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MORE MORTGAGES, LOWER GROWTH?

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In newly collected data on 46 economies over 1990–2011, we show that financial development since 1990 was mostly due to growth in credit to real estate and other asset markets, which has a negative growth coefficient. We also distinguish between growth effects of stocks and flows of credit. We find positive growth effects for credit flows to nonfinancial business but not for mortgage and other asset market credit flows. By accounting for the composition of credit stocks and for the effect of credit flows, we explain the insignificant or negative growth effects of financial development in recent times. What was true in the 1960s, 1970s, and 1980s when the field of empirical credit-growth studies blossomed, is no longer true in the 1990s and 2000s. New bank lending is not primarily to nonfinancial business and financial development may no longer be good for growth. These trends predate the 2008 crisis. They prompt a rethink of the role of banks in the process of economic growth. (*JEL* E44, O16, O40, C33)

I. INTRODUCTION

A large empirical literature had established the positive effects of the growth in bank credit on output growth, in data from the 1960s until the mid 2000s.[1] Recent research however shows that above a threshold level, a high credit-to-gross domestic product (GDP) ratio may slow down rather than boost growth (Arcand, Berkes, and Panizza 2012; Beck et al. 2012; Cecchetti and Kharroubi 2012; Manganelli and Popov 2013; Rousseau and Wachtel 2011; Shen and Lee 2006; Valickova, Havranek, and Horvath 2013). To illustrate, Figure 1 shows the unconditional growth correlation of bank credit stocks scaled by GDP across 50 economies since the 1970s. The correlation of credit to output growth was not significantly different from zero in the 1990s and 2000s. This motivates our paper.

Different explanations have been proposed. Wachtel (2011) questions the interpretation of credit/GDP ratios as indicating financial deepening, and notes it may also indicate increasing financial fragility. Beck, Degryse, and Kneer (2014) and Beck et al. (2012) identify the growth in nonintermediation activities and in nonenterprise credit, respectively, as causes of the weakening growth effectiveness of the financial

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1. This literature builds on Schumpeter (1934, 1939), Goldsmith (1969), McKinnon (1973), and Shaw (1973). Levine (2005) and Ang (2008) provide overviews. The latest year analyzed in this literature is 2005.

ABBREVIATIONS

CPI: Consumer Price Index
ED: External Dependence
FDS: Financial Development and Structure
FE: Fixed-Effect
GDP: Gross Domestic Product
GMM: Generalized-Method-of-Moment
ICRG: International Country Risk Guide
INDSTAT4: United Nations Industrial Development Organization Industrial Statistics Database
OECD: Organization for Economic Co-operation and Development
TC: Total Credit

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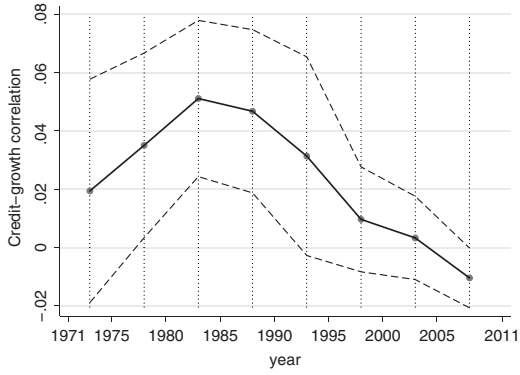
FIGURE 1
The Cross-country Credit-growth Correlation, 1971–2011



Note: This figure plots the coefficient estimate of a univariate regression of the private-credit-to-GDP ratio on the real GDP per capita growth rate for a balanced panel of 50 countries over 1971–2011, using 5-year nonoverlapping averages. The countries included are listed in Table A3 in the Appendix. Credit data are from the Financial Development and Structure Dataset (Beck, Demirgüç-Kunt, and Levine 2010). Data on real GDP per capita growth are from the World Development Indicators. The solid line plots the point estimates and the dashed lines the boundaries of the 95% confidence interval.

sector. Rousseau and Wachtel (2011) suggest that since the 1990s, many countries liberalized their financial markets before the associated legal and regulatory institutions were sufficiently well developed, undermining the positive impact of financial deepening on growth. Arcand, Berkes, and Panizza (2012) develop a model in which the expectation of a bailout may lead to a financial sector which is too large with respect to the social optimum. Cecchetti and Kharroubi (2013) present evidence that skilled labor is drawn away from R&D intensive industries into finance during a credit boom, so that the financial sector may grow at the expense of the real sector. Earlier, Stockhammer (2004) analyzed a causal relation for selected Organization for Economic Co-operation and Development (OECD) economies between expanding asset markets and a slowdown in investment.

In this paper, we analyze newly collected data originally reported in national central bank statistics on four categories of bank credit, for 46 economies over 1990–2011, with country coverage and time period dictated by data availability. As in several other papers (Arcand, Berkes, and Panizza 2012; Beck et al. 2012; Cecchetti and Kharroubi 2012), we observe high growth of credit relative to GDP in this new sample. We also see a rapid increase of the share of household mortgage debt in total debt, again in line with Beck et al. (2012) and also with recent findings reported in Bezemer (2014) and Jordà et al. (2014). In Figure 3 in the next section, we observe in a cross section of countries over 1990–2011 that total domestic bank debt rose from below 80% to over 120% of GDP, with mortgage credit rising from 20% to 50% and credit to nonfinancial business remaining stable around 40% of GDP. Credit booms in the 1990s and 2000s caused credit to asset markets to become a large (in some countries, the largest) part of bank credit. For instance, in the Netherlands, credit to asset markets (mostly, household mortgage credit) accounted for 70% of outstanding loans in 2011, up from less than 50% in 1990.[2]

The reasons for the disproportional growth and then defaults in mortgage lending since the 1990s have been explored in several recent studies. They include policy preferences for increased home ownership and relaxation of mortgage lending rules (Dell'Ariccia et al. 2012; Jordà et al. 2014), credit market deregulation (Favara and Imbs 2015), and financial innovations such as new forms of securitization (Jiménez et al. 2012) as part of the originate-to-distribute model of lending (Purnanandam 2011). Softening of loan standards and securitization were amplified by low policy rates (Maddaloni and Peydro 2011), while house price declines and deteriorating underwriting standards triggered the exceptional rise in defaults from 2007 (Mayer et al. 2009). In this paper, we do not research these and other causes of mortgage credit expansion, but analyze its effect on output growth. We hypothesize that the use of credit matters to its growth effectiveness. The distinction is that credit supporting asset transactions may have weaker or negative growth effects compared to credit supporting transactions in goods and services, as suggested by Werner (1997, 2012). Werner (1997) applied this insight to data on Japan for the 1980s and 1990s. In this paper, we extend this disaggregation to a large panel of countries.

2. In our dataset, there are seven countries for which we have data going back substantially before 1990: Switzerland, Chile, Germany, Hong Kong, Japan, Portugal, and the United States. We plot the development of credit composition in these countries in Figures A1 and A2 in the Appendix. In each of them, the stock of mortgage credit rose faster than the stock of nonfinancial-business credit especially since the 1990s and except for Hong Kong, this decline occurred mostly in the 2000s.

Our paper is closely related to Beck et al. (2012). This paper was the first, to our knowledge, to decompose bank credit into enterprise credit and household credit. They examined the different effects of these two types of credit on real sector outcomes for 45 countries over 1994–2005. They show that enterprise credit is positively associated with growth, whereas household credit is not. The present paper is different in several respects. Compared to Beck et al. (2012) who investigate a number of real sector outcomes, we focus on growth only. While Beck et al. (2012) analyze one aggregate household credit category, we separate mortgage and consumption credit. The distinction appears important: our results are driven by mortgage credit, not consumer credit. Further, we observe each credit category independently as reported in central bank statistics.[3] And while Beck et al. (2012) use a cross-section of data, we build a panel data set for four credit categories over a longer time-period. While this allows for more efficient estimates, our findings broadly confirm those of Beck et al. (2012).

Our paper also relates to Beck, Degryse, and Kneer (2014), where the activities of banks are differentiated according to whether banks intermediate or undertake other, nonintermediation activities. They contrast the credit-to-GPP-ratio (as proxy for intermediation activities) and the value-added share of the financial sector (as proxy for size) and find that intermediation activities are positively associated with growth whereas an increase in size is not. We corroborate their main finding that more finance is not necessarily better. Instead of using the total-credit-to-GDP ratio to measure the financial intermediation, we focus on how the composition of financial intermediation activities matters for growth. To do so, we use disaggregated credit-to-GDP ratios for different credit categories. We now motivate this distinction.

In most of the credit-growth literature to date, "credit" is tacitly interpreted as credit to the nonfinancial sector, supporting production of goods and services (for recent exceptions, see Beck et al. 2012; Beck, Degryse, and Kneer 2014; Bezemer 2014; Jordà et al. 2014). Biggs, Mayer, and Pick (2010) show that with only nonfinancial-sector credit, the dynamics of credit, debt, and capital are identical, so that the growth effect of credit can indeed only be positive. The depth of financial markets can then be viewed simply as a measure of economies' productive absorption capacity (Masten, Coricelli, and Masten 2008) and negative growth coefficients present a puzzle.

In contrast, if credit which finances transactions in assets (rather than in goods and services) is included in the analysis, the growth coefficient need not be positive. Credit growth may now inflate asset markets rather than leading to growth in GDP. This by itself decreases the credit-growth correlation. It also increases growth of the credit-to-GDP ratio, since credit stocks grow without (or with much less) growth in GDP.

Why would financial deepening, measured by credit stocks, have a negative impact on output growth? Credit stock measures capture agents' ability to use finance to reallocate factors of production, which may support growth. This is the traditional, positive "financial development" effect on growth (King and Levine 1993). But credit stocks are also debt stocks, which may depress growth through more financial fragility and larger uncertainty, through larger debt servicing out of income, through a debt overhang effect, or through a negative wealth effect on consumption. Theoretically, the growth effect of credit stocks is therefore ambiguous; with large credit stocks, it may well be negative. What matters is "how large a credit boom [is] relative to the possibilities of productive uses for loans" (Lorenzoni 2008; Boissay et al. 2015). Credit growth in support of other outcomes than production by nonfinancial business (such as investment in existing real estate) will result in smaller growth coefficients than credit growth to nonfinancial business. At high levels of debt, the effect may be negative: a rise in overall debt levels has been widely noted as a growth retarding factor (Barajas, Chami, and Yousefi 2013; Boissay et al. 2015; Jordà, Schularick, and Taylor 2013; Lorenzoni 2008; Radelet and Sachs 1998; Reinhart 2010; Rousseau and Wachtel 2011; Schularick and Taylor 2012; Wachtel 2011).

To the extent that credit for real estate transactions is household mortgage credit, this argument is reinforced by the literature on household credit and growth. Jappelli and Pagano (1994) argue that more household credit leads to lower private savings and so slower economic growth. Beck et al. (2012) show that credit to households (most of which is mortgages, in most economies) has negligible growth effects. Earlier, Xu (2000) had identified business investment, not household spending, as the channel through which financial

3. We provide a more detailed discussion in the Appendix.

development affects growth. Büyükkarabacak and Valev (2010) and Büyükkarabacak and Krause (2009) find that countries with more household credit have higher probabilities of crisis and weaker external balances. Jappelli, Pagano, and di Maggio (2008), Barba and Pivetti (2009), and Sutherland et al. (2012) find positive crisis and recession effects of the expansion of household credit, respectively. Mian and Sufi (2014) show the close relationship between the severity of a recession and the build-up of household debt that preceded it. In the present paper we go beyond this: we find a negative growth coefficient *on average*, not just during recessions.

We find that the growth coefficient of total bank credit stocks, traditionally used to measure financial development, was insignificant or negative in fixed-effect (FE) panel regressions over the sample period—also before the 2008 crisis and also when controlling for the level of credit-to-GDP ratios, for institutions, and for financial crises. In generalized-method-of-moment (GMM) estimations, this appears to be due primarily to the negative growth coefficient for credit to asset markets, predominantly household mortgages. These findings hold up in regressions with Rajan and Zingales's (1998) methodology, and in a battery of robustness checks. The negative growth coefficient of mortgage credit—and of bank credit to asset markets generally—helps clarify why financial development was not good for growth in our 1990–2011 sample.

While this is our main contribution, we augment the analysis with the distinction between stocks and flows of credit (Biggs, Mayer, and Pick 2010). The rationale for this distinction is that credit flows are a stimulus to growth due to more spending, different from the traditional reallocation effect of more financial development. Credit flows increase agents' ability to finance expenditures. This is a direct short-term "liquidity effect" on output, since "[l]oans cause deposits and those deposits cause an expansion of transactions" (Borio and Lowe 2004, 555; Caporale and Howells 2001). This "expansion of transactions" will be GDP growth insofar as transactions of goods and services (not of assets) are involved. Without this distinction, we might overestimate financial development effects, which are credit stock effects.

This stock-flow distinction is new to the empirical credit-growth literature, but there is a clear parallel in the fiscal macro literature. Flows of government deficit spending may boost growth in the short term, but by simultaneously raising stocks of public debt they may decrease longer-term growth. The (positive) impact of deficits differs from the (negative) impact of debt. What goes for public debt, goes for private debt. We therefore analyze credit stocks and credit flows separately. We find more negative growth effects of financial development (measured by credit stocks scaled by GDP) when controlling for the positive effect of credit flows.[4] Note that our main argument does not depend on the stock-flow distinction.

Our paper provides evidence for the argument made in Bezemer (2014) that the empirical credit-growth literature inspired by Schumpeter (starting with King and Levine 1993) needs to take differentiation of credit into account. A "[d]istinction between debts according to purpose, however difficult to carry out," as Schumpeter (1939, 148) wrote, may help understand changes in the growth-effectiveness of credit. In the next section we present the new data. Sections III and IV present the methodology and empirical findings. Section V concludes the paper with a summary, discussion, and conclusion.

II. DATA

We collected data from the consolidated balance sheets of monetary financial institutions in central bank sources, for 46 countries over 1990–2011. On the asset side of the balance sheet, loans to nonbanks are reported separately as mortgages to households, household consumption credit, credit to nonfinancial business, and credit to financial business (insurance, pension funds, and other nonbank financial firms).[5] To the best of our knowledge, no data with similar detail has been collected and reported before.[6] In the Appendix we report sources and compare our data to other data sets. In this section we introduce definitions for the key variables in the analysis:

4. We follow the traditional measure for credit stocks, which is the summation of current and past credit flows (Equation (1) below). Therefore the growth coefficient for credit stocks includes the growth effect of current credit flows. In the analysis we will account for this effect by including credit flows as a separate variable.

5. A fifth category is bank lending to government, which is however often not reported and in any case mostly small.

6. Related data sets are in Beck et al. (2012) (which ends in 2005 and does not have 15 countries included in our data) and BIS (2013) which includes both bonds and bank credit and does not differentiate bank credit. We refer to the Appendix for a comparative discussion.

stocks and flows of credit categories. We discuss their development over time and across countries.

A. *Definitions and Trends*

We define credit stocks as the credit-to-GDP ratio:

$$s_{i,t} = C_{i,t}/\mathrm{GDP}_{i,t}, \tag{1}$$

where i denotes country, t denotes time, and C is a credit measure. We measure credit flows by the annual change of credit stocks relative to lagged GDP, as follows (Biggs, Mayer, and Pick 2010):

$$f_{i,t} = \left(C_{i,t} - C_{i,t-1}\right)/\mathrm{GDP}_{i,t-1}. \tag{2}$$

We aggregate the four types of credit into two broader categories: "nonfinancial" credit (credit to nonfinancial business plus household consumption loans) and "asset market" credit (mortgages plus credit to financial business). The latter follows the "finance, insurance and real estate" sectors classification of the U.S. National Income and Product Accounts.[7]

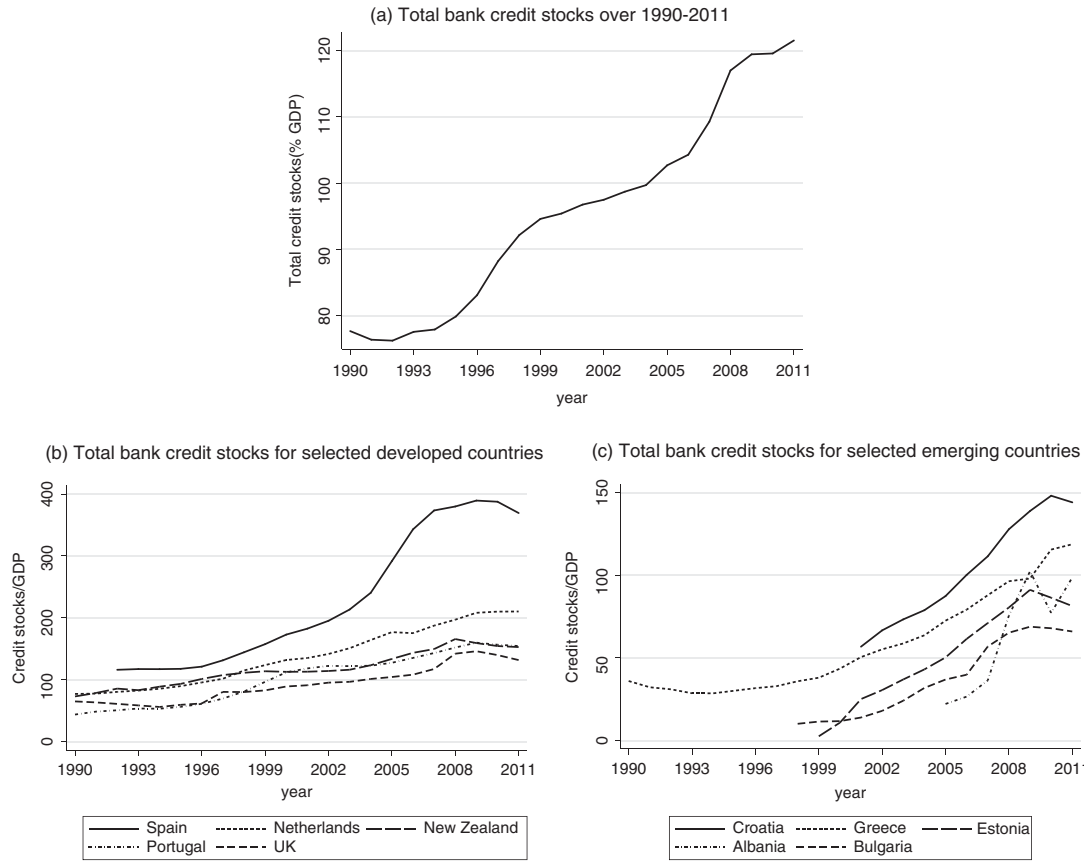
Three features stand out in the 1990–2011 data: the expansion of credit relative to GDP over time (Figure 2), the changing composition of credit stocks (Figure 3), and the correlation of stocks and flows of credit categories with economic growth (Figure 4). Figure (2A) shows that for a balanced panel of 14 countries in our data—selected on data availability—on average the total-credit-to-GDP ratio increased from 75% to 120% over 1990–2011. Although the finance-growth relation differs between developed and emerging economies (Rioja and Valev 2004), we observe that the increase is pronounced in both country groupings. Figure 2B shows the trends for five selected developed economies. In Spain, the credit-to-GDP ratio rose over 1992–2011 from 118% in 1992 to 389% at the time of the 2008 financial crisis. The increases are also pronounced in the Netherlands, from 77% to 210%; in Greece, from 33% to 115%; and in the United Kingdom, from 39% to 90% over the 1990–2011 period. Figure 2C for emerging economies shows that here much of the increase in the credit-to-GDP ratio occurred in the 2000s. In Croatia for instance, the credit-to-GDP ratio increased from 55% in 2001 to 150% in 2011. Declines were rare and often associated with episodes of financial crisis. The average of country credit ratios peaked and then declined slightly after the 2008 financial crisis.

A second trend is the changing composition of credit. Table A1 in the Appendix shows that on average, lending to nonfinancial business and household mortgage lending are the two principal credit categories. Figure 3A shows that most of the growth in the credit-GDP ratio is due to growth of credit to asset markets, especially mortgage credit (bank credit to nonbank financials is small in these data). The ratio of nonfinancial credit to GDP is roughly stable over time around 40%. We study the shifting credit composition in more detail. Figure 3B first illustrates that the share of nonfinancial credit in total credit varies considerably across countries. It appears to be negatively correlated to income levels. Figure 3C shows the shift in credit composition over time. The vertical distance to the diagonal measures a country's shift in the share of nonfinancial credit in total credit between its first and last observation. The share was nondeclining in 10 countries, positive in one and falling in all others.

A third observation is on the credit-growth relation, for stocks and flows of credit. Table 1 presents the growth correlations of stocks and flows of the two credit aggregates and the four categories of credit. There appears to be a robustly negative cross-section relation over 1990–2011 of credit stocks relative to GDP with real per capita GDP growth, though with significant scatter and possible nonlinearity around the trend line (Figure 4A). There also appears to be a positive correlation over time of per capita output growth with total-credit flows (Figure 4B). Panel A in Table 1 shows that the negative correlation of credit stocks with growth is mainly driven by mortgages and (to a lesser extent) financial-sector credit. The correlation of growth with credit to all asset markets is less negative and less significant. Panel B further

7. Three notes are in order. First, the present paper differs from other studies which distinguish between credit into "enterprise" and "household" credit (Beck et al. 2012; Büyükkarabacak and Krause 2009; Büyükkarabacak and Valev 2010). In practice the difference is not a large one on average as credit stocks to financial business and household consumption credit are both relatively small. Second, we aggregated into two categories for reasons of parsimony in presentation; alternative aggregations are possible but do not qualitatively affect our results. For robustness purposes, we also analyze growth effects of all four types of credit below. We will find that the decisive distinction is between household mortgages and nonfinancial business credit. Third, while this delineation is useful, its measurement is necessarily imprecise. For instance, mortgage credit often also serves as consumer credit through home equity withdrawals, while business credit includes business mortgage credit. Conversely, nonfinancial businesses realize part of their returns in trading financial assets (see, e.g., Krippner 2005 on the United States).

FIGURE 2
Developments of Bank Credit Stocks



Note: Panel (A) plots the unweighted average based on authors' own calculations for a balanced panel of 14 countries, namely Canada, Switzerland, Chile, Germany, UK, Greece, Hong Kong, Hungary, Japan, Netherlands, New Zealand, Portugal, Singapore, and United States.

shows that flows of nonfinancial credit have the highest correlation with growth, closely followed by its two components, nonfinancial business credit and household consumption loans. Growth correlations of credit flows to financial business and household mortgage credit flows are much smaller. We also note the large correlations of total credit stocks with mortgage credit stocks.

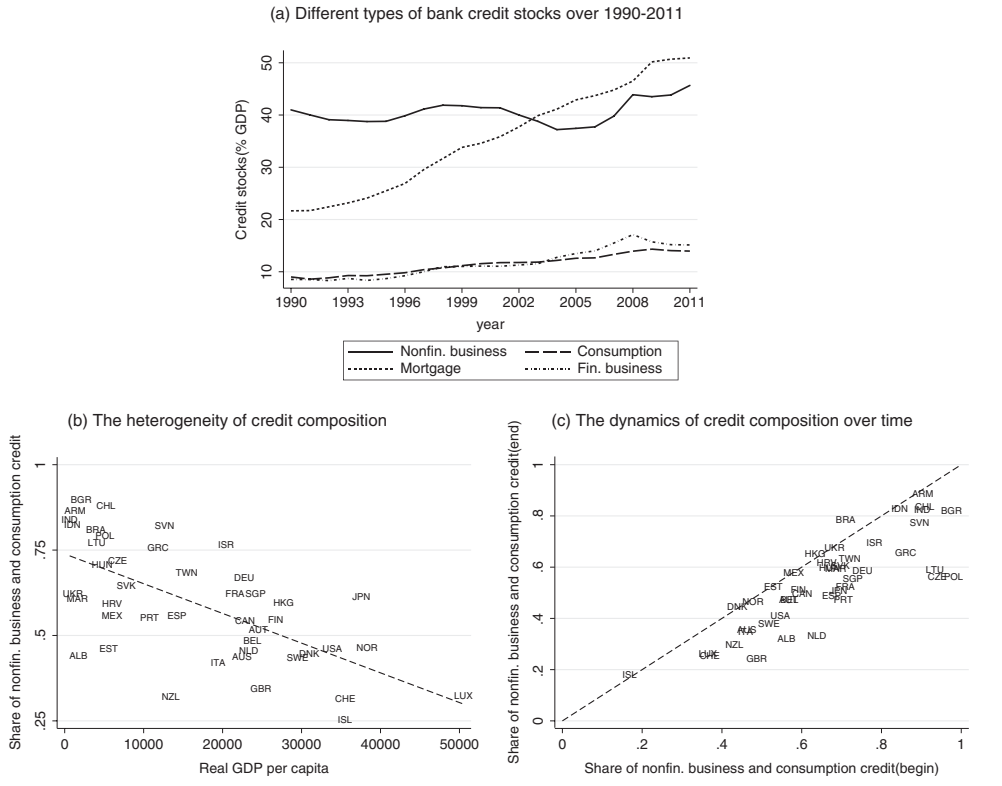
III. EMPIRICAL STRATEGY

We regress real GDP per capita growth on annual stocks and flows of total credit and of the two credit aggregates, controlling for other determinants of growth. Given the short time span of our sample, we use 3-year averages of the underlying annual data to iron out business cycle fluctuations.[8] We start with a baseline FE panel data baseline model over 1990–2011 for 46 countries. Then we estimate system-GMM and difference-in-difference models to account for endogeneity. The baseline specification is:

$$(3)\quad g_{i,t} = \alpha + \beta_1 s_{i,t} + \beta_2 f_{i,t} + \gamma X_{i,t} + \varphi_i + \phi_t + \varepsilon_{i,t},$$

8. We also computed results with the more common 5-year intervals, which are available on request. We estimated FE and system GMM models and for the latter we use two lags of the endogenous variables as internal instruments. The loss of observations compared to using 3-year periods is large, e.g. from 237 to 143 observations in the first specification (column (1) in Table 3). Still, we are able to replicate the qualitative findings. In some cases the results have stronger significance, in other cases they weaken; but the signs of coefficients are never the opposite of what we report here.

FIGURE 3
Developments in Credit Composition



Note: Panel (A) plots the unweighted averages based on authors' own calculations for a balanced panel of 14 countries. Panels (B) and (C) are based on an unbalanced panel of 44 countries, excluding Egypt, and Uruguay in which the share of nonfinancial business and consumption credit was equal to one throughout.

where $g_{i,t}$ is the growth rate of real GDP per capita (2000 constant US dollar) of country i in 3-year period t; Coefficients β_1 and β_2 capture the relations of credit stocks ($s_{i,t}$), and credit flows ($f_{i,t}$) with growth, respectively, where we will estimate a total-credit measure, "nonfinancial" credit and "asset market" credit separately. X_{it} is a vector of control variables, including the level of real GDP per capita at the beginning of t, trade openness (imports plus exports as a percentage of GDP), government expenditure as a share of GDP, inflation, education (average years of schooling of the adult population), and a composite country risk indicator as a proxy for institutional quality, ranging from 50 (low institutional quality) to 100 (high institutional quality). We include unobserved country-specific time-invariant effects in φ_i, time dummies ϕ_t and a white-noise error term with mean zero $\varepsilon_{i,t}$. In robustness checks we will also include an interaction term of credit flows with credit stocks and a systematic banking crises indicator (Laeven and Valencia 2013).[9] Table 2 summarizes definitions, sources, and descriptive statistics.

Since financial development may be endogenous to growth, we also estimate a GMM dynamic panel model.[10] We difference (3) to obtain:

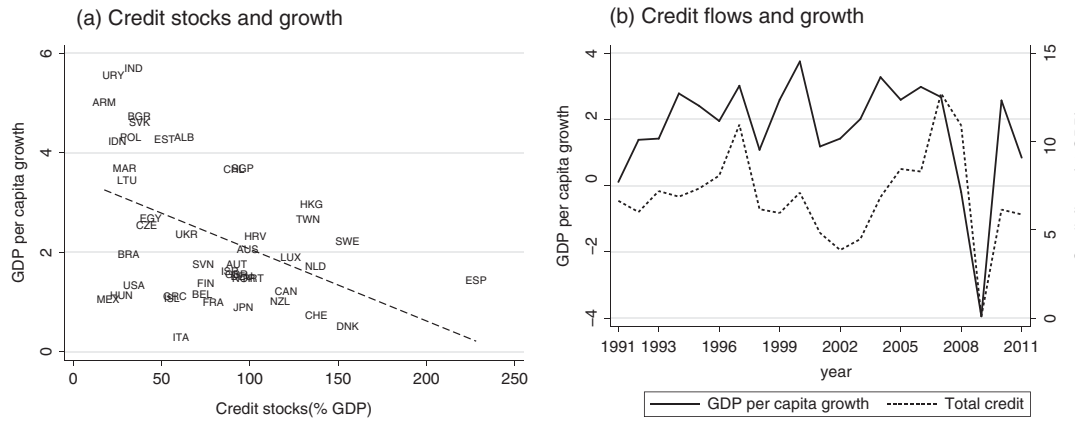
(4)
$$\Delta g_{i,t} = \beta_1 \Delta s_{i,t} + \beta_2 \Delta f_{i,t} + \gamma \Delta X_{i,t} + \Delta \phi_t + \Delta \varepsilon_{i,t},$$

and then estimate Equations (3) and (4) using system-GMM estimation. The endogenous credit variables are now instrumented by their lags in

9. All country-level variables are taken from the World Bank Development Indicators, except education (which is retrieved from the Barro and Lee 2013 database) and institutional quality, extracted from the International Country Risk Guide (ICRG) database.

10. See Arellano and Bover (1995) and Blundell and Bond (1998). The GMM specification combines regressions in levels and in differences, yielding unbiased estimators for the coefficients of interest.

FIGURE 4
Credit Stocks, Credit Flows, and Economic Growth Over 1990–2011



Note: Panel (A) is based on authors' own calculations for the whole sample of 46 countries, whereas panel (B) is based on a balanced panel of 14 countries indicated above.

TABLE 1
Credit Stocks, Credit Flows, and Growth: Correlations

	GDP p.c. Growth	Total Credit	Nonfinancial Sector	Financial Sector	Nonfinancial Credit	Consumer Credit	Mortgage Credit	Financial Business Credit
Panel A: Stocks								
GDP p.c. growth	1							
Total credit	−0.324***	1						
Nonfinancial credit (a+b)	−0.282***	0.827***	1					
Asset market credit (c+d)	−0.287***	0.917***	0.535***	1				
a. Nonfinancial business	−0.275***	0.786***	0.965***	0.497***	1			
b. Consumption	−0.190*	0.622***	0.710***	0.432***	0.502***	1		
c. Mortgage	−0.312***	0.903***	0.606***	0.928***	0.543***	0.542***	1	
d. Financial business	−0.147	0.626***	0.231**	0.777***	0.248**	0.097	0.488***	1
Panel B: Flows								
GDP p.c. growth	1							
Total credit	0.27***	1						
Nonfinancial credit (a+b)	0.313***	0.802***	1					
Asset market credit (c+d)	0.147	0.856***	0.377***	1				
a. Nonfinancial business	0.273***	0.782***	0.952***	0.373***	1			
b. Consumption	0.282	0.440***	0.568***	0.19*	0.35***	1		
c. Mortgage	0.104	0.748***	0.384***	0.826***	0.356***	0.274***	1	
d. Financial business	0.131	0.605***	0.203*	0.761***	0.228**	0.01	0.263***	1

Note: This table reports pairwise correlation coefficients between growth and different types of credit stocks and flows, ***$p < 0.01$, **$p < 0.05$, *$p < 0.1$.

Equation (4). We use lagged differences as instruments for the levels Equation (3) and lagged variables in levels as instruments for the differenced Equation (4).[11] The consistency of the GMM estimator depends on the validity of instruments and on the validity of the assumption that the error term, $\varepsilon_{i,t}$, does not exhibit serial correlation. We apply the Hansen test for over-identifying restrictions, testing for the overall validity of the instruments, along with a test for second order serial correlation of the residuals.

Third, we will also use the Rajan and Zingales (1998) industry-level methodology to account

11. In all specifications, two or three lags are used as instruments. In all cases, the number of instruments is smaller than the number of countries.

TABLE 2
Descriptive Statistics (3-year averaged data)

Variable	Source	Unit	Obs	Mean	Std	Min	Max
Credit stocks							
Total credit	Own Calculation	% of GDP	237	82.174	50.941	9.82	381.584
Credit aggregates							
Nonfinancial credit	Own Calculation	% of GDP	237	45.135	25.504	5.944	187.026
Asset market credit	Own Calculation	% of GDP	228	38.501	32.206	0.245	194.559
Credit categories							
Nonfinancial business	Own Calculation	% of GDP	237	35.594	18.226	5.565	92.696
Consumption	Own Calculation	% of GDP	206	10.976	12.458	0.221	94.33
Mortgage	Own Calculation	% of GDP	228	30.273	27.386	0.245	194.559
Financial business	Own Calculation	% of GDP	191	9.822	12.302	0.058	76.323
Credit flows							
Total credit	Own Calculation	% of lagged GDP	228	7.406	7.517	−4.335	70.305
Credit aggregates							
Nonfinancial credit	Own Calculation	% of lagged GDP	228	3.74	4.239	−4.612	32.055
Asset market credit	Own Calculation	% of lagged GDP	219	3.816	4.44	−2.931	38.249
Credit categories							
Nonfinancial business	Own Calculation	% of lagged GDP	228	2.801	3.217	−4.771	16.767
Consumption	Own Calculation	% of lagged GDP	199	1.075	1.779	−1.803	15.288
Mortgage	Own Calculation	% of lagged GDP	219	2.976	3.617	−2.825	38.249
Financial business	Own Calculation	% of lagged GDP	183	1.006	2.327	−2.621	21.978
Other variables							
GDP per capita growth	WDI	Percentage points	237	2.306	2.475	−7.602	12.629
Initial GDP per capita	WDI	In log	237	9.323	1.095	6.142	10.913
Trade openness	WDI	% of GDP	237	94.554	76.798	15.546	424.013
Government size	WDI	% of GDP	237	17.81	4.805	7.197	28.413
Inflation	WDI	Percentage points	237	4.431	6.679	−3.123	66.008
Education	Barro and Lee (2013)	Years	237	9.553	2.202	3.472	13.262
Institution	ICRG	Index	237	78.433	6.992	60.867	92.067
Crisis	Laeven and Valencia (2013)	Dummy variable	237	0.11	0.313	0	1

Note: "Total credit" was computed only for country-year observations where there was at least one nonzero observation for nonfinancial credit and one observation for asset market credit.

for the endogeneity of credit to growth.[12] In contrast to past studies based on cross sectional data (including Rajan and Zingales 1998), we use panel data. Our approach has two distinctive features compared to similar analyses. First, we are able to control for a wider range of industry-time and industry-country fixed effects. This alleviates omitted variables bias. Second, by including the credit variable itself, in addition to its interaction with financial dependence, our specification allows for an assessment of the direct effect of credit on industry-level growth. Our specification is:

$$\begin{aligned}(5)\quad \text{growth}_{j,i,t} &= \theta_0 \text{share}_{j,i,t_0} + \theta_1 s_{i,t} + \theta_2 s_{i,t} \\ &\times ED_j + \theta_3 f_{i,t} + \theta_4 f_{i,t} \times ED_j + +\mu_j \\ &+ \varphi_i + \phi_t + \delta_{j,t} + \eta_{j,i} + \gamma X_{i,t} s + \varepsilon_{j,i,t},\end{aligned}$$

where j denotes industry, i denotes country, and t denotes time (i.e., a 3-year period). This specification is closely related to Braun and Larrain (2005); *growth* is measured as the annual percentage change of industry real value added.[13]

12. Rajan and Zingales (1998) utilize an industry-specific index of external financial dependence, defined as capital expenditures minus cash flow from operations divided by capital expenditures. They rank industries by the median (U.S. Compustat) firm's external dependence on finance and observe that industries that are more dependent on external finance grow faster in countries with more developed financial systems, measured as the credit-to-GDP ratio. By exploiting cross-industry variations while controlling for a range of country-specific and industry-specific factors, this widely used methodology alleviates endogeneity concerns. Other studies support this approach. Using European micro-level data for 1996-2005, Bena and Ondko (2012) show that firms in industries with growth opportunities use more external finance in more financially developed countries. This result is particularly significant for firms that are more likely to be financially constrained and dependent on domestic financial markets, such as small and young firms. Kroszner, Laeven, and Klingebiel (2007) use a similar approach to show that sectors highly dependent on external finance experience a greater contraction during a banking crisis in countries with deeper financial systems. Raddatz (2006) shows that sectors with larger liquidity needs are more volatile and experience deeper crises in financially underdeveloped countries.

13. As the industry-specific deflators are not available across a large number of countries, we choose to deflate industry nominal value added by the country-specific consumer price index (CPI), as in Braun and Larrain (2005). Albeit imperfect, this provides a good approximation for a wide range of countries in our sample.

Share is defined as the size of each industry as a percentage of manufacturing value added at the beginning of each 3-year period. Similar to our country-level specifications above, s and f denote the stocks and flows of credit categories. *ED* is the external financial dependence indicator, taken from Rajan and Zingales (1998). We include a series of dummy variables to control for industry (μ_j), country (φ_i), time (ϕ_t), industry-time ($\delta_{j,t}$), and industry-country ($\eta_{j,i}$) fixed effects. We include the same vector of control variables $X_{i,t}$ as in Equations (9) and (10), which vary at the country-time dimension. Finally, $\varepsilon_{j,i,t}$ is an error term.

Our industry-level analysis covers an unbalanced panel of 36 ISIC three- and four-digit manufacturing industries for 41 countries during 1990–2011 from the United Nations Industrial Development Organization Industrial Statistics Database (INDSTAT4). We ensure that the number of industries available through time is constant across each individual country, while the number of industries across countries may vary. Table A4 in the Appendix lists the 41 countries and the availability of industry coverage. Table A5 lists 36 industries, ISIC code, and the value of external financial dependence per industry.

It is worth noting that our industry-level methodology presupposes that the dependence on external finance is sufficiently constant over time that the industry ranking does not change. In defense of this assumption, Rajan and Zingales (1998) argue (but do not test) that external dependence on finance reflects technological factors of an industry, such as project scale, gestation and cash harvest period, and the need for continual investment. These industry-inherent characteristics are likely to be persistent over time. In support, Kroszner, Laeven, and Klingebiel (2007) report a correlation of 0.82 between the external dependence index for the period 1980–1999 measure and the original Rajan–Zingales measure for 1980–1989. Haltenhof et al. (2014) also find remarkable stability of the external dependence measures over the 1980s, 1980–1997, and 1990–2011. The latter period supports the use of 1980s values in our 1990–2011 sample.

A more problematic assumption may be that the U.S.-based measure of external dependence is a valid proxy for the same industries across countries. Furstenberg and Kalckreuth (2006) show that even in the United States, the measure for financing conditions in manufacturing industries changes when using an alternative source of industry data. Furthermore, they find that the presumed correlations between external dependence and a number of structural/technological industry characteristics, are in fact weak. Nevertheless, Kroszner, Laeven, and Klingebiel (2007) provide some empirical validation of this assumption. They find that their results are robust when using other countries (Canada and noncrisis countries) as the benchmark, instead of the United States. In view of these caveats, we present the Rajan–Zingales results as additional rather than conclusive evidence.

IV. ESTIMATION RESULTS

In this section we present estimation results for stocks and flows of a total-credit measure and of credit aggregates. We then proceed with a variety of robustness checks and a discussion of our findings.

A. Credit Stocks, Credit Flows, and Their Growth Effects

Table 3 presents the results of the FE panel baseline model (columns 1–3) and the system-GMM model (columns 4–6). Results for credit stocks are in columns (1) and (4), results for credit flows in columns (2) and (5). Credit stocks, the common measure for financial development, have no significant positive correlation to growth, in line with other studies (Rousseau and Wachtel 2011; Stengos et al. 2007; Valickova, Havranek, and Horvath 2013). We go beyond this observation in columns (3) and (6), where both stocks and flows are included. We observe negative (but weakly significant) growth effects of credit/GDP stocks. That is, controlling for the positive effect of credit flows, financial development appears bad for growth. Credit-growth studies which do not control for the positive effect of credit flows will tend to overestimate the stock effect, which represents financial development. But even without controlling for flows (i.e., adopting the common methodology in the credit-growth literature), the growth effect of financial deepening was insignificantly different from zero over 1990–2011.

We proceed to distinguish "nonfinancial" from "asset market" credit. Table 4 reports baseline model results in columns (1)–(6) and the corresponding system GMM results in columns (7)–(12), with identical coefficient signs as in the baseline panel results. In all specifications, the validity of the instruments and the absence of second-order autocorrelation is not rejected.

TABLE 3
Credit and Economic Growth: Stock and Flow Effects

	FE			System GMM		
	(1)	(2)	(3)	(4)	(5)	(6)
Total credit						
Credit stocks	−0.008		−0.013*	−0.02		−0.016**
	(0.005)		(0.007)	(0.014)		(0.007)
Credit flows		0.055	0.067		0.085	0.071
		(0.040)	(0.043)		(0.057)	(0.054)
Initial GDPPC	−5.632*	−7.132**	−6.210**	−2.618**	−3.071***	−2.271***
	(2.954)	(2.750)	(2.974)	(1.122)	(1.055)	(0.808)
Trade	0.012	0.014*	0.011	0.007**	0.006*	0.006**
	(0.009)	(0.008)	(0.008)	(0.003)	(0.003)	(0.003)
Government	−0.374**	−0.361**	−0.295	0.008	0.012	−0.004
	(0.163)	(0.171)	(0.182)	(0.050)	(0.060)	(0.046)
Inflation	−0.102	−0.112	−0.105	−0.112	−0.114	−0.113
	(0.097)	(0.099)	(0.098)	(0.094)	(0.088)	(0.087)
Education	0.54	0.42	0.455	0.249	0.293*	0.199
	(0.515)	(0.477)	(0.485)	(0.178)	(0.167)	(0.131)
Institutions	0.182***	0.189***	0.167***	0.259**	0.225**	0.200***
	(0.064)	(0.059)	(0.059)	(0.108)	(0.104)	(0.073)
Time FE	Yes	Yes	Yes	Yes	Yes	Yes
Observations	237	228	228	237	228	228
Number of id	46	46	46	46	46	46
R^2	0.484	0.505	0.517			
AR(2)				0.485	0.651	0.617
Overidentification				0.403	0.383	0.346

Notes: This table presents the results using total credit based on Equations (3) and (4). Columns (1)–(3) present the FE results, columns (4)–(6) show the system-GMM results. The dependent variable is the average growth rate of real GDP per capita (constant 2005 US dollar) over each 3-year period. Credit stocks and flows are defined as in Equations (1) and (2). Initial GDPPC is real GDP per capita at the beginning of each 3-year period. Trade is imports plus exports, divided by GDP. Government is government consumption divided by GDP. Inflation is the change in CPI. Education is average years of schooling. Institutions is the ICRG composite country risk measure. AR(2) is the Arellano-Bond serial correlation test (we report the p value). Overidentification is the Hansen J statistic (we report the p value). All specifications include time dummies (coefficients not reported). Coefficients for the constant are not reported. Robust standard errors are in parentheses.

***$p < 0.01$, **$p < 0.05$, *$p < 0.1$.

We find that stocks of both credit aggregates correlate negatively to growth. It is striking that the coefficient for nonfinancial credit stocks is significantly negative in the FE specifications but no longer significant in the system-GMM models. Conversely, the coefficient for asset market credit is negative and significant in the system-GMM specification only. While it is hazardous to attach firm conclusions to the change in statistical significance, this pattern would be consistent with a negative effect of asset market credit after controlling for endogeneity, but not for credit to nonfinancial business after controlling for endogeneity. This begs the question what endogeneity problems would be consistent with this pattern?[14] An important endogeneity highlighted in the credit-growth literature is reverse causality from growth to credit. We tentatively suggest the following interpretation. Stocks of asset market credit such as mortgages accumulate in response to income growth (a positive correlation due to reverse causation). But they are also a burden to growth due to a combination of repayment, consumption and debt overhang effects (a negative correlation). This combination of positive and negative effects may produce the insignificant estimates in the FE specification, but correcting for the reverse causality underlying the positive effect, we obtain significantly negative GMM coefficients. Further, it is plausible that nonfinancial business borrowing responds less strongly to GDP growth than does asset market investment, and that nonfinancial business investments supported by bank credit produce growth effects which are larger and more persistent than the asset price increases that credit to asset markets causes. If we accept these two assumptions, then the positive reverse causality effect is weaker for credit to nonfinancial business (leading to on

14. We thank an anonymous referee for asking the question.

TABLE 4
Credit Aggregates and Economic Growth

	FE						System GMM					
	(1)	(2)	(3)	(4)	(5)	(6)	(7)	(8)	(9)	(10)	(11)	(12)
	Nonfinancial Credit			Asset Market Credit			Nonfinancial Credit			Asset Market Credit		
Credit stocks	−0.030**		−0.039**	0.002		−0.005	−0.026		−0.013	−0.032*		−0.057**
	(0.014)		(0.016)	(0.008)		(0.009)	(0.043)		(0.014)	(0.016)		(0.027)
Credit flows		0.104	0.129*		0.073	0.079		0.208**	0.189*		0.018	0.052
		(0.064)	(0.065)		(0.053)	(0.055)		(0.092)	(0.103)		(0.059)	(0.097)
Initial GDPPC	−4.469	−7.044**	−4.765	−6.778**	−7.507**	−7.429**	−2.803*	−2.360**	−2.685***	−1.582**	−2.869***	−1.587*
	(3.114)	(2.767)	(3.220)	(2.896)	(2.835)	(2.908)	(1.472)	(0.948)	(0.790)	(0.613)	(0.879)	(0.812)
Trade	0.009	0.013*	0.008	0.017*	0.018**	0.017**	0.007**	0.005**	0.006**	0.006***	0.007**	0.006*
	(0.009)	(0.008)	(0.008)	(0.009)	(0.008)	(0.009)	(0.003)	(0.002)	(0.003)	(0.002)	(0.003)	(0.003)
Government	−0.363**	−0.362**	−0.285	−0.419**	−0.388**	−0.373*	−0.003	0.008	0.015	−0.01	0.006	0.002
	(0.161)	(0.170)	(0.177)	(0.170)	(0.173)	(0.186)	(0.069)	(0.050)	(0.051)	(0.041)	(0.052)	(0.056)
Inflation	−0.102	−0.113	−0.109	−0.118	−0.118	−0.116	−0.116	−0.114	−0.125	−0.093	−0.111	−0.091
	(0.095)	(0.100)	(0.097)	(0.102)	(0.102)	(0.103)	(0.093)	(0.083)	(0.089)	(0.081)	(0.091)	(0.087)
Education	0.665	0.429	0.614	0.281	0.21	0.209	0.27	0.246*	0.268*	0.119	0.231	0.107
	(0.554)	(0.476)	(0.513)	(0.427)	(0.425)	(0.430)	(0.221)	(0.143)	(0.140)	(0.099)	(0.146)	(0.129)
Institution	0.177***	0.183***	0.158**	0.187***	0.188***	0.183***	0.231*	0.170*	0.212***	0.161**	0.201**	0.226***
	(0.064)	(0.059)	(0.059)	(0.067)	(0.064)	(0.063)	(0.122)	(0.089)	(0.074)	(0.078)	(0.081)	(0.072)
Time FE	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes
Observations	237	228	228	228	219	219	237	228	228	228	219	213
Number of id	46	46	46	44	44	44	46	46	46	44	44	43
R^2	0.495	0.506	0.53	0.497	0.517	0.517						
AR(2)							0.415	0.807	0.748	0.569	0.707	0.804
Overidentification							0.408	0.331	0.598	0.627	0.386	0.607

Notes: This table presents the results using nonfinancial credit and asset market credit based on Equations (3) and (4), respectively. Columns (1)–(3) present the FE results, columns (4)–(6) show the system-GMM results. The dependent variable is the average growth rate of real GDP per capita (constant 2005 US dollar) over each 3-year period. Credit stocks and flows are defined as in Equations (1) and (2). Initial GDPPC is real GDP per capita at the beginning of each 3-year period. Trade is imports plus exports, divided by GDP. Government is government consumption divided by GDP. Inflation is the change in CPI. Education is average years of schooling. Institutions is the ICRG composite country risk measure. AR(2) is the Arellano-Bond serial correlation test (we report the *p* value). Overidentification is the Hansen J statistic (we report the *p* value). All specifications include time dummies (coefficients not reported). Coefficients for the constant are not reported. Robust standard errors are in parentheses.

***$p < 0.01$, **$p < 0.05$, *$p < 0.1$.

balance negative FE estimates) while the positive "true" credit-growth effect is stronger (leading to on balance insignificant GMM effects). We emphasize that this interpretation is tentative and subject to further research.

In column (12), a one standard deviation increase in the stock of asset-market credit corresponds to 0.74 standard deviation decrease in the growth rate, which is equal to a 1.83 percentage points decrease in growth in this sample.[15] Considering that the average growth rate in our sample is 2.3 percentage points, the effect is large. The result in column (9) implies that a one standard deviation increase in nonfinancial credit flows is associated with a 0.32 standard deviation increase in growth, which is equal to an additional 0.79 percentage point increase in growth in this sample.[16] Overall, the results suggest that controlling for endogeneity, the growth effect of financial deepening of asset markets, as measured by credit stocks, was negative.

B. Industry-level Evidence

Estimation results applying the Rajan and Zingales (1998) methodology are shown in Table 5. The "external dependence on finance" variable is defined as the annual excess of investment over profit, that is, the annual flow of bank credit and other borrowing to finance investment. Thus, it captures ability to access external finance. Columns (1)–(3) show the results for total credit, columns (4)–(6) and columns (7)–(9) report results for nonfinancial credit and credit to asset markets, respectively. The results are in line with the panel data estimations. We find that the coefficient for credit stocks is again consistently negative, with more significant coefficients for credit to asset markets. The positive coefficients for the interaction of credit stocks and financial dependence suggest that firms in industries which are better able to access external finance, experience smaller growth-retarding effects from debt stocks. In line with this, the coefficient for nonfinancial credit flows is positive. Coefficients

15. The calculation is: (−0.057*32.2)/2.475 = 0.74, where 32.2 and 2.475 are one standard deviation of asset-market credit stocks and one standard deviation of the output growth rate, respectively.

16. The calculation is 0.189*4.24/2.475 = 0.32, where 4.24 and 2.475 are one standard deviation of nonfinancial credit flows and output growth rate, respectively.

TABLE 5
Credit and Economic Growth: Industry-Level Results

	(1)	(2)	(3)	(4)	(5)	(6)	(7)	(8)	(9)
	Total credit			Nonfinancial credit			Asset market credit		
Credit stocks	−0.030**		−0.044***	−0.034		−0.064**	−0.069***		−0.084***
	(0.013)		(0.014)	(0.027)		(0.028)	(0.021)		(0.024)
ED*credit stocks	0.053***		0.054***	0.089**		0.099**	0.095***		0.094**
	(0.019)		(0.021)	(0.040)		(0.042)	(0.036)		(0.040)
Credit flows		0.134**	0.175***		0.387***	0.429***		0.067	0.154*
		(0.053)	(0.056)		(0.121)	(0.124)		(0.077)	(0.089)
ED*credit flows		0.016	−0.021		−0.007	−0.062		0.056	−0.022
		(0.090)	(0.095)		(0.186)	(0.192)		(0.154)	(0.164)
Initial share	0.473*	0.543**	0.539**	0.474*	0.537**	0.534**	0.234	0.303	0.3
	(0.260)	(0.261)	(0.261)	(0.259)	(0.260)	(0.260)	(0.226)	(0.226)	(0.228)
Observations	5,415	5,182	5,182	5,415	5,182	5,182	5,306	5,073	5,073
Number of countries	41	41	41	41	41	41	41	41	41
R^2	0.447	0.457	0.459	0.446	0.459	0.46	0.417	0.425	0.427
Marginal effects of credit stocks									
for high dependence industry	−0.006		−0.019	0.007		−0.018	−0.025		−0.041
for low dependence industry	−0.026		−0.039	−0.027		−0.056	−0.061		−0.076
Implied differential effect	0.02		0.02	0.02		0.038	0.036		0.035

Notes: This table presents the industry-level evidence based on Equation (5). Columns (1)–(3) presents the results for total credit, columns (4)–(6) for "nonfinancial credit" (the sum of nonfinancial business and consumption credit) and columns (7)–(9) for "asset market credit" (the sum of financial business and mortgage credit). The dependent variable is the average growth rate of real value added over each 3-year period. Credit stocks and flows are defined as in Equations (1) and (2). *ED* is external dependence on finance, taken from Rajan and Zingales (1998). Initial share is the share of each industry in a country's s total manufacturing value added at the beginning of each 3-year period. All estimations include a constant and country, year, industry, industry-year, and industry-country dummies (coefficients not reported). Country-time controls include initial GDP per capita at the beginning of each 3-year period, trade openness, government spending, inflation, education and institution, as in the country-level regressionsin table 4. The last three rows show the marginal growth effect of credit stocks for an industry in the 75th percentile and an industry in the 25th percentile in the external finance dependence index. The difference between these two is the implied differential effect. All standard errors in parentheses are adjusted for industry-country level heteroskedasticity and autocorrelation.

***$p < 0.01$, **$p < 0.05$, *$p < 0.1$.

for flows of (mostly) household mortgage credit are insignificantly different from zero—which is unsurprising in this industry-level analysis. The bottom panel of Table 5 reports marginal effects. The implied growth difference between high external dependence (ED) and low ED industries is 3–4 percentage points growth.

C. Interacting Credit Stocks and Flows

So far, we treated the growth effects of credit stocks and flows independently, as if the effect of obtaining new loans is independent of debt levels. One can think of a number of plausible mechanisms linking both, in most cases weakening the positive growth effect of credit flows at higher levels of credit stocks (Cecchetti and Kharroubi 2012; Stockhammer 2004). Not accounting for these effects might partly drive our results through omitted-variable bias. We therefore introduce an interaction term of credit flows with stocks (i.e., with financial development). Table 6 reports the results. We find a negative interaction effect between credit stocks and credit flows for nonfinancial credit and for total credit, with weak significance. At higher levels of financial development (credit stocks), the growth effect of credit flows is indeed smaller. Possible interpretations include diminishing returns to credit and a balance sheet effect of debt.

D. Robustness Tests

We run a number of robustness checks. Table 7 summarizes the findings. Due to space limitations, we do not include full regression tables, which are available on request. We first explore how the results change when we replace the two credit aggregates with their components. This is motivated by the concern that the aggregates might be hiding heterogeneity in the credit-growth relations of their underlying components. We report FE results for each of the four underlying credit categories in columns (1a)–(4a) and system-GMM results in columns (1b)–(4b). We find that the negative relations between credit stocks and growth holds overall but is particularly strong for nonfinancial business credit (column (1a)) and mortgage credit (column (3b)). This is unsurprising since they constitute the bulk of their respective aggregates. None of the four components have coefficients with an opposite

TABLE 6
Credit and Economic Growth: Stock and Flow Interaction Effects

	FE			System-GMM		
	(1) Total credit	(2) Nonfinancial	(3) Asset market	(4) Total credit	(5) Nonfinancial	(6) Asset market
Credit stocks	−0.005	−0.028	0.012	0.01	0.011	0.004
	(0.007)	(0.017)	(0.009)	(0.010)	(0.024)	(0.021)
Credit flows	0.184***	0.299***	0.304***	0.141	0.239*	0.124
	(0.041)	(0.070)	(0.085)	(0.085)	(0.131)	(0.242)
Stocks * flows	−0.001***	−0.003**	−0.002**	−0.0002	−0.001*	−0.0003
	(0.0002)	(0.001)	(0.001)	(0.0003)	(0.0008)	(0.002)
Initial GDPPC	−6.787**	−5.089	−8.049***	−4.124**	−3.817***	−2.938**
	(2.850)	(3.232)	(2.678)	(1.624)	(1.417)	(1.233)
Trade	0.013	0.009	0.020**	0.006	0.006	0.006**
	(0.008)	(0.008)	(0.009)	(0.004)	(0.004)	(0.003)
Government	−0.256	−0.26	−0.348*	0.045	0.048	0.007
	(0.177)	(0.176)	(0.178)	(0.083)	(0.081)	(0.055)
Inflation	−0.114	−0.117	−0.122	−0.127	−0.131	−0.111
	(0.095)	(0.096)	(0.097)	(0.102)	(0.102)	(0.093)
Education	0.499	0.648	0.155	0.402	0.393*	0.231
	(0.453)	(0.493)	(0.385)	(0.248)	(0.226)	(0.177)
Institutions	0.157***	0.146**	0.180***	0.304**	0.311**	0.198*
	(0.054)	(0.055)	(0.059)	(0.149)	(0.129)	(0.099)
Observations	228	228	219	228	228	219
Number of id	46	46	44	46	46	44
R^2	0.548	0.548	0.552			
AR(2)				0.979	0.962	0.892
Overidentification				0.288	0.483	0.415

Notes: This table reports results including the interactions of credit stocks and flows. Columns (1) and (4) use total credit, whereas columns (2), (5) and (3), (6) use "nonfinancial credit" (the sum of nonfinancial business and consumption credit) and "asset market credit" (the sum of financial business and mortgage credit), respectively. Columns (1)–(3) present the FE results, columns (4)–(6) show the system-GMM results. The dependent variable is the average growth rate of real GDP per capita (constant 2005 US dollar) over each 3-year period. Credit stocks and flows are defined as in Equations (1) and (2). Initial GDPPC is the real GDP per capita at the beginning of each 3-year period. Trade is imports plus exports, divided by GDP. Government is government consumption divided by GDP. Inflation is the change in CPI. Education is average years of schooling. Institutions is the ICRG composite country risk measure. AR(2) is the Arellano-Bond serial correlation test (p value is reported). Overidentification is the Hansen J statistic (p value is reported). All specifications include constants and time dummies (coefficients are not reported). Robust standard errors in parentheses.

***$p < 0.01$, **$p < 0.05$, *$p < 0.1$.

sign to their aggregate. This suggests that the stock aggregates do not hide significant heterogeneity in the underlying credit-growth relations. Credit flows to nonfinancial business are positively related to growth. Coefficients for flows of mortgage and consumer credit are both insignificant in the system-GMM results.

Further, a potential bias may arise from the equal treatment of countries with high and low levels of credit stocks, if the relation between credit and growth is nonlinear over credit stocks. First, we check whether our results are driven by countries with high-credit stocks but low growth (Denmark, Spain, and Switzerland) or low credit levels but high growth (Armenia, India, and Uruguay). We drop these six countries and report results for "nonfinancial credit" and "asset market credit" in columns (5a)–(6a) and columns (5b)–(6b). Second, we test whether the results are similar in countries with high and low levels of credit stocks. We construct two subsamples based on the distribution of the average credit stocks per country, one excluding countries in the lowest quantile (a "high-credit-stocks" subsample), and the other excluding the highest quantile (a "low-credit-stocks" subsample). Results are shown in columns (7a)–(10a) and (7b)–(10b). In both analyses, our results do not qualitatively change.

Moreover, Rousseau and Wachtel (2011) find that the positive relationship that was estimated using the data from the 1960s to the 1980s disappeared over the subsequent 15 years as a result of the increased incidence of crises. Other papers show that the link between credit and growth varies over the business cycle (Borio

TABLE 7
Robustness Analyses

	(1a)	(2a)	(3a)	(4a)	(5a)	(6a)	(7a)	(8a)	(9a)	(10a)	(11a)	(12a)	(13a)	(14a)
	The Four Categories of Credit				Country Outliers			Level of Credit Stocks			The Role of Crisis			
Panel A: FE	**NonFin**	**Consumer**	**Mortgage**	**FinBus**	**NF**	**AM**	**NF_HD**	**NF_LD**	**AM_HD**	**AM_LD**	**NF**	**AM**	**NF**	**AM**
Credit stocks	−0.060***	−0.059	−0.005	−0.004	−0.070***	−0.009	−0.032*	−0.070**	0.004	0.001	−0.067***	−0.023	−0.062***	0.014
	(0.017)	(0.040)	(0.009)	(0.028)	(0.018)	(0.013)	(0.016)	(0.026)	(0.009)	(0.023)	−0.018	−0.023	(0.014)	(0.013)
Credit flows	0.198***	0.076	0.067	0.099*	0.223***	0.169***	0.103*	0.251***	0.036	0.264**	0.236***	0.105	0.174***	0.101*
	(0.069)	(0.151)	(0.076)	(0.050)	(0.054)	(0.056)	(0.057)	(0.060)	(0.039)	(0.099)	−0.063	−0.087	(0.048)	(0.054)
Crisis													−1.117	−0.385
													(0.803)	(0.809)
Crisis*Credit stocks													0.031**	0.011
													(0.013)	(0.010)
Time FE	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes
Observations	228	199	219	183	204	197	173	176	166	167	182	175	228	219
Number of id	46	39	44	37	40	39	33	37	32	35	46	44	46	44
R^2	0.542	0.48	0.512	0.506	0.556	0.522	0.632	0.573	0.64	0.555	0.392	0.308	0.543	0.52
Panel B: System-GMM	**(1b) NonFin**	**(2b) Consumer**	**(3b) Mortgage**	**(4b) FinBus**	**(5b) NF**	**(6b) AM**	**(7b) NF_HD**	**(8b) NF_LD**	**(9b) AM_HD**	**(10b) AM_LD**	**(11b) NF**	**(12b) AM**	**(13b) NF**	**(14b) AM**
Credit stocks	−0.017	−0.057	−0.033*	−0.041	−0.054	−0.015	−0.023	−0.031	−0.007	−0.054	−0.035	−0.056*	−0.068**	−0.035
	(0.019)	(0.041)	(0.019)	(0.048)	(0.036)	(0.021)	(0.034)	(0.027)	(0.013)	(0.044)	−0.023	−0.029	(0.027)	(0.023)
Credit flows	0.273***	0.096	0.023	−0.139	0.203**	0.004	0.058	0.211**	−0.021	−0.013	0.332***	0.112	0.165**	0.109
	(0.097)	(0.133)	(0.047)	(0.206)	(0.090)	(0.073)	(0.079)	(0.086)	(0.051)	(0.241)	−0.088	−0.188	(0.08)	(0.078)
Crisis													−2.438*	−1.246
													(1.275)	(1.012)
Crisis*Credit stocks													0.055**	0.030*
													(0.022)	(0.018)
Observations	228	199	219	183	204	197	173	176	166	167	182	175	228	219
Number of id	46	39	44	37	40	39	33	37	32	35	46	44	46	44
AR(2)	0.696	0.909	0.755	0.766	0.931	0.851	0.268	0.875	0.187	0.821	0.793	0.641	0.88	0.984
Overidentification	0.515	0.579	0.57	0.19	0.384	0.448	0.211	0.459	0.356	0.536	0.527	0.492	0.313	0.45

Notes: This table presents the robustness analyses. Panel A reports FE results, Panel B reports corresponding system-GMM results. *NF* denotes "nonfinancial credit" (the sum of nonfinancial business and consumption credit) and *AM* denotes "asset market credit" (the sum of financial business and mortgage credit). *HD* denotes the "high-credit-stocks" subsample, whereas *LD* denotes the "low-credit-stocks" subsample. Columns (1a)–(4a) and (1b)–(4b) examine the relations between each of the four underlying credit categories, namely nonfinancial business, consumer, mortgage, and financial business credit and growth. Columns (5a)–(6a) and (5b)–(6b) drop outlier countries with high-credit stocks/low growth (i.e., Denmark, Spain, and Switzerland) and low credit levels/high growth (i.e., Armenia, India, and Uruguay). Columns (7a)–(10a) and (7b)–(10b) consider the differential credit-growth relations in countries with high and low levels of credit stocks. Columns (11a)–(14a) and (11b)–(14b) examine the role of crisis. The dependent variable is the average growth rate of real GDP per capita (constant 2005 US dollar) over each 3-year period. Credit stocks and flows are defined as in Equations (1) and (2). Initial GDPPC is real GDP per capita at the beginning of each 3-year period. Trade is imports plus exports, divided by GDP. Government is government consumption divided by GDP. Inflation is the change in CPI. Education is average years of schooling. Institutions is the ICRG composite country risk measure. *Crisis* is a dummy variable that takes the value of one if a country was in crisis for at least 1 year during a 3-year period, and zero otherwise. The identification of crisis is based on Laeven and Valencia (2013). All specifications include control variables, constants, and time dummies (coefficients not reported). AR(2) is the Arellano-Bond serial correlation test (p value is reported). Overidentification is the Hansen J statistic (p value is reported). Robust standard errors in parentheses.

***$p < 0.01$, **$p < 0.05$, *$p < 0.1$.

2014; Braun and Larrain 2005; Jordà, Schularick, and Taylor 2013). The concern may then be that our results are driven by the extraordinary 2008–2011 years. To explore this, we construct a new sample by excluding the post-2007 observations and re-estimate both our specifications in columns (11a)–(12a) and (11b)–(12b). The results are consistent with our longer sample.

We also address Rousseau and Wachtel's (2011) argument by including the Laeven and Valencia (2013) systematic banking crises variable. We characterize a 3-year country observation as a crisis episode if the country was in crisis for at least 1 year during this period.[17] Of the 46 countries in our sample, 20 experienced at least one crisis episode. We introduce an interaction term between credit stocks and crisis episodes, controlling for any independent effect of crises on growth. The results in columns (13a)–(14a) and (13b)–(14b) show that the coefficient for nonfinancial credit stocks is significant and negative in the FE estimation, the coefficient for asset market credit is significant and negative in the GMM estimation, just as in Table 4. Our results are not driven by country-specific banking crisis.

V. SUMMARY AND CONCLUSION

Financial deepening is a double-edged sword. It supports investments and increases the economy's capacity to reallocate factors of production. But a large credit-to-GDP ratio may be a drag on growth. It may imply high levels of private debt, reduce investment and innovation, and induce volatility, financial fragility, and crisis. We show that credit to real estate and other asset markets tends to increase the credit-to-GDP ratio while stocks of credit to nonfinancial business rise roughly in line with GDP. In recent decades, a shift in the composition of credit toward real estate and other asset markets has therefore coincided with rising credit-to-GDP ratios. It may have diminished the growth effectiveness of credit.

To test this conjecture, we present and analyze new, hand-collected data for 46 economies over 1990–2011. We document and explore trends in credit categories. We find that the growth coefficient of different credit stocks scaled by GDP is insignificant or negative, especially credit stocks supporting asset markets. We observe insignificant or negative correlations of credit stocks with output growth. This holds up in FE panel data regressions, dynamic panel estimations (system-GMM models), in regressions with the Rajan and Zingales (1998) methodology, and in robustness checks. These results are confirmed in an industry-level difference-in-difference analysis. The positive effect of credit flows diminishes at higher levels of financial development.

These results are in line with declined growth effectiveness of financial development as a result of a change in the use of bank credit. Bank credit has shifted away from nonfinancial business toward asset markets, where it has no or small growth effects. This shift toward more credit to asset markets also implies faster growth of credit stocks relative to GDP, which may be harmful in itself.

A clear limitation of our study is the short time sample, which is dictated by data availability. We would also like to see a better disaggregation of credit, for instance between business mortgages and other business credit. Given the recent crises in commercial real estate markets in several economies, this would seem a relevant distinction. Researchers depend here on the quality and detail of the data provided by central banks. Another limitation is the use of country-level data. In future research, the effect of bank loan portfolios on output growth could be examined in matched bank-firm data. Recent studies in this vein show promising results (e.g., Jiménez et al. 2012). The use of microlevel data also opens up new avenues for dealing with endogeneity problems.

In summary, our new data and analysis suggest that what was true in the 1960s, 1970s, and 1980s when the field of empirical credit-growth studies blossomed, is no longer true in the 1990s and 2000s. Banks do not primarily lend to nonfinancial business and financial development may no longer be good for growth. These trends predate the 2008 crisis. They prompt a rethink of the role of banks in the process of economic growth.

Our findings are consistent with broader concerns with a world which has too much rather than too little financial development. Cecchetti and Kharroubi (2012) conclude that "there is a pressing need to reassess the relationship of finance and real growth in modern economic systems. More finance is definitely not always better." Piketty (2014) suggests that a large ratio of capital to income may depress growth, where capital is the sum of financial and fixed

17. Alternatively, we characterize a 3-year episode as *crisis* if the country was in crisis for at least 2 years during a 3-year period. Our results are quantitatively similar.

capital. His empirical work shows that most of the increase in the capital-income ratio is due to the increase in the value of financial assets. In our data, we observe large increases in bank lending supporting asset markets and insignificant or negative growth correlations of these credit stocks. Mian and Sufi (2014) emphasize the role of household leverage in a consumption slowdown in high-debt economies. Summers (2013) suggests that equilibrium real interest rates may have been declining over the last decades, possibly to negative values. In these views, more financial development leading to more savings, more financial capital, lower interest rates, and more debt may not stimulate growth. Our estimates show that even though credit flows may constitute a stimulus to growth, credit stocks—the traditional measure for financial development—have negative or insignificant growth coefficients.

The common theme between these analyses and our paper appears to be that there are costs to having an economy and a financial system increasingly geared toward growing markets for real estate and financial assets. This opens up a wide array of research questions. It is not clear that these trends arise because of growing inequality, as Piketty suggests. It is unclear which of the many reasons suggested by Summers are relevant to negative real returns. We do not know whether the finance-growth relation we document for the last two decades is a temporary or secular trend. These are subjects for future research.

APPENDIX: DATA

The aim of the database is to provide a detailed description of monetary financial institutions' (banks and credit unions) loan assets where the counterparty is a domestic nongovernment nonbank. We collected data from the consolidated balance sheet of monetary financial institutions from central bank sources of 46 countries over 1990–2011. On the asset side of the balance sheet, loans to nonbanks are reported. We included a country in the data set if loans were reported separately for mortgages to households, household consumption credit, credit to nonfinancial business, and credit to financial business (insurance firms, pension funds, and other nonbank financial firms).[18]

18. An alternative would be to collect data from the liabilities side of the counterparty, in a country's flow of fund data. However, not all countries provide sufficiently detailed flow of funds data on bank loans by sector. What is often reported is total borrowing, including equity market borrowing while we focus on the analysis of bank credit. Also, to the extent that equity is held in the private nonfinancial sector, this is a debt from the private nonfinancial sector to the private nonfinancial sector.

TABLE A1
Credit Stocks Across Countries (% of GDP)

Country	Start	End	Non-financial Business	Con-sumer	Mort-gage	Financial Business	Total
ALB	2005	2011	23.468		6.541	32.775	62.784
ARM	2005	2011	11.163	4.069	1.938	0.39	17.17
AUS	1994	2011	34.748	7.462	48.507	8.001	98.718
AUT	1995	2011	47.674		38.202	6.609	92.485
BEL	1999	2011	30.167	5.185	28.032	9.669	73.053
BGR	1998	2011	25.722	6.408	5.261		37.391
BRA	1994	2011	19.671	5.755	2.067	3.887	31.38
CAN	1990	2011	40.139	25.225	43.519	11.652	120.535
CHE	1990	2011	43.161		92.931	1.516	137.608
CHL	1990	2011	43.381	36.427	11.262		91.07
CZE	1997	2011	24.613	5.287	8.591	3.089	41.58
DEU	1990	2011	52.973	10.874	28.532	3.204	95.583
DNK	2000	2011	44.121	25.34	78.656	7.189	155.306
EGY	1991	2011	36.225	7.714			43.939
ESP	1992	2011	59.497	61.904	106.719		228.12
EST	1999	2011	22.55	2.161	20.497	6.496	51.704
FIN	2002	2011	27.272	13.409	33.675	0.685	74.356
FRA	1993	2011	36.177	12.514	26.556	4.111	79.358
GBR	1990	2011	21.11	8.693	36.584	26.032	92.419
GRC	1990	2011	34.011	7.142	15.43	0.984	56.583
HKG	1990	2011	68.83	11.604	39.323	15.192	134.949
HRV	2001	2011	61.143		32.591	9.446	103.18
HUN	1990	2011	15.393	3.325	5.279	3.316	27.313
IDN	2002	2011	15.269	5.33	1.994	2.44	25.033
IND	2001	2011	25.292	3.259	3.248	2.364	34.163
ISL	2003	2011	14.132		41.737		55.869
ISR	1999	2011	57.681	10.545	20.44		88.666
ITA	1998	2011	22.691	2.776	23.921	11.673	61.061
JPN	1990	2011	56.62	3.211	28.048	8.538	96.417
LTU	1993	2011	18.373	2.981	7.35	1.732	30.436
LUX	1999	2011	30.183	8.318	33.755	50.92	123.176
MAR	2001	2011	14.651	2.906	11.232	0.293	28.789
MEX	2000	2011	7.955	3.109	8.69		19.754
NLD	1990	2011	49.114	8.104	60.016	19.99	137.224
NOR	1995	2011	33.606	11.069	49.059	2.875	96.609
NZL	1990	2011	32.034	4.846	55.136	25.089	117.105
POL	1996	2011	14.785	9.476	7.048	1.201	32.51
PRT	1990	2011	41.924	11.202	37.904	10.876	101.906
SGP	1990	2011	59.365		23.2	13.397	95.962
SVK	2004	2011	19.773	4.337	11.163	2.403	37.676
SVN	2004	2011	48.487	11.476	8.729	4.933	73.625
SWE	1996	2011	55.302	11.221	40.686	48.119	155.328
TWN	1997	2011	70.616	19.951	38.949	3.426	132.942
UKR	2005	2011	39.58		19.441	5.243	64.264
URY	2005	2011	13.883	8.908			22.791
USA	1990	2011	9.547	6.032	18.823		34.402

Lending to government by banks is usually a very small part of total bank lending. We choose not to include this in our data. Mortgages in our data are household mortgages, which is only part of total mortgages. Some countries also report business mortgage lending separately from other lending to business, and in these cases it is clear that a substantial part of lending to business is lending secured by real estate. But the use of secured lending to business will be more linked to production and trade, and thus GDP, while the use of mortgages to household is almost exclusively to purchase real estate assets. Thus, the impact on GDP will be different, which suggest that separating out households mortgages is functional, but separating out business mortgages is less so. Apart from that, it was not practicable to do this. Since only few countries report business mortgages, we cannot consistently include total mortgages.

Domestic bank credit includes loans by both domestic and foreign banks, in domestic and foreign currency. For reasons of consistency, it excludes nonbank lending and securitized

TABLE A2
Comparison to Other Datasets

	Private Credit			Nonfinancial Business Credit			Household Credit		
	Ours 1994–2005	**BECK2012 1994–2005**	**BUY2010 1990–2006**	**Ours 1994–2005**	**BECK2012 1994–2005**	**BUY2010 1990–2006**	**Ours 1994–2005**	**BECK2012 1994–2005**	**BUY2010 1990–2006**
AUS	0.777	0.823	0.806	0.311	0.279	0.285	0.466	0.544	0.52
AUT	0.84	1.005	1.035	0.486	0.653	0.683	0.354	0.352	0.352
BEL	0.651	0.744	0.748	0.315	0.314	0.319	0.336	0.43	0.439
BGR	0.198	0.219	0.245	0.148	0.145	0.157	0.05	0.075	0.088
CAN	1.029	0.962	1.012	0.396	0.188	0.128	0.633	0.773	0.892
CHE	1.369	1.603	1.6	0.445	0.604	0.62	0.924	1	0.98
CZE	0.347	0.484	0.481	0.272	0.314	0.309	0.075	0.171	0.172
DEU	0.97	1.053	1.053	0.558	0.653	0.605	0.412	0.4	0.375
DNK	1.277	0.894	0.338	0.379	0.133	0.095	0.898	0.761	0.247
EGY	0.495	0.446	0.432	0.411	0.372	0.355	0.083	0.075	0.073
EST	0.194	0.286	0.336	0.11	0.176	0.208	0.084	0.111	0.127
FRA	0.69	0.85	0.86	0.344	0.339	0.337	0.346	0.511	0.513
GBR	0.62	1.269	1.337	0.187	0.557	0.293	0.433	0.712	1.04
GRC	0.444	0.663	0.691	0.294	0.379	0.389	0.15	0.283	0.3
HUN	0.212	0.231	0.302	0.143	0.189	0.218	0.069	0.042	0.085
IDN	0.205	0.252	0.249	0.142	0.17	0.169	0.063	0.082	0.08
IND	0.249	0.219	0.227	0.203	0.156	0.159	0.046	0.063	0.068
ISL	0.551	0.918	0.916	0.118	0.492	0.39	0.434	0.426	0.526
JPN	0.903	1.549	1.105	0.596	1.07	0.747	0.307	0.479	0.357
LTU	0.159	0.149	0.177	0.126	0.104	0.13	0.032	0.045	0.064
MAR	0.224	0.187	–	0.122	0.14	–	0.102	0.046	–
MEX	0.179	0.186	0.194	0.078	0.087	0.122	0.101	0.099	0.072
NLD	1.093	1.639	1.152	0.465	0.63	0.478	0.628	1.01	0.98
NZL	0.861	1.118	1.152	0.301	0.703	0.444	0.56	0.415	0.718
POL	0.238	0.244	0.229	0.143	0.135	0.162	0.095	0.11	0.07
PRT	0.85	1.103	0.961	0.391	0.507	0.124	0.458	0.596	0.51
SVK	0.219	0.415	0.409	0.142	0.265	0.262	0.077	0.15	0.151
SVN	0.476	0.34	0.362	0.339	0.24	0.252	0.138	0.099	0.11
SWE	0.963	0.636	0.374	0.534	0.233	0.228	0.429	1	0.149
URY	0.219	0.392	0.329	0.143	0.194	0.174	0.077	0.198	0.155
USA	0.324	0.498	0.503	0.095	0.118	0.095	0.229	0.38	0.408

Notes: BECK2012 and BUY2010 refer to Beck et al. (2012) and Büyükkarabacak and Valev (2010), respectively. This table shows the comparison of private credit (excluding financial business credit), nonfinancial business credit and household credit (the sum of consumer credit and mortgage credit) for 31 countries (that exist in all three dataset except MAR) between our dataset, Beck et al. (2012), and Büyükkarabacak and Valev (2010). We takes the average of our credit data during the period 1994–2005, which is in line with Beck et al. (2012). As a result, LVA, FIN, and KOR dropped out due to limited time span in our dataset. Thirteen countries in our dataset, namely BRA, CHL, ARM, HKG, HRV, ISR, ITA, ESP, NOR, TWN, UKR, LUX, SGP do not exist in either Beck et al. (2012) or Büyükkarabacak and Valev (2010).

TABLE A3
Country Coverage

AUS, BDI, BFA, BHS, BOL, CIV, CMR, CRI, DOM, ECU, EGY, FIN, FJI, GAB, GHA, GMB, GRC, GTM, HND, IND, IRL, ISR, ITA, JPN, KEN, KOR, LKA, MDG, MEX, MLT, MYS, NER, NGA, NPL, PAK, PAN, PER, PHL, PRT, PRY, SEN, SGP, SLV, SWZ, TGO, THA, TTO, TUR, URY, USA

TABLE A4
Industry Coverage Across Countries

ALB(11), AUS(36), AUT(36), BEL(36), BGR(36), BRA(12), CAN(35), CHE (18), CHL(30), CZE(31), DEU(36), DNK(32), EGY(36), ESP(36), EST(36), FIN(34), FRA(36), GBR(36), GRC(36), HKG(9), HUN(36), IDN(36), IND(32), ISL(29), ISR(24), ITA(36), JPN(36), LTU(36), LUX(29), MAR(36), MEX(36), NLD(36), NOR(36), NZL(14), POL(36), PRT(36), SGP(36), SVK(34), SVN(36), SWE(36), TWN(28), URY(33), USA(34)

Note: The number in the parenthesis indicates the number of industries available.

bank loans. Some countries have large nonbank debt markets or much securitization, so that loan assets on banks' balance sheets paint only a small part of the picture. For one extreme example, this is why "total bank credit" values for the United States are comparatively low: most credit in the United States is nonbank credit (bonds and short-term paper) and a large part of loans (especially, mortgages) is securitized so that it cannot be observed on banks' balance sheets. The total stock of credit market instruments relative to GDP in the United States was 386% in 2011 (BEA flow of fund data), of which only 34% was bank credit (this data). However, the United States is exceptional in this respect.

TABLE A5
Industry Classification and External Financial Dependence

ISIC code	Sector	External Dependence (ED)
311	Food products	0.14
313	Beverages	0.08
314	Tobacco	−0.45
321	Textiles	0.4
322	Apparel	0.03
323	Leather	−0.14
324	Footwear	−0.08
331	Wood products	0.28
332	Furniture	0.24
341	Paper products	0.18
342	Printing and publishing	0.2
352	Other chemical products	0.22
353	Refineries	0.04
354	Petroleum and coal	0.33
355	Rubber products	0.23
356	Plastic products	1.14
361	Pottery	−0.15
362	Glass and products	0.53
369	Nonmetal products	0.06
371	Iron and steel	0.09
372	Nonferrous metal	0.01
381	Metal products	0.24
382	Machinery	0.45
383	Electrical machinery	0.77
384	Transport equipment	0.31
385	Professional equipment	0.96
390	Other manufacturing	0.47
3211	Spinning	−0.09
3411	Pulp and paper	0.15
3511	Basic chemicals	0.25
3513	Synthetic resins	0.16
3522	Drugs	1.49
3825	Office and computing	1.06
3832	Radio	1.04
3841	Ship building	0.46
3843	Motor vehicles	0.39

Note: The external dependence on finance is taken from Rajan and Zingales (1998).

FIGURE A1

The Developments of Credit Composition Over Time—Selected Countries

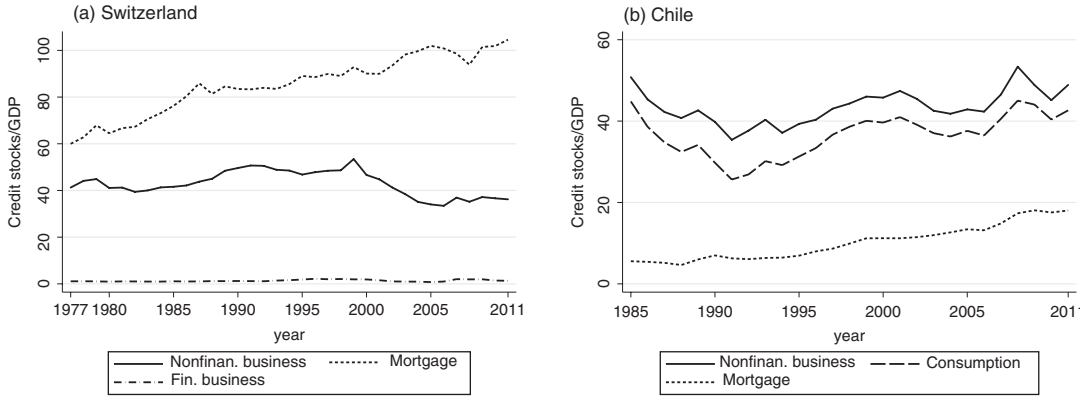


FIGURE A1

Continued

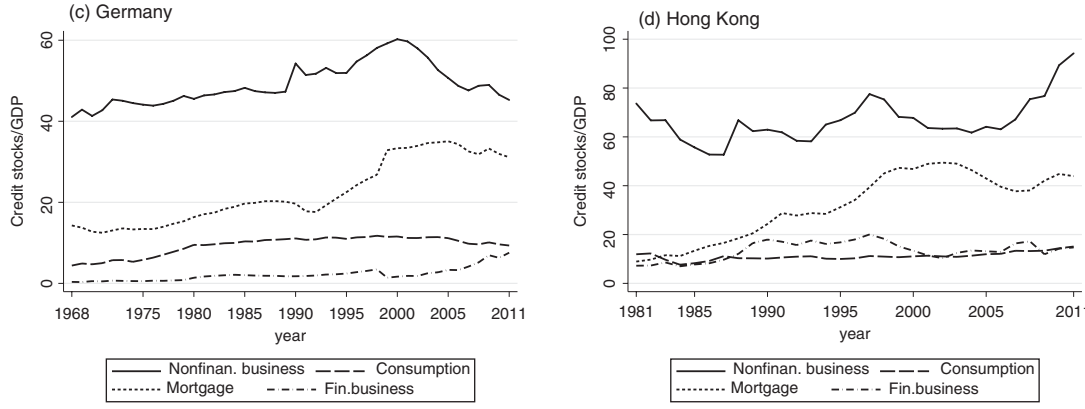
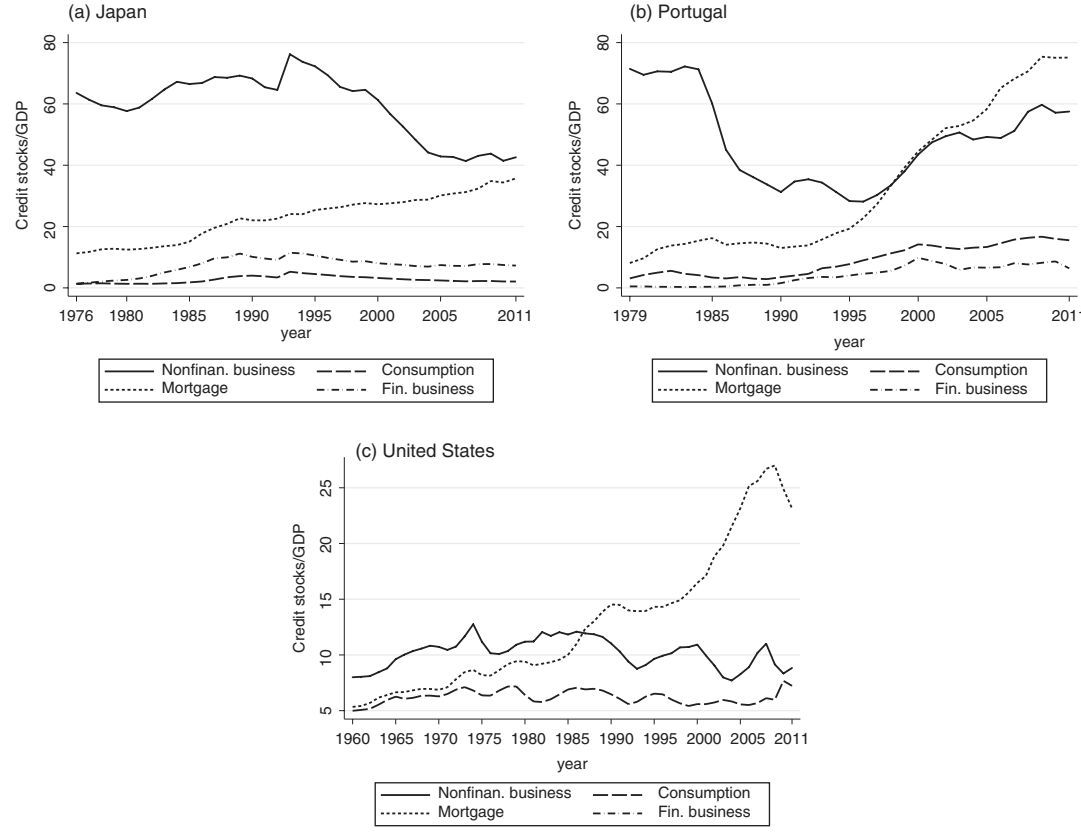


FIGURE A2

The Developments of Credit Composition Over Time—Selected Countries (Cont.)



For each country, the source was always the country's central bank. There is large diversity in reporting formats. Only few central banks distinguish deposit taking institutions within the broader category of Monetary Financial Institutions. Most do not differentiate between lending to public sector firms and private sector firms, or between domestic currency loans and foreign currency loans. Some central banks (e.g., Switzerland's) report credit to 10 or 15 business sectors of the economy separately, which we collapsed into "financial" and "nonfinancial." Some report bank lending to nonbanks as well as interbank lending (which we excluded from the data). Some report only "household" and "business" lending. In these cases, we assigned household lending to mortgages, unless we had evidence that it was unsecured consumer lending. Some data go back much before 1990; Switzerland's goes back to 1977, the United States to 1960. But on average, data before 1990 were rare.

COMPARISON TO SIMILAR DATA

Beck et al. (2012) and Büyükkarabacak and Valev (2010) were the first to study similar data, using a data set for 73 countries over the years 1994 to 2005. These papers are ground breaking in that they are the first studies to look at growth effects of different credit aggregates across countries. Our data are not an update of this, but are newly collected. We aimed to separate out mortgage and other household credit and to observe each credit category at source. The Beck et al. (2012) data combine mortgage and other household credit into one household credit category. The data are based on the financial development and structure (FDS) database described in Beck, Demirgüç-Kunt, and Levine (2000) and updated in Beck, Demirgüç-Kunt, and Levine (2010). Here "private credit" captures the financial intermediation with the private nonfinancial sector, including mortgages, as explained in note 5 in Beck, Demirgüç-Kunt, and Levine (2000) ("claims on real estate (=mortgage credit) is included for nonbanks lending"). In observing the different credit aggregates, Beck et al. (2012) start with a "total credit" (TC) measure taken from the FDS database, which is credit to nonfinancial business (BC) plus credit to households. The "household credit" measure in Beck, Demirgüç-Kunt, and Levine (2010) and in Büyükkarabacak and Valev (2010) is defined as (TC-BC), that is, all nonbusiness credit, including both consumer credit and mortgage credit. These are not distinguished. The Beck et al. (2012) credit data are deflated by the consumer price index (CPI) deflator and then divided by real (deflated) GDP. Our data is nominal credit divided by nominal GDP.

Table A2 is a comparison of our data to the Beck et al. (2012) data. We find that the data are mostly in agreement, except for a few countries. In the Czech Republic, our credit/GDP ratio is about half of those in the two other data sets. Personal communications with the Czech National Bank suggest that part of the reason is widespread credit write-downs and therefore data revisions since 2005, a large reduction in the number of banks, and the inclusion of foreign banks. The same applies to Slovakia, Iceland, and Uruguay. For Sweden, our data yield a credit/GDP ratio which is much higher than in the Beck et al. (2012) data, which is about double the Büyükkarabacak and Valev (2010) measure. Reclassifications of what counts as a bank may be behind this. There is also some disparity on the United Kingdom.

A more recent and somewhat comparable data set is the March 2013 Bank of International Settlement "Long series on credit to private non-financial sectors" (BIS 2013). A description of the data is in Dembiermont, Drehmann, and Muksakunratana (2013), including a link to data documentation. In the BIS data, only "lending by all sectors" (i.e., bank and securities markets) is disaggregated to households and enterprises (except for Brazil, Portugal, Saudi Arabia, and Russia). Bank debt is not disaggregated. This implies on one hand that the BIS data provide a more complete picture of all loans to the private sector, while on the other hand they do not include lending to the nonbank financial sector (which is substantial in some countries). Another limitation of the BIS data is that by including in one credit measure also nonbank lending (which mostly is lending through securities markets), it is not possible to study the unique role of bank loans. Since bank debt is not disaggregated, we cannot directly compare the BIS data to our data.

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