Financial Systems, Growth, and Volatility

Searching for the Perfect Fit

Roumeen Islam
Abstract

This paper builds on recent research examining the impact of finance on growth, looking at the effect of the financial system on volatility in gross domestic product per capita and consumption per capita growth. It also examines the impact of credit on the composition of growth. The findings show that financial development smooths growth in gross domestic product and consumption per capita, but only up to a point. At high levels of credit, further credit is positively associated with volatility even after controlling for the quality of institutions and periods of financial crises. In large financial systems, finance may not help individuals smooth consumption volatility. The threshold at which finance’s effect may be volatility enhancing may be lower than previously thought. In terms of the impact on growth, total credit (and credit to firms) has a nonlinear relationship, with rising credit supporting higher growth up to a point, beyond which the additional impact of finance on growth is negative. This can be explained by finance flowing into less productive activities (or drawing other resources into less productive activities). In addition, household credit is negatively related to manufacturing sector growth, although credit to firms has a positive relationship to manufacturing growth. This may be explained by the fact that much of household credit is used to finance the consumption (including imports) of goods and services broadly (not just manufacturing sector goods) or investment in housing.
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¹ I am grateful to colleagues at the World Bank for their comments.
Financial crises generally beget research analyzing the impact of the financial system on growth and welfare. In this regard, the recent financial crisis was no different. A number of papers, theoretical and empirical, have built on previous research studying on the one hand, the contributions of finance to growth and on the other, to volatility. The benefits of deep financial systems have long been recognized for consumption smoothing purposes and to support long term growth. More recently, research has focused on whether finance in all forms supports growth or whether some types of finance should be constrained (regulated) in its development because it is not productivity/growth enhancing. Previous research has also addressed whether financial systems can increase volatility in an economy. New research reexamines this issue in the context of the changing global markets where credit creation has been linked closely to large cross border financial flows and financial markets have been progressively liberalized.

This paper builds on recent research that examines the link between financial system growth and economic growth and volatility. Most research indicates that financial system development enhances growth and allows consumption smoothing. Enhancing access to credit for firms and households is an important goal of policy around the world. The paper examines whether greater financial depth can increase output, or consumption volatility (instead of smoothing consumption per capita). Specifically, it uses panel data estimation covering 153 countries over the period 1964-2013, extending the period over which other papers have investigated this issue, using both 2SLS and GMM estimations and it is found that private credit is associated with lower volatility in GDP and consumption per capita, though the effect is nonlinear. At very high levels of financial system development as measured by the level of private sector credit to GDP or the value of financial assets to GDP, finance has a positive effect on economic volatility. This effect holds true even after accounting for trade and financial openness, institutions, the level of development among other things, and even after accounting for regional differences, including income levels. The paper also examines whether the speed of credit creation, rather than the size of financial development affects volatility; it does not find evidence that it is so.

The second part of the paper focuses on whether the composition of borrowers—households versus firms—matters in terms of how financial system size may affect economic growth and volatility. This section builds on recent research by Beck et al (2012) that concludes
that there is no significant relationship between household credit and economic growth, though there is a significant relationship between enterprise credit and economic growth. I use a different data set for 41 countries and spanning a longer period to examine the effects of household or firm credit on GDP per capita welfare. I find that there is no significant relationship between credit to households and economic growth. However, the share of household credit in total credit has a significant negative relationship with manufacturing sector growth, though firm credit has a significant positive relationship. Though OLS specifications indicate a nonlinear relationship with high levels of firm credit (with the quadratic term negative), GMM specifications do not.

Another question that is examined is whether the type of borrower matters for volatility. One reason why there may be a difference is that one type of credit extension may be riskier than another type, yet more likely to have its risk underestimated in periods of general low risk aversion or rising asset prices (housing markets are prone to boom and bust periods). Moreover, certain debt may be considered to be guaranteed (government or household) and therefore (incorrectly) rated low risk. Another reason may be that households may be less able to manage risks associated with borrowing and therefore more prone to overspending and then contracting spending. A significant and fairly robust negative relationship between GDP per capita growth volatility and household credit to GDP is found. A larger share of household credit in overall private credit smooths consumption per capita growth volatility, though only up to a point. Too large a share of household credit increases volatility.

Related Literature

This paper builds on studies that analyze the impact of financial activity on growth and volatility in output or consumption growth. Studies on finance and growth are plenty. Levine (2005) and Demirguc-Kunt and Levine (2008) discuss the many channels through which finance supports growth including through higher investment, supporting innovation, consumption smoothing and risk sharing. When the financial sector mobilizes savings and allocates resources to the highest value use, it supports growth. They discuss theoretical and empirical papers that demonstrate the how finance supports growth. King and Levine (1993b), Levine et al (2000), Rousseau and Wachtel (2000), Beck et al (2000) do a number of studies showing the impact of finance on growth. Rajan and Zingales (1998) and Demirguc-Kunt and Maksimovic (1998) use
industry and firm level data to explore the positive impact of finance on growth. More recently, Oliver, Levine and Warusawitharana (2014) find that external finance supports productivity growth in their sample of European countries.

However, a number of recent papers revisit the finance-growth relationship and find more nuanced effects. This paper builds on this newer literature on productivity and finance that examines the possible negative relationship between productivity and/or growth and finance in very large financial systems. Gazdar and Cherif (2015) find that finance is more likely to support growth in MENA countries in good institutional contexts. Demetriades and Law (2006) find that financial development has larger effects on GDP per capita when the financial system is imbedded within a sound institutional framework. Barajas et al (2013) find that the beneficial effect of financial deepening on growth varies across countries; lower income countries benefit less because their regulatory and supervisory systems are less developed. Aizenman, Yinjarak and Park (2015) find a nonlinear effect of finance and growth and an uneven effect across sectors; they compare East Asia and Latin America, concluding that both the quantity and quality of finance matter. When the financial system channels resources to productive sectors of the real economy, then growth in finance and real output are positively correlated. Arcand et al (2012) find that there is a threshold beyond which finance does not have a positive impact on growth. Shen and Lee (2005) show that stock market development has a positive effect on growth but banking development does not; they find that the conditioning variables of financial liberalization, high income level and good shareholder protection mitigate the negative effects of banking development on growth. Cecchetti and Kharrroubi (2012, 2015) find that the impact of finance on growth is nonlinear (very large financial sectors can have a negative relationship with growth) and that a fast growing financial sector has a negative impact on aggregate productivity growth. In their theoretical model, this is because low productivity (and high collateral) projects are more likely to be financed and also because the financial sector may take away human resources from more productive sectors. Their empirical work covers advanced economies.

Few papers have differentiated between the impact of credit going to households versus firms. Yet in recent times, there has been increasing attention given to credit to households as there have been fast increases in this type of credit (for example in European and US credit markets); moreover much of credit to households is mortgage credit a type of credit that
increases relative to enterprise credit during asset price booms. There is also an ongoing move to support further financial inclusion, that is, not just providing consumers with a savings source, but also facilitating household credit, as a means of improving welfare.

Theory is ambiguous with respect to the effect of higher household credit on growth. Results vary according to whether it is assumed/demonstrated that higher household credit raises consumption and lowers savings (and therefore investment), or whether it raises investment (for example in human capital). The former argument is made by Jappelli and Pagano (1994), while the latter is made by Galor and Zeira (1993) and De Gregorio (1996). Using a different data set and for the period 1994-2005, Beck et al (2012) analyze the contribution of household credit to economic growth and find that household credit has no positive relationship with growth, but that enterprise credit does. Moreover, enterprise credit is associated with faster reductions in income inequality and household credit is not. BIS (2006) discusses the implications of increasing household credit for financial and macroeconomic stability in mature markets. IMF (2006) highlights also the additional risks associated with rapid household credit growth in emerging markets where weaknesses in financial institutions and regulatory capacity can heighten risks. The IMF report concludes that access to credit should be accompanied by measures to enhance resilience and safety of the financial system. A special BIS paper ² examined the rise of housing finance pre-2008, raising concerns about the rise of subprime mortgages, and highlighting the important role that governments play, particularly through tax and subsidy systems for housing and land, in affecting housing market developments and the rise of borrowing/lending for houses. Both the IMF and BIS papers focus on risks- for example debt financed household borrowing leading to larger current account deficits on the one hand, and borrowing in situations where there is little regulation to protect households or banks from taking on excessive risk.

The size of financial systems and the rate of growth of the financial system have both been linked to economic volatility. While financial systems, when functioning well, promote productivity and help smooth consumption, they can also increase volatility in an economy by creating boom-bust cycles such as those related to asset prices. Mispricing of risk or incentives to take on risk that cannot be managed (given the existing state of information and/or instruments,

² Committee on the Global Financial System, Papers, No. 26, January 2006.
moral hazard, pay based on short term profits, for example) lead to financial sector and economic volatility. Large and/or fast growing financial sectors also present a challenge for oversight: legal and supervisory systems can find it difficult to keep up with the pace of financial innovation. Aghion et al (1999, 2000) develop a model where economies with less developed financial sectors will tend to be more volatile and have slower growth; the second paper shows that volatility is more likely in open economies with intermediate levels of financial development. Bernanke and Gertler (1990), Greenwald and Stiglitz (1993) and Kiyotaki and Moore (1997) develop models where asymmetric information in financial markets exacerbates volatility. Iyigun and Owen (2004) show that credit provided to the private sector is important in smoothing consumption and output variability in economies where there are more low-income people. Denizer et al (2002) show that financial depth is negatively correlated to growth, consumption and investment volatility. Acemoglu et al (2003) do not find a robust relationship between financial intermediary development and growth volatility. Beck et al (2001) find that well developed financial intermediaries dampen the effect of real sector shocks on the volatility of growth and magnify the impact of monetary shocks. They conclude that overall the impact of financial intermediaries on volatility is ambiguous. Braun and Larrain(2005) and Raddatz (2006) using sectoral value added data in a large cross section of countries, finds that financial development lowers output volatility.

Easterly et al (2000) find that while the financial system acts as a stabilizer and reduces growth volatility, its impact is nonlinear so that the financial system’s risk enhancing properties can result in higher growth volatility. Dabla-Norris and Srivisal (2013) find a nonlinear relationship between financial depth and macroeconomic volatility. At very high levels, financial depth amplifies consumption and investment volatility. However, they find that deeper financial systems are also shock absorbers, mitigating the negative effects of real external shocks on macroeconomic volatility. This is particularly true for consumption volatility when trade and financial openness are high. Related studies examine the effect of financial liberalization on volatility (financial depth often increases with financial liberalization, particularly when cross border lending increases) on volatility. Bekaert et al (2006) show that equity market liberalization and capital account openness is associated with lower consumption growth volatility. Countries with more developed banking sectors have significantly lower consumption growth volatility after financial liberalizations. Aghion et al (2010) find that countries with
tighter credit constraints experience both higher volatility of growth and lower growth rates. Acemoglu et al (2003) find that macroeconomic and financial variables do not have a significant role in explaining volatility once they account for institutions. Institutions are the key determinant of volatility; the only macro variable that may have some additional impact on volatility is the real exchange rate. These papers do not examine whether the effect of finance varies by size.

The paper is organized as follows: the first section examines the relationship between finance and economic volatility. In particular, it analyzes the relationship between total private credit in an economy and GDP or consumption per capita growth volatility and then considers the relationship of these two with household credit.³ The second part of the paper is devoted to borrower characteristics, whether households or firms and growth in GDP per capita. I also examine what effect borrower characteristic may have on the composition of output by differentially affecting growth of certain sectors over others.

Data and Methodology

The data for total private credit are taken from the World Bank’s Global Financial Database and covers 150 countries during 1964-2013. All regressions use 5-year averages. The data for household and firm credit are taken from the Bank for International Settlements. Most regressions cover around 40 countries during 1960-2013. The first section of the paper revisits the relationship between financial development (total private credit over GDP) and volatility in output and consumption per capita. The following section looks separately at household credit. All other data sources and time periods are described in Annex 1. The relationships are estimated using OLS, IV and GMM methods, as appropriate.

Section 1. Volatility

This section examines the relationship between financial system development and volatility that was explored earlier in Easterly et al (2000) and has been explored since in various papers (Beck et al, 2001, Dabla-Norris and Srivisal, 2013). The base regression of interest

³ The analysis is also conducted for enterprise credit, but the results are not shown here for all the cases analyzed.
examines the relationship between volatility in the growth of GDP pc or consumption pc and financial development measured as the share of private credit to GDP.4

\[(1) \text{GDP per capita growth volatility} = a + b(\text{private credit}/\text{GDP}) + c(\text{private credit}/\text{GDP})^2 + e(\text{financ. open}) + f(\text{trade openness}) + g(\log \text{initial GDPpc}) + h(\text{Financial Crisis DV}) + i(\text{DVregion})\]

where volatility is measured as the standard deviation over the 5 year period, DV stands for dummy variable and finance.open is a measure of financial openness. Other variables are included in the robustness checks: the quality of banking supervision, a measure of overall institutional quality, real exchange rate volatility, terms of trade volatility, a dummy variable for commodity exporters, among other things. The results are presented in Tables 1 and 2. The private credit to GDP ratio has a negative relationship with economic volatility in the linear formulation. This is as expected, financial development should help stabilize output volatility. However, the quadratic term is also significant at the 1% level and enters with a positive sign. The volatility reducing effects are due to the financial system’s ability to help smooth expenditures over time and to facilitate longer-term expenditure decisions. However, as the system becomes larger, the financial system’s ability to help agents manage economic risk outweighs its ability to enhance risk /uncertainty in the economy. The turning point at which this occurs varies somewhat between specifications. The lower bound is found in the 2SLS estimation at 95% of GDP. The OLS versions (see Table 1a, equations 2,3) indicate a threshold of 150% of GDP.

Even after accounting for the volatility induced by the financial crisis years, the results hold. Trade openness is significantly associated with economic volatility. The magnitude of the impact of financial systems on volatility depends on the income level of the country; moreover,– OECD countries are less likely to suffer from economic volatility, and African countries (in most specifications), more so.5 Various controls such as real exchange rate volatility, terms of trade volatility, a dummy variable for commodity exporting status, among other things were added.

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4 GDP and consumption volatility were also used as robustness checks.
5 Regressions assessing the impact of the financial sector on growth are also done and shown in Annex 1.
The significance of the private credit variables remains, though these variables are also significant.

A similar set of regressions were done for consumption per capita volatility to see how individual welfare is affected by financial sector development (as differentiated from net exports and investment).
Table 1a: GDP per capita growth volatility and private credit as a share of GDP

| Dep. Var: std_gdppc | OLS (1) | OLS (2) | OLS (3) | FE (4) | 2SLS (5) | GMM (6) |
|---------------------|--------|--------|--------|-------|---------|--------|
| privatecredit       | -0.0110*** | -0.0298*** | -0.0296*** | -0.0126 | -0.0944** | -0.0369*** |
|                     | (0.000)     | (0.000)     | (0.000)     | (0.116) | (0.047)   | (0.000)   |
| privatecredit²      | 0.0001***   | 0.0001***   | 0.0001*     | 0.0005*  | 0.0001*** |
|                     | (0.000)     | (0.000)     | (0.094)     | (0.060)  | (0.001)   |
| financ.open.        | 0.0000*     | 0.0000      | 0.0000      | -0.0012  | 0.0000    |
|                     | (0.071)     | (0.312)     | (0.984)     | (0.210)  | (0.737)   |
| tradeopen.          | 0.0040***   | 0.0047***   | 0.0040**    | 0.005    | 0.0080**  | 0.0051*** |
|                     | (0.002)     | (0.000)     | (0.024)     | (0.023)  | (0.029)   | (0.008)   |
| initialgdppc        | -0.1228**   | -0.0467     | -0.0811     | -0.3164  | 0.2069    | 0.0027   |
|                     | (0.020)     | (0.405)     | (0.221)     | (0.250)  | (0.410)   | (0.977)   |
| financialcrisis     |            |            |            | 1.0962*** |
|                     |            |            |            | (0.001)  |
| ECA                 | -0.0950     | -0.1909     |            |         |
|                     | (0.597)     | (0.386)     |            |         |
| Constant            | 3.0233***   | 3.3321***   | 3.8198***   | 3.8083*** | 2.9289*** | 3.4367*** |
|                     | (0.000)     | (0.000)     | (0.000)     | (0.000)  | (0.005)   | (0.000)   |
| # of Obs.           | 984         | 984         | 894         | 984     | 891       | 984     |
| R-squared           | 0.06        | 0.074       | 0.087       | 0.014   |
| Prob > F            | 0.000       | 0.000       | 0.000       | 0.036   | 0.000     | 0.000   |
| # of countries      | 147         | 147         | 133         | 147     | 147       | 147     |

*: in 2SLS, legal origin is used as instrument.

Robust p-values are presented in parentheses and significance at 1% (***) and 5% (**), and 10%(*) levels are indicated.
(contd) Table 1b: GDP per capita growth volatility and private credit as a share of GDP

| Dep. Var: | GMM (7) | OLS (8) | OLS (9) | OLS (10) | GMM (11) | GMM (12) |
|-----------|---------|---------|---------|---------|----------|----------|
| std_gdppc |         |         |         |         |          |          |
| privatecredit | -0.0322*** | -0.0103** | -0.0181*** | -0.0266*** | -0.0181** | -0.0347*** |
|           | (0.003) | (0.045) | (0.002) | (0.000) | (0.028) | (0.002) |
| privatecredit$^2$ | 0.0001** | 0.0000 | 0.0000** | 0.0001*** | 0.0001* | 0.0001** |
|           | (0.016) | (0.149) | (0.050) | (0.001) | (0.078) | (0.018) |
| financ.open. | 0.0000 | 0.0001 | 0.0004 | -0.0000 | 0.0000 | 0.0000 |
|           | (0.813) | (0.663) | (0.198) | (0.894) | (0.286) | (0.512) |
| tradeopen. | 0.0045* | 0.0061*** | 0.0026 | 0.0051*** | 0.0039* | 0.0044** |
|           | (0.054) | (0.001) | (0.135) | (0.002) | (0.060) | (0.046) |
| initialgdppc | -0.1950 | -0.1767** | 0.0350 | -0.0775 | -0.0713 | -0.0650 |
|           | (0.268) | (0.022) | (0.679) | (0.179) | (0.585) | (0.577) |
| financialcrisis | 1.1157*** |         |         |         | 1.1453*** | |
|           | (0.001) |         |         |         | (0.001) | |
| ECA | 0.7328 | | | | | |
|       | (0.173) | | | | | |
| std_exchangerate | 0.0307* | | | | | |
|           | (0.085) | | | | | |
| tot_change | 0.0009 | 0.0033 | | | | |
|           | (0.854) | (0.529) | | | | |
| commodityexporter | | | 0.3070** | | | |
|           | | | (0.043) | | | |
| Constant | 4.5870*** | 3.5880*** | 2.6603*** | 3.6714*** | 3.2877*** | 3.8188*** |
|           | (0.000) | (0.000) | (0.000) | (0.000) | (0.000) | (0.000) |
| # of Obs. | 900 | 474 | 542 | 978 | 545 | 900 |
| R-squared | 0.112 | 0.032 | 0.078 | | | |
| Prob > F | 0 | 0.000 | 0.000 | 0.000 | 0.003 | 0.000 |
| # of countries | 133 | | | | | |

Robust p-values are presented in parentheses and significance at 1% (***) , 5% (**), and 10%(*) levels are indicated.
### Table 2a: Consumption per capita growth volatility and private credit as a share of GDP

| Dep. Var: std_cons. pc | OLS (1) | OLS (2) | FE (3) | GMM (4) | OLS (5) | 2SLS (6) | GMM (7) |
|------------------------|--------|--------|--------|--------|--------|--------|--------|
| privatecredit         | -0.017*** (0.000) | -0.0507*** (0.000) | 0.0008 (0.947) | -0.0520*** (0.000) | -0.056*** (0.000) | -0.153** (0.022) | -0.060*** (0.001) |
| privatecredit$^2$     | 0.002*** (0.000) | 0.0000 (0.838) | 0.0002*** (0.000) | 0.0002*** (0.000) | 0.0008** (0.045) | 0.0002** (0.020) |
| financ.open.          | -0.001*** (0.004) | -0.0001*** (0.000) | -0.0001*** (0.475) | -0.0001*** (0.000) | -0.0007 (0.130) | -0.002 (0.135) | -0.0001** (0.012) |
| tradeopen.            | 0.0098*** (0.000) | 0.0108*** (0.000) | -0.0001 (0.987) | 0.0113*** (0.000) | 0.0122*** (0.000) | 0.0175*** (0.001) | 0.0113*** (0.003) |
| initialgdppc          | -0.476*** (0.000) | -0.3445*** (0.000) | -0.7918* (0.067) | -0.3261** (0.033) | -0.222** (0.049) | 0.1961 (0.539) | -0.1502 (0.576) |
| financialcrisis       |                   |                   |                   |                   | 1.7668*** (0.000) |                   | 1.2206* (0.057) |
| ECA                   |                   |                   |                   |                   | -0.835*** (0.000) |                   | -0.8344*** (0.003) | -0.7240 (0.386) |
| Constant              | 4.021*** (0.000) | 4.607*** (0.000) | 4.3413*** (0.000) | 4.6308*** (0.000) | 6.1907*** (0.000) | 5.0621*** (0.000) | 5.8678*** (0.001) |
| # of Obs.             | 781               | 781               | 781               | 781               | 740               | 737               | 746               |
| R-squared             | 0.148             | 0.166             | 0.01              | 0                 | 0.189             | 0.080             |
| Prob > F              | 0                 | 0                 | 0.282             | 0                 | 0                 | 0                 |
| # of countries        | 133               | 133               | 133               | 133               |                   |                   | 124               |

*: in 2SLS, legal origin is used as instrument.

Robust p-values are presented in parentheses and significance at 1% (***) , 5% (**), and 10%(*) levels are indicated.
Table 2b: Consumption per capita growth volatility with private credit

| Dep. Var:         | OLS      | OLS      | OLS      | GMM      |
|-------------------|----------|----------|----------|----------|
| stddev_cons.pc    | (1)      | (2)      | (3)      | (4)      |
| privatecredit     | -0.0313*** | -0.0510*** | -0.0422*** | -0.0436*** |
|                   | (0.000)  | (0.000)  | (0.000)  | (0.004)  |
| privatecredit²    | 0.0001*** | 0.0002*** | 0.0002*** | 0.0001**  |
|                   | (0.001)  | (0.000)  | (0.000)  | (0.013)  |
| financialopenness | 0.0001   | -0.0001  | -0.0006  | -0.0001***|
|                   | (0.867)  | (0.891)  | (0.168)  | (0.008)  |
| tradeopenness     | 0.0071** | 0.0095*** | 0.0132*** | 0.0127*** |
|                   | (0.013)  | (0.000)  | (0.000)  | (0.001)  |
| log_initialgdppc  | -0.5663*** | -0.2060  | -0.4334*** | -0.4244** |
|                   | (0.000)  | (0.106)  | (0.000)  | (0.038)  |
| std_exchangerate  | 0.0641*  |          |          |          |
|                   | (0.084)  |          |          |          |
| tot_change        |          | 0.0041   |          |          |
|                   |          | (0.644)  |          |          |
| commodityexporter |          |          | 1.0831*** | 0.9711** |
|                   |          |          | (0.000)  | (0.029)  |
| Constant          | 7.9294*** | 5.8570*** | 6.9072*** | 6.9775*** |
|                   | (0.000)  | (0.000)  | (0.000)  | (0.000)  |
| # of Obs.         | 388      | 462      | 775      | 781      |
| R-squared         | 0.254    | 0.124    | 0.185    |          |
| Prob > F          | 0.000    | 0.000    | 0.000    | 0.000    |
| # of countries    | 133      |          |          |          |

Robust p-values are presented in parentheses and significance at 1% (***) , 5% (**), and 10%(*) levels are indicated.

Section 1b: Does volatility depend on who borrows?

This section examines the relationship between different types of credit and their relationship to volatility. The dependent variables are the same as in the previous section (as are the control variables). However, the explanatory variable is now either household credit as a ratio to GDP or the share of household credit in total private credit. The estimations using share in GDP of household and firm credit to explain economic volatility are shown in Tables 3 and 4.
Table 3: GDP per capita growth volatility and household credit as a share of GDP

| Dep. Var: | OLS  (1) | OLS  (2) | OLS  (3) | FE   (4) | GMM  (5) | OLS  (6) |
|-----------|--------|--------|--------|--------|--------|--------|
| stddev_gdppc | -0.0106*** | -0.0125*** | -0.0116** | -0.0131* | -0.0108 | -0.0175 |
|           | (0.001)  | (0.000)  | (0.017)  | (0.095)  | (0.105)  | (0.144) |
| hhcredit  | 0.0001 |        |         |        |        |        |
|           |         |         |         |        |        | (0.284) |
| hhcredit2 | 0.0008*** | 0.0009*** | 0.0004* | 0.0006 | 0.0000 | 0.0006*** |
|           | (0.000)  | (0.000)  | (0.078)  | (0.328)  | (0.955)  | (0.004) |
| financ.open. | 0.0006 | 0.0001 | 0.0026 | -0.0017 | 0.0043** | 0.0018 |
|           | (0.708)  | (0.965)  | (0.114)  | (0.708)  | (0.114)  | (0.246) |
| tradeopen. | -0.1797 | -0.0948 | -0.0116 | 0.0583 | -0.1315 | -0.212 |
|           | (0.118)  | (0.436)  | (0.958)  | (0.865)  | (0.574)  | (0.174) |
| initialgdppc | -0.0975 |         |         |        |        |        |
|           |         |         |         |        |        | (0.469) |
| institutions | -0.333* | -0.434** |         |        |        |        |
|           | (0.051)  | (0.042)  |         |        |        |        |
| ECA | 1.19 | 1.11*** | 1.68*** |        |
|       | (0.178) | (0.000) | (0.000) |
| financialcrisis | 2.60*** | 2.66*** | 2.65*** | 2.15*** | 2.14*** | 2.74*** |
|           | (0.000)  | (0.000)  | (0.000)  | (0.003)  | (0.000)  | (0.000) |
| Constant | 2.60*** | 2.66*** | 2.65*** | 2.15*** | 2.14*** | 2.74*** |
|           | (0.000)  | (0.000)  | (0.000)  | (0.003)  | (0.000)  | (0.000) |
| # of Obs. | 220  | 220 | 178 | 216 | 216 | 220 |
| R-squared | 0.135  | 0.150 | 0.215 | 0.000 | 0.000 | 0.139 |
| Prob > F  | 0.000  | 0.000 | 0.000 | 0.000 | 0.000 | 0.000 |
| # of countries | 39 | 39 |

Robust p-values are presented in parentheses and significance at 1% (***) , 5% (**), and 10%(*) levels are indicated.

The regressions show a statistically significant and negative relationship between the volatility of GDP per capita growth and household credit. When household credit rises as a share of GDP, it is associated with reduced output volatility, even after accounting for initial GDP per capita. The quadratic term is not significant. However, consumption per capita volatility does not have a consistent association with the share of household credit in GDP. Instead, the share of household credit in total credit (the relative importance of credit to individuals versus firms) is negatively associated with consumption per capita growth volatility and this relationship is
nonlinear. The threshold value, when a rising share of household credit raises volatility is 37%. The quadratic relationship probably indicates the dual purpose of household credit. High shares of household credit probably reflect the greater importance of mortgages. However, this effect disappears in the fixed effects estimation, and only firm credit is significant and enters with a positive sign.
Table 4: Consumption per capita growth volatility with household credit as a share of total private non-financial credit

| Dep. Var: std_conspc | OLS | OLS | FE | FE | FE | FE |
|---------------------|-----|-----|----|----|----|----|
|                     | (1) | (2) | (3) | (4) | (5) | (6) |
| hhcredit/pnfscredit | -0.1253*** | -0.1030*** | -0.0626*** | -0.0753** | -0.0162* | -0.0515* |
|                     | (0.002) | (0.005) | (0.004) | (0.012) | (0.088) | (0.057) |
| (hhcredit/pnfscredit)^2 | 0.0017*** | 0.0011** | 0.0006* | 0.0007* | 0.0006 |
|                     | (0.004) | (0.014) | (0.088) | (0.076) | (0.145) |
| financ.open.        | -0.0000 | 0.0002 | -0.0000 | 0.0001 | -0.0000 | -0.0001 |
|                     | (0.889) | (0.376) | (0.986) | (0.813) | (0.936) | (0.867) |
| tradeopen.          | 0.0048** | 0.0025** | -0.0108 | -0.0092 | -0.0078 | -0.0075 |
|                     | (0.013) | (0.041) | (0.114) | (0.104) | (0.188) | (0.203) |
| initialgdppc        | -0.4602*** | -0.1847 | 0.2503 | 0.4841 |
|                     | (0.002) | (0.363) | (0.463) | (0.254) |
| institutions        | -0.1350 | 0.4698 |
|                     | (0.325) | (0.130) |
| Constant             | 7.6560*** | 5.7346*** | 1.4239 | -2.9863 | 2.5851*** | 3.0416*** |
|                     | (0.000) | (0.000) | (0.618) | (0.493) | (0.000) | (0.000) |

Income Group

| [=all, if empty] | HIGH | HIGH |
|------------------|------|------|
|                  | INCOME | INCOME |
| # of Obs.        | 212 | 177 |
|                  | 212 | 177 |
|                  | 182 | 182 |
| R-squared        | 0.279 | 0.267 |
|                  | 0.279 | 0.267 |
| Prob > F         | 0.000 | 0.000 |
|                  | 0.000 | 0.000 |
|                  | 0.006 | 0.006 |
|                  | 0.003 | 0.003 |
|                  | 0.003 | 0.003 |
| # of countries   | 40 | 39 |
|                  | 30 | 30 |

Robust p-values are presented in parentheses and significance at 1% (***) and 5% (**), and 10%(*) levels are indicated.
Section II: Does it matter for growth who borrows?

This section analyzes the relationship between borrower type and economic growth. The growth regressions are of the following form (using either share of household credit over total credit or using household credit to GDP):

\[
(1) \text{GDP p.c. growth} = a + b \times \text{initial GDP p.c} + c \times \text{household credit/GDP} + d \times \text{household credit/GDP}^2 + e \times X
\]

Where \(X\) encompasses the usual variables used in growth regressions, including foreign direct investment, secondary school enrollment, inflation, institutions, and the quality of banking supervision, among others. Dummy variables for the proportion of years in a banking crisis and to indicate the region of the world where the country is located, are also added.

These regressions are run using annual data as well as five-year averages. The growth regressions use the standard set of control variables and various specifications (not all shown) and are estimated using OLS, 2SLS and GMM.\(^6\) Similar to the results in Beck et al (2008, 2012), I find that per capita growth is not significantly related to the share of household credit in GDP. This is true in OLS, 2SLS, and fixed effects analysis (not all reported here). In the GMM analysis, it is significant, but enters with a negative sign. In contrast, the linear relationship between the share of firm credit in GDP and per capita growth is significant and positive in the 2SLS specification.

In addition, the paper explores the possibility of a nonlinear relationship between household or firm credit and GDP growth. Tables 5a and 5b present some key results. A number of additional control variables are used to check the robustness of the results. The IV regressions use legal origin and religion as instruments. GDP per capita growth is associated with household credit- in the nonlinear specification in OLS, FE and 2SLS estimations. GMM estimation shows no significance or a negative association. Estimations using firm credit on the other hand indicate a consistent nonlinear relationship. When both household credit and firm credit as a ratio to GDP are included, household credit is still insignificant, though firm credit maintains its significant, nonlinear relationship (2SLS shown).

\[^6\] The growth regressions are initially run with total private credit and the results usually found in the literature prevail. Credit and growth are positively associated, but up to a point.
Table 5a: GDP per capita growth with household credit as a share of GDP

| Dep. Var: growth_gdppc | OLS (1) | OLS (2) | FE (3) | FE (4) | GMM (5) | 2SLS (6) |
|------------------------|---------|---------|--------|--------|---------|---------|
| hhcredit               | 0.3144*** | 0.2358** | 0.7880** | 0.8010*** | -0.1030** | 0.4033  |
|                        | (0.006)   | (0.043)  | (0.016)  | (0.015)  | (0.038)  | (0.103) |
| hhcredit^2             | -0.0031*** | -0.0022** | -0.0050** | -0.0038*  | -0.0043*  |         |
|                        | (0.001)   | (0.016)  | (0.016)  | (0.063)  | (0.086)  |         |
| fdi                    | 0.1539    | 0.2275** | 0.4155*  | 0.4472*  | 0.102    | 0.2878* |
|                        | (0.228)   | (0.017)  | (0.098)  | (0.094)  | (0.535)  | (0.081) |
| enrollment             | 0.0426    | 0.0484   | 0.0252   | 0.0095   | 0.0183   | -0.0036 |
|                        | (0.333)   | (0.259)  | (0.713)  | (0.902)  | (0.842)  | (0.942) |
| initialgdppc           | -7.059*** | -6.397*** | -29.33*** | -31.01*** | -5.307   | -6.848*** |
|                        | (0.000)   | (0.000)  | (0.000)  | (0.000)  | (0.102)  | (0.000) |
| financialcrisis        | 13.101*** |          |        |        |         |         |
|                        | (0.000)   |          |        |        |         |         |
| bsupervision           |          | 0.8435   | 3.4665  |        |         |         |
|                        |          | (0.501)  | (0.129) |        |         |         |
| bsupervisionXhhcredit  | -0.0584   |          |        |        |         |         |
|                        |          | (0.175)  |        |        |         |         |
| Inflation              |          |          |        |        | -0.207  |         |
|                        |          |          |        |        | (0.141) |         |
| Constant               | 22.421*** | 22.768*** | 69.443*** | 72.664*** | 30.411*** | 27.780*** |
|                        | (0.000)   | (0.000)  | (0.000)  | (0.000)  | (0.000)  | (0.001) |
| # of obs               | 199       | 199      | 155     | 155     | 199      | 147     |
| R-squared              | 0.278     | 0.378    |        |        |         |         |
| Prob>F                 | 0.000     | 0.000    | 0.000   | 0.000   | 0.002    | 0.000   |
| # of countries         | 36        | 36       | 39      |        |         |         |

*: in 2SLS, legal origin is used as instrument.

Robust p-values are presented in parentheses and significance at 1% (***)**, 5% (**), and 10%(*) levels are indicated.
Table 5b: GDP per capita growth with non-financial corporation credit as a share of GDP

| Dep. Var: growth_gdppe | OLS  | OLS  | FE   | GMM  | 2SLS | 2SLS | 2SLS |
|------------------------|------|------|------|------|------|------|------|
|                        | (1)  | (2)  | (3)  | (5)  | (6)  | (7)  | (8)  |
| nfccredit              | 0.1402*** | 0.1537*** | 0.2465*** | 0.1511** | 1.0213* | 1.1371* | 0.5856* |
|                        | (0.008) | (0.002) | (0.004) | (0.044) | (0.063) | (0.067) | (0.064) |
| nfccredit²             | -0.0004** | -0.0003** | -0.0011*** | -0.0004** | -0.0052 | -0.0059* | -0.003 |
|                        | (0.010) | (0.013) | (0.009) | (0.031) | (0.104) | (0.090) | (0.105) |
| fdi                    | 0.1324 | 0.1301 | 0.5072** | 0.2274 | 0.1290 | 0.3211 | 0.1048 |
|                        | (0.398) | (0.341) | (0.026) | (0.114) | (0.466) | (0.240) | (0.588) |
| enrolment              | 0.0108 | 0.0301 | 0.0562 | 0.0138 | -0.0119 | -0.0237 | -0.0234 |
|                        | (0.817) | (0.486) | (0.149) | (0.793) | (0.825) | (0.687) | (0.618) |
| initialgdppe           | -7.08*** | -6.98*** | -18.26*** | -6.70*** | -10.58*** | -10.94*** | -8.92*** |
|                        | (0.000) | (0.000) | (0.000) | (0.010) | (0.000) | (0.000) | (0.000) |
| initial incomeXnfccredit|      |      |      |      |      |      |      |
| financialcrisis        | -16.08*** | -15.36** | -16.02*** | -16.58*** |      |      |      |
|                        | (0.000) | (0.049) | (0.000) | (0.000) |      |      |      |
| inflation              |      |      |      |      | -0.18 |      |      |
|                        |      |      |      |      | (0.198) |      |      |
| tradeopen.             |      |      |      |      | -0.0313 |      |      |
|                        |      |      |      |      | (0.342) |      |      |
| constant               | 23.27*** | 22.02*** | 47.07*** | 23.28*** | 3.40 | 1.60 | 18.11* |
|                        | (0.000) | (0.000) | (0.000) | (0.000) | (0.808) | (0.910) | (0.060) |
| # of obs               | 197 | 195 | 195 | 195 | 146 | 146 | 146 |
| R-squared              | 0.245 | 0.402 |      |      |      |      |      |
| Prob>F                 | 0.000 | 0.000 | 0.000 | 0.000 | 0.000 | 0.001 | 0.000 |
| # of countries         | 38 | 38 |      |      |      |      |      |

*: in 2SLS, legal origin is used as instrument.

Robust p-values are presented in parentheses and significance at 1% (***) , 5% (**), and 10%(*) levels are indicated.

The regressions are re-run using consumption per capita growth as the dependent variable in order to obtain additional insights as to the effect of finance on welfare (Tables 6a and 6b).
Table 6a: Consumption per capita growth with household credit

| Dep. Var: growth_cons.pc | OLS (1) | OLS (2) | FE (3) | FE (4) | GMM (5) | GMM (6) | 2SLS (7) | 2SLS (8) |
|--------------------------|--------|--------|--------|--------|---------|---------|----------|----------|
| hhcredit                 | 0.185** | 0.1265 | -0.0538 | 0.1483 | 0.192*  | 0.1317  | 0.1987   | 0.1400   |
|                          | (0.040) | (0.144) | (0.347) | (0.298) | (0.069) | (0.202) | (0.397)  | (0.558)  |
| hhcredit^2               | -0.002** | -0.0008 | -0.0014 | -0.002** | -0.0009 | -0.0021 | -0.0014  |          |
|                          | (0.026) | (0.206) | (0.152) | (0.029) | (0.289) | (0.348) | (0.544)  |          |
| fdi                      | 0.0835  | 0.1321** | 0.0813  | 0.0963  | 0.0973  | 0.1997  | 0.1401   | 0.1189   |
|                          | (0.258) | (0.024) | (0.561) | (0.513) | (0.291) | (0.106) | (0.220)  | (0.270)  |
| enrolment                | 0.0156  | 0.0150  | 0.0404  | 0.0124  | 0.0125  | 0.0042  | 0.0426   | 0.0364   |
|                          | (0.652) | (0.651) | (0.394) | (0.803) | (0.719) | (0.927) | (0.302)  | (0.372)  |
| initialgdppc             | -6.85*** | -6.31*** | -8.19** | -9.87*** | -7.06*** | -6.19*** | -5.63***  | -5.57***  |
|                          | (0.000) | (0.000) | (0.032) | (0.010) | (0.000) | (0.001) | (0.000)  | (0.000)  |
| financialcrisis          | -9.7978*** |          |         |         | -12.2440*** |          |         | -7.56**  |
|                          | (0.000) |          |         |         | (0.000) |          |         | (0.028)  |
| Constant                 | 25.31*** | 25.99*** | 33.62*** | 35.72*** | 26.71*** | 26.66*** | 21.09***  | 22.88***  |
|                          | (0.000) | (0.000) | (0.001) | (0.000) | (0.000) | (0.000) | (0.000)  | (0.000)  |
| # of Obs.                | 174     | 174     | 174     | 174     | 174     | 174     | 127      | 127      |
| R-squared                | 0.356   | 0.441   |         |         |         |         |          |          |
| Prob > F                 | 0.000   | 0.000   | 0.001   | 0.001   | 0.000   | 0.000   | 0.000    | 0.000    |
| # of countries           | 38      | 38      | 38      | 38      | 38      | 38      | 38       | 38       |

*: in 2SLS, legal origin is used as instrument.

Robust p-values are presented in parentheses and significance at 1% (***) , 5% (**), and 10%(*) levels are indicated.
Table 6b: Consumption per capita growth with nonfinancial corporation credit

| Dep. Var: growth_cons.pc | OLS  | OLS  | FE   | GMM  | 2SLS | 2SLS |
|--------------------------|------|------|------|------|------|------|
|                          | (1)  | (2)  | (3)  | (4)  | (5)  | (6)  |
| nfc.credit               | 0.0915** | 0.0995*** | 0.1275 | 0.1132** | 0.4772** | 0.4818** |
|                          | (0.024) | (0.009) | (0.125) | (0.034) | (0.029) | (0.025) |
| nfc.credit²              | -0.0003** | -0.0002** | -0.0005** | -0.0003** | -0.0030** | -0.0029** |
|                          | (0.019) | (0.032) | (0.040) | (0.026) | (0.017) | (0.019) |
| fdi                      | 0.0921 | 0.0836 | 0.2861* | 0.1649 | 0.1433 | 0.1259 |
|                          | (0.419) | (0.408) | (0.075) | (0.201) | (0.328) | (0.371) |
| enrolment                | 0.0037 | 0.0138 | 0.0054 | 0.0273 | 0.0277 | 0.0248 |
|                          | (0.923) | (0.697) | (0.918) | (0.586) | (0.463) | (0.518) |
| initialgdppc             | -6.70*** | -6.52*** | -7.86*** | -6.74*** | -6.39*** | -6.55*** |
|                          | (0.000) | (0.000) | (0.002) | (0.000) | (0.000) | (0.000) |
| financialcrisis          | -10.6872*** | -10.5720*** | -11.7216*** | -11.7216*** | -11.7216*** | -11.7216*** |
|                          | (0.000) | (0.000) | (0.000) | (0.000) | (0.067) | (0.067) |
| Constant                 | 25.24*** | 24.54*** | 27.99*** | 23.10*** | 11.65* | 12.10** |
|                          | (0.000) | (0.000) | (0.000) | (0.000) | (0.056) | (0.041) |
| # of Obs.                | 173   | 173   | 173   | 173   | 126   | 126   |
| R-squared                | 0.359 | 0.465 | 0.465 | 0.465 | 0.465 | 0.465 |
| Prob > F                 | 0.000 | 0.000 | 0.000 | 0.000 | 0.000 | 0.000 |
| # of countries           | 38    | 38    | 38    | 38    | 38    | 38    |

*: in 2SLS, legal origin is used as instrument.

Robust p-values are presented in parentheses and significance at 1% (***) , 5% (**), and 10%(*) levels are indicated.
Table 7: GDP per capita and consumption per capita growth with household and nonfinancial corporation credit

| Dep. Var: | growth_gdpcc | growth_gdpcc | growth_cons.pc |
|-----------|--------------|--------------|---------------|
|           | 2SLS         | 2SLS         | 2SLS          |
|           | (1)          | (2)          | (3)           |
| hhcredit  | 0.0627       | 0.0901       | 0.0805        |
|           | (0.324)      | (0.664)      | (0.630)       |
| hhcredit^2| -0.0006      | -0.0005      |               |
|           | (0.764)      | (0.743)      |               |
| nfccredit | 0.1683***    | 0.3244***    | 0.2002***     |
|           | (0.004)      | (0.000)      | (0.002)       |
| nfccredit^2| -0.0009***   | -0.0005***   |               |
|           | (0.000)      | (0.003)      |               |
| fdi       | -0.4300*     | 0.1688       | 0.0819        |
|           | (0.082)      | (0.474)      | (0.631)       |
| enrolment | 0.0342       | -0.0288      | -0.0277       |
|           | (0.557)      | (0.594)      | (0.546)       |
| initialgdppc | -10.00***    | -9.99***     | -8.24***      |
|           | (0.000)      | (0.000)      | (0.000)       |
| Constant  | 92.0477***   | 90.8370***   | 81.0123***    |
|           | (0.000)      | (0.000)      | (0.000)       |
| # of Obs. | 197          | 168          | 157           |

*: in 2SLS, legal origin and religion are used as instruments.

Robust p-values are presented in parentheses and significance at 1% (***) , 5% (**), and 10%(*) levels are indicated.

The other variables have the expected signs, though enrollment is never significant, and FDI is only significant in some specifications. Consumption per capita growth rates tend to be less robustly associated with household credit, particularly after controlling for financial crises. There is no positive relationship in the linear versions, or in the quadratic specification except in the OLS and GMM basic specifications. On the other hand, firm credit retains its quadratic relationship to consumption per capita growth.
Household credit and firm credit are generally used for different purposes, mortgage lending being a large part of household credit in many countries. In order to take a closer look at how credit to different types of agents may be related to the composition of output, a set of regressions are estimated with growth in real manufacturing value added as the dependent variable. Household credit is generally not significantly associated with manufacturing sector growth, and when it is, it enters with a negative sign (Table 8a). In contrast, credit to firms does have a robust relationship with manufacturing sector growth in all types of estimations used. Moreover, the relationship with manufacturing growth is nonlinear. The marginal impact of credit on growth becomes negative for large financial sectors. As discussed earlier, this can be explained by investors are going towards less productive investments (which are safer) or if the opportunities to finance high productivity activities “run out”.

**Table 8a: Manufacturing growth with household credit**

| Dep. Var: | OLS | OLS | GMM | GMM | 2SLS | 2SLS |
|-----------|-----|-----|-----|-----|------|------|
| growth_manuf. | (1) | (2) | (3) | (4) | (5) | (6) |
| hhcredit  | -0.1804*** | 0.0094 | -0.2696*** | -0.3488 | 0.0028 | 0.6807 |
|           | (0.001) | (0.959) | (0.000) | (0.162) | (0.981) | (0.146) |
| hhcredit^2 | -0.0012 | 0.0014 | -0.0074 | (0.396) | (0.390) | (0.105) |
| fdi       | -0.0470 | 0.0340 | -0.1702 | 0.1349 | -0.0845 | 0.4327 |
|           | (0.836) | (0.872) | (0.581) | (0.576) | (0.660) | (0.304) |
| enrolment | 0.1545 | 0.1173 | 0.1124 | 0.1245 | 0.1285 | 0.1068 |
|           | (0.123) | (0.253) | (0.406) | (0.448) | (0.240) | (0.386) |
| initialgdppc | -11.72*** | -11.18*** | -11.24** | -9.63 | -13.86*** | -16.18*** |
|           | (0.000) | (0.000) | (0.016) | (0.134) | (0.000) | (0.000) |
| financialcrisis | -16.28*** | -17.68*** | -16.28*** | -17.68*** | -16.28*** | -17.68*** |
|           | (0.000) | (0.000) | (0.000) | (0.000) | (0.000) | (0.000) |
| Constant  | 44.24*** | 43.47*** | 52.07*** | 45.86*** | 43.76*** | 44.39*** |
|           | (0.000) | (0.000) | (0.001) | (0.001) | (0.000) | (0.000) |

# of Obs. | 147 | 145 | 147 | 145 | 147 | 101 |
R-squared | 0.348 | 0.397 |
Prob > F   | 0.000 | 0.000 | 0.000 | 0.000 | 0.000 | 0.000 |
# of countries | 37 | 36 |

*: in 2SLS, legal origin is used as instrument.
Robust p-values are presented in parentheses and significance at 1% (***)*, 5% (**), and 10%(*) levels are indicated.

Table 8b: Manufacturing growth with nonfinancial corporation credit

| Dep. Var: growth_manuf. | OLS (1) | OLS (2) | OLS (3) | FE (4) | GMM (5) | 2SLS (6) | 2SLS (7) |
|-------------------------|---------|---------|---------|--------|---------|---------|---------|
| nfccredit               | 0.0104  | 0.1897**| 0.7959***| 0.3123*| 0.2009* | 0.9735**| 1.1723**|
|                         | (0.831) | (0.030) | (0.001) | (0.090)| (0.086) | (0.045) | (0.016) |
| nfccredit$^2$           | -0.0005*| -0.005***| -0.001***| -0.0007*| -0.0037 | -0.007**|
|                         | (0.056) | (0.003) | (0.005) | (0.055)| (0.353) | (0.030) |         |
| fdi                     | -0.1164 | 0.0579  | 0.4811  | 0.7786***| 0.2418 | 0.2268  | 0.2133  |
|                         | (0.657) | (0.849) | (0.246) | (0.008)| (0.473) | (0.533) | (0.542) |
| enrolment               | 0.1251  | 0.0586  | 0.1202  | 0.0345 | 0.0987 | 0.0437  | 0.0146  |
|                         | (0.226) | (0.605) | (0.273) | (0.830)| (0.451) | (0.710) | (0.900) |
| initialgdppc            | -13.93***| -13.25***| -16.90***| -39.42***| -15.78***| -15.22***| -19.11***|
|                         | (0.000) | (0.000) | (0.000) | (0.000)| (0.000) | (0.000) | (0.000) |
| financialcrisis         | -19.37***| -15.93***| -19.92***| 3.81   |         |         |         |
|                         | (0.000) | (0.000) | (0.000) | (0.724)|         |         |         |
| financialcrisisX        |         |         |         |        | -0.0601|         |         |
|                         |         |         |         |        | (0.675)|         |         |
| nfccredit               |         |         |         |        | -4.5266**|         |         |
|                         |         |         |         |        | (0.021)|         |         |
| bsupervision            |         |         |         |        |         | 14.60   | 28.26** |
|                         |         |         |         |        |         | (0.635) | (0.025) |
| Constant                | 43.83***| 41.06***| 33.67***| 108.70***| 42.98***| 14.60   | 28.26** |
|                         | (0.000) | (0.000) | (0.001) | (0.000)| (0.006) | (0.635) | (0.025) |
| # of Obs.               | 146     | 144     | 104     | 144    | 144     | 93      | 100     |
| R-squared               | 0.310   | 0.395   | 0.434   |        |         |         |         |
| Prob > F                | 0.000   | 0.000   | 0.000   | 0.000  | 0.000   | 0.000   | 0.000   |
| # of countries          | 36      | 36      |         |        |         |         |         |

*: in 2SLS, legal origin is used as instrument.

Robust p-values are presented in parentheses and significance at 1% (***)**, 5% (**), and 10%(*) levels are indicated.

Taking a deeper look at the relationship between the manufacturing growth and the characteristic of the borrower, the paper examines the relationship between manufacturing value
added and the *share* of household credit to total private credit and separately, the share of firm credit in total credit. As Tables 9 and 10 show, the household credit share is negatively, if at all, related to manufacturing growth. In contrast, the share of firm credit is positively associated with manufacturing sector growth, having a similar relationship as with overall consumption or GDP growth, in that it is also nonlinear.  

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7 The estimation is rerun using both the share of household credit and firm credit in GDP as explanatory variables and there is no substantial change in the results. Both shares have nonlinear relationships with the expected signs.
Table 9: Manufacturing growth with household credit as a share of total private nonfinancial credit

| Dep. Var: growth_ manuf. | OLS   | OLS   | OLS   | GMM   | GMM   | GMM   |
|--------------------------|-------|-------|-------|-------|-------|-------|
|                          | (1)   | (2)   | (3)   | (6)   | (7)   | (8)   |
| hhcredit/ pnfscredit     | -0.426*** | 0.7354 | -0.418*** | -0.635*** | -0.546** | -0.751** |
|                          | (0.000) | (0.177) | (0.000) | (0.004) | (0.014) | (0.049) |
| (hhcredit/ pnfscredit)^2 |       | -0.0165** |       |       |       |       |
|                          |       | (0.029) |       |       |       |       |
| fdi                      | -0.2064 | -0.1667 | -0.1110 | -0.5124 | -0.0277 | -0.7049 |
|                          | (0.362) | (0.437) | (0.587) | (0.140) | (0.928) | (0.130) |
| enrolment                | 0.1855* | 0.1439 | 0.1537 | 0.2769** | 0.3292** | 0.2029 |
|                          | (0.063) | (0.163) | (0.128) | (0.023) | (0.013) | (0.145) |
| initialgdppc             | -13.31*** | -13.61*** | -11.51*** | -15.54*** | -12.50*** | -14.1504*** |
|                          | (0.000) | (0.000) | (0.000) | (0.000) | (0.000) | (0.000) |
| financialcrisis          |       | -18.95*** | -22.57*** |       |       |       |
|                          |       | (0.000) | (0.000) |       |       |       |
| inflation                |       |       |       |       | -0.4110 |       |
|                          |       |       |       |       | (0.212) |       |
| Constant                 | 144.5*** | 133.5*** | 132.8*** | 165.3*** | 128.2*** | 166.49*** |
|                          | (0.000) | (0.000) | (0.000) | (0.000) | (0.000) | (0.000) |
| # of Obs.                | 147   | 147   | 145   | 147   | 145   | 142   |
| R-squared                | 0.358 | 0.378 | 0.420 | 0.000 | 0.000 | 0.000 |
| Prob > F                 | 0.000 | 0.000 | 0.000 | 0.000 | 0.000 | 0.000 |
| # of countries           | 37    | 36    | 36    | 37    | 36    | 36    |

Robust p-values are presented in parentheses and significance at 1% (***) , 5% (**), and 10%(*) levels are indicated.

Table 10: Manufacturing growth with nonfinancial corporation credit as a share of total private nonfinancial credit

| Dep. Var: growth_ | OLS   | OLS   | OLS   | GMM   | GMM   | GMM   |
|-------------------|-------|-------|-------|-------|-------|-------|
|                   | (1)   | (2)   | (3)   | (4)   | (5)   | (6)   |
| hhcredit/ pnfscredit |       |       |       |       |       |       |
|                   |       |       |       |       |       |       |
| fdi               |       |       |       |       |       |       |
| enrolment         |       |       |       |       |       |       |
| initialgdppc      |       |       |       |       |       |       |
| financialcrisis   |       |       |       |       |       |       |
| inflation         |       |       |       |       |       |       |
| Constant          |       |       |       |       |       |       |
| # of Obs.         |       |       |       |       |       |       |
| R-squared         |       |       |       |       |       |       |
| Prob > F          |       |       |       |       |       |       |
| # of countries    |       |       |       |       |       |       |

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| Variable                      | Coefficient 1 | Coefficient 2 | Coefficient 3 | Coefficient 4 | Coefficient 5 | Coefficient 6 |
|-------------------------------|---------------|---------------|---------------|---------------|---------------|---------------|
| nfccredit/pnfscredit         | 0.4263***     | 2.5609***     | 2.2844**      | 3.4730*       | 0.6941**      | 4.2245*       |
|                               | (0.000)       | (0.009)       | (0.017)       | (0.072)       | (0.020)       | (0.077)       |
| (nfccredit/pnfscredit)^2      | -0.0165**     | -0.0144**     | -0.0223       | -0.0269       |               |               |
|                               | (0.029)       | (0.046)       | (0.116)       | (0.125)       |               |               |
| fdi                           | -0.2064       | -0.1667       | -0.0787       | -0.0566       | -0.7064**     | -0.3821       |
|                               | (0.362)       | (0.437)       | (0.698)       | (0.864)       | (0.025)       | (0.140)       |
| enrolment                     | 0.1855*       | 0.1439        | 0.1177        | 0.2258        | 0.2395**      | 0.1339        |
|                               | (0.063)       | (0.163)       | (0.256)       | (0.109)       | (0.043)       | (0.335)       |
| initialgdppc                  | -13.32***     | -13.61***     | -11.81***     | -14.01***     | -15.26***     | -15.24***     |
|                               | (0.000)       | (0.000)       | (0.000)       | (0.004)       | (0.001)       | (0.001)       |
| financialcrisis               |               |               |               | -18.4604***   | -21.6409***   |               |
|                               |               |               |               | (0.000)       | (0.000)       |               |
| inflation                     |               |               |               |               | -0.3592**     | -0.1899       |
|                               |               |               |               |               | (0.039)       | (0.223)       |
| Constant                      | 101.92***     | 42.30         | 39.13         | 6.72          | 102.47**      | -0.4252       |
|                               | (0.000)       | (0.102)       | (0.133)       | (0.898)       | (0.011)       | (0.995)       |
| # of Obs.                     | 147           | 147           | 145           | 145           | 142           | 142           |
| R-squared                     | 0.358         | 0.378         | 0.435         |               |               |               |
| Prob > F                       | 0.000         | 0.000         | 0.000         | 0.000         | 0.008         | 0.000         |
| # of countries                | 36            | 36            | 36            |               |               |               |

Robust p-values are presented in parentheses and significance at 1% (***) and 10%(*).
Conclusion

This paper has examined the relationship between financial system development and economic growth and volatility, adding to recent research on the topic. There is a substantial theoretical and empirical literature examining the role of the financial sector in raising GDP growth/welfare (consumption per capita), and also, in managing (redistributing or increasing) risk in the economy. This literature got a substantial boost after the 2008 global financial crisis. In addition, policies to enhance the positive effects of financial system development (growth, consumption smoothing) and diminish the potentially negative consequences of financial system growth (unmanageable risks and Knightian uncertainty, misallocation of resources from their most productive use, etc.) were developed and debated. These included various types of macroprudential regulation, regulations on capital market transactions (financial system development being closely linked to cross border capital flows in recent times), and banking regulations, among others.

It finds that private credit has a negative and significant relationship with income per capita growth volatility up to a point. At high levels of private credit to GDP, a larger financial sector increases the volatility of GDP per capita growth. Private credit serves to help smooth consumption per capita, yet at high levels of credit, this effect is dominated by factors that increase consumption per capita volatility. These factors may be related to market perceptions of increased risk, and more frequent enforced consumer deleveraging (at higher ratios, banks are likely to be lending to more risky borrowers, ceteris paribus). I examined whether volatility is influenced by who borrows. The ratio of household credit to GDP is always negatively associated with volatility – probably reflecting the fact that household credit is generally a much less substantial share of GDP than firm credit. However, the share of household credit over private credit does exhibit the same non linear relationship with consumption per capita volatility.

It also examines whether the characteristic of the borrower affects per capita income growth as well in particular manufacturing sector growth. As shown in Beck et al (2012) household credit as a ratio to GDP does not have a consistently significant relationship with GDP per capita growth in 2SLS.
estimation (only OLS and GMM version show some relationship, though of opposing signs). Moreover, the share of household credit in overall credit has a negative relationship with manufacturing sector growth (the ratio to GDP is not significantly associated with manufacturing growth). The share of enterprise credit (as a ratio to GDP or as a ratio to total private credit) on the other hand, has a fairly robust positive association with both overall growth in GDP per capita and manufacturing sector growth. These results are intuitively persuasive as households are not likely to borrow for production of manufactured goods.

The analysis in this paper can be refined and broadened in different ways, particularly as data over longer time periods and for more countries become available. Private credit is only one measure of financial sector development, and it would be interesting to know how different measures, such as stock market capitalization or liquidity, may be related to economic growth and volatility. In addition, analysis to gain more insight about the types of conditions under which financial system induced volatility can be reduced, such as specific regulations on bankers’ pay, or profit taxes would be useful. In terms of the growth impact of financial systems, further research on household credit and its impact on growth composition would be useful.
### Annex 1. Variables used in regressions

| Variable          | Explanation                                                                 | Time Frame | Source                        |
|-------------------|-----------------------------------------------------------------------------|------------|-------------------------------|
| growth_gdppc      | Growth in GDP per capita (constant LCU)                                      | 1964-2013  | WDI                           |
| growth_cons.pc.   | Growth in per capita final consumption expenditure (constant LCU)           | 1964-2013  | WDI                           |
| growth_manuf.     | Growth in value added in manufacturing (constant LCU)                        | 1964-2013  | WDI                           |
| std_gdppc         | Standard deviation of the growth in per capita GDP (constant LCU)            | 1964-2013  | WDI                           |
| std_cons.pc       | Standard deviation of the growth in per capita final consumption expenditure (constant LCU) | 1964-2013  | WDI                           |
| privatecredit     | Private credit by deposit money banks as a share of GDP (%)                  | 1964-2013  | WB-GFD Database               |
| hhcredit          | Total credit to households from all sectors as a share of GDP (%)            | 1964-2013  | BIS                           |
| nfcredit          | Total credit to non-financial corporations from all sectors as a share of GDP (%) | 1964-2013  | BIS                           |
| pnfscredit        | Total credit to private non-financial sector from all sectors as a share of GDP (%) | 1964-2013  | BIS                           |
| institutions      | \[1.5 \times \text{bureaucracy} + \text{corruption} + \text{lawandorder}] / 3 \]  
  \text{bureaucracy}: Bureaucracy Quality Index (4: highest quality, 0: lowest quality)  
  \text{corruption}: Corruption Index (6: least corrupted, 0: most corrupted)  
  \text{lawandorder}: Law and Order Index (6: best, 0: worst) | 1984-2013  | ICRG                          |
| initialgdppc      | Log of GDP per capita in previous period (constant 2005 thousand USD)        | 1964-2013  | WDI                           |
| financ.open.      | Total foreign assets plus total foreign liabilities of the country as a share of GDP | 1970-2011  | Lane and Milesi-Ferretti (2007) |
| Variable          | Description                                                                 | Start Year | End Year | Source                        |
|-------------------|------------------------------------------------------------------------------|------------|----------|-------------------------------|
| tradeopen         | Total exports plus total imports of goods and services as a share of GDP (%) | 1964-2013  |          | WDI                           |
| enrolment         | Gross secondary school enrolment rate (%)                                    | 1964-2013  |          | WDI                           |
| fdi               | Foreign direct investment, net inflows as a share of GDP (%)                  | 1964-2013  |          | WDI                           |
| bsupervision      | Banking Supervision (3: highly supervised, 0: not supervised)                | 1973-2005  |          | Abiad et al (2008)            |
| financialcrisis   | The ratio of the years with banking crises to total number of years in the period | 1970-2011  |          | Laven and Valencia (2012)     |
| legalorigin       | Legal origin of the company law or commercial code of the country. There are five categories: (1) English Common Law, (2) French Commercial Code, (3) German Commercial Code, (4) Scandinavian Commercial Code, (5) Socialist/Communist Laws. | dummy |          | La Porta et al (1999)         |
| religion          | Percentage of the population of country that belonged to the three most widely spread religions in the world in 1980. There are four categories: (1) Roman Catholic, (2) Protestant, (3) Muslim, (4) Other. | dummy |          | La Porta et al (1999)         |
| inflation         | Change in consumer prices (annual %)                                         | 1964-2013  |          | WDI                           |
| std_exchangerate  | Standard deviation of the change in real effective exchange rate index (2010 = 100) | 1964-2013  |          | WDI                           |
| tot_change        | Percentage change in net barter terms of trade index (2000 = 100)            | 1964-2013  |          | WDI                           |
| commodityexporter | =1 if the country is classified as commodity exporter by WEO October 2011, =0 if otherwise. | dummy |          | WEO                           |
| HIGHINCOME        | =1 if the country is classified as high income by WDI, =0 if otherwise        | dummy |          | WDI                           |
| ECA               | =1 if the country is located in Europe and Central Asia region, =0 if otherwise | dummy |          | WDI                           |
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