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Do Capital Flows Change Domestic Credit Allocation?

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This version: March 31, 2015

Abstract

Since the late 1990s, domestic bank credit has been reallocated from lending to nonfinancial business towards households. An expanding literature discusses negative effects on growth and stability. We research drivers of this change. If capital flows into economies with few investment opportunities, this substitutes for for domestic bank lending to nonfinancial business, so that bank balance sheets become more dominated by household lending. In GMM estimations on data for 36 economies over 1990-2011, we find evidence consistent with this mechanism. Foreign capital inflows decreased the share of business lending in domestic bank portfolios, more strongly in economies with fewer investment opportunities. The effect is alleviated in countries with current account surpluses and in EMU member economies.

Keywords: domestic credit allocation; capital inflows; investment opportunities

JEL Classification: F32, F36, G15, G21

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1 Introduction

The decline of bank lending to business, mirrored in the growth of household credit, creates macroeconomic vulnerabilities, as an expanding literature shows. In this paper we suggest that capital inflows into the nonbank business sector are a possible driver of this change. When firms substitute foreign finance for domestic bank loans, the share of household mortgages in bank loan portfolios rises. The effect is weaker in economies with more investment opportunities, where both domestic loans and foreign financing can expand. This finding sheds new light on the role of bank balance sheets in the effect of capital inflows on financial fragility.

The context to this new finding is that the allocation of bank loans has changed profoundly in recent decades. In a sample of 17 advanced economies, **?** observed an increase of credit/GDP of 78 percentage points between 1960 and 2010. More than two thirds of this was an expansion of household credit, which rose by 53 per centage points; the remaining 25 points was the increase in bank loans to buisiness as a share of GDP.Other sources suggest that most of this divergence occured after 1980. In the present paper, we find that over 1990–2011 in a sample of 36 countries, the nonfinancial business share in all bank loans declined from 54% to 42% on average.

The rapid change in allocation of domestic bank credit raises concerns about the effects on growth and stability, as a small but expanding literature shows. Less lending to business, and more household credit, causes lower private savings **?** and slower economic growth **??**. Economies with more household credit have larger external imbalances **?** and . The have less investment, lower growth increased probability of crisis, and both deeper and longer recessions

In this paper we research the drivers of this change. We test the hypothesis that capital inflows into non-banks decrease the share of domestic bank loans to non-banks (the non-financial loan share, for short). We collected data taken from the consolidated balance sheets of monetary financial institutions in 36 countries over 1990–2011 (with the time period dictated by data availability). We also collect

data on debt and equity capital inflows distinguished by destination into bank and non-bank sectors, plus control variables.

Exploration of the data shows how the decline in banks' non-financial loan share coincided with a surge in capital inflows from around 2002–2003. In panel GMM models, we find that the decline in the non-financial loan share is significantly caused by growth in credit-to-GDP ratios, credit market deregulation, inflation, lower interest rates, and capital inflows into the non-bank sectors - with stronger loan substitution effects in economies with little investment, where domestic and foreign finance compete for investment opportunities.

Since we use inflows not net flows, we include current account positions in the sensitivity analysis. Another extension is to add the interaction of capital inflows with EMU membership (15 of 36 countries in our sample are EMU members). While the key findings remain robust throughout these robustness checks, we find that both capital account surplus and EMU membership counteract the negative effect of non-bank capital inflows on the domestic non-financial loan share.

The paper proceeds as follows. In Section 2 we discuss the channels from capital inflows to domestic credit allocation. In Section 3 we introduce and explore the data, while Section 4 describes the methodology. In Section 5 we present the main estimation results. Section 6 discusses the robustness checks and Section 7 concludes.

2 Capital Flows and Domestic Credit Allocation: Channels of Transmission

Capital flows may be part of the catching-up process of less productive economies through the formation and upgrading of productive capacity. They may support growth and external sustainability, provided capital flows finance productive investment in tradable goods, such that repayment is assured by a future export surplus (**???**). In this scenario, capital flows should lead to rising investment by non-financial

firms in the tradable sector. Many deficit countries, however, lag behind in productivity growth. They experienced booms in real estate and consumption, rather than in non-financial business investment (**?**). **?** discusses how the nontradable sector rather than the tradable sector tends to expand during a high-deficit phase. **?** test this argument for 69 countries over 1975–2010 and find that large capital inflows are associated with growth of the nontradable sectors at the expense of the tradable sectors, such as agriculture and manufacturing. This raises questions about the "distinction between productive and unproductive purposes of foreign borrowing" and investment, as **?**, p.7 note.

While the risks of cross-border loans and capital flows into the *banking* sector are well recognized, we point to a different channel. We suggest that capital inflows into the non-bank sector may have an unintended side effect on the allocation of domestic bank credit. Even though these inflows result from rational investment strategies if foreign capital costs are lower than costs of domestic bank lending, the effect on bank loan portfolios is potentially alarming, creating macro vulnerabilities and adverse growth effects. Foreign capital flowing into the non-bank sector may be equally, if not more important for sustainability of capital flows (**?**).

A substitution effect between domestic bank loans and foreign capital inflows to non-financial firms is especially relevant in economies with limited investment opportunities. Here, domestic and foreign loans are more likely to compete for investment opportunities, rather than both increasing. (**?**) point to the importance of investment constraints in limiting the growth effectiveness of capital inflows. The substitution effect does not imply that *total* bank lending falls: in fact, financial openness tends to cause domestic credit booms, as a large literature discusses.[1] It

[1] **?** build a small open economy DSGE model which shows that capital flows generate credit expansion and asset price booms. Empirically, **?** examine 54 countries over 1994–2008 and find that net debt inflows increase domestic credit growth. This is particularly evident during the boom period 2003–2008. Additionally, **?** and **?** show that capital inflows into the domestic banking sector boost bank lending. **?**, **?** and **?** report that a capital inflow surge causes domestic credit booms. In line with this, 2011 IMF World Economic Outlook surveys 47 economies over 1960–2011 and finds that financial inflows systematically precede credit booms. See also **??**

allows domestic banks to fund domestic lending in international markets, rather than from domestic deposits only. This loosens their financing constraint. Simultaneously, due to the substitution effect, domestic banks experience falling demand for loans in non-financial business. If banks respond by expanding lending to consumer finance and household mortgages, the non-financial loan share will fall. With limited investment opportunities, it can be expected to fall even more.

In illustration of this mechanism, in the balance sheets in Figure **??**, non-financial firms increase their liabilities to foreign investors and lenders and decrease domestic bank loans. Banks reduce their lending to non-financial firms and, to maintain some realism, we assumed they also issue foreign liabilities (capital flows typically go in majority to the financial sector). Banks maintain their loan books by expanding mortgage lending to households, even more than they reduced bank lending. [2]

Note that in this mechanism, household debt expansion does NOT hinge on the expansion of foreign liabilities in banks. The substitution effect occurs due to capital inflows into non-banks, which crowd out domestic lending. This is the key point we illustrate. With foreign capital flowing only into banks, then all else equal, there are no pressures for change in the allocation of bank loans over the household and business sectors. It follows that the variable driving the decline of the non-financial loan share is foreign capital flows to non-financial business, substituting domestic bank loans. An empircal test of this mechanism is in sections 4 and 5. We now consider the data.

[2]For simplicity, we assume no changes to their capital investment and bank deposits, not in banks domestic bonds, reserves or equity (although each of these are likely to be affected). We also assume there are no demand side constraints to household debt expansion.

Figure 1: **Balance sheets of non-financial firms and banks with(out) capital inflows**

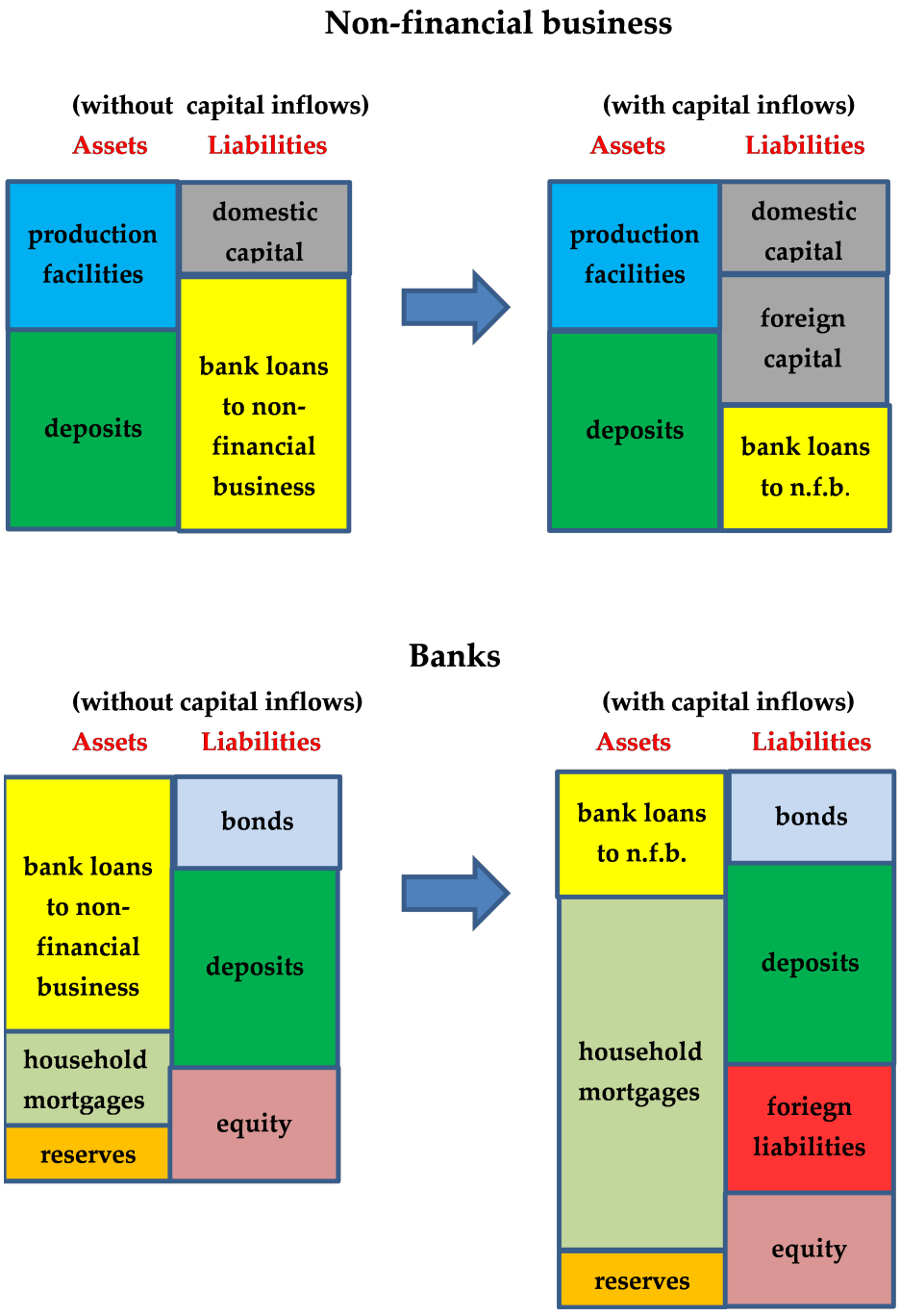


Table 1: **List of countries included in the sample**

EU countries					
Country	EMU	Country	EMU	Country	EMU
Austria	1999	Germany	1999	Poland	–
Belgium	1999	Greece	2001	Portugal	1999
Bulgaria	–	Hungary	–	Romania	–
Cyprus	2008	Italy	1999	Slovakia	2009
Czech Rep.	–	Lithuania	–	Slovenia	2007
Denmark	–	Latvia	–	Spain	1999
Estonia	2011	Malta	2008	Sweden	–
Finland	1999	Netherlands	1999	UK	–
France	1999				
Non-EU countries					
Australia	Canada	Chile	Israel	Japan	S. Korea
Norway	Turkey	Mexico	Switzerland	USA	

3 Data

3.1 Description of the dataset

Our dataset covers 36 advanced countries over the period 1990–2011, with the time period dictated by data availability. The country sample includes 25 (eventual) EU member countries — of which 15 EMU member-states — plus 11 other OECD economies (see Table **??** for a list of countries).[3]

The data were collected from national central bank statistics on the consolidated balance sheets of Monetary Financial Institutions. Four types of domestic bank credit are distinguished: credit to non-financial business, credit to financial business (insurance companies, pension funds, and other non-bank financial institutions), household consumer credit, and mortgages to households. We analyze the share of credit to non-financial business in total bank credit. A detailed data description is in (**?**)

Net capital flows and current account positions reveal little about financing con-

[3]New Zealand was dropped from the OECD group as there was no data available on bank and non-bank inflows. As in (e.g., **?**), we exclude Luxembourg, Ireland and Iceland due to their extremely large capital inflows during 2002–2007 (e.g. up to 900% of GDP in Luxembourgs)

ditions (**??**) and we focus on gross capital inflows.[4] Bank and non-bank inflows are constructed as the sum of portfolio equity, portfolio debt, and other investment (loans) into banking and non-banking sectors. OUr coice of control is guided by the literature. We include: initial income level (log of real GDP per capita in constant 2005 USD, at the beginning of each 3-year period), CPI inflation rate, the overnight money market interest rate (capturing domestic money market conditions and risk perceptions) and the credit market deregulation index from the Fraser Institute's Economic Freedom Indicators. Higher values of the deregulation index indicate less regulation of credit markets, which tends to stimulate credit growth (**??**). We proxy investment opportunities by the percentage share of gross fixed capital formation in nominal GDP. In the robustness analysis, we include current account status (as binary variable, to avoid multicollinearity problems) and EMU membership. The Data Appendix gives more details and sources and motivates our periodization of capital flows data.

Descriptive statistics for all variables are reported in Table **??**. Tables **??**–**??** show correlations of the non-financial credit share with all explanatory variables. The share of credit to non-financial business is significantly and negatively correlated with all categories of capital inflows (except FDI), lagged one period, most strongly with non-bank inflows.

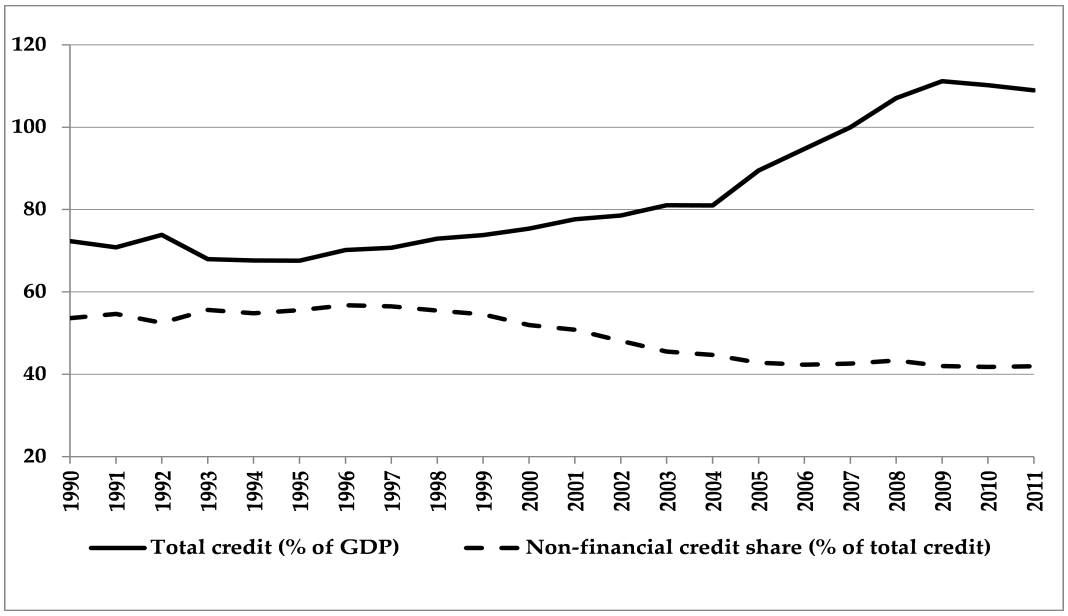
3.2 Data trends

Several trends can be observed in bank credit and capital inflows during the period 1990–2011. First, the ratio of total bank credit to GDP in the full, unbalanced sample increased rapidly, from 72% of GDP in 1990 to about 109% in 2011 (see Figure **??**). The share of loans to non-financial business declined over 1990–2011 from 54% to 42% of total bank credit. Household mortgages increased their share from 28% of total credit in 1990 to 38% in 2011, while loan shares for household con-

[4] In sensitivity analysis below, we test the robustness of results by including net instead of gross inflows.

sumption and for financial firms oscillated around 13–15% and 7–9%, respectively. After 2008, the non-financial credit share continued declining, but the growth of the total credit-to-GDP ratio reversed during the global credit crunch.

Figure 2: **Total credit and non-financial credit share**

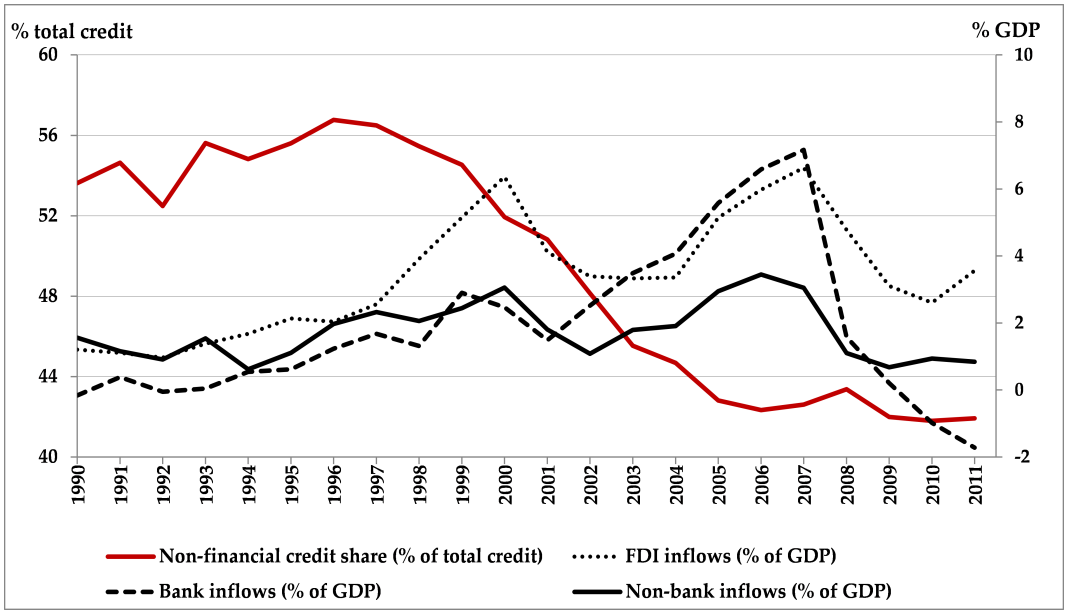


Source: Authors' calculations based on central banks statistics.

Figure **??** shows the evolution of the nonfinancial credit share and of capital inflows. Advanced countries experienced a large decline in the non-financial credit share in the same years in which they absorbed large capital inflows. From 1990 to 2007, total capital inflows increased by 14% of GDP, of which 7 percentage points (p.p.) due to the growth of bank inflows, 2 p.p. due to non-bank inflows, and 5 p.p. due to FDI. Meanwhile, the non-financial credit share decreased by 11 p.p. of total bank credit. The financial crisis in 2008–2010 led to a substantial drop in capital inflows. On average from 2007 to 2011, total capital inflows decreased by 14% of GDP, mostly due to decline in bank inflows (dropped by 8% of GDP). Debt inflows into banking sector were volatile and experienced the largest reversals during the crisis;[5] FDI inflows were more stable.

[5]Capital inflow reversal implies that inflows turn negative. It occurs when foreign capital that flew in a country is retrenched back to its foreign owners due to deleveraging. Strictly speaking, this is not equivalent to a capital outflow, defined as domestic capital flowing out of a country.

Figure 3: **Non-financial credit share and capital inflows**



Source: Authors' calculations based on IMF BoP and central banks statistics.

In the Data Appendix (Figure **??**) we discuss the structure and periodization of capital inflows.

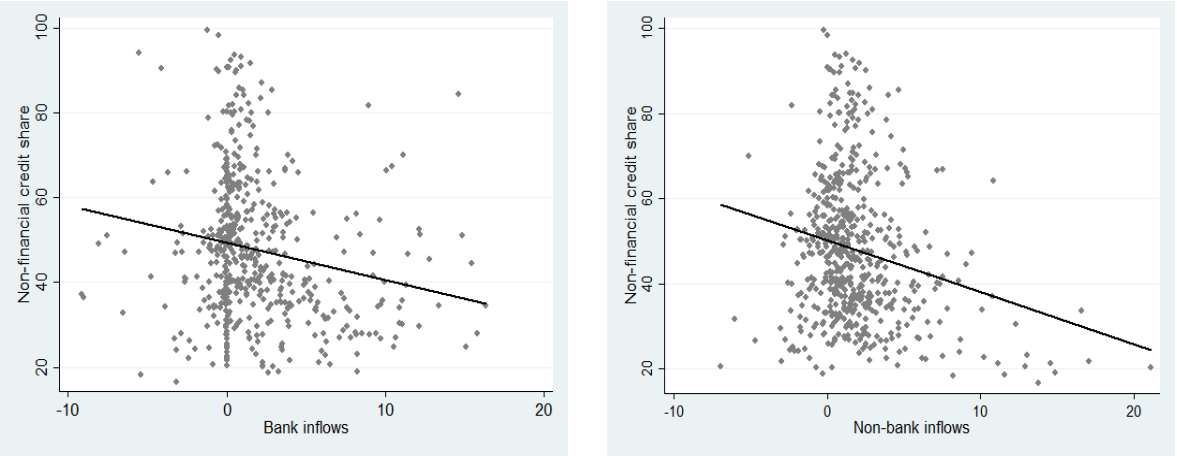
We present bivariate scatter plots of the nonfiancial credit share with capital inflows to banks and non-banks in Figure **??**. [6]. The graphs visualize that the non-financial credit share is smaller for larger capital inflows. As the correlation coefficients suggested, this negative relation is clearest for non-bank inflows.

In this 3-year averaged data, 23% of the bank inflows and 12% of the non-bank inflows observations are negative, all during the capital flow reversals in the crisis years 2008–2011 . This is not alarmingly large; we will exclude negative inflows in the robustness analysis to test their impact on results.

Table **??** shows average bank and non-bank inflows for 1990–2011 and for sub-periods, and reports the nonfiancial credit share for five significant years: sample start (1990), EMU-stage III start (1999), capital flow boom start (2002) and end (2007), and sample end (2011). The average total credit-to-GDP ratio increased dramatically between 2002 and 2007 by 21% of GDP, while the nonfinancial credit

[6] We exclude extreme values for bank inflows in order to place the horizontal axis of both scatter plots in the same interval from -10 and 20% of GDP

Figure 4: **Non-financial credit share, bank and non-bank inflows: scatter plots**



Source: Authors' calculations based on IMF BoP and central banks statistics.

Table 2: **Credit, bank and non-bank inflows**

	Bank inflows (% GDP)	Non-bank inflows (% GDP)
1990–2011	1.86	1.74
1990–1998	0.63	1.47
1999–2001	2.29	2.44
2002–2007	4.90	2.37
2008-2011	-0.23	0.89
	Total credit (% of GDP)	Non-financial credit (% of total credit)
1990–2011	82.87	49.46
1990	72.36	53.63
1999	73.83	54.54
2002	78.56	48.14
2007	100.01	42.60
2011	108.95	41.93

share in the same period has dropped by 5 p.p. Expansion of domestic credit coincided with changes in bank loan allocation.

Over 1990–2011, advanced economies attracted bank inflows equal to 1.9% of GDP per year, slightly more than non-bank inflows (1.7%). During the 2002–2007 capital flow boom years, that difference widened to 4.9% compared to 2.4% of GDP. In the crisis years 2008–2011, bank inflows also experienced a larger drop and turned negative, while non-banks inflows dropped but remained just positive.

4 Methodology

The aim of the analysis is to examine the impact of capital inflows on the non-financial credit share, while taking into account sectoral distinction of inflows and including control variables. We use averages of the underlying annual data in 3-year non-overlapping periods, due to high volatility of capital inflows and in order to examine effects in the medium-run. We estimate system-GMM models, accounting for potential endogeneity of the regressors.

The baseline model specification is the following:

$$NFC_{it} = \alpha + \beta_1 CRD^0_{it} + \kappa INF_{i,t-1} + \gamma X_{it} + \mu_i + \omega_t + \epsilon_{it},\ i = 1, ..., N; t = 1, ..., T, \quad (1)$$

where NFC_{it} is the average share of credit to non-financial business in all bank credit to the private sector of country i in period t. To control for initial financial development, we include the total credit-to-GDP ratio at the beginning of period t, CRD^0_{it}.

$INF_{i,t-1}$ is a matrix of explanatory variables related to capital inflows. Depending on the specification of inflows, this matrix will consist of one, two, or three variables. Our specifications include: (i) total capital inflows as the sum of FDI, bank and non-bank inflows; (ii) bank and non-bank inflows separately; and (iii) bank, non-bank, and FDI inflows separately. κ is a vector of estimated parameters

for capital inflows. All categories of capital inflows are included in the model with a lag of one period.

X_{it} is a matrix of control variables, as described in Section 3.1. μ_i are unobserved country-specific fixed effects. We also include time dummies ω_t to control for time fixed effects. Finally, ϵ_{it} is an independently and identically distributed white noise error term with mean 0 and variance σ^2_ϵ.

The model in equation (1) may suffer from potential endogeneity, for instance, due to the inclusion of the initial level of total credit-to-GDP as a regressor.[7] To deal with it, we employ a panel system-GMM model.[8] System GMM combines the regression equation (1) in levels with the equation in first differences. The endogenous variable CRD^0_{it} is then instrumented by its lags in the first-difference equation.[9]

GMM estimation produces consistent and unbiased estimates, provided that the error term in the baseline equation (1) is not serially correlated and that the instruments, used to deal with endogenous regressors, are valid. In our empirical analysis, we conduct Hansen tests of over-identifying restrictions to check for the joint validity of instruments and tests for the first- second-order autocorrelation of the residuals. Obviously, the system GMM estimator does not solve the endogeneity concerns completely, but given the data, it is the best available method of reducing the endogeneity bias in our model. One source of variation in GMM estimation results is the choice of lags for instrumenting the endogenous regressor. In our case, the results are not sensitive to the number of lags.

[7]High credit-to-GDP ratios tend to go together with a low share of credit to non-financial business.

[8]See **?**, **?**, and **?** for a description of system GMM estimators.

[9]Our estimation procedure for system GMM in STATA follows **?**. We use the `xtabond2` command; CRD^0_{it} is included as a predetermined variable in `gmmstyle` and instrumented by its lags. To increase efficiency, we restrict the number of lags from 2 to 3 and `collapse` instrument sets. The remaining explanatory variables are included in `ivstyle` as strictly exogenous regressors. We apply the two-step efficient GMM with small-sample corrections to the covariance matrix estimate.

5 Empirical results

We conduct estimations in two periods: 1990–2010 and 1990–2007. We use the period till 2007 in an attempt to isolate the effect of the 2008–2010 crisis years, which cannot be estimated as a separate period due to its short duration.

As a first step of our empirical analysis, we estimate equation (1) using total capital inflows as the sum of FDI, bank and non-bank inflows. The regression results are reported in Table **??**, columns (1)-(2). The results suggest that lumping all capital inflows together leads to insignificant overall effects even if separately different categories of inflows have a noticeable impact.

Next, we examine the effects of capital inflows distinguished by sectoral destination. We estimate the model including separately bank and non-bank inflows (see columns (3)-(4) in Table **??**). The findings show that the effect of total inflows, reported in the first analysis, can be decomposed into an insignificant positive effect of bank inflows and a strong negative effect of non-bank inflows. In line with our hypothesis, capital inflows into the non-banking sector significantly reduce the non-financial credit share in all periods. This impact is larger in magnitude in the pre-crisis period 1990–2007. Thus, an increase of non-bank inflows by 1% of GDP leads to the decline of loan share to non-financial business on average annually by 1.6 percentage point of total bank credit. This is due to the substitution effect as foreign capital is crowding out domestic bank lending in competition for funding productive investments of non-financial firms.

Remarkably, bank inflows have no bearing on domestic credit allocation. That is, more foreign capital flowing into banks does not lead to changes in the banks' portfolio mix between lending to non-financial business and to other sectors.

In a third analysis, we include FDI inflows together with bank and non-bank inflows. FDI is an important part of capital flows as it has a direct impact on productive investment. Hence, it could also play a role in changing domestic credit allocation. Regression results are shown in columns (5)-(6) in Table **??**. The findings

Table 3: **Credit allocation and capital inflows, main estimation results**

	(1)	(2)	(3)	(4)	(5)	(6)
	1990–2010	1990–2007	1990–2010	1990–2007	1990–2010	1990–2007
Total credit$_0$	−0.118 **	−0.186 *	−0.072 *	−0.129 *	−0.073 *	−0.128 *
	(0.044)	(0.106)	(0.037)	(0.074)	(0.040)	(0.073)
Total inflows	0.051	−0.018				
	(0.155)	(0.319)				
FDI inflows					0.367	0.091
					(0.311)	(0.330)
Bank inflows			0.095	0.129	0.029	0.105
			(0.117)	(0.302)	(0.110)	(0.267)
Non-bank inflows			−1.620 ***	−1.644 ***	−1.646 ***	−1.646 ***
			(0.451)	(0.414)	(0.467)	(0.418)
GDP per capita$_0$	−4.502	−1.090	−5.775 *	−3.195	−4.863 *	−3.032
	(3.080)	(4.029)	(3.057)	(3.305)	(2.672)	(3.458)
Inflation	−0.024	0.001	−0.043 **	−0.020	−0.043 **	−0.021
	(0.025)	(0.037)	(0.021)	(0.026)	(0.020)	(0.026)
Overnight	0.180 **	0.111	0.203 **	0.144 *	0.213 ***	0.148 *
interest rate	(0.083)	(0.109)	(0.077)	(0.085)	(0.074)	(0.084)
Credit market	−5.606 ***	−7.334 ***	−5.306 ***	−6.634 ***	−5.677 ***	−6.711 ***
deregulation	(1.464)	(1.704)	(1.506)	(1.553)	(1.386)	(1.562)
Observations	148	113	148	113	148	113
Countries	35	33	35	33	35	33
Hansen test p-value	0.52	0.48	0.46	0.48	0.52	0.48
AR (1) test p-value	0.73	0.39	0.84	0.51	0.64	0.48
AR(2) test p-value	0.80	0.95	0.81	0.56	0.83	0.60

Notes: The table reports coefficient estimates with robust standard errors in parentheses. ***p<0.01, **p<0.05, *p<0.1. Constant term, time dummies, and country-fixed effects are included in the estimations but not reported. AR(1) and AR(2) are the Arellano-Bond tests for first- and second-order serial correlation of residuals, respectively. The Hansen test reports the Hansen over-identification statistic.

suggest that FDI inflows do not have a significant impact on the non-financial credit share in both analyzed periods, while the effects of bank and non-bank inflows are similar to the estimations without FDI. Given this result, it is likely that FDI inflows simply serve a different funding purpose than bank credit or non-FDI foreign capital due to their long lasting presence and a broader scope of activities.

Finally, we briefly discuss the results for control variables.[10] The initial total-credit-to-GDP ratio significantly reduces the non-financial credit share. Thus, in this sample domestic bank credit expansion leads to credit disallocation away from non-financial business and towards household consumption and mortgages. Furthermore, higher initial income level, higher inflation, and lower interest rate decrease the share

[10]We also estimated all models in Table 3 without control variables. This modification did not affect significance or signs of coefficient estimates of remaining variables. Thus, the main results for capital inflows are not driven by controls. These estimations are available upon request.

Table 4: **The impact of investment opportunities**

	1990–2010	1990–2007
Total credit$_0$	−0.115 *	−0.127
	(0.063)	(0.082)
Bank inflows	−0.507	2.477
	(1.534)	(2.563)
Non-bank inflows	−4.891 **	−1.327
	(2.298)	(4.242)
Investment/GDP$_0$	−0.264	0.336
	(0.782)	0.782)
Investment/GDP$_0$×Bank inflows	0.031	−0.110
	(0.083)	(0.113)
Investment/GDP$_0$×Non-bank inflows	0.169	−0.012
	(0.124)	(0.228)
GDP per capita$_0$	−3.018	−3.234
	(3.790)	(3.998)
Inflation	−0.042	−0.013
	(0.029)	(0.032)
Overnight interest rate	0.219 **	0.128
	(0.086)	(0.092)
Credit market deregulation	−5.892 ***	−6.823 ***
	(1.539)	(1.543)
Observations	148	113
Countries	35	33
Hansen test p-value	0.30	0.51
AR(1) test p-value	0.52	0.43
AR(2) test p-value	0.62	0.62

Notes: The table reports coefficient estimates with robust standard errors in parentheses. ***p<0.01, **p<0.05, *p<0.1. Constant term, time dummies, and country-fixed effects are included but not reported. AR(1) and AR(2) are the Arellano-Bond tests for first- and second-order serial correlation of residuals, respectively. The Hansen test reports the Hansen over-identification statistic.

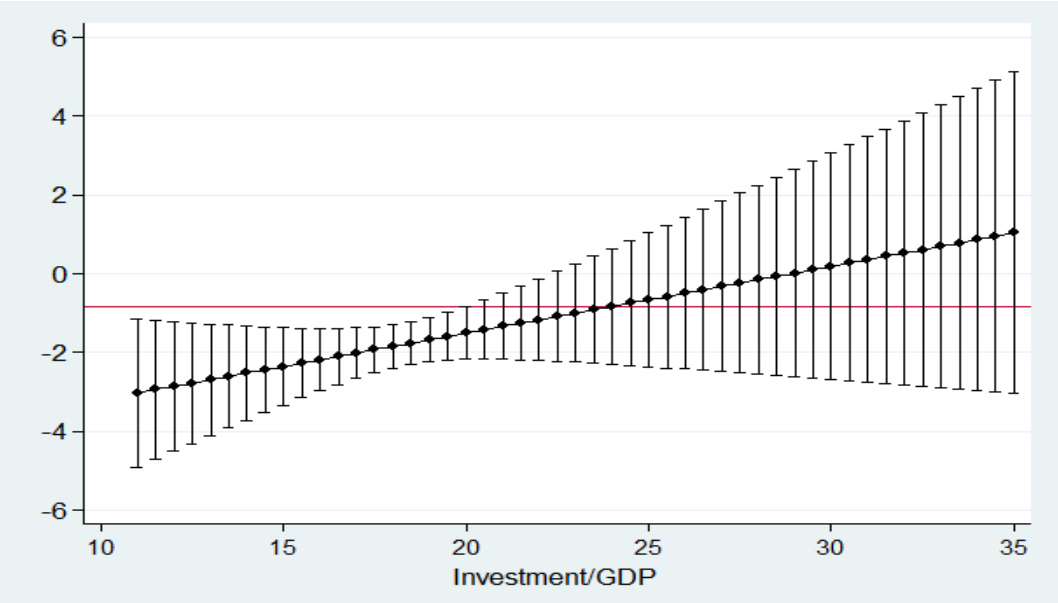
of lending to non-financial business. An interesting and robust result is that credit market deregulation has a strong negative effect on domestic credit allocation. This suggests that deregulated credit markets are not always favorable as they are more likely to experience credit booms and undesirable shifts in bank lending from non-financial business and towards real estate and consumption.

In additional analysis, we control for the presence of good investment opportunities. According to our hypothesis, in economies with limited investment opportunities the substitution effect between foreign and domestic sources of funding for non-financial firms could be stronger. We proxy investment opportunities with total investment-to-GDP ratio at the beginning of each 3-year period. Alternatively, we used such measures as investment-to-GDP and TFP growth rates; those measures

performed relatively worse in the models (results available upon request). We report the estimation results in Table **??**.

The findings show that for period 1990–2010 non-bank inflows have a smaller detrimental effect on the non-financial credit share in countries with more investment opportunities. Figure **??** illustrates the total marginal effect of non-bank inflows on credit allocation conditional on different levels of investment, based on the regression results for 1990–2010. The marginal effect is significant for investment levels below 22.5% of GDP, that counts for around 60% of all observations in our sample. Thus, for low levels of investment in a country, the increase in investment opportunities alleviates the negative impact of non-bank inflows on credit allocation. That is, both bank loans and foreign capital could be channeled into non-financial firms as competition for productive investments is less stringent. For the pre-crisis period, this result is weaker and less evident, but holds significant for half of a sample.

Figure 5: **The effect of non-bank inflows on non-financial credit share conditional on investment opportunities**



Notes: The solid line shows the total marginal effect of non-bank inflows on non-financial credit share at different levels of investment; vertical boundaries indicate 95% confidence interval. The marginal effect is significant when the solid line and confidence intervals are above (below) zero.

6 Sensitivity analysis

In a sensitivity analysis, we control for a number of factors that could potentially influence the relation between capital inflows and credit allocation.

First, we test whether current account (CA) position matters. Surplus countries with strong export sectors are less likely to be investment-constrained in the sense of **?** and more likely to utilize capital inflows productively by channeling them into credit for non-financial business; here, foreign capital and bank loans do not have to substitute each other in financing investments. Meanwhile, deficit countries are more likely to be investment-constrained and to use capital inflows unproductively; with limited investment opportunities, substitution effect would be more evident. Thus, capital inflows into deficit economies are expected to reduce the share of credit allocated to non-financial business.

We include CA dummy and its interaction term with bank and non-bank inflows. The estimation results are reported in Table **??**, columns (1)-(2). We find that in surplus economies bank inflows have a negative effect on domestic credit allocation. Non-bank inflows robustly reduce the share of credit to non-financial business; this negative effect is substantially counteracted in surplus countries compared to deficit ones. Apparently, surplus economies have more investment opportunities; this weakens the substitution effect between foreign capital and domestic credit as both sources of funding for non-financial firms can be used to realize those plentiful investments. The results for control variables are comparable to the main.

Second, membership in the EMU could influence how capital inflows change domestic credit allocation. More financial integration led to larger capital flows within the euro area (**??**). As a result, non-banks can borrow more easily abroad within EMU and banks have easier access to international interbank markets (**?**). Cross-border access to finance is further enhanced by the absence of exchange rate risk and (in the case of EMU) borrowing at low costs of the strongest creditor economies. Unless domestic investment opportunities have also increased, this larger

Table 5: **Sensitivity analysis: CA position and EMU membership**

	(1)	(2)	(3)	(4)
	1990–2010	1990–2007	1990–2010	1990–2007
Total credit$_0$	−0.055	−0.134 *	−0.110 ***	−0.187 *
	(0.034)	(0.079)	(0.037)	(0.109)
Bank inflows	0.237 *	0.619 **	0.142	0.231
	(0.119)	(0.279)	(0.287)	(0.357)
Non-bank inflows	−1.712 ***	−1.819 ***	−1.776 ***	−1.937 ***
	(0.350)	(0.264)	(0.392)	(0.362)
CA position	3.474	3.981		
	(3.471)	(3.277)		
CA×Bank inflows	−0.672 **	−0.983 **		
	(0.249)	(0.417)		
CA×Non-bank inflows	1.610 ***	1.410 ***		
	(0.585)	(0.455)		
EMU membership			2.346	−0.078
			(4.491)	(3.512)
EMU×Bank inflows			−0.039	0.865
			(0.315)	(0.798)
EMU×Non-bank inflows			1.152	1.170 **
			(0.714)	(0.444)
GDP per capita$_0$	−7.864 **	−4.513	−5.163	−1.746
	(3.260)	(3.332)	(3.114)	(3.969)
Inflation	−0.060 **	−0.037	−0.037 *	−0.007
	(0.027)	(0.028)	(0.021)	(0.035)
Overnight interest rate	0.195 **	0.149 *	0.186 **	0.111
	(0.072)	(0.084)	(0.079)	(0.102)
Credit market deregulation	−5.445 ***	−6.576 ***	−5.210 ***	−6.656 ***
	(1.353)	(1.507)	(1.562)	(1.641)
Observations	148	113	148	113
Countries	35	33	35	33
Hansen test p-value	0.79	0.62	0.44	0.39
AR(1) test p-value	0.69	0.59	0.96	0.63
AR(2) test p-value	0.74	0.82	0.68	0.86

Notes: The table reports coefficient estimates with robust standard errors in parentheses. ***p<0.01, **p<0.05, *p<0.1. Constant term, time dummies, and country-fixed effects are included in the estimations but not reported. AR(1) and AR(2) are the Arellano-Bond tests for first- and second-order serial correlation of residuals, respectively. The Hansen test reports the Hansen over-identification statistic.

loan supply is likely to translate into loans other than to non-financial business.

Table **??**, columns (3)-(4) present estimation results including EMU dummy and its interaction terms with capital inflows. The outcomes are consistent with the main results. Bank inflows do not matter for credit allocation. Meanwhile, non-bank inflows strongly decrease the non-financial credit share, but EMU membership significantly moderates this negative effect. That is, foreign capital crowds out domestic bank lending to non-financial firms much less in euro area countries, probably due to larger supply of productive investment opportunities and synergies.

Third, we check whether our results are sensitive to the change of time window used, by re-estimating the models for 4- and 5-year non-overlapping windows. For both windows the analyzed period is 1990–2009; the years 2010–2011 could not be used to generate a full 4- or 5-year period. Table **??** reports the results. Most of outcomes are similar to the results with a 3-year window. The only difference is the change of coefficient signs for inflation and interest rate in a 4-year window estimations. This however did not affect our main conclusions. Moreover, the magnitude of impact of non-bank inflows becomes larger with a 5-year horizon.

Fourth, we include net capital inflows instead of gross. This way we aim to control for the possible impact of bank and non-bank outflows which we did not take into account when estimating models for gross inflows. The estimation results using net bank and non-bank inflows in two periods and models without/with investment opportunities are reported in Table **??**. We reach similar conclusions as compared to our main outcomes. That is, net non-bank inflows significantly reduce the non-financial credit share, while having more investment opportunities alleviates this effect. Additionally, net inflows into the banking sector, unlike gross inflows, also have a detrimental effect on credit allocation. This outcome is apparently driven by bank outflows.

Finally, we check how sensitive our results are to extreme and negative values for capital inflows. We re-estimated models while i) excluding negative values for bank

Table 6: **Sensitivity analysis: Alternative time windows**

	4-year window	5-year window
Total credit$_0$	−0.105 **	−0.111 *
	(0.046)	(0.061)
Bank inflows	0.155	0.105
	(0.194)	(0.327)
Non-bank inflows	−1.227 **	−1.970 ***
	(0.503)	(0.528)
GDP per capita$_0$	−4.377	−4.102
	(2.997)	(3.533)
Inflation	0.547 *	−0.026
	(0.292)	(0.035)
Overnight interest rate	−0.293	0.222 **
	(0.272)	(0.099)
Credit market deregulation	−6.359 ***	−5.566 ***
	(1.536)	(1.789)
Observations	95	77
Countries	33	33
Hansen test p-value	0.39	0.16
AR(1) test p-value	0.39	0.75
AR(2) test p-value	0.23	.

Notes: The table reports coefficient estimates with robust standard errors in parentheses. ***p<0.01, **p<0.05, *p<0.1. Constant term, time dummies, and country-fixed effects are included but not reported. AR(1) and AR(2) are the Arellano-Bond tests for first- and second-order serial correlation of residuals, respectively. The Hansen test reports the Hansen over-identification statistic.

Table 7: **Sensitivity analysis: net bank and non-bank inflows**

	1990–2010	1990–2007	1990–2010	1990–2007
Total credit$_0$	−0.097 **	−0.162 **	−0.123 ***	−0.149 **
	(0.045)	(0.071)	(0.040)	(0.058)
Net bank inflows	−0.247 *	−0.402 *	1.592 *	0.828
	(0.145)	(0.226)	(0.821)	(0.817)
Net non-bank inflows	−1.164 **	−1.452 ***	−6.078 ***	−5.214
	(0.476)	(0.437)	(1.723)	(3.213)
Investment/GDP$_0$			0.260	0.125
			(0.470)	(0.487)
Investment/GDP$_0$× Net bank inflows			−0.101 *	−0.066 *
			(0.044)	(0.038)
Investment/GDP$_0$×Net non-bank inflows			0.249 ***	0.198
			(0.091)	(0.172)
GDP per capita$_0$	−6.297 **	−3.782	−2.615	−3.370
	(3.038)	(2.888)	(3.557)	(3.262)
Inflation	−0.028	−0.007	−0.018	−0.015
	(0.023)	(0.025)	(0.026)	(0.026)
Overnight interest rate	0.148 *	0.098	0.180 **	0.141 *
	(0.079)	(0.084)	(0.070)	(0.079)
Credit market deregulation	−5.465 ***	−6.550 ***	−6.110 ***	−6.377 ***
	(1.531)	(1.479)	(1.344)	(1.513)
Observations	146	111	146	111
Countries	35	32	35	32
Hansen test p-value	0.61	0.79	0.44	0.68
AR(1) test p-value	0.98	0.48	0.15	0.15
AR(2) test p-value	0.84	0.65	0.28	0.55

Notes: The table reports coefficient estimates with robust standard errors in parentheses. ***p<0.01, **p<0.05, *p<0.1. Constant term, time dummies, and country-fixed effects are included but not reported. AR(1) and AR(2) are the Arellano-Bond tests for first- and second-order serial correlation of residuals, respectively. The Hansen test reports the Hansen over-identification statistic.

and non-bank inflows; ii) excluding extreme values for bank inflows that lie above 20% and below -10% GDP. The results were not affected by these modifications of the sample (results available upon request).

To conclude, the sensitivity analysis shows that our main results are quite robust. The important new insight is that a CA surplus and EMU membership reduce the negative impact that non-bank inflows have on the share of credit to non-financial business.

7 Conclusion

This paper investigates whether capital inflows affect the shift away from bank lending to non-financial business. We construct a novel measure for 'domestic credit

allocation', defined as the share of bank credit to non-financial business. This measure is based on newly collected data from consolidated balance sheets of domestic banks in 36 countries over 1990–2011. We observe large declines in this share in the 1990s and during the pre-crisis credit boom period in 2002–2007. We distinguish capital inflows according to their sectoral destination, i.e. bank and non-bank inflows.

We explore the data and estimate system GMM regressions. In line with our hypothesis, we find that a decline in the non-financial loan share is significantly larger in those economies which experience more capital inflows into their non-bank sectors, while bank inflows do not influence credit allocation. This provides an evidence for the existence of a substitution effect between foreign capital and domestic bank loans which compete for investments in non-financial firms. Moreover, the negative impact of non-bank inflows is largely reduced in countries with more of productive investment opportunities. We also find that current account surplus and EMU membership offset the negative effect of non-bank inflows on the non-financial business loan share.

One policy implication of this study is that financial integration and capital mobility may have a detrimental effect on productive allocation of bank credit through the increase of inflows into the non-banking sector which crowd out domestic loans to non-financial business sector. Such shifts in credit allocation lead to real estate booms, financial fragility, and lower economic growth. However, creating more investment opportunities could considerably mitigate the adverse effects of capital inflows.

Acknowledgments

This work has been supported by the Institute for New Economic Thinking under grant INO13-000. We thank Rob Alessie, John V. Duca, Rients Galema, Jan Jacobs, Bert Scholtens, an anonymous referee, and participants of the May 2014

CEUS Workshop in Vallendar (Germany), the June 2014 Conference of the Financial Engineering & Banking Society, University of Surrey (UK), and the October U4 Workshop "Globalization of Trade Flows, Capital Flows and Production", University of Göttingen (Germany) for helpful comments and suggestions.

Data Appendix

Data on capital inflows was collected from the IMF Balance of Payments (BoP) Statistics database. Following IMF methodology, bank inflows are defined as capital inflows into deposit-taking corporations except the central bank. Non-bank inflows are capital inflows into other private sectors, namely other financial corporations, non-financial corporations, households, and non-profit institutions serving households.For details on classification and definition of institutional sectors, see **?**, Balance of Payments and International Investment Position Manual.Due to the lack of data for FDI by sectors of the economy, we were not able to separate FDI inflows into bank and non-bank investment. Therefore, we use total FDI inflows into all sectors.

All capital inflows are measured in percentage of nominal GDP.To alleviate volatility of annual capital inflow data, we computed 3-year non-overlapping averages. The overnight money market interest rate data is compiled from Thomson Reuters Datastream and central bank statistics.central bank statistics. The credit market deregulation index from the Fraser Institute's Economic Freedom Indicators consists of three components: ownership of banks (percentage of deposits held in privately owned banks), extension of credit (share of private sector credit in total bank credit), and presence of interest rate controls/negative interest rates. Each component is scaled from 1 to 10; the credit deregulation index is an average of the components. Data on gross fixed capital formation is taken from IMF statistics.

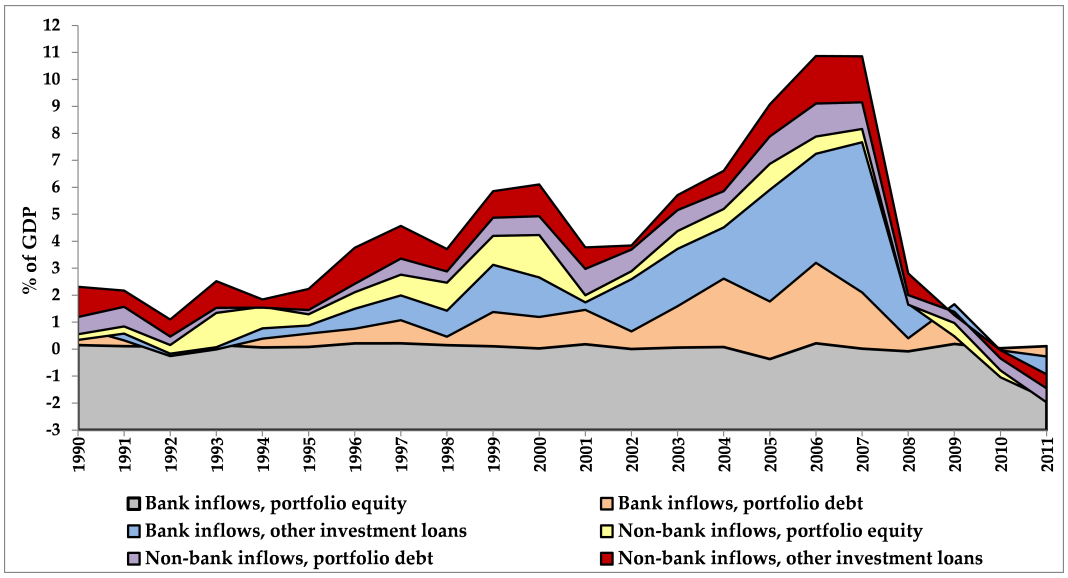
We create a current account position dummy, which takes the value 1 if a country has a current account surplus in a given period, and 0 if it has a deficit, based on the current account balance data from the IMF BoP statistics. EMU membership dummy takes the value 1 if a country is an EMU member in at least one year during a particular 3-year period, and 0 otherwise.

In Figure **??** we disaggregate bank and non-bank inflows over 1990–2011 into portfolio equity, portfolio debt, and other investment loans. Bank inflows are on

average larger in size and more volatile than non-bank inflows. Debt inflows — portfolio debt and other investment loans — constitute the largest share of bank inflows, while other investment loans dominate in non-bank inflows. Moreover, debt inflows had higher volatility than equity, especially from 1999 onwards.

Figure **??** suggests a periodization for capital inflows. First, the 1990–1998 pre-EMU years, with low and stable growth of capital inflows when average annual bank and non-bank inflows were equal 0.6% and 1.5% of GDP, respectively. Second, the period 1999–2001: the start of EMU in 1999 inaugurated faster growth of capital inflows in many European countries. Bank inflows rose to 2.3% of GDP on average and non-bank inflows to 2.4%. The period 2002–2007 were the capital boom years. Both bank and non-bank inflows more than tripled in size relative to GDP, from 2.5% in 2002 to 7.2% of GDP in 2007 for bank inflows, and from 1% to 3% for non-bank inflows. **?** notes that the growth of international financial transactions in these years was more rapid than the growth in international trade of goods and services. A fourth period in our sample are the financial crisis years 2008–2011, which saw a remarkable drop in capital inflows. Bank debt inflows declined most dramatically, from over 7% of GDP in 2007 to -1.7% in 2011, while non-bank inflows remained positive.

Figure A.1: **Composition of bank and non-bank inflows**



Source: Authors' calculations based on IMF Balance of Payments Statistics.

Table A.1: **Descriptive statistics, 1990–2010 (3-year periods)**

Variable	Unit	No. obs.	Mean	Sd	Min	Max
Credit variables						
Non-financial credit	% of total credit	187	48.71	17.33	18.64	98.33
Initial total credit	% of GDP	175	83.15	52.85	2.56	379.89
Capital Inflows						
Total inflows	% of GDP	228	7.58	8.56	−22.96	73.83
FDI inflows	% of GDP	241	3.47	3.58	−0.63	23.22
Bank inflows	% of GDP	229	2.18	5.94	−28.29	56.02
Non-bank inflows	% of GDP	239	1.79	2.25	−1.99	14.86
Control variables						
Initial GDP per capita	In log	183	9.88	0.76	7.77	11.11
Inflation	%	199	8.56	32.64	−0.60	399.55
Overnight interest rate	%	189	7.89	17.02	0.00	148.91
Credit market deregulation	1 to 10	200	8.40	1.52	1.47	10
Current account position	0/1	246	0.36	0.48	0	1
EMU membership	0/1	246	0.18	0.39	0	1
Initial Investment level	% of GDP	246	22.21	4.17	11.18	34.64

Table A.2: **Correlations of non-financial credit share with capital inflows (lagged one period)**

	Non-financial credit	Total inflows	FDI inflows	Bank inflows	Non-bank inflows
Non-financial credit	1.00				
Total inflows	−0.26***	1.00			
FDI inflows	−0.09	0.74***	1.00		
Bank inflows	−0.18**	0.85***	0.38***	1.00	
Non-bank inflows	−0.32***	0.42***	0.24***	0.07	1.00

Note: The table reports pairwise correlation coefficients. ***p<0.001, **p<0.05, *p<0.1.

Table A.3: **Correlations of non-financial credit share with other explanatory variables**

	Non-financial credit	Initial total credit	GDP p.c.	Inflation	Interest rate	Credit mkt dereg.	CA position	EMU	Investment
Non-financial credit	1.00								
Initial total credit	−0.51***	1.00							
GDP per capita	−0.63***	0.54***	1.00						
Inflation	0.39***	−0.16**	−0.38***	1.00					
Interest rate	0.50***	−0.25***	−0.43***	0.86***	1.00				
Credit mkt dereg.	−0.68***	0.31***	0.46***	−0.41***	−0.47***	1.00			
CA position	−0.21***	0.34***	0.50***	−0.02	−0.11	0.27***	1.00		
EMU	−0.13*	0.30***	0.28***	−0.11	−0.18**	0.17**	0.11*	1.00	
Investment	0.05	0.07	−0.16**	−0.12*	−0.14**	0.07	−0.22***	−0.03	1.00

Note: The table reports pairwise correlation coefficients. ***p<0.01, **p<0.05, *p<0.1.

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