. Karabarbounis, and B. Neiman (2017). The global rise of corporate saving. *Journal of Monetary Economics* 89(C), 1–19.
- Chudik, A., K. Mohaddes, M. H. Pesaran, and M. Raissi (2017, March). Is There a Debt-Threshold Effect on Output Growth? *The Review of Economics and Statistics* 99(1), 135–150.

- Cline, W. R. (2015a, October). Further Statistical Debate on “Too Much Finance”. Working Paper Series WP15-16, Peterson Institute for International Economics.
- Cline, W. R. (2015b, June). Too Much Finance, or Statistical Illusion? Policy Briefs PB15-9, Peterson Institute for International Economics.
- Cournède, B. and O. Denk (2015, June). Finance and economic growth in OECD and G20 countries. OECD Economics Department Working Papers 1223, OECD Publishing.
- Demirgüç-Kunt, A., E. Feyen, and R. Levine (2013). The Evolving Importance of Banks and Securities Markets. *World Bank Economic Review* 27(3), 476–490.
- Drehmann, M., M. Juselius, and A. Korinek (2018, April). Going With the Flows: New Borrowing, Debt Service and the Transmission of Credit Booms. NBER Working Papers 24549, National Bureau of Economic Research, Inc.
- Eggertsson, G. B. and P. Krugman (2012). Debt, Deleveraging, and the Liquidity Trap: A Fisher-Minsky-Koo Approach. *The Quarterly Journal of Economics* 127(3), 1469–1513.
- Feenstra, R. C., R. Inklaar, and M. P. Timmer (2015, October). The Next Generation of the Penn World Table. *American Economic Review* 105(10), 3150–3182.
- Gambacorta, L., J. Yang, and K. Tsatsaronis (2014, March). Financial structure and growth. *BIS Quarterly Review*.
- Guerrieri, V. and G. Lorenzoni (2017). Credit Crises, Precautionary Savings, and the Liquidity Trap. *The Quarterly Journal of Economics* 132(3), 1427–1467.
- Jordà, O., M. Schularick, and A. M. Taylor (2011, June). Financial Crises, Credit Booms, and External Imbalances: 140 Years of Lessons. *IMF Economic Review* 59(2), 340–378.
- Jordà, O., M. Schularick, and A. M. Taylor (2013, December). When Credit Bites Back. *Journal of Money, Credit and Banking* 45(s2), 3–28.
- Jordà, O., M. Schularick, and A. M. Taylor (2016). The great mortgaging: housing finance, crises and business cycles. *Economic Policy* 31(85), 107–152.
- King, R. G. and R. Levine (1993). Finance and Growth: Schumpeter Might Be Right. *The Quarterly Journal of Economics* 108(3), 717–737.
- Korinek, A. and A. Simsek (2016, March). Liquidity Trap and Excessive Leverage. *American Economic Review* 106(3), 699–738.
- Langfield, S. and M. Pagano (2016). Bank bias in Europe: effects on systemic risk and growth. *Economic Policy* 31(85), 51–106.
- Law, S. H. and N. Singh (2014). Does too much finance harm economic growth? *Journal of Banking & Finance* 41(C), 36–44.
- Levine, R. (2002, October). Bank-Based or Market-Based Financial Systems: Which Is Better? *Journal of Financial Intermediation* 11(4), 398–428.

- Levine, R. (2005). Finance and Growth: Theory and Evidence. In P. Aghion and S. Durlauf (Eds.), *Handbook of Economic Growth*, Volume 1 of *Handbook of Economic Growth*, Chapter 12, pp. 865–934. Elsevier.
- Lind, J. T. and H. Mehlum (2010, February). With or Without U? The Appropriate Test for a U-Shaped Relationship. *Oxford Bulletin of Economics and Statistics* 72(1), 109–118.
- Lombardi, M. J., M. Mohanty, and I. Shim (2017, January). The real effects of household debt in the short and long run. BIS Working Papers 607, Bank for International Settlements.
- Mian, A., K. Rao, and A. Sufi (2013). Household Balance Sheets, Consumption, and the Economic Slump. *The Quarterly Journal of Economics* 128(4), 1687–1726.
- Mian, A. and A. Sufi (2010, August). Household Leverage and the Recession of 2007-09. *IMF Economic Review* 58(1), 74–117.
- Mian, A. and A. Sufi (2014, November). What Explains the 2007-2009 Drop in Employment? *Econometrica* 82, 2197–2223.
- Mian, A., A. Sufi, and E. Verner (2017). Household Debt and Business Cycles Worldwide. *The Quarterly Journal of Economics* 132(4), 1755–1817.
- Reinhart, C. M. and K. S. Rogoff (2010, May). Growth in a Time of Debt. *American Economic Review* 100(2), 573–578.
- Schularick, M. and A. M. Taylor (2012, April). Credit Booms Gone Bust: Monetary Policy, Leverage Cycles, and Financial Crises, 1870-2008. *American Economic Review* 102(2), 1029–1061.
- Valencia, F. and L. Laeven (2012, June). Systemic Banking Crises Database; An Update. IMF Working Papers 12/163, International Monetary Fund.

A Data

Instrument	Description & SNA 2008 Code	Sectors
Total liabilities	obligation to provide a payment, F	NFC & PH
Debt securities	negotiable debt instruments, F.3	NFC
Loans	non-negotiable funds lent to debtors, F.4	NFC & PH
Equity	claims on the residual value of a corporation, F.5	NFC
Listed shares	equity securities listed on an exchange, F.511	NFC
Trade credit	credit by the suppliers of goods and services, F.81	NFC
Debt	all debt instruments, (F – F.5)	NFC
Shares	listed and unlisted shares, (F.511 + F.512)	NFC
Other equity	equity other than listed shares, (F.5 – F.511)	NFC

Table 6: Financing variables: Definitions and sources (*Sources:* Eurostat, OECD. *Notes:* For details on the financial instruments, see the statistical guidebook [SNA 2008](#).)

Instrument	Non-financial private sector		Private households		Non-financial corporations				
	Total	Loans	Total	Loans	Total	Loans	Other debt	Listed shares	Other equity
Austria	221.2	125.9	48.8	48.5	172.4	77.5	22.6	17.4	54.9
Belgium	379.2	155.8	47.4	45.5	331.8	110.3	47.7	34.6	139.2
Bulgaria	272.0	82.5	16.9	12.9	255.1	69.6	79.4	9.2	96.9
Canada	337.2	132.9	76.0	73.6	261.2	59.3	67.1	62.2	72.7
Chile	337.5	89.5	33.7	31.1	303.8	58.4	64.8	69.8	110.9
Croatia	288.2	110.7	35.1	34.1	253.1	76.6	75.6	27.2	73.7
Cyprus	536.8	299.9	108.5	91.5	428.3	208.4	49.6	17.3	152.9
Czech Republic	232.7	61.4	21.4	17.9	211.3	43.5	69.7	15.5	82.5
Denmark	353.5	184.7	118.5	110.1	235.0	74.6	22.4	49.3	88.8
Estonia	289.0	102.3	31.2	27.4	257.8	74.8	48.1	11.3	123.6
Finland	325.5	126.3	49.2	45.8	276.3	80.5	39.4	93.1	63.3
France	379.6	129.3	54.2	42.7	325.4	86.6	50.9	56.2	131.7
Germany	235.8	115.2	64.2	63.5	171.5	51.7	45.5	37.0	37.4
Greece	161.9	79.9	41.7	34.0	120.2	45.9	10.6	29.0	34.7
Hungary	245.9	84.1	24.8	20.0	221.1	64.1	44.4	16.3	96.3
Ireland	453.2	221.5	90.9	86.9	362.3	134.5	65.5	27.8	134.5
Italy	246.5	93.8	44.1	31.4	202.4	62.3	47.5	22.6	70.0
Japan	353.6	158.3	65.9	61.8	287.6	96.5	88.5	64.3	38.3
Latvia	195.1	79.3	24.7	22.2	170.4	57.1	48.8	0.9	63.5
Lithuania	166.0	48.8	17.2	13.6	148.8	35.2	32.9	12.9	67.9
Luxembourg	907.1	252.6	49.8	49.8	857.3	202.8	63.8	183.3	407.5
Malta	359.3	190.6	66.5	54.3	292.8	136.3	65.5	10.2	80.8
Netherlands	402.9	208.3	109.6	99.4	293.3	108.9	43.4	59.2	81.7
Norway	372.0	174.4	73.6	68.4	298.4	106.0	62.2	40.9	89.3
Poland	165.4	48.9	19.5	18.5	145.9	30.4	43.9	12.7	58.9
Portugal	358.1	159.8	80.4	70.2	277.8	89.6	79.4	28.2	80.5
Romania	235.4	54.0	15.4	10.3	219.9	43.7	101.7	7.0	67.5
Slovakia	182.9	58.5	18.2	14.0	164.7	44.5	43.4	1.1	75.7
Slovenia	253.5	97.4	28.2	23.6	225.3	73.8	46.0	20.9	84.6
Spain	351.1	153.7	67.8	61.4	283.4	92.4	53.1	35.1	102.8
Sweden	457.0	168.7	64.6	61.1	392.5	107.6	59.6	79.6	145.6
Switzerland	366.7	175.1	112.1	110.2	254.6	64.9	22.8	166.9	
United Kingdom	348.6	143.7	86.3	77.9	262.3	65.8	59.0	89.4	48.1
United States	352.8	118.1	82.9	79.5	269.9	38.6	67.0	85.8	78.5

Table 7: Financing sources of the non-financial private sector (*Notes:* All variables are expressed as a percentage of GDP. Data for all EU countries as well as Norway and Switzerland are from Eurostat. Data for Canada, Chile, Japan and the United States are from the OECD. Simple average for each country over the period 1995 to 2014. Time span can vary due to data availability. Total refers to total liabilities. Other equity is calculated as the difference between equity and listed shares. Other debt equals total liabilities minus equity minus loans. No breakdown of different equity instruments is available for Switzerland.)

Sector	Non-financial corporations						Private households		
	Instrument	Equity			Debt			Liabilities	
Country		1995	2006	2014	1995	2006	2014	1995	2006
Austria	43.8	92.4	97.9	81.5	99.7	111.3	42.2	52.8	51.8
Belgium	90.0	188.0	249.8	110.1	155.7	192.7	39.7	46.4	61.9
Bulgaria	91.8	145.7	140.7	77.0	151.3	216.9	6.1	20.3	30.5
Canada	96.7	169.1	158.7	116.5	113.8	142.8	59.1	76.5	95.3
Chile		173.5	181.0		108.9	145.8		28.7	41.2
Croatia		112.6	105.7		136.2	181.2		35.2	41.4
Cyprus	120.0	147.1	216.7	291.6	216.6	295.7	74.8	110.5	149.5
Czech Republic	105.0	105.2	91.0	124.4	101.7	111.8	15.0	22.0	33.8
Denmark		161.1	184.2		130.7	132.3	91.6	126.6	136.4
Estonia	84.1	176.1	183.9	62.7	152.8	148.0	4.7	45.3	44.1
Finland	79.6	174.3	151.1	103.4	118.8	146.8	37.9	54.4	69.7
France	85.1	242.9	230.7	121.8	138.7	160.9	41.2	57.2	64.7
Germany	47.2	82.4	86.7	87.5	97.5	96.4	60.9	65.5	54.7
Greece	42.5	79.1	50.2	36.7	57.7	71.9	12.7	47.8	71.5
Hungary	98.0	119.3	127.5	75.4	114.5	129.4	10.8	30.9	30.0
Ireland		111.0	322.1		159.8	311.3		94.5	87.1
Italy	53.2	128.5	99.7	96.0	115.2	122.9	26.9	49.1	56.5
Japan	86.4	160.6	168.5	225.5	174.7	170.1	66.4	62.0	64.8
Latvia	68.5	53.8	72.3	56.8	113.4	128.1	2.0	43.0	29.7
Lithuania	74.5	86.1	91.1	45.5	77.7	74.8	3.2	26.8	27.0
Luxembourg		757.9	608.9		214.4	388.1		45.6	60.0
Malta		86.5	93.6		170.4	222.7		61.6	68.2
Netherlands	135.3	133.2	143.1	175.8	144.8	141.4	76.9	117.3	124.1
Norway	77.0	168.8	170.1	138.5	155.4	182.4	60.4	75.3	94.2
Poland	87.4	80.8	75.6	49.5	68.3	84.2	2.3	19.3	36.4
Portugal	68.7	126.1	118.9	120.6	176.0	202.3	35.1	92.9	99.8
Romania	220.1	74.9	55.3	340.3	159.5	128.8	7.2	26.4	24.2
Slovakia	101.1	72.6	66.0	111.4	75.3	90.1	7.1	17.9	36.0
Slovenia		112.6	99.0		113.4	118.4		25.6	32.7
Spain	71.9	176.3	174.3	91.1	180.1	153.9	39.7	83.7	77.6
Sweden	94.4	331.4	314.5	139.0	148.7	209.8	44.6	68.9	86.6
Switzerland		183.8	233.7		75.6	102.5		111.9	122.8
United Kingdom	124.2	140.5	136.0	97.4	129.0	131.2	65.7	100.3	92.2
United States	137.9	181.1	203.6	89.9	106.5	115.4	65.9	97.4	82.3

Table 8: Financing of the private sector (*Notes:* All variables are expressed as a percentage of GDP. Data for all EU countries as well as Norway and Switzerland are from Eurostat. Data for Canada, Chile, Japan and the United States are from the OECD. Debt for non-financial corporations equals total liabilities minus equity.)

Variable	Description	Time series	Transformation
$\Delta RGDP$	Annual change in real GDP p.c.	<i>rgdpna, pop</i>	$\Delta \ln\left(\frac{rgdpna}{pop}\right) * 100$
$\Delta RGDP_{pw}$	Annual change in real GDP p.w.	<i>rgdpna, emp</i>	$\Delta \ln\left(\frac{rgdpna}{emp}\right) * 100$
$\Delta RGDP_{phw}$	Annual change in real GDP p.h.w.	<i>rgdpna, avh</i>	$\Delta \ln\left(\frac{rgdpna}{avh}\right) * 100$
ΔTFP	Annual change in TFP	<i>rtfpna</i>	$\Delta \ln(rtfpna) * 100$
<i>rgdp_ppp</i>	GDP per capita at current PPP	<i>cgdpe, pop</i>	$\ln\left(\frac{cgdpe}{pop}\right)$
<i>hum</i>	Human capital index	<i>hc</i>	$\ln(hc)$
<i>gov</i>	Government consumption, % of GDP	<i>csh_g</i>	$\ln(csh_g)$
<i>open</i>	(Exports + Import), % of GDP	<i>csh_x, csh_m</i>	$\ln(csh_x + csh_m)$
<i>inf</i>	Gross inflation rate	<i>GFDD.OE.01</i>	$\ln\left(\frac{GFDD.OE.01_t}{GFDD.OE.01_{t-1}}\right)$

Table 9: Dependent and control variables: Definitions and sources (*Notes:* p.c.=per capita, p.w.=per worker, p.h.w.=per hour worked, TFP=Total Factor Productivity, PPP=Purchasing Power Parity. *inf* is from the [Global Financial Development Database](#). All other variables are from the [Penn World Tables](#).)

Variable	Obs.	Mean	Std. Dev.	Min	Max
$\Delta RGDP$	680	2.2	3.4	-15.6	12.5
$\Delta RGDP_{pw}$	680	1.9	3.0	-12.7	21.4
$\Delta RGDP_{phw}$	660	2.1	2.9	-12.6	23.9
ΔTFP	680	0.8	2.7	-10.6	18.2
$rgdp_ppp$	680	30392	14214	6357	94224
hum	680	3.1	0.3	2.1	3.7
gov	680	0.2	0.1	0.1	0.4
$open$	680	0.9	0.5	0.2	2.9
inf	680	4.8	25.2	-5.0	547.7

Table 10: Dependent and control variables: Summary statistics (*Notes:* Obs.=number of annual observations, Std. Dev.=standard deviation. For variable definitions see [Table 9](#). For illustrative purposes the values for $rgdp_ppp$, hum , gov , $open$ and inf are shown as levels instead of as logs.)

B Additional graphs and tables

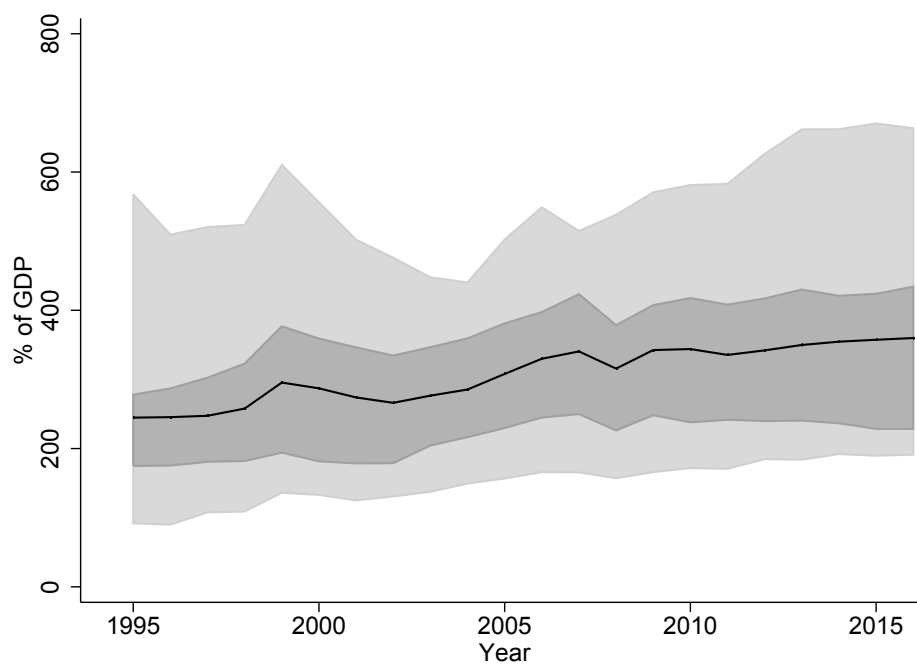


Figure 5: Total liabilities of the private sector 1995 to 2014 (*Sources: Eurostat, OECD and own calculations. Notes: The solid line shows the mean of total liabilities of the private sector for a given year for the sample of countries for which data are available over the whole time period. The dark-gray shaded area delineates the first and third quartile range, the light-gray shaded area the minimum and maximum range.*)

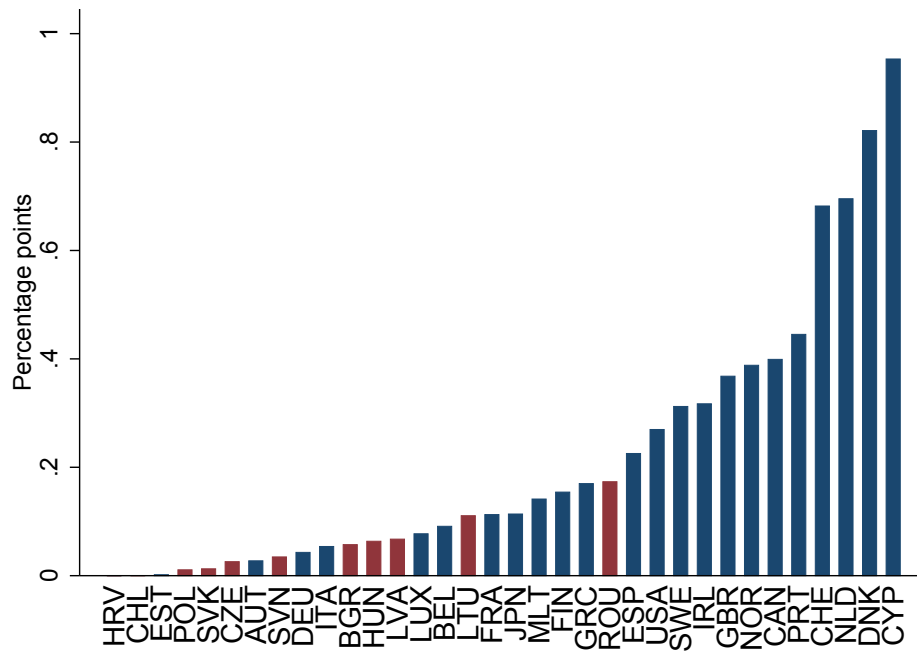


Figure 6: Change in economic growth rates after adjustment to optimal leverage of households (Notes: The change in the annual growth rate of real GDP per capita is estimated based on the coefficients for $liabilities_{ph}$ and $liabilities_{ph}^2$ from model A-2 in Table 2 and the value for total liabilities of private households for 2014. It assumes that total liabilities of households as a percentage of GDP increase (red bars) or decrease (blue bars) to the financing level at which the relation between financing and growth turns from positive to negative.)

Instrument/Model	Listed shares	Shares	Debt securities	Loans	Bank loans	Trade credit
Variable	F-1	F-2	F-3	F-4	F-5	F-6
<i>liabilities_nfc</i>	5.969 (15.218)	9.596 (13.492)	7.808 (13.366)	7.936 (11.517)	8.066 (12.991)	3.778 (10.709)
<i>liabilities_nfc</i> ²	-0.843 (1.337)	-1.170 (1.207)	-0.976 (1.203)	-1.045 (1.042)	-0.999 (1.170)	-0.635 (0.966)
<i>liabilities_ph</i>	4.423*** (1.148)	3.295*** (0.953)	4.312*** (1.218)	4.248*** (0.946)	4.481*** (1.205)	4.105*** (1.260)
<i>liabilities_ph</i> ²	-0.531* (0.307)	-0.377 (0.289)	-0.590** (0.250)	-0.538** (0.260)	-0.615** (0.290)	-0.612* (0.310)
<i>ph/nfp</i>	-0.254* (0.148)	-0.247* (0.142)	-0.202* (0.100)	-0.263** (0.108)	-0.213* (0.111)	-0.199 (0.128)
<i>debt/liabilities</i>	-0.031 (0.048)	-0.040 (0.055)	-0.043 (0.044)	-0.032 (0.040)	-0.039 (0.045)	-0.030 (0.044)
<i>instrument/equity</i>	0.015 (0.028)	0.016 (0.014)				
<i>instrument/debt</i>			0.129 (0.207)	0.044 (0.035)	-0.003 (0.017)	-0.040 (0.054)
<i>rgdp_ppp</i>	-4.208** (1.699)	-3.764** (1.587)	-4.027** (1.647)	-4.176** (1.609)	-3.600** (1.712)	-4.931*** (1.482)
<i>hum</i>	3.934 (10.314)	6.662 (10.323)	6.796 (9.576)	5.489 (8.932)	7.132 (9.137)	5.152 (8.937)
<i>gov</i>	0.357 (1.593)	0.381 (1.650)	0.024 (1.726)	0.679 (1.650)	0.479 (1.534)	-1.215 (1.335)
<i>open</i>	1.000 (1.071)	1.543 (0.979)	1.089 (0.992)	0.914 (0.863)	1.103 (1.067)	0.870 (0.858)
<i>inf</i>	-6.178*** (1.632)	-7.673*** (1.358)	-6.576*** (1.400)	-6.272*** (1.261)	-6.711*** (1.441)	-7.327*** (1.663)
<i>Threshold</i>	65% ^{ph}	79% ^{ph}	39% ^{ph}	52% ^{ph}	38% ^{ph}	29% ^{ph}
<i>R</i> ² (<i>within</i>)	0.769	0.768	0.770	0.773	0.770	0.777
<i>Observations</i>	118	114	122	122	120	117
<i>Countries</i>	33	32	34	34	34	32

Table 11: Instrumental decomposition: Notional stocks (*Notes:* The dependent variable is the annual change in real GDP per capita. *nfp*, *nfc* and *ph* are the non-financial private sector, non-financial corporations and private households. *liabilities* refers to the log of total liabilities to GDP. *ph/nfp* is the percentage share of total liabilities of *ph* in total liabilities of *nfp*. *debt/liabilities* is the percentage share of debt financing in total liabilities of *nfp*. *instrument/equity* and *instrument/debt* refer to the percentage share of the respective instrument indicated in the column header in equity or debt financing of *nfp*. Liabilities in the form of equity are included as notional stocks. For definitions of all other explanatory variables, see Table 9. All variables except *rgdp_ppp* enter as non-overlapping five-year averages. *rgdp_ppp* enters as the value of the first period of the respective five-year time spell. *Threshold* is the level of financing to GDP at which the relation between finance and growth turns from positive to negative. All models include country and time fixed effects. Robust standard errors clustered at the country level in parenthesis. ***, ** and * denote significance at the 1%, 5% and 10% level.)

Variable	Model					
	G-1	G-2	G-3	G-4	G-5	G-6
<i>liabilities.nfp</i>	-0.922*** (0.291)			-0.909*** (0.308)		
<i>liabilities.nfp</i> ²	0.000 (0.000)			0.000 (0.000)		
<i>liabilities.nfc</i>		-0.391 (0.550)	-1.552 (1.432)		-0.385 (0.551)	-2.273 (2.376)
<i>liabilities.nfc</i> ²		0.000 (0.000)	0.002 (0.003)		0.000 (0.000)	0.003 (0.003)
<i>equity.nfc</i>			0.521 (0.869)			1.007 (2.089)
<i>equity.nfc</i> ²			-0.001 (0.001)			-0.001 (0.001)
<i>liabilities.ph</i>		-3.511 (5.670)	-3.611 (5.849)		-3.412 (5.820)	-3.038 (5.504)
<i>liabilities.ph</i> ²		-0.005 (0.023)	-0.010 (0.025)		-0.010 (0.025)	-0.011 (0.024)
<i>ph/nfp</i>	-0.225*** (0.047)	-0.152 (0.098)	-0.108 (0.102)	-0.218*** (0.077)	-0.105 (0.107)	-0.141 (0.137)
<i>debt/liabilities</i>				-0.007 (0.044)	-0.027 (0.040)	0.030 (0.117)
<i>rgdp_ppp</i>	-2.401 (1.482)	-2.271 (1.559)	-2.037 (1.614)	-2.364 (1.491)	-2.247 (1.603)	-1.967 (1.648)
<i>hum</i>	6.110 (9.568)	4.807 (9.828)	4.456 (10.089)	6.224 (9.718)	5.795 (9.976)	4.417 (10.015)
<i>gov</i>	-1.302 (1.520)	-0.795 (1.468)	-0.305 (1.592)	-1.247 (1.552)	-0.582 (1.508)	-0.236 (1.614)
<i>open</i>	2.682*** (0.785)	1.853** (0.703)	1.587** (0.748)	2.660*** (0.818)	1.523** (0.763)	1.688* (0.925)
<i>inf</i>	-9.297*** (0.739)	-9.221*** (0.642)	-9.517*** (0.784)	-9.310*** (0.883)	-9.415*** (0.734)	-9.510*** (0.791)
<i>R</i> ² (within)	0.722	0.732	0.735	0.719	0.733	0.736
<i>Observations</i>	124	122	122	124	122	122
<i>Countries</i>	34	34	34	34	34	34

Table 12: Sectoral decomposition: Financing in levels (*Notes:* The dependent variable is the annual change in real GDP per capita. *nfp*, *nfc* and *ph* are the non-financial private sector, non-financial corporations and private households. *liabilities* refers for *nfp* and *ph* to total liabilities to GDP. For *nfc* it refers to total liabilities to GDP in models F-1, F-2, F-4 and F-5 and to debt (total liabilities minus equity) to GDP in models F-3 and F-6. *ph/nfp* is the percentage share of total liabilities of *ph* in total liabilities of *nfp*. *debt/liabilities* is the percentage share of debt (total liabilities minus equity) in total liabilities of *nfp*. For definitions of all other explanatory variables, see Table 9. All variables except *rgdp_ppp* enter as non-overlapping five-year averages. *rgdp_ppp* enters as the value of the first period of the respective five-year time spell. All models include country and time fixed effects. Robust standard errors clustered at the country level in parenthesis. ***, ** and * denote significance at the 1%, 5% and 10% level.)

Instrument/Model	Listed shares	Shares	Debt securities	Loans	Bank loans	Trade credit
Variable	H-1	H-2	H-3	H-4	H-5	H-6
<i>liabilities_nfc</i>	-0.385 (0.594)	-0.474 (0.545)	-0.282 (0.546)	-0.769 (0.601)	-0.194 (0.498)	-1.118** (0.517)
<i>liabilities_nfc</i> ²	0.000 (0.000)	0.000 (0.000)	0.000 (0.000)	0.000 (0.000)	0.000 (0.000)	0.001 (0.000)
<i>liabilities_ph</i>	-2.753 (6.350)	-1.589 (5.803)	-4.313 (5.811)	-2.937 (5.527)	-5.473 (5.507)	-5.815 (4.948)
<i>liabilities_ph</i> ²	-0.007 (0.027)	-0.017 (0.025)	-0.006 (0.026)	-0.010 (0.022)	-0.006 (0.023)	0.002 (0.021)
<i>ph/nfp</i>	-0.123 (0.122)	-0.115 (0.120)	-0.079 (0.094)	-0.151 (0.094)	-0.115 (0.099)	-0.109 (0.095)
<i>debt/liabilities</i>	-0.024 (0.040)	-0.054 (0.049)	-0.035 (0.041)	-0.023 (0.036)	-0.021 (0.041)	-0.025 (0.043)
<i>instrument/equity</i>	0.053 (0.032)	0.030 (0.022)				
<i>instrument/debt</i>			0.204 (0.214)	0.043 (0.043)	0.019 (0.018)	-0.100** (0.046)
<i>rgdp_ppp</i>	-2.911* (1.494)	-2.201 (1.515)	-2.335 (1.577)	-2.539 (1.649)	-1.850 (1.605)	-3.802*** (1.379)
<i>hum</i>	6.465 (10.704)	8.652 (10.427)	6.918 (10.774)	4.598 (10.240)	8.134 (9.800)	3.020 (9.861)
<i>gov</i>	-0.151 (1.674)	0.514 (1.826)	-0.844 (1.650)	-0.485 (1.494)	0.150 (1.426)	-2.297 (1.511)
<i>open</i>	1.893** (0.817)	1.749** (0.873)	1.419* (0.786)	1.475* (0.825)	1.796** (0.837)	0.814 (0.962)
<i>inf</i>	-8.116*** (1.038)	-10.330*** (0.618)	-9.113*** (0.871)	-8.938*** (0.879)	-9.309*** (0.769)	-10.123*** (0.732)
<i>R</i> ² (<i>within</i>)	0.751	0.761	0.739	0.738	0.743	0.754
<i>Observations</i>	118	114	122	122	120	117
<i>Countries</i>	33	32	34	34	34	32

Table 13: Instrumental decomposition: Financing in levels (*Notes*: The dependent variable is the annual change in real GDP per capita. *nfp*, *nfc* and *ph* are the non-financial private sector, non-financial corporations and private households. *liabilities* refers to total liabilities to GDP. *ph/nfp* is the percentage share of total liabilities of *ph* in total liabilities of *nfp*. *debt/liabilities* is the percentage share of debt financing in total liabilities of *nfp*. *instrument/equity* and *instrument/debt* refer to the percentage share of the respective instrument indicated in the column header in equity or debt financing of *nfp*. For definitions of all other explanatory variables, see Table 9. All variables except *rgdp_ppp* enter as non-overlapping five-year averages. *rgdp_ppp* enters as the value of the first period of the respective five-year time spell. All models include country and time fixed effects. Robust standard errors clustered at the country level in parenthesis. ***, ** and * denote significance at the 1%, 5% and 10% level.)

C Main tables including control variables

Variable	World Bank		Financial Accounts			
	A-1	A-2	A-3	A-4	A-5	A-6
<i>loans_nfp</i>	-1.115** (0.459)	6.387** (2.408)	-1.453*** (0.780)	7.968* (4.248)	-1.544*** (0.704)	12.610*** (4.293)
<i>loans_nfp</i> ²		-0.964*** (0.332)		-1.121** (0.505)		-1.695** (0.499)
<i>ph/nfp</i>					-0.043 (0.027)	-0.087*** (0.031)
<i>rgdp_ppp</i>	-2.992** (1.475)	-4.760** (2.167)	-4.180** (1.456)	-4.489** (1.354)	-3.366** (1.656)	-3.001*** (1.395)
<i>hum</i>	-11.368 (9.497)	-6.109 (9.708)	-7.803 (11.176)	-4.956 (12.950)	-4.254 (9.742)	3.674 (10.581)
<i>gov</i>	-0.965 (1.384)	-0.899 (1.596)	-2.701* (1.593)	-2.500 (1.577)	-2.578 (1.537)	-2.148 (1.475)
<i>open</i>	2.452*** (0.828)	1.309 (1.029)	1.805* (0.964)	0.915 (1.146)	2.675 (1.059)	2.219 (1.189)
<i>inf</i>	-9.754*** (1.937)	-7.538*** (1.130)	-10.468*** (1.386)	-8.982*** (1.676)	-10.412*** (1.283)	-8.109*** (1.986)
<i>Threshold</i>		28%		35%		41%
<i>LR test</i>		17.17*** (0.000)		8.23*** (0.004)		16.52*** (0.000)
<i>BIC</i>	411.6	399.3	370.5	367.1	372.3	360.6
<i>AIC</i>	382.6	367.4	342.3	336.1	341.3	326.8
<i>R</i> ² (<i>within</i>)	0.663	0.704	0.646	0.669	0.654	0.698
<i>Observations</i>	134	134	124	124	124	124
<i>Countries</i>	34	34	34	34	34	34

Table 14: Functional form: Full table (*Notes:* The dependent variable is the annual change in real GDP per capita. *nfp* and *ph* are the non-financial private sector and private households. Loans refers to the log of private credit by deposit money banks to GDP according to the World Bank in models A-1 to A-2 and to the log of loans to GDP according to the financial accounts in models A-3 to A-6. *ph/nfp* is the percentage share of loans of *ph* in loans of *nfp*. For definitions of all other explanatory variables, see Table 9. All variables except *rgdp_ppp* enter as non-overlapping five-year averages. *rgdp_ppp* enters as the value of the first period of the respective five-year time spell. *Threshold* is the level of financing to GDP at which the relation between finance and growth turns from positive to negative. *LR test* are the results of an exclusion test of the quadratic financing term. All models include country and time fixed effects. Robust standard errors clustered at the country level in parenthesis. ***, ** and * denote significance at the 1%, 5% and 10% level.)

Variable	Model					
	B-1	B-2	B-3	B-4	B-5	B-6
<i>liabilities.nfp</i>	25.315*			26.246*		
	(12.864)			(13.435)		
<i>liabilities.nfp</i> ²	-2.449**			-2.522**		
	(1.151)			(1.195)		
<i>liabilities.nfc</i>		10.087	2.760		11.066	2.657
		(11.205)	(10.295)		(11.663)	(10.044)
<i>liabilities.nfc</i> ²		-1.177	-0.482		-1.229	-0.480
		(1.002)	(1.082)		(1.041)	(1.031)
<i>equity.nfc</i>			7.614			7.667
			(6.475)			(7.994)
<i>equity.nfc</i> ²			-0.820			-0.817
			(0.651)			(0.681)
<i>liabilities.ph</i>		4.365***	4.649***		4.668***	4.641***
		(1.252)	(1.285)		(1.207)	(1.476)
<i>liabilities.ph</i> ²		-0.585**	-0.716***		-0.673**	-0.714*
		(0.234)	(0.285)		(0.252)	(0.367)
<i>ph/nfp</i>	-0.258***	-0.276***	-0.196	-0.238***	-0.210*	-0.197
	(0.068)	(0.079)	(0.120)	(0.082)	(0.108)	(0.248)
<i>debt/liabilities</i>				-0.020	-0.041	0.004
				(0.044)	(0.044)	(0.355)
<i>rgdp.ppp</i>	-2.352	-3.961**	-3.904**	-2.322	-3.933**	-3.903**
	(1.430)	(1.612)	(1.564)	(1.419)	(1.593)	(1.573)
<i>hum</i>	7.361	2.333	4.283	8.373	4.575	4.244
	(10.058)	(8.906)	(9.568)	(10.518)	(9.782)	(10.608)
<i>gov</i>	-0.894	-0.096	0.131	-0.739	0.181	0.130
	(1.455)	(1.513)	(1.577)	(1.497)	(1.469)	(1.573)
<i>open</i>	2.623***	1.225	1.053	2.582***	1.092	1.054
	(0.680)	(0.989)	(1.033)	(0.714)	(1.032)	(1.025)
<i>inf</i>	-8.802***	-6.331***	-6.510***	-8.861***	-6.439***	-6.514***
	(0.888)	(1.227)	(1.456)	(0.956)	(1.375)	(1.424)
<i>Threshold</i>	176% ^{nfp}	42% ^{ph}	26% ^{ph}	182% ^{nfp}	32% ^{ph}	26% ^{ph}
<i>LR test</i>	8.45***	8.72**	13.71***	8.64***	9.94***	10.36**
	(0.004)	(0.013)	(0.003)	(0.003)	(0.007)	(0.016)
<i>R</i> ² (<i>within</i>)	0.730	0.762	0.764	0.728	0.763	0.764
<i>Countries</i>	34	34	34	34	34	34
<i>Observations</i>	124	122	122	124	122	122

Table 15: Sectoral decomposition: Full table (*Notes:* The dependent variable is the annual change in real GDP per capita. *nfp*, *nfc* and *ph* are the non-financial private sector, non-financial corporations and private households. *liabilities* refers for *nfp* and *ph* to the log of total liabilities to GDP. For *nfc* it refers to the log of total liabilities to GDP in models A-1, A-2, A-4 and A-5 and to the log of debt (total liabilities minus equity) to GDP in models A-3 and A-6. *ph/nfp* is the percentage share of total liabilities of *ph* in total liabilities of *nfp*. *debt/liabilities* is the percentage share of debt (total liabilities minus equity) in total liabilities of *nfp*. For definitions of all other explanatory variables, see Table 9. All variables except *rgdp.ppp* enter as non-overlapping five-year averages. *rgdp.ppp* enters as the value of the first period of the respective five-year time spell. *Threshold* is the level of financing to GDP at which the relation between finance and growth turns from positive to negative. *LR test* are the results of an exclusion test of the quadratic financing term. All models include country and time fixed effects. Robust standard errors clustered at the country level in parenthesis. ***, ** and * denote significance at the 1%, 5% and 10% level.)

Instrument/Model	Listed shares	Shares	Debt securities	Loans	Bank loans	Trade credit
Variable	C-1	C-2	C-3	C-4	C-5	C-6
<i>liabilities_nfc</i>	5.088 (10.518)	13.541 (12.807)	10.214 (10.726)	11.174 (11.341)	11.281 (11.947)	8.473 (11.874)
<i>liabilities_nfc</i> ²	-0.658 (0.918)	-1.436 (1.142)	-1.128 (0.928)	-1.287 (1.014)	-1.239 (1.075)	-1.015 (1.068)
<i>liabilities_ph</i>	4.306*** (1.326)	3.390*** (1.003)	4.600*** (1.252)	4.453* (0.986)	4.656*** (1.249)	4.371*** (1.282)
<i>liabilities_ph</i> ²	-0.638** (0.276)	-0.485* (0.282)	-0.712*** (0.220)	-0.621** (0.226)	-0.703** (0.253)	-0.682** (0.280)
<i>ph/nfp</i>	-0.197* (0.110)	-0.211 (0.138)	-0.180** (0.087)	-0.252*** (0.092)	-0.202* (0.103)	-0.195 (0.124)
<i>debt/liabilities</i>	-0.036 (0.043)	-0.048 (0.054)	-0.046 (0.044)	-0.036 (0.039)	-0.040 (0.044)	-0.035 (0.044)
<i>instrument/equity</i>	0.048 (0.029)	0.023 (0.017)				
<i>instrument/debt</i>			0.117 (0.217)	0.040 (0.035)	-0.004 (0.017)	-0.034 (0.058)
<i>rgdp_ppp</i>	-4.229** (1.622)	-3.407** (1.567)	-3.845** (1.615)	-4.160** (1.559)	-3.437** (1.633)	-4.764*** (1.408)
<i>hum</i>	4.808 (10.346)	6.862 (10.501)	5.291 (10.329)	3.878 (9.440)	6.066 (9.489)	4.398 (9.702)
<i>gov</i>	0.531 (1.597)	0.556 (1.736)	-0.075 (1.520)	0.382 (1.477)	0.301 (1.399)	-1.115 (1.405)
<i>open</i>	1.232 (1.052)	1.736 (1.076)	1.080 (1.078)	1.018 (0.906)	1.155 (1.102)	0.913 (0.897)
<i>inf</i>	-5.721*** (1.564)	-7.761*** (1.315)	-6.469*** (1.336)	-6.058*** (1.254)	-6.566*** (1.393)	-7.008*** (1.775)
<i>Threshold</i>	29% ^{ph}	33% ^{ph}	25% ^{ph}	36% ^{ph}	27% ^{ph}	25% ^{ph}
<i>R</i> ² (within)	0.777	0.767	0.764	0.768	0.768	0.773
<i>Observations</i>	118	114	122	122	120	117
<i>Countries</i>	33	32	34	34	34	32

Table 16: Instrumental decomposition: Full table (*Notes:* The dependent variable is the annual change in real GDP per capita. *nfp*, *nfc* and *ph* are the non-financial private sector, non-financial corporations and private households. *liabilities* refers to the log of total liabilities to GDP. *ph/nfp* is the percentage share of total liabilities of *ph* in total liabilities of *nfp*. *debt/liabilities* is the percentage share of debt financing in total liabilities of *nfp*. *instrument/equity* and *instrument/debt* refer to the percentage share of the respective instrument indicated in the column header in equity or debt financing of *nfp*. For definitions of all other explanatory variables, see Table 9. All variables except *rgdp_ppp* enter as non-overlapping five-year averages. *rgdp_ppp* enters as the value of the first period of the respective five-year time spell. *Threshold* is the level of financing to GDP at which the relation between finance and growth turns from positive to negative. All models include country and time fixed effects. Robust standard errors clustered at the country level in parenthesis. ***, ** and * denote significance at the 1%, 5% and 10% level.)