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DOMESTIC CREDIT GROWTH AND INTERNATIONAL CAPITAL FLOWS

Philip R. Lane and Peter McQuade

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ABSTRACT

Europe experienced substantial cross-country variation in domestic credit growth and cross-border capital flows during the pre-crisis period. We investigate the inter-relations between domestic credit growth and international capital flows over 1993-2008, with a special focus on the 2003-2008 boom period. We establish that domestic credit growth in European countries is strongly related to net debt inflows but not to net equity inflows. This pattern also holds for an extended sample of 54 advanced and emerging economies.

Keywords: Financial stability, financial globalisation, macro-prudential regulation

JEL codes: E51, F32, G15

NON-TECHNICAL SUMMARY

Understanding the origins of the various waves of the global financial crisis (especially the current European crisis) is a high priority for researchers and policy-makers. Such diagnostic work is essential both in designing policy solutions to resolve the current crisis and in improving preventive frameworks to mitigate the risk of future crises.

Two key contributory factors in the current crisis have been the balance sheet problems associated with rapid credit growth in some countries (most obviously, Ireland and Spain) during the pre-crisis period and excessive external imbalances. For instance, Lane and Milesi-Ferretti (2011) have documented that the variation in the size of recessions during 2008-2009 was significantly related to the scale of domestic credit growth during the 2003-2008 period and the size of outstanding current account imbalances. In related fashion, Lane and Milesi-Ferretti (2012) show that above-normal current account deficits during the pre-crisis period was significantly associated with major declines in domestic demand and sharp reversals in private capital flows over 2008-2010.

The importance of these twin factors raises the question of whether there are important interactions between domestic credit growth and international capital flows. If these variables are jointly determined and/or interact in economically-interesting ways, this should frame the analytical framework guiding theoretical and policy analysis. Along one dimension, it would indicate that international capital flows should be a central theme in the rapidly-growing macro-prudential literature that seeks to understand the dynamics of domestic credit growth (and the associated risk factors). Along another dimension, it would indicate the domestic credit channel is a key channel in understanding the relation between international capital flows and domestic macroeconomic and financial variables.

In this paper, our main focus is on the relation between domestic credit growth and international capital flows for a sample of European countries. In particular, we focus on the EU27, plus Norway, Switzerland and Iceland. (Taken together, we label these countries as the E30 group.) Europe is an important testing ground for exploring the inter-relation between credit and capital flows, in view of the remarkable dispersion in domestic credit patterns during the pre-crisis period and the very high level of cross-border capital flows.

Moreover, the large and persistent intra-European external imbalances provide an additional layer of complexity (Giavazzi and Spaventa 2010, Lane and Pels 2012). In particular, net capital ows and domestic credit growth have been separately identified as important sources of macroeconomic imbalances, such that it is highly relevant to understand any inter-connections between these variables.

A major trend in European banking systems during the pre-crisis period was the divergence between domestic deposit growth and credit growth. In order to finance credit growth that was more rapid than deposit growth, banks raised funds by borrowing short term on international interbank and money markets and by issuing bonds. These shifts in bank funding patterns in Europe and the associated growth in cross-border bank-related financial flows are suggestive that a systematic relation might exist between international capital flows and domestic credit growth.

The primary focus is on the E30 group over the period 2003-2008, although additional analysis is conducted on annual data for an extended sample of 54 countries for the period 1994-2008. Using these data we present stylised facts and run a series of OLS regressions to explain credit growth. As there may be two-way causality effects between domestic credit growth and international capital flows, we also report IV estimates, where international financial flows are instrumented by their lagged values.

Our analysis confirms that the current account balance is a misleading indicator in understanding the relation between international capital flows and domestic credit growth, in view of the striking differences in the co-variation of domestic credit growth with net debt flows and net equity flows. Moreover, it is striking that net debt flows appears to be the relevant measure, with no apparent gain to splitting net debt flows between gross debt inflows and gross debt outflows. This may have to do with the nature of international trade in debt claims, with many types of gross inflows and outflows essentially cancelling each other out. Furthermore, while our primary motivation is to study the European experience, it is striking that the results are quite similar in the extended sample.

The apparent empirical connection between net international debt flows and domestic credit growth calls for analytical models that can capture this relation. In particular, it is important to understand better both the direct relation between international debt flows and domestic credit growth (for instance, through the international funding activities of domestic banks) and the indirect relation (the impact of international debt flows on domestic macroeconomic and financial variables that can affect both supply and demand factors influencing domestic credit growth).

In turn, these findings have implications for macro-prudential policy frameworks and the monitoring of excessive imbalances. In particular, our analysis indicates that there is a strong international dimension to the determination of national credit growth rates and that domestic credit growth and external imbalances should be interpreted in an integrated, joint framework.

I INTRODUCTION

Understanding the origins of the various waves of the global financial crisis (especially the current European crisis) is a high priority for researchers and policy-makers. Such diagnostic work is essential both in designing policy solutions to resolve the current crisis and in improving preventive frameworks to mitigate the risk of future crises.

Two key contributory factors in the current crisis have been the balance sheet problems associated with rapid credit growth in some countries (most obviously, Ireland and Spain) during the pre-crisis period and excessive external imbalances. For instance, Lane and Milesi-Ferretti (2011) have documented that the variation in the size of recessions during 2008-2009 was significantly related to the scale of domestic credit growth during the 2003-2008 period and the size of outstanding current account imbalances. In related fashion, Lane and Milesi-Ferretti (2012) show that above-normal current account deficits during the pre-crisis period were significantly associated with major declines in domestic demand and sharp reversals in private capital flows over 2008-2010.

The importance of these twin factors raises the question of whether there are important interactions between domestic credit growth and international capital flows. If these variables are jointly determined and/or interact in economically-interesting ways, this should frame the analytical framework guiding theoretical and policy analysis. Along one dimension, it would indicate that international capital flows should be a central theme in the rapidly-growing macro-prudential literature that seeks to understand the dynamics of domestic credit growth (and the associated risk factors). Along another dimension, it would indicate the domestic credit channel is a key channel in understanding the relation between international capital flows and domestic macroeconomic and financial variables.

In terms of related literature, there is a sizeable body of work on the macroeconomic effects of credit booms (see, amongst others, Mendoza and Terrones 2012). In related fashion, there is considerable evidence that financial crises are often preceded by domestic credit booms (Jorda et al 2011, Schularick and Taylor 2012, Gourinchas and Obstfeld 2012).

Still, these studies largely do not focus on the driving forces behind cross-country differences in credit growth. While there is a development finance literature that studies cross-country variation in credit ratios, this literature focuses on differences between developing and advanced countries, rather than on variation within the set of advanced economies (Djankov et al 2007, Tressel and Detragiache 2008).

Moreover, Hume and Sentance (2009) emphasise that the nature of the recent credit boom poses a challenge to existing macroeconomic models. In part, this reflects the general limitations of

current macroeconomic models to adequately incorporate the full spectrum of macro-financial linkages. In addition, financial innovation and structural changes in financial systems can disrupt traditional credit mechanisms. In this regard, Schularick and Taylor (2012) and Baeriswyl and Ganarin (2012) emphasise the weakening connection between monetary aggregates and credit growth, reducing the reliability of traditional monetary models of credit growth.

One of the major structural changes in financial systems in recent decades has been the rapid growth in international financial integration (Lane and Milesi-Ferretti 2007). Moreover, as emphasised by Lane and Milesi-Ferretti (2008), there is a strongly positive relation between the size of domestic financial systems and the scale of cross-border financial positions.

The opening up of financial systems and the rise in cross-border financial flows can influence domestic credit growth through multiple channels. At a macroeconomic level, current account imbalances can affect macroeconomic variables such as the rate of output growth, the level of domestic spending, exchange rates, inflation and asset prices which can all influence equilibrium credit growth in a range of macro-financial models.

Still, it is important to emphasise that financial integration can influence credit dynamics even if the current account is in balance (Borio and Disyatat 2011, Gourinchas 2012, Obstfeld 2012a, 2012b). In particular, gross international financial flows affect the funding environment faced by domestic banks and non-banks, while also altering the menu of financial assets that can be held by domestic banks and non-banks.

Under financial integration, domestic banks can seek funding from foreign depositors and international counterparties in the interbank market and money market. In addition, domestic banks can obtain medium-term funding through international bond issues. Interoffice funding is yet another channel, with domestically-owned banks linked to overseas affiliates and foreign-owned affiliates active in the domestic system linked to their parent banks. In relation to equity funding, foreign portfolio investors and foreign direct investors are important sources of shareholder capital for domestic banks.

On the asset side, domestic banks can hold foreign assets as well as domestic assets, with foreign banks a primary set of counterparties for cross-border transactions. In relation to international banks and multinational banks, a substantial proportion of cross border positions are maintained vis-a-vis other branches and affiliates within the same banking organisation (see also McCauley et al 2010).

In relation to non-banks, most domestic corporates and households only indirectly engage with international financial system, with most claims and liabilities intermediated by the domestic

banking system. Accordingly, these entities are mainly affected by international capital flows to the extent that these flows influence the provision of credit by domestic banks. However, large corporates can raise international funding through bond issuance and inter-o-ce lending/borrowing between domestic and foreign affiliates, as well as maintaining direct cross-border relations with foreign banks. As quantified by Lanau (2011), tighter domestic financial regulation can also prompt an increase in direct cross-border borrowing by domestic non-banks that seek to overcome domestic restrictions on access to credit. Borio et al (2011) show that international credit grew strongly during the pre-crisis period, which is complementary to our focus on domestic credit.

Some recent contributions have focused on the role of gross international capital flows in the funding of banks and the shadow banking system. For instance, Acharya and Schnabl (2009) highlight that the overall current account balance is not a good guide to the direction of bank-related capital flows. These authors focus on the sources of foreign funding for the US shadow banking system and establish that European banks (rather than the main current account surplus countries) were the main international purchasers of US mortgage-related assets.

Similarly, Shin (2012) emphasises the role of gross capital flows between Europe and the United States in fuelling the US credit boom in the mid-2000s, even though the associated net capital flows were zero since European banks were raising funding in the US to buy US-located assets, while Cetorelli and Goldberg (2012) highlight the role of cross-border internal funding in determining the behaviour of global banks.

While highly informative on specific channels, these studies do not examine aggregate capital flows and aggregate domestic credit growth. Bruno and Shin (2013) look at the inter-relation between international banking-sector flows and domestic private credit, emphasising that global liquidity and the leverage cycle of global banks as a key driver of credit growth in a wide sample of countries. However, their specification does not directly examine the relation between cross-country variation in capital flows and the cross-country variation in domestic credit growth.

Jorda et al. (2011) highlight that the bilateral correlation between credit growth and the current account was not important historically but turned significant after 1975. However, these authors do not systematically look at the inter-relation between the current account and credit growth in a multivariate setting, nor at the possible differences between the underlying net debt and net equity flows.

Mendoza and Terrones (2012) also find that credit booms are typically associated with net capital inflows. However, that study does not differentiate between net debt flows and net

equity flows. Moreover, it only considers credit booms rather than also investigating the behaviour of capital flows during periods of low (or even negative) domestic credit growth. In a recent contribution, Calderon and Kubota (2012) examine a large sample of countries over 1975.Q1 to 2010.Q4 and find that surges in gross debt inflows are a good predictor of subsequent credit booms, which is a pattern consistent with the results in this paper.

Finally, a related strand of research examines the connections between house prices and international capital flows, with a primary emphasis on the current account (see, amongst others, Aizenman and Jinjarik 2009, Adam et al 2011, Favilukis et al 2012a).

Domestic credit growth is surely a key mechanism linking capital flows and house prices but this channel is not directly studied by this line of work, even if credit supply factors and international capital flows are recognised in some of this work as separate factors influencing house price dynamics.

In this paper, our main focus is on the relation between domestic credit growth and international capital flows for a sample of European countries. In particular, we focus on the EU27, plus Norway, Switzerland and Iceland. (Taken together, we label these countries as the E30 group.) Europe is an important testing ground for exploring the interrelation between credit and capital flows, in view of the remarkable dispersion in domestic credit patterns during the pre-crisis period and the very high level of cross-border capital flows. Moreover, the large and persistent intra-European external imbalances provide an additional layer of complexity (Giavazzi and Spaventa 2010, Lane and Pels 2012). In particular, net capital flows and domestic credit growth have been separately identified as important sources of macroeconomic imbalances, such that it is highly relevant to understand any inter-connections between these variables.[1]

Still, we also check whether the patterns observed in the European data also show up in an extended sample of 54 advanced and emerging economies. Previewing our results, we find that the European evidence is largely replicated for the broader sample. The structure of the rest of the paper is as follows. In Section 2, we provide a brief narrative of some of the main trends in European banking activity, with a particular focus on the growth in cross-border funding. Next, we present some key stylized facts and correlation patterns in Section 4. Section 5 reports the econometric analysis. Finally, Section 6 concludes.

[1] The European Commission's "excessive imbalances" procedure (as laid out in the 2011 "six pack" regulations) includes both rapid credit growth and large current account deficits as warning indicators.

2 DOMESTIC CREDIT AND INTERNATIONAL CAPITAL FLOWS IN EUROPE: A BRIEF NARRATIVE

A major trend in European banking systems during the pre-crisis period was the divergence between domestic deposit growth and credit growth. In the E30 group of countries, the average ratio of bank deposits to GDP grew from 57 percent in 1999 to 89 percent in 2007, whereas the average ratio of private credit to GDP grew much more quickly from 67 percent in 1999 to 107 percent in 2007.

In order to finance credit growth that was more rapid than deposit growth, banks raised funds by borrowing short term on international interbank and money markets and by issuing bonds. The tight correlation between bank deposits and private credit began to break down as banks increasingly resorted to wholesale cross border funding (Hoggarth et al 2010). According to European Central Bank (2009), the total balance sheets of euro area monetary financial institutions (MFI) increased by 53 percent between December 2003 and December 2007. In particular, banks increasingly resorted to short-term funding, with the share of money markets in the total funding of European banks increasing from 11.8 percent in 2003 to 16 percent in 2007, with rapid growth also in interbank funding and bond issuance.

Much of the increase in domestic credit has been shown to have been facilitated by a large increase in cross border interbank lending, the opening of international subsidiaries and the emergence of financial derivatives (Altunbas et al 2007, Cetorelli and Goldberg 2011, 2012). Accounts of the growth in cross-border banking in Europe are provided by Allen et al (2011), Barnes et al (2010), Committee on the Global Financial System (2010a, 2010b) and Committee on International Economic Policy and Reform (2012).

In relation to intra-European international capital flows, Milesi-Ferretti and Tille (2011) show that bank capital flows increased more rapidly than other types of capital flows.[2] The share of banks in total developed-country outflows went from 21 to 33 percent between the periods 2000-2003 and 2004-2007, while the share of banks in inflows increased from 24 to 32 percent. In the euro area, the share of banks in total capital outflows also rose rapidly from 22 to 32 percent, while the share of banks in inflows increased from 22 to 33 percent. In related fashion, McCauley et al (2010) report that the cross-border positions of banks accounted for 40-60 percent of the external liabilities of Belgium, Switzerland and the UK in 2007 and for a quarter or more in France, Italy and the Netherlands.

[2] See also Lane (2013).

In relation to the new EU member states, a number of studies have identified external factors as driving credit growth during this period (Bakker and Gulde 2010, European Bank for Reconstruction and Development 2010, Jevcak et al 2010). As highlighted by Allen et al (2011), the dominant role of foreign-owned banks in many of these countries meant that these countries were especially influenced by international developments in credit markets. Moreover, Schmitz (2011) highlights that capital inflows into these countries were concentrated in those economies with the most liberalised financial systems.

These shifts in bank funding patterns in Europe and the associated growth in cross border bank-related financial flows suggest that a systematic relation might exist between international capital flows and domestic credit growth. However, an exclusive reliance on banking-sector data may miss other linkages between aggregate capital flows and the supply and demand factors that determine domestic credit growth. Accordingly, it is important to examine the inter-relations between broader measures of international capital flows and domestic credit growth. We turn to these data in Sections 3 and 4.

3 DATA AND STYLIZED FACTS

3.1 COUNTRY SAMPLE

In what follows, we mainly focus on the E30 group, which consists of the 27 member countries of the European Union, plus Iceland, Norway and Switzerland. The latter three countries are all members of the European Economic Area and adhere to EU rules in relation to many dimensions of economic and financial policies. Europe is an especially interesting region for understanding the links between domestic credit growth and international capital flows, in view of the very high degree of international financial integration. In addition, we also examine an extended sample of 54 advanced and emerging countries as listed in Table 1.[3]

3.2 DATA SOURCES

The data appendix gives the full details of the data sources and methods. We measure domestic credit growth as the five-year change in the ratio of private credit to GDP. It is measured over five-year intervals: 1993-1998, 1998-2003 and 2003-2008. We focus on five-year changes to focus on medium-term persistent changes in credit growth and the medium-term correlates of these changes.

In relation to international capital flows, we look at a range of indicators (drawn from the IMF Balance of Payments Statistics (BOPS) databank). In terms of aggregate net flows, we examine the current account balance.[4] We also split aggregate net flows between net debt flows and net equity flows. Going further, we also differentiate between gross inflows and outflows. The capital flows data are expressed as ratios to GDP and are measured as five-year averages.

In terms of sectoral capital flow data, we also examine the BIS international banking statistics dataset and banking component of the BOPS databank. However, the number of BIS reporting countries is limited (especially in relation to Central and Eastern Europe) and the sectoral banking data are quite sparse in the BOPS databank, so that these data are primarily reported in relation descriptive statistics in Section 3 rather than employed for the regression analysis in Section 4.

In relation to other possible co-variates of domestic credit growth, we examine a credit regulation quality index CRINDEX, which is taken from the Fraser Institute Index of Economic Freedom. The subcomponent of the index related to credit regulation quality is itself composed of a number of elements including the percentage of deposits held in privately owned banks, the

[3] We follow Lane and Milesi-Ferretti (2011, 2012) in picking this sample. It consists of all countries that exceed a threshold value of GDP ($20 billion dollars). Accordingly, it excludes tiny countries and countries with very low income per capita.

[4] In the absence of statistical discrepancies, the current account balance should equal net financial flows.

extent to which banks face competition from foreign banks, the percentage of credit extended to the private sector and the presence of interest rate controls.

In addition, we also consider the co-variation between domestic credit growth and the level of GDP per capita and the rate of home ownership, where the latter is taken from the European Union's Survey on Income and Living Conditions (EU-SILC).

3.3 STYLIZED FACTS

Figure 1 shows aggregate domestic credit growth for the E30 group over 1994-2008. Domestic credit growth trended upwards over this period. Although there was a dip during the 2001-2002 recession, this was followed by a period of faster and rising credit growth during 2003-2008. Figure 2 shows the cross-country standard deviation of domestic credit growth, which rose sharply during 2003-2008 relative to previous periods - the credit boom was far from uniform across countries.

This is also clear from Figure 3 which shows domestic credit growth in the individual countries over the period 2003-2008. Mature economies such as Germany, Austria and Norway experienced relatively little credit growth or even negative credit growth. This was also true of new member states like the Slovak Republic, Poland and the Czech Republic. At the other end of the spectrum, Iceland, Ireland, Spain and the Baltic states underwent unprecedented credit booms.

See Figure 1, 2 and 3

As a first step in thinking about the co-variation between domestic credit growth and international capital flows, it is useful to examine differences across the cross-country distribution of credit growth experiences. Table 2 splits countries into three terciles according to the rate of credit growth over 2003-2008. The median increase in the credit-GDP ratio was 13.8 percentage points for the bottom tercile and 56.1 percentage points for the top tercile. In relation to capital flows, the median country in the bottom tercile ran a small current account surplus of 1.3 percent of GDP, whereas the median current account deficit for the top tercile was 9.1 percent.

See Table 2

The differences in terciles are not large for net international equity flows (which are small for the median country in each tercile). However, there is a sizeable difference in relation to net international debt flows - the median net debt flow is close to zero for the bottom tercile, while the median net debt inflow is 9.1 percent of GDP for the top tercile. Furthermore, if we split net

debt flows between non-reserve debt flows and reserve flows, we can see that the inter-tercile difference is driven by non-reserve debt flows.

In relation to gross capital flows, there is little difference across terciles in relation to gross equity flows or gross debt outflows - the difference is in relation to gross debt inflows, with the median value for the bottom tercile at 10.1 percent of GDP compared to 18.1 percent of GDP for the top tercile. In relation to other country characteristics, the top tercile had a higher initial value for the credit/GDP ratio, lower initial GDP per capita, a more liberal credit regulation regime and a markedly-higher rate of home ownership compared to the values for the bottom tercile.

We take a closer look at the different capital flow measures in Table 3. The current account balance is significantly correlated with both net equity flows and net debt flows; however, the bivariate correlation between net equity flows and net debt flows is weakly negative. There is a very high correlation between gross debt inflows and gross debt outflows (0.91), whereas the correlation between gross equity inflows and gross equity outflows is much smaller (0.41). If we look at simple correlations, the current account balance is most closely correlated with net debt flows.

See Table 3

We can learn more by looking at the bivariate scatter plots in Figures 4 and 5. In Figure 4, the scatter shows that domestic credit growth is negatively correlated with the current account. However, the co-variation between domestic credit growth and net debt flows is much closer than is the case for the relation between credit growth and net equity flows. Looking across the different measures of international capital flows, the correlation between the current account and net international debt and net international equity flows appears reasonably similar, especially if we exclude Iceland which is an extreme value in many of the panels. In Figure 5 we show bivariate scatter plots between the domestic credit growth and a number of country characteristics.

Table 4 shows the correlations between net aggregate international debt flows, banking-sector net debt flows (both from the IMF BOPS dataset) and the BIS-sourced measure of the change in the net external assets of the banking sector. (Figure 6 shows bivariate scatter plots for these variables.) The banking-sector data are available for fewer countries than the aggregate measure of net debt flows but Table 4 and Figure 6 indicate reasonably-strong correlations across these different measures.

See Figures 4, 5, 6 and Table 4

4 ECONOMETRIC ANALYSIS

4.1 EMPIRICAL SPECIFICATION

Our baseline cross-sectional specification can be written as

$$(CREDIT_{it} - CREDIT_{it-s}) = \alpha_p - \delta_p CREDIT_{it-s} + \beta_p \ln\left(GDP^{PC}_{it-s}\right) + \theta_{1p} * CRINDEX_{it-s} + \theta_{2p} * HO_{it-s} + \delta_p * \sum_{k=t-(s+1)}^{k=t} INTFIN_{ik+\varepsilon_{ip}}$$

where *CREDIT* is the level of domestic credit to the private sector (expressed as a ratio to GDP), GDP^{PC} is GDP per capita, *CRINDEX* is an index of credit market liberalisation, *HO* is that rate of home ownership and *INTFIN* are measures of international financial flows.[5] We consider multi-year periods, with the main focus on the 2003-2008 boom period.

The inclusion of the lagged level of *CREDIT* and the lagged level of (log) GDP per capita is intended to capture a possible convergence mechanism by which, all else equal, countries with low initial credit ratios and low inital GDP per capita might be expected to experience faster credit growth.

The credit market liberalisation index and the homeownership rate are included to capture structural features of national financial systems that can help to explain differential responses to shifts in global financial conditions. For instance, a more liberal credit market regulatory regime may be more likely to foster and tolerate rapid growth in credit during periods of low risk aversion.[6] A high rate of home ownership can promote faster credit growth during periods of rising housing prices, in view of the positive feedback from housing collateral to the capacity of households to sustain higher leverage (Hofmann 2001, De Bandt et al 2006).[7]

Finally, as was discussed in the introduction, we postulate that international financial inflows can facilitate more rapid credit growth through several mechanisms. Most directly, the domestic banking system can fund an expansion in lending through cross-border liabilities in addition to domestic deposits and other domestic sources. At an indirect level, a higher level of financial inflows can also generate domestic credit growth by pushing up domestic asset prices and

[5] Our focus is on the change in the credit-GDP ratio over five year periods, so we selected control variables that may help to explain the medium-term change in the credit-GDP ratio. We also examined a set of other possible control variables including demographic structure, bank regulation indices, banking sector concentration, the net interest margin, a euro area dummy and the change in the real interest rate. While these variables may plausibly help to explain the cross-country variation in the level of the credit-GDP ratio, it turns out that these do not have significant co-variation with the 5-year change in the ratio.

[6] See also Giannone et al (2011).

[7] As pointed out by a referee, a possible countervailing effect is that a low rate of home ownership may stimulate credit provision if there tends to be convergence in the home ownership rate over time.

raising the level of domestic demand in goods markets, thereby encouraging greater investment and financial acquisitions.

We consider several different specifications for the INTFIN variables. At the most basic level, we examine aggregate net financial flows, as captured by the current account balance. However, net debt flows and net equity flows may have different effects on domestic credit, so we also consider a specification in which aggregate flows are broken down into these two components. Finally, we recognise that gross financial inflows and gross financial outflows may not have symmetric effects on the domestic credit system, so we also look at specifications in which equity and debt flows are further disaggregated between inflows and outflows.

We drop Ireland and Luxembourg from the sample in all the regressions, on account of their outsized role in the international mutual funds industry. The international capital flows associated with mutual funds create very large foreign equity liabilities and foreign debt assets for the hosts of international mutual funds (foreign investors are the predominant owners of equity shares in the funds, while these funds hold large international bond asset portfolios), with these positions having zero impact on the domestic economy.

While the initial credit-GDP ratio, GDP per capita, the credit market liberalisation index and the home ownership rate are predetermined variables, the INTFIN variables are measured contemporaneously with credit growth. Clearly, there may be two-way causality effects between domestic credit growth and international capital flows. Accordingly, we also report IV estimates, where international financial flows are instrumented by lagged values.[8]

As indicated above, our primary focus is understanding credit growth during the 2003-2008 boom period. However, we also run cross-section specifications for the earlier periods (1993-1998 and 1998-2003) and pooled specifications that combine the three cross-sections to see if the relation between capital flows and domestic credit growth is also evident over a longer time period.[9] Furthermore, while our primary motivation is to understand the European experience, we also run our empirical specifications on an extended sample of 54 countries to check if the patterns are similar across a wider group of countries.

4.2 ECONOMETRIC RESULTS

Table 5 shows the results for the 2003-2008 period. We begin in column (1) by just including the convergencevariables (the initial value for the credit-GDP ratio and log GDP per capita).

[8] Our primary focus is on cross-sectional regressions, so the use of lagged values as instruments does not pose the same set of potential problems as in a time series context.

[9] We run separate cross-sections since it is plausible that coefficients should be time-varying, as is written in equation (1). We also report pooled estimates to capture the "average" effects across the whole sample.

While GDP per capita is significant and has the expected negative sign, the initial credit-GDP ratio is significantly positive. This indicates that credit growth during the 2003-2008 period was most intense among those countries that already had high credit-GDP ratios. In fact, this pattern holds across columns (1)-(6).

We expand the specification to include the credit market liberalisation index and the home ownership rate in column (2). Each of these variables is significantly positive: credit growth was faster under more liberal regulatory regimes and in countries with higher rates of home ownership. The former result is consistent with a greater elasticity of credit growth to favourable market conditions in lightly-regulated countries; the latter result is in line with a positive role for housing equity in collateral-based lending during periods of rising asset values.

We introduce the international capital flow variables in columns (3)-(6). We start in column (3) by including the average current account balance. This turns out to be significantly negative: credit growth was faster in countries running current account deficits during this period. Moreover, the inclusion of the current account balance results in the home ownership rate losing individual significance; furthermore, this pattern holds true across columns (3)-(6).

We investigate whether domestic credit growth has similar covariation patterns with net international debt flows and net international equity flows in column (4). The difference is quite striking: net debt flows are highly significant but net equity flows are not significant. This suggests that it is not the overall current account balance that intrinsically matters in understanding the relation between international capital flows and domestic credit growth. Rather, the significant connection is between international net debt flows and credit growth.[10]

We further probe this result in column (5) by splitting net flows into gross inflows and gross outflows. The coefficients on debt inflows and debt outflows are both highly significant and are similar in absolute value. This pattern suggests that it is net debt flows that mainly matters in understanding the inter-relation between international capital flows and domestic credit growth.

See Table 5

In Table 6, we ask whether these results also hold during earlier periods (1993-1998, 1998-2003) and in a pooled specification.[11] We focus on the specifications corresponding to columns (3) and (4) in Table 5. For ease of comparability, we also repeat the 2003-2008 results in columns (5) and (6). Finally, we also report the pooled estimates in column (7) and (8).

[10] As a robustness check, we dropped Iceland from the sample. While the exclusion of Iceland resulted in a less significant result for the current account balance in the column (3) specification, net debt flows remain highly significant and net equity flows are not significant.

[11] In each cross section, we ensure a fixed sample between the current account specification and the specification that splits net financial flows between net debt flows and net equity lows. In the main tables, we do allow the sample to vary across time periods, since the data availability is scarcer for the earlier time periods. However, we also ran a _constant country_ sample, which we report in Section A of the web appendix. The results are very similar for the "constant country" sample.

It turns out the main findings are quite similar across the time periods.[12] In particular, domestic credit growth is significantly related to the current account balance in each time period and in the pooled specification but this is driven by net debt flows rather than net equity flows.

See Table 6

In Table 7, we follow the same format as in Table 6 but now report IV estimates. The instrumental variables regression is estimated using two-stage least squares, with lagged values of the international capital flow variables used as instruments. In all specifications of the first-stage regressions, the lagged flow variables are typically highly significant.[13] As captured by the Kleibergen-Paap LM statistic, the hypothesis of under-identification is typically rejected.[14] We also report the Kleibergen-Papp Wald statistic as a weak instruments test statistic, which is a stier test than the under-identification test. Following Bazzi and Clemens (2013), we tabulate p-values for two thresholds (15 percent and 25 percent) for the size of Wald test that the parameters for the endogenous variables equal zero at the 5 percent significance level. Along this dimension, the results are decidedly mixed, such that our IV strategy should be interpreted as only partially successful. (The instruments are stronger in the larger sample in Table 9.) In the IV estimates, the current account balance is no longer significant in any of the cross-sections while net debt flows and net equity flows are not significant in the individual 1993-1998 and 1998-2003 cross sections. However, net debt flows retain significance in the core 2003-2008 cross section and in the pooled specification.

Next, we turn to the extended sample. To illustrate the main pattern in the data, Figure 7 shows the strong negative correlation between domestic credit and net debt flows in the extended sample for the 2003-2008 cross-section.

See Table 7

We report the regression results for the extended sample in Tables 8 and 9, which have the same format as Tables 6 and 7.[15] In the OLS estimates in Table 8, the significant co-variation pattern between net debt flows and domestic credit growth is again evident in the 1998-2003 and 2003-2008 cross sections and in the pooled estimates. In fact, net equity flows are marginally significant but with a positive sign in the 1998-2003 cross section and in the pooled estimates.

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[12] There are fewer observations for the earlier time periods. Belgium is dropped for 1998-2003, since capital flow data were jointly reported for Belgium and Luxembourg until 2001. The following countries were additionally dropped for 1993-1998: Cyprus, Czech Republic, Slovak Republic, Latvia, Lithuania, Slovenia and Romania.

[13] These results are available in Section C of the web appendix.

[14] We focus on the Kleibergen-Paap statistic, since there are two potentially-endogenous regressors once we include both net debt flows and net equity flows. We also investigated whether the lagged capital flow variables provide additional explanatory power in explaining credit growth but these were insignificant, suggesting that these are valid instruments since they only operate through their influence on contemporaneous capital flows

[15] We also ran the regressions separately for the non-European sample. These results are available in Section B of the web appendix. The co-variation between net debt flows and domestic credit growth is significant for the non-European sample in the OLS estimates for the 2003-2008 cross section and the pooled specification but is not significant in the IV estimates.

The patterns in the IV estimates in Table 9 are similar to those for the European sample in Table 7, with net debt flows significant in the 2003-2008 cross section and in the pooled estimates.

See Tables 8 and 9

In Tables 10 and 11, we report the results for an additional specification in which we split net debt flows between non-reserve net debt flows and reserve flows (which are one component in gross debt outflows). We make this split to check whether the key link is between non-reserve net debt flows and domestic credit growth. While reserve flows have been low for advanced economics in recent times, these were more important for Central and Eastern Europe and the wider set of emerging economies that are included in the extended sample.

We report estimates for a variety of sample splits. In columns (1) and (2), we report the estimates for the extended sample for the key 2003-2008 cross section and the pooled specification. Since the relation between capital flows and credit growth may also depend on the exchange rate regime, we investigate further sample splits in columns (3)-(8). In columns (3)-(4), we restrict attention to the group of European peggers; in columns (5)-(6), we examine all peggers in the extended sample; in columns (7) and (8), we consider the non-peggers in the extended sample.[16]

Across the OLS estimates reported in Table 10, non-reserve net debt flows are highly correlated with domestic credit growth, confirming the basic pattern from the previous tables. In column (2), reserve flows are individually significant, so that rapid accumulation of foreign reserves is associated with slower credit growth. However, reserve flows are not individually significant in the other sample splits. Finally, net equity flows are positive and significant in the pooled estimates for the full extended sample in column (2) and the non-pegger sample in column (8). Non-reserve debt flows generally retain significance for the 2003-2008 cross section in the IV estimates reported in Table 11 and are also marginally significant in the pooled estimates for the European peggers sample.

See Tables 10 and 11

In summary, the econometric analysis shows that several country characteristics are correlated with the cross-country variation in credit growth. In relation to international capital flows, the most striking result is that those countries receiving net debt inflows also experienced the fastest credit growth. This seems to be fairly general pattern but is strongest for the 2003-2008 pre-crisis period.

[16] We follow a de facto peg criterion as implemented by Lane and Milesi-Ferretti (2012). Members of the euro area are defined as de facto peggers. There are not enough non-peggers to examine separately the set of non-peggers for the core European sample.

So far, our empirical work has focused on the 1993-2008 period. We further investigate the relation between capital flows and domestic credit growth by examining the credit boom episodes compiled by Mendoza and Terrones (2012). We focus on episodes in which the credit-GDP ratio increased by more than 10 percent of GDP over a three-year window.

Table 12 flows that the median credit boom in this group involved a large net debt inflow, whereas net equity flows were typically small (in fact, the median case shows a net equity outflow).[17] Accordingly, the general pattern in the case studies conforms to the main findings in our empirical analysis.

4.3 DIRECTIONS FOR FUTURE RESEARCH

Clearly, our empirical focus on the cross-country variation in national-level aggregate data is limited in scope. One direction for future research is to investigate the joint time series dynamics of capital flows and domestic credit growth using higher-frequency data. However, this is likely to be challenging, since capital flow data are quite volatile at high frequencies, whereas credit growth tends to be more stable and persistent, such that medium-term co-variation between these variables may be overshadowed in higher frequency data.

Furthermore, the evidence on the strength of our instruments is decidedly mixed. Accordingly, a further empirical challenge is to investigate alternative approaches in identifying lines of causality between international capital flows and domestic credit growth.

Along another dimension, it would be desirable to investigate the specific channels determining the interaction between international capital flows and domestic credit growth. In particular, given the central role of banking systems in cross-border debt flows, micro econometric studies would be a useful complement in understanding how access to international capital flows influences decisions over funding and credit provision at the level of individual banks and, in the other direction, how domestic credit conditions influence the decision to raise cross-border wholesale funding.

Furthermore, the empirical analysis of cross-border bank flows as a key mechanism linking international capital flows and domestic credit growth should incorporate the central intermediation role played by global banking groups, building on the interesting recent contributions by Cetorelli and Goldberg (2011, 2012), Ivashina et al (2012), Bruno and Shin (2013) and Niepmann (2013).

[17] The main counter-examples are the well-known cases of Japan and Switzerland where the credit booms were associated with current account surpluses and a large net debt outflow in the Swiss episode.

The empirical patterns we have uncovered can also help guide future theoretical research. For instance, the significant correlation between net international debt flows and domestic credit growth suggests that models of domestic credit fluctuations are incomplete if the open-economy dimension is ignored.

Equally, open-economy models that seek to capture the macroeconomic impact of capital flow cycles should incorporate their impact on domestic credit conditions, suggesting that models that lack a distinct role for the financial system miss an important mechanism by which capital flows affect macro-financial outcomes.[18] Moreover, the sharp empirical differences between net debt flows and net equity flows (in terms of the co-variation patterns with domestic credit growth) cry out for models that can match the composition of international capital flows and explain these different co-movement patterns.

In terms of policy relevance, the potential interplay between international debt flows and domestic credit growth is especially important in view of the various distortions that can give rise to inefficient credit booms and international overborrowing (Lorenzoni 2008, Mendoza 2010, Bianchi 2011, Jeanne and Korinek 2011, Bianchi et al 2012). Accordingly, a high priority is to further develop open-economy macroeconomic models with financial frictions that can jointly generate these phenomena. In turn, such models can provide the laboratory to study the general equilibrium impact of various policy proposals (versions of macro-prudential instruments, capital controls) that can mitigate such distortions.[19]

[18] A recent quantitative model for the US that links domestic financial variables to capital inflows is provided by Favilukis et al (2012b). However, that contribution just focuses on the holdings of US treasuries by the foreign official sector rather than a full-scale treatment of capital flows.

[19] It is important to distinguish between macro-prudential regulation and capital controls. Although capital controls might be justifiable on macro-prudential grounds, there could be other unrelated motivations for introducing capital controls.

5 CONCLUSIONS

Our aim in this paper has been to explore the links between international capital flows and domestic credit growth, with a particular focus on understanding the European experience during the 2003-2008 boom period. Our analysis confirms that the current account balance is a misleading indicator in understanding the relation between international capital flows and domestic credit growth, in view of the striking differences in the co-variation of domestic credit growth with net debt flows and net equity flows.

Moreover, it is striking that net debt flows appears to be the relevant measure, with no apparent gain to splitting net debt flows between gross debt inflows and gross debt outflows. This may have to do with the nature of international trade in debt claims, with many types of gross inflows and outflows essentially cancelling each other out. Furthermore, while our primary motivation was to study the European experience, it is striking that the results are quite similar in the extended sample.

The apparent empirical connection between net international debt flows and domestic credit growth calls for analytical models that can capture this relation. In particular, it is important to understand better both the direct relation between international debt flows and domestic credit growth (for instance, through the international funding activities of domestic banks) and the indirect relation (the interplay between international debt flows and domestic macroeconomic and financial variables that can affect both supply and demand factors influencing domestic credit growth).

In turn, these findings have implications for macro-prudential policy frameworks and the monitoring of excessive imbalances.In particular, our analysis indicates that there is a strong international dimension to the determination of national credit growth rates and that domestic credit growth and external imbalances should be interpreted in an integrated, joint framework.

DATA APPENDIX

TERCILE LIST FOR TABLE 2

- Tercile 1: Argentina, Austria, Dominican Republic, El Salvador, Germany, Hong Kong, Indonesia, Israel, Japan, Malaysia, Mexico, Pakistan, Peru, Philippines, Singapore, Sri Lanka, Thailand, Tunisia, Uruguay.
- Tercile 2: Belgium, Brazil, Canada, Chile, Colombia, Costa Rica, Czech Republic, Finland, France, Guatemala, India, Korea, Malta, Norway, Poland, Russian Federation, Slovak Republic, Switzerland, Turkey.
- Tercile 3: Australia, Bulgaria, Cyprus, Denmark, Estonia, Greece, Hungary, Italy, Latvia, Lithuania, Morocco, Netherlands, New Zealand, Portugal, Romania, Slovenia, South Africa, Spain, Sweden.

DESCRIPTION OF VARIABLES

- DCREDIT is the 5 year change in private credit from deposit-taking banks as a ratio to GDP. The main source is the World Bank's Financial Development and Structure dataset, as described in Beck et al (2009). The raw data are taken from the series Private credit by deposit money banks(IFS line 22d), downloaded from the electronic version of the IMF's International Financial Statistics, October 2008. A small number of observations were missing. A number of countries (Austria, Belgium, France, Luxembourg, Netherlands) were missing for the years 1998 and 1999. In these instances the values were interpolated based on the and the 1997 and 2000 values. Supplementary data for the private credit data were taken from the Central Bank of Iceland and the Central Bank of Norway. The series for Norway is total domestic credit and is taken from the Monetary Aggregates Norway series, Table A4. The series used for Iceland were from the Central Bank statistics, household and non-nancial corporation loans from banks in the loans from nancial corporations series and these two series were then summed. The raw data for GDP in USD is also taken from Beck et al (2009).
- CREDIT0 Beginning-of-period ratio of private credit to GDP. Same data sources as for DCREDIT.
- GDP per capita. Dollar GDP from IFS. Population data are the total population series taken from the population section of the population and social conditions section of the Eurostat database.

- CRINDEX is taken credit regulation quality component of the Fraser Institute's Indicators of Economic Freedom dataset. The observations used are either from the beginning of period or, if beginning of period is not available, the earliest available observation. Where data were missing (Bulgaria, Malta and Slovakia), values were constructed on the basis of a comparison of the available Fraser Institute data with data from the Banking Environment and Performance Survey (BEPS) provided by European Bank for Reconstruction and Development (EBRD). The subcomponent of the index related to credit regulation quality is itself composed of a number of elements including the percentage of deposits held in privately owned banks, the extent to which banks face competition from foreign banks and the percentage of credit extended to the private sector and the presence of interest rate controls. For the privately owned banks component, countries with larger shares if of privately held deposits received higher ratings on intervals ranging from 0 to 10. Thus if privately held deposits totaled between 95 and 100 percent, countries were give a rating of 10, between 75-95 percent received 8, and so on while a zero rating was assigned when private deposits were 10 percent or less. The foreign bank competition component is calculated using of the share of foreign bank assets as a share of total bank assets, and the foreign bank license denial rate. The data are scaled from 1 to 10 with higher values indicating more foreign bank competition. The component on the percentage of credit extended to the private sector is calculated as the government fiscal deficit as a share of gross saving. If these data are not available, this sub-component is instead based based on the share of private credit to total credit extended in the banking sector. The data are scaled between 1 and 10 where higher values indicate a greater share of credit extended to the private credit. The data on interest rate controls were scaled from 1 to 10 where higher values indicated greater economic freedom. If, for example, interest rates were determined primarily by market forces and real interest rates were positive, countries were given a rating of 10. A zero rating would apply if the deposit and lending rates were fixed by the government and real rates were persistently negative by double-digit amounts.
- HO is the percentage of households who own their own home and it is taken from the housing section of Eurostat's Income and Living conditions (EU-SILC) survey.
- CAB is the 5 year average current account balance as a ratio to GDP. The data are taken from the IMF Balance of Payment statistics (BOPS).
- NDEBT is the 5 year average net debt flows as a ratio to GDP. The series was calculated using underlying series from the IMF BOPS. Namely, it is the sum of flows series for net portfolio debt assets, net other investment and reserve assets.

- NEQUITY is a variable representing the 5 year average net equity flows assets a ratio to GDP. The series was calculated using underlying series from the IMF BOPS. It is the sum of net portfolio equity assets and net foreign direct investment.
- GDEBTA 5 year average gross debt asset flows as a ratio to GDP. The series was calculated using underlying series from the IMF BOPs. It is the sum of portfolio debt assets, reserve assets and other investment assets.
- GDEBTL 5 year average gross debt liability flows as a ratio to GDP. The series was calculated using underlying series from the IMF BOPs. It is the sum of portfolio debt liabilities and other investment liabilities.
- GEQA 5 year average gross equity asset flows as a ratio to GDP. The series was calculated using underlying series from the IMF BOPs. It is the sum of portfolio equity assets and foreign direct investment assets.
- GEQL 5 year average gross equity liability as a ratio to GDP. The series was calculated using underlying series from the IMF BOPs. It is the sum of portfolio equity liabilities and foreign direct investment liabilities.

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FIGURES AND TABLES

Table 1: Country Sample

United States	Finland	El Salvador	Czech Republic
United Kingdom	Greece	Guatemala	Slovak Republic
Austria	Iceland	Mexico	Estonia
Belgium	Ireland	Peru	Latvia
Denmark	Malta	Uruguay	Hungary
France	Portugal	Cyprus	Lithuania
Germany	Spain	Israel	Slovenia
Italy	Turkey	Indonesia	Poland
Luxembourg	Australia	Korea	Romania
Netherlands	New Zealand	Malaysia	
Norway	South Africa	Singapore	
Sweden	Argentina	Thailand	
Switzerland	Brazil	Morocco	
Canada	Colombia	Bulgaria	
Japan	Dominican Republic	Russia	

Source: Author's calculations based on Beck et al (2009) data.

Table 2: European Domestic Credit Growth: Terciles, 2003-2008

	Tercile 1	Tercile 2	Tercile 3
DCREDIT	13.8	27.1	56.1
CAB	1.3	-3.9	-9.1
NEQUITY	1.5	0.4	-1.1
NDEBT	0.0	-4.8	-9.1
$NDEBT^{NONRES}$	-0.2	-5.1	-10.4
RESERV ES	1.0	0.0	0.8
GDEBTA	12.7	9.6	10.4
GDEBTL	10.1	14.3	18.1
GEQUITY A	3.7	5.2	6.7
GEQUITY L	5.2	4.9	5.9
$CREDIT_0$	90.8	63.7	89.4
Log [GDP_{PC}]	3.5	3.1	2.8
CRINDEX	90.1	87.6	95.0
HO	72.9	77.8	83.1

Note: Countries divided into terciles according to change in credit-GDP ratio between 2003 and 2008, where Tercile 1 are the countries with the slowest credit growth and Tercile 3 are the countries with the fastest credit growth. CAB is current account balance, NEQUITY net equity flows, NDEBT is net debt flows, NDEBTNONRES is the non-reserve component of net debt flows, RESERV ES are official reserve flows, GDEBTA gross debt asset flows, GDEBTL gross debt liability flows, GEQA gross equity asset flows, GEQL gross equity liability flows, CREDIT0 initial credit/GDP ratio, Log[GDPPC] is log GDP per capita, CRINDEX is credit regulation index, HO is home ownership rate. Sample is E30 minus Luxembourg. Ireland and Iceland also excluded from rows for equity and debt flows.

Table 3: International Capital Flows in Europe: Correlations, 2003-2008

	CAB	NDEBT	NEQUITY	GDEBTA	GDEBTL	GEQUITYA	GEQUITYL
CAB	1						
NDEBT	0.50	1					
NEQUITY	0.50	-.032	1				
GDEBTA	-0.07	0.03	-0.17	1			
GDEBTL	-0.27	-0.33	-0.04	0.93	1		
GEQUITYA	0.07	-0.46	0.36	0.45	0.59	1	
GEQUITYL	-0.25	-0.09	-0.43	0.63	0.63	0.67	1

CAB is current account balance, NDEBT is net debt flows, NEQ net equity flows, GDEBTA gross debt asset flows, GDEBTL gross debt liability flows, GEQA gross equity asset flows, GEQL gross equity liability flows. All variables are expressed as ratios to GDP.

Table 4: Alternative Measures of International Debt Flows in Europe: Correlations, 2003-2008

	N DEBT	*NDEBT^{B}*	*NDEBT^{NB}*	*NDEBT^{BIS}*
N DEBT	1 (27)			
NDEBT^{B}	0.85 (17)	1 (17)		
NDEBT^{NB}	0.23 (17)	-0.33 (17)	1 (17)	
NDEBT^{BIS}	0.07 (15)	0.77 (8)	-0.74 (8)	1 (15)

NDEBT is net debt flows, NEQ net equity flows, NDEBTB banking-sector net debt flows, NDEBTNB is non-bank net debt flows, NDEBTBIS BIS-reported change in net external assets of banking sector. All variables are expressed as ratios to GDP. Number of observations in parentheses.

Table 5: European Sample I: OLS

	(1)	(2)	(3)	(4)	(5)
$CREDIT_0$	0.41*	0.54*	0.32	0.17	0.29*
	(0.24)	(0.28)	(0.19)	(0.12)	(0.15)
$Log[GDP_{PC}]$	-0.01*	-0.01	0.01	0.00	0.00
	(0.01)	(0.01)	(0.01)	(0.01)	(0.01)
CRINDEX		1.03*	1.08**	0.92**	1.20***
		(0.55)	(0.46)	(0.34)	(0.41)
HO		1.37**	0.55	0.16	0.22
		(0.64)	(0.40)	(0.31)	(0.30)
CAB			-2.72**		
			(1.03)		
NDEBT				-2.67***	
				(0.33)	
NEQUITY				-0.68	
				(0.64)	
GDEBTA					-3.41***
					(0.45)
GDEBTL					3.15***
					(0.35)
GEQA					-1.73*
					(0.85)
GEQL					1.33
					(0.90)
α	46.8***	-173.3*	-166.6**	-95.3**	-129.2**
	(13.6)	(85.1)	(71.1)	(44.9)	(56.3)
Observations	28	28	28	28	28
R_2	0.13	0.41	0.60	0.86	0.88

Dependent variable is DCREDIT from 2003 to 2008. All columns report results for OLS regressions. Robust standard errors in parentheses. ***, **, * denote significance at 1, 5 and 10 percent levels respectively.

Table 6: European Sample II: OLS

	(1) 93-98	(2) 93-98	(3) 98-03	(4) 98-03	(5) 03-08	(6) 03-08	(7) Pooled	(8) Pooled
$CREDIT_0$	-0.02	0.28*	-0.41**	-0.36*	0.32	0.17	-0.08	-0.14
	(0.13)	(0.15)	(0.18)	(0.19)	(0.19)	(0.12)	(0.14)	(0.12)
$Log[GDP_{PC}]$	0.14*	0.05	0.36***	0.30**	0.11	0.03	0.23***	0.15***
	(0.06)	(0.11)	(0.10)	(0.11)	(0.12)	(0.06)	(0.06)	(0.05)
CRINDEX	-0.38	-0.55	1.86**	1.37*	1.08**	0.92**	0.04	-0.08
	(0.40)	(0.46)	(0.79)	(0.77)	(0.46)	(0.34)	(0.36)	(0.28)
HO	-0.37	-0.24	0.21	-0.10	0.55	0.16	0.18	-0.03
	(0.28)	(0.26)	(0.38)	(0.35)	(0.40)	(0.31)	(0.24)	(0.21)
CAB	-3.18**		-3.54**		-2.72**		-2.78***	
	(1.27)		(1.26)		(1.03)		(0.70)	
NDEBT		-6.57***		-6.32***		-2.67***		-3.13***
		(2.05)		(1.25)		(0.33)		(0.40)
NEQUITY		-1.64		-1.58		-0.68		-0.30
		(2.22)		(2.16)		(0.64)		(0.61)
α_{9803}							-17.6*	-16.7**
							(8.8)	(7.8)
α_{0308}							-0.002	1.8
							(8.2)	(7.5)
α	21.5	20.9	-218.4**	-152.6**	-166.6**	-95.3**	-49.8	-4.8
	(22.5)	(24.1)	(79.0)	(68.3)	(71.1)	(44.9)	(43.1)	(29.3)
Observations	20	20	27	27	28	28	75	75
R2	0.44	0.55	0.58	0.67	0.60	0.86	0.47	0.64

Dependent variable is DCREDIT. Three cross-sections (1993-1998; 1998-2003; 2003-2008). All columns report results for OLS regressions. Robust standard errors in parentheses. ***,**,* denote significance at 1, 5 and 10 percent levels respectively.

Table 7: European Sample II: IV

	(1) 93-98	(2) 93-98	(3) 98-03	(4) 98-03	(5) 03-08	(6) 03-08	(7) Pooled	(8) Pooled
$CREDIT_0$	0.22	0.24**	-0.43**	-0.43**	0.40*	0.18	-0.06	-0.17
	(0.44)	(0.10)	(0.17)	(0.19)	(0.21)	(0.13)	(0.15)	(0.15)
$Log[GDP_{PC}]$	-0.13	-0.16*	0.32***	0.30**	0.03	-0.13	0.18**	0.15
	(0.34)	(0.08)	(0.10)	(0.13)	(0.12)	(0.13)	(0.08)	(0.10)
CRINDEX	-1.04	-0.33	1.21	0.87	1.07***	0.59*	0.19	0.04
	(1.73)	(0.30)	(0.81)	(0.77)	(0.40)	(0.36)	(0.37)	(0.27)
HO	0.95	0.08	0.42	0.41	0.90*	0.08	0.48	-0.20
	(2.26)	(0.19)	(0.43)	(0.64)	(0.48)	(0.38)	(0.32)	(0.31)
CAB	8.24		-1.58		-1.59		-1.26	
	(17.20)		(1.69)		(1.03)		(0.90)	
NDEBT		-2.69		-1.47		-2.58***		-3.88***
		(1.71)		(4.44)		(0.75)		(1.14)
NEQUITY		3.39		-0.62		1.54		-0.23
		(2.29)		(2.71)		(1.72)		(1.28)
α_{9803}							-22.2**	-13.1
							(8.9)	(8.7)
α_{0308}							-3.2	5.4
							(9.1)	(10.2)
α	31.3	46	-164.7**	-131.5*	-172.4***	-14.4	-71.1 -	4.9
	(78.7)	(28.7)	(75.8)	(73.5)	(66.3)	(55.4)	(48.7)	(32.0)
KP LM test	0.49	0.02	0.003	0.05	0.02	0.08	0.002	0.03
K.P. Wald test	0.4	2.1	11.7	1.6	43.2	2.8	51.9	2.1
p – val: 15%	0.80	0.55	0.02	0.66	0.00	0.42	0.00	0.55
p – val: 25%	0.63	0.18	0.00	0.27	0.00	0.10	0.00	0.17
Observations	18	18	26	26	27	27	71	71

Dependent variable is DCREDIT from 2003 to 2008. All columns report results for 2 stage least squares regressions. K.P. LM test refers to the p-value of the Kleibergen-Paap test for under identification. The K.P. Wald test and p-values refer to the Kleibergen-Paap rk Wald statistic for weak identification. p-values calculated based on method outlined in Bazzi and Clemens (2013). For the p-values, the null hypotheses are that that the actual size of the Wald test that the point estimates on the endogenous variables equal zero at the 5 percent significance level is greater than 15 or 25 percent respectively. Robust standard errors in parentheses. ***,**,* denote significance at 1, 5 and 10 percent levels respectively.

Table 8: Extended Sample I: OLS

	(1) 93-98	(2) 93-98	(3) 98-03	(4) 98-03	(5) 03-08	(6) 03-08	(7) Pooled	(8) Pooled
$CREDIT_0$	0.20	0.19	-0.46***	-0.40***	0.23	0.07	-0.09	-0.13
	(0.14)	(0.17)	(0.15)	(0.14)	(0.16)	(0.07)	(0.12)	(0.10)
$Log[GDP_{PC}]$	-0.05	-0.05	0.20***	0.11**	0.05	0.01	0.11***	0.04
	(0.07)	(0.09)	(0.05)	(0.05)	(0.04)	(0.03)	(0.03)	(0.03)
CRINDEX	0.17	0.16	0.41	0.29	0.26	0.25	0.27	0.21
	(0.17)	(0.19)	(0.30)	(0.32)	(0.36)	(0.27)	(0.17)	(0.16)
HO	-0.07	-0.09	0.17	0.25	0.51*	0.33	0.24	0.20
	(0.31)	(0.34)	(0.28)	(0.29)	(0.28)	(0.21)	(0.18)	(0.17)
CAB	-0.83		-0.32		-2.08***		-1.64***	
	(1.29)		(0.69)		(0.51)		(0.46)	
NDEBT		-0.36		-1.84**		-2.33***		-2.29***
		(1.90)		(0.88)		(0.21)		(0.23)
NEQUITY		-0.82		2.73*		0.50		1.23*
		(1.96)		(1.55)		(0.64)		(0.70)
α_{9803}							-6.5	-5.2
							(5.9)	(5.4)
α_{0308}							-5.7	-4.5
							(5.6)	(4.8)
α	0.1	2.8	-49.2*	-28.8	-67.9*	-36.2	-42.0**	-17.8
	(22.5)	(23.4)	(26.6)	(26.0)	(39.6)	(29.4)	(21.1)	(17.3)
Observations	39	39	48	48	53	53	140	140
R^2	0.11	0.09	0.48	0.55	0.51	0.77	0.29	0.46

Dependent variable is DCREDIT from 2003 to 2008. All columns report results for OLS regressions. Robust standard errors in parentheses. ***, **, * denote significance at 1, 5 and 10 percent levels respectively.

Table 9: Extended Sample II: IV

	(1) 93-98	(2) 93-98	(3) 98-03	(4) 98-03	(5) 03-08	(6) 03-08	(7) Pooled	(8) Pooled
$CREDIT_0$	0.17	-0.01	-0.48***	-0.38***	0.21	0.04	-0.14	-0.16*
	(0.10)	(0.16)	(0.13)	(0.10)	(0.15)	(0.07)	(0.12)	(0.10)
$Log[GDP_{PC}]$	-0.08**	0.05	0.21***	0.07	0.06	-0.00	0.12***	0.07*
	(0.04)	(0.07)	(0.05)	(0.09)	(0.04)	(0.03)	(0.03)	(0.04)
CRINDEX	0.01	0.14	0.43	0.22	0.28	0.25	0.25	0.19
	(0.18)	(0.19)	(0.28)	(0.29)	(0.33)	(0.23)	(0.16)	(0.15)
HO	0.00	-0.34	0.27	0.36	0.63*	0.45**	0.34*	0.30*
	(0.21)	(0.33)	(0.28)	(0.31)	(0.32)	(0.21)	(0.20)	(0.17)
CAB	0.52		-0.12		-1.69***		-1.01**	
	(1.12)		(0.58)		(0.51)		(0.42)	
NDEBT		3.46		-2.52		-2.15***		-1.60***
		(3.47)		(1.79)		(0.32)		(0.57)
NEQUITY		-4.56		4.42		1.34		1.06
		(3.82)		(2.92)		(0.86)		(1.45)
α_{9803}							-9.2*	-8.0*
							(5.4)	(4.8)
α_{0308}							-6.1	-5.2
							(5.6)	(5.0)
α	17.3	6.9	-58.7**	-21.0	-78.0*	-38.6	-46.2**	-25.5
	(23.2)	(29.3)	(27.1)	(36.7)	(40.3)	(26.6)	(21.3)	(17.5)
KP LM test	0.09	0.09	0.02	0.08	0.01	0.01	0.0001	0.02
K.P. Wald test	12.1	1.2	66.3	1.5	78.7	6.9	127.5	3.4
p – val: 15%	0.00	0.75	0.00	0.68	0.00	0.05	0.00	0.32
p – val: 25%	0.00	0.37	0.00	0.29	0.00	0.00	0.00	0.06
Observations	35	35	46	46	51	51	132	132

Dependent variable is DCREDIT. Three cross sections (1993-1998; 1998-2003; 2003-2008). All columns report results for 2 stage least squares regressions. K.P. p-val. refers to the p-value of the Kleibergen-Paap test for underidentification. The K.P. Wald test and p-values refer to the Kleibergen-Paap rk Wald statistic for weak identification. p-values calculated based on method outlined in Bazzi and Clemens (2013). For the p-values, the null hypotheses are that that the actual size of the Wald test that the point estimates on the endogenous variables equal zero at the 5 percent significance level is greater than 15 or 25 percent respectively. Robust standard errors in parentheses. ***,**,* denote significance at 1, 5 and 10 percent levels respectively.

Table 10: Alternative Specifications: OLS

	(1) 03-08	(2) Pooled	(3) E30 Peg 03-08	(4) E30 Peg Pooled	(5) Peg 03-08	(6) Peg Pooled	(7) Non-Peg 03-08	(8) Non-Peg Pooled
$CREDIT_0$	0.05	-0.13	0.14	-0.10	0.22	-0.10	-0.15	-0.16
	(0.08)	(0.10)	(0.17)	(0.15)	(0.17)	(0.14)	(0.14)	(0.14)
$Log[GDP_{PC}]$	0.02	0.04	0.15	0.23**	-0.02	0.08	0.03	0.00
	(0.03)	(0.03)	(0.11)	(0.11)	(0.06)	(0.07)	(0.03)	(0.04)
CRINDEX	0.24	0.21	1.35***	1.08**	0.19	0.53	0.32	0.09
	(0.27)	(0.16)	(0.38)	(0.39)	(0.40)	(0.38)	(0.38)	(0.20)
HO	0.24	0.21	0.15	0.12	0.66	-0.17	-0.20	0.18
	(0.26)	(0.19)	(0.48)	(0.34)	(0.56)	(0.38)	(0.35)	(0.22)
$NDEBT^{NONRES}$	-2.41***	-2.27***	-4.64***	-4.29***	-2.27**	-3.20***	-2.42***	-1.95***
	(0.19)	(0.25)	(0.92)	(0.74)	(0.89)	(0.76)	(0.28)	(0.25)
RESERVES	-1.45	-2.54**	-9.53	-4.01	0.05	-4.10	0.23	-1.74
	(1.26)	(1.19)	(5.45)	(4.40)	(5.48)	(4.07)	(1.47)	(1.21)
NEQUITY	0.50	1.21*	-2.29	-1.58	0.99	-0.47	1.50	2.93***
	(0.60)	(0.70)	(1.48)	(1.07)	(1.37)	(0.95)	(1.11)	(0.97)
α_{9803}		-5.4		52.9		7.5		-1.5
		(5.3)		(31.6)		(19.0)		(6.0)
α_{0308}		-4.8		17.4		2.7		-4.6
		(5.3)		(12.4)		(10.9)		(5.9)
α	-31.2	-18.2	-172.7**	-154.0**	-57.6	-32.0	-4.8	1.2
	(32.6)	(17.8)	(68.0)	(61.6)	(58.2)	(45.0)	(41.8)	(19.7)
Observations	53	140	20	40	22	47	31	93
R^2	0.77	0.46	0.73	0.60	0.62	0.50	0.86	0.48

Dependent variable is DCREDIT from 2003 to 2008. All columns report results for OLS regressions. Robust standard errors in parentheses. ***, **, * denote significance at 1, 5 and 10 percent levels respectively.

Table 11: Alternative Specifications: IV

	(1) 03-08	(2) Pooled	(3) E30 Peg 03-08	(4) E30 Peg Pooled	(5) Peg 03-08	(6) Peg Pooled	(7) Non-Peg 03-08	(8) Non-Peg Pooled
$CREDIT_0$	0.03	-0.16	0.18	-0.15	0.24	-0.06	-0.18	-0.21
	(0.08)	(0.10)	(0.18)	(0.23)	(0.20)	(0.14)	(0.12)	(0.16)
$Log[GDP_{PC}]$	-0.00	0.07	-0.02	0.39	-0.07	0.02	0.03	0.07
	(0.04)	(0.04)	(0.21)	(0.28)	(0.05)	(0.08)	(0.03)	(0.05)
CRINDEX	0.19	0.22	0.47	1.81	-0.16	0.53	0.34	0.10
	(0.24)	(0.16)	(1.00)	(1.18)	(0.40)	(0.37)	(0.32)	(0.20)
HO	0.35	0.45**	0.13	-0.47	0.74	-0.08	-0.11	0.40
	(0.31)	(0.23)	(0.81)	(0.94)	(0.90)	(0.75)	(0.37)	(0.27)
CAB	-2.30***	-0.88	-4.53**	-8.81*	-2.83	-3.78	-2.22***	-0.16
	(0.40)	(1.08)	(2.26)	(4.49)	(2.29)	(2.43)	(0.39)	(1.24)
NDEBT	-1.61	-1.98	-4.26	-12.59	4.56	-2.15	0.07	-2.13
	(1.27)	(1.27)	(11.08)	(13.66)	(6.18)	(5.31)	(1.32)	(1.63)
NEQUITY	1.26	1.16	1.43	-4.65	3.99**	1.75	2.25*	2.05
	(0.87)	(1.45)	(4.43)	(5.79)	(1.55)	(1.71)	(1.27)	(2.33)
α_{9803}		-10.0**		83.0		7.7		-10.1
		(4.9)		(70.2)		(16.0)		(6.5)
α_{0308}		-7.2		38.9		2		-9.5
		(6.1)		(28.5)		(12.0)		(7.8)
α	-27.8	-36	-47.6	-240.3*	-22.3	-27.8	-8.4	-20.9
	(30.8)	-22	(142.2)	(140.6)	(95.9)	(61.5)	(36.3)	(24.4)
KP LM test	0.08	0.03	0.18	0.14	0.05	0.04	0.01	0.05
K.P. Wald test	3.2	2.5	1.0	0.8	1.7	1.9	3.7	2.0
p – val: 15%	0.35	0.47	0.80	0.84	0.64	0.60	0.28	0.57
p – val: 25%	0.07	0.13	0.43	0.54	0.24	0.21	0.05	0.20
Observations	50	132	19	37	21	43	30	89

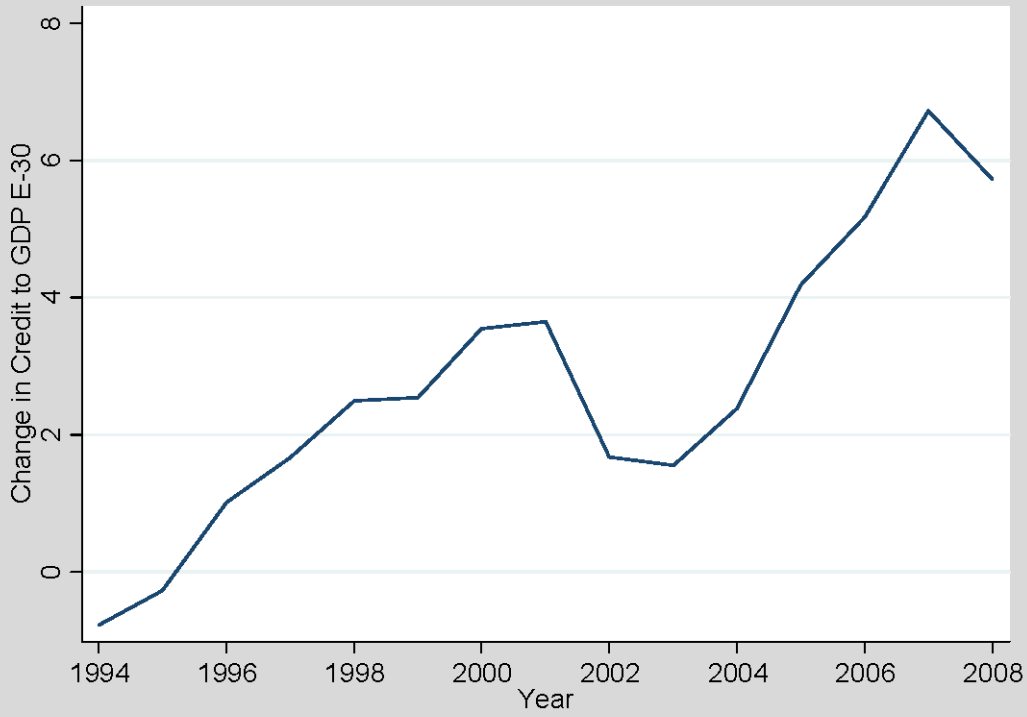
Dependent variable is DCREDIT. Three cross sections (1993-1998; 1998-2003; 2003-2008). All columns report results for 2 stage least squares regressions. K.P. p-val. refers to the p-value of the Kleibergen-Paap test for underidentification. The K.P. Wald test and p-values refer to the Kleibergen-Paap rk Wald statistic for weak identification. p-values calculated based on method outlined in Bazzi and Clemens (2013). For the p-values, the null hypotheses are that that the actual size of the Wald test that the point estimates on the endogenous variables equal zero at the 5 percent significance level is greater than 15 or 25 percent respectively. Robust standard errors in parentheses. ***,**,* denote significance at 1, 5 and 10 percent levels respectively.

Table 12: Credit Booms and Capital Flows

		DCREDIT	CAB	NDEBT	NEQUITY
Australia	1985-1988	10.0	-10.2	-11.7	-1.4
Brazil	1987-1989	24.7	0.8	0.5	-0.9
Chile	1977-1980	19.7	-6.4	-19.3	-2.1
Denmark	1984-1987	17.6	-11.3	-15.8	2.1
Finland	1987-1990	17.3	-11.1	-17.3	4.4
France	1987-1990	10.9	-1.5	-2.0	2.3
Japan	1987-1990	23.6	6.1	-0.3	5.2
Norway	1984-1987	21.9	-6.5	-13.4	3.0
Switzerland	1986-1989	16.6	12.3	17.9	-0.7
United Kingdom	1986-1989	37.0	-9.8	-14.1	3.0
United States	1985-1988	12.4	-8.4	-6.2	-2.0
Median		17.6	-6.5	-11.7	2.1

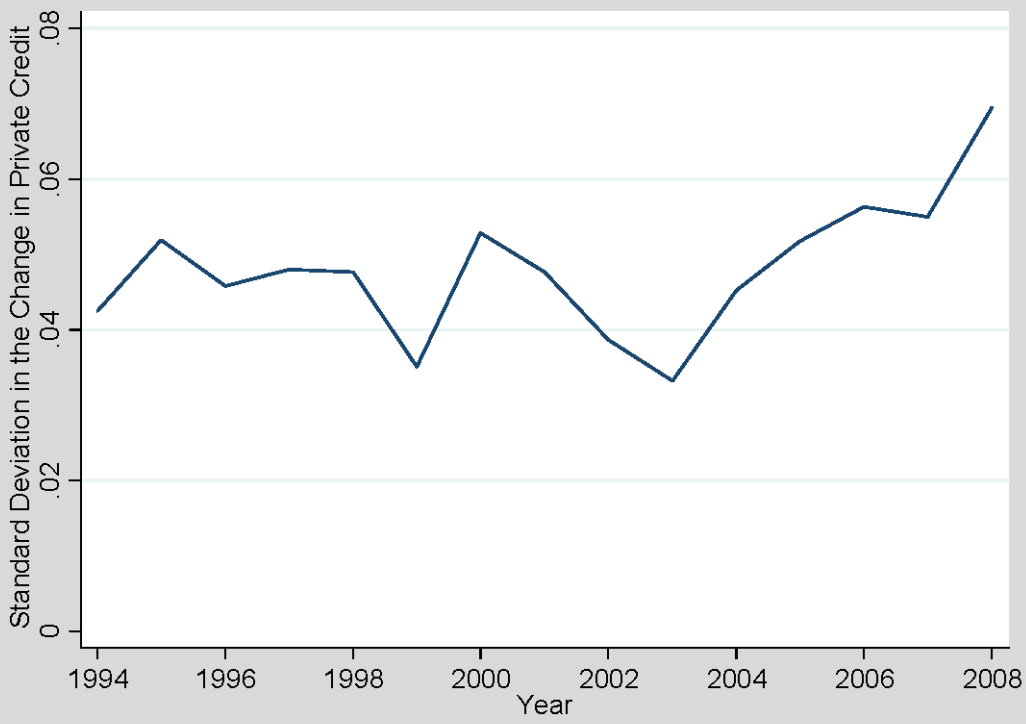
Credit boom episodes (T-3,T) where year T is the peak of the boom. Episodes taken from Mendoza and Terrones (2012) and restricted to those with increases in credit/GDP ratio by more than 10 percent of GDP. Singapore excluded due to high errors and omissions in capital flow data.

Figure 1: E30; Aggregate Domestic Credit Growth, 1994-2008.



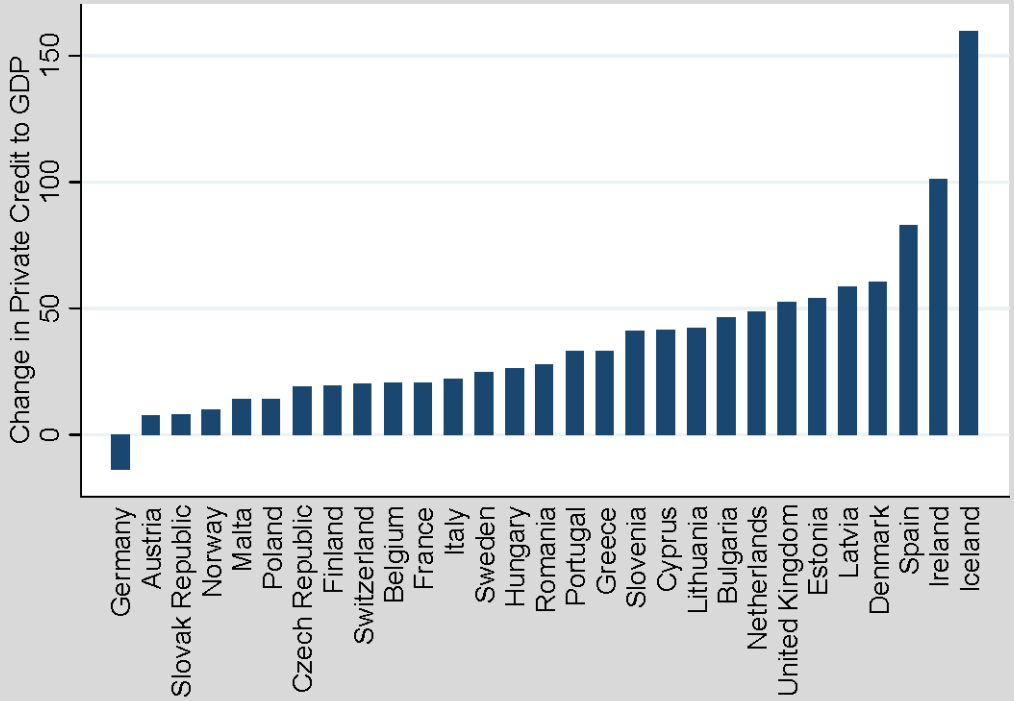
Source: Author's calculations based on Beck et al (2009) data.

Figure 2: E30; Cross-Country Standard Deviation of Domestic Credit Growth, 1994-2008.



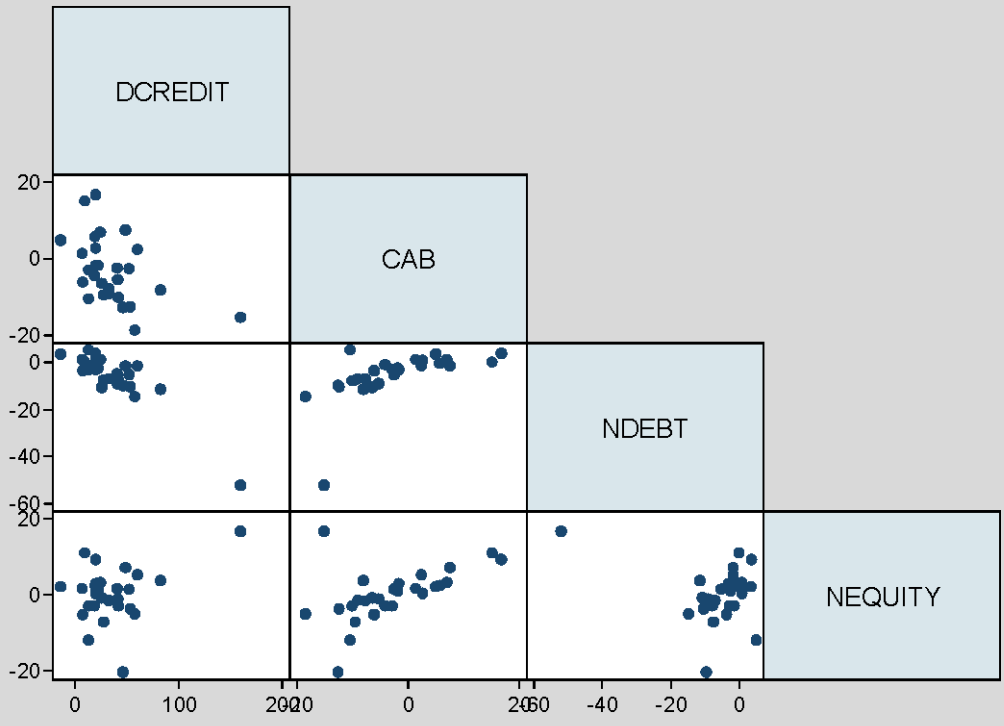
Source: Author's calculations based on Beck et al (2009) data.

Figure 3: E30; Domestic Credit Growth, 2003-2008.



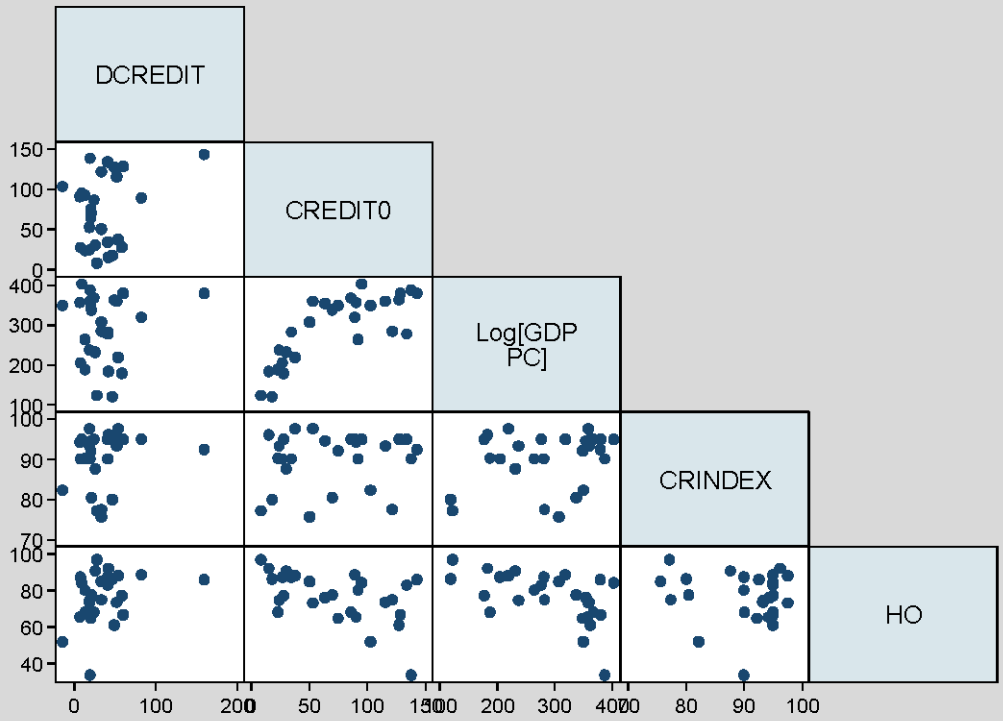
Source: Author's calculations based on Beck et al (2009) data.

Figure 4: E30; Domestic Credit Growth and International Capital Flows, 2003-2008.



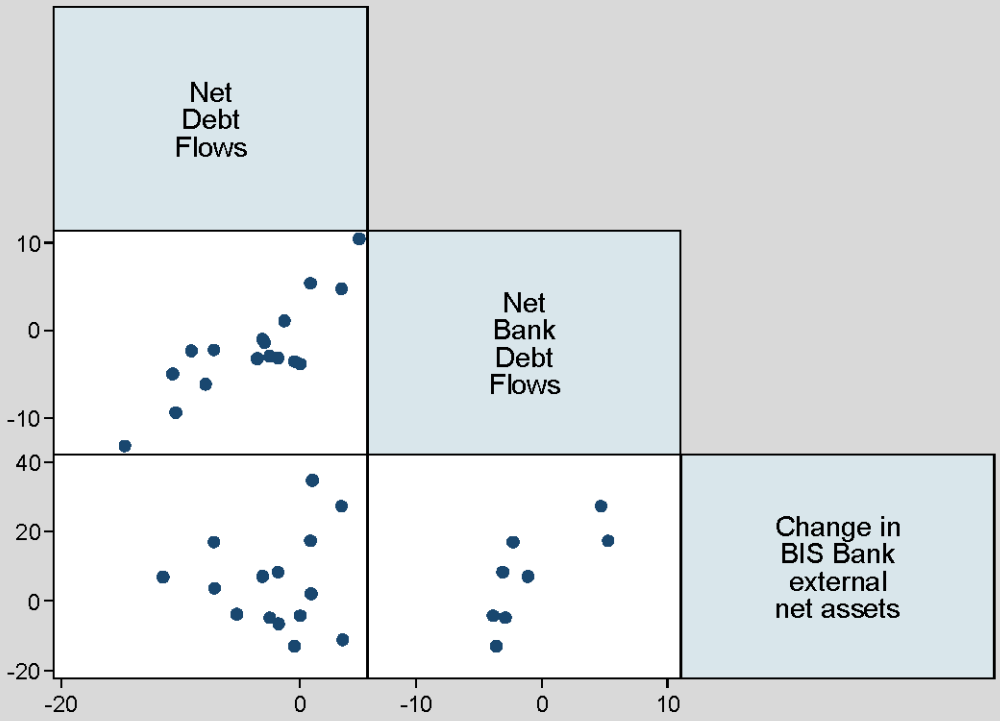
Source: Author's calculations based on Beck et al (2009) and IMF BOPS data.

Figure 5: E30; Domestic Credit Growth and Country Characteristics, 2003-2008.



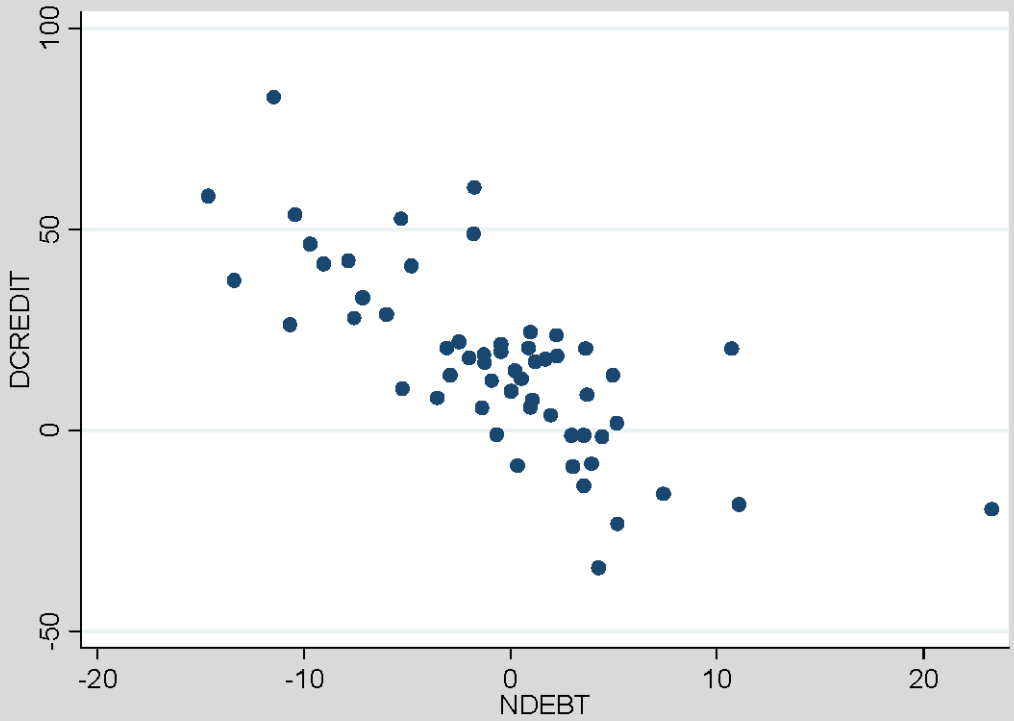
Source: Author's calculations based on Beck et al (2009), World Bank, Fraser Institute and Eurostat data.

Figure 6: E30; International Debt Flows Alternative Measures, 2003-2008.



Source: Author's calculations based on Beck et al (2009), IMF BOPS and BIS data.

Figure 7: Extended Sample; Domestic Credit Growth and Net Debt Flows, 2003-2008.



Source: Author's calculations based on Beck et al (2009) and IMF BOPS data.
Note: Excludes Iceland.