Domestic Credit Growth and International Capital Flows *

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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 for a sample of European countries over 1993-2008, with a special focus on the 2003-2008 boom period. We establish that the current account balance is an inadequate proxy, since the main co-variation pattern is between net international debt flows and domestic credit growth, whereas international equity flows are relatively less important.

1   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 policymakers. 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 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 macroprudential 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 2008). In related fashion, there is considerable evidence that credit booms are a significant predictor of

subsequent financial crises (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 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 an 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

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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 inter-bank market and money market. In addition, domestic banks can obtain medium-term funding through international bond issues. 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 the international credit system, with most positions intermediated by the domestic banking system. However, large corporates can raise international funding through international bond issuance and inter-office lending and borrowing across 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.

A number of 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 (2012) 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 betwen the underlying net debt and net equity flows.

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, Adams et al 2011, Favilukis et al 2012). 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, we address 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, current account imbalances 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]

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.

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 inter-bank 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 (BIS 2009,

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[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.

Hoggarth et al 2010). According to ECB (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 inter-bank 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 inter-bank lending, the opening of international subsidiaries and the emergence of financial derivatives (Cetorelli and Goldberg 2008, 2010, Altunbas et al 2007). Accounts of the growth in cross-border banking in Europe are provided by Allen et al (2011), Barnes et al (2010), CGFS (2010a, 2010b).

In relation to intra-European international capital flows, Milesi-Ferretti and Tille (2010) show that bank capital flows increased more rapidly than other types of capital flows. 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.

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, EBRD 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.

Theses 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. 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 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.[2]

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

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[2]That said, in ongoing work, we have expanded the sample to fifty-five countries that includes the major emerging market economies in addition to the set of advanced economies. The broad patterns also apply in that larger sample, with a highly significant relation between net debt inflows and credit growth. We will report these results in the next draft.

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 include the current account balance. We also split aggregate net flows between net debt flows and net equity flows. Going further, we also differentiate between gross debt and equity inflows and outflows.[3] Again, 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 is quite sparse in the *BOPS* databank, so that these data are primarily used for descriptive statistics in Section 3 rather than 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 Frazer 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 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.

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).

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[3]In a future draft, we will further decompose debt and equity flows between portfolio and non-portfolio components.

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 2006-2008 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. This was also true of new member states like Slovakia, Poland and the Czech Republic. At the same time, countries like Iceland, Ireland, Spain and the Baltic states experience an unprecedented credit boom.

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 1 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 lowest 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.

The differences in terciles are not large for net international equity flows (which are small in each case for the median country). However, there is a sizeable difference in relation to net international debt flows - the median net debt outflow is 0.04 percent of GDP for the bottom tercile, while the median net debt inflow is 9.1 percent of GDP for the top tercile.

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 2. 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 most closely correlated with net debt. Net debt flows are most closely correlated with gross equity asset and gross debt liability flows. Gross debt assets and gross debt assets liabilities are also closely correlated.

We can learn more by looking at the bivariate scatter plots for the full cross-country distribution in Figures 4 and 5. In Figure 4, domestic credit growth is negatively correlated with the current account. However, the correlation of credit growth with net debt flows is much closer than is the case for 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 ignore 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.

Finally, Table 3 shows the correlations between 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

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6 shows bivariate scatter plots.) The banking-sector data are available for fewer countries than the aggregate measure of net debt flows but Table 3 and Figure 6 indicate reasonably-strong correlations across these different measures.

4   Econometric Analysis

4.1   Empirical Specification

Our baseline cross-sectional specification can be written as

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\begin{aligned}
(CREDIT_{it} - CREDIT_{it-s}) \ = \ & \alpha_p - \delta_p CREDIT_{it-s} + \beta_p \ln(GDP - PC_{it-s}) \\
& + \theta_{1p} * CRINDEX_{it-s} + \theta_{2p} * HO_{it-s} \\
& + \sigma_p * \sum_{k=t-(s+1)}^{k=t} INTFIN_{ik} + \varepsilon_{ip}
\end{aligned}
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where $CREDIT$ is the level of domestic credit to the private sector (expressed as a ratio to GDP), YPC 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. 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 convergence dynamics 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 credit market 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.[4] 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).

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

We will consider several different specifications for the $INTFIN$ variables. At the most basic level, we examine aggregate net financial inflows, as captured by the current account balance. However, net debt flows and net equity flows may have different effects on the domestic credit system, so we will 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 in view 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

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

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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. Since it is difficult to find convincing instruments that might help establish causality, we simply report OLS regressions, so that the reported coefficients establish partial correlations. The goal is that these estimates can help guide future theoretical work on the relation between international capital flows and domestic credit growth.[5]

As indicated above, our primary focus is understanding credit growth during the 2003-2008 boom period. However, we also examine credit growth during the pre-EMU period 1993-1998 and the initial phase of EMU 1998-2003. We run pooled specifications (with time dummies to capture shifts in the global/common rate of credit growth), including a specification in which we allow parameters to vary during the 2003-2008 boom period.

4.2   Econometric Results

Table 4 shows the results for the 2003-2008 period. We begin in column (1) by just including the "convergence" variables (the initial value for the credit-GDP ratio and log GDP per capita). While GDP per capita has the expected negative sign and is highly significant, 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

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[5]In current work, we are looking to other empirical approaches that might be able to provide some identification of the relation between domestic credit growth and international capital flows.

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 GDP per capita and the home ownership rate losing individual significance — this pattern holds true across columns (3)-(6).

We investigate whether domestic credit growth have 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.

We probe this results further 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, while gross equity outflows is negative and marginally significant. The former pattern suggests that it is net debt flows that mainly matters in understanding the inter-relation between international capital flows and domestic credit growth, while the latter pattern is consistent with outward equity outflows providing an alternative to expansion to domestic balance sheets.

In columns (6)-(8), we repeat the specifications in columns (3)-(5) but drop Iceland from the sample, in view of its extreme experience during the boom period. The exclusion of Iceland means that the current account balance is smaller and less statistically significant in column (6). However, columns (7)-(8) show that net debt flows remains highly significant and the size of the coefficient on this variable increases in magnitude relative to columns

(4)-(5). However, gross equity outflows are no longer significant in column (8).

Next, we ask whether these results hold in a pooled specification over three periods 1993-1998, 1998-2003 and 2003-2008. Time dummies are included to allow for differences in average credit growth across the three periods. We focus on the specifications that include measures of international capital flows. The results are reported in Table 5. In relation to the control variables, GDP per capita is positive and marginally significant in columns (1) and (3), while the credit regulation index is highly significant in column (3) and the home ownership rate is marginally significant in column (1).

The results for the international capital flows in the pooled specification are quite similar to those reported in Table 4. The current account balance has the expected sign and is highly significant in the pooled specification reported in column (1). In column (2), the net international debt flows variable has the same sign and similar size and significance to that reported in the cross sectional regressions. Consistent with the cross-sectional regressions, the net international equity flows coefficient is not statistically significant. Similarly, gross debt inflows and gross debt outflows are highly significant and the coefficients are similar in absolute value but gross equity flows are not significant in column (3).

Next, we allow the coefficients to vary between the 2003-2008 period and the earlier periods, since the final period was the global credit boom period.[6] The results are reported in Table 6. Comparing across Tables 5 and 6, we see that there is no significant difference in the results for the specification that includes the current account balance in column(1).

However, there is a remarkable shift in results once aggregate net flows are split between debt and equity. Column (2) of Table 6 shows an attenuation of the relation between net debt and domestic credit growth during 2003-2008. Moreover, there is a reversal in the direction of the relation between net equity flows and domestic credit growth, with a higher

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[6]We also investigated possible differences in coefficients between the 1994-1999 and 1999-2003 periods. The main significant difference is in relation to the credit regulation index but we suppress that difference in the reported regressions in order to focus on the differences between 2003-2008 and the earlier periods.

rate of net equity outflows associated with more rapid credit growth during 1993-2003 but less rapid credit growth during 2003-2008.

In fact, the results in column (3) show that reversal has to do with the relation between gross equity inflows and domestic credit growth. In the earlier periods, a higher rate of gross equity inflows was associated with lower domestic credit growth, whereas it was associated with faster domestic credit growth during 2003-2008. We leave the interpretation of this empirical pattern to future research but note that either sign could be generated in view of the myriad mechanisms that could link equity inflows and domestic credit growth.

Finally, we repeat the specifications that include debt and equity flows in columns (4) and (5) but only allow period interaction terms with the capital flow variables in these specifications. The results are quite similar between columns (2) and (3) and columns (4) and (5).

In summary, the econometric analysis shows that several country characteristics are correlated with the cross-country variation in credit growth during the 2003-2008 boom period. In relation to international capital flows, the most striking result is that those countries receiving net debt inflows also experienced the fastest credit growth. While this pattern also holds true in the pooled regressions over 1993-2008, Table 6 also reveals a striking reversal in the relation between gross equity inflows and domestic credit growth between 1993-2003 and 2003-2008.

Clearly, our empirical approach faces several limitations. In relation to aggregate macroeconomic data, our analysis should be cross-checked with the estimation of a VAR model that can capture the dynamic inter-relations between domestic credit growth and international capital flows. Furthermore, it would be desirable to come up with an identification scheme that might be able to draw inferences about the causal impact of international capital flows on domestic credit growth (and vice-versa). Finally, microeconometric studies would be a useful complement in understanding how access to international capital markets influences bank-level funding and domestic credit decisions.

5 Conclusions

Our goal 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 inter-relation between international capital flows and domestic credit growth, in view of the strong asymmetry between net debt flows and net equity flows. However, it is striking that net debt flows appears to be the relevant measure (at least during the crucial 2003-2008 boom period), 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 instruments, with many types of inflows and outflows essentially cancelling each other out.

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.

Data Appendix

- DCREDIT is the 5 year change in private credit from deposit-taking banks as a ratio to GDP. Main source is 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-financial corporation loans from banks in the loans from financial corporations series and these two series were then summed. The raw data for GDP in USD is also derived 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 Frazier 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 Frazier 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 Frazier Institute took these data from Barth et al (2002, 2006, 2008). 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 more foreign bank competition. The data for these indicators are also from from Barth et al (2002, 2006, 2008). 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 this data is 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 and the underlying data are taken from the World Bank, World Development Indicators and the IMF, International Financial Statistics. The component on interest rate controls was calculated using data taken from the World Bank, World Development Indicators and the IMF, International Financial Statistics. Countries with interest rates determined by the markets, stable monetary policy and positive real deposit and lending rates received higher ratings. The data were scaled from 1 to 10 where higher values indicated greater economic

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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.

- Period2 is a dummy variable for the period 1999-2003, Period 3 is a dummy variable for the period 2004-2008.

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Table 1: Domestic Credit Growth: Terciles, 2003-2008

	1	2	3
DCREDIT	13.8	27.1	56.1
CAB	1.3	-3.9	-9.1
NEQ	1.5	0.4	-1.1
NDEBT	0.04	-4.8	-9.1
GEQA	3.7	5.2	6.7
GDEBTA	12.7	9.6	10.4
GEQL	5.2	4.9	5.9
GDEBTL	10.1	14.3	18.1
CREDIT0	102.2	76.9	118.0
LYPC	3.5	2.9	3.3
CRINDEX	90.0	87.5	93.5
HO	72.9	80.4	84.3

Note: 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, CREDIT0 initial credit/GDP ratio, LYPC 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 2: International Capital Flows: Correlations, 2004-2008

	CAB	NDEBT	NEQ	GDEBTA	GDEBTL	GEQA	GEQL
CAB	1						
NDEBT	0.58	1					
NEQ	0.53	-0.26	1				
GDEBTA	-0.10	-0.19	0.10	1			
GDEBTL	-0.32	-0.57	0.20	0.91	1		
GEQA	0.07	-0.60	0.54	0.30	0.50	1	
GEQL	-0.35	-0.36	-0.29	0.31	0.41	0.63	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 3: Alternative Measures of International Debt Flows: Correlations, 2004-2008

	NDEBT	$NDEBT^B$	$NDEBT^{NB}$	$NDEBT^{BIS}$
NDEBT	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, $NDEBT^B$ banking-sector net debt flows, $NDEBT^{NB}$ is non-bank net debt flows, $NDEBT^{BIS}$ BIS-reported change in net external assets of banking sector. All variables are expressed as ratios to GDP. Number of observations in parentheses.

Table 4: Cross-Country Variation in Credit Growth, 2003 to 2008

	(1)	(2)	(3)	(4)	(5)	(6)	(7)	(8)
CREDIT0	0.51**	0.54**	0.36**	0.17	0.24*	0.24**	0.15	0.25*
	(0.25)	(0.23)	(0.16)	(0.10)	(0.13)	(0.11)	(0.11)	(0.14)
LYPC	-0.02**	-0.013	0.005	0.001	0.002	-0.003	0.005	0.002
	(0.01)	(0.01)	(0.01)	(0.006)	(0.006)	(0.007)	(0.006)	(0.007)
CRINDEX		1.06**	1.04**	1.00***	1.17***	1.17**	0.90**	1.20**
		(0.49)	(0.49)	(0.35)	(0.39)	(0.41)	(0.35)	(0.47)
HO		1.19**	0.56	0.13	0.17	0.39	0.03	0.19
		(0.51)	(0.36)	(0.29)	(0.27)	(0.31)	(0.26)	(0.29)
CAB			-2.22**			-1.13*		
			(0.92)			(0.65)		
NDEBT				-2.49***			-3.30***	
				(0.36)			(0.63)	
NEQ				-0.54			-0.62	
				(0.66)			(0.63)	
GDEBTA					-3.09***			-2.97***
					(0.42)			(0.73)
GDEBTL					2.86***			2.72***
					(0.36)			(0.85)
GEQA					-1.43*			-1.48
					(0.79)			(0.89)
GEQL					1.06			1.10
					(0.88)			(0.93)
α	51.50***	-157.95**	-152.15**	-95.26**	-116.83**	-117.51**	-91.05**	-120.62**
	(12.81)	(61.89)	(60.05)	(39.93)	(46.91)	(51.38)	(38.46)	(52.35)
N	28	28	28	28	28	27	27	27
R^2	0.29	0.53	0.65	0.87	0.89	0.49	0.69	0.72

Dependent variable is DCREDIT from 2003 to 2008.Robust standard errors in parentheses.

***,**,* denote significance at 1,5 and 10 percent levels respectively.

Table 5: Credit Growth, 1993-2008: Pooled I

	(1)	(2)	(3)
CREDIT0	0.12	-0.09	-0.19
	(0.15)	(0.14)	(0.14)
LYPC	0.01*	0.01	0.02**
	(0.01)	(0.01)	(0.01)
CRINDEX	0.10	0.18	1.81***
	(0.45)	(0.41)	(0.52)
HO	0.47*	0.08	-0.07
	(0.25)	(0.23)	(0.25)
CAB	-2.52***		
	(0.78)		
NDEBT		-3.13***	
		(0.55)	
NEQ		-0.01	
		(0.83)	
GDEBTA			-3.72***
			(0.57)
GDEBTL			3.74***
			(0.55)
GEQA			-1.55
			(0.99)
GEQL			0.94
			(1.15)
α_2	0.1	-1.3	
	(8.6)	(8.2)	
α_3	-0.7	-2.9	-9.1
	(8.7)	(8.2)	(7.4)
α	-70.7	-22.8	-165.3***
	(42.9)	(35.3)	(45.1)
N	74	68	53
R^2	0.32	0.55	0.71

Dependent variable is DCREDIT. Three-period panel (1993-1998; 1998-2003; 2003-2008). Robust standard errors in parentheses. ***,**,* denote significance at 1,5 and 10 percent levels respectively.

Table 6: Credit Growth, 1993-2008: Pooled II

	(1)	(2)	(3)	(4)	(5)
CREDIT0	0.14	0.16	-0.14*	0.16*	0.07
	(0.18)	(0.14)	(0.07)	(0.08)	(0.08)
LYPC	0.01	-0.01	0.01**	-0.01	0.01
	(0.01)	(0.01)	(0.00)	(0.01)	(0.00)
CRINDEX	-0.06	0.01	2.37***	0.15	1.30***
	(0.52)	(0.37)	(0.54)	(0.27)	(0.32)
HO	0.50*	0.35	-0.13	0.27	0.05
	(0.27)	(0.25)	(0.22)	(0.19)	(0.19)
CAB	-2.57**				
	(1.14)				
NDEBT		-6.00***		-6.35***	
		(1.46)		(1.37)	
NEQ		2.98**		2.26**	
		(1.45)		(1.08)	
GDEBTA			-6.97***		-7.28***
			(1.09)		(1.27)
GDEBTL			6.47***		6.55***
			(0.78)		(1.08)
GEQA			1.22		1.77
			(1.47)		(1.39)
GEQL			-2.68**		-2.63*
			(1.20)		(1.33)
CREDIT0*α_3	0.21	-0.02	0.34**		
	(0.24)	(0.17)	(0.15)		
$ln(GDP-PC)$*α_3	-0.01	0.01	-0.01		
	(0.02)	(0.01)	(0.01)		
CRINDEX*α_3	1.04	0.87*	-1.34*		
	(0.71)	(0.49)	(0.66)		
HO*α_3	0.07	-0.24	0.25		
	(0.45)	(0.38)	(0.36)		
CAB*α_3	0.32				
	(1.46)				
NDEBT*α_3		3.40**		4.03***	
		(1.50)		(1.38)	
NEQ*α_3		-3.52**		-1.84**	
		(1.57)		(0.83)	
GDEBTA*α_3			3.90***		4.13***
			(1.16)		(1.25)
GDEBTL*α_3			-3.56***		-3.46***
			(0.86)		(1.15)
GEQA*α_3			-2.54		-3.13**
			(1.66)		(1.47)
GEQL*α_3			3.70**		3.60**
			(1.46)		(1.41)
N	68	63	49	63	49
R^2	0.48	0.80	0.90	0.79	0.88

Dependent variable is DCREDIT. Three-period panel (1993-1998; 1998-2003; 2003-2008).

Robust standard errors in parentheses. ***,**,* denote significance at 1,5 and 10 percent

levels respectively. Intercepts not reported.

Figure 1: Aggregate E30 Domestic Credit Growth, 1994-2008. Note: Author's calculations.
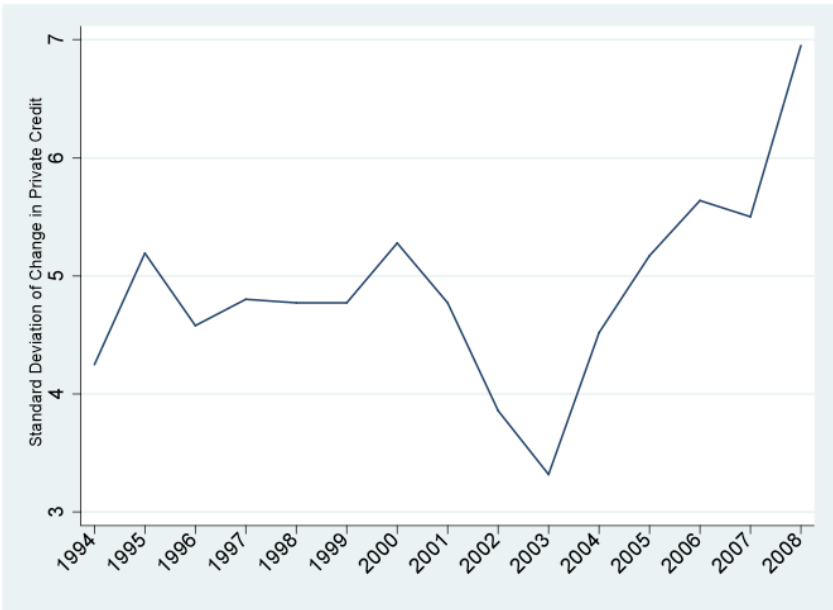
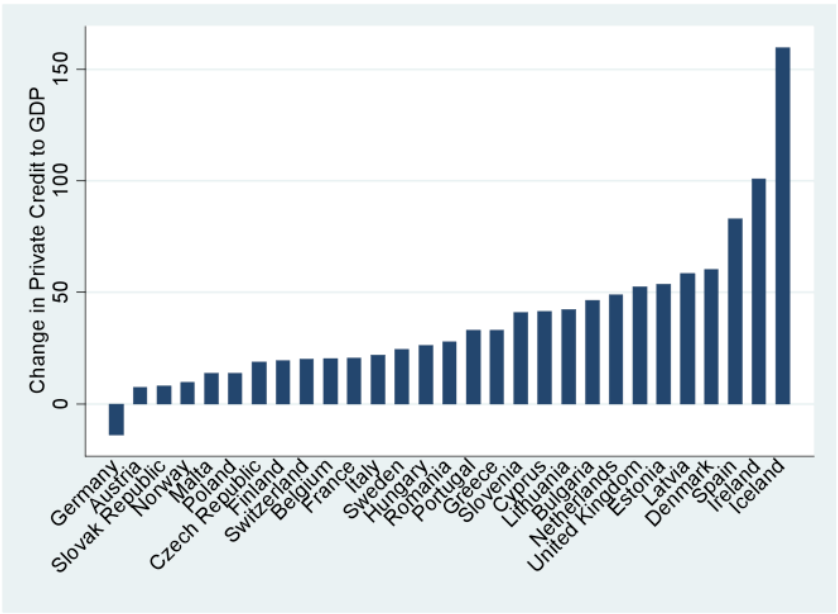Figure 2: Cross-Country Standard Deviation of Domestic Credit Growth, 1994-2008.

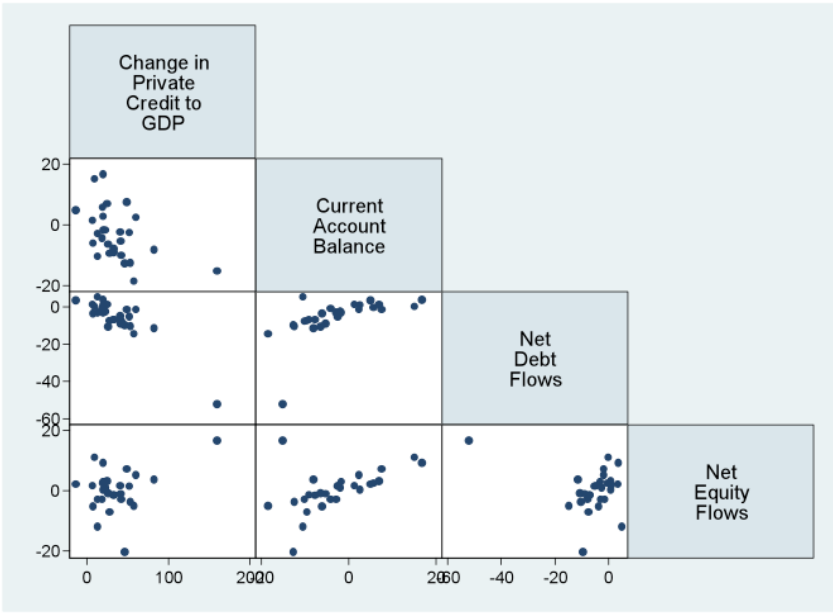Figure 3: Domestic Credit Growth, 2003-2008.

Figure 4: Domestic Credit Growth and International Capital Flows: Scatter Plots, 2003-2008.

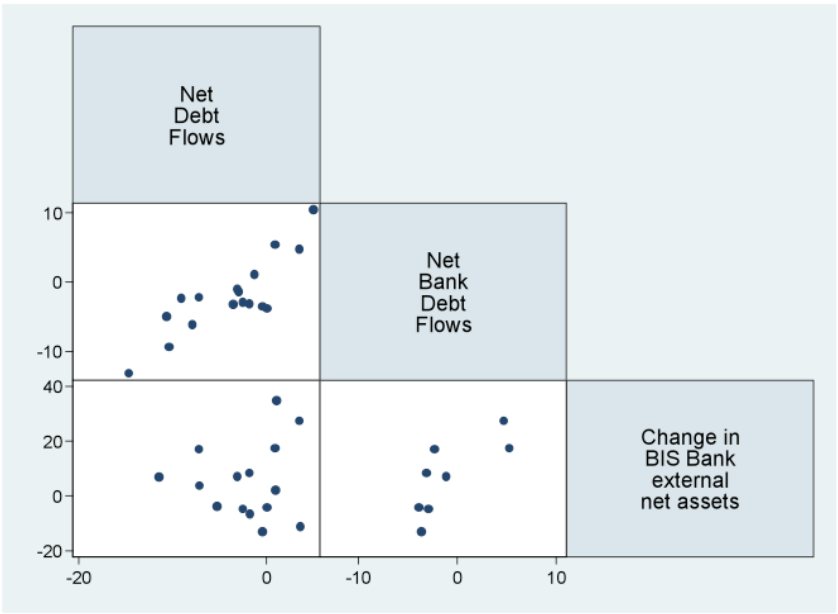Figure 5: Domestic Credit Growth and Country Characteristics, 2003-2008.

Figure 6: International Debt Flows: Alternative Measures.