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1 Introduction

The impact of international financial flows on the real economy is one of the key questions in international economics. Several papers focusing on the surge of capital inflows in Southern Europe in the early 2000s argue they led to significant misallocation of resources both across and within sectors, lowering aggregate productivity (Reis, 2013; Benigno et al., 2015; Gopinath et al., 2017). This finding is contrast to the experience of financial liberalization in Eastern Europe and other emerging countries, where evidence points to a positive effect of capital inflows on productivity growth (Larrain and Stumpner, 2017; Varela, 2018; Bau and Matray, 2020). Studying how international capital flows affect financial intermediaries and shape credit allocation across producers would be key to understanding such differences in those contexts. Unfortunately, a common feature of these papers is the impossibility of directly looking at the link between capital flows, banks, and firms.

In this paper, we revisit the Southern European episode of capital inflows of the early 2000s leveraging on detailed micro data on banks, credit, and firms for Italy. This focus allows us to identify empirically the link between international financial flows, the allocation of bank credit, and productivity. Contrary to the conventional view for this episode, we find international financial flows did not contribute to an increase in misallocation. Banks exposed to capital inflows increased lending to high-productivity industries and, within industries, to high-productivity firms, thus reducing the dispersion of productivity in the economy. Aggregating our firm-level results accounting for general equilibrium effects, as proposed by Sraer and Thesmar (2020), we find foreign flows had a positive impact on reducing misallocation and increasing aggregate total factor productivity (TFP).

These results are somewhat surprising in light of two widely documented facts characterizing the Italian and other European economies between the late 1990s and the global financial crisis. One is the remarkable worsening of allocative efficiency. For example, Calligaris et al. (2018) estimate that misallocation dragged down Italian TFP growth by more than one percentage point per year in that period. The other is a process of significant financial deepening, involving the banking sector in particular, e.g., banks' assets increased from 90% to 150% of GDP between 1998 and 2007 and there was also a sharp increase in banking competition. Yet, foreign financial flows were just one of the sources fueling banks and credit expansion. The issuance of bank bonds played an equally large though largely overlooked role. We find evidence that thanks to higher bond issuance, largely sold in domestic markets, part of the banking system managed to maintain or even improve its market position. The associated credit expansion was, however, tilted toward less productive borrowers contributing to an increase in misallocation.

This paper estimate the impact of international capital flows on misallocation matching banks and firms at a granular level, in a way that has not been previously done. Gopinath et al. (2017), Larrain and Stumpner (2017), Varela (2018), and Bau and Matray (2020) use firm-level data but cannot directly link firms to banks and capital inflows. By contrast, Baskaya et al. (2017) and di Giovanni et al. (2017) link capital flows to banks and customers through credit registry data, but do not observe firm-level characteristics such as productivity. Matching credit registry data with balance-sheet information on all banks operating in Italy and the universe of incorporated firms allows us to identify the impact of international financial flows on misallocation, which proves crucial for assessing the productivity consequences of capital inflows in Southern Europe.

In the early 2000s a sharp increase of cross-border financial flows involved countries in the European Monetary Union (EMU), especially the more peripheral ones. The Italian banking system benefitted largely from these inflows; between 2002 and 2008, the net international investment position of banks went from -5.5% to -25.5% of GDP, mostly driven by an increase in liability flows. This large shift is similar to the one experienced by Spain[1] and was largely driven by global push factors (Lane and Milesi-Ferretti, 2007*b*, 2008; Kalemli-Ozcan et al., 2010; Lane, 2013; Hale and Obstfeld, 2016; Amiti et al., 2017).

We exploit the heterogeneity of bank exposure to such a boom as measured by banks' ex-ante foreign-liability ratio (foreign liabilities relative to total liabilities). The intuition of this approach, which is similar to Paravisini et al. (2015) and Mian and Sufi (2018), is that capital inflows would disproportionately benefit banks already relying on funding from foreign markets.[2]

To establish the causal effect of bank exposure on credit supply, we use the Khwaja and Mian (2008) within-firm estimator. This approach allows us to absorb any firm-wide innovation that equally affects credit by all lenders to the same firm, such as changes in credit demand due to the boom of inflows itself. We find that a 10-percentage-point (pp) higher exposure increases credit supply by 4.0% after the shock. Importantly, bank exposure does not affect credit supply in the years preceding the boom of capital inflows. We find evidence of some substitution across sources of funding, but overall bank-firm

[1] In Spain, the net IIP of banks moved from -19% to -42% of GDP. A decrease in banks' net IIP of 20% of GDP over six years, as the one experienced by Italy and Spain, is in the top 10% of the distribution of changes in net IIPacross both developed and developing countries.

[2] We show the ex-ante ratio between foreign liabilities and total liabilities captures well the subsequent share of total inflows across banks. We also use two alternative measures aimed at isolating the push component of international capital flows: a shift-share indicator constructed exploiting bank-level information about the sourcing country of foreign funding, and a time-varying measure of exposure obtained following Cesa-Bianchi et al. (2018).

relationships proved sticky. We arrive at this conclusion by comparing the total credit of firms that prior to 2001 borrowed from the most exposed banks, relative to firms in the same sector borrowing from less constrained sources. Firms borrowing from a bank with a 10pp higher exposure faced a roughly 3% increase in aggregate credit.

We then analyze the effect of capital inflows on misallocation across and within sectors. We investigate the patterns of credit supply according to firms' ex-ante marginal revenue product of capital (MRPK) and total factor productivity revenue (TFPR), and accounting for the degree of credit constraint, proxied by firms' fixed assets as a measure of collateral. Exposed banks disproportionally lending to low-productivity firms would be important evidence that the surge in capital inflows induces an increase in resource misallocation. However, our results show the strength of the credit-supply shock associated with capital inflows is greater for firms with ex-ante above-average productivity. Exposed banks also increase credit to firms with higher fixed assets, but in a way that is not independent of productivity. Firms with low fixed assets but with high productivity do benefit from the credit-supply shock. Only the worse borrowers (i.e., those with both low productivity and low collateral) see no increase in credit from exposed banks. Moreover, our sector-level analysis shows exposed banks increase lending to firms in manufacturing, but not in services or construction. These results suggest banks benefitting from a positive funding shock from capital inflows allocate credit in a way consistent with *reducing* misallocation.

To quantify the implications of these findings on aggregate TFP, we rely on the methodology of Sraer and Thesmar (2020). This approach allows us to infer the impact of capital inflows accounting for general equilibrium effects through a set of sufficient statistics that are consistent with a large class of models in the macro-finance literature. We find that, absent the credit-supply shock induced by international flows, the yearly aggregate TFP growth in Italy would have been 0.9% lower. Calligaris et al. (2018) estimate that the increase of misallocation in Italy in that period led to about a 1.3% decline in productivity growth per year; hence, capital inflows could undo about two-thirds of such a decline.

Finally, we show foreign financial flows were just one of the drivers of banks' expansion at that time. Foreign capital flows contributed to such expansion after 2002, but the increase of bonds, largely sold in domestic markets to households, insurance companies, and mutual funds, was an equally relevant source of funding that fueled banks throughout the entire period. We find that banks most intensively relying on bond funding allocated credit in ways that are compatible with misallocation. Our investigation of the mechanism behind this result suggests the increasing reliance on bonds could be one channel through which part of the banking system managed to keep up or even improve its market position amid a wave of significant financial deepening and increasing bank competition. The associated credit expansion, however, was tilted towards less productive, high-interest-rate borrowers, who compensated for the higher funding costs of bonds but increased misallocation.

The idea that funding structure and competition could affect banks' lending strategy is not new. For instance, Jasova et al. (2021) show that decreasing the rollover risk of bank funding moves the allocation of credit toward riskier firms. Similarly, Boyd and Nicoló (2005) argue that tighter competition can push banks' portfolio towards more opaque borrowers. Our results on credit allocation by banks with bond versus foreign funding are in line with these findings in the literature.

Our results are robust to alternative definitions of bank exposure, changing the timing of the shock, controlling for bank characteristics and variation in other sources of funding, and withstand a host of specification checks. We investigate if foreign capital flows could affect misallocation through a credit demand channel, as opposed to a credit supply one, but we don't find that this is the case. We also check the possibility of *indirect* effects of capital inflows on misallocation. For example, banks exposed to foreign flows can increase the liquidity of other banks through interbank lending, bond and equity acquisition, which in turn might favor a higher flow of credit to less productive firms. We do not find evidence of spillover effects from exposed to non-exposed banks, however. For instance, interbank lending did not increase across banking groups, and no surge in bonds or equity financing occurred from exposed to non-exposed banks. Moreover, we do not find a significant effect on the share of deposits to less exposed banks, which could have been associated with capital inflows feeding into changes in banks' retail policy. We also test whether capital inflows made banks more fragile after 2008, as foreign funding began to decline rapidly, but we don't find evidence of an increased fragility of banks.

Related literature

The paper contributes to the literature about the impact of international financial flows on productivity such as Buera et al. (2011), Reis (2013), Moll (2014), Benigno and Fornaro (2014), Benigno et al. (2015), Larrain and Stumpner (2017), Buera and Shin (2017), Gopinath et al. (2017), Varela (2018), Castillo-Martínez (2019), Bau and Matray (2020), and Saffie et al. (2020). These papers have different theoretical predictions about the impact of capital inflows, resource allocation, and aggregate TFP. They differ in the type of shock they consider; for example, some focus on the transitional dynamics following a decline in the real interest rate in developed countries (Gopinath et al., 2017; Reis, 2013; Benigno and Fornaro, 2014) and others on financial liberalization episodes in emerging economies (Buera and Shin, 2017; Varela, 2018). Relative to this literature, we can empirically identify the causal impact of capital inflows on misallocation in a way that these other papers could not. This contribution leads us to assess a beneficial effect of capital inflows in Southern Europe on productivity. Moreover, our findings highlight that during episodes of capital inflows, often there are other confounding shocks that increase the financial deepening of a country and that is key to account for such concurrent factors to analyze the link between capital inflows and productivity.

More broadly, our paper contributes to the literature on the effects of foreign capital flows on the real economy, such as Gourinchas and Jeanne (2006), Prasad et al. (2007), Bonfiglioli (2008), Rodrik and Subramanian (2009), Levchenko et al. (2009), Bekaert et al. (2011); Chari et al. (2012), Gourinchas and Jeanne (2013), Broner and Ventura (2016), Baskaya et al. (2017), di Giovanni et al. (2017), Sander (2019). These papers typically look at episodes of financial account liberalization across emerging countries at the macro level. Baskaya et al. (2017) and di Giovanni et al. (2017) are notable exceptions. They use micro data on banks and credit in Turkey to look at the impact of capital inflows on bank lending exploiting exogenous fluctuations in the global financial cycle. Relative to these papers, we also observe firm characteristics, which allows us to focus on the link between credit allocation and aggregate productivity.

Finally, the current paper speaks to the literature analyzing capital flows and the EMU such as, Lane and Milesi-Ferretti (2007*a*), Spiegel (2009), Kalemli-Ozcan et al. (2010), Giavazzi and Spaventa (2011), Lane (2013), and Hale and Obstfeld (2016). Our contribution is to look into the effect of these flows on local banking and productivity. Our paper relates also to the extensive literature on the so-called bank-lending channel as in Khwaja and Mian (2008), Paravisini (2008), Amiti and Weinstein (2011), Schnabl (2012), Jiménez et al. (2014), Chodorow-Reich (2014), Paravisini et al. (2015), Cingano et al. (2016), Mian et al. (2017), and Amiti and Weinstein (2018).

The paper is structured as follows: section 2 describes the historical context of our setting; section 3 presents the data; section 4 discusses the empirical strategy; section 5 presents the results; section 6 looks at the aggregate implication on TFP; section 7 analyzes other potential sources of misallocation; section 8 analyzes the robustness of our results along several dimensions; and section 9 concludes.

2 The early 2000s boom of cross-border flows

Considerable research documents the acceleration of capital inflows from 2002 to 2007 in Southern European countries. The extent to which these flows involved banks is exemplified in Figure 1, which plots gross foreign liabilities and claims of banks in Italy between 1995 and 2010. Until 2002, foreign liabilities remained stable but then increased by almost four-fold up to the global financial crisis. This surge was not matched by a growth of foreign assets, and thus translated into more funding available in the domestic economy. The majority of the foreign funding took the form of loans denominated in euro, that is with low currency risk relative to assets, and had an average maturity around 12 months. The aggregate trends are similar to those experienced by other European countries, such as Spain, and underpin the idea of foreign-capital-induced misallocation.

Lane and Milesi-Ferretti (2007*b*) and Lane (2013) show the increase in cross-border flows was part of a general international pattern associated with global factors, such as the rise of securitization, that increased banks' liquidity for further lending, and the decline in global uncertainty, as exemplified by the reduction in the VIX in that period. In the euro area, the rise of cross-border flows was particularly remarkable because the common currency stimulated international financial integration (Kalemli-Ozcan et al., 2010), and European banks were frontrunners in the surge of securitization (Lane and Milesi-Ferretti, 2008). More specifically, Hale and Obstfeld (2016) document how, leveraging on foreign funds, banks from core eurozone countries increased their lending to the banks of peripheral countries in the euro area.

Despite the substantial increase in its banking-sector foreign liabilities, in Italy, the overall current account imbalance was milder than that in other Southern European countries. Some of these countries, such as Portugal and Greece, experienced large sovereign inflows. In others, such as Spain, domestic pull factors exacerbated capital inflows. Amiti et al. (2017) decompose the growth of foreign bank inflows to several countries into (i) global shocks, (ii) idiosyncratic demand shocks, and (iii) idiosyncratic supply shocks. Their analysis shows that, in the case of Italy, the surge in foreign capital inflows was largely driven by global factors (see Figure 2). By contrast, in Spain idiosyncratic demand factors played a prominent role.

The distinction between capital inflows driven by global push versus domestic pull factors has relevant policy implications. Finding evidence that capital inflows cause misallocation when driven by push factors would provide a rationale for capital controls, whereas misallocation being associated with domestic pull factors would point to the need to strengthen macro-prudential policies. The distinction is also useful for identification purposes: capital flows being mainly driven by global factors, as in Italy, reduces the potential contamination of the estimated impact of cross-border flows by domestic endogenous drivers.

Finally, the literature shows a remarkable worsening of allocative efficiency in Southern European countries, including Italy, since the mid-1990s(Gopinath et al. 2017; Calligaris et al. 2018; GarcíaSantana et al. 2020), which many associates to the surge in capital inflows. Figure 3 confirms the presence of this pattern in our data. It looks at the evolution of the dispersion in (the log of) total factor productivity revenue (TFPR), the marginal revenue product of capital (MRPK), and the marginal revenue product of labor (MRPL).[3] We find a substantial increase in the dispersion of TFPR and MRPK, while that of MRPL remains fairly constant. The paper will identify the causal link between the rise of capital inflows and that of misallocation.

3 Data

Our analysis is based on a matched loan-bank-firm dataset containing information on bank credit for a large sample of Italian companies. The final dataset is obtained by combining three sources: credit register, banks' balance-sheet data, firms' balance-sheet data.

The first source is the Italian Credit Register administered by the Bank of Italy, which contains a monthly panel of the outstanding debt of every borrower (firms or individuals) with loans above EUR 75,000 with each bank operating in Italy. We focus on non-financial corporations and build an annual bank-firm panel, where loans are measured as the outstanding credit (committed credit lines and fixed-term loans) granted at the end of a given year.

Banks' balance-sheet data are from the Bank of Italy Supervisory reports, which provide detailed data on banks' assets and liabilities, including details about banks' foreign funding. Whenever a bank stop to exist, due to either bankruptcy or merger, firms will cease reporting that bank as a source of loans. Firms' balance-sheet data (including variables such as revenues, investment, employment, and wage bill) are taken from the CERVED database, which covers the universe of incorporated firms in Italy.[4] We match the bank-firm loan data to banks' and firms' balance-sheet data using unique bank and

[3] As Restuccia and Rogerson (2008) and Hsieh and Klenow (2009) emphasize, an increase in the dispersion of a factor's return and TFPR across firms could reflect, with some well known caveats, a decrease in allocative efficiency and a loss in aggregate TFP.

[4] Incorporated firms from CERVED account for 70% of value added in manufacturing and 60% in services from national accounts and their aggregate trend follows very closely the national one.

firm identifiers, respectively.

Lending and funding policies of banks are typically decided at the banking-group level, so we consolidate banks' balance sheet at the group level, because this unit of observation is relevant for analyzing the dynamics of credit supply. Thus, if a firm borrows from two banks of the same group, we consider it a single relationship given by the sum of the two loans. We also keep track of mergers and acquisitions among banks. If a firm is borrowing from a bank and the bank disappears because it is acquired or merged, we track if a new relationship develops with the newly formed bank or with the acquirer, in which case, we consider the relationship as still existing. This approach ensures we do not have any gaps associated with mergers.

Table 1 shows the summary statistics of banks and firms characteristics in our sample. The unit of observation in our empirical analysis is at the bank-firm-year level. The dataset includes, on average, about 500 banks and 170,000 firms in manufacturing and services per year. The simple average of the share of banks' foreign liability is 3.7%, and the standard deviation 13.1%. The distribution of banks' foreign funding shows that many banks, mostly the small ones, are not exposed to international financial markets; hence, as a robustness check, we drop banks with no exposure or with exposure below 2%, in that case we have about 90 banks per year in our sample, which account for the vast majority of credit, and the results go through. Finally, note that Italian firms usually borrow from multiple banks, even small firms. About 68% of firms in our sample borrow from two or more banks, and these account for 90% of total corporate credit. The average number of banking relationships for firms with multiple lenders is 4.5. As we discuss in the following sections, the fact that firms borrow from multiple banks is an essential feature of our identification strategy.

4 Empirical strategy

4.1 Bank-level exposure to foreign capital

Financial institutions rely on a number of sources of financing when originating loans. The literature suggests relevant distinctions between banks that rely on core deposits versus non-core liabilities. Hahm et al. (2013) show non-core financing is associated with greater risk-taking in the banking sector. Hanson et al. (2015) and Drechsler et al. (2017) argue that financial institutions that rely more heavily on core deposits are less prone to runs and cost shocks due to monetary policy.

Our empirical approach rests on the idea that the surge of international capital flows between 2002 and 2007 offered greater funding opportunities to banks featuring a higher liability share of foreign funding before the shock. A relevant underlying assumption of this approach is that some stickiness is present in the liability structure of banks.[5]

Figure 4 shows a strong correlation between how much a bank used to fund itself from abroad (foreign-liability ratio in 1998-2001, horizzontal axis) and how much it actually benefited from capital inflows (bank's share of total inflows after 2002, vertical axis). Panel A looks at this relation unconditionally, whereas Panel B controls for key bank characteristics measured in the first period.[6] In both cases, we observe a positive and significant correlation between the two variables. This observation suggests the intensity of foreign financing in the years pre-capital inflows boom is a good proxy to measure banks' exposure to the increase in international flows in the years 2002-2007.

Table 2 provides further support for this approach with cross-sectional bank-level regressions. Column (1) reports the regression coefficient plotted in Figure 4-B. The second column confirms the significant positive correlation between the ex-ante foreign-liability ratio and exposure to capital inflows using a different dependent variable, namely the growth of the foreign-liability ratio between the pre- and post-2002 periods. Column (3) checks the stickiness of the liability structure of banks, looking at the persistence of banks' ranking by foreign-liability ratio: a regression of the ranking as of 1998-2001 on the ranking as of 2002-2007 delivers a coefficient of 0.75. Such persistence has several possible causes, for example fixed costs to engage foreign funding, but the finding that the share of foreign liabilities ex-ante captures well the heterogeneity of exposure to capital flows ex-post is reassuring.

Although our baseline approach relies on existing evidence on the drivers and dating of the surge of foreign capital flows to Italy, we look at alternative approaches that allow for more flexibility in both dimensions. First, we employ a shift-share measure of exposure exploiting bank-level information on the country of origin of foreign funding. This usage allow us to predict the exposure of an Italian bank as a weighted average of how much foreign countries are exporting capital in general (the "shift"), with weights that come from the initial bank composition of inflow by country of origin (the "shares").

[5]The source of variation that we exploit is similar to that of Paravisini et al. (2015), di Giovanni et al. (2017), and Mian and Sufi (2018). The former looks at the effects of capital flows reversal in Peru and measure bank exposure to capital outflows as the share of foreign liability before the global financial crisis. The second, analyzes the transmission of the Global Financial Cycle to the local credit market in Turkey and measures banks' exposure as the share of non-deposit liabilities. Finally, the latter exploits the fact that US lenders which relied on non-core deposits in their liability structure pre-2002 are the ones that benefited more from the global rise of shadow banking and private label securitisation post-2003.

[6]These include log-assets, as a proxy for bank size; the share of core liabilities, to capture the relevance of deposit funding in the liability structure; capital ratio, as a proxy for leverage; and the share of NPLs, to control for bank vulnerability.

Second, we construct a time-varying measure of bank exposure isolating a shock of capital inflows induced by push factors as in Cesa-Bianchi et al. (2018) (see subsection 8.2 for details). Our results are confirmed using these alternative measures.

Identification also rests on the assumption that bank exposure to capital inflows does not correlates with unobserved determinants of credit supply. Table 3 looks at the balancing of observable characteristic of banks (i.e., their size or balance-sheet composition) and of their borrower (e.g., in terms of productivity) between high-exposure and low-exposure banks (Imbens and Wooldridge, 2008). The characteristics of the average borrower across the two groups show a high degree of overlap, which suggests sorting between banks and firms is unlikely to drive our results. Although normalized differences lie within the commonly accepted 0.25 threshold, the degree of overlap is less satisfactory in the case of some banks characteristics. To account for their potential concurring effect in the estimation of the lending channel from capital inflows, our baseline specification allows for a differential impact of each such variable on credit.

4.2 Foreign capital flows and the bank-lending channel

Our empirical approach relies on the Khwaja and Mian (2008)'s within-estimator, which allows isolation of the demand and supply of credit. The estimator exploits the fact that the vast majority of firms borrow from multiple banks, which enables a comparison of credit supply by banks with different exposures to the *same* firm:

$$\ln C_{ibt} = \beta_1 \, Exposure_b \times Post_t + \beta_2 \, Spec_{ibt} + \boldsymbol{X_b'\delta} \times Post_t + \alpha_{it} + \gamma_{ib} + \epsilon_{ibt} \quad (1)$$

The dependent variable is the log of outstanding credit granted by bank b to firm i at the end of year t. The variable $Exposure_b$ measures the ex-ante share of foreign funding in the bank's liability over the 1998-2001 period, and it is interacted with a dummy equal to 1 for the years after the boom in capital inflows (2002-2007), and 0 for the earlier years ($Post_t$). The specification includes a full set of firm-year fixed effects (α_{it}) that control for any firm-specific shock potentially affecting credit demand (expected to be common across all banks). Because demand shocks may not be equally distributed across banks (Paravisini et al., 2017), the specification also includes $Spec_{ibt}$, a dummy equal to 1 if a firm operates in a sector into which a bank is specialized.[7] We also control for potential non-random matching between firms and banks by including a set of firm-bank fixed effects (γ_{ib}). These fixed effects capture all time-invariant factors that may affect credit

[7] A bank is considered to be specialized in one sector (3-digit) if its share of loans in that sector is above the interquartile range of all the other banks in the economy.

for any bank-firm pair, such as relational banking and time-invariant drivers of sorting between banks and firms. Finally, the specification accounts for potentially confounding determinants of changes in credit supply, interacting a set of bank characteristics with the post dummy.[8] Given that our source of variation is at the bank level and that firms' demand for specific banks can vary according to the sector of specialization of the bank, we double cluster the standard errors at the bank-sector (3-digits) level.[9]

The coefficient of interest is β_1, which captures the marginal effect of bank exposure on credit supply, following the surge in capital inflows. Given the presence of firm-year fixed effects, our source of identification relies on within-firm variation of credit across multiple lenders with different degrees of exposure. The firm-year fixed effects, combined with the bank-specialization dummy, absorb firm-level shocks that affect the demand of credit, so β_1 represents a credit-supply shock due to the bank's exposure to capital inflows.

To assess the relevance of pre-trends across banks that could be associated with different bank characteristics and drive our results, we also estimate a dynamic difference-in-difference estimation. This approach allows us to look into the full dynamics of credit supply between 1998 and 2007, and to show in a transparent way how this supply varies for the years before and after the boom in capital inflows.[10]

One concern is that equation (1) only captures the *intensive* margin of credit, because it only accounts for bank-firm relations that exist before and after the boom of capital inflows. However, we are also interested in the effects on the *extensive* margin. For this reason, we run the following specification:

$$Entry_{ib\tau}\ (Exit_{ib\tau}) = \beta_1\ Exposure_b * \times Post_\tau + \beta_2\ Spec_{ib\tau} + \boldsymbol{X_b'\delta} \times Post_\tau + \alpha_{i\tau} + \gamma_b + \epsilon_{ib\tau} \quad (2)$$

where the dependent variable takes the value of 1 if bank b and firm i starts (exit) a lending relation after the boom of capital inflows. This two-period panel, $\tau = 1, 2$, refers to the years pre and post 2002. The coefficient of interest β_1 captures the marginal effect of the

[8]These characteristics include the following: log assets as a proxy for bank size; the share of non-performing loans (NPLs), to captures bank performance and management; bank core liabilities, which control for the funding structure of the bank; and the capital ratio, which controls for the degree of bank leverage. All variables are average values (1998-2000).

[9]As a robustness check, we run specification 1 using a balanced panel only, and results are confirmed (see Table A14 in the Appendix). We also compute equation (1) in first difference by taking the average of the pre and post period for the variables of interest, as in the original paper of Khwaja and Mian (2008). This approach makes the standard errors robust to possible concerns of autocorrelation as highlighted by Bertrand et al. (2004). Specifically, we run $\Delta \ln C_{ib} = \beta_1\ Exposure_b + \beta_2\ \Delta Spec_{ib} + \boldsymbol{X_b'\delta} + \alpha_i + \epsilon_{ib}$. Results are confirmed; see Table A15 in the Appendix for details.

[10]Specifically, we run $\ln C_{ibt} = \sum_{q=1998}^{2007} \beta_q\ Exposure_b \times \mathbb{1}_{t=q} + \beta_2\ Spec_{ibt} + \sum_{q=1998}^{2007} \boldsymbol{X_b'\delta_q} \times \mathbb{1}_{t=q} + \alpha_{it} + \gamma_{ib} + \epsilon_{ibt}$, where β_q captures the year-by-year effect of bank exposure.

bank's exposure to foreign capital on the probability that the bank starts (ends) a credit relation with firm i after the shock. The specification controls for whether the bank is specialized in the sector in which the firm operates, for bank's pre-characteristics, for firm-time fixed effects, and for the bank fixed effects. Errors are double clustered at the bank-sector (3-digit) level.

Another concern is that an increase in credit supply from more exposed banks could be compensated by a decline of credit from less exposed ones, so the aggregate amount of credit that a firm receives may not be affected. Moreover, if there were no stickiness in lending, all firms would rapidly establish or intensify relationships with banks that benefit from the inflows, significantly attenuating (or even undoing) the within-firm effect of bank exposure. To investigate these possibilities, we compute the exposure of firms to the bank lending channel of international financial flows as the weighted average of the exposure of all the banks a firm borrows from:

$$Exposure\ Firm_i = \sum_b Exposure_b\ \frac{Credit_{ib}}{Total\ Credit_i} \tag{3}$$

With this measure in hand, we look at the effect of firm exposure on the aggregate credit of a firm by running

$$\ln C_{ist} = \beta_1\ Exposure\ Firm_i \times Post_t + \boldsymbol{X_i'\delta} \times Post_t + \hat{\alpha_{it}} + \gamma_i + \delta_{st} + \epsilon_{ist} \tag{4}$$

The overall amount of loans firm i receives in year t is regressed on firm fixed effects and sector-time fixed effects, X_i, which is a weighted average of firm lenders' characteristics measured in 1998-2001. The coefficient of interest β captures the interaction between firm exposure to capital inflows, through the banks it borrows from, and the post-2002 dummy. This specification includes also the firm-time fixed effects estimated in equation (1), as a proxy for credit demand by firms.

The set of specifications presented in this section should give us a complete picture of the credit effect of a trade shock. Equation (1) allows us to distinguish neatly between supply and demand effects; equation (2) accounts for the extensive margin of credit; and equation (4) looks into the effect on the aggregate credit that a firm receives. In the following sections, we also look into the effect of the trade shock on the total credit that a firm receives and its effect on misallocation.

4.3 Foreign capital flows and credit allocation

We next investigate whether the patterns of credit supply induced by foreign capital inflows are compatible with an increase in resource misallocation either within and across sectors. Specifically, we ask whether exposed banks tilted the composition of their credit portfolio toward low-productivity firms or toward services and construction. We also explore the role of borrowing constraints, the main mechanism preventing an optimal allocation of resources toward high-productivity firms in the literature linking financial friction to misallocation.[11]

A simple way to nest the insights of these papers into our empirical strategy is to assume a bank's supply shock varies with borrowers' characteristics. Finding that exposed banks passed along the shock more to firms with low TFPR or MRPK would confirm that foreign capital inflows contributed to dampening aggregate efficiency in Italy through bank lending. On the other side, if banks exposed to capital inflows increase credit supply disproportionately more towards firms with high TFPR or MRPK, it would lead to an improvement in the allocative efficiency of the country.

For each 3-digit industry in our sample, we compute the average MRPK and TFPR before the shock and we group firms above (below) the mean threshold as high-(low)MRPK or TFPR firms.[12] Then, we analyze the heterogeneity in the strength of credit-supply shocks across these groups of firms by writing our baseline specification as:

$$\ln C_{ibt} = \sum_{d=H,L} \beta_d \, D_i^d \, (Exposure_b \times Post_t) + \beta_2 \, Spec_{ibt} + \boldsymbol{X_b'\delta} \times Post_t + \alpha_{it} + \gamma_{ib} + \epsilon_{ibt} \quad (5)$$

where D_i^d is an indicator distinguishing high-MRPK (or TFPR) borrowers from low-MRPK ones. This specification captures credit misallocation along the intensive margin, but we run similar specifications for equations (2) and (4) to look also at the extensive margin and aggregate credit, respectively. Estimating $\beta_L > \beta_H$ would reveal exposed banks disproportionately allocated funds to relatively less productive firms following the shock. This finding would be consistent with the idea that capital inflows ended up dampening

[11]The role of financial frictions on aggregate productivity is well developed by, among others, Banerjee and Duflo (2005); Buera et al. (2011); Reis (2013); Midrigan and Xu (2014); Moll (2014); Buera and Moll (2015); Buera and Shin (2017); Gopinath et al. (2017); Varela (2018); David and Venkateswaran (2019); Saffie et al. (2020).

[12]Estimating the threshold in the overall sample of firms rather than by industry does not affect our findings. TFPR is computed following the methodology of Levinsohn and Petrin (2003), Wooldridge (2009), and Gandhi et al. (2020) and MRPK is estimated following De Loecker and Warzynski (2012), we outline the details of these estimates in the Appendix (subsection A.3). We thank Simone Lenzu and Francesco Manaresi for sharing their data and code for the estimation of TFPR and MRPK on the CERVED sample. Results are confirmed also if we use a Hsieh and Klenow (2009) measure of TFPR and MRPK.

aggregate TFP through credit misallocation.

We explore several robustness for this analysis. We use a continuous measure of ex-ante firm-level productivity interacted with bank exposure and the results are confirmed (section A.1 in the Appendix). Moreover, in our baseline specification the productivity's thresholds are determined in the period before the shock to limit endogeneity concerns, i.e. the risk that the distribution of firms' characteristics could partly depend on the credit supply shock. However, our results hold if we define firm characteristics based on the distributions of productivity at $t-1$ or if we look at firms' realized productivity at the end of our sample period (see subsection 8.3).

Then, we study the relevance of credit constraints and exploit the idea that they should be less stringent, on average, for firms with high collateral availability. Our simple framework is illustrated in Figure 5, where the set of borrowers is now split into four groups along both a productivity and a collateral dimension. For productivity we refer to either TFPR or MRPK, and as a proxy of collateral we use borrowers' fixed assets. Our main set of variables therefore becomes $\sum_{d} \beta_d \, D_i^d$ with $d = HH, LH, LL, HL$ (for the two dimensions of productivity and collateral, respectively), and we analyze how credit-supply shocks vary for each group.[13]

In a simple world in which credit is optimally allocated across projects accounting for the risk-return trade-off, an increase in the funding available to banks should favor the financing of projects by high-productive and high-collateral (low risk) firms (first quadrant). Banks pursuing a balanced expansion of their portfolios should also pass along their shocks to high-collateral but low-productivity firms, and to low-collateral high-productivity firms ($\beta_{L,H} \cong \beta_{H,L}$). However, if lending is severely constrained by the availability of collateral, large firms in the third quadrant would disproportionately benefit from the easing of credit conditions ($\beta_{L,H} > \beta_{H,L}$). Finally, the credit expansion should not (or only to a limited extent) concern low-productivity constrained firms ($\beta_{L,L} \approx 0$).

5 Results

5.1 Capital inflows and credit supply

Table 4 reports our baseline results on the intensive margin of credit supply. The five columns refers to alternative specifications of the within-firm regression 1, testing

[13]Little overlap exists between these firm-level characteristics. For instance the correlation between marginal product of capital and total fixed assets is -0.27, which is sufficiently low to ensure that firms with a high MRPK ex-ante are not also the ones with low collateral to start with. Similarly, the correlation between MRPK and other measures of risk, such as credit score, is -0.05, which is very low.

whether banks exposed to foreign capital inflows increased their lending relative to less exposed banks when looking at the same firm. Column (1) shows they did in the baseline specification, when exposure is measured by a bank's ratio of foreign liabilities before the shock. The estimated coefficient implies a 10-percentage-point (pp) increase in this ratio leads to a 4% increase in lending between the pre and post years. To account for non-linearities in columns (2) and (3) banks' exposure is captured by a dummy variable equal to 1 for banks with a share of foreign liabilities above 10% and 15% respectively, and 0 otherwise (as suggested by Paravisini et al. (2015)). In both cases, the treated banks increase credit supply by 7% relative to control banks. In column (4), we check for the relevance of the large number of small banks with limited access to foreign capital flows in our sample, restricting the analysis to those with higher exposure than a minimum threshold, here 2%. Finally, in column (5), we check the relevance of firm size, weighting the least-squares estimates by firm revenues. In either case, the results are unaffected.

Figure 6(a) plots the marginal effect of bank exposure on credit supply estimated every year between 1998 and 2007. Bank exposure to capital inflows has no effect on the supply of credit until 2002, it shows a positive effect only following the surge in foreign capital inflows.

Next, we look at the effects of foreign capital inflows on the extensive margin of credit, estimating the effects of bank exposure on the probability of terminating an existing credit relation and on the probability of starting a new relation. The results in Table 5 show exposed banks are less likely to terminate a credit relation (columns (1) and (2)) and more likely to enter a new relation with an existing firm (columns (3) and (4)). Both results hold using the linear and the dummy-variable exposure measures. The estimated coefficients imply a 10pp increase in exposure is associated with a 1.1% lower probability to stop lending to a given firm and a 1.9% higher probability of starting a new credit relation.

In Table 6, we extend our analysis to estimate the impact of firm exposure to foreign capital (as defined in equation (3)) on total credit following specification (4). If clients of low-exposure banks were able to promptly switch to lenders who benefit from the shock, or if firms were simply substituting credit between low-exposure and high-exposure banks, we would see little or no difference between aggregate credit and initial firm exposure. The results in Table 6 suggest these substitutions are not taking place and credit relations are sticky: a 10pp increase in firm exposure before the shock is associated with a 2.4% increase in credit afterwards (column (1)). The other columns replicate the specification changes of Table 4 confirming the baseline finding. The estimates being smaller than those of the firm-bank-level specification in Table 4 suggests some credit substitution, which is, however, unable to undo the transmission of the shock to borrowers.

5.2 Capital inflows and misallocation

We next analyze the allocation of credit induced by capital inflows across firms. The results in Table 7 refer to the specification in equation (5), which allows for heterogeneous credit-supply shocks across firms with different productivity and credit constraints. Columns (1) and (2) show that loans by exposed banks are disproportionally allocated to firms with an above industry level of MRPK and TFPR: a 10pp increase in bank exposure translates into a 4.4% higher credit supply to high-MRPK firms (4.6%, high-TFPR) and a 3.4% increase to low-MRPK firms (2.6%, low TFPR). In both cases, the difference between the two groups is statistically significant at conventional thresholds.[14]These initial results are not compatible with capital inflows increasing misallocation through the bank-lending channel.[15] We also find the supply shock is significantly stronger for firms with high collateral (column (3)).

In columns (4) and (5) of Table 7, we decompose our sample accounting for both MRPK (TFPR) and collateral. We find that, after the boom in capital inflows, exposed banks increase credit the most for unconstrained high-productivity borrowers (high-MRPK and high-collateral), whereas they do not increase lending to risky and low-productivity firms (low-MRPK and low-collateral). Figures 6(b) and 6(c) plots the year-by-year marginal effects of bank exposure on the credit supply for these two groups of firms. For high-MRPK and high-collateral firms the coefficient of bank exposure is not statistically different from zero in the years preceding the boom and it increases only afterwards. For low-MRPK and low-collateral firms we find a positive, although only marginally significant, coefficient in the years preceding the boom, but the coefficient becomes not different from zero afterwards, suggesting, if anything, a disciplining effect of capital inflows on exposed banks.

Columns (4) and (5) of Table 7 also shows that firms with low collateral but high MRPK (or TFPR) benefit from a significant increase of credit supply by exposed banks, and this increase has a similar magnitude to the one experienced by high-collateral and low-productivity firms. This suggests that collateral availability is not independent from productivity for banks supplying more credit, at least in the context of the credit-supply shock induced by capital inflows we are analyzing.

[14]To ease the exposition, we do not report the tests for the statistical difference across coefficients but they are available upon request.

[15]These findings are confirmed using simpler measures of firm performance such as sales per capita or returns on assets. Results available upon request,

In Table 8, we look at the extensive margin of credit. On the exit side, the results show that banks more exposed to capital inflows have a lower probability of terminating a relationship with more productive firms, even if these firms have low collateral (columns (1)-(3)); thus, this channel is unlikely to have contributed to higher misallocation. The results are more mixed when we look at firms' entry (columns (4)-(7)).

We find exposed banks are more likely to start a credit relation with more productive but also more risky firms (column (2)). In this case a 10pp increase in bank exposure raises the probability of entry, over a five-year horizon, by 3.6%. However, given that the unconditional probability of entry in the post period is 30%, this increase is not very large. Moreover, the size of the new loans granted to less productive firms is smaller than that of productive firms.[16] Finally, if we look at the effects in terms of net-entry (probability of entry minus probability of exit), the results are not different across type of firms. Taken together, these results suggest foreign capital flows are unlikely to have increased misallocation in any substantial way through the extensive margin of credit.

Next, to combine both the intensive and the extensive margin, we look at the aggregate effect on credit. In Table 9, we analyze the impact of capital inflows on misallocation on the aggregate credit of firms. The results account for both the intensive and extensive margin and confirm that the more productive and more collateralised firms are the ones that benefited more from the higher supply of credit by exposed banks. This finding supports the evidence that no direct link exists between foreign capital inflows and credit misallocation by banks and that the allocation of credit by exposed banks is actually consistent with a reduction in misallocation.

Finally, we analyze how the credit-supply shock varied across industries. Table A1 in the Appendix reports the results obtained when running the baseline within-firm specification in equation (1) for manufacturing, services, and construction. We find that exposed banks increase lending to manufacturing firms (column 1), but not to firms in construction or services (columns 2 and 3). This result is consistent, for instance, with Gopinath et al. (2017), who focus their analysis on capital flows and misallocation within manufacturing.

These findings are confirmed when looking at the extensive margin (Table A2). While high-exposure banks reduce the exit rates of their existing relationships, the effect is significantly larger for firms in manufacturing (column (5)), than in services and construction (columns (6) and (7)). The former also benefit from a higher probability of starting a credit relation (column (1)). The fact that capital inflows translate into more credit for firms in the manufacturing sector, but not for those in services and construction, is confirmed in Table A3, where we analyze the effect of firms' exposure to the bank lending channel on

[16] Results available upon request.

the aggregate credit.

6 Effects on aggregate misallocation and TFP

In the previous sections, we showed that exposure to capital inflows induced banks to allocate credit in a way that is consistent with a reduction in misallocation. Here, we provide a quantification of its aggregate impact on allocative efficiency, following the methodology proposed by Sraer and Thesmar (2020).

Since the seminal papers of Foster et al. (2008), Restuccia and Rogerson (2008), and Hsieh and Klenow (2009), misallocation is measured as the cross-sectional dispersion of marginal products across firms. The idea behind this approach is simple: with no frictions, the marginal revenue product of inputs should be equalized across firms as factors move from from low- to high-marginal-revenue-product firms.[17]

Hsieh and Klenow (2009) show how to compute aggregate TFP losses from misallocation when distortions, which create a wedge between the marginal product and the cost of production factors, are primitives of their model. Sraer and Thesmar (2020) consider capital wedges as endogenous and shows that, under certain assumptions, the distribution of wedges is invariant to macroeconomic general equilibrium conditions. This finding implies that a shock altering the distribution of MRPK, such as a boom in capital inflows relaxing the credit constraints that some firms face, would have the same impact on misallocation independently from the equilibrium condition of the economy or other concurrent additional shocks. Hence, the impact of a quasi-experimental shock on misallocation can be estimated through a sufficient-statistics approach.

This result hinges on two main assumptions: First, firm-level production follows a Cobb-Douglas technology, and second, firm-level distortions are homogenous of degree one. The latter implies distortions grow proportionally with the economy; that is, if general equilibrium forces that affect firm size follow a shock or a policy intervention, they will not have an impact on the relative distribution of distortions. Sraer and Thesmar

[17]This approach has several caveats and the literature documents the dispersion in marginal products could arise without necessarily implying resource misallocation. Asker et al. (2014) argue that, in the presence of adjustment costs in investment, transitory idiosyncratic TFP shocks across firms naturally generate dispersion in productivity without implying inefficiency. De Loecker and Goldberg (2014) and Haltiwanger (2016) argue that much of the variation in revenue-based TFP reflects demand shifts and market power rather than allocative inefficiency. Bils et al. (2018) stress the role of mismeasurement of factors' marginal product in the calculation of misallocation. Finally, Haltiwanger et al. (2018) show the HK model can map observed production behaviors to inefficient wedges/distortions only under strict theoretical assumptions that may not hold in all cases. David and Venkateswaran (2019) show that for the US, firms' adjustment costs could explain only a small fraction of dispersion in productivities and that markups could account for about 28% of the overall productivity dispersion.

(2020) show these assumptions are largely satisfied in the structural macro-finance literature, so their sufficient-statistics approach provides a valid alternative to structural estimation in the context of this class of models.[18]

In this framework, the effect of international financial flows on aggregate TFP depends on three sufficient statistics that can be directly estimated in a quasi-experimental setting. These statistics are the difference-in-differences estimates of the effect of capital inflows on (i) the change in the log-MRPK variance within industries, (ii) the change in the average log-MRPK by industry, and (iii) the change in the covariance between log-MRPK and log-sales by industry. Sraer and Thesmar (2020) show the aggregate change in TFP can then be expressed with the following formula:

$$\begin{aligned}\Delta \ln TFP = &-\frac{\alpha}{2}\left(1+\frac{\alpha\theta}{1-\theta}\right)\sum_{s=1}^{S}\kappa_s\widehat{\Delta\Delta\sigma^2(s)}\\ &-\frac{\alpha}{2}\left(1+\frac{\alpha\theta}{1-\theta}\right)\sum_{s=1}^{S}(\phi_s-\kappa_s)\left(\widehat{\Delta\Delta\mu^2(s)}+\widehat{\Delta\Delta\sigma_{mrpk,py}}(s)+\frac{1}{2}\frac{\alpha\theta}{1-\theta}\widehat{\Delta\Delta\sigma^2(s)}\right)\end{aligned} \tag{6}$$

This expression arises from a simplified version of the aggregation in Hsieh and Klenow (2009). The three statistics mentioned above are as follows: (i) $\widehat{\Delta\Delta\sigma^2(s)}$, the estimated change in the log-MRPK variance in industry s; (ii) $\widehat{\Delta\Delta\mu^2(s)}$, the estimated change in log-MRPK average; and (iii) $\widehat{\Delta\Delta\sigma_{mrpk,py}}(s)$, the estimated change in the covariance between log-MRPK and log-sales. ϕ_s and κ_s are the shares of industry s in total sales and capital before the shock; α is the share of capital in firms' production function; and θ corresponds to the elasticity of substitution across varieties. The first term of the formula captures the effect of capital inflows on misallocation *within* sectors, whereas the second term captures the effect *between* sectors.

Two assumptions are specific to the aggregation expression in equation (6): log-MRPK should be normally distributed, and no frictions should be present in the labor market. Figure 6 shows the c.d.f. of log-MRPK in the data for broad industries follows closely the c.d.f. of a normal distribution. Moreover, Figure 3 shows that while the dispersion

[18] Among the papers they review 98% of them assume that the production function is Cobb-Douglas and 93% of them that the borrowing constraint is homogenous. Gopinath et al. (2017) is a notable exception regarding the latter assumption. Their model includes a size-dependent borrowing constraint: firms can borrow up to a fraction of their assets, but this fraction is increasing in firm size, implying a non-linear relation between credit and size. We test for the non-linearity between firm credit and assets in our data by running a quadratic regression between the two variables. The results (Table A4 in the Appendix) show a positive and significant coefficient for the linear term and a slightly negative and statistically not different from zero coefficient for the quadratic term.

of log-MRPK was increasing over the years, the dispersion of log-MRPL remained fairly stable. Both pieces of evidence suggest the assumptions needed to derive the aggregation formula are reasonable in our setting.

Preliminary, non-parametric evidence suggests the patterns of MRPK dispersion across industries are negatively correlated with industry exposure to capital inflows. The latter is obtained as the credit-weighted average exposure of banks lending to the sector.[19] Dispersion is the variance of log-MRPK computed for each 3-digit industry and year and is further aggregated across industries in the four quartiles of exposure, using credit shares as weights. Figure 7 shows that although initially no differential trend is present, the difference of MRPK dispersion between the most exposed industries (top quartile) and the least exposed industries (bottom quartile) declines following the surge in capital inflows.

Then, for each of the three moments in equation (6) we run the following difference-in-differences specification:

$$M_{st} = \beta_1 \, Exposure \; Sector_s \times Post_t + \boldsymbol{X_s'\delta} \times Post_t + \gamma_s + \delta_t + \mu_s \times t + \epsilon_{st} \tag{7}$$

where M_{st} is alternatively the industry variance of log-MRPK, the average of log-MRPK and the covariance between log-MRPK and sales in year t, X_s is our usual vector of sector lenders' characteristics measured in 1998-2000, γ_s and δ_t are industry and year fixed effects, $\mu_s \times t$ are industry-specific trends, and the errors are clustered at the industry level.

Columns 1 and 2 of Table 10 confirm that exposure to capital inflows has a negative impact on the variance of log-MRPK. The estimated coefficient implies a 10% increase in industry exposure leads to a 7% decline in the dispersion of log-MRPK, following the boom in capital inflows. The result holds with and without industry trends. The effect on average log-MRPK is negative, suggesting that the more constrained firms are disproportionately benefitting from industry exposure, but it is not statistically significant. Similarly, we find a positive but not significant effect of capital inflows on the covariance between MRPK and sales.

Overall, these results, which are similar to those in Sraer and Thesmar (2020), point to a positive impact of capital inflows on resource allocation. To quantify it, we use the coefficients on sector exposure in column (2) of Table to compute $\sum_{s=1}^{S} \widehat{\Delta\Delta\sigma^2(s)} = \sum_{s=1}^{S} \beta_{VarMRPK}(-0.812) \times Sector \; Exposure_s$, and the coefficients in column (4) and (6) to compute the corresponding statistics for the average of log-MRPK and for the covariance term. We use the same calibration as in Sraer and Thesmar (2020) that follows the standard in the literature, and set $\alpha = 0.33$ and $\theta = 0.83$, which corresponds to setting the

[19] For each 3-digit sector we compute: $Exposure \; Sector_s = \sum_b Exposure_b \; \frac{Credit_{sb}}{Total \; Credit_s}$

price elasticity of demand to 6.

We find the reallocation gains from international financial flows lead to 0.9% aggregate TFP growth per year between 2002 and 2007, and are concentrated in the within-sector component (the first term of equation (6)). To weigh the magnitude of this effect, using the Hsieh and Klenow (2009) framework, Calligaris et al. (2018) find the increase in aggregate misallocation in the Italian economy led to a 1.3% TFP loss per year over those years, so capital inflows substantially reduced that trend.

7 What can explain the increase in misallocation?

Our results show the sharp increase in international financial flows toward Italy in the early 2000s was beneficial to reduce misallocation. Yet, that period has been convincingly associated with a remarkable worsening of allocative efficiency (Gopinath et al. 2017; Calligaris et al. 2018; GarcíaSantana et al. 2020), which many attributed to the existence of significant frictions in financial markets distorting credit allocation. In Italy as well as in other Southern European countries, the late 1990s and early 2000s were years of strong overall financial deepening. In Italy, the ratio of banks' total assets relative to GDP increased from 90% to 160% of GDP between 1998 and 2007, and the value of loans to non-financial corporations rose from 60% to 120% of GDP.[20]

Although foreign financial flows certainly contributed to these patterns, they were not the only factor fueling banks' expansion. An increasingly relevant source of funding was the issuance of bank bonds, largely sold in domestic markets to households, insurance companies, and mutual funds. Although, bonds' volume grew at an equal pace as foreign capitals (Figure 8), it received little attention in the literature (a notable exception is Lane (2013)), and its implication for credit allocation has not been studied. In the same period, the banking sector was experiencing a large increase in competition, as shown by the significant decline of the concentration of credit across Italian provinces (Figure 9). This section explores whether the expansion of bond funding can be linked to the increase in misallocation, and if so, through which mechanism.

Mirroring our baseline analysis we start asking whether low-productivty and high-risk firms benefit from a higher supply of credit from banks that are more bond intensive in their funding structure. To do so we augment specification 5 with a full set of interactions between firms' characteristics and banks' reliance on bond funding. Figure 10 suggests the data provide room to estimate the impact of both foreign funding and bond

[20] In Spain, credit to non-financial corporations increased from 90% to 200% of GDP, and in Portugal, from 100% to 180% of GDP.

funding in the same specification. In fact, many banks rely either on bond funding or foreign funding (Panel A); and for banks that use both sources, the correlation is not significant (Panel B).

Table 11 (columns (1) and (2) shows the result of this extension.[21] First, it confirms that high-productivity and low-risk firms see a higher increase in credit supply from banks with more exposure to capital flows and the results for the other groups of firms corroborate our baseline findings. Second, it shows that a 10pp increase in the share of bond funding is associated to a 3% increase in credit for low-productivity and high-risk firms. Such firms would see no credit supply increase form banks exposed to capital inflows. At the same time, higher reliance on bonds is not associated to higher credit flowing toward high-productivity firms. In columns (3) and (4) we exclude banks with positive exposure to foreign funding from the sample and focus only on the variation in the intensity of bond funding across non-exposed banks. The results are even stronger among these group of banks: a 10pp increase in bond funding is associated to a 12% increase in credit to low-MRPK and low-fixed assets firms.

Although these estimates do not rely on a tight difference-in-differences identification framework, they provide suggestive evidence that banks exploiting the expansion of bond funding tend to allocate credit in a way that is consistent with raising misallocation. However, given the lack of a quasi-experimental setting for this analysis, we cannot quantify such effect on aggregate TFP using the methodology of Sraer and Thesmar (2020).

In light of the result above it is important to investigate whether increasing reliance on bond funding is an indirect consequence of the boom in foreign capital inflows, traceable to the competitive pressure of intermediaries exposed to such flows. To this purpose we combine a panel of bank balance sheet data with detailed information on the geographical distribution of each bank loans. We take the province as the relevant market for intermediaries and measure province exposure to foreign capital as the average of exposure of banks in the province, weighted by their relevance in terms of loans.[22] The potential competitive pressure from intermediaries benefitting from foreign capital flows is the credit credit-weighted average of exposure of provinces in which it operates. Fixed effect estimates reported Table 12 suggest that competitive pressures from banks benefiting from the increase in foreign funds is not correlated with an increased relevance of bonds as a

[21]Specifically, we run the following regression: $\ln C_{ibt} = \sum_d \beta_d \; D_i^d \; (Exposure_b \times Post_t) + \sum_d \beta_d \; D_i^d \; Bond\ Funding_{bt-1} + \beta_2 \; Spec_{ibt} + \boldsymbol{X_b'\delta} \times Post_t + \alpha_{it} + \gamma_{ib} + \epsilon_{ibt}$.

[22]Provinces are administrative units corresponding to level 3 of the European "Nomenclature of Territorial Units for Statistics" (NUTS). They are the relevant market for regulation of banking competition. In the period considered, there were 104 provinces in Italy with an average area comparable to US counties.

source of funding (column 1).

We then ask whether relying on bond funding is a consequence of the more general increase in local competition in the industry (see Figure 9 above). For each intermediary, exposure to market competition is computed as the credit-weighted average change in the Herfindhal-index (based on bank-province-year loan data) in those provinces where it operates. Results in column 2 show that the patterns of market competition are indeed associated to the relevance of bonds as a source of funding. The estimated coefficient implies that a 0.1 reduction in HHI is associated with a 3pp increase in the share of bonds in bank liabilities. These results are confirmed when considering both measures simultaneously (column 3). Finally, column 4 shows that, unlike the case of bonds, the weight of foreign capital in banks liabilities (which we argued was a largely supply driven phenomenon) is not correlated to changes in local competitive pressure.

Next, we exploit the analysis of banks' balance-sheet to gather further insights on the relation between bonds' issuance, misallocation and competition. Table 13 shows that higher bond issuances is associated to higher costs, both when pooling funding plus operational costs (relative to liabilities, column (1)) and when relying on an estimate of marginal costs (column (2)).[23] Interestingly, intermediaries exposed to the shock in foreign funding did not experience such increase. Column (3) focuses on a measure of revenues from credit activities, namely the ratio between interest payments from firms and the total loans granted. This proxy of the price of credit turns out to be higher for banks relying on bond funding, probably as a consequence of their allocation choices. In fact, looking at the distribution of interest rates across firms reveals low-productivity low-fixed assets firms pay a higher interest rate than the high-productivity high-fixed assets firms (Figure 8). The net effect of the two previous results is a slight increase in the Lerner index (column (4)), namely the difference between credit price and marginal costs (a proxy of markup). Finally, in column (5) we find evidence that bond funding is associated with a higher market share of loans.

Taken together, these results suggest the increasing reliance on bonds as a source of funding could be one channel through which part of the banking system managed to keep up or even improve its market position amid a wave of significant financial deepening and growing bank competition. The associated credit expansion was tilted toward less productive, high-interest-rate borrowers, which compensated for the higher funding costs of bonds, but increased misallocation.

[23]Marginal costs are obtained through the estimation of a translog cost function as in Demirguc-Kunt and Peria (2010). See Benvenuti and Prete (2019) for a detailed analysis of profit and marginal cost estimates of Italian banks; we thank the authors for sharing their codes and data with us.

The literature provides evidence that higher competition could lead banks to expand their portfolios toward more opaque borrowers (Boyd and Nicoló, 2005). Evidence also shows rollover risk can have a disciplining effect on banks' credit allocation (Jasova et al., 2021), which would be consistent with the idea that foreign funding can lead to a better allocation of credit relative to bond funding also because of a shorter maturity or higher monitoring. We believe the interplay between competition, banks' funding structure, and credit allocation is a complex and important issue that need further investigation beyond the scope of this paper. However, in this section we show that alternative sources of funding can have a different impact on credit allocation and this result reconciles the finding of a beneficial effects of capital inflows on misallocation with the increasing trend of misallocation observed in the data.

8 Robustness checks

In this section, we address several potential identification challenges. Specifically, we first analyze the role of the credit-demand channel of capital inflows. Then, we explore alternative measures of bank exposure to international financial flows. Next, we check robustness to a time-varying measure of firms' grouping by productivity and collateral. Further, we analyze if exposed banks increased lending to households for mortgages. In addition, we investigate whether spillover across banks can affect our results. Subsequently, we look at threat to identification coming from confounding factors Finally, we analyze wether more exposed banks turn out to be more fragile after the global financial crisis and what happens to credit supply with the reversal of capital inflows.

Additionally, we report in the Appendix a further set of robustness checks using alternative specifications, measures of banks' exposure, and firms' classification. We show that our results are unchanged when: (i) using a balanced panel; (ii) estimating a first-difference transformation of the baseline specification; (iii) using a continuous measure of firm productivity and collateral; (iv) looking at credit allocation by firm characteristics measured at the end of the sample; (v) saturating our regressions with bank-time fixed effects when possible.

8.1 Foreign capital inflows and the demand channel

Our specifications in equations (1) and (5) captures the bank-lending channel effect of capital inflows, that is the *supply-side* effects. One possible concern is that misallocation could come from the credit-demand channel because low-productivity firms could increase their demand of credit to more exposed banks more than high-productivity firms. To check the credit-demand channel, we run the following specification:

$$\ln C_{ibt} = \sum_{d=H,L} \beta_d \, D_i^d \, (Exposure_b \times Post_t) + \beta_2 \, Spec_{ibt} + \boldsymbol{X_b'\delta} \times Post_t + \lambda_{bt} + \gamma_{ib} + \epsilon_{ibt} \quad (8)$$

This specification is very similar to the one in equation (5). The difference is that here we absorb *bank-time* fixed effects, rather than *firm-time* fixed effects. The coefficient β_d captures the marginal effect of bank exposure to capital inflows on firm credit, net of any other supply-side bank shock, but allowing firm-time demand shocks to affect the results. For example, if low-productivity and high-collateral firms were to increase their demand for credit to exposed banks, the corresponding coefficient would be large and significant (as opposed to small and non-significant in the baseline regression). The results are reported in Table A5 in the Appendix and they are similar to our baseline findings. Specifically, following the surge in capital inflows exposed banks increased lending to high-productivity and high-collateral firms (relative to low-productivity and low-collateral firms, the excluded category), but also to high-productivity firms, even if with low collateral. Hence, even when allowing for firm-demand to respond to capital inflows, credit allocation appears conducive to lower misallocation.

8.2 Alternative measures of bank exposure to capital flows

We experiment with two other measures of the shock to banks' balance sheet induced by the surge in foreign capital inflows. The first is a shift-share Bartik instrument combining (i) the bank composition of foreign liabilities by sourcing country before the shock with (ii) data on changes in capital outflows from those countries to the rest of the world after the shock. We focus on the top 15 sourcing countries that account for more than 90% of foreign liabilities, and we measure their change in capital outflows towards the rest of the world (excluding Italy) between 1998-2001 and 2002-2007. As an illustrative example, Figure A1 in the Appendix plots the patterns of foreign claims of banks in Germany and Luxembourg. These patterns are similar to those in the 1980s and in the 1990s but diverge starting in 2002, when cross-border lending from Germany sharply increased. The new bank-level exposure indicator would then capture that Italian banks borrowing from Germany before 2002 are disproportionally more exposed to financial flows than banks borrowing from Luxembourg.[24] Table A6 shows this alternative exposure measure does not affect our core results on misallocation.

The second measure aims at isolating the supply-side component of capital flows and exploiting the time-series dimension of the data. We first project the log-change of Italian banks' foreign liabilities on their world counterpart over 1998-2007, as in Cesa-Bianchi et al. (2018), using BIS data on changes in outstanding cross-border liabilities:

$$\Delta \ln KF_t^{IT} = \lambda_0 + \lambda_1 \Delta \ln KF_t^{World} + \epsilon_t^{IT} \tag{9}$$

where KF_t^{IT} are the outstanding foreign liabilities of the Italian banking sector in year t and KF_t^{World} are the foreign outstanding liabilities of the other countries in the world, excluding Italy. If country-specific pull shocks to Italy do not affect world capital flows, the fitted values $\hat{\lambda}_1 \Delta \ln KF_t^{World}$ can be interpreted as the supply-side component of capital inflows into the Italian banking sector. With this measure in hand, we estimate

$$\ln C_{ibt} = \sum_{d=1}^{4} \beta_d \, D_{di} \times Exposure_b \times \hat{\lambda}_1 \Delta \ln \; KF_t^{World} + \beta_2 \, Spec_{ibt} + \boldsymbol{X_b'\delta} \times Post_t + \alpha_{it} + \gamma_{ib} + \epsilon_{ibt} \tag{10}$$

where the strength of credit-supply shocks is obtained by comparing the patterns of lending by banks with different exposure induced by yearly changes in push determinants of foreign capital flows. The results in Table A7 confirm that although exposed banks increase credit supply as global flows gain strength, the allocation of such credit is not consistent with an increase in misallocation.

8.3 Additional and time-varying firm-level characteristics

The firm-level measures of productivity and credit constraint in our baseline specifications are defined according to ex-ante characteristics, but we check the robustness of results to allowing them varying over time. For example, due to firms' life cycle or to idiosyncratic shocks, some ex-ante high-productivity firm might become unproductive, and vice versa. The time-varying measures of firm productivity and credit constraint are taken at $t-1$, so that the classification of firms' group can vary year by year. Because firm characteristics might also change in response to credit-supply allocation, the results

[24] Here, bank exposure is computed as: $Exposure_b^{Geo} = \sum_c \omega_{bc} \, \Delta World \, Outflows_c^{post-pre}$, where ω_{bc} is the share of foreign liability that bank b sources from country c in 1998-2000, and $\Delta World \, Outflows_c^{post-pre}$ is the increase in lending of country c to the rest of the world.

should only be taken as indicative, but they confirm our baseline findings (Table A8).[25]

Moreover, we extend our analysis by looking at alternative definitions of firm productivity and credit constraint. First, we focus on firms' credit rating, an index computed by CERVED as an Altman score that accounts for, among other things, firms' profitability, assets, and credit history. The credit score takes values between 1 and 9; firms with a credit score above 6 are considered to have a high risk of default (Rodano et al., 2018). The first two columns of Table A9 show our core findings on misallocation are unaltered if we group firms based on productivity and the credit score. In particular, high-productivity but risky firms benefitted from the increase in lending by exposed banks as much as low-productivity but low-risk firms, irrespective of the productivity measure. Then, in the third column, we look at value added per worker as an alternative measure of productivity, and we can confirm the previous results of the paper.

8.4 A focus on household lending

Foreign capital may also induce higher lending to households, especially through mortgages which may fuel the expansion of real estate, which is a low-productivity sector. To this end, we use an empirical approach similar to that of Greenstone et al. (2014) and Gilchrist et al. (2017); because households rarely borrow from two or more banks, identification exploits bank lending across multiple provinces:

$$\ln C^H_{pbt} = \beta_1 \; Exposure_b \times Post_t + \boldsymbol{X_b'\delta} \times Post_t + \alpha_{pt} + \gamma_{pb} + \epsilon_{pbt} \tag{11}$$

The dependent variable is the log of outstanding credit from bank b to households in province p in year t. The specification includes province-time fixed effects to control for local shocks to credit demand, and province-bank fixed effects accounting for the sorting of banks in specific provinces. The vector $\boldsymbol{X_b}$ contains the same set of pre-2002 bank controls used in the previous specifications with banks' characteristics, and β_1 is our coefficient of interest, estimated with weighted least squares (WLS).[26]

The results reported in Table A10 show exposed banks do not significantly increase household credit supply relative to other banks (column (1)). The result holds also look-

[25] An alternative way to look at the same issue is to define firms' characteristics as an average of the ex-post years, and our results hold using that approach as well (Table A17).

[26] We estimate equation (11) using the geometric average of two different sets of weights. The first captures the importance of a particular bank in a given province: $b_{pbt} = C^H_{pbt} / \sum_b C^H_{pbt}$. The second captures the importance of a particular province in a bank's household loan portfolio: $c_{pbt} = C^H_{pbt} / \sum_p C^H_{pbt}$. A high b-weight implies the market share of home mortgage lending of bank b in province p is high, so it is useful to capture the impact of bank-specific credit-supply shocks. Observations with relatively high c-weights are useful in identifying the county-specific credit-demand effects.

ing at the dummy-variable definition of exposure, capturing non-linearities of capital inflows exposure, which if anything would lead to the opposite conclusion (columns (2) and (3)). Hence, although Italy did see a considerable expansion in household lending after 2002, based on our results, this expansion was not associated with the boom in foreign capital inflows.

8.5 Potential spillovers across banks

The possibility of spillovers from exposed to non-exposed banks is a relevant threat to our identification strategy. Non-exposed banks could in principle benefit from international capital inflows indirectly through interbank linkages or through market effects, such as bond or equity purchases. Moreover, exposed banks may change their retail policy, by either focusing less on deposits, or bidding more aggressively for them. In all such cases, capital inflows would end up affecting the funds available to non-exposed banks. We therefore check for the relevance of these indirect effects.

In principle, interbank lending is of particular concern for identification, because the interbank market grew disproportionately in Italy around the same time as the surge in capital inflows. In practice, however, we do not expect spillovers through that market to be a relevant confounding factor in our case. The reason is that the upward trend in interbank transactions was driven by intra-group lending, that is, loans between banks belonging to the same banking group (Figure A2). As explained in section 3, our analysis is at the banking-group level so that intra-group lending is consolidated in the data. As the figure shows, lending across groups, and therefore exposed versus non-exposed banks, remains flat over the period. We test for this potential channel more formally by running the following bank-level specification:

$$Y_{bt} = \beta_1 \; Exp_b \times Post_t + \boldsymbol{X_b'\delta} \times Post_t + \gamma_b + \alpha_t + \epsilon_{bt} \tag{12}$$

where Y_{bt} is alternatively (i) interbank lending of bank b in year t, (ii) holding of bonds and equity of financial institutions, (iii) share of deposit on banks' liabilities, and (iv) bank's b share of the total deposit taking in the economy. The coefficient β_1 captures how these variables change after 2002 for banks more exposed to capital inflows, controlling for our standard vector of bank characteristics pre 2002, banks' fixed effects, and year dummies; errors are clustered at the bank level.

The results, reported in Table A11, show bank exposure is uncorrelated with bonds or equity holdings, as well as with the share of deposits. Moreover, interbank lending by exposed banks decreased slightly after 2002. These results imply potential indirect effects of capital inflows are unlikely to weaken the results on misallocation discussed in section 5.2.

8.6 Omitted-variable bias and confounding factors

Potential threats to identification stem from simultaneous shocks correlated with bank exposure to foreign capital flows. We are particularly concerned about (i) the rise of securitisation in the early 2000s, (ii) a sharp decrease in GDP growth in 2002-03, and (iii) banks' exposure to the China shock. Table A12 reports the results obtained when accounting for these potential confounds, augmenting the baseline specification (column (1)) with indexes of banks' exposure to these alternative drivers of credit-supply decisions (columns (2) to (4)).

In column 2 we allow banks' propensity toward securitization before the shock (the average share of securitized lending in 2001) to affect credit supply after 2002. Because securitization affects available liquidity, it might also spur an increase in credit supply, which would bias our estimates if securitization is correlated with reliance on foreign funding. Column 3 accounts for bank exposure to the slowdown, measured by the share of outstanding loans to the sectors that were most affected by the GDP slowdown, identified by taking industry-level changes in revenues in 2002-03 relative to 2000-01. Finally, column 4 accounts for banks' exposure to the industries that suffered most from the trade shock following China's entrance into the WTO, as in Federico et al. (2020).

The results in Table A12 show our core finding on the impact of bank exposure to capital inflows on credit supply is robust to these potential confounding factors.

8.7 Fragility of exposed banks after the global financial crisis

Our baseline analysis focuses on the boom in capital inflows during the run up to the global financial crisis. In 2008, the Italian economy suffered the consequences of the Great Recession, which was followed by a second severe downturn in 2011 when the sovereign debt crisis erupted; as a result, its banking system experienced a disproportionate increase in NPLs.

In this context, the question whether reliance on foreign funds made banks more vulnerable, implying a higher incidence of NPLs during the following double-dip recession, is relevant. The global financial crisis also implied a reversal of international financial flows, which begs the questions of whether borrowers of exposed banks were made more vulnerable by a credit contraction.

We check for these possibilities, extending our time window to 2013, and evaluating the differential impact of bank exposure across three subperiods (1998-2001, 2002-2007, 2008-2013).[27] We focus on (i) the effect of exposure on the patterns of NPL ratios at the bank level and (ii) the effects on the intensive margin of credit supply in the bank-firm-level regressions.

Our findings in Table A13 suggest that the higher credit supply of exposed banks during the boom of capital inflows did not imply a higher incidence of loans in or near default in the subsequent years (columns 1 and 2). Moreover, we find no evidence of a decline in credit supply from exposed banks in the post-2008 period (columns 3 an 4).

The many concurring shocks to banks' and firms' financial conditions during the crisis and double-dip recession period, however, suggest the results of this analysis should be interpreted with caution.

9 Concluding remarks: Remaining puzzles and further research

To the best of our knowledge, this paper is the first to link international financial flows and misallocation at the bank-firm level. Looking at the boom of cross-border flows of the early 2000s, we find that capital flows reduced misallocation and were beneficial for aggregate productivity. Moreover, we find evidence that other factors that were fueling banks' expansion, such as bond funding, are associated to an allocation of credit conducive to higher misallocation. To conclude, we discuss a few potential avenues for future research seeking to investigate further the impact of cross-border flows on productivity.

For one thing, international financial flows may distort resource allocation not through the bank lending channel but through the government, or households. For instance, in Italy government borrowing accounted for a small but non-negligible fraction of the decrease of the net international investment position (around 20% of the total decline). To the extent that these funds induced an increase in, for example, public procurement, the government channel of capital inflows can play a role for aggregate misallocation. Similarly, capital inflows could trigger a reallocation of households' investments towards less productive firms or toward banks that then increase credit to firms with lower productivity. These alternative channels deserve further investigation.

Second, capital inflows may have different consequences when driven by domestic pull factors rather than by push factors external to the country, as was largely the case

[27]We consolidate the data based on groups' composition in 2013, and we recompute all bank-specific variables accordingly.

for Italy. Establishing whether such difference exists would be important in terms of policy implications. If international financial flows distort resource allocation when driven by global factors, then capital controls should be called for to mitigate this negative effect. However, if capital flows have a negative effect only when driven by domestic pull-factors, then macro-prudential tools would be more appropriate.

Third, our findings suggest that the interplay between bank competition and funding structure play a key role on the allocation of credit in a period of financial deepening and expansion of the banking sector. This result lays the ground for further research on how the liability structure of banks matters for credit allocation and on its quantitative effects for aggregate productivity.

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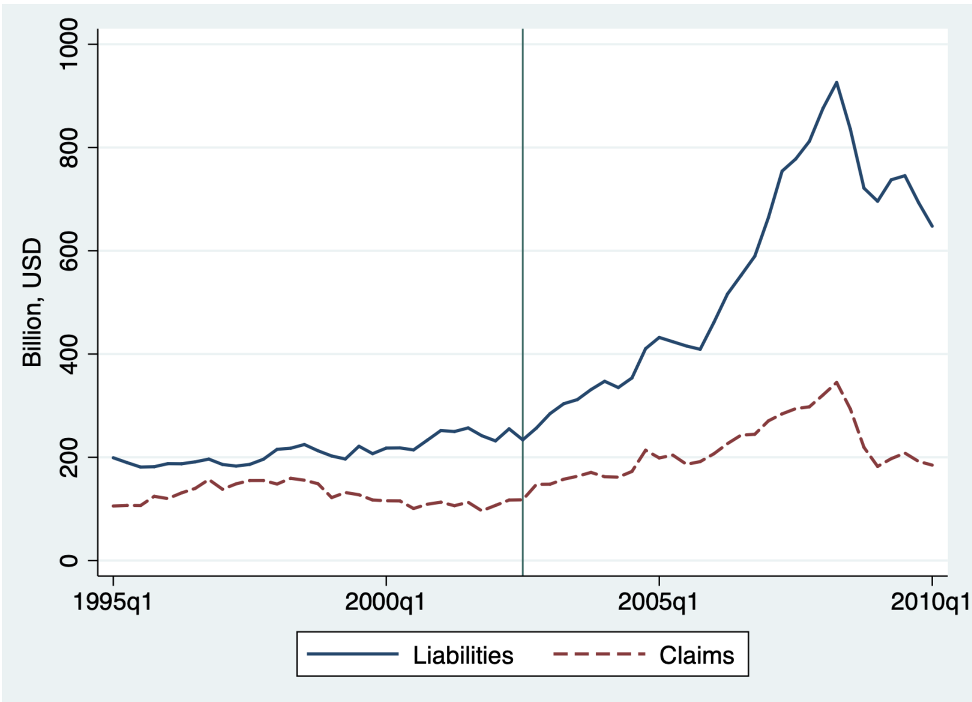
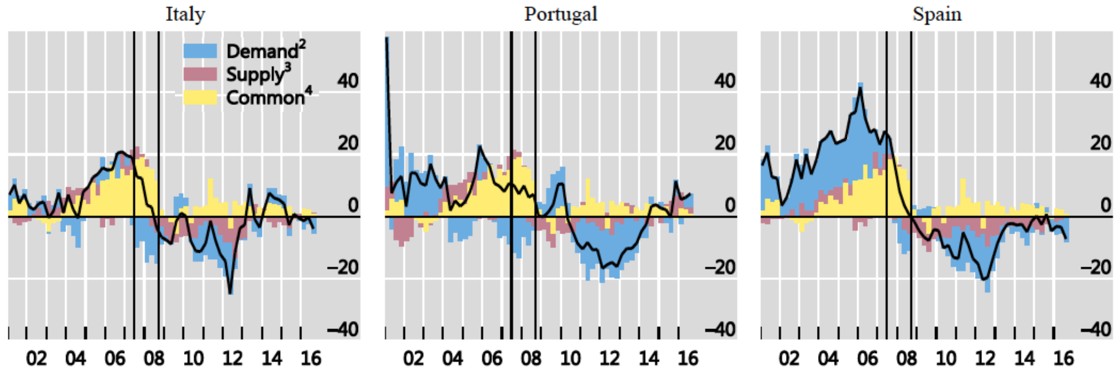
Figures

Figure 1: Foreign liabilities and claims of banks operating in Italy



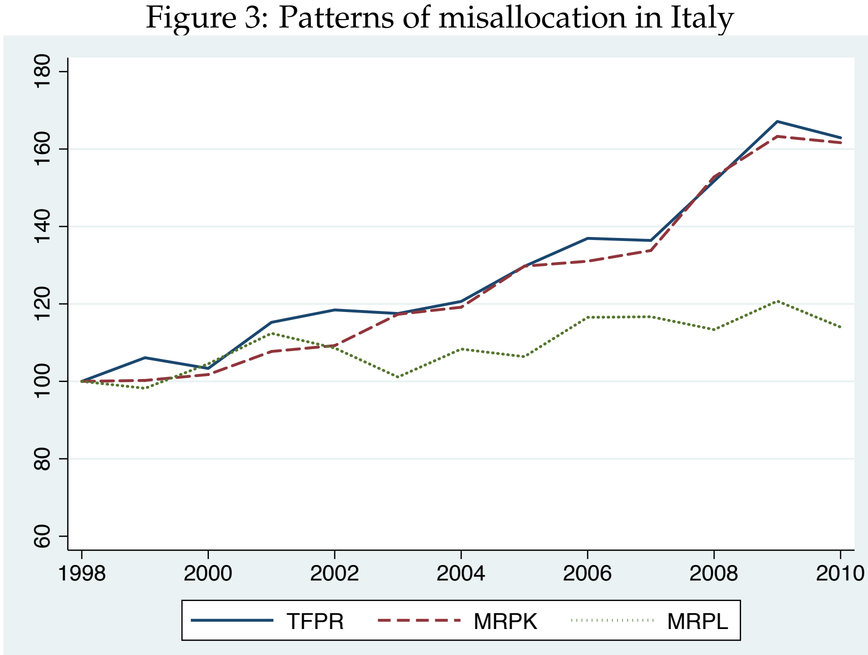
Source: BIS, locational banking statistics. Foreign liabilities (claims) of banks located in Italy are defined by taking the total cross-border claims (liabilities) of all other countries and sectors; (nominal USD). Vertical line is at 2002-Q3.

Figure 2: Capital inflows to the banks operating in selected Euro area countries, decomposition of drivers



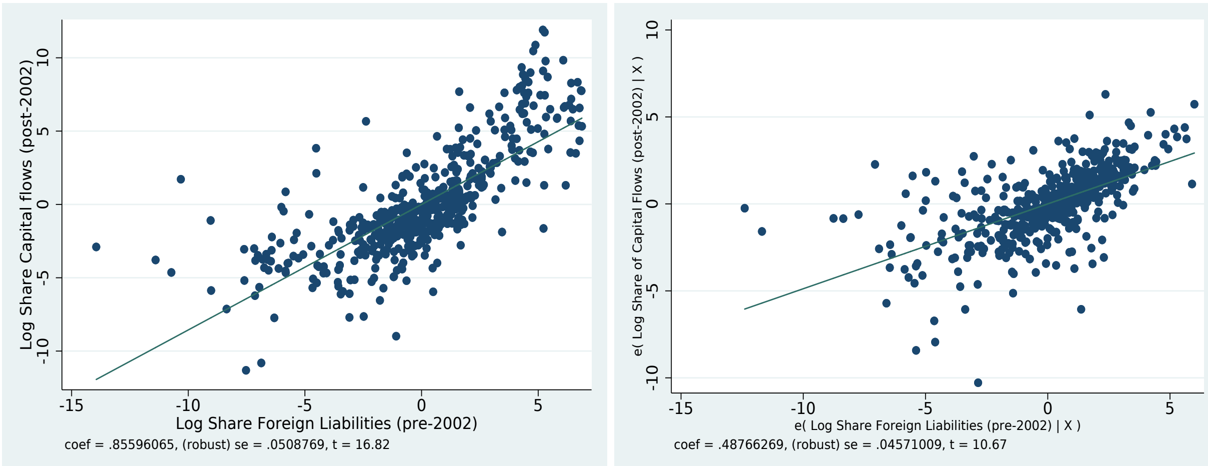
Source: Amiti et al. (2017). Year-on-year growth in foreign claims of all reporting internationally active banks on the country listed in the panel title, adjusted for breaks in series and exchange-rate movements. 2: Estimated demand shocks by borrowing country. 3: Estimated net supply shocks to the banking system by country. 4: Estimated shocks that are common to all banking systems across countries.

Figure 3: Patterns of misallocation in Italy



The Figure shows the evolution of the variance of TFPR, MRPK and MRPL in Italian manufacturing industries as in Calligaris et al. (2018).

Figure 4: Share of foreign liabilities and capital inflows received by bank



(a) Without bank controls

(b) With bank characteristics

For each bank, we look at the average share of capital flows that it received relative to the overall flows in the economy in the post-2002 period (vertical axis) and at the average foreign liabilities ratio - foreign liabilities relative to overall liabilities - pre-2002 (horizontal axis). Panel (a) shows the unconditional correlation between the two variables, and in panel (b) we control for bank characteristics such as log-assets, share of non-core liabilities, share of NPLs, and capital share (pre-2002 average).

Figure 5: Portfolio allocation by productivity and credit constraint

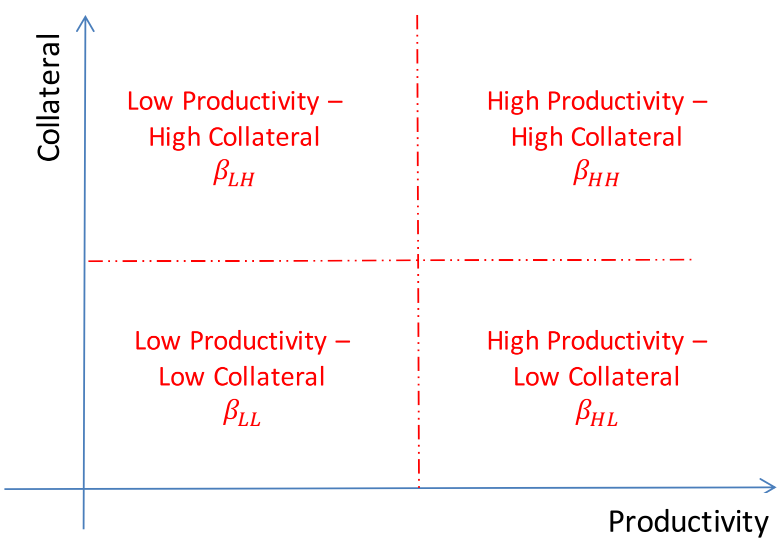
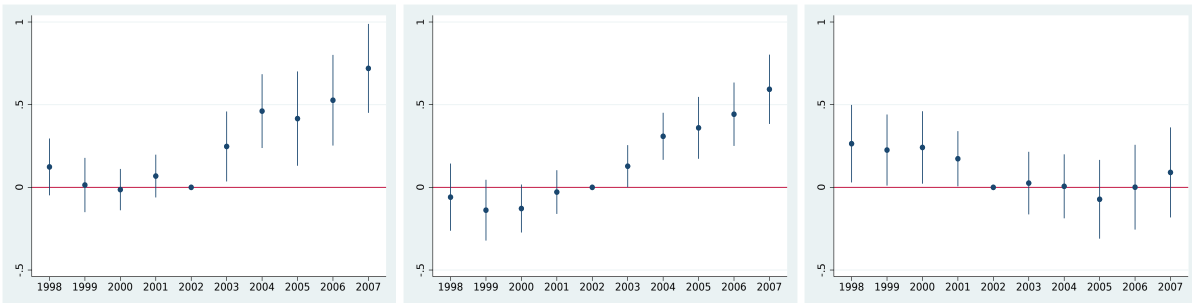


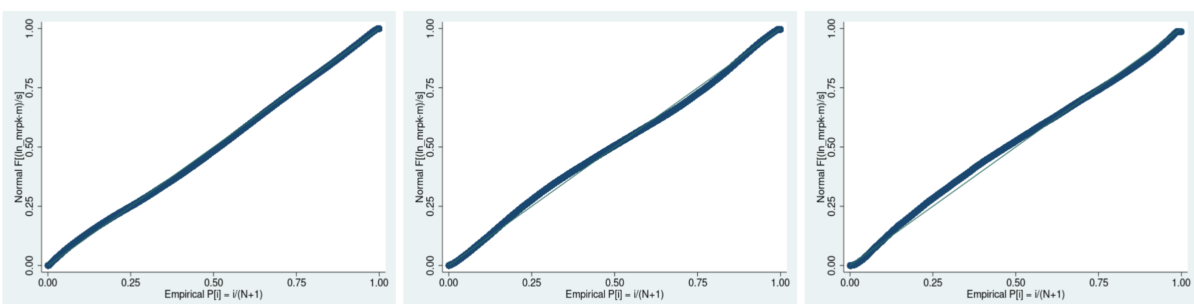
Figure 6: Dynamic difference-in-differences



(a) Full sample (b) High-MRPK and High-FA (c) Low-MRPK and Low-FA

The graphs reports the year-by-year marginal effect of bank exposure. In panel (a) the coefficients are for the the full sample and are estimated with the the dynamic difference-in-differences version of specification 1. In panel (b) the coefficients are for high-MRPK and high-fixed assets firms and in panel (c) for the low-MRPK and low-fixed assets firms. These coefficients are derived by the dynamic difference-in-differences version of specification 5.

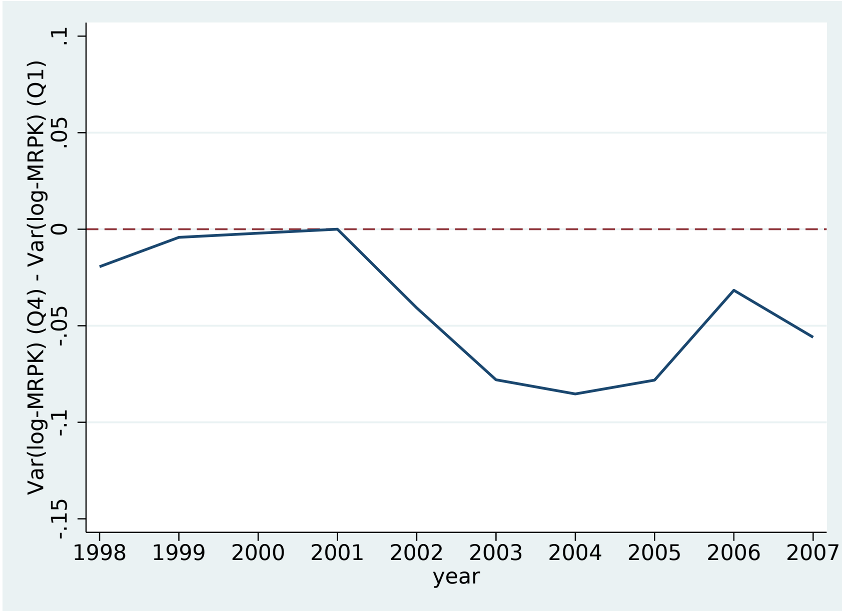
Figure 6: Log-normality of MRPK in broad industries



(a) Manufacturing (b) Services (c) Construction

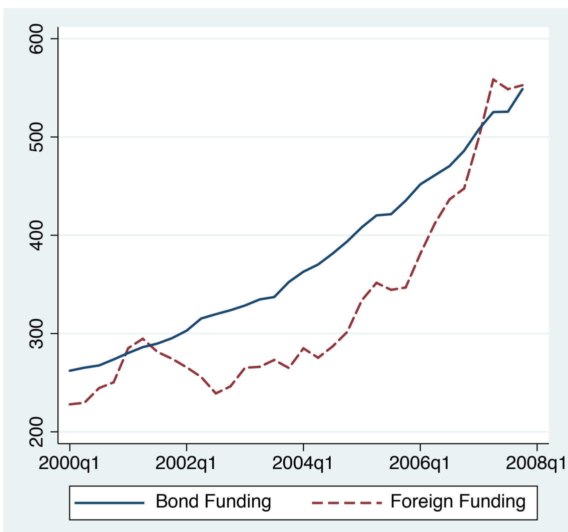
The graphs shows the normal probability plots of log-MRPK for manufacturing, services, and construction.

Figure 7: Variance of log-MRPK and exposure to capital inflows



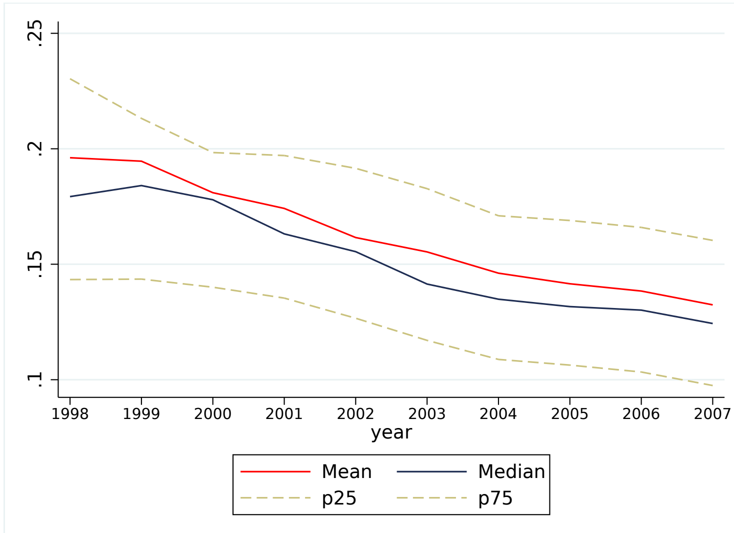
The graph shows the difference of the log-MRPK variance between industries that are in the top quartile of exposure to capital inflows and those that are in the bottom quartile (normalized to zero in 2001). For each 3-digit sector in the economy exposure to capital inflows is computed as the credit-weighted average exposure of banks lending to the sector. We then aggregate the dispersion of the variance of log-MRPK across industries in the top and bottom quartile of exposure, using credit shares as weights.

Figure 8: Cross-border and bond funding of banks operating in Italy



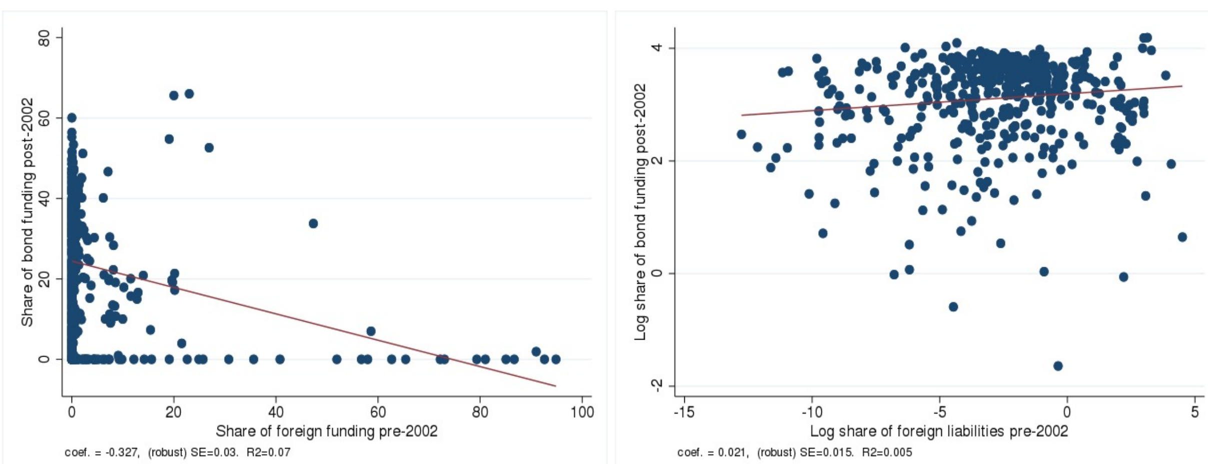
Source: Bank of Italy, Bank Supervisory Reports (Euro, billions).

Figure 9: Herfindal-index of bank lending in Italian provinces (moments of the distribution)



The Figure shows the mean, median, 25th percentile and 75th percentile of the Herfindahl Index of bank lending across Italian provinces over time.

Figure 10: Foreign and bond funding

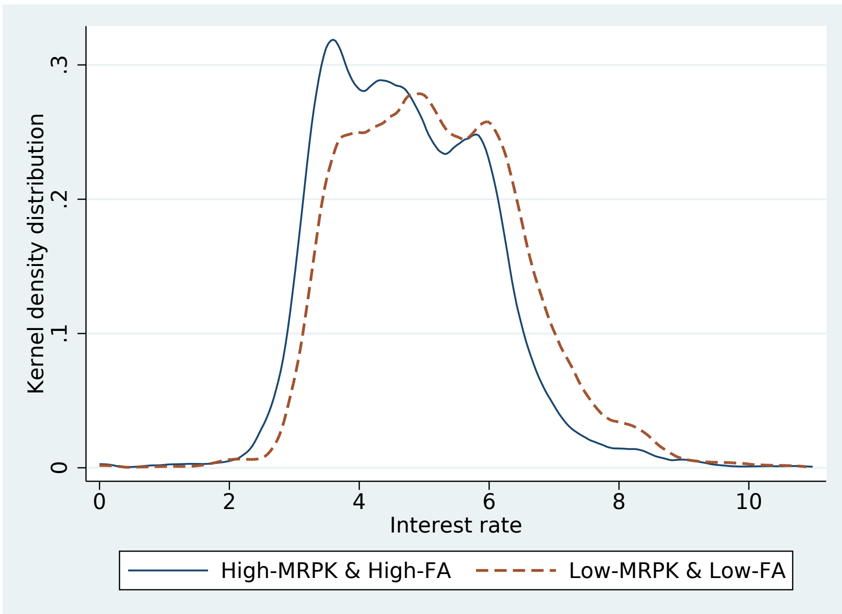


(a) Full sample

(b) Banks using both sources

The figure reports the correlation between the average foreign funding pre-2002 and the average bond funding post-2002 by bank. Panel (a) includes the full sample of banks, and panel (b) zooms into the banks that use both sources exlcluding the ones on the axes.

Figure 11: Interest rate distribution by firm type



Distribution of interest rates for high-MRPK and high-fixed assets firms vs. low-MRPK and low-fixed assets firms.

Tables

Table 1: Summary statistics

	Unit	Mean	S.D.	p25	p50	p75
Bank characteristics						
Total Assets	€Millions	3,230	27,800	79	176	442
Liquid Assets	% Assets	3,605	5,230	626	1,473	3,841
Nonperforming Loans	% Assets	2.6	3.3	0.8	1.7	3.3
Core capital	% Assets	1.8	8.2	0.01	0.2	1.5
Deposits	% Liabilities	54.5	19.1	45	54	68
Bonds	% Liabilities	22.3	16.2	8.4	22.0	34.7
Foreign Funding	% Liabilities	3.7	13.1	0.003	0.01	0.06
Firm characteristics						
Bank Credit	€Thousands	1,642	15,700	155	395	1083
Revenues	€Thousands	4,173	5,673	743	1,751	4,708
Fixed Assets	€Thousands	2,327	72,301	70	240	819
Gross operating margin	% Revenues	6	52	3.3	7.6	13
Credit Score	Units	5.2	1.9	4	5	7

Note: The table reports relevant statistics (1998-2007, average) of banks and firms in the firm-bank matched sample. Bank balance-sheet data are from the Supervisory Reports submitted by banks to the Bank of Italy. Credit data are from the Italian Credit Register. Firm balance-sheet data are from CERVED. Liquid assets include cash, interbank deposits, and bond holdings. Firms' credit score is computed by CERVED based on past defaults and firms' balance-sheet information.

Table 2: High foreign-liability ratio predicts exposure to capital inflows

	Share of total inflows (02-07) (1)	Growth of foreign liabilities (post vs. pre) (2)	Rank foreign liability ratio (02-07) (3)
Foreign liability ratio (98-00)	0.54***	0.51***	
	(0.03)	(0.04)	
Rank foreign liability ratio (98-00)			0.75***
			(0.03)
Bank Controls	✓	✓	✓
Observations	494	494	494
$Adj.R^2$	0.80	0.63	0.71

Note: Cross-sectional bank-level regressions. Column (1) reports the elasticity of the average share of the aggregate capital inflows that bank b gets in the period 2002-2007 ($ForeignLiab_b^{02-08}/\sum_b ForeignLiab_b^{02-08}$) on the foreign-liability ratio of the bank measured 1998-2001 ($ForeignLiab_b^{98-01}/TotLiab_b^{98-01}$). Column (2) reports the elasticity of the growth in foreign funding (pre-vs.post) relative to the total liabilities in the pre-period ($\Delta ForeignLiab_b/TotLiab_b^{98-01}$) on the foreign-liability ratio of the bank ($ForeignLiab_b^{98-01}/TotLiab_b^{98-01}$). Column (3) regress the ranking of banks by the foreign liability ratio in the 2002-07 period relative to the ranking in 1998-2001. All regressions include bank controls measured in the 1998-2001 period such as log-assets, NPL ratio, capital ratio and core funding ratio. Standard errors are clustered at the bank level. ***significant at the 1% level, ** significant at the 5% level, * significant at the 10% level.

Table 3: Balancing tests

	Unit	*High exposed Banks* Mean	*Low exposed banks* Mean	Normalized difference
Bank characteristics				
Total Assets	€Millions	5,780	1,800	0.23
Nonperforming Loans	% Assets	2.4	3.4	-0.25
Domestic interbank	% Liability	8	13.1	0.21
Core capital	%Liabilities	3.7	3.9	0.007
Bond funding	%Liabilities	19.5	11.4	-0.20
Borrower characteristics				
Fixed Assets	€Thousands	2,990	1,095	0.02
Gross operating margin	% Revenues	8.4	8.7	-0.04
Credit Score	Units	5.3	5.4	0.04
Productivity	log-TFPR	5.2	4.9	0.12
Age	years	15	13	0.19

Note: The table reports relevant balance-sheet characteristics of banks and of their average borrower (1998-2001 average), dividing the sample between high- and low-exposed banks. High-exposed (low-exposed) banks have a share of foreign liabilities above (below) 10% over 1998-2001. The last column shows the normalized difference between the two groups as specified in Imbens and Wooldridge (2008); an absolute value above 0.25 indicates an imbalance between the two groups.

Table 4: Capital inflows and credit supply, intensive margin

	Dependent variable: ln $Credit_{ibt}$				
$Bank\ Exposure$:	Continuous (1)	Dummy 10% (2)	Dummy 15% (3)	Exposure above 2% (4)	WLS (5)
$Exposure_b \times Post_t$	0.40***	0.069***	0.070***	0.40***	0.40***
	(0.06)	(0.004)	(0.004)	(0.05)	(0.06)
Firm-time F.E.	✓	✓	✓	✓	✓
Firm-bank F.E.	✓	✓	✓	✓	✓
Specialization	✓	✓	✓	✓	✓
Bank Controls	✓	✓	✓	✓	✓
Observations	4,141,748	4,141,748	4,141,748	3,407,129	4,110,749
$Adj.R^2$	0.82	0.82	0.82	0.82	0.82

Note: The table reports the coefficients of the baseline specification in equation (1). The dependent variable, $\ln C_{ibt}$, is the log of outstanding credit between bank b and firm i in year t. $Exposure_b$ captures bank exposure to foreign capital flows, defined as the foreign-liability ratio over 1998-2001. Specialization is a time-varying dummy that captures if a firm operates in a sector in which the bank specializes its lending activities. Bank controls include bank characteristics measured in 1998-2001, interacted with a post-2002 dummy: log-assets, share of NPLs, core-funding ratio, and the capital ratio. All regressions include firm-year fixed effects and firm-bank dummies. Standard errors are clustered at the bank-sector (2-digit) level. ***significant at the 1% level, ** significant at the 5% level, * significant at the 10% level.

Table 5: Capital inflows and bank-firm relation, extensive margin

	Dependent variable:			
	$Exit_{ib\tau}$		$Entry_{ib\tau}$	
$Bank\ Exposure$:	Continuous (1)	Dummy 15% (2)	Continuous (3)	Dummy 15% (4)
$Exposure_b * Post_\tau$	-0.11***	-0.009***	0.19***	0.03***
	(0.024)	(0.002)	(0.03)	(0.004)
Firm-period F.E.	✓	✓	✓	✓
Bank F.E.	✓	✓	✓	✓
Specialization	✓	✓	✓	✓
Bank Controls	✓	✓	✓	✓
Observations	1,030,013	1,030,013	1,030,013	1,030,013
$Adj.R^2$	0.55	0.55	0.45	0.48

Note: The table reports the coefficients of the extensive-margin specification in equation (2). The dependent variable is a dummy that takes the value of 1 if firm i starts (entry) or ends (exit) a credit relation with bank b in period τ=1998-2001, 2002-07. $Exposure_b$ captures bank exposure to foreign capital flows, defined as the foreign-liability ratio over the period 1998-2001. Specialization is a time-varying dummy that captures if a firm operates in a sector in which the bank specializes its lending activities. Other bank controls include bank characteristics measured in 1998-2001, interacted with a post-2002 dummy: log-assets, share of NPLs, core-funding ratio, and the capital ratio. All regressions include firm-period fixed effects and bank dummies. Standard errors are clustered at the bank-sector (2-digit) level. ***significant at the 1% level, ** significant at the 5% level, * significant at the 10% level.

Table 6: Capital inflows and credit supply, aggregate credit

	Dependent variable: ln $Credit_{it}$				
$Bank\ Exposure$:	Continuous (1)	Dummy 10% (2)	Dummy 15% (3)	Exposure above 2% (4)	WLS (5)
$Exposure_i \times Post_t$	0.24*** (0.06)	0.031*** (0.006)	0.032*** (0.005)	0.40*** (0.05)	0.216*** (0.04)
Estimated firm-time F.E.	✓	✓	✓	✓	✓
Firm F.E.	✓	✓	✓	✓	✓
Sector-time F.E.	✓	✓	✓	✓	✓
Bank Controls	✓	✓	✓	✓	✓
Observations	4,141,748	4,141,748	4,141,748	3,407,129	4,110,749
$Adj.R^2$	0.82	0.82	0.82	0.82	0.82

Note: The table reports the coefficients of the baseline specification in equation (4). The dependent variable, $\ln C_{it}$, is the log of outstanding credit of firm i in year t. The variable $Exposure_i$ is the weighted average of exposure to foreign capital inflows of firm's i lenders in the period 1998-2001, as defined in equation (3). Bank controls are a weighted average of firm's i lenders' characteristics measured in 1998-2001, interacted with a post-2002 dummy: log-assets, share of NPLs, core-funding ratio, and the capital ratio. All regressions include sector-year fixed effects and firm dummies, and the firm-time fixed effects computed in the intensive margin regression. Standard errors are bootstrapped with clusters at the sector-main-bank level. ***significant at the 1% level, ** significant at the 5% level, * significant at the 10% level.

Table 7: Capital inflows and credit allocation by firm characteristics, intensive margin

	Dependent variable: ln $Credit_{ibt}$				
Firm characteristic D_i:	MRPK	TFPR	Fixed Assets	MRPK / Fixed Assets	TFPR / Fixed Assets
Ind. var.: $Exposure_b * Post_t * D_i$	(1)	(2)	(3)	(4)	(5)
High	0.436***	0.460***	0.448***		
	(0.077)	(0.067)	(0.065)		
Low	0.343***	0.262***	0.253***		
	(0.065)	(0.066)	(0.067)		
High P - High FA				0.524***	0.478***
				(0.084)	(0.068)
Low P - High FA				0.358***	0.334***
				(0.066)	(0.07)
High P - Low FA				0.240***	0.352***
				(0.076)	(0.086)
Low P - Low FA				0.113	0.122
				(0.081)	(0.074)
Firm-time F.E.	✓	✓	✓	✓	✓
Firm-bank F.E.	✓	✓	✓	✓	✓
Specialization	✓	✓	✓	✓	✓
Bank Controls	✓	✓	✓	✓	✓
Observations	2,689,020	3,183,909	3,183,909	2,689,020	3,183,909
$Adj.R^2$	0.90	0.90	0.90	0.90	0.90

Note: The dependent variable is the log of outstanding credit between bank b and firm i in year t, , $\ln C_{ibt}$,. The variable $Exposure_b$ captures bank exposure to foreign capital flows, defined as the foreign-liability ratio over 1998-2001. Specialization is a time-varying dummy that captures if a firm operates in a sector in which the bank specializes its lending activities. Bank controls include bank characteristics measured in 1998-2001 interacted with a post-2002 dummy: log-assets, share of NPLs, core-funding ratio, and the capital ratio. Standard errors are clustered at the bank-sector (2-digit) level. ***significant at the 1% level, ** significant at the 5% level, * significant at the 10% level.

Table 8: Capital inflows and bank-firm relation by firm characteristics, extensive margin

	Dependent variable:					
	$Exit_{ib\tau}$			$Entry_{ib\tau}$		
Firm characteristic D_i:	MRPK	Fixed Assets	MRPK/ Fixed Assets	MRPK	Fixed Assets	MRPK / Fixed Assets
$Exposure_b * Post_\tau * D_i$	(1)	(2)	(3)	(4)	(5)	(6)
High	-0.14***	-0.162***		0.221***	0.125***	
	(0.028)	(0.030)		(0.035)	(0.029)	
Low	-0.070***	0.026		0.162***	0.365***	
	(0.028)	(0.027)		(0.033)	(0.037)	
High P - High FA			-0.223***			0.100***
			(0.030)			(0.035)
Low P - High FA			-0.100***			0.136***
			(0.029)			(0.034)
High P - Low FA			0.00			0.368***
			(0.033)			(0.043)
Low P - Low FA			0.113***			0.345***
			(0.040)			(0.049)
Firm-period F.E.	✓	✓	✓	✓	✓	✓
Bank F.E.	✓	✓	✓	✓	✓	✓
Specialization	✓	✓	✓	✓	✓	✓
Bank Controls	✓	✓	✓	✓	✓	✓
Observations	766,654	841,324	766,654	766,654	841,324	766,654
$Adj.R^2$	0.55	0.55	0.55	0.45	0.46	0.46

Note: The table reports the coefficients of the specification on misallocation on the extensive margin in the context of specification in equation (2). The dependent variable is a dummy that takes the value of 1 if firm i starts (entry) or ends (exit) a credit relation with bank b in period τ=1998-2001, 2002-07. We show the results of bank exposure to foreign capital flows by firm types, where firms are divided along a productivity dimension (above and below the sectoral average) and credit constraint (fixed assets above and below the sectoral average). Specialization is a time-varying dummy that captures if a firm operates in a sector in which the bank specializes its lending activities. Bank controls include bank characteristics measured in 1998-2001 interacted with a post-2002 dummy: log-assets, share of NPLs, core-funding ratio, and the capital ratio. All regressions include firm-period fixed effects and bank dummies. Standard errors are clustered at the bank-sector (2-digit) level. ***significant at the 1% level, ** significant at the 5% level, * significant at the 10% level.

Table 9: Capital inflows and credit allocation by firm characteristics, aggregate credit

	Dependent variable: $\ln\ Credit_{it}$				
Firm characteristic D_i:	MRPK	TFPR	Fixed Assets	MRPK / Fixed Assets	TFPR / Fixed Assets
Ind. var.: $Exposure_i * Post_t * D_i$	(1)	(2)	(3)	(4)	(5)
High	0.346***	0.293***	0.311***		
	(0.068)	(0.061)	(0.062)		
Low	0.220***	0.170***	0.155***		
	(0.061)	(0.062)	(0.061)		
High P - High FA				0.497***	0.340***
				(0.082)	(0.068)
Low P - High FA				0.223***	0.215***
				(0.075)	(0.073)
High P - Low FA				0.144**	0.260***
				(0.072)	(0.073)
Low P - Low FA				0.105	0.040
				(0.10)	(0.071)
Est. Firm-time F.E.	✓	✓	✓	✓	✓
Firm F.E.	✓	✓	✓	✓	✓
Sector-time F.E.	✓	✓	✓	✓	✓
Bank Controls	✓	✓	✓	✓	✓
Observations	743,522	886,227	886,227	743,522	886,227
$Adj.R^2$	0.92	0.92	0.92	0.92	0.92

Note: The table reports the coefficients of the specification on misallocation on aggregate credit. The dependent variable, $\ln C_{it}$, is the log of outstanding credit of firm i in year t. We show the results of firm exposure to foreign capital flows according to the exposure of the banks they are borrowing from, as defined in equation (3). Firms are divided along a productivity dimension (above and below the sectoral average) and credit constraint (fixed assets above and below the sectoral average). Bank controls include bank characteristics pre-2002 interacted with a post-2002 dummy: log-assets, share of NPLs, core-funding ratio, and the capital ratio. All regressions include sector-year fixed effects and firm dummies, and the firm-time fixed effects estimated in the intensive margin regression. Standard errors are bootstrapped with clusters at the sector-main bank level. ***significant at the 1% level, ** significant at the 5% level, * significant at the 10% level.

Table 10: Moments of log-MRPK distribution and sector exposure to capital inflows

	Var(log-MRPK)		Mean(log-MRPK)		Cov(log-MRPK, log-Sales)	
	(1)	(2)	(3)	(4)	(5)	(6)
$Exposure_s \times Post_t$	-1.027***	-0.812**	-0.905	-0.173	0.248	0.235
	(0.359)	(0.402)	(0.600)	(0.446)	(0.350)	(0.421)
Industry -trend		✓		✓		✓
Sector F.E.	✓	✓	✓	✓	✓	✓
Year F.E.	✓	✓	✓	✓	✓	✓
Sector Controls	✓	✓	✓	✓	✓	✓
Observations	2,397	2,397	2,397	2,397	2,397	2,397
$Adj.R^2$	0.54	0.65	0.87	0.92	0.44	0.55

Note: The table reports the coefficients of the specification in equation (7). The dependent variable is the variance of log-MRPK (columns (1) and (2)), the mean of log-MRPK (columns (3) and (4)) and the covariance between log-MRPK and log-Sales (columns (5) and (6)). Sector exposure to capital inflows is obtained as the credit-weighted average exposure of banks lending to the sector and it is interacted with a post-2002 dummy. Regressions in columns (2), (4), and (6) include 3-digit industry trends. All regressions include firm fixed effects, year fixed effects, and the weighted average of banks' characteristics lending to the sector: log-assets, NPLs ratio, capital ratio, and core funding. Standard errors are clustered at the sector (3-digit) level. ***significant at the 1% level, ** significant at the 5% level, * significant at the 10% level.

Table 11: Capital inflows and credit allocation by firm characteristics, intensive margin

	Dependent variable: ln $Credit_{ibt}$			
Bond funding focus	All banks: $Bond_{bt-1}$		Banks with bond fund.($Bond_{bt-1}$) but no foreign-funding	
Firm characteristic D_i: Ind. var.: $Exposure_b * Post_t * D_i$	MRPK / Fixed Assets (1)	TFPR / Fixed Assets (2)	MRPK / Fixed Assets (3)	TFPR / Fixed Assets (4)
High P - High FA	0.543***	0.531***		
	(0.073)	(0.071)		
Low P - High FA	0.410***	0.414***		
	(0.067)	(0.068)		
High P - Low FA	0.308***	0.306***		
	(0.074)	(0.073)		
Low P - Low FA	0.029	0.09		
	(0.11)	(0.11)		
Bond Fund. High P - High FA	0.035	0.014	0.399	0.290
	(0.048)	(0.047)	(0.285)	(0.231)
Bond Fund. Low P - High FA	0.039	0.047	0.401**	0.441**
	(0.035)	(0.035)	(0.184)	(0.193)
Bond Fund. High P - Low FA	0.083*	0.102**	0.638**	0.592
	(0.047)	(0.047)	(0.302)	(0.488)
Bond Fund. Low P - Low FA	0.316***	0.132**	1.287**	0.789***
	(0.087)	(0.068)	(0.64)	(0.328)
Firm-time F.E.	✓	✓	✓	✓
Firm-bank F.E.	✓	✓	✓	✓
Specialization	✓	✓	✓	✓
Bank Controls	✓	✓	✓	✓
Observations	2,689,020	3,183,909	924,130	924,130
$Adj.R^2$	0.90	0.90	0.93	0.93

Note: The dependent variable is the log of outstanding credit between bank b and firm i in year t, , $\ln C_{ibt}$. The variable $Exposure_b$ captures bank exposure to foreign capital flows, defined as the foreign-liability ratio over the period 1998-2001. In column (1) and (2) bond funding is time varying and interacted with firm characteristics; in columns 3 and 4 it is the average of bond funding pre-2002. Columns (3) and (4) focus on banks that use bond funding, but not foreign funding. Specialization is a time-varying dummy that captures if a firm operates in a sector in which the bank specializes its lending activities. Bank controls include bank characteristics measured in 1998-2001 interacted with a post-2002 dummy: log-assets, share of NPLs, core-funding ratio, and the capital ratio. Standard errors are clustered at the bank-sector (2-digit) level. ***significant at the 1% level, ** significant at the 5% level, * significant at the 10% level.

Table 12: Exposure to competition and bond funding

Dependent variable:	Bond Funding			Foreign Funding
	(1)	(2)	(3)	(4)
Competition from capital inflows$_{bt}$	-0.001		-0.002	
	(0.003)		(0.003)	
Overall competition$_{bt}$		0.031***	0.030***	-0.01
		(0.01)	(0.008)	(0.008)
Bank F.E.	✓	✓	✓	✓
Bank Controls	✓	✓	✓	✓
Year F.E.	✓	✓	✓	✓
Observations	4,761	4,761	4,761	4,761
$Adj.R^2$	0.93	0.93	0.95	0.95

Note: To compute competition from capital inflows, first, for each Italian province we measure exposure to foreign capital as the average of exposure of banks in the province, weighted by their relevance in terms of loans' share: $Exposure\ Province_{pt} = \sum_b Exposure_b \frac{Credit_{bpt}}{Credit_{pt}}$. Then for each bank we take the average of this province measure weighted by the share of that province in the banks' portfolio: $Competition\ from\ capital\ inflows_{bt} = \sum_p Exposure\ \ Province_{pt} \frac{Credit_{bpt}}{Credit_{bt}}$. Exposure to market competition is computed as the credit-weighted average change in the Herfindhal-index: $Overall\ competition_{bt} = \sum_p -\Delta HHI_{pt} \frac{Credit_{bpt}}{Credit_{bt}}$ (we take the change in HHI with a minus in front to facilitate the interpretation of the coefficients) across the provinces where the bank operates. The dependent variables are the share of bond funding per year (columns 1 and 3) and the share of foreign funding per year (column 4). All regressions include bank fixed effects, year fixed effects and bank controls (log-assets, share of NPLs, core-funding ratio, and the capital ratio). Standard errors are clustered at the bank level. ***significant at the 1% level, ** significant at the 5% level, * significant at the 10% level.

Table 13: Bond funding, bank costs, pricing, and market power

Dependent variable	Costs over liabilities		Marginal cost		Price of credit		Lerner index		Market share firm credit	
	(1)	(2)	(3)	(4)	(5)	(6)	(7)	(8)	(9)	(10)
Bond funding$_{bt-1}$	0.0127***	0.0128**	0.008***	0.008***	0.026***	0.026***	0.017***	0.017***	0.002***	0.002***
	(0.0003)	(0.0003)	(0.002)	(0.002)	(0.006)	(0.006)	(0.004)	(0.004)	(0.0003)	
Foreign funding$_{bt-1}$		0.001		-0.003		-0.007		0.004.		0.001
		(0.008)		(0.01)		(0.026)		(0.012).		(0.003)
Bank Controls	✓	✓	✓	✓	✓	✓	✓	✓	✓	✓
Bank F.E.	✓	✓	✓	✓	✓	✓	✓	✓	✓	✓
Time F.E.	✓	✓	✓	✓	✓	✓	✓	✓	✓	✓
Observations	4,761	4,761	4,761	4,761	4,761	4,761	4,761	4,761	4,761	4,761
$Adj.R^2$	0.87	0.87	0.86	0.86	0.90	0.90	0.90	0.90	0.97	0.97

Note: The table reports the coefficients of the specification $Y_{bt} = \beta_1\ Bond\ Funding_{bt-1} + \beta_2\ Foreign\ Funding_{bt-1} + \boldsymbol{X'_{bt-1}\delta} + \gamma_b + \delta_t + \epsilon_{bt}$. The dependent variable is funding and operational costs relative to liabilities (column (1) and (2)); the marginal cost of banks obtained by estimating a translog cost function as in Demirguc-Kunt and Peria (2010) (column (3) and (4)); interest rate from firms relative to total loans granted (column (5) and (6)); the Lerner index which is the difference between the price of credit and the marginal costs (the variables in the previous columns); and finally, the share of credit to non-financial corporations. Bond funding is the share of outstanding bonds relative to liabilities; foreign funding is the share of funding from abroad relative to liabilities; X_b is a vector of bank characteristics: log-assets, share of NPLs, core-funding ratio, and the capital ratio. All regressions include bank and year fixed effects. Standard errors are clustered at the bank level. ***significant at the 1% level, ** significant at the 5% level, * significant at the 10% level.

A Appendix

Tables A1-A3 shows the effects of bank exposure to capital inflows on credit supply across different industries (intensive margin, extensive margin, and aggregate credit).

Table A4 tests for a non-linear relationship between firm credit and assets.

Table A5 shows the results of the credit-demand channel of capital inflows discussed in Subection .

Tables A6 and A7 show the results on credit allocation using alternative measures of bank exposure to capital inflows, as discussed in Subsection 8.2.

Table A8 shows the results on credit allocation using a time-varying measure to classify firms by productivity and collateral. Whereas Table A9 uses alternative measure of firm constraint and productivity based on credit-score and labor productivity. These tables are discussed in Subsection 8.3.

Table A10 shows the result of bank exposure to capital inflows on household lending, as discussed in Subsection .

Table A11 analyzes the potential spillover across banks, as discussed in Subsection 8.5.

Table A12 shows the effects of bank exposure to capital inflows on the supply of credit controlling for potential confounding factors, as discussed in Subsection 8.6.

Table A13 looks at the effects of bank exposure to capital inflows on the non-performing loans (NPLs) and on credit, after the global financial crisis when capital inflows revert. This table is discussed in Subsection 8.7.

Table A14 reports the coefficients of the baseline specification in equation (5) using a balanced panel of firm-bank relations.

Table A15 reports the coefficients of a first-difference transformation of the diff-in-diff specification in Equation 5: $\Delta \ln C_{ib} = \sum_{d=1}^{4} \beta_d \, D_{di} \times Exposure_b + \beta_2 \, \Delta \, Spec_{ib} + \boldsymbol{X_b'\delta} + \alpha_i + \epsilon_{ib}$

Table A16 looks at credit allocation by firms' characteristics using a continuous measure of firm-level productivity and collateral (rather than an indicator variable if the firm is above or below average). We run the baseline specification in Equation 5 adding an interaction term between bank-level exposure and firm-level ex-ante characteristics.

Table A17 reports the coefficients of the baseline specification in equation (5), but firms' characteristics are computed based on their 2002-2007 average.

Table A18 reports the coefficients of the baseline specification in equation (5) with bank-time fixed effects: $\ln C_{ibt} = \sum_{d=1}^{3} \beta_d \, D_{di} \times Exposure_b \times Post_t + \beta_2 \, Spec_{ibt} + \alpha_{it} + \gamma_{ib} + \mu_{bt} + \epsilon_{ibt}$. Given the presence of bank-time fixed effects, we need to omit a category, namely, low-productivity and low-collateral, so the coefficients should be interpreted as the marginal difference with respect to the excluded category. Moreover, we no longer have the ex-ante bank controls X the post dummy, because these are absorbed by the bank-year fixed effects.

Figure A1 shows the evolution of cross-border banking flows in Germany and Luxembourg in the context of the discussion of alternative measures of bank exposure to capital inflows in Subsection 8.2.

Figure A2 shows the evolution of the Italian interbank lending market in the context of the discussion of potential spillovers across banks in Subsection 8.5.

Subsection A.3 outlines the methodology for computing firm-level MRPK and TFPR.

A.1 Appendix tables

Table A1: Capital inflows and credit allocation by industry, intensive margin

	Dependent variable: ln $Credit_{ibt}$			
	Manufacturing (1)	Construction (2)	Trade Service (3)	Other (4)
$Exposure_b \times Post_t$	0.57***	0.14	0.18	0.34***
	(0.06)	(0.19)	(0.16)	(0.10)
Firm-time F.E.	✓	✓	✓	✓
Firm-bank F.E.	✓	✓	✓	✓
Specialization	✓	✓	✓	✓
Bank Controls	✓	✓	✓	✓
Observations	1,922,581	427,477	1,101,423	690,267
$Adj.R^2$	0.90	0.87	0.91	0.91

Note: The table reports the coefficients of the baseline specification in equation (1), where we divide the sample by firms' macro sectors. The dependent variable, $\ln C_{ibt}$, is the log of outstanding credit between bank b and firm i in year t. The variable $Exposure_b$ captures bank exposure to foreign capital flows, defined as the foreign-liability ratio over 1998-2001. Specialization is a time-varying dummy that captures if a firm operates in a sector in which the bank specializes its lending activities. Bank controls include bank characteristics measured in 1998-2001, interacted with a post-2002 dummy: log-assets, share of NPLs, core-funding ratio, and the capital ratio. Specialization is a dummy that captures if a firm operates in a sector in which the bank specializes its lending activities. All regressions include firm-year fixed effects and firm-bank dummies. Standard errors are clustered at the bank-sector (2-digit) level. ***significant at the 1% level, ** significant at the 5% level, * significant at the 10% level

Table A2: Capital inflows and firm-bank relations by industry, extensive margin

	Dependent variable:							
	$Entry_{ib\tau}$				$Exit_{ib\tau}$			
	Manuf. (1)	Constr. (2)	Trade Service (3)	Other (4)	Manuf. (5)	Constr. (6)	Trade Service (7)	Other (8)
$Exposure_b * Post_\tau$	0.0548*	-0.0793	0.0321	-0.0191	-0.260***	-0.134**	-0.190***	-0.188***
	(0.0322)	(0.108)	(0.0865)	(0.0330)	(0.0252)	(0.0592)	(0.0471)	(0.0308)
Firm-period F.E.	✓	✓	✓	✓	✓	✓	✓	✓
Bank F.E.	✓	✓	✓	✓	✓	✓	✓	✓
Specialization	✓	✓	✓	✓	✓	✓	✓	✓
Bank Controls	✓	✓	✓	✓	✓	✓	✓	✓
Observations	358,591	115,188	234,597	188,242	358,591	115,188	234,597	188,242
$Adj.R^2$	0.337	0.316	0.328	0.328	0.340	0.354	0.345	0.357

Note: The table reports the coefficients of the extensive-margin specification in equation (2), where we divide the sample by firms' macro sectors. The dependent variable is a dummy that takes the value of 1 if firm i starts (entry) or ends (exit) a credit relation with bank b in period τ=1998-2001, 2002-07. The variable $Exposure_b$ captures bank exposure to foreign capital flows, defined as the foreign liability ratio over the period 1998-2001. Specialization is a time-varying dummy that captures if a firm operates in a sector in which the bank specializes its lending activities. Bank controls include bank characteristics measured in 1998-2001 interacted with a post-2002 dummy: log-assets, share of NPLs, core-funding ratio, and the capital ratio. Standard errors are clustered at the bank-sector (2-digit) level. ***significant at the 1% level, ** significant at the 5% level, * significant at the 10% level.

Table A3: Capital inflows and credit allocation by industry, aggregate effect

	Dependent variable: ln $Credit_{it}$			
	Manufacturing (1)	Construction (2)	Trade Service (3)	Other (4)
$Exposure_b \times Post_t$	0.24***	0.11	0.05	0.42***
	(0.07)	(0.15)	(0.09)	(0.11)
Estimated firm-time F.E.	✓	✓	✓	✓
Firm F.E.	✓	✓	✓	✓
Sector-time F.E.	✓	✓	✓	✓
Bank Controls	✓	✓	✓	✓
Observations	504,261	129,812	317,217	218,134
$Adj.R^2$	0.90	0.87	0.91	0.91

Note: The table reports the coefficients of the baseline specification in equation (1), where we divide the sample by firms' macro sectors. The dependent variable, $\ln C_{it}$, is the log of outstanding credit of firm i in year t. The variable $Exposure_i$ is the weighted average of exposure to foreign capital inflows of firm's i lenders in the period 1998-2001 as defined in equation (3). Specialization is a time-varying dummy that captures if a firm operates in a sector in which the bank specializes its lending activities. Bank controls are a weighted average of firm's i lenders' characteristics measured in 1998-2001, interacted with a post-2002 dummy: log-assets, share of NPLs, core-funding ratio, and the capital ratio. All regressions include sector-year fixed effects and firm dummies, and the firm-time fixed effects computed in the intensive-margin regression. Standard errors are bootstrapped with clusters at the sector-main-bank level. ***significant at the 1% level, ** significant at the 5% level, * significant at the 10% level. .

Table A4: Relationship between firm credit and assets

Dependent variable: C_{it}	Total assets (1)	Total Fixed Assets (2))
$Assets_t$	0.560***	0.630***
	(0.148)	(0.207)
$Assets_t^2$	-0.003	-0.079
	(0.098)	(0.154)
Sector F.E.	✓	✓
Time F.E.	✓	✓
Observations	1,421,218	1,421,218
$Adj.R^2$	0.57	0.57

Note: The table reports the coefficients of the following regression: $C_{ist} = \beta_0 + \beta_1$ *Assets*$_{it}$ $+ \beta_2$ *Assets*$_{it}^2$ $+ \gamma_s + \delta_t + \epsilon_{ist}$, where C_{ist} is the total outstanding credit of firm i operating in sector s in year t, *Assets*$_{it}$ are total assets (column (1)) or total fixed assets (column (2)), γ_s and δ_t are sector and time fixed effects, and errors are clustered at the firm level. The specification captures the average relation between credit, assets, and squared assets across firms in a given sector and year. All variables are standardized, so the interpretation of the coefficient is such that, for example, a one standard-deviation increase in total assets is associated to 0.56 standard-deviation increase in credit. ***significant at the 1% level, ** significant at the 5% level, * significant at the 10% level.

Table A5: Capital inflows and credit allocation by firm characteristics, the credit-demand channel

	Dependent variable: ln $Credit_{ibt}$				
Firm characteristic D_i:	MRPK	TFPR	Fixed Assets	MRPK / Fixed Assets	TFPR / Fixed Assets
Ind. var.: $Exposure_b * Post_t * D_i$	(1)	(2)	(3)	(4)	(5)
High	0.441***	0.304***	-0.023		
	(0.024)	(0.024)	(0.023)		
Low	-	-	-		
High P - High FA				0.613***	0.657***
				(0.030)	(0.032)
Low P - High FA				0.159***	0.108***
				(0.033)	(0.030)
High P - Low FA				0.353***	0.337***
				(0.026)	(0.032)
Low P - Low FA				-	-
Bank-time F.E.	✓	✓	✓	✓	✓
Firm-bank F.E.	✓	✓	✓	✓	✓
Specialization	✓	✓	✓	✓	✓
Observations	2,782,114	3,599,755	3,599,755	2,782,114	3,599,755
$Adj.R^2$	0.84	0.84	0.84	0.84	0.84

Note: The table reports the coefficients of the specification in equation (8). The dependent variable, $\ln C_{ibt}$, is the log of outstanding credit between bank b and firm i in year t. We show the results of bank exposure to foreign capital flows by firm types, where firms are divided along a productivity dimension (above and below the sectoral average) and credit constraint (fixed assets above and below the sectoral average), Low-Productivity and Low-Collateral are the excluded categories. The variable $Exposure_b$ captures bank exposure to foreign capital flows, defined as the foreign-liability ratio over 1998-2001. Specialization is a time-varying dummy that captures if a firm operates in a sector in which the bank specializes its lending activities. All regressions include firm-year fixed effects and firm-bank dummies. Standard errors are clustered at the bank-sector (2-digit) level. ***significant at the 1% level, ** significant at the 5% level, * significant at the 10% level.

Table A6: Capital inflows and credit allocation by firm characteristics, shift-share measure of bank exposure

	Dependent variable: ln $Credit_{ibt}$				
Firm characteristic: D_i	MRPK	TFPR	Fixed Assets	MRPK / Fixed Assets	TFPR / Fixed Assets
Ind. var.: $Exposure_b^{Geo} * Post_t * D_i$	(1)	(2)	(3)	(4)	(5)
High	0.151***	0.142***	0.135***		
	(0.007)	(0.006)	(0.006)		
Low	0.112***	0.092***	0.099***		
	(0.007)	(0.007)	(0.007)		
High P - High FA				0.170***	0.145***
				(0.008)	(0.006)
Low P - High FA				0.122***	0.103***
				(0.008)	(0.008)
High P - Low FA				0.109***	0.123***
				(0.009)	(0.008)
Low P - Low FA				0.061***	0.074***
				(0.012)	(0.009)
Firm-time F.E.	✓	✓	✓	✓	✓
Firm-bank F.E.	✓	✓	✓	✓	✓
Specialization	✓	✓	✓	✓	✓
Bank Controls	✓	✓	✓	✓	✓
Observations	2,689,020	3,183,909	3,183,909	2,689,020	3,183,909
$Adj.R^2$	0.90	0.90	0.90	0.90	0.90

Note: The table reports the coefficients of the specification in equation (5) with and alternative measure of bank exposure. The dependent variable, $\ln C_{ibt}$, is the log of outstanding credit between bank b and firm i in year t. We show the results of bank exposure to foreign capital flows by firm types, where firms are divided along a productivity dimension (above and below the sectoral average) and credit constraint (fixed assets above and below the sectoral average), Low-Productivity and Low-Collateral are the excluded categories. Bank exposure is defined as $Exposure_b^{Geo} = \sum_c \omega_{bc}\ \Delta World\ Outflows_c^{post-pre}$, where $\Delta World\ Outflows_c^{post-pre}$ is the change in outstanding claims of the banks of country c towards the rest of the world, excluding Italy, in the period before and after 2002; ω_{bc} is the share of inflows of bank b from country c in the 1998-2001 period. Specialization is a time-varying dummy that captures if a firm operates in a sector in which the bank specializes its lending activities. Bank controls include bank characteristics measured in 1998-2001, interacted with a post-2002 dummy: log-assets, share of NPLs, core-funding ratio, and the capital ratio. All regressions include firm-year fixed effects and firm-bank dummies. Standard errors are clustered at the bank-sector (2-digit) level. ***significant at the 1% level, ** significant at the 5% level, * significant at the 10% level.

Table A7: Capital inflows and credit allocation by firm characteristics, bank exposure to a time-varying measure capital inflows driven by push-factors

	Dependent variable: ln $Credit_{ibt}$				
Firm characteristic: D_i	MRPK	TFPR	Fixed Assets	MRPK / Fixed Assets	TFPR / Fixed Assets
Ind. var.: $Exposure_b * \hat{\lambda}_1 \Delta \ln KF_t^{World} * D_i$	(1)	(2)	(3)	(4)	(5)
High	0.400***	0.416***	0.393***		
	(.020)	(0.017)	(0.017)		
Low	0.310***	0.240***	0.260***		
	(0.022)	(0.022)	(0.023)		
High P - High FA				0.518***	0.433***
				(0.029)	(0.019)
Low P - High FA				0.356***	0.274***
				(0.023)	(0.029)
High P - Low FA				0.309***	0.334***
				(0.029)	(0.032)
Low P - Low FA				0.126***	0.185
				(0.046)	(0.031)
Firm-time F.E.	✓	✓	✓	✓	✓
Firm-bank F.E.	✓	✓	✓	✓	✓
Specialization	✓	✓	✓	✓	✓
Bank Controls	✓	✓	✓	✓	✓
Observations	2,689,020	3,183,909	3,183,909	2,689,020	3,183,909
$Adj.R^2$	0.90	0.90	0.90	0.90	0.90

Note: The table reports the coefficients of the specification in equation (10) with an alternative measure of bank exposure. The dependent variable, $\ln C_{ibt}$, is the log of outstanding credit between bank b and firm i in year t. We show the results of bank exposure to foreign capital flows by firm types, where firms are divided along a productivity dimension (above and below the sectoral average) and credit constraint (fixed assets above and below the sectoral average). The variable $Exposure_b$ is the foreign-liability ratio over the period 1998-2001, and it is interacted with a measure of capital inflows to Italy in year t driven by push factors, as estimated in equation (9). Specialization is a time-varying dummy that captures if a firm operates in a sector in which the bank specializes its lending activities. Bank controls include bank characteristics measured in 1998-2001, interacted with a post-2002 dummy: log-assets, share of NPLs, core-funding ratio, and the capital ratio. All regressions include firm-year fixed effects and firm-bank dummies. Standard errors are clustered at the bank-sector (2-digit) level. ***significant at the 1% level, ** significant at the 5% level, * significant at the 10% level.

Table A8: Capital inflows and credit allocation by lagged firm characteristics

	Dependent variable: ln $Credit_{ibt}$				
Firm characteristic D_i:	MRPK	TFPR	Fixed Assets	MRPK / Fixed Assets	TFPR / Fixed Assets
Ind. var.: $Exposure_b * Post_t * D_{it-1}$	(1)	(2)	(3)	(4)	(5)
High$_{t-1}$	0.492***	0.496***	0.462***		
	(.064)	(0.068)	(0.065)		
Low$_{t-1}$	0.339***	0.255***	0.237***		
	(0.062)	(0.069)	(0.063)		
High P - High FA$_{t-1}$				0.589***	0.528***
				(0.048)	(0.038)
Low P - High FA$_{t-1}$				0.369***	0.327***
				(0.047)	(0.044)
High P - Low FA$_{t-1}$				0.242***	0.337***
				(0.049)	(0.043)
Low P - Low FA$_{t-1}$				0.153***	0.115**
				(0.053)	(0.045)
Firm-time F.E.	✓	✓	✓	✓	✓
Firm-bank F.E.	✓	✓	✓	✓	✓
Specialization	✓	✓	✓	✓	✓
Bank Controls	✓	✓	✓	✓	✓
Observations	2,585,734	3,016,942	3,016,942	2,585,734	3,016,942
$Adj.R^2$	0.90	0.90	0.90	0.90	0.90

Note: The table reports the coefficients of the specification $\ln C_{ibt} = \sum_{d=1}^{4} \beta_d \, D_{dit-1} \times Exposure_b \times Post_t + \beta_2 \, Spec_{ibt} + \boldsymbol{X_b'\delta} \times Post_t + \alpha_{it} + \gamma_{ib} + \epsilon_{ibt}$. The dependent variable, $\ln C_{ibt}$, is the log of outstanding credit between bank b and firm i in year t. We show the results of bank exposure to foreign capital flows by firm types, where, for each $t-1$ year, firms are divided along a productivity dimension (above and below the sectoral average) and credit constraint (fixed assets above and below the sectoral average). The variable $Exposure_b$ captures bank exposure to foreign capital flows, defined as the foreign-liability ratio over 1998-2001. Specialization is a time-varying dummy that captures if a firm operates in a sector in which the bank specializes its lending activities. Bank controls include bank characteristics measured in 1998-2001, interacted with a post-2002 dummy: log-assets, share of NPLs, core-funding ratio, and the capital ratio. All regressions include firm-year fixed effects and firm-bank dummies. Standard errors are clustered at the bank-sector (2-digit) level. ***significant at the 1% level, ** significant at the 5% level, * significant at the 10% level.

Table A9: Capital inflows and credit allocation by alternative measure of firm risk and productivity

	Dependent variable: ln $Credit_{ibt}$		
Firm characteristic: D_i Ind. var.: $Exposure_b * Post_t * D_i$	P: MRPK R: Credit score	P: TFPR R: Credit score	P: Labor prod. R: Fixed assets*
High P - Low R	0.51***	0.482***	0.513***
	(0.06)	(0.067)	(0.07)
Low P - Low R	0.38***	0.299***	0.279***
	(0.06)	(0.067)	(0.063)
High P - High R	0.35***	0.285***	0.299***
	(0.09)	(0.086)	(0.09)
Low P - High R	0.066	0.088	0.079
	(0.09)	(0.07)	(0.091)
Firm-time F.E.	✓	✓	✓
Firm-bank F.E.	✓	✓	✓
Specialization	✓	✓	✓
Bank Control	✓	✓	✓
Observations	2,689,020	3,183,909	3,151,375
$Adj.R^2$	0.90	0.90	0.90

Note: The table reports the coefficients of the specification in equation (5) using alternative definitions of firm credit constraint and productivity. The dependent variable, $\ln C_{ibt}$, is the log of outstanding credit between bank b and firm i in year t. We show the results of bank exposure to foreign capital flows by firm characteristics (above or below their sectoral average), looking at productivity as MRPK (column (1)), TFPR (column (2)) and value added per worker (column (3)), and credit constraint using credit score (columns (1) and (2)) and fixed assets (column (3), where low R is associated with high fixed assets). The variable $Exposure_b$ captures bank exposure to foreign capital flows, defined as the foreign liability ratio over 1998-2001. Specialization is a time-varying dummy that captures if a firm operates in a sector in which the bank specializes its lending activities. Bank controls include bank characteristics measured in 1998-2001, interacted with a post-2002 dummy: log-assets, share of NPLs, core-funding ratio, and the capital ratio. All regressions include firm-year fixed effects and firm-bank dummies. Standard errors are clustered at the bank-sector (2-digit) level. ***significant at the 1% level, ** significant at the 5% level, * significant at the 10% level.

Table A10: Capital inflows and household lending

	Dependent variable: $\ln Household\ credit_{pbt}$		
$Exposure_b$:	Continuos (1)	Dummy 10% (2)	Dummy 15% (3)
$Exposure_b \times Post_t$	0.086 (0.068)	-0.043* (0.024)	-0.013 (0.021)
Province-Year F.E..	✓	✓	✓
Province-BankF.E.	✓	✓	✓
Bank Controls	✓	✓	✓
Observations	128,904	128,904	128,904
$Adj.R^2$	0.97	0.97	0.97

Note: The table reports the coefficients of the specification in equation (11). The dependent variable is household lending by bank b in province p at time t. The variable $Exposure_b$ captures bank exposure to foreign capital flows, defined as the foreign-liability ratio over the period 1998-2001. Bank controls include bank characteristics pre-2001 interacted with the post-dummies: log-assets, share of NPLs, core-funding ratio, and the capital ratio. All regressions include province-year fixed effects, bank-province fixed effects and bank controls. Standard errors are clustered at the province level. ***significant at the 1% level, ** significant at the 5% level, * significant at the 10% level.

Table A11: Spillover effects across banks, a balance sheet analysis

Dependent variable Y_{bt}:	Interbank lending (1)	Bonds & equity holdings (2)	Deposits (3)	Share of deposits (4)
$Exposure_b \times Post_t$	-1.92***	-0.36	0.21	-0.0003
	(0.45)	(1.07)	(0.40)	(0.0003)
Bank controls	✓	✓	✓	✓
Bank F.E.	✓	✓	✓	✓
Time F.E.	✓	✓	✓	✓
Observations	4,761	4,761	4,761	4,761
$Adj.R^2$	0.90	0.90	0.93	0.99

Note: The table reports the coefficients of the specification in equation (12). The dependent variable is the log of domestic interbank-lending (column (1)); the log of bonds and equity holdings of other financial institutions (column (2)); the log of deposits (column (3)); and the share of the total deposit in the economy (column (4)). The variable $Exposure_b$ captures bank exposure to foreign capital flows, defined as the foreign-liability ratio over 1998-2001. Bank controls include bank characteristics measured in 1998-2001, interacted with a post-2002 dummy. All regressions include bank fixed effects and year dummies. Standard errors are clustered at the bank level. ***significant at the 1% level, ** significant at the 5% level, * significant at the 10% level.

Table A12: Capital inflows and credit supply, potential confounding factors

	Dependent variable: ln $Credit_{ibt}$				
Confounding:	Baseline (1)	Securitization (2)	Recession (3)	China (4)	All (5)
$Exposure_b \times Post_t$	0.40***	0.383***	0.424***	0.397***	0.411***
	(0.06)	(0.06)	(0.06)	(0.06)	(0.06)
$Securitization\ Share_b \times Post_t$		-2.02***			-1.8***
		(0.30)			(0.32)
$Recession\ Share_b \times Post_t$			-0.427***		-0.379***
			(0.07)		(0.12)
$China\ Share_b \times Post_t$				-0.142***	-0.04
				(0.03)	(0.11)
Firm-time F.E.	✓	✓	✓	✓	✓
Firm-bank F.E.	✓	✓	✓	✓	✓
Specialization	✓	✓	✓	✓	✓
Bank Controls	✓	✓	✓	✓	✓
Observations	4,141,748	4,059,984	4,059,984	4,059,984	4,059,984
$Adj.R^2$	0.82	0.82	0.83	0.83	0.83

Note: The table reports the coefficients of the baseline specification in equation (1) with additional controls for potential confounding factors. The dependent variable, $\ln C_{ibt}$, is the log of outstanding credit between bank b and firm i in year t. $Exposure_b$ captures bank exposure to foreign capital flows, defined as the foreign-liability ratio over 1998-2001. Specialization is a time-varying dummy that captures if a firm operates in a sector in which the bank specializes its lending activities. Bank controls include bank characteristics measured in 1998-2001, interacted with a post-2002 dummy: log-assets, share of NPLs, core-funding ratio, and the capital ratio. All regressions include firm-year fixed effects and firm-bank dummies. Standard errors are clustered at the bank-sector (2-digit) level. Column (1) reports the baseline results; column (2) accounts for the share of securitized loans that banks made in 2001; column (3) controls for the share of loans in 1998-2000 to sectors that experienced a recession in 2001-02; column (4) controls for the share of loans in 1998-2000 to sectors that turned out to be more exposed to competition from China after its access in the WTO; column (5) includes all the robustness controls. ***significant at the 1% level, ** significant at the 5% level, * significant at the 10% level.

Table A13: Bank exposure to capital inflows and post-2008 fragility

	Bank level regression		Bank-firm level regression	
Dependent variable:	*NPL ratio*$_{bt}$		*Credit*$_{ibt}$	
Bank Exposure:	Continuos (1)	Dummy 15% (2)	Continuos (3)	Dummy 15% (4)
$Exposure_b \times Post_t^{2002}$	0.02	-0.001	0.23***	0.05***
	(0.02)	(0.004)	(0.06)	(0.004)
$Exposure_b \times Post_t^{2008}$	0.03	0.008	0.25***	0.04***
	(0.02)	(0.012)	(0.05)	(0.007)
Bank F.E.	✓	✓		
Year F.E.	✓	✓		
Firm-time F.E.			✓	✓
Firm-bank F.E.			✓	✓
Specialization			✓	✓
Bank Controls	✓	✓	✓	✓
Observations	5,846	5,846	7,494,518	7,494,518
$Adj.R^2$	0.62	0.62	0.84	0.84

Note: In columns (1) and (2) we report the results of the bank-level regression $NPL\ Ratio_{bt} = \beta_1\ Exposure_b \times Post_t^{2002-07} + \beta_2\ Exp_b \times Post_t^{2008-13} + \boldsymbol{X_b'\delta} \times Post_t + \gamma_b + \alpha_t + \epsilon_{bt}$. In columns (3) and (4) we report the results of the bank-firm-level regression $\ln C_{ibt} = \beta_1\ Exposure_b \times Post_t^{2002-07} + \beta_2\ Exposure_b \times Post_t^{2008-13} + \beta_3\ Spec_{ibt} + \boldsymbol{X_b'\delta} \times Post_t^{2002-07} + \boldsymbol{X_b'\delta} \times Post_t^{2008-13} + \alpha_{it} + \gamma_{ib} + \epsilon_{ibt}$. Standard errors are clustered at the bank level (columns (1) and (2)) and at the bank-sector (2-digit) level (columns (3) and (4)). ***significant at the 1% level, ** significant at the 5% level, * significant at the 10% level.

Table A14: Capital inflows and credit allocation by firm characteristics, balanced panel

	Dependent variable: ln $Credit_{ibt}$				
Firm characteristic D_i:	MRPK	TFPR	Fixed Assets	MRPK / Fixed Assets	TFPR / Fixed Assets
Ind. var.: $Exposure_b * Post_t * D_i$	(1)	(2)	(3)	(4)	(5)
High	0.48***	0.48***	0.45***		
	(0.08)	(0.07)	(0.07)		
Low	0.37***	0.30***	0.29***		
	(0.07)	(0.08)	(0.08)		
High P - High FA				0.66***	0.48***
				(0.08)	(0.07)
Low P - High FA				0.40***	0.45***
				(0.08)	(0.08)
High P - Low FA				0.30***	0.37***
				(0.08)	(0.09)
Low P - Low FA				0.18*	0.11
				(0.10)	(0.09)
Firm-time F.E.	✓	✓	✓	✓	✓
Firm-bank F.E.	✓	✓	✓	✓	✓
Specialization	✓	✓	✓	✓	✓
Bank Controls	✓	✓	✓	✓	✓
Observations	1,307,788	1,491,312	1,491,312	1,307,788	1,491,312
$Adj.R^2$	0.83	0.83	0.83	0.83	0.83

Note: The table reports the coefficients of the specification in equation (5) using a balanced panel of firm-bank relations. The dependent variable, $\ln C_{ibt}$, is the log of outstanding credit between bank b and firm i in year t. $Exposure_b$ captures bank exposure to foreign capital flows, defined as the foreign-liability ratio over 1998-2001. Specialization is a time-varying dummy that captures if a firm operates in a sector in which the bank specializes its lending activities. Bank controls include bank characteristics measure in 1998-2001 interacted with a post-2002 dummy: log-assets, share of NPLs, core-funding ratio, and the capital ratio. All regressions include firm-year fixed effects and firm-bank dummies. Standard errors are clustered at the bank-sector (2-digit) level. ***significant at the 1% level, ** significant at the 5% level, * significant at the 10% level.

Table A15: Capital inflows and credit allocation by firm characteristics, first difference

	Dependent variable: $\Delta \ln Credit_{ib}$				
Firm characteristic D_i:	MRPK	TFPR	Fixed Assets	MRPK / Fixed Assets	TFPR / Fixed Assets
Ind. var.: $Exposure_b * D_i$	(1)	(2)	(3)	(4)	(5)
High	0.055***	0.048***	0.043***		
	(0.007)	(0.009)	(0.008)		
Low	0.031***	0.015	0.017*		
	(0.007)	(0.009)	(0.009)		
High P - High FA				0.066***	0.051***
				(0.008)	(0.009)
Low P - High FA				0.034***	0.019*
				(0.007)	(0.01)
High P - Low FA				0.027***	0.030***
				(0.008)	(0.01)
Low P - Low FA				-0.007	0.003
				(0.01)	(0.01)
Firm-F.E.	✓	✓	✓	✓	✓
Specialization	✓	✓	✓	✓	✓
Bank Controls	✓	✓	✓	✓	✓
Observations	249,687	334,319	332,656	248,574	332,656
$Adj.R^2$	0.43	0.43	0.43	0.43	0.43

Note: The table reports the coefficients of equation (5) estimated in first difference as $\Delta \ \ln C_{ib} = \sum_{d=1}^{4} \beta_d \, D_{di} \times Exposure_b + \beta_2 \, \Delta \, Spec_{ib} + \boldsymbol{X_b'\delta} + \alpha_i + \epsilon_{ib}$. The dependent variable $\Delta \ln C_{ib}$ is the difference between the post (2002-2007) and pre (1998-2001) period of the log of outstanding credit between bank b and firm i. We show the results of bank exposure to foreign capital flows by firm types, where firms are divided along a productivity dimension (above and below the sectoral average) and credit constraint (fixed assets above and below the sectoral average). $Exposure_b$ captures bank exposure to foreign capital flows, defined as the foreign-liability ratio 1998-2001. Specialization is a time-varying dummy that captures if a firm operates in a sector in which the bank specializes its lending activities. Bank controls include bank characteristics measured in 1998-2001: interacted with a post-2002 dummy: log-assets, share of NPLs, core-funding ratio, and the capital ratio. All regressions include firm-year fixed effects and firm-bank dummies. Standard errors are clustered at the bank-sector (2-digit) level. ***significant at the 1% level, ** significant at the 5% level, * significant at the 10% level.

Table A16: Capital inflows and credit allocation by continuous measures of firm characteristics

	Dependent variable: $\ln Credit_{ibt}$				
Firm characteristic D_i:	MRPK (1)	TFPR (2)	Fixed Assets (3)	D_i: MRPK / F_i: Fixed Assets (4)	D_i: TFPR / F_i: Fixed Assets (5)
$Exposure_b * Post_t$:	0.37***	0.33***	0.03	-0.01	-0.19*
	(0.06)	(0.06)	(0.10)	(0.11)	(0.11)
$Exposure_b * Post_t * D_i$:	0.02**	0.06***	0.06***	0.05***	0.14***
	(0.009)	(0.008)	(0.01)	(0.01)	(0.03)
$Exposure_b * Post_t * F_i$				0.05***	0.08***
				(0.01)	(0.01)
$Exposure_b * Post_t * D_i * F_i$				-0.01**	-0.004
				(0.005)	(0.002)
Firm-time F.E.	✓	✓	✓	✓	✓
Firm-bank F.E.	✓	✓	✓	✓	✓
Specialization	✓	✓	✓	✓	✓
Bank Controls	✓	✓	✓	✓	✓
Observations	2,689,020	3,183,909	3,183,909	2,689,020	3,183,909
$Adj.R^2$	0.83	0.83	0.83	0.83	0.83

Note: The table reports the coefficients of the specification equation (1) adding an interaction term with ex-ante firm-level characteristics (MRPK, TFPR, and fixed assets). The dependent variable, $\ln C_{ibt}$, is the log of outstanding credit between bank b and firm i in year t. $Exposure_b$ captures bank exposure to foreign capital flows, defined as the foreign-liability ratio over the period 1998-2001. Specialization is a time-varying dummy that captures if a firm operates in a sector in which the bank specializes its lending activities. Bank controls include bank characteristics measured in 1998-2001: interacted with a post-2002 dummy: log-assets, share of NPLs, core-funding ratio, and the capital ratio. All regressions include firm-year fixed effects and firm-bank dummies. Standard errors are clustered at the bank-sector (2-digit) level. ***significant at the 1% level, ** significant at the 5% level, * significant at the 10% level.

Table A17: Capital inflows and credit allocation by post-2002 firm characteristics

	Dependent variable: ln $Credit_{ibt}$				
Firm characteristic D_i^{02-07}: Ind. var.: $Exposure_b * Post_t * D_i^{02-07}$	MRPK (1)	TFPR (2)	Fixed Assets (3)	MRPK / Fixed Assets (4)	TFPR / Fixed Assets (5)
High$^{02-07}$	0.49*** (0.08)	0.50*** (0.07)	0.46*** (0.07)		
Low$^{02-07}$	0.37*** (0.06)	0.23*** (0.07)	0.19*** (0.06)		
High P - High FA $^{02-07}$				0.60*** (0.10)	0.52*** (0.06)
Low P - High FA $^{02-07}$				0.42*** (0.06)	0.29*** (0.07)
High P - Low FA $^{02-07}$				0.27*** (0.08)	0.28*** (0.06)
Low P - Low FA $^{02-07}$				0.08 (0.06)	0.07 (0.07)
Firm-time F.E.	✓	✓	✓	✓	✓
Firm-bank F.E.	✓	✓	✓	✓	✓
Specialization	✓	✓	✓	✓	✓
Bank Controls	✓	✓	✓	✓	✓
Observations	2,628,302	2,894,797	2,894,797	2,628,302	2,894,797
$Adj.R^2$	0.83	0.83	0.83	0.83	0.83

Note: The table reports the coefficients of the specification similar to equation (5), where firms' are grouped according to their characteristics in the 2002-07 period. The dependent variable, $\ln C_{ibt}$, is the log of outstanding credit between bank b and firm i in year t. We show the results of bank exposure to foreign capital flows by firm types, where firms are divided along a productivity dimension (above and below the sectoral average) and credit constraint (fixed assets above and below the sectoral average). The variable $Exposure_b$ captures bank exposure to foreign capital flows, defined as the foreign-liability ratio over 1998-2001. Specialization is a time-varying dummy that captures if a firm operates in a sector in which the bank specializes its lending activities. Bank controls include bank characteristics measured in 1998-2001, interacted with a post-2002 dummy: log-assets, share of NPLs, core-funding ratio, and the capital ratio. All regressions include firm-year fixed effects and firm-bank dummies. Standard errors are clustered at the bank-sector (2-digit) level. ***significant at the 1% level, ** significant at the 5% level, * significant at the 10% level.

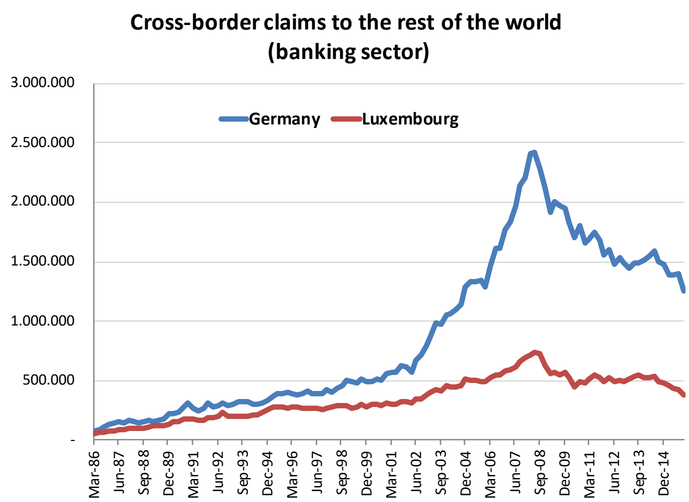
Table A18: Capital inflows and credit allocation by firm characteristics, adding bank-time fixed effects

	Dependent variable: ln $Credit_{ibt}$				
Firm characteristic D_i: Ind. var.: $Exposure_b * Post_t * D_i$	MRPK (1)	TFPR (2)	Fixed Assets (3)	MRPK / Fixed Assets (4)	TFPR / Fixed Assets (5)
High	0.135*** (0.04)	0.228*** (0.04)	0.236*** (0.04)		
Low	-	-	-		
High P - High FA				0.562*** (0.064)	0.381*** (0.050)
Low P - High FA				0.366*** (0.062)	0.193*** (0.51)
High P - Low FA				0.233*** (0.058)	0.197*** (0.052)
Low P - Low FA				-	-
Firm-time F.E.	✓	✓	✓	✓	✓
Bank-time F.E.	✓	✓	✓	✓	✓
Firm-bank F.E.	✓	✓	✓	✓	✓
Specialization	✓	✓	✓	✓	✓
Observations	2,689,020	3,183,909	3,183,909	2,689,020	3,183,909
$Adj.R^2$	0.90	0.90	0.90	0.90	0.90

Note: The table reports the coefficients of the specification in equation (5) with the addition of bank-time fixed effects. The dependent variable, $\ln C_{ibt}$, is the log of outstanding credit between bank b and firm i in year t. We show the results of bank exposure to foreign capital flows by firm types, where firms are divided along a productivity dimension (above and below the sectoral average) and credit constraint (fixed assets above and below the sectoral average), Low-Productivity and Low-Collateral are the excluded categories. The variable $Exposure_b$ captures bank exposure to foreign capital flows, defined as the foreign-liability ratio over 1998-2001. Specialization is a time-varying dummy that captures if a firm operates in a sector in which the bank specializes its lending activities. All regressions include firm-year fixed effects and firm-bank dummies. Standard errors are clustered at the bank-sector (2-digit) level. ***significant at the 1% level, ** significant at the 5% level, * significant at the 10% level.

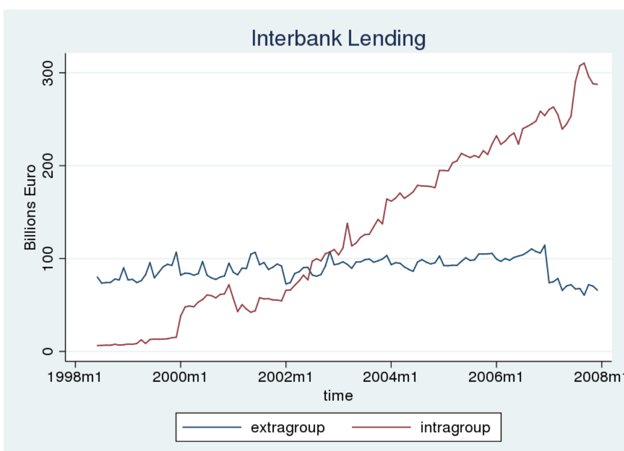
A.2 Appendix figures

Figure A1: Capital outflows by banks operating in Germany and Luxembourg



Source: BIS, locational banking statistics. Foreign claims of banks located in Germany and Luxembourg to the banks located in the rest of the world (nominal USD).

Figure A2: Interbank lending between and within groups



Source: Bank of Italy Supervisory Reports. The figure reports the evolution of the interbank lending at monthly frequency between 1998 and 2007 across and within banking groups. It shows interbank lending increased mainly within banking groups and not much across groups.

A.3 Estimation of MRPK and TFPR

The marginal revenue product of capital (MRPK) and the total factor productivity revenues (TFPR) are obtained through a production function estimation as described in Lenzu and Manaresi (2018), who follow Gandhi et al. (2020). The starting point is a gross output production function of the form:

$$y_{it} = f(k_{it}, l_{it}, m_{it}) + \nu_{it} \tag{A1}$$

where k_{it}, l_{it}, and m_{it} are the production inputs (capital, labor, and material) and ν is a productivity shock that can be decomposed as $\nu_{it} = \omega_{it} + \epsilon_{it}$. ω_{it} is assumed to be known to the firm prior to input decisions, while ϵ_{it} is an ex-post productivity shock.

The production function in A1 is assumed to be a second-oder Tanslog:

$$f(k_{it}, l_{it}, m_{it}) = \beta_K k_{it} + \beta_L l_{it} + \beta_M m_{it} + \beta_{KK} k_{it}^2 + \beta_{LL} l_{it}^2 + \beta_{MM} m_{it}^2 + \beta_{KL} k_{it} l_{it} + \beta_{KM} k_{it} m_{it} + \beta_{ML} m_{it} l_{it} \tag{A2}$$

To estimate the production function, firm-level output is measured by log-revenues; log-capital is recovered through the perpetual inventory method using both tangible and intangible fixed assets (relying on firm-level data starting in 1994); labor is proxied by the log of annual wage bill; and intermediate inputs are measured as the log of total expenditures in raw materials, services, and energy consumption. Revenues and materials variables are deflated using a 2-digit output deflator, capital is deflated with a 2-digit investment deflator, and the wage bill is deflated by the consumer price index.

Equation A2 is estimated through a 2-step estimation routine and allowing the structural technology parameters to vary by 4-digit industry. First, the routine recovers the elasticity of intermediate inputs m from the maximization conditions for flexible inputs. The estimated parameter is then used in a second step to compute the elasticities with respect to capital and labor. Given the elasticity of all inputs, TFPR can be simply obtained as the difference between revenues and the estimated production function:

$$TFPR_{it} = y_{it} - f(k_{it}, \widehat{l_{it}, m_{it}}, \hat{\beta}) \tag{A3}$$

Finally, MRPK is obtained as:

$$MRPK_{it} = \theta_{it}^K \frac{Y_{it}}{K_{it}} \frac{1}{\mu_{it}} \tag{A4}$$

where the first term (θ_{it}^K) is the elasticity of capital computed through the the production function estimation; the second term is the average product of capital; and the third term is the firm's markup, which is estimated as in De Loecker and Warzynski (2012) using the elasticity of intermediate inputs.