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Interbank syndicated lending

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ABSTRACT

We study syndicated lending among financial intermediaries, focusing on interactions between banks and non-bank financial intermediaries (NBFIs) around the Global Financial Crisis (GFC). Using granular loan-level data for more than 80,000 lender-borrower relationships across more than 100 countries, we decompose the growth of syndicated lending into lender-side and borrower-side components following a matched fixed-effects approach, controlling for differences between domestic and cross-border relationships. We document a marked reallocation of syndicated credit toward NBFIs during the GFC, in both domestic and cross-border markets, driven almost entirely by borrowers' rather than lenders' characteristics. These results point to the importance of monitoring non-bank borrowers' characteristics within the financial sector.

1. Introduction

Syndicated lending plays a central role in global credit markets. As a primary means of large-scale credit intermediation, syndicated loans are essential for funding major projects, with lending volumes exceeding $3 trillion in recent years. A significant body of research has examined syndicated lending, especially in the context of non-financial corporations (NFCs), analyzing the dynamics of these loans from the perspectives of borrowers and lenders alike (Ivashina & Scharfstein, 2010). However, much less attention has been paid to the role of financial institutions themselves – particularly banks and non-bank financial intermediaries (NBFIs) – as both lenders and borrowers in syndicated loan markets. This is partly surprising, since within our sample lending among financial intermediaries represents nearly half of the total volume of syndicated lending.

The interaction between financial institutions in syndicated loans presents a complex and underexplored dimension of credit markets. Unlike non-financial borrowers, financial institutions are often deeply interconnected, and their lending and borrowing behaviors are shaped not only by market dynamics but also by regulatory frameworks, capital requirements, and liquidity constraints. The recent rise of non-bank financial institutions (NBFIs) as key players in global finance has only added to the complexity of these relationships. NBFIs, which include entities like insurance companies, pension funds, and investment firms, have become increasingly active in syndicated lending, especially in cross-border markets (Cetorelli and Prazad, 2024). However, while research on NBFIs has

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grown substantially, a gap has been left in understanding how banks and NBFIs interact in syndicated loan markets. The purpose of our analysis is to fill this gap, with a particular focus on the period around the Global Financial Crisis (GFC).

Studying syndicated lending among banks and other financial institutions offers critical insights into the dynamics of credit intermediation, especially during times of financial distress, when the interconnectedness of financial institutions and the cross-border spillover effects of their actions become starkly evident (Ozgur, 2023). During the GFC, for example, the retreat of banks from international lending led to a sharp decline in cross-border syndicated loans, while NBFIs, lacking access to government-backed liquidity, faced unique challenges (Adrian and Ashcraft, 2012). Understanding what drives the changes in syndicated lending in response to such crises provides valuable lessons for policymakers and market participants, particularly as new regulatory frameworks have reshaped the landscape of financial intermediation (see, e.g., Čihák and Podpiera, 2008) and non-bank balance sheets and leverage dynamics have been shown to play an independent macroeconomic role during and after the GFC (Istiak, 2019).

In this paper, we explore these critical relationships within syndicated lending markets by focusing on the interactions among financial intermediaries, be they banks and NBFIs. We build a granular dataset of 80,000 bilateral lender-borrower relationships on individual credit lines (loan-tranches) in more than 100 countries between 2002 and 2011. We thus estimate the distinct contribution of each lender and borrower to the aggregate value of syndicated lending, applying a high-dimensional fixed-effects weighted-least-squares (WLS) model, along the lines proposed by Amiti and Weinstein (2018). This methodology allows us to compute the overall contributions of lenders' and borrowers' characteristics and their evolution through time. The analysis on the whole sample provides some interesting insights into the role of borrowers' and lenders' characteristics in determining the overall evolution of the domestic and cross-border syndicated loan market. In both markets, most of the overall variation in lending is driven by borrowers' characteristics, with a far smaller contribution provided by lenders' characteristics.

While the overall picture is broadly consistent through time, some differences emerge during the GFC. In the second part of the paper, we therefore exploit more thoroughly the information produced by our original estimates and focus explicitly on the period surrounding the GFC. For this purpose, we estimate a Difference-in-Differences (DiD) model to analyze the evolution of lending and the contribution of lenders' and borrowers' characteristics across the GFC. Our results document a marked reallocation of syndicated credit toward NBFIs during the GFC, in both domestic and cross-border markets. The shift is almost entirely driven by borrowers' rather than lenders' characteristics, highlighting the central role of demand-side forces in the reconfiguration of inter-financial credit during crises.

The rest of the paper is organized as follows. We start by briefly reviewing the literature relevant to our analysis. Next, we describe our data sources and present some descriptive evidence. In Section 4 we describe the empirical methodology and present our main findings. In Section 5 we summarize our results, draw our conclusions and propose avenues for future research.

2. Motivation and related literature

2.1. Interbank markets and syndicated lending

"Interbank markets are critical funding sources for all banking institutions [..] especially in periods of financial stress" (Bechara et al., 2024), and they can have a prominent role in transmitting financial shocks. Indeed, the role that lending within the financial sector has played in spreading the effects of the GFC has been studied extensively in the literature, as Gorton and Metrick (2012) have thoroughly summarized. Interbank lending is central to modern financial systems because it reallocates liquidity and credit risk across institutions. A large theoretical and empirical literature emphasizes that interconnected balance sheets can propagate stress through direct exposures and endogenous withdrawals, making interbank markets a key transmission channel in crises (Allen and Gale, 2000; Iyer and Peydró, 2011; Upper, 2011; Acharya and Merrouche, 2012; Glasserman and Young, 2016). Starting from the seminal study by Furfine (2001), a first strand of literature connected with our research focused on the determinants of interbank lending. Notably, while the early paper by Furfine (2001) provides evidence that the interest rates on US Federal Funds transactions reflect differences in borrowers' credit risk, Cocco et al. (2009) and Affinito (2012) also document monitoring activities on borrowing banks. Bräuning and Fecht (2017) also concur that bank-pair relationships have a significant impact on interbank credit availability and pricing, and Temizsoy et al. (2017) provide evidence that interbank spreads over LIBOR are significantly affected by the connectedness among lenders and borrowers. Analyzing the prices of US corporate bank loans, Quijano (2013) finds that banks with lower financing spreads pass this benefit on to borrowers. The broad message of these works is once again that interbank lending relationships are all but casual and have an impact on the credit supply.

While interbank markets have been studied extensively, a practical obstacle for research is that most interbank funding is typically short-term and over the counter. This institutional structure limits observability, complicates the identification of counterparties and volumes, and constrains the scope for matched lender-borrower analyses precisely when such analyses are most valuable (Armantier and Copeland, 2015). These limitations are particularly salient in periods of stress, when market structure shifts (e.g., from unsecured to collateralized funding) and when counterparty risk and relationship effects become first-order determinants of access and pricing (Cappelletti and Guazzarotti, 2019).

Against this background, syndicated lending is arguably the most transparent sector of lending. Notably, syndicated lending among financial intermediaries is not negligible in size, making it a useful and largely underexploited laboratory. Remarkably, syndicated

loans typically have longer maturities than classic interbank instruments, so they embed a more substantive assessment of counterparty risk, monitoring intensity, and syndicate design, connecting naturally to the canonical information-asymmetry view of syndication (Sufi, 2007).

The corporate syndicated loan literature provides the conceptual and empirical foundations for our approach, documenting how monitoring incentives, syndicate structure, and pricing respond to borrower risk and information frictions (Focarelli et al., 2008; Ivashina, 2009). A parallel line of work highlights how shocks and risk-management incentives shape syndicated exposures and their pricing, including during crisis episodes (Giannetti and Laeven, 2012; Aldasoro and Barth, 2017).

A second motivation for focusing on syndicated lending among financial intermediaries is the secular rise of non-bank financial intermediaries (NBFIs). Over the past decade, NBFIs have increased their footprint across wholesale finance and credit intermediation, raising questions about liquidity transformation, leverage, and bank–nonbank interconnections. Recent Financial Stability Board (FSB) monitoring indicates that non-bank finance accounts for a very large share of global financial assets (FSB, 2024; FSB, 2025). A growing literature has documented that the rise of NBFIs is not simply the mirror image of bank retrenchment but rather reflects an active reconfiguration of financial intermediation in which banks themselves play a central role. Banks have progressively extended their footprint beyond the regulated perimeter by sponsoring, funding, and maintaining close balance-sheet and off-balance-sheet linkages with nonbank entities. Cetorelli and Prazad (2024) document that large banking groups increasingly channel credit intermediation through affiliated NBFIs – such as broker-dealers, finance companies, and investment funds – while retaining indirect exposure through credit lines, equity stakes, and funding relationships. This organizational form allows banks to economize on regulatory capital and liquidity requirements, while preserving access to fee income and risk-adjusted returns. Acharya et al. (2024) provide a unifying interpretation of these developments, arguing that the boundary between banks and NBFIs has become increasingly blurred, as maturity transformation, liquidity provision, and risk transfer are performed across institutional forms, often within the same financial conglomerate.[1] Regulatory constraints on banks after the GFC accelerated this functional migration toward nonbank balance sheets, but without eliminating banks' ultimate exposure to the risks involved. From this perspective, the growth of NBFIs should be understood as a reorganization of intermediation rather than a simple shift away from banks. Taken together, this literature suggests that the secular rise of NBFIs reflects both demand-side forces (investor search for yield and portfolio rebalancing) and supply-side forces (banks' strategic use of nonbank vehicles), resulting in tighter and more opaque interconnections within the financial sector. This makes the study of credit flows within finance – rather than only from finance to the real economy – particularly interesting. From this perspective, syndicated lending among financial intermediaries provides a valuable and relatively transparent setting to observe how banks and NBFIs interact as both lenders and borrowers, and how these interactions evolved around the GFC. For this purpose, we study the inter-financial syndicated loan market itself, jointly considering banks and nonbanks as both lenders and borrowers, thereby focusing directly on the within-finance reallocation of credit.

The global financial crisis (GFC) is a particularly informative quasi-natural experiment for this purpose. The crisis revealed the fragility of short-term wholesale funding and the speed with which runs and margin spirals can disrupt market-based intermediation (Gorton and Metrick, 2012). It also coincided with a broader reconfiguration of cross-border banking and syndicated lending. Prior research documents sharp retrenchment in international bank flows and a re-pricing and reallocation of syndicated credit in the aftermath of the GFC (Milesi-Ferretti and Tille, 2011; Giannetti and Laeven, 2012; De Haas and van Horen, 2013; Hale et al., 2020). Building on this evidence, we focus on whether, within inter-financial syndicated lending, the relative importance of lending to NBFIs (versus banks) changed after the GFC, also distinguishing between domestic and cross-border markets, and whether this compositional shift is better characterized as a lender-driven phenomenon (changes in lender capacity, risk appetite, or business models) or a borrower-driven phenomenon (changes in borrower demand, constraints, or form of intermediation).

This brings us to the methodological motivation. A growing literature emphasizes that aggregate credit movements are the net outcome of heterogeneous supply and demand forces, and that identification requires matched data and a decomposition that separates lender-side from borrower-side shocks. The methodology pioneered by Amiti and Weinstein (2018) provides a tractable way to decompose loan growth into lender (supply) and borrower (demand) components using granular matched relationships, and it has been influential well beyond its original setting because it shifts attention from "average" credit conditions to the distribution of idiosyncratic lender shocks and their macro implications (Amiti and Weinstein, 2018). Our paper adapts this logic to the inter-financial syndicated loan market, where transparency on counterparties and contract terms makes the decomposition especially appealing.

In this context, our contribution is twofold. First, we provide a modest methodological step by implementing a lender–borrower decomposition tailored to syndicated inter-financial lending relationships, exploiting the contract-level granularity and the ability to track the same lenders and borrowers across time and across counterpart types. Second, we deliver new evidence on the evolution of syndicated lending among financial intermediaries around the GFC, with particular attention to: (i) the increase in lending involving NBFIs relative to banks; (ii) whether the post-GFC reallocation is primarily driven by changes in the composition and behavior of lenders, by changes in the composition and behavior of borrowers, or by both; and (iii) whether this phenomenon differs between domestic and cross-border lending. By moving from aggregate exposures to matched lender–borrower outcomes in a relatively transparent wholesale-credit setting, our analysis complements the interbank and cross-border banking literatures that often must rely on partial observability, aggregation, or indirect proxies for credit-supply shocks.

[1] Consistent with this view, recent evidence shows that tighter enforcement and regulatory penalties significantly reduce banks' risk-taking and exposure to quasi-credit and interbank activities, reinforcing incentives to rebalance activities across institutional boundaries (Ke et al., 2024).

3. Data and descriptive evidence

3.1. Data sources

We obtained data on syndicated loans from Loan Pricing Corporation Deal Scan (LPC-Dealscan), a private database on the global commercial loan market, providing information on both borrowers and lenders in the market – Acharya et al. (2013), Bhattacharya et al. (2020) and Dennis et al. (2000) took a similar approach.[2] The basic unit of observation in LPC-Dealscan is a loan-tranche, the key unit of reference in syndicated loans. Loans comprise all deals signed between a borrower and a syndicate of lenders at a particular date. Based on this information, we build the key measure for our analysis: the rate of growth of the total value of loans granted in each year by each lender to each borrower. As anticipated above, we focus only on facilities granted among financial intermediaries – those with SIC codes between 6000 and 6999 (and excluding codes 6011 and 6019, which refer to central banks) – which represents on average just below 50 per cent of the total value of syndicate loans granted during our sample period. These data allow for "a granular view of lending relationships" (Aldasoro and Barth, 2017), containing information on various aspects of the loan (e.g., amount, start/end date) and most importantly on lenders' and borrowers' identity, enabling us to form lender-borrower pairs. While our initial sample starts from 1995, we focus our analysis on the decade around the GFC, starting from 2002 and ending in 2011.

3.2. Descriptive evidence

Fig. 1 shows lending for loans in the financial sector, covering a total of 2545 lenders and 2968 borrowers from 88 lending and 86 borrowing countries.

As expected, the drop in the value of loans granted in 2008 and especially in 2009 is remarkable, but a full recovery to pre-crisis levels was attained already in 2010. On the contrary, there is no evident impact of the beginning of the European Sovereign Debt Crisis in syndicated lending among financial intermediaries. Two interesting patterns emerge. First, lending to banks represents a small share of total lending among financial intermediaries, between 13 and 20 per cent of the total. Second, and most interesting, lending to NBFIs registered a smaller drop around the GFC, and a stronger recovery, leading to a substantial gain in the market share during our sample period.[3] The stylized facts emerging from Fig. 1 provide an interesting picture of the market for syndicated loans among financial intermediaries, highlighting especially the role of banks as lenders and NBFIs as borrowers, and the progressive shift in this direction that took place around the GFC, a trend that the recent literature has shown to have continued also in the following years.

Table 1 offers some additional descriptive information. The average size of the tranche is slightly less than 35 million US dollars. Notably, deals involving banks are less than half the size of average deals, confirming the evidence from Fig. A2.[4] In our sample each lender grants on average nearly 41 tranches, and each borrower receives on average slightly more than 18 tranches. Since by construction the total number of tranches is the same for both borrowers and lenders, it follows that there are more borrowers than lenders. However, mean values hide a large heterogeneity: one lender lent 198 times on average each year, and one borrower borrowed 113 times on average. Others took part in only very few operations. Notably, the same couple of borrowers and lenders interact on average less than twice a year. Similarly, each year less than two financial intermediaries act at the same time as borrowers and as lenders, suggesting that there are no intermediaries that play the role of hub.

A key distinction in syndicated lending is between domestic and cross-border markets. The latter are considerably more complex, and the geographical location of a financial institution may also be an important determinant of whether it acts as a borrower or a lender. Lending during the GFC may also have differed significantly across countries because of the strong expansionary monetary policies enacted by the world's largest central banks. To control for these potential confounding effects, we further decompose total lending along two additional dimensions: distinguishing between domestic and cross-border lending, and between lending within G7 and other countries.

Fig. 2 shows that the geographic distribution of domestic and cross-border lending is very different. Lending between banks is almost entirely cross-border. In contrast, lending by banks to NBFIs is sizeable and remains the dominant market component in both the domestic and cross-border segments. Interestingly, the drop in cross-border lending from banks to NBFIs in 2008 and 2009 was more pronounced than the decline in domestic lending, and the recovery in the following years was similarly weaker.

Splitting cross-border lending between G7 and non-G7 countries provides some additional insights. Fig. 3, which classifies lending

[2] LPC-Dealscan is known for its extensive coverage of syndicated bank loans. Different from BIS international banking statistics, which report aggregated country/sector data, and Bankscope/Bankfocus, which does not provide data on bilateral relationships, LPC-Dealscan provides detailed information on single loans, lenders' and borrowers' characteristics. Both BIS and Bankscope/Bankfocus databases report stock data, unlike LPC-Dealscan which accounts for flows and so is more convenient to our analysis.

[3] Remarkably, the vast majority of syndicated loans to NBFIs are originated by banks. Among these, Fig. A1 in the online Appendix shows that a large share is represented by loans to Holdings and investment offices and to Real estate financial intermediaries, while non-depository financial institutions registered a surge especially in 2010 and 2011. Fig. A2 also suggests that the distribution of lending volumes has a long right tail, meaning that a few large values pull the mean above the median.

[4] Within our sample, top 10 borrowing countries represent more than 80 % of borrowing volume and are: US (58.7 %), Hong Kong (7.5 %), Switzerland (2.5 %), Australia (2.4 %), Turkey (2.4 %), France (2.4 %), UK (2.3 %), South Korea (2.0 %), Japan (1.6 %) and Spain (1.6 %). Top 10 lending countries also lend around 80 % of quantities, but they do not match with top 10 borrowers: US (36 %), Japan (8.7 %), UK (6.7 %), Germany (6.6 %), France (5.7 %), Hong Kong (4.5 %), Canada (4.4 %), Taiwan (3.9 %), Italy (3.0 %) and Netherlands (2.7 %).

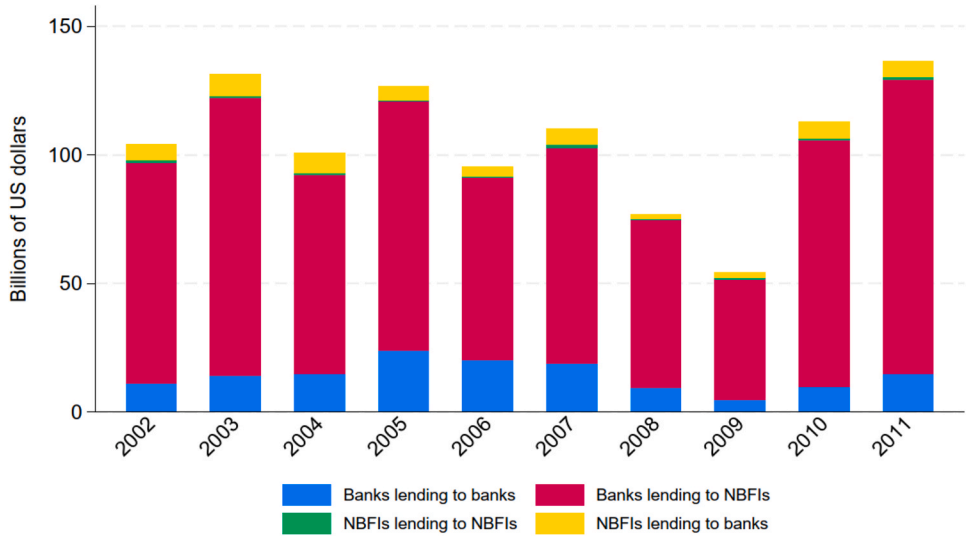


Fig. 1. Total syndicate lending among financial intermediaries.
Source: LPC-Dealscan

Table 1
Syndicated lending among financial intermediaries.

	Mean	10° percentile	Median	90° percentile	Coefficient of variation
Tranche value					
Total	34.7	3.2	18.3	75.0	1.75
To banks	15.1	2.5	10.0	30.0	1.78
To NBFIs	44.3	5.0	25.0	100.0	1.57
No. of operations per borrower	18.2	4	14	38	0.87
No. of operations per lender	41.4	2	27	109	1.01
Simultaneous borrower and lender	1.6	1	1	2	0.38

Notes: Tranche value is in millions of US dollars; data are from LPC-Dealscan.

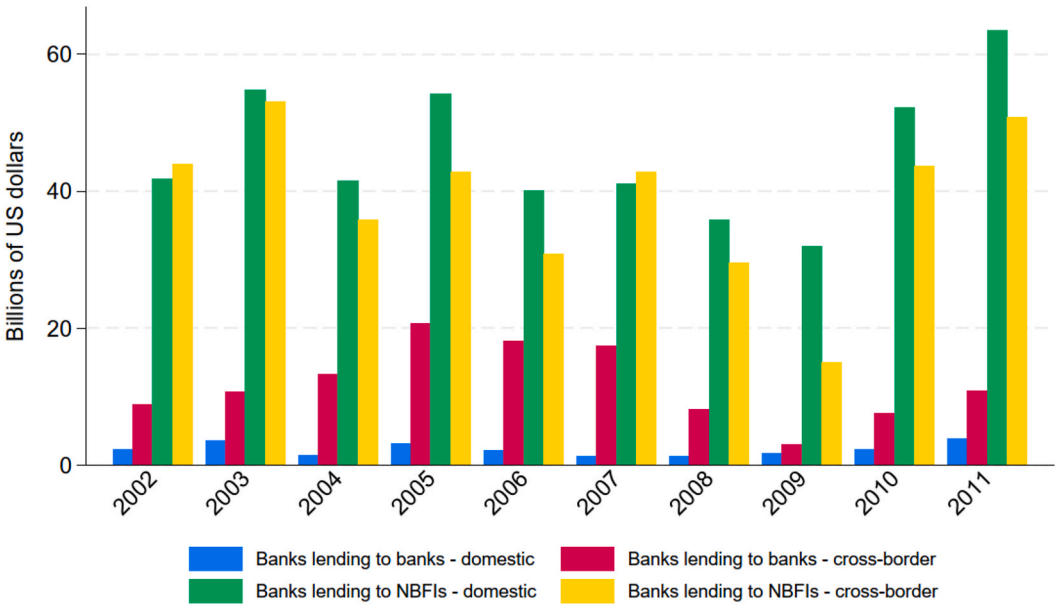


Fig. 2. Domestic and cross-border lending among financial intermediaries.
Source: LPC-Dealscan

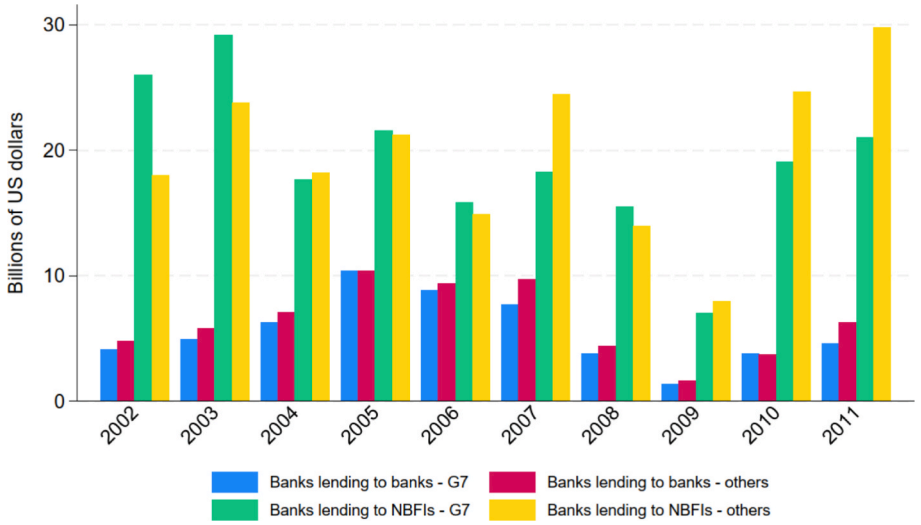


Fig. 3. Cross-border syndicated lending among financial intermediaries, from G7 and other countries.
Source: LPC-Dealscan

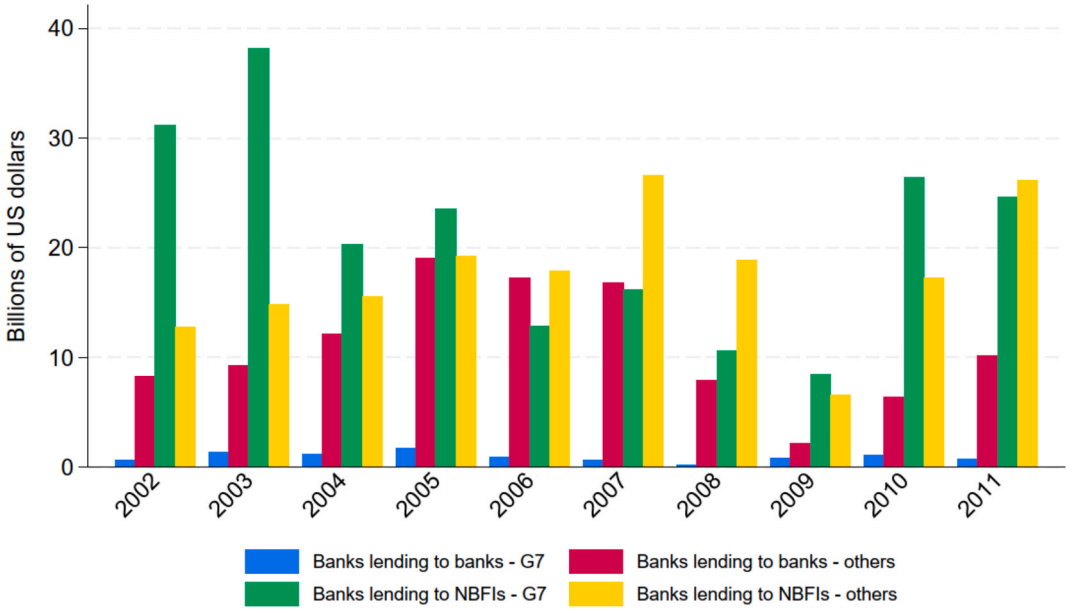


Fig. 4. Cross-border syndicated lending among financial intermediaries, to G7 and other countries.
Source: LPC-Dealscan

by the nationality of the lender, shows that the relative importance of lending to NBFIs by G7 banks declined compared with that by banks from non-G7 countries, particularly after the GFC. This pattern is only partly mirrored when lending is classified by the nationality of the borrower. Fig. 4 shows two additional features. First, cross-border bank-to-bank lending is directed almost entirely to borrowers in non-G7 countries. Second, in 2007 and 2008, cross-border bank lending to NBFIs in non-G7 countries increased relative to lending to NBFIs in the G7. After the sharp decline in 2009, however, lending to G7 NBFIs recovered to broadly comparable levels.

Overall, Figs. 3 and 4 suggest that in analyzing syndicated lending among financial intermediaries it is crucial to account for differences between domestic and cross-border lending, and for cross-border lending from and to G7s and other countries.

The facts described above may have important policy implications. For example, the increasing weight of lending to NBFIs may call for a further expansion of lending programs targeted to financial intermediaries different from banks in the event of a crisis.

To better understand the drivers behind this shift towards lending to NBFIs, in the following we propose an econometric analysis,

which aims to disentangle the effect arising from the characteristics of lenders, which may call for supply-side determinants, from that arising from the characteristics of borrowers.

4. Econometric analysis

4.1. Empirical methodology

Our empirical methodology aims at answering a simple question: is the rate of growth of aggregate syndicated lending among financial intermediaries driven by the behavior of lenders or by that of borrowers? Consider a simple example where there are two lenders and two borrowers, and each borrower has received an aggregate value of loans of 10 US dollars. Assume that one of the lenders increases its lending towards both borrowers by 10 per cent, to a total of 11 dollars (5.5 dollars per borrower), while the other lender keeps lending an aggregate of 10 dollars. The aggregate rate of growth of lending is in this case 5 per cent, but it is the sum of a growth of 10 per cent by one lender and zero by the other. The variability in the rate of growth is therefore entirely explained by the behavior of one of the lenders. The opposite would be true if we considered a case in which both lenders increased their lending to just one borrower: in this case the variability in the rate of growth would be explained entirely by the behavior of one of the borrowers. From an economic perspective, these two cases are very different, because in the first case it is the lender that decides to increase its supply of loans towards all clients, while in the second it is the borrower that is demanding credit from all potential lenders. When there are many borrowers and lenders, the split between the contributions of borrowers and lenders is not so clear-cut, but the economic intuition is identical.

To disentangle the contributions of lender- and borrower-specific factors to the growth of aggregate syndicated lending among financial intermediaries, let L_{lbt} denote the total value of syndicated loan tranches extended by lender l to borrower b in year t. Because a substantial number of lending relationships are initiated or terminated each year, we measure growth at the lender-borrower-year level using the symmetric growth rate:

$$g_{lbt} = \frac{L_{lbt} - L_{lbt-1}}{(L_{lbt} + L_{lbt-1})/2} \tag{1}$$

We then estimate the following two-way fixed-effects specification by weighted least squares (WLS)[5]:

$$g_{lbt} = \alpha_{lt} + \beta_{bt} + \varepsilon_{lbt} \tag{2}$$

In equation (2), α_{lt} denotes a lender-year fixed effect that captures time-varying lender-specific supply factors, whereas β_{bt} denotes a borrower-year fixed effect that captures time-varying borrower-specific demand factors, and the term ε_{lbt} is an idiosyncratic disturbance. The estimated lender-year and borrower-year fixed effects provide, respectively, the lender-side and borrower-side components of lending growth.[6]

Having estimated the borrowers' and lenders' fixed effects, we then calculate their contribution to the aggregate variability of the rate of growth as the square of their semipartial contribution. This represents the proportion of variance in the dependent variable that is explained by, respectively, lenders' and borrowers' fixed effects, or the decrease in the model's R-squared that results from removing them from the full model.

4.2. Baseline results

Studying percentage changes of lending using weighted least squares, our baseline estimates produce: 4,096 lender-by-year fixed effects and 5,294 borrower-by-year fixed effects. Fig. 5 shows that the model provides a nearly perfect fit of the aggregate realized rate of growth of syndicated lending: the R-squared of the simple time series regression of realized on predicted growth rates of aggregate lending is 0.99, despite the high turbulence that characterized our sample.[7]

Fig. 6 disentangles the contribution of lenders' and borrowers' characteristics in explaining the heterogeneity of the rate of growth. Overall, lender-by-year and borrower-by-year fixed effects account for more than 80 per cent of total variability in almost every year of our sample, peaking at over 90 per cent in 2008.

[5] Our empirical framework builds on the work of Amiti and Weinstein (2018), who show that, for continuing lending relationships, WLS estimation of equation (2) yields lender and borrower fixed effects identical to those obtained from a model containing dyadic terms that capture match-specific characteristics. Amiti and Weinstein (2018) also develop an extension that accommodates newly formed and terminated relationships. However, implementing that extension is computationally infeasible in our setting, given the large number of relationship entries and exits in the sample.

[6] The model is estimated using the reghdfe command in Stata, which implements the high-dimensional fixed-effects estimator described by Correia (2017).

[7] This result is also remarkable in light of the fact that we cannot precisely follow the methodology suggested by Amiti and Weinstein precisely due to the computational issues caused by the very large number of new and severed relationships in our sample.

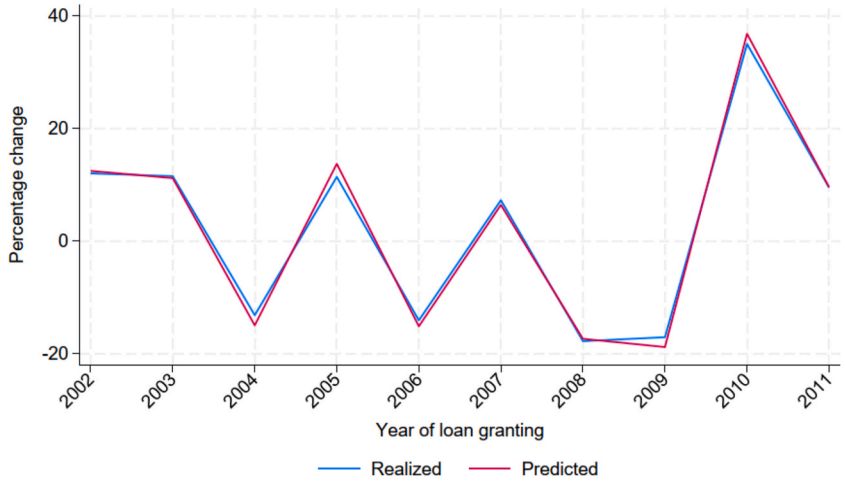


Fig. 5. Predicted and realized rate of change of aggregate syndicated lending. *Notes: The figure presents the yearly rates of change of aggregate syndicated lending and the values predicted using the model in Equation (2).*

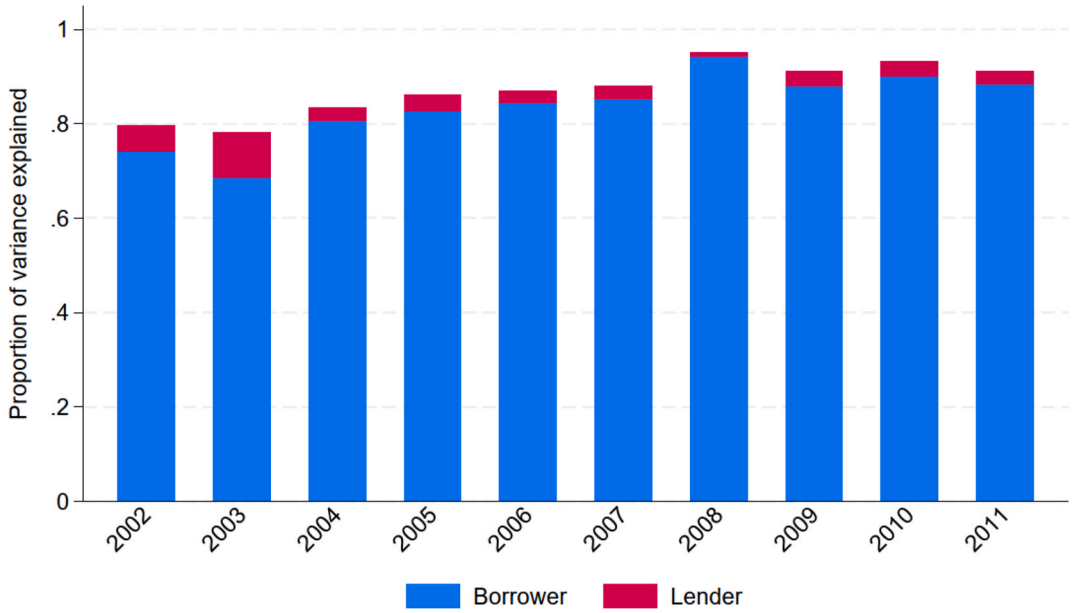


Fig. 6. Growth of lending: lenders' and borrowers' contributions. *Notes: The figure shows the average contribution of lenders' and borrowers' characteristics to explaining the rate of growth of syndicated lending, calculated by taking the square of the semipartial contribution of lenders' and borrowers' fixed effects in the model in Equation (2).*

The variation is almost entirely explained by borrowers' fixed effects, with values also in this case almost always above 80 per cent, while lenders' fixed effects explain less than 5 per cent of total variability at most.[8] Another striking result of the decomposition is the stability of the findings over time, encompassing the periods through the GFC and the beginning of the European Sovereign Debt Crisis.

Fig. 7 shows the results of the decomposition focusing only on loans made by banks, which account for 94 per cent of total syndicated lending to other financial intermediaries in our sample period, and splitting the sample between loans made to other banks and loans made to NBFIs, which, on average, represent more than 80 per cent of the total in our sample period. Two interesting facts emerge. First, although the overall proportion of variance explained is high in both cases, it is smaller for loans to banks than for loans

[8] Fig. A3 disentangles the proportion of variance explained by distinguishing between lenders and borrowers depending on whether they belong, respectively, to the top 5 per cent (Lender_05; Borrower_05), the next 5 per cent (Lender_10; Borrower_10) or the remaining 90 per cent (Lender_90; Borrower_90) of the aggregate amount lent or borrowed in each year. Interestingly, it shows that a non-negligible proportion of total variance is explained by the largest borrowers.

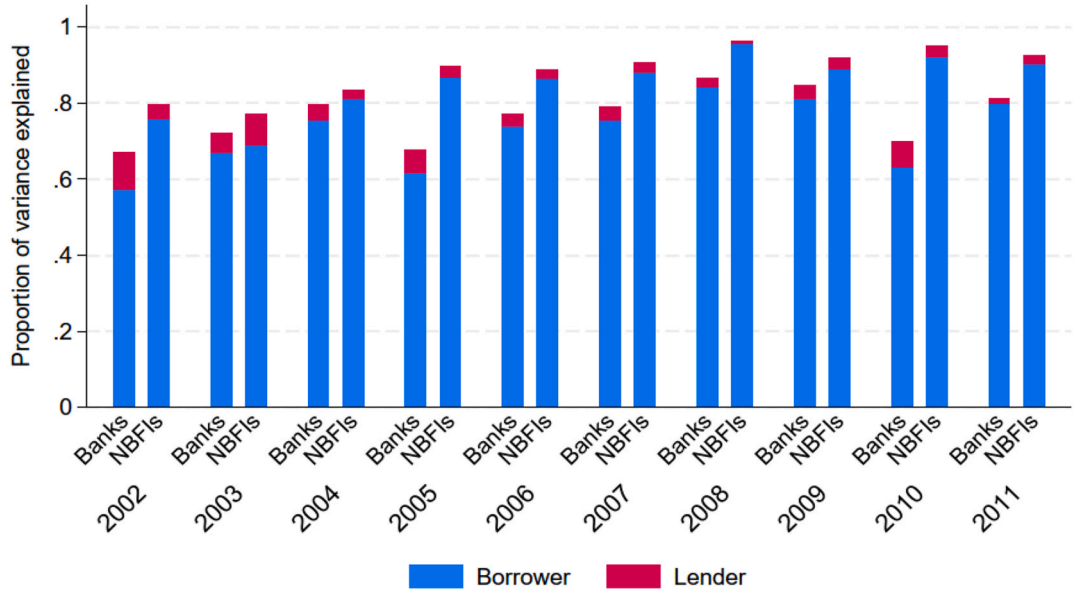


Fig. 7. Growth of lending to banks and NBFIs: lenders' and borrowers' contributions. *Notes: The figure shows the average contribution of lenders' and borrowers' characteristics to the explanation of the rate of growth of syndicated lending, calculated by taking the square of the semipartial contribution of lenders' and borrowers' fixed effects in the model in Equation (2), distinguishing between lending to banks and NBFIs.*

to NBFIs. Second, the proportion explained by lenders' fixed effects is slightly higher for loans to banks.

To verify that the finding that the variability of syndicated lending is predominantly explained by borrowers' rather than lenders' characteristics is not an artefact of pooling heterogeneous domestic and cross-border segments, we have considered an additional specification in which borrowers' and lenders' fixed effects are estimated separately for domestic and cross-border relationships.[9] Fig. 8 shows the proportion of variance explained by borrowers' and lenders' fixed effects separately for domestic and cross-border relationships. In every year and in both segments, borrowers' fixed effects account for between 65 and 95 per cent of the explained variance, while lenders' fixed effects never account for more than around 15 percentage points.

4.3. Changes in overall interbank lending

To assess whether the many events that took place around the Global Financial Crisis (GFC) altered the allocation of syndicated lending between banks and non-bank financial institutions (NBFIs), we next estimate a difference-in-differences specification that allows the relative growth of lending to NBFIs to vary by year. For each lender and year, we aggregate the value of newly originated syndicated loans separately across all bank borrowers and all NBFI borrowers, yielding two observations for each lender–year whenever both counterparty types are present. We then compute the annual growth rate of lending for each lender–counterparty-type pair. Thus, unlike equation (1), which measures lending growth at the individual lender–borrower level, the model in Equation (3) captures changes in each lender's aggregate lending to banks and to NBFIs. The unit of observation is therefore a given lender in a given year, and one of two counterparty categories: banks or NBFIs. In practice, we estimate the following specification:

$$g_{lct} = \alpha + \beta NBFI + \sum_{\tau \neq \tau_0} \lambda_\tau Year_\tau + \sum_{\tau \neq \tau_0} \delta_\tau (NBFI \text{x} Year_\tau) + \varepsilon_{lct} \tag{3}$$

where g_{lct} is the rate of change in total syndicated lending by lender l to all counterparties of type c (with c being either a bank or an NBFI) in year t; $NBFI$ is an indicator equal to one when the counterparty category is NBFIs and zero when it is banks; and $Year_\tau$ is an indicator for year τ. One year, denoted τ_0, is omitted and serves as the reference period. The coefficients of interest are δ_τ, which measure, for each year, the difference in lending growth to NBFIs relative to banks, compared with the corresponding difference in the omitted year. Thus, positive values of δ_τ indicate that lending to NBFIs grew faster (or contracted less) than lending to banks relative to the reference year. We choose τ_0 to be 2007, at the beginning of the GFC.

[9] To allow lender- and borrower-side effects to differ between domestic and cross-border relationships, we jointly estimate the model over the full sample and interact the lender-by-year and borrower-by-year fixed effects with an indicator for the type of bilateral relationship: $g_{lbt} = \sum_{r \in \{D,CB\}} 1\{R_{lb} = r\}(\alpha^r_{lt} + \beta^r_{bt}) + \varepsilon_{lbt}$, where R_{lb} denotes the type of lender–borrower relationship, with $R_{lb} = D$ for domestic relationships and $R_{lb} = CB$ for cross-border relationships. Therefore, the coefficients α^r_{lt} and β^r_{bt} capture lender-by-year and borrower-by-year effects that are allowed to vary according to whether lending is domestic or cross-border.

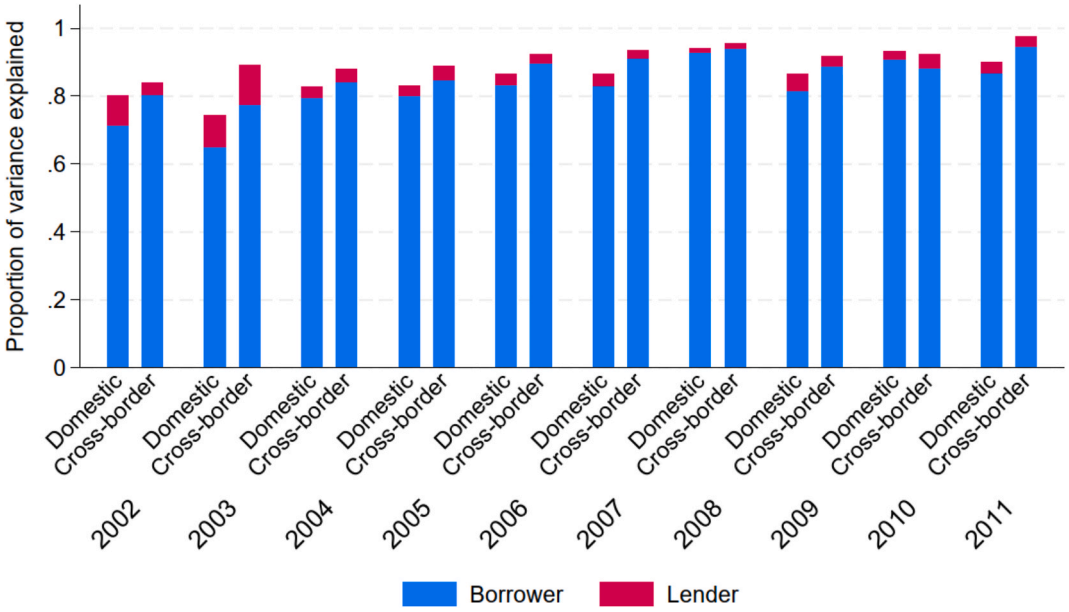


Fig. 8. Growth of domestic and cross-border lending to banks and NBFIs: lenders' and borrowers' contributions. *Notes: The figure shows the average contribution of lenders' and borrowers' characteristics to the explanation of the rate of growth of syndicated lending, calculated by taking the square of the semipartial contribution of lenders' and borrowers' fixed effects in the model in Equation (2), distinguishing between domestic and cross-border lending.*

Fig. 9 shows that the differential growth rate of lending to NBFIs relative to banks increased significantly in 2008 compared with 2007. The negative and nearly statistically significant coefficients δ_τ for the period 2009–2011 indicate that this differential was subsequently reabsorbed relative to its 2007 level.

In addition to the specification described in Equation (3), we estimate two related models that exploit the time-varying lender and borrower fixed effects obtained from the decomposition described in Section 4.1. Specifically, in the first model, the dependent variable is the estimated lender-by-year fixed effect, which captures the time-varying component of lending associated with each lender after controlling for borrower-side characteristics. In the second model, the dependent variable is the estimated borrower-by-year fixed effect, which analogously captures the time-varying component associated with each borrower after controlling for lender-side characteristics. In both cases, we distinguish between fixed effects estimated from syndicated loans involving banks and those involving NBFIs. These specifications therefore allow us to assess whether changes in lender-side or borrower-side characteristics contributed in a similar or different way to the evolution of syndicated lending to banks and NBFIs documented by the estimates of Equation (3) on growth rates. The results, reported in Figs. 10 and 11, provide some additional insights into the evolution of interbank syndicated lending during the GFC.

Fig. 10 shows that the change in lenders' characteristics does not mirror that of total lending: the coefficients δ_τ after 2007 are in this case statistically insignificant. Fig. 11, on the contrary, shows that the changes in borrowers' characteristics mirror those of total lending. In other words, our evidence suggests that the higher rate of growth in lending to NBFIs during the GFC can be explained by higher demand from borrowers, rather than stronger supply from lenders.

4.4. Matching

To better understand the combined contribution of lenders' and borrowers' characteristics to the growth rate of syndicated lending, we further analyze the correlation between the fixed effects estimated from Equation (2). These lender-year and borrower-year fixed effects (α_{lt} and β_{bt}) capture idiosyncratic, time-varying lender (supply-side) and borrower (demand-side) shocks. Since they measure deviations from average lending growth, they can be either positive or negative, implying that the idiosyncratic characteristics of some banks contribute positively to lending growth in a given year, while those of others contribute negatively. This information allows us to address an additional question: do lenders that contribute positively to average lending growth tend to match with borrowers that also make a positive contribution (positive assortativity), or with borrowers that make a negative contribution (negative assortativity)? In practice, estimating assortativity amounts to asking whether banks that lend more than average are more or less likely to lend to banks that borrow less than average. As shown, for example, by Dauth et al. (2022), this question can be addressed by examining the correlation between the lender- and borrower-specific fixed effects obtained from our previous estimates.

Fig. 12 shows the evolution of the yearly correlations between lenders' and borrowers' fixed effects and highlights an interesting pattern. In the case of lending by banks to other banks, the correlation is positive and relatively stable over our sample period, implying

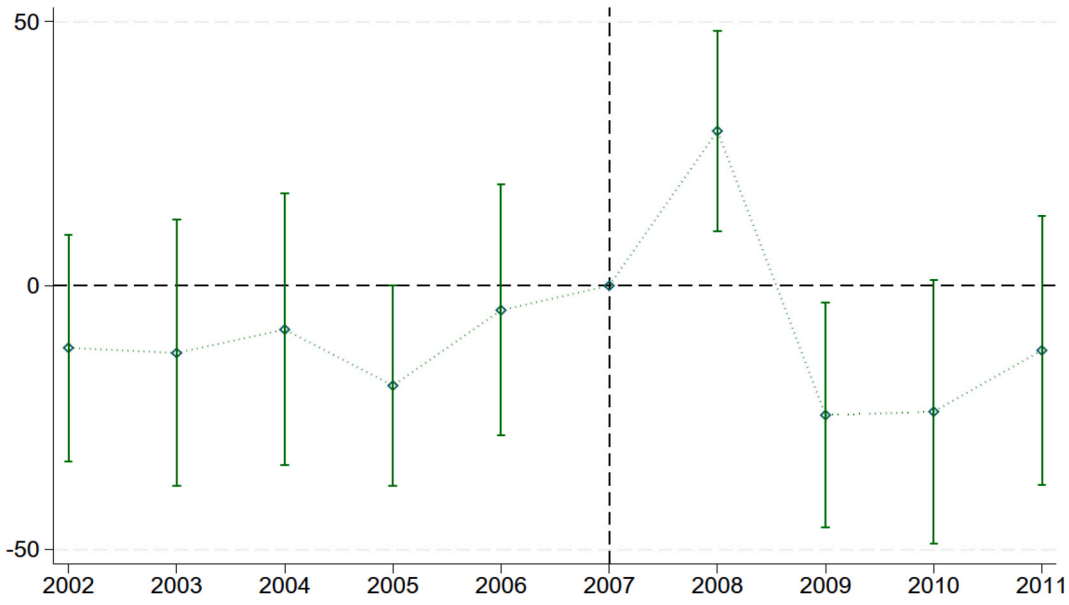


Fig. 9. Growth of syndicated lending to NBFIs vs. banks across the GFC. *Notes: The figure shows the coefficients of the two-way-fixed-effects model of the lenders' rate of growth of lending to NBFIs compared to that of lending to banks, as described in Equation (3); the bars represent the 95 per cent confidence intervals.*

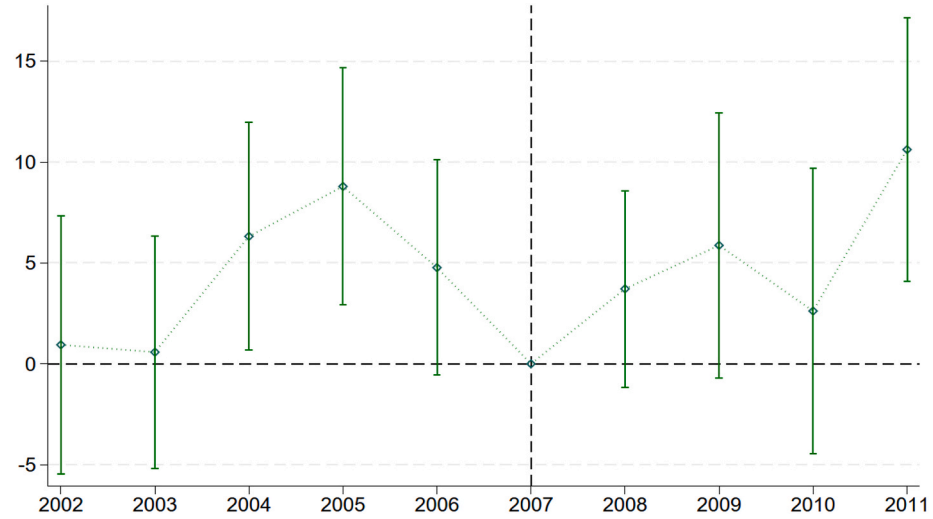


Fig. 10. Growth of syndicated lending to NBFIs vs. banks across the GFC: lenders' characteristics. *Notes: The figure shows the coefficients of the two-way-fixed-effects model of the lenders' fixed effects from equation (2) for loans to NBFIs compared to that of loans to banks, as described in Equation (3); the bars represent the 95 per cent confidence intervals.*

that banks that increase their lending are more likely to match with borrowers that also increase their borrowing (positive assortativity). On the contrary, in the case of banks' lending to NBFIs, the correlation is initially positive and has a size comparable to that of banks' lending to banks, but in 2007 it drops significantly, becoming negative in 2008, and remaining so in the following years. Contrary to the case of bank lending to banks, with the unfolding of the GFC, banks that increase their lending by more are more likely to match NBFIs that increase their borrowing by less (negative assortativity). Since the correlation remained negative post-GFC, this shows a structural shift from positive to negative assortative matching between banks and NBFIs. This suggests that lenders to NBFIs increase their activities more on the extensive margin, by augmenting the number of borrowers, than on the intensive margin, that is by lending to borrowers that increase their borrowing the most.

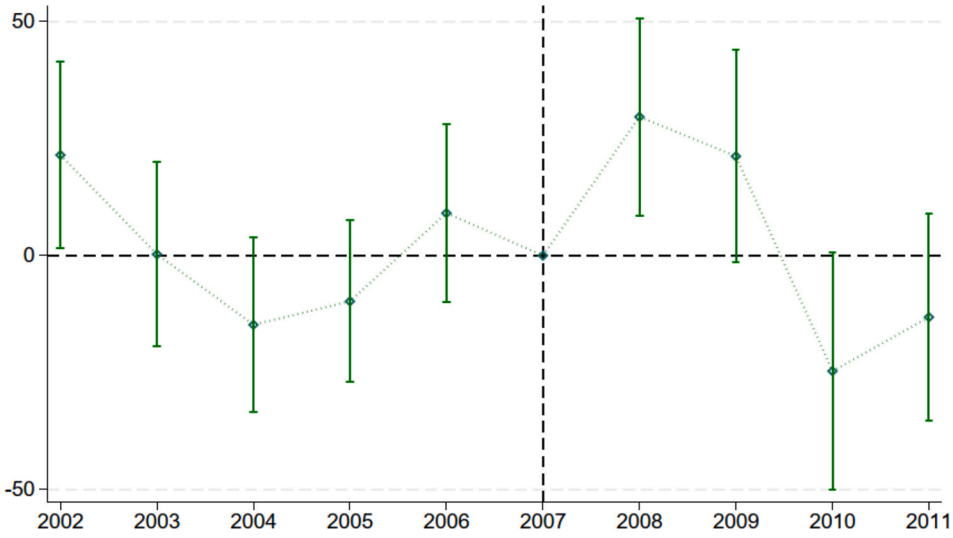


Fig. 11. Growth of syndicated lending across the GFC: borrowers' characteristics. *Notes: The figure shows the coefficients of the two-way-fixed-effects model of the borrowers' fixed effects from equation (2) for loans to NBFIs compared to that of loans to banks, as described in Equation (3); the bars represent the 95 per cent confidence intervals.*

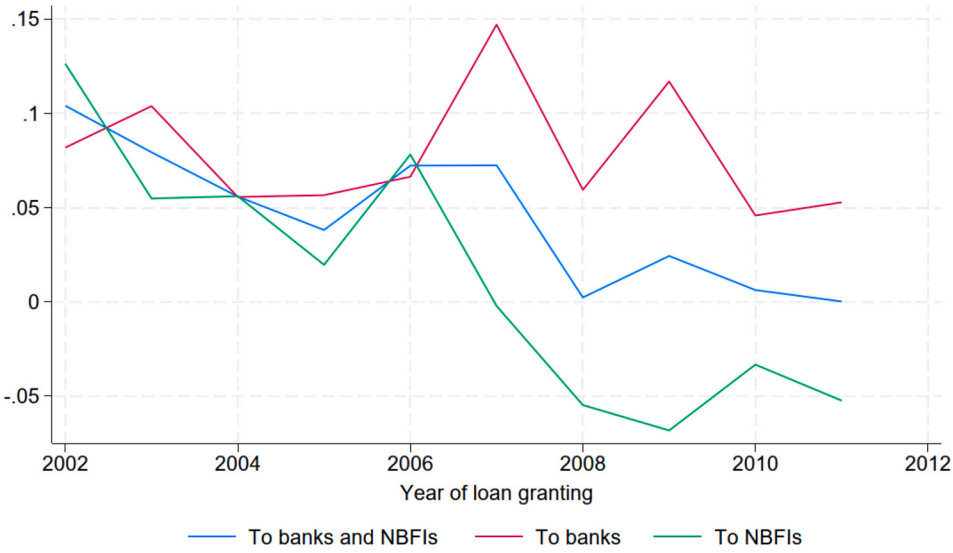


Fig. 12. Growth of syndicated lending: correlations of lenders' and borrowers' fixed effects. *Notes: The figure shows the yearly correlations between lenders' and borrowers' fixed effects estimated using the model in Equation (2).*

4.5. Additional results

The overall evidence presented above may hide some differences when we focus on specific markets. Leveraging on the descriptive evidence which highlights relevant dissimilarities between domestic and cross-border lending, we first verify if these components grew differently across the financial crisis. Next, we replicate our analysis on the increase in lending to NBFIs, but we account for the differences between domestic and cross-border lending, and between cross-border lending involving G7 or non-G7 countries. Finally, we verify the impact of the GFC on the allocation of short-term and long-term syndicated lending.

Domestic* vs. *cross-border lending. In our first exercise, we aggregate our data across all financial intermediaries, i.e. banks and NBFIs, but distinguish between domestic and cross-border lending. Fig. 13 illustrates that the domestic and cross-border markets are of a similar size.

However, Fig. 13 also shows that cross-border lending dropped in 2008 and especially in 2009 more radically than domestic lending, which remained broadly stable, and even in the following years did not recover entirely such contraction. To verify econometrically this hypothesis, we estimate a modified version of Equation (3), in which we disentangle the rates of growth of domestic and

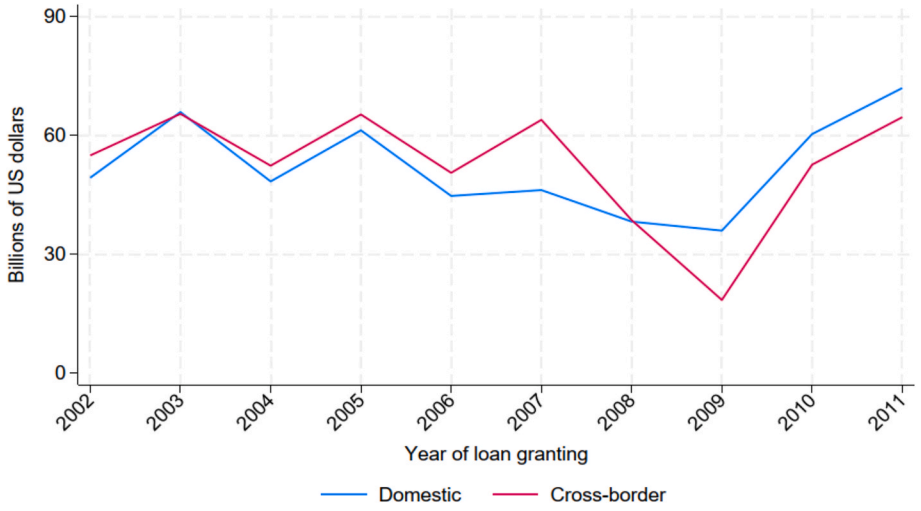


Fig. 13. Domestic and cross-border syndicated lending to financial intermediaries. *Notes: The figure shows the aggregate value of domestic and cross-border syndicated lending.*

cross-border lending, instead of that of lending to banks and NBFIs.[10] Fig. 14 confirms that the decline in lending was more pronounced for foreign than for domestic counterparts. Despite a partial recovery in 2010, cross-border lending remained relatively subdued in the following years, with the difference between cross-border and domestic lending remaining below its 2007 level.[11]

Domestic and cross-border lending to banks and NBFIs. Next, we verify whether the shift in lending towards NBFIs is confirmed when we distinguish between domestic and foreign counterparts. To this purpose, we estimate Equation (3) separately on the two subsamples of domestic and foreign counterparts.

Fig. 15 confirms the evidence of Fig. 9, showing that the difference in the rate of growth of domestic lending to NBFIs with respect to banks increased in 2008 relative to 2007, but in following years this increase was partly reabsorbed. Fig. 16, focusing on cross-border lending, presents a slightly different picture.[12] While it is confirmed that the rate of growth of lending to NBFIs with respect to banks increased also in the cross-border market, the rise is anticipated to 2007 relative to the previous years, and it is also in this case mostly reabsorbed in the following years, confirming the overall pattern shown by the aggregate figures.

Cross-border lending to G7s and other countries. Central banks in many countries reacted to the GFC with massive, non-standard, expansionary monetary policies, with very sizeable interventions, particularly in the most advanced countries. To verify if this has affected the pattern of cross-border lending across the GFC, we estimate the model of Equation (3) for cross-border lending to banks and NBFIs separately for borrowers based in G7 and non-G7 countries. The evidence from Figs. 17 and 18 suggests that the surge in cross-border lending shown by Fig. 16 is primarily driven by non-G7 borrowers.

We also examine whether the origin, rather than the destination, of cross-border loans played a role, distinguishing lending originated by banks based in G7 countries from lending originated by banks based in non-G7 countries. For lending originated in G7 countries, the shift toward NBFIs shows little discernible pattern across the GFC (Fig. A10). For lending originated in non-G7 countries, by contrast, the shift toward NBFIs increased in 2007 and 2008 relative to earlier years (Fig. A11).

Overall, this evidence suggests that the shift in lending from banks to NBFIs characterized both domestic and cross-border activities, with the latter driven by borrowers that most likely benefitted less from domestic expansionary monetary policies.[13]

Short-term and long-term lending. Finally, we distinguish between short- and long-term syndicated lending, since loan maturity is associated with substantially different risks for both lenders and borrowers. Short-term lending entails greater rollover and refinancing risk and is more closely related to liquidity management, whereas long-term lending exposes lenders to credit risk over a longer horizon and requires a more persistent commitment of balance-sheet capacity. We define short-term loans as those with a maturity of up to 12 months and long-term loans as all remaining loans.

Fig. 19 shows that, after 2003, long-term syndicated lending expanded substantially, reaching more than three times the volume of short-term lending in 2005. The impact of the GFC also differed markedly across maturities. Despite the severe disruptions documented in short-term wholesale funding markets during the crisis, short-term syndicated lending among financial intermediaries did not experience a comparable contraction. Instead, the decline was concentrated in long-term lending, which fell sharply in 2008 and 2009

[10] We estimate the following model: $g_{lct} = \alpha + \beta Crossborder + \sum_{\tau \neq \tau_0} \lambda_\tau Year_\tau + \sum_{\tau \neq \tau_0} \delta_\tau (CrossborderxYear_\tau) + \varepsilon_{lct}$, where g_{lct} is the rate of change in total syndicated lending by lender l to counterparty type c, for c being either a domestic or a foreign counterpart, in year t, *Crossborder* is a dummy taking the value of one for cross-border deals and zero otherwise, and all other variables are as defined above.

[11] Unsurprisingly, the pattern is almost entirely mirrored by that of borrowers' characteristics (Fig. A5), but not of lenders' (Fig. A4).

[12] The dynamics of lenders' and borrowers' characteristics are in these cases less clear (Figs. A6–A9).

[13] Figs. A12–15 show that the dynamics of lenders' and borrowers' characteristics are also in these cases more difficult to interpret.

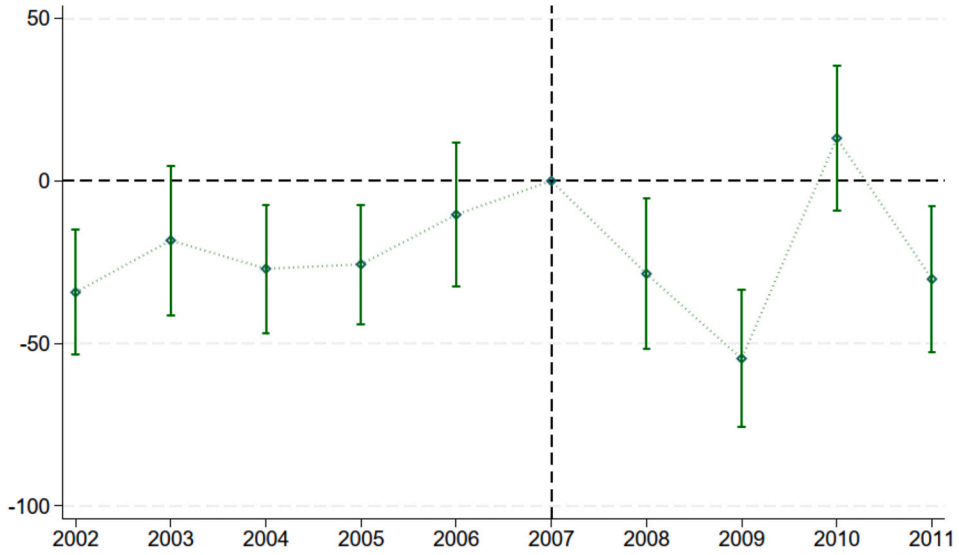


Fig. 14. Growth of domestic and cross-border syndicated lending across the GFC. *Notes: The figure shows the coefficients of the two-way-fixed-effects model of the lenders' rate of growth of cross-border lending compared to that of domestic lending, as described in Equation (3); the bars represent the 95 per cent confidence intervals.*

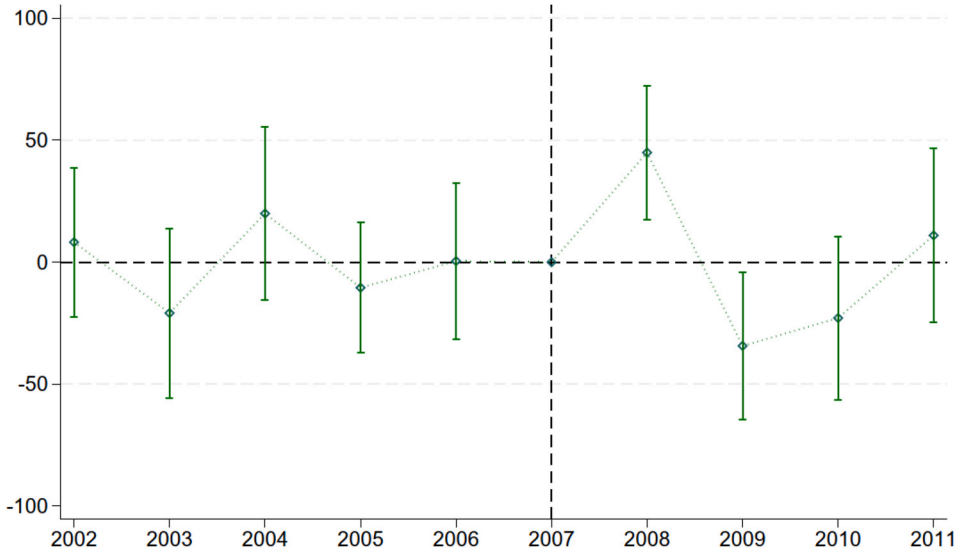


Fig. 15. Growth of domestic syndicated lending to NBFIs vs. banks across the GFC. *Notes: The figure shows the coefficients of the two-way-fixed-effects model of the lenders' rate of growth of domestic lending to NBFIs compared to banks, as described in Equation (3); the bars represent the 95 per cent confidence intervals.*

before recovering fully over the following two years.

To investigate the sources of these differences, we extend Equation (3) in a similar way as in the analysis of domestic and cross-border lending.[14] This specification allows us to assess whether the different dynamics of short- and long-term lending reflect differences in time-varying lender-side or borrower-side factors.

The estimates uncover some interesting patterns. First, relative to 2007, the rate of growth of short-term lending was significantly lower than that of long-term lending only from 2010 onwards (Fig. 20).

Second, and most interestingly, the effect is driven by the differing attitudes of lenders and borrowers. As Fig. 21 shows, lenders contributed to a reduction in the rate of growth from 2008 onwards.

However, in 2008 and 2009 this effect was counterbalanced by the positive contribution of borrowers, as shown by Fig. 22. Lenders are therefore less willing to lend short-term relative to long-term, while borrowers are more willing to borrow short-term.

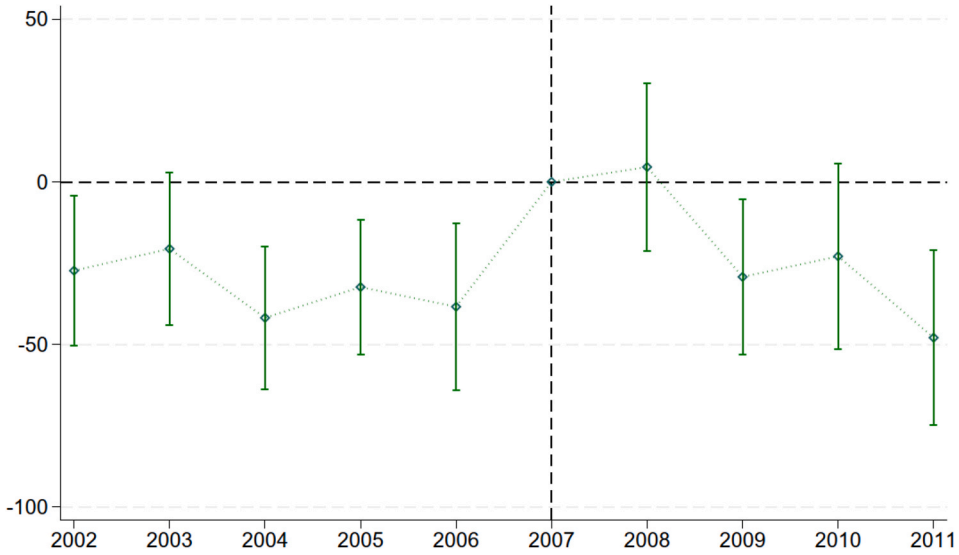


Fig. 16. Growth of cross-border syndicated lending to NBFIs vs. banks across the GFC. *Notes: The Figure shows the coefficients of the two-way-fixed-effects model of the lenders' rate of growth of cross-border lending to NBFIs compared to banks, as described in Equation (3); the bars represent the 95 per cent confidence intervals.*

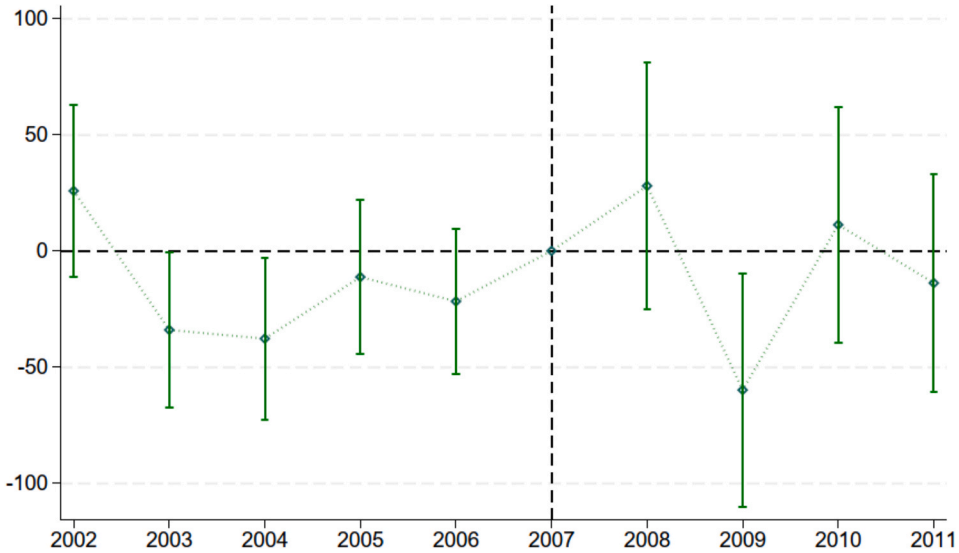


Fig. 17. Growth of cross-border syndicated lending to NBFIs vs. banks based in G7 countries across the GFC. *Notes: The figure shows the coefficients of the two-way-fixed-effects model of the lenders' rate of growth of cross-border lending to NBFIs compared to banks, as described in Equation (3), for borrowers based in the G7 countries; the bars represent the 95 per cent confidence intervals.*

5. Conclusions

Syndicated lending among financial intermediaries represents a non-negligible market that offers a transparent and economically meaningful setting to study credit flows within the financial sector. Using detailed loan-level data, we document that lending among financial intermediaries represents a substantial share of the syndicated loan market and that NBFIs play an increasingly prominent role as borrowers.

Our analysis uncovers four main stylized facts. The first fact relates to the general evolution of the market. By decomposing lending growth into lender-side and borrower-side components, we show that the variability of syndicated lending is overwhelmingly driven by borrowers' characteristics. This result holds throughout the sample period and remains remarkably stable even during episodes of severe financial stress. Lenders' characteristics play only a limited role in explaining aggregate fluctuations, suggesting that changes in credit volumes primarily reflect shifts in demand or borrower-specific constraints rather than broad changes in banks' willingness to supply credit.

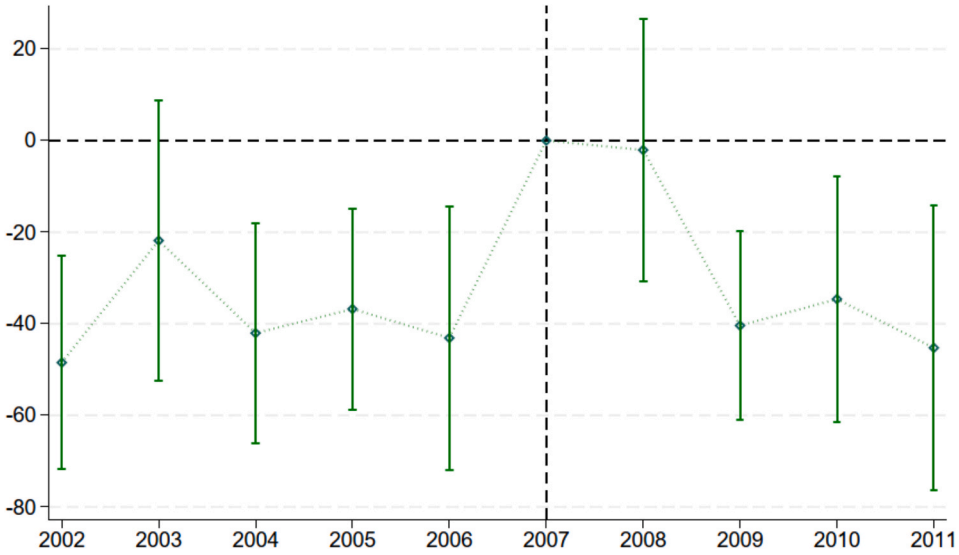


Fig. 18. Growth of cross-border syndicated lending to NBFIs vs. banks based in non-G7 countries across the GFC. *Notes: The figure shows the coefficients of the two-way-fixed-effects model of the lenders' rate of growth of cross-border lending to NBFIs compared to banks, as described in Equation (3), for borrowers based in non-G7 countries; the bars represent the 95 per cent confidence intervals.*

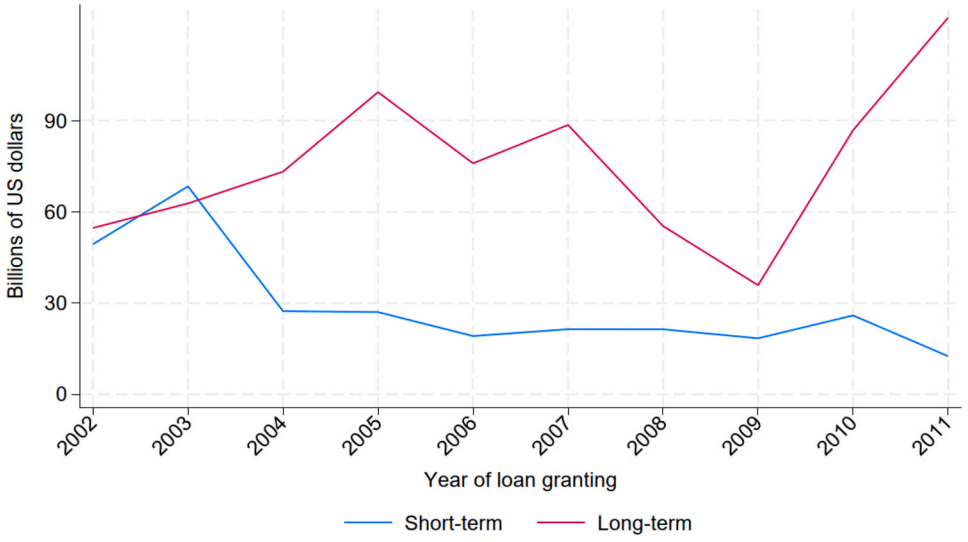


Fig. 19. Short-term and long-term syndicated lending to financial intermediaries. *Notes: The figure shows the aggregate value of short-term (up to 12 months) and long-term (over 12 months) syndicated lending to financial intermediaries.*

The other three stylized facts relate to the behavior across the GFC. Although we cannot make claims of specific causes, because many events overlapped during this period, the following facts emerge. The second stylized fact that emerges from our analysis is that the crisis marked a clear reallocation of syndicated credit, moving away from banks and toward non-bank financial intermediaries. At the height of the GFC, lending to NBFIs contracted significantly less than lending to banks and recovered more rapidly, resulting in a temporary but economically meaningful increase in the relative growth rate of credit to non-banks. This differential was concentrated in 2008 and was partially reversed in the subsequent years, but it suggests that NBFIs absorbed a larger share of syndicated lending precisely when stress in the banking system was most acute. This pattern is also confirmed when watching separately at domestic and cross-border markets. Additional evidence on assortative matching suggests that, during the crisis, banks expanding their lending increasingly matched with NBFIs on the extensive margin, further reinforcing the reorientation of credit flows within the financial sector.

The third fact is that the reallocation of credit during the GFC was linked to the cross-border dimension of syndicated lending. International lending experienced a deeper and more persistent contraction than domestic lending in 2008–2009, and the recovery of cross-border flows remained incomplete relative to domestic activity in the following years. This suggests that heightened risk

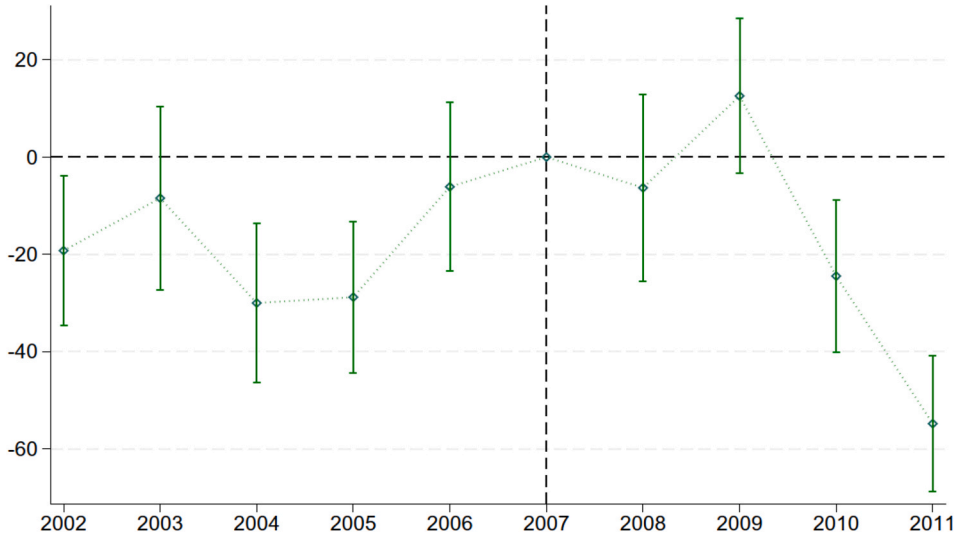


Fig. 20. Growth of short-term and long-term syndicated lending across the GFC. *Notes: The figure shows the coefficients of the two-way-fixed-effects model of the lenders' rate of growth of short-term lending compared to that of long-term lending, as described in Equation (3); the bars represent the 95 per cent confidence intervals.*

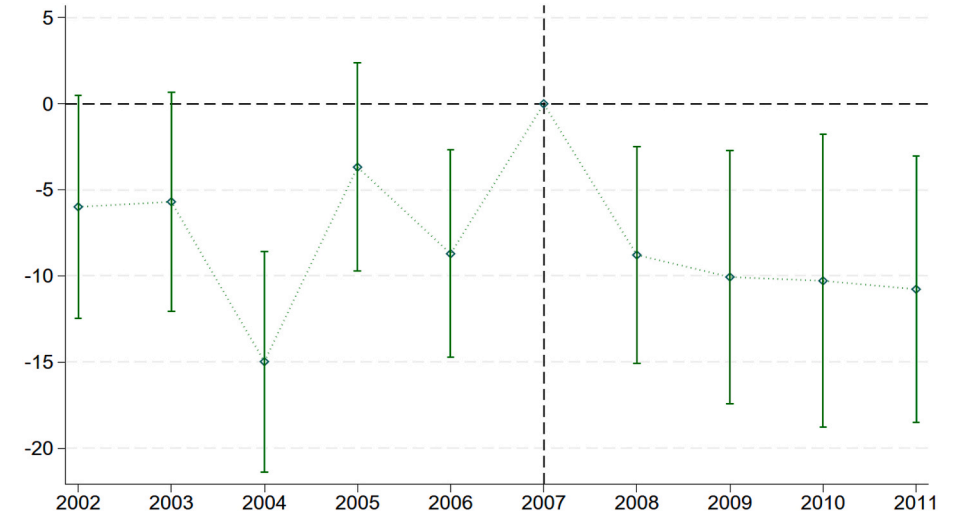


Fig. 21. Growth of short-term and long-term syndicated lending across the GFC: lenders' characteristics. *Notes: The figure shows the coefficients of the two-way-fixed-effects model of the lenders' fixed effects from equation (2) for short-term loans compared to long-term loans, as described in footnote 14[1]; the bars represent the 95 per cent confidence intervals.*

aversion, balance-sheet constraints, and regulatory frictions disproportionately affected international intermediation among financial institutions during the crisis.

Finally, our last finding is that the adjustment in syndicated lending impacted on the maturity dimension. The GFC primarily affected long-term syndicated loans, which experienced a sharp decline in 2008–2009, while short-term lending proved comparatively resilient and even grew faster than long-term lending in 2009. This maturity shift is consistent with a generalized shortening of lending horizons during periods of stress and highlights the role of borrower behavior in reshaping not only the volume but also the composition of syndicated credit.

Taken together, our findings contribute to the literature on interbank markets, syndicated lending, and non-bank financial intermediation by providing new evidence on how credit within the financial system is reallocated during crises. They suggest that the growing role of NBFIs in syndicated lending reflects not only regulatory or supply-side considerations, but also fundamental changes in the demand for inter-financial credit. From a policy perspective, these results underscore the importance of monitoring credit flows within finance, as shifts toward non-bank borrowers may alter the transmission of shocks and the effectiveness of crisis-management

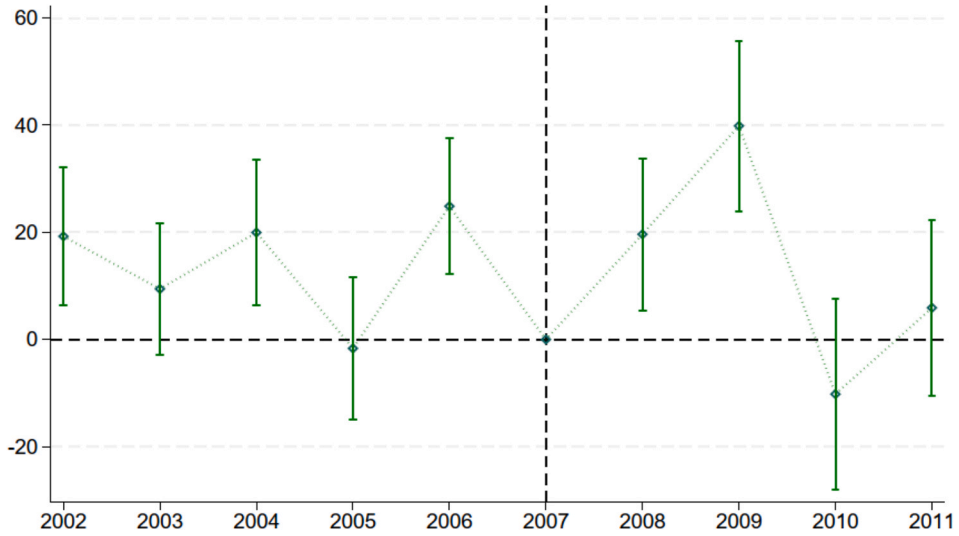


Fig. 22. Growth of short-term and long-term syndicated lending across the GFC: borrowers' characteristics. *Notes: The figure shows the coefficients of the two-way-fixed-effects model of the borrowers' fixed effects from equation (2) for short-term loans compared to long-term loans, as described in footnote 14; the bars represent the 95 per cent confidence intervals.*

tools that are traditionally centered on banks. Moreover, while further research is needed to refine the analysis to uncover reliable causal relationships, the methodology described in this paper can provide a useful tool.

Authorshipand originality

All authors have seen and approved the final version of the manuscript being submitted. The article is the authors' original work, hasn't received prior publication and isn't under consideration for publication elsewhere.

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CRediT authorship contribution statement

Carlos Manuel Pinheiro: Writing – review & editing, Writing – original draft, Investigation, Data curation, Conceptualization. **Alberto Franco Pozzolo:** Writing – review & editing, Project administration, Methodology, Investigation, Data curation, Conceptualization.

Declaration of Competing Interest

The authors declare that they have no known competing financial interests or personal relationships that could have appeared to influence the work reported in this paper.

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Appendix A. Supplementary data

Supplementary data to this article can be found online at https://doi.org/10.1016/j.najef.2026.102726.

Data availability

The authors do not have permission to share data.

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