The Transmission of Bank Liquidity Shocks: Evidence from the Eurosystem Collateral Framework*

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September 29, 2023

Abstract

How does a shock to the liquidity of bank assets affect credit supply, cross-border lending, and real activity at the firm level? We exploit that, in 2007, the European Central Bank replaced national collateral frameworks by a single list. This collateral framework shock added loans to non-domestic euro area firms to the pool of eligible assets. Using loan level data, we show that banks holding a large share of newly eligible cross-border loans increase loan supply by 14% and reduce spreads by 16 basis points, compared to banks with smaller holdings of such loans. The additional credit is mainly extended to (previously eligible) domestic borrowers, suggesting only a limited cross-border effect of the collateral framework shock. However, the shock had real effects: firms highly exposed to affected banks increase their total debt, employment, and investment.

JEL classification: E44, E58, G21

Keywords: Bank Liquidity Shocks, Bank Lending Channel, Financial Integration, Real Effects, Eligibility Premia

*We thank Tobias Berg, Max Bruche, Stefano Corradin, Brahim Gaies, Thomas Krause, Isabella Müller, Loriana Pelizzon, Jung Sakong and Lena Tonzer for their insightful discussions. Christian Bittner, Marco Corsi, Martin Goetz, Benjamin Grosse-Rüschkamp, Rainer Haselman, Rajkamal Iyer, Boryana Ilieva, Björn Imbierowicz, Jan Keil, Beatriz Mariano, Ralf Meisenzahl, Karsten Müller, Benoît Nguyen, Steven Ongena, Melissa Pala, Malte Rieth, Farzad Saidi, Alex Stomper, Tobias Witter, Tom Zimmermann, and participants of the 2021 Day-Ahead Workshop on Financial Regulation (Zürich), 2022 Banking Workshop (Münster), HU-IWK Joint Junior Seminar in Finance (Halle), Paris Financial Economics Meeting, AEFIN Finance Forum (Santiago de Compostela), ECB Money Market Conference, 2023 Royal Economic Society (Glasgow), and the brown bag seminars at the DIW Berlin, HU Berlin, University of Cologne, Bundesbank Research Centre provided valuable comments and suggestions. A previous draft of this paper was circulated under the name *Real Effects of Financial Market Integration: Evidence from an ECB Collateral Framework Change*. The views expressed here are our own and do not necessarily reflect those of the Deutsche Bundesbank or the Eurosystem.

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1 Introduction

In this paper, we study the transmission of a shock to the liquidity of bank assets to credit supply, cross-border lending, and the non-financial firm sector. To do so, we exploit a collateral framework change that made cross-border bank loans eligible as collateral for Eurosystem standing facilities. By expanding the pool of eligible assets, this shock enhances the overall liquidity of bank assets. Since the collateral framework shock augments the pool of eligible assets with a new asset class - cross-border loans - it provides an ideal setting to study the *international* transmission of bank liquidity shocks. Furthermore, the shock does not directly affect the fundamentals of bank assets, such that it is also well suited to trace the transmission of bank liquidity shocks to the real sector.

We use loan-level data from the euro area syndicated loan market and exploit heterogeneity in banks' loan portfolios prior to the collateral framework shock to identify affected and unaffected banks.[1] Employing a standard difference-in-difference setup, we document three effects. First, banks with a high exposure to cross-border euro area loans increase their credit supply, compared to a control group of unaffected banks. Second, cross-border lending increases significantly. However, the effect on cross-border lending is an order of magnitude smaller than the domestic effect. This suggests that harmonized collateral policy can barely overcome real barriers to financial integration, for example differences in bankruptcy laws or a competitive disadvantage in relationship lending and information acquisition. Third, the positive shock to bank liquidity transmits into a positive shock to firm funding conditions: their borrowing, employment and real investment increases significantly.

In January 2007, the ECB introduced a *single collateral list* specifying which assets euro area banks can use as collateral in refinancing operations. After this collateral framework change, banks were able to pledge loans extended to borrowers in the whole euro area. Before 2007, each national central bank specified different collateral eligibility criteria, according to which banks could at most pledge domestic loans. To identify banks that are affected by the collateral framework shock, we use their issuance history of *newly eligible* loans. Specifically, we construct a bank-level measure using the loan issuance to newly eligible firms, which mostly consist of *non-*

[1] Our approach is related to, but distinct from the literature on the bank lending channel of monetary policy. This literature typically finds that bank liquidity conditions shape the credit supply response to a monetary policy shock, see Kashyap and Stein (2000), Gambacorta (2005) and Jiménez et al. (2014) among others. In contrast, the collateral framework shock us to study the transmission of shocks to bank liquidity conditions themselves.

domestic euro area firms, prior to the announcement of the single list in June 2005.[2] We then perform a median split along the *Affected*-measure to classify banks into affected and unaffected banks and compare changes in the lending of affected banks relative to the control group of unaffected banks.

We provide support for our identifying assumption that unaffected banks provide a counterfactual for the lending of affected banks in the absence of the collateral framework shock. A specific concern is the proximity to the financial crisis unfolding after the burst of the US subprime bubble in the third quarter of 2007, which is a possible confounding event of our identifying assumption. While its earlier announcement in 2005 suggests that the collateral framework shock is a crisis-unrelated policy change, we still identify affected banks through their cross-border activity on the euro area syndicated loan market. Affected banks might also be more active on the US market and would then change their credit supply in 2007 and 2008 for reasons unrelated to the collateral framework shock. To address this, we first test for differential pre-trends and, in addition, present two falsification tests. On the one hand, we show that internationally active banks, located in the EU but *outside the euro area*, do not expand credit supply relative to their unaffected peers, controlling for loan demand. On the other hand, we use an ineligible asset class, revolving credit lines, as placebo treatment indicator and find no credit supply effect by affected banks either.

To tackle endogeneity concerns that typically arise in empirical strategies like ours, we enrich our baseline difference-in-difference specification along several dimensions. The treatment could lack random assignment, i.e. it might instead be based on a variable that affects treated and control groups differentially and correlates with the shock. For example, large banks could be more active internationally or less profitable banks could depend more on central bank facilities. Therefore, we include a large set of bank level controls. Another concern is that the pool of potential borrowers is not orthogonal to a banks' actual loan portfolio, such that affected and unaffected banks would face different lending opportunities after the collateral framework shock. To address this concern, we add firm $\times$ quarter fixed effects, which absorb any time-varying difference in firm-specific factors such as loan demand, along the lines of Khwaja and Mian

[2] In Italy, Belgium, Ireland, and Finland, domestic bank loans were ineligible prior to the collateral framework shock as well. We take this into account when classifying banks as affected and show that the expansionary credit supply effects are not driven by newly eligible domestic loans in these four countries.

(2008).[3] Once loan demand is controlled for, we find that affected banks increase their quarterly loan supply by 14% (corresponding to almost 70 million USD each quarter) and reduce spreads by 16 basis points (compared to a full sample average of 200 basis points). Our baseline credit supply result is consistent with the credit supply effects of liquidity shocks to bank liabilities, originating on the interbank market (Iyer et al. 2013 and Mitchener and Richardson 2019).

As a second step, we study the transmission of the single list to cross-border lending.[4] To do so, we re-estimate our baseline specification for three sub-samples, based on the borrower location: domestic, non-domestic euro area, and non-euro area. As expected, we find no evidence of additional credit supply to non-euro area firms, which remained ineligible under the single list. Furthermore, our findings suggest that the lion's share of additional credit supply was targeted at previously eligible domestic firms. In contrast, newly eligible firms in other euro area countries receive only a small increase in credit supply. This result relates our paper to the literature studying the role of liquidity in international banking.[5] The positive cross-border lending effect in response to the collateral framework shock is consistent with this literature. In addition, our setup allows for a direct comparison to domestic lending effects of bank liquidity shocks. The expansionary effects of our collateral framework shock stem from the enhanced liquidity of cross-border loans, such that one would expect pronounced effects on international lending. Credit supply to non-domestic euro area borrowers increased by 2 percent, while the domestic effect is around 30 percent. Thus, our results suggest a comparatively modest effect of bank liquidity shocks on international lending, relative to its domestic importance.[6]

Understanding the real effects of bank liquidity shocks is important for macroeconomic stabilization policies (Bernanke and Gertler 1989), monetary policy (Bernanke and Gertler 1995),

[3]We also show that the effect estimated size hardly changes when using country × industry × quarter fixed effects in spirit of Degryse et al. (2019) instead of firm × quarter fixed effects.

[4]Syndicated bank loans make up 75% of total cross-border loans in the euro area, see Doerr and Schaz (2021).

[5]Peek and Rosengren (2000) and Schnabl (2012) study international spillovers of adverse shocks to bank assets. Cetorelli and Goldberg (2011) study the transmission of bank shocks from developed to emerging economies using country-level data. Giannetti and Laeven (2012) demonstrate that banks disproportionately decrease international credit supply when funding conditions in their home market deteriorate. Popov and Udell (2012) provide evidence for downsides of financial integration by exploring how adverse liquidity shocks to international banks decrease SME lending in Eastern Europe through local subsidiaries. Giannetti and Jang (2020) argue that foreign lenders are more likely to extend credit supply prior to banking crises. In contrast, Doerr and Schaz (2021) find that international lenders maintain a higher credit supply during banking crises in borrower countries.

[6]The literature has suggested information asymmetries (Van Nieuwerburgh and Veldkamp 2009), cultural differences (Giannetti and Yafeh 2012), and country-specific bank regulation and corporate bankruptcy laws (Davydenko and Franks 2008) as barriers to international loan market integration. Irrespective its source, barriers to international lending imply a low substitution elasticity between domestic and international lending. Since liquidity shocks also have a positive wealth effect on affected banks, domestic credit supply expands more than foreign credit supply.

and bank regulation (Diamond and Rajan 2001). Since our collateral framework shock has no direct effect on the fundamentals of bank loans, it also provides an excellent opportunity to trace the impact of bank asset liquidity to the real sector. Therefore, we examine the pass-through to risk-taking at the bank level and real outcomes at the firm level in a third step.

At the bank level, we show that banks increase loan supply to riskier borrowers as measured by the loan-volume weighted distance-to-default (Merton 1974). An alternative interpretation of this finding is that banks extend loans to firms with tighter borrowing constraints (Farre-Mensa and Ljungqvist 2015). As a complementary approach, we subset borrowers into firms active in tradable and non-tradable sectors along the lines of Müller and Verner (2021) and only find positive credit supply effects for the non-tradable sector.[7]

At the firm level, we demonstrate that the collateral framework shock did not merely induce a reallocation of loan financing from unaffected to affected banks, but also increases loan growth at the firm level. Furthermore, we show that firms with a large exposure to affected banks increase their employment and tangible assets. Our results are consistent with findings in Paravasini (2008), Chodorow-Reich (2014) or Amiti and Weinstein (2018) and are in line with standard theories of credit supply and firm borrowing constraints: upon experiencing an increase in liquidity conditions, banks' additional credit supply is directed to riskier and more credit-constrained borrowers, who use the additional credit supply to increase their real activity.

Our findings have direct implications for monetary policy implementation and financial market integration policies. By employing a shock to the collateral framework, our paper extends the literature on the effects of central bank operational frameworks.[8] Van Bekkum, Gabarro, and Irani (2018) document that changes in collateral eligibility concerning residential mortgage backed securities affects bank lending and risk-taking behavior in the mortgage market. Delatte, Garg, and Imbs (2019) find that the Banque de France's Additional Credit Claims program has an positive impact on credit supply to French firms. Using a similar dataset, Harpedanne de Belleville (2023) documents positive effects on credit supply and employment. Mésonnier,

[7]This risk-taking effect of a positive shock to bank liquidity shares similarities with Delis and Kouretas (2011), who establish risk-taking effects of interest rate policy, Grosse-Rueschkamp, Steffen, and Streitz (2019), who document elevated bank risk-taking after the Eurosystem's CSPP, Bruno and Shin (2015), who stress the role of bank risk-taking for the international transmission of US monetary policy, and Dinger and Kaat (2020), who demonstrate that international capital flows increase bank credit supply and risk taking.

[8]This literature is largely empirical. However, a small literature studies the role of collateral policy as central bank instrument through a theoretical lens, see for example Chapman, Chiu, and Molico (2010), Ashcraft, Garleanu, and Pedersen (2011), Koulischer and Struyven (2014), and Cassola and Koulischer (2019).

O'Donnell, and Toutain (2021) document that such eligibility translates also into a relative reduction in rates for newly eligible bank loans. Cahn, Duquerroy, and Mullins (2022) use the ECB's very long term refinancing operations to study credit supply to single- and multi-bank firms. We show that credit supply effects of collateral policy identified in the literature are also robust to using a period of low financial stress, positive interest rates, and a small central bank balance sheet. Thereby, our results suggest that central bank collateral policy also matters in "conventional" times.[9]

Closely related to our paper is Pelizzon et al. (2023), who also use properties of the ECB collateral framework in their empirical strategy. Using the collateral eligibility of corporate bonds, they find that eligibility reduces secondary market bond yields and increases bond issuance at the firm level. While our baseline results are consistent with these findings, our empirical strategy builds on heterogeneous bank level exposure to a collateral framework shock, which allows us to explore the transmission of the shock to bank credit supply, especially cross-border, and to real effects for all borrowers interacting with affected banks.

Our results also inform the ongoing discussion about the European banking and capital markets union. Since its inception, the euro area has been characterized by a low level of *direct* cross-border lending, as shown in Burietz and Ureche-Rangau (2020) and Hoffmann, Maslov, and Sørensen (2022) using country level data. It has been argued that the absence of a banking and capital markets union was an important driver of the European banking and sovereign debt crisis (see for example Lane (2012) and the references therein). There is both compelling empirical evidence and theoretical argument in favor of a banking and capital markets union.[10] Nevertheless, it is still not known which policy instruments are well suited for a successful implementation. By making cross-border loans eligible as collateral, monetary policy frameworks might reduce the home bias in collateral portfolios inherent in national collateral lists and, thus, contribute to financial integration. However, our analysis suggests that, even though collateral frameworks have a significant effect on cross-border credit supply, their relative importance is

[9]Our focus on a non-crisis episode also allows us to cleanly attribute the credit supply and real effects of collateral policy to the demand for eligible assets, rather than to a temporary deviation of credit conditions from borrower fundamentals, see Gilchrist and Zakrajšek 2012.

[10]The effects of financial market integration on the real economy have been studied extensively using bank deregulation in the United States, see Morgan, Rime, and Strahan (2004), Karakaya, Michalski, and Örs (2022) or Goetz and Gozzi (2022). Constâncio (2014) provides an overview in the context of the European debt crisis. See Martinez, Philippon, and Sihvonen (2022) conduct a welfare analysis of a banking and capital markets union, stressing the role of international risk sharing.

economically not large.[11]

The remainder of our paper is organized as follows. Section 2 describes the institutional setting and the collateral framework shock. Section 3 lays out the empirical strategy, while details on our data and variables are shown in Section 4. Section 5 presents the results on bank credit supply and establishes real effects at the firm level. Section 6 concludes.

2 Institutional Setting

On 22 July 2005, the ECB announced the introduction of a *single collateral list*, applicable to the whole euro area, specifying which assets banks can pledge as collateral to obtain central bank funding through main refinancing operations or the marginal lending facility.[12] The single list came into effect on 1 January 2007. Previously, the collateral eligibility of bank assets was determined following a two-tier system. Tier-one assets consisted of marketable debt instruments, mostly government bonds, fulfilling euro area-wide eligibility criteria. The eligibility of tier-two assets was specified by national central banks, allowing them to incorporate idiosyncrasies of the respective domestic banking sector in the collateral framework.[13]

Under the single list regime, the ECB directly specifies eligible assets for all euro area banks. Furthermore, the single list regime established the eligibility of (syndicated) bank loans extended to all borrowers located in the euro area.[14] This modification drastically increased the fungibility of loans as collateral: prior to the single list, only the national central banks of Germany, Austria, Spain, France, Ireland and the Netherlands accepted bank loans to domestic companies as collateral, while cross-border loans were not accepted by any national central bank. Notably, the expansion of the set of eligible assets was not achieved by a relaxation of minimum rating

[11] This is also consistent with Buch (2003), who shows that the European Union's Banking Directive did not overcome national fragmentation in cross-border lending.

[12] The official announcement on 22 July 2005 contained details on the inclusion of bank loans, see ECB (2005).

[13] For a detailed review of the Eurosystem Collateral Framework, we refer to Nyborg (2017) and Bindseil et al. (2017). Tabakis and Tamura (2013) discuss the collateral eligibility of credit claims, such as syndicated loans, in the Eurosystem.

[14] In the syndicated loan market, different banks form a syndicate to jointly lend to a single borrower. The syndicate includes one lead bank and a number of participating banks. Lead arrangers are those members of a syndicate typically negotiate credit conditions, conduct due diligence, and monitor firms (Dennis and Mullineaux 2000 and Ivashina and Scharfstein 2010). Participants are usually not in direct contact with the borrower, but merely supply credit via the lead arranger. Since collateral eligibility is restricted to loan contracts involving at most two jurisdictions, this restriction is particularly appealing in our setting: by removing relationships between firms and participating banks we make sure not to include "false positives" into our *Affected*-measure, for example the loan share of a participant bank (country A) in a syndicated loan from lead bank (country B) to a firm located in country C.

requirements, which is in contrast with the ECB's expansionary policy measures undertaken later.[15] The ECB Monthly Bulletin (2006) explicitly states the following objectives of switching to a single list regime:

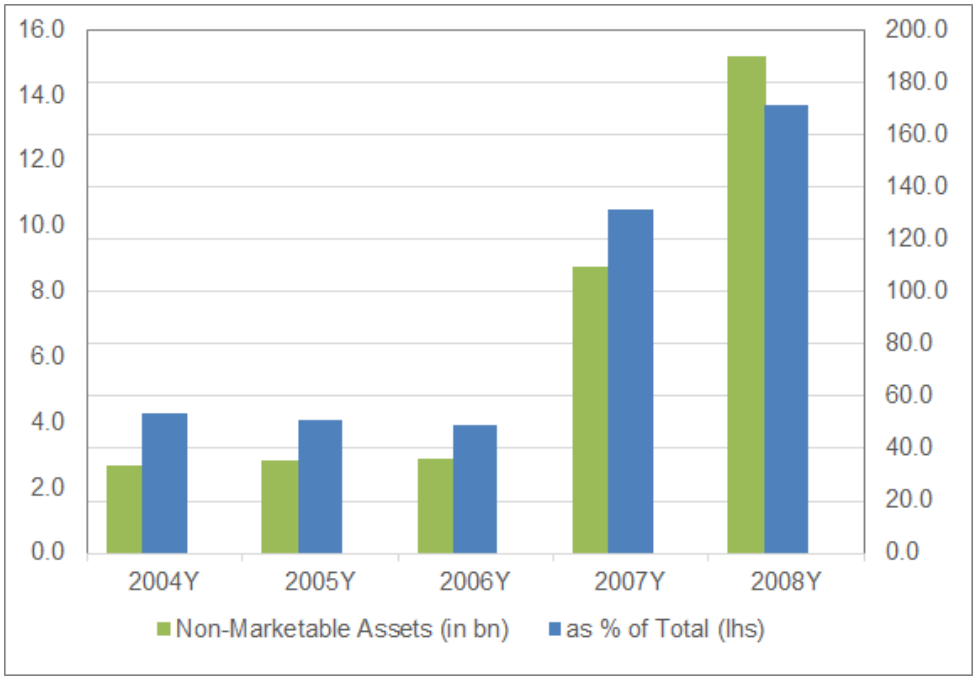
> *The aims of the single list are to* ***enhance the level playing field in the euro area, further promoting equal treatment for counterparties and issuers****, and to increase the overall transparency of the collateral framework. Moreover, the single list takes into account the fact that, with increasing collateralization in private wholesale markets and relatively high consumption of collateral by the Eurosystem, there are now* ***competing demands on the collateral holdings*** *of banks. More generally, by increasing the liquidity of an entire asset class, such as bank loans, the single list of collateral fosters the* ***smooth functioning of the euro area financial system.***
>
> ECB Monthly Bulletin 2006, page 76.

The ECB Monthly Bulletin (2006) suggests that both the lack of financial market integration and the shortage of high-quality collateral were identified as major issues already prior to the financial crisis unfolding in 2008. Therefore, the single collateral list aimed to increase financial integration within the euro area through direct cross-border lending. Second, reducing collateral scarcity was deemed necessary to ensure an effective pass-through of interest rate policy via the bank lending channel and to facilitate trade among financial institutions.

As a first step, to achieve either objective, collateral policy needs to change banks' pledging behavior which, in turn, might also affect their loan supply. Sauerzopf (2007) provides suggestive evidence along these lines based on collateral pledged by Austrian banks. This is consistent with aggregate usage of non-marketable assets as collateral in ECB refinancing operations over time (Figure 1). Before 2007, both the absolute amount of non-marketable assets and their share of total collateral use was stagnant at around 35 bn EUR, or 4% of total collateral. By the end of 2007, the usage of non-marketable assets more than doubled to 109 bn EUR, and its share of total collateral increased to almost 11%.

[15] Nyborg (2017) documents the effects of reducing the minimum rating requirement from A to BBB during the financial crisis 2008 and of the temporary suspension of minimum rating requirements during the euro area debt crisis. Furthermore, the ECB suspended minimum rating requirements in April 2020.

Figure 1: Non-Marketable Assets Pledged as Collateral



Notes: The right axis shows the "market value" of pledged non-marketable assets. "Market values" of non-marketable assets can either be based on recent transactions or assigned based on valuation models (Nyborg 2017). The left axis displays the share of pledged non-marketable assets. Prior to 2007, collateral data are unavailable at higher frequencies. *Source*: ECB collateral data.

While Figure 1 does not provide a bank-specific analysis of pledging behavior, an aggregate increase is indicative of banks' willingness to use non-marketable assets in Eurosystem operations. This has implications for bank behavior on the loan market: *First*, even if banks do not intend to pledge a specific loan, they might still prefer to hold eligible loans for precautionary reasons, for example to self-insure against adverse liquidity shocks. In technical terms, banks submit eligible assets into so called collateral portfolios or collateral accounts, such that these assets can be mobilized quickly if they are needed as collateral. Put differently, the eligibility into collateral portfolios matters for the pricing of an asset. Consistent with this idea, Barthélemy, Bignon, and Nguyen (2018) show that, even though banks pledged more assets into collateral accounts than required *on aggregate*, around 10% of euro area banks hit their collateral constraints between 2011 and 2016. *Second*, the eligibility of non-marketable assets can have a positive spillover effect on bank holdings of high-quality liquid assets, such as government bonds. As argued in Pelizzon et al. (2023), there is effectively no private wholesale funding market for corporate sector assets in the euro area. If loans can be pledged at the Eurosystem, high-quality

liquid assets can be used more effectively on the wholesale funding (repo) market instead.[16] In both cases, the collateral framework shock should have positive effects on banks' net worth. In the next section, we test whether banks that were strongly affected by the shock in fact take advantage of this positive effect by increasing their credit supply.

3 Empirical Strategy

We use a standard difference-in-differences set-up to compare the lending of banks affected by the collateral framework shock to the lending of unaffected banks. To take out potential anticipation effects, we classify banks as affected based on their loan issuance histories to newly eligible borrowers prior to the single list's announcement. Our baseline result establishes that banks with a large share of newly eligible loans on their balance sheet increase their credit supply relative to banks with a smaller share of such assets. After studying cross-border lending effects, we test to which extent the positive shock to the liquidity of bank assets can be traced at the firm level.

Identifying Affected Banks Banks are classified into *affected* and *unaffected* based on the share of newly eligible loans after the collateral framework shock.[17] Assuming that the collateral framework shock has larger effects on banks which were already actively issuing loans that became eligible under the single list, we identify affected banks according to their issuance history from 2003 Q1 until 2005 Q3, the last quarter prior to the announcement. To accurately measure bank-level exposure at the group level, the subsidiary structure of each group i has to be taken into account, since subsidiaries directly interact with the NCB in the country where they are chartered. We denote the set of all subsidiaries of bank groups i by $\mathcal{K}^i$. The set of all subsidiaries is restricted to euro area subsidiary banks.

To construct the *Affected*-measure at the group level, we first cumulate subsidiary k's issuance of newly eligible loans over the period prior to the single list's announcement. Let c_j denote the

[16] Positive spillover effects from "freeing up" high-quality liquid assets are explicitly mentioned in ECB (2006), page 9. Choi, Santos, and Yorulmazer (2021) provide a theoretical analysis of this mechanism. Related "crowding-in" effects have been documented by Arce, Mayordomo, and Gimeno (2020). They show that the ECB's corporate sector purchase programme enabled firms to switch from loan towards bond financing. This switch allowed banks to reallocate funds towards formerly constrained firms without bond market access, who were therefore not directly affected by the CSPP.

[17] For banks headquartered in Austria, France, Germany, Ireland, the Netherlands and Spain, all loans to firms in other euro area countries are *newly eligible*. For banks in Belgium, Greece, Italy and Portugal, all loans are *newly eligible*.

home country of firm j and let $\mathcal{C}_k^{new}$ the set of countries where loans became newly eligible under the single list regime. For a subsidiary located in Germany, the set of newly eligible countries is given by $\mathcal{C}_k^{new} = \mathcal{C}^{ea} \backslash \{DE\}$, since loans to German firms were already eligible under the NCB-regime in Germany. In contrast, for a subsidiary located in Italy, we simply have $\mathcal{C}_k^{new} = \mathcal{C}^{ea}$. The subsidiary-level *Affected*-measure is then given by

$$\text{Affected}_k \equiv \frac{\sum_{t \in \mathcal{T}} \sum_{j \in \mathcal{J}^{ea}} \mathbf{1}\{c_j \in \mathcal{C}_k^{new}\} \cdot L_{kjt}}{\sum_{t \in \mathcal{T}} \sum_{j \in \mathcal{J}^{ea}} L_{kjt}} , \tag{1}$$

where L_{kjt} are loan issuances by subsidiary bank k to firm j at time t. The set of pre-announcement dates is denoted by $\mathcal{T}$ = [Q1 2003, Q3 2005], while $\mathcal{J}^{EA}$ is the set of all euro area firms in our sample. We then aggregate the subsidiary-level *Affected*-measure to the group level, weighted by the subsidiary shares in the group-level loan portfolio:

$$\text{Affected}_i \equiv \frac{\sum_{t \in \mathcal{T}} \sum_{j \in \mathcal{J}^{ea}} L_{kjt}}{\sum_{k \in \mathcal{K}^i} \sum_{t \in \mathcal{T}} \sum_{j \in \mathcal{J}^{ea}} L_{kjt}} \cdot \text{Affected}_k . \tag{2}$$

We perform a sample split of banks along the *Affected*-measure (2) and interpret all banks with an above-median share of newly eligible euro area loans in their portfolio as affected.[18]

Baseline Specification We test the effect of the single list's inclusion on credit supply at the bank-firm-quarter level by estimating:

$$ln(L_{ijt}) = \beta_1 \text{Affected}_i(0/1) \times \text{Post07}_t + \beta \text{X}_{i,t-4} + \mu_{ij} + \nu_{jt} + c_{jt} + \epsilon_{ijt} , \tag{3}$$

Here, $Post07_t$ indicates the single list regime.[19] $X_{i,t-4}$ is a vector of loan and bank level controls, which are lagged by 4 quarters. μ_{ij} denotes bank × firm, ν_{jt} denotes firm × quarter, and c_{jt} denotes country × quarter fixed effects. In line with the restriction of at most two jurisdictions being involved in a loan contract, we focus on lead arrangers in the baseline specification. We operationalize this exclusion restriction as follows: if bank i has been a lead arranger in at least one loan extended to firm j, all interactions between this bank-firm pair are included in our

[18] This identification strategy is common in the literature, see for example Huber (2018), Van Bekkum, Gabarro, and Irani (2018) or Grosse-Rueschkamp, Steffen, and Streitz (2019).

[19] Given that the average maturity of syndicated loans is 5 years in our sample, we use the implementation date (Q1 2007) rather than the announcement date (Q2 2005). Using the announcement date as a robustness, we find no significant effect on bank lending.

sample.

The coefficient β_1 measures how affected banks respond to the collateral framework shock relative to unaffected banks. We expect $\beta_1 > 0$, as a larger share of eligible loans should stimulate credit supply after the framework shock. Standard errors are clustered at the bank level, the level at which the treatment occurs, to adjust for serial correlation within treated units. Our identifying assumption is that banks less active in cross-border euro area loan syndication provide a valid counterfactual for bank behavior in the absence of a framework shock.

For a causal interpretation of the estimated effect and the coefficient size, several concerns need to be dismissed. *First*, the heterogeneous lending behavior of affected and unaffected banks could be caused by other factors than collateral eligibility of their loan portfolio, for example their size or funding conditions. *Second*, the treatment could lack random assignment if it were based on a variable that has a differential impact on affected and unaffected banks and correlates with the collateral framework shock. To address these concerns, we include bank level controls for size, leverage, profitability (return on equity), cash ratio, and deposit ratio. In Panel B of Table 3, we show that banks do not significantly differ along any of these dimensions.

Third, the pool of potential borrowers might differ for affected and unaffected banks, and hence banks would face different lending opportunities after the shock. To address this concern, we include bank-firm fixed effects and firm-quarter fixed effects. The former captures lending from the same bank to the same firm. The latter allows identification of loan supply, as we compare the lending of affected and unaffected banks to the same borrower, absorbing loan demand, similar to Khwaja and Mian (2008). In an alternative specification, we replace firm $\times$ quarter fixed effects by country $\times$ industry $\times$ quarter fixed effects, following Degryse et al. (2019).

While we mostly focus on the quantity dimension of credit supply (loan volume), we also use the price dimension (loan spreads). Therefore, we use the same specification to test the effect of the single list regime on loan spreads:

$$S_{ijt} = \beta_1 \text{Affected}_i(0/1) \times \text{Post07}_t + \gamma \text{X}_{i,t-4} + \mu_{ij} + \nu_{jt} + c_{jt} + \epsilon_{ijt} \, . \tag{4}$$

Since we expect affected banks to increase their credit supply, the coefficient β_1 should be negative when using spreads as dependent variable.

Extensive and Total Margin To alleviate concerns that banks simply reduce the frequency of new loan issuances but increase loan size, we also consider the extensive and total margin of credit supply. This can be relevant in the context of collateral eligibility if more frequent but smaller loan sizes would render the loans ineligible. We operationalize this by estimating equation (3) over a balanced panel and add zeros to all bank-firm-quarter triples where there was no loan issuance. A positive coefficient in this specification suggests a positive effect of the collateral framework shock on total credit supply. For the extensive margin, specified as linear probability model, we transform all observations into an indicator variable equal to one if bank i supplied a loan to firm j in quarter t. Combined with a positive intensive margin, a positive effect in the extensive margin specification also points towards an increase in total credit supply, since banks interact with firms more often and supply more credit when they interact.

Falsification Tests, Announcement Effect and Participant Sample Our classification of affected banks is based on their cross-border lending history prior to the collateral framework shock. These banks might also be more active on the international loan market in general and the US market in particular. In the context of the financial crisis unfolding in 2008, affected banks might exhibit a stronger credit supply reaction that is unrelated to the collateral framework shock.[20] To alleviate this concern, we conduct two *falsification tests* exploiting that the Eurosystem single list is relevant (i) only for banks headquartered in the euro area and (ii) only applies to fixed-term loans. For the first test, we build a group of affected banks residing outside the euro area, but inside the EU. Similar to equation (1), we compute the share of euro area loans over total loans for every subsidiary of a non-euro area headquartered bank group:

$$\text{Foreign-Affected}_k \equiv \frac{\sum_{t\in\mathcal{T}}\sum_{j\in\mathcal{J}} \mathbf{1}\{c_j \in \mathcal{C}^{EA}\} \cdot L_{kjt}}{\sum_{t\in\mathcal{T}}\sum_{j\in\mathcal{J}} L_{kjt}} \ .$$

We then aggregate the subsidiary-level *ForeignAffected*-measure using the subsidiary share in the group loan portfolio

$$\text{Foreign-Affected}_i \equiv \frac{\sum_{t\in\mathcal{T}}\sum_{j\in\mathcal{J}} L_{kjt}}{\sum_{k\in\mathcal{K}^i}\sum_{t\in\mathcal{T}}\sum_{j\in\mathcal{J}} L_{kjt}} \cdot \text{Foreign-Affected}_k \ , \tag{5}$$

[20] Puri, Rocholl, and Steffen (2011) show that European banks exposed to U.S. sub-prime market exhibit a more pronounced decrease of credit supply. In contrast to this narrative, we expect the collateral framework shock to stimulate loan issuance of affected banks. Therefore, the financial crisis would at most bias the results downwards.

where $\mathcal{J}$ is the set of *all* firms in our sample. As before, we use a median split along the *Foreign-Affected*-measure to test whether the collateral framework shock has a differential impact on foreign lenders that would be heavily affected by the single list's introduction, relative to their unaffected peers. For the second falsification test, we make use of the fact that only term loans are pledgeable as collateral under the single list. Reconstructing the *Affected*-measure at subsidiary and bank group level using the issuance history of revolving credit lines thus provides us with a *Placebo-Affected*-measure that we use to re-estimate equation (3).[21] For both placebo measures, there should be no significant effects on loan supply.

The single list and the future eligibility of cross-border bank loans was announced around one and a half years before its implementation. Therefore, we test for announcement effects on credit supply. Since syndicated loans are non-marketable assets, we do not expect to find a large announcement effect: until these assets can actually be posted into collateral accounts, they continue to occupy balance sheet space and can not be used as collateral.

Due to the restriction of at most two jurisdictions being involved in an eligible loan, we also use the sample of *lead and participating* banks to further enhance the plausibility that our results on credit supply are driven by collateral eligibility. Specifically, a participating bank located in country A would be unable to use its share in a syndicated loan extended from lead arranger in country B to a firm in country C. Depending on the specific structure of the syndicate, which might involve special purpose vehicles in which all syndicate members are involved, even a participating bank located in country B or C might not be able to pledge its loan share (see also the discussion in Tabakis and Tamura 2013). Credit supply effects should therefore be most pronounced for lead arrangers, such that we expect the coefficient β_1 to be smaller once participant banks are included.

Borrower Location Building on our baseline specification, we then take a closer look at borrower characteristics. Specifically, we test whether the framework shock increased direct cross-border lending by estimating equation (3) on three sub-samples, based on borrower vis-a-vis bank location. While the first two groups, domestic and other euro area borrowers, are potentially subject to larger loan supply, firms located outside the euro area should not be directly affected by the single list. A high coefficient on the sub-sample of non-domestic euro

[21] Using an ineligible asset class to conduct a falsification test is in line with Van Bekkum, Gabarro, and Irani (2018).

area borrowers would be indicative of a strong cross-border lending effect. As for the baseline results, we use stringent fixed effect structures and also consider the effects on loan spreads.

Borrower Characteristics and Bank Risk-Taking To test whether certain firm types are receiving a particularly high share of additional credit, we perform a sample split of firms along their SIC-codes into the tradable and non-tradable sector, since firms active in the non-tradable sector are typically associated with higher credit risk and tighter borrowing constraints (Müller and Verner 2021). We also take a more direct approach *at the bank level* and use the bank-portfolio distance-to-default (Merton 1974) as dependent variable. The advantage of this measure is that it can be easily computed from Compustat balance sheet and stock price data. For details on the distance-to-default, its theoretical foundations and practical implementation, we refer to Gilchrist and Zakrajšek (2012), Bharath and Shumway (2008) and the references therein. Specifically, we estimate effect of the single list regime on the distance-to-default of bank i's loan portfolio at quarter t:

$$D2D_{it} = \gamma_1 \text{Affected}_i(0/1) \times \text{Post07}_t + \gamma \text{X}_{i,t-4} + c_{jt} + \epsilon_{ijt} \, . \tag{6}$$

Since our analysis is carried out at the bank level, we define country-quarter fixed effects based on the bank headquarter in (6). A positive coefficient γ_1 suggests that expansionary collateral policy has similar effects on bank risk-taking as expansionary interest rate policy, as shown in Delis and Kouretas (2011).

Firm Level We study the real effects of the collateral framework shock at the firm level using annual data. To do so, we construct a firm level *exposure* measure to the shock based on the share of loans obtained from affected banks. Formally, the exposure measure is given by

$$\text{Exposed}_j = \frac{\sum_{i \in \mathcal{I}} \sum_{t \in \mathcal{T}} \mathbf{1}\{i \in \mathcal{I}^{Affected}\} L_{ijt}}{\sum_{i \in \mathcal{I}} \sum_{t \in \mathcal{T}} L_{ijt}} \, , \tag{7}$$

where $\mathcal{I}^{Affected}$ is the set of affected banks according to the *Affected*-measure (2) and $\mathcal{T}$ = [Q1 2003, Q3 2005] is the pre-announcement sub-sample. We then classify all firms in the upper tercile as *Exposed* and use firms in the lower tercile as control group in the following regression

at the firm-year level:

$$y_{jt} = \delta_1 \text{Exposed}_j \times \text{Post}_{07,t} + \delta \text{X}_{j,t-1} + \chi_{jt} + c_{jt} + \mu_j + \epsilon_{jt} \tag{8}$$

We first link the baseline credit supply effect to real effects at the firm level by using loan growth $\Delta ln(L_{jt})$ as dependent variable. $X_{j,t-1}$ is a vector of firm level controls, which consists of log of total assets, leverage (total debt over total assets), and a measure of corporate liquidity (cash holdings over total assets), all lagged by one year. μ_j are firm, χ_{jt} industry $\times$ year, and c_{jt} country $\times$ year fixed effects. We expect $\delta_1 > 0$, in line with the positive credit supply effect found at the loan level. In order to interpret the estimated coefficients as a loan supply effect at the firm level, we use firm fixed effects, country $\times$ year, and industry $\times$ year fixed effects to absorb country- and industry-specific determinants of corporate borrowing.

To test whether the positive credit supply shock translates into real outcomes at the firm level, we also estimate (8) using *ln(Tangible Assets)* and *ln(Employment)*. The relative change in property, plants, and equipment is a standard proxy for tangible investment. Since tangible investment is typically financed using long-term debt issuance, we expect the most pronounced effect at this margin. A positive coefficient δ_1 indicates positive real effects: firms that are highly exposed to the collateral framework shock use the proceeds of higher loan take-up to increase their investment and employment.

4 Data

Our analysis is based on syndicated loan market data from DealScan, where we observe the borrowing firm and all participating banks at the loan level. We complement loan level information with bank data from CapitalIQ and firm data from Compustat.

Loan Data As a first step, we restrict the sample to non-financial firms and to commercial, savings, cooperative and investment banks. We decompose syndicated loan deals into loan portions provided by each lender to obtain loan level data. Whenever DealScan provides information on lending shares of each bank, we use this information to split loan volume accordingly. In other cases, we follow Schwert (2018) to estimate lending shares via a Tobit estimation using information on the facility amount, the number of participants, borrower and lender sales. In

addition to each bank's share in the syndicate, we observe the purpose of each loan, Finally, DealScan indicates whether a loan was used to refinance an existing loan, and whether or not it is secured. Transactions with deal status 'canceled', 'suspended', or 'rumor' are removed and all loan nominations transformed into million USD using the spot exchange rate at origination, provided by DealScan. If after this allocation procedure the loan portion is smaller than 10,000 USD, we drop the observation to remove erroneously small loans. We then aggregate all loan issuances between a bank-firm combination to obtain bank i's loan issuance to firm j in quarter t, which we define as a bank-firm-quarter observation.

Total loan volume in a given quarter is the sum of all new loans issued by bank i to firm j. In doing so, we only account for syndicated loan issuances, disregarding its redemption profile. Table 1 presents summary statistics on the bank-firm-quarter level over the sample period Q1 2006 to Q4 2007. The average loan issuance from bank i to firm j in quarter t amounts to 451.13 million, the average spread over LIBOR to 204 basis points, and the average maturity of the loans to around 7 years. All loans in our sample have at least one designated lead arranger. We also observe whether a loan is secured. The share of loans issued to other euro area and domestic firms amounts to 54%, respectively, of which around a third is issued to domestic firms, while 46% of all loans are extended to non-euro area firms. Domestic firms are defined as firms which have their headquarters in the same country as the corresponding bank.

Bank Characteristics To control for bank characteristics, we match the banks included in the DealScan dataset with bank balance sheet data from CapitalIQ. Panel A of Table 3 presents summary statistics for all euro-area banks in the period prior to the framework shock (Q1 2006 - Q4 2006) included in our sample. On average, banks hold 59% loans and 26% securities over total assets. On the funding side, deposits make up 41% and equity 5.0% of total assets on average. The Return on Equity amounts to 15.3% on average across the sample period. Panel B of Table 3 presents evidence on the difference in bank characteristics between affected and unaffected banks using univariate t-tests. Affected banks are banks which have an above median share of euro area loan issuances in their syndicated loan issuances in the period prior to the announcement (Q1 2003 - Q2 2005). Affected banks are similar in terms of size, cash and deposit ratios, and leverage, but have a slightly higher return-on-equity (13.7% vs 17.3%), significant at the 19% level.

Firm Variables We obtain annual firm accounting data for European firms from Compustat. We aggregate the quarterly loan data from DealScan to the firm-year level and match borrowers in DealScan with firms in Compustat. The matching is based on Chava and Roberts (2008), updated in April 2018. Combining those two databases reduces observations, since not all firms have balance sheet data available con Compustat, especially not smaller ones. Eventually, we obtain a sample of 1795 firms. Variables are winsorized at the 1st and 99th percentile. As customary, financials (SIC codes 6000-6999) are dropped. Panel A of Table 5 shows summary statistics for the full sample while Panel B establishes that more and less exposed firms did not differ significantly along the dimensions we use as a control or outcome variable in 2006, the last year prior to the shock.

5 Results

We present the results in four steps. In Section 5.1, we demonstrate that affected banks increase their credit supply. We provide evidence on the validity of the parallel trend assumption using a parametric test and then corroborate our baseline results in a number of robustness checks in Section 5.2. Section 5.3 presents evidence that the collateral framework shock has a cross-border credit supply effect, which is positive but small compared to the domestic effect. Section 5.4 also sheds light on borrower fundamentals and demonstrates that bank liquidity shocks are primarily transmitted through lending towards riskier and more credit-constrained firms as measured by their distance-to-default. Section 5.5 presents loan growth and real effects at the firm level.

5.1 Baseline Specification

Table 6 presents the baseline result from estimating equation (3). Each column includes increasingly stringent levels of fixed effects. In column (1), we only use bank $\times$ firm fixed effects to compare lending of affected and unaffected banks to the same firm j before and after the collateral framework change in January 2007. Both the coefficient of interest (0.165) and the $Post07_t$ indicator (0.143) are positive but insignificant. In column (2), we control for time-varying country differences by including bank-country $\times$ quarter and firm-country $\times$ quarter fixed effects. In addition, we add firm $\times$ quarter fixed effects to control for loan demand (Khwaja and Mian 2008). We find a positive treatment effect (0.115), which is significant at the 1% level.

Column (3) shows a specification with loan and bank level controls that refine the comparison between treatment and control group. We include the log of assets, return on equity, as well as leverage, cash, securities and deposits ratios over total assets, all lagged by four quarters. These control variables are standard in the empirical literature on the bank-lending channel (Kashyap and Stein 2000). Banks with a higher securities ratio supply fewer loans on average, which is however not robustly significant across specifications. Other bank level controls are insignificant across specifications. Additional loan supply is significantly larger for secured loans, other loan level controls are at most weakly significant. Including controls even increases the coefficient of interest: affected banks increase their lending by 14.8%, relative to unaffected banks. To put this effect into perspective, we multiply the coefficient by the (full sample) average loan volume from bank i to firm j at time t (see Table 1). Affected banks increase their loan supply by $0.148 \cdot 451 = 67$ mn USD each quarter.

To ensure that our results are not driven by heterogeneity in the treatment of bank loans under the NCB-regime, we define the indicator $DomAff_i(0/1)$ that equals one for banks located in countries where the respective NCB did not accept domestic bank loans before the policy change (BE, GR, IT, PT) and zero for banks in all other euro area countries (AT, DE, ES, FR, IR, NL). Column (4) shows that interacting $DomAff_i(0/1)$ with the treatment indicator yields no significant effect. The estimated coefficient on the *Affected*-measure is slightly smaller than the baseline effect in column (3) but still highly significant.[22] In column (5), we replace firm $\times$ quarter fixed effects by country $\times$ industry $\times$ quarter fixed effects (Degryse et al. 2019), which barely changes the results. In all specifications, the magnitude of the estimated credit supply effect is similar to Van Bekkum, Gabarro, and Irani (2018).

Parallel Trend Assumption Figure 2 plots coefficient estimates of the baseline specification for loan supply over a 12-quarter event window, spanning all quarters between announcement and implementation in January 2007. The null hypothesis of different pre-trends between affected and unaffected banks can not be rejected, with statistically insignificant coefficient estimates hovering around zero. After the collateral framework shock, the lending activity of affected banks becomes positive and significant relative to the control group of unaffected banks. As long as confounding factors affect both types of banks in the same way, for example an accommodative

[22] As Table 2 shows, banks headquartered in Belgium, Greece, Italy, and Portugal only make up 11% of all loans in our sample.

monetary policy stance in the early 2000s, they are canceled out by the difference-in-differences approach.

5.2 Additional Results and Robustness

Next, we discuss the results of several different specifications and robustness checks to corroborate the baseline credit supply effects. In Table 7, we show the extensive and total margin, complementing our baseline results at the intensive margin. Controlling for loan demand and adding bank country × time fixed effects, column (2) shows that there is also a significantly positive effect at the total margin. Likewise, column (4) shows that the probability of bank i extending a loan to firm i in quarter t is one percentage point larger for affected banks after the treatment. Second, Table 8 shows that the response of loan spreads is consistent with our baseline results. Under the most stringed specifications in columns (3) to (5), the coefficient on $Affected_i(0/1) \times Post07_t$ is significantly negative at the 1%-level once loan demand is controlled for. The effect size of 16 basis points is comparable to Pelizzon et al. (2023) and Mésonnier, O'Donnell, and Toutain (2021). Bank and loan level controls are mostly insignificant, only the loan purpose has a significantly positive effect on loan spreads.

Falsification Tests and Participant Sample Table 9 and Table 10 show that, for both falsification tests, the coefficients on $Foreign\text{-}Affected_i(0/1) \times Post07_t$ and $Placebo\text{-}Affected_i(0/1) \times Post07_t$ are insignificant or even negative across all specifications. This suggests that the credit supply effects in our baseline specification indeed reflect the collateral framework shock and are not driven by other factors that affect treatment and control group in heterogeneous ways.

Table 11 presents results of using an announcement treatment indicator instead of the implementation data. It therefore takes on the value of zero until Q2 2005 and a value of one afterwards. We find no significant effect across all specifications, which suggests that the announcement date did not play a relevant role in banks' lending decisions. Since syndicated bank loans are non-marketable, it is not surprising that there are no announcement effects of the collateral framework shock. In a final step, we augment the sample by all participant banks and re-estimate equation (3). The results are presented in Table 12 and show that, compared to the baseline results in Table 6, the effect size is around 50% smaller, but still significant at the 1%

level. This is plausible given the three jurisdiction restriction on collateral eligibility.

5.3 Borrower Location

The results so far indicate that banks holding a large share of other euro area loans significantly increase their lending, compared to their unaffected peers. We now investigate the geographical distribution of affected banks' additional credit supply. Table 13 shows that the effect on direct cross-border lending is positive and significant, but relatively small (0.019) compared to the full sample. This result also holds under a very stringent fixed effect structure and is also robust to using firm × industry × time fixed effects (Degryse et al. 2019). In contrast, the single list's effect is an order of magnitude larger for firms headquartered in the affected banks' home country (0.311 or 0.296, depending on the specification).

Using loan spreads as an alternative proxy for credit supply yields very similar results: the spread on domestic firms declines by 21bp to 24bp, depending on the specification, which is significant at the 1% level. In contrast, spreads for other euro area borrowers decline only by 14bp, which is only significant at the 10% level and smaller than the effect in the full sample. There is no significant effect on loan volumes or spreads for the sub-sample firms outside the euro area. The absence of large international lending effects implies a relatively weak substitution effect between domestic and cross-border lending. At the same time, the positive shock to the liquidity of bank assets has a positive wealth effect on affected banks. They predominately increase their credit supply domestically, where they have a comparative advantage over their international competitors.

5.4 Borrower Fundamentals

We now take a closer look at the firms benefiting from this credit expansion. We provide two complementary approaches to show that in particular high-risk and credit constrained borrowers are subject to funding inflows. Similar to borrower location, we estimate equation (3) on two sub-samples split according to firms being classified as tradable or non-tradable. We classify firms based on primary SIC codes reported in DealScan following Müller and Verner (2021) and Giannetti and Jang (2020).[23] The coefficient on $Affected_{0i}(0/1) \times \text{Post07}_t$ is positive and

[23]The tradable sector mainly consists of manufacturing firms (SIC code 2000-3999), while the non-tradable sector includes construction (SIC code 1500-1799), wholesale and retail services (SIC code 5000-5999) and accommodation (SIC code 7000-7099).

significant for non-tradables (column 2), but insignificant for tradables. This result is consistent with Berg et al. (2022), who show that the positive liquidity shock to the banking system induced by the ECB's corporate bond purchase programme had positive credit supply effects almost exclusively in the real estate sector.

The complementary approach using distance-to-default as dependent variable is shown in Table 15. Across all specifications, the distance-to-default declines after the shock for affected banks: the riskiness of the loan portfolio increases. This result is consistent with risk-taking effects reported in Van Bekkum, Gabarro, and Irani (2018), who show that banks were investing into riskier residential mortgages following a relaxation in eligibility requirements for residential mortgage backed securities. Interpreting the distance-to-default as a measure of borrowing constraints (Farre-Mensa and Ljungqvist 2015), the result can also be read as follows: the transmission of positive shocks to bank liquidity conditions is particularly pronounced for borrowing constrained firms.

5.5 Firm Level Results

Lastly, we describe the results at the firm level. We restrict the sample to firms with available balance sheet data. Robust standard errors are clustered at the firm level and we include firm level control variables (log of total assets, leverage ratio and liquidity ratio), all lagged by one year. As the last column of Table 16 shows, the effect on debt issuance is positive and significant. Firms in the upper tercile of the *Exposed*-ratio increased their loan growth by around 80%, compared to firms in the lower tercile. The single list's effects are, thus, not restricted to credit supply by affected banks, but also translate into an increase of debt issuance at the firm level. This effect is consistent with Pelizzon et al. (2023).

In Table 17 and Table 18, we show how the shock to liquidity of bank assets transmits into a positive funding shock for the real sector. Interacting the firm level exposure dummy with the Post07_t-indicator variable reveals a positive and significant effect on tangible assets (around 10 percent) and employment (around 4 percent), once firm and industry $\times$ year fixed effects are included. While both effects are robust to including firm controls such as size, leverage, and liquid asset holdings, the liquidity shock had more pronounced effects on investment. In unreported results, we do not find significant effects on firm's debt maturity profile or their liquid asset holdings. Notably, the increase in real activity is measured in 2007 and 2008, which

already contains the first quarters of the financial crisis. This suggests that the real effects of the collateral framework shock were not short-lived or restricted to periods of overall benign credit conditions.

6 Conclusion

In this paper, we discussed the transmission of bank liquidity shocks to credit supply, cross-border lending, and real effects at the firm level. Using a collateral policy change by the ECB as exogenous shock to the liquidity of bank assets, we find that harmonizing the collateral framework has an impact on banks' credit supply and the real economy. Banks with eligible assets on their balance sheet increase their lending in the syndicated loan market by around 14% compared to unaffected banks. Firms borrowing from affected banks prior to the liquidity shock experience growth in loan issuance, employment, and tangible investment.

Our results furthermore suggest that the inclusion of cross-border bank loans stimulates direct cross-border lending, but only to a small extent. The international dimension of the collateral framework shock allows us to cleanly benchmark the cross-border effects against domestic lending effects. Here, we find that the single list induced banks to primarily increase lending to domestic firms, suggesting a positive but *relatively* small international transmission of bank liquidity shocks. We also study the role of borrower fundamentals for banks' credit supply and find that additional credit supply was primarily directed to riskier firms as measured by their distance-to-default and firms active in the non-tradable sector, which is in line with conventional theories of financial intermediation.

References

Amiti, Mary and David E. Weinstein (2018). "How Much Do Idiosyncratic Bank Shocks Affect Investment? Evidence from Matched Bank-Firm Loan Data." *Journal of Political Economy* 126(2), 525–587.

Arce, Óscar, Sergio Mayordomo, and Ricardo Gimeno (2020). "Making Room for the Needy: The Credit-Reallocation Effects of the ECB's Corporate QE." *Review of Finance* 25(1), 43–84.

Ashcraft, Adam, Nicolae Garleanu, and Lasse Heje Pedersen (2011). "Two Monetary Tools: Interest Rates and Haircuts." *NBER Macroeconomics Annual* 25(1), 143–180.

Barthélemy, Jean, Vincent Bignon, and Benoît Nguyen (2018). "Monetary Policy and Collateral Constraints since the European Debt Crisis." Banque de France Working Paper 69.

Berg, Tobias et al. (2022). "Unintended Consequences of QE: Real Estate Prices and Financial Stability." mimeo.

Bernanke, Ben and Mark Gertler (1989). "Agency Costs, Net Worth, and Business Fluctuations." *American Economic Review* 79(1), 14–31.

Bernanke, Ben S and Mark Gertler (1995). "Inside the Black Box: The Credit Channel of Monetary Policy Transmission." *Journal of Economic Perspectives* 9(4), 27–48.

Bharath, Sreedhar T. and Tyler Shumway (2008). "Forecasting Default with the Merton Distance to Default Model." *Review of Financial Studies* 21(3), 1339–1369.

Bindseil, Ulrich et al. (2017). "The Eurosystem Collateral Framework Explained." *ECB Occasional Paper Series.*

Bruno, Valentina and Hyun Song Shin (2015). "Capital Flows and the Risk-Taking Channel of Monetary Policy." *Journal of Monetary Economics* 71, 119–132.

Buch, Claudia (2003). "Information or Regulation: What Drives the International Activities of Commerical Banks." *Journal of Money, Credit and Banking* 35(6), 851–869.

Burietz, A. and L. Ureche-Rangau (2020). "Better the Devil you Know: Home and Sectoral Biases in Bank Lending." *International Economics* 164, 69–85.

Cahn, Christophe, Anne Duquerroy, and William Mullins (2022). "Unconventional Monetary Policy Transmission and Bank Lending Relationships." Working Paper.

Cassola, Nuno and François Koulischer (2019). "The Collateral Channel of Open Market Operations." *Journal of Financial Stability* 41, 73–90.

Cetorelli, Nicola and Linda Goldberg (2011). "Global Banks and International Shock Transmission: Evidence from the Crisis." *IMF Economic Review* 59(1), 41–76.

Chapman, James T. E., Jonathan Chiu, and Miguel Molico (2010). "Central Bank Haircut Policy." *Annals of Finance* 7(3), 319–348.

Chava, Sudheer and Michael R. Roberts (2008). "How does Financing Impact Investment? The Role of Debt Covenants." *Journal of Finance* 63(5), 2085–2121.

Chodorow-Reich, Gabriel (2014). "The Employment Effects of Credit Market Distruptions." *Quarterly Journal of Economics Economics* 129(1), 194–208.

Choi, Dong Beom, João A C Santos, and Tanju Yorulmazer (2021). "A Theory of Collateral for the Lender of Last Resort." *Review of Finance*.

Constâncio, Vítor (2014). "The European Crisis and the Role of the Financial System." *Journal of Macroeconomics* 39, 250–259.

Davydenko, Sergei and Julian Franks (2008). "Do Bankruptcy Codes Matter? A Study of Defaults in France, Germany, and the U.K." *Journal of Finance* 63(2), 565–608.

Degryse, Hans et al. (2019). "Identifying Credit Supply Shocks with Bank-Firm Data: Methods and Applications." *Journal of Financial Intermediation* 40, 100813.

Delatte, Anne-Laure, Pranav Garg, and Jean Imbs (2019). "The Transmission Channels of Unconventional Monetary Policy: Evidence from a Change in Collateral Requirements in France." CEPII Working Paper.

Delis, Manthos D. and Georgios P. Kouretas (2011). "Interest Rates and Bank Risk-Taking." *Journal of Banking and Finance* 35(4), 840–855.

Dennis, Steven A and Donald J Mullineaux (2000). "Syndicated Loans." *Journal of Financial Intermediation* 9(4), 404–426.

Diamond, Douglas and Raghuram Rajan (2001). "Liquidity Risk, Liquidity Creation, and Financial Fragility: A Theory of Banking." *Journal of Political Economy* 109(2), 287–327.

Dinger, Valeriya and Daniel Marcel te Kaat (2020). "Cross-border Capital Flows and Bank Risk-Taking." *Journal of Banking and Finance* 117, 105842.

Doerr, Sebastian and Philipp Schaz (2021). "Geographic Diversification and Bank Lending During Crises." *Journal of Financial Economics* 140(3), 768–788.

ECB (2005). "Eurosystem Collateral Framework: Inclusion of Non-Marketable Assets in the Single List." Press Release.

— (2006). "Euro Money Market Study 2006." Technical Report.

ECB Monthly Bulletin (2006). "The Single List in the Collateral Framework of the Eurosystem." Monthly Bulletin.

Farre-Mensa, Joan and Alexander Ljungqvist (2015). "Do Measures of Financial Constraints Measure Financial Constraints?" *Review of Financial Studies* 29(2), 271–308.

Gambacorta, Leonardo (2005). "Inside the Bank Lending Channel." *European Economic Review* 49(7), 1737–1759.

Giannetti, Mariassunta and Yeejin Jang (2020). "Who Lends Before Banking Crises? Evidence from the International Syndicated Loan Market." *SSRN Electronic Journal*.

Giannetti, Mariassunta and Luc Laeven (2012). "The Flight Home Effect: Evidence from the Syndicated Loan Market during Financial Crises." *Journal of Financial Economics* 104(1), 23–43.

Giannetti, Mariassunta and Yishay Yafeh (2012). "Do Cultural Differences Between Contracting Parties Matter? Evidence from Syndicated Bank Loans." *Management Science* 58(2), 365–383.

Gilchrist, Simon and Egon Zakrajšek (2012). "Credit Spreads and Business Cycle Fluctuations." *American Economic Review* 102(4), 1692–1720.

Goetz, Martin R. and Juan Carlos Gozzi (2022). "Financial Integration and the Co-Movement of Economic Activity: Evidence from U.S. States." *Journal of International Economics* 135, 103561.

Grosse-Rueschkamp, Benjamin, Sascha Steffen, and Daniel Streitz (2019). "A Capital Structure Channel of Monetary Policy." *Journal of Financial Economics* 133(2), 357–378.

Harpedanne de Belleville, Louis-Marie (2023). "Real Effects of Central Bank Collateral Policy: Liquidity Insurance at Work." mimeo.

Hoffmann, Mathias, Egor Maslov, and Bent E. Sørensen (2022). "Small Firms and Domestic Bank Dependence in Europe's Great Recession." *Journal of International Economics*.

Huber, Kilian (2018). "Disentangling the Effects of a Banking Crisis: Evidence from German Firms and Counties." *American Economic Review* 108(3), 868–898.

Ivashina, Victoria and David Scharfstein (2010). "Bank Lending During the Financial Crisis of 2008." *Journal of Financial Economics* 97(3), 319–338.

Iyer, Rajkamal et al. (2013). "Interbank Liquidity Crunch and the Firm Credit Crunch: Evidence from the 2007–2009 Crisis." *Review of Financial Studies* 27(1), 347–372.

Jiménez, Gabriel et al. (2014). "Hazardous Times for Monetary Policy: What Do Twenty-Three Million Bank Loans Say About the Effects of Monetary Policy on Credit Risk-Taking?" *Econometrica* 82(2), 463–505.

Karakaya, Neslihan, Tomasz K. Michalski, and Evren Örs (2022). "Banking Integration and Growth: Role of Banks' Previous Industry Exposure." *Journal of Financial Intermediation* 49, 100944.

Kashyap, Anil K. and Jeremy C. Stein (2000). "What Do a Million Observations on Banks Say about the Transmission of Monetary Policy?" *American Economic Review* 90(3), 407–428.

Khwaja, Asim Ijaz and Atif Mian (2008). "Tracing the Impact of Bank Liquidity Shocks: Evidence from an Emerging Market." *American Economic Review* 98(4), 1413–1442.

Koulischer, François and Daan Struyven (2014). "Central Bank Liquidity Provision and Collateral Quality." *Journal of Banking and Finance* (49), 113–130.

Lane, Philip R (2012). "The European Sovereign Debt Crisis." *Journal of Economic Perspectives* 26(3), 49–68.

Martinez, Joseba, Thomas Philippon, and Markus Sihvonen (Nov. 2022). "Doeas a Currency Union need a Capital Market Union?" *Journal of International Economics* 139(103675).

Merton, Robert (1974). "On the Pricing of Corporate Debt: The Risk Structure of Interest Rates." *Journal of Finance* 29, 449–470.

Mésonnier, Jean-Stéphane, Charles O'Donnell, and Olivier Toutain (2021). "The Interest of Being Eligible." *Journal of Money, Credit and Banking* 54(2-3), 425–458.

Mitchener, Kris James and Gary Richardson (2019). "Network Contagion and Interbank Amplification during the Great Depression." *Journal of Political Economy* 127(2), 465–507.

Morgan, Donald, Bertrand Rime, and Philip Strahan (2004). "Bank Integration and State Business Cycles." *Quarterly Journal of Economics* 119(4), 1555–1584.

Müller, Karsten and Emil Verner (2021). "Credit Allocation and Macroeconomic Fluctuations." Working Paper.

Nyborg, Kjell (2017). *Collateral Frameworks: The Open Secret of Central Banks*. Cambridge University Press.

Paravasini, Daniel (2008). "Local Bank Financial Constraints and Firm Access to External Finance." *Journal of Finance* 63(5), 2161–2193.

Peek, Joe and Eric S Rosengren (2000). "Collateral Damage: Effects of the Japanese Bank Crisis on Real Activity in the United States." *American Economic Review* 90(1), 30–45.

Pelizzon, Loriana et al. (2023). "The Corporate Debt Supply Effects of the Eurosystem's Collateral Framework." SAFE Working Paper No. 275.

Popov, Alexander and Gregory F. Udell (2012). "Cross-border banking, credit access, and the financial crisis." *Journal of International Economics* 87(1), 147–161.

Puri, Manju, Jörg Rocholl, and Sascha Steffen (2011). "Global Retail Lending in the Aftermath of the US Financial Crisis: Distinguishing Between Supply and Demand Effects." *Journal of Financial Economics* 100(3), 556–578.

Sauerzopf, Birgit (2007). "Credit Claims as Eligible Collateral for Eurosystem Credit Operations." Monetary Policy and the Economy, Oesterreichische Nationalbank.

Schnabl, Philipp (2012). "The International Transmission of Bank Liquidity Shocks: Evidence from an Emerging Market." *Journal of Finance* 67(3), 897–932.

Schwert, Michael (2018). "Bank Capital and Lending Relationships." *Journal of Finance* 73(2), 787–830.

Tabakis, Evangelos and Kentaro Tamura (2013). "The Use of Credit Claims as Collateral for Eurosystem Credit Operations." *ECB Occasional Paper Series* (148).

Van Bekkum, Sjoerd, Marc Gabarro, and Rustom M. Irani (2018). "Does a Larger Menu Increase Appetite? Collateral Eligibility and Credit Supply." *Review of Financial Studies* 31(3), 943–979.

Van Nieuwerburgh, Stijn and Laura Veldkamp (2009). "Information Immobility and the Home Bias Puzzle." *Journal of Finance* 64(3), 1187–1215.

7 Tables and Figures

7.1 Summary Statistics

This subsection presents summary statistics at the loan, bank, and firm level.

Table 1: **Summary Statistics: Bank-Loan-Quarter Level.** This table presents summary statistics on the bank-loan-quarter level. The sample period is Q1 2006 to Q4 2007. *Loan amount* is the loan issuance granted by euro-area lead arranger i to firm j at quarter t. The *spread* is calculated as the yield minus LIBOR including annual fees, measured in basis points. *Loan Deal Purpose* is a categorical variable with five categories: Other Corporate (1), Working Capital (2), Fixed Investment (3), Debt Repayment (4), M & A (5).

	mean	sd	min	max	count
Loan amount (mn USD)	451.13	711.36	8.96	3,176.25	3,209
Spread (bps)	203.72	129.69	25.00	550.00	3,209
Maturity (months)	85.11	41.66	5.00	515.00	3,167
Share of lead arrangers (%)	1.00	0.00	1.00	1.00	3,209
Loan Deal Purpose $\in 0, 5$	3.33	1.64	1.00	5.00	3,209
Loan Refinancing (0/1)	0.30	0.46	0.00	1.00	3,209
Loan Secured (0/1)	0.97	0.17	0.00	1.00	2,301
Distance to Default	15.23	14.35	4.08	42.56	245
Foreign loans (%)	0.46	0.50	0.00	1.00	3,209
Euro area loans (%)	0.54	0.50	0.00	1.00	3,209
Of which					
Other euro area loans (%)	0.38	0.49	0.00	1.00	1,747
Domestic loans (%)	0.62	0.49	0.00	1.00	1,747

Table 2: **Summary Statistics: Distribution over Countries.** This table splits loan-level observations over the full sample by bank headquarter country.

Country	Number of Loans	Frequency (%)
Austria	15	0.47
Belgium	57	1.78
France	1,373	42.83
Germany	786	24.52
Greece	2	0.06
Ireland	67	2.09
Italy	288	8.98
Netherlands	383	11.95
Portugal	10	0.31
Spain	225	7.02

Table 3: **Summary Statistics: Bank Level.** Panel A presents summary statistics for all euro area banks included in the baseline sample from Q1 2006 to Q4 2006. *Loans ratio* refers to gross loans outstanding and is defined - as all other ratios - over total assets and indicated in percent. The *Affected*-measure is defined according to equation (2). Panel B shows univariate t-tests between affected and unaffected banks, based on a median split along the *Affected*-measure (2) in the period prior to the collateral framework shock Q1 2006 - Q4 2006.

Panel A: Full Sample

	Mean	SD	Min	Max	Count
ln(Total Assets)	12.08	1.36	8.83	14.17	35
Loans ratio	58.86	17.77	14.84	85.38	35
Securities ratio	25.74	20.68	6.41	94.08	35
Cash ratio	1.49	2.22	0.02	11.12	35
Deposit ratio	40.53	18.79	5.17	72.87	35
Equity ratio	4.98	2.64	2.21	15.23	35
Return on Equity (%)	15.29	6.21	4.63	29.17	35
$\text{Affected}_i(\%)$	61.36	36.89	0.00	100.00	35
$\text{Affected}_i(0/1)$	0.46	0.51	0.00	1.00	35

Panel B: Univariate t-tests

	Less Affected		More Affected			
	Mean	N	Mean	N	Diff.	t-stat.
ln(Total Assets)	12.00	19	12.17	16	-0.173	-0.370
Loans ratio	62.19	19	54.91	16	7.274	1.215
Securities ratio	31.00	19	19.50	16	11.504	1.683
Cash ratio	1.32	19	1.68	16	-0.364	-0.477
Deposit ratio	38.17	19	43.34	16	-5.180	-0.808
Equity ratio	4.50	19	5.55	16	-1.048	-1.179
Return on Equity (%)	13.63	19	17.25	16	-3.613*	-1.768

Table 4: **List of Banks.**

Bank	Country
Raiffeisen Zentralbank	Austria
Fortis Bank	Belgium
KBC Group	Belgium
Societe Generale	France
BNP Paribas	France
Natixis	France
Credit Agricole	France
Portigon AG	Germany
Landesbank Hessen-Thuringen	Germany
BayernLB	Germany
Landesbank Baden-Wurttemberg	Germany
Deutsche Bank	Germany
DZ Bank	Germany
HSH Nordbank	Germany
IKB Deutsche Industrie Bank	Germany
NordLB	Germany
Commerzbank	Germany
Alpha Bank	Greece
Bank of Ireland Group	Ireland
Allied Irish Banks	Ireland
Unione di Banche Italiane	Italy
Mediobanca	Italy
UniCredit	Italy
Intesa Sanpaolo	Italy
Rabobank	Netherlands
ING Group	Netherlands
Caixa Geral de Depositos	Portugal
Caixabank	Spain
Banco Guipuzcoano	Spain
Banco Pastor	Spain
Banco Bilbao Vizcaya Argentaria	Spain
Bankinter	Spain
Banco de Sabadell	Spain
Banco Santander	Spain

Table 5: **Summary Statistics: Firm Level.** This table presents summary statistics for the firm cross-section in 2005-2006, the years prior to the collateral framework shock. *Loan Vol* refers to the sum of issued syndicated loans issued to firm j in year t. *Leverage* is based on firm j's long term debt, *Liquidity* refers to operating net cash flows (Compustat item "ibc"). Both ratios are defined with respect to total assets and indicated in percentage points. The last two columns in Panel B shows the univariate t-statistic for a test of equal means between both groups in 2006, the year prior to the collateral framework shock.

Panel A: Full Sample

	Mean	SD	Min	Max	Count
ln(Loan amount)	2.86	3.47	0.00	12.28	1,121
ln(Total assets)	8.25	1.72	4.40	14.89	1,068
Leverage ratio	37.67	17.87	0.06	79.40	1,070
Liquidity ratio	3.15	6.77	-25.13	19.44	1,074
ln(Tangible assets)	6.86	2.22	1.59	13.51	1,042
ln(No of employees)	2.16	1.23	0.04	5.03	938
$\text{Exposed}_j(0/1)$	0.50	0.50	0.00	1.00	1,121
$\text{Exposed}_j(\%)$	46.94	36.76	0.00	100.00	1,121

Panel B: Univariate t-tests

	Less Exposed		More Exposed		Diff	t-stat
ln(Loan amount)	2.94	180	3.07	189	-0.132	-0.363
ln(Total assets)	8.30	170	8.13	180	0.170	0.931
Leverage ratio	37.42	172	37.87	178	-0.454	-0.237
Liquidity ratio	2.09	172	3.23	180	-1.142	-1.497
ln(Tangible assets)	6.97	169	6.69	172	0.276	1.160
ln(No of employees)	2.34	150	2.05	151	0.285**	2.054

7.2 Baseline Results

Table 6: **Loan Supply: Loan-Quarter Level.** This table presents the effect of the single list's introduction on credit supply. *Loan Vol* is the loan issuance from bank i to firm j at quarter t. *Affected$_i$(0/1)* is based on a median split of banks along the *Affected*-measure, see equation (2). *DomAff$_i$*(0/1) equals one for banks located in countries where the respective national banks *did not accept* domestic bank loans as collateral before the policy change. It is equal to zero for banks located in countries where the respective national banks accepted domestic bank loans (ES, FR, DE, AT, NL, IE). *Post07$_t$* indicates the single-list regime after January 2007. The control variables on bank and loan level are lagged by 4 quarters. ***, **, * denote significance at the 1, 5, and 10% level, respectively.

	(1)	(2)	(3)	(4)	(5)
VARIABLES	ln(Loan Vol)	ln(Loan Vol)	ln(Loan Vol)	ln(Loan Vol)	ln(Loan Vol)
Affected$_i$(0/1) × Post07$_t$	0.165	0.115***	0.148***	0.111***	0.149***
	(0.149)	(0.041)	(0.047)	(0.032)	(0.048)
ln(Total Assets)			0.105**	0.053	0.113
			(0.051)	(0.035)	(0.103)
Equity ratio			-0.013	-0.009	-0.011
			(0.016)	(0.011)	(0.025)
Return on Equity			0.000	-0.000	0.000
			(0.001)	(0.000)	(0.001)
Cash ratio			-0.002	-0.005*	-0.001
			(0.009)	(0.003)	(0.011)
Securities ratio			-0.002*	-0.000	-0.002**
			(0.001)	(0.001)	(0.001)
Deposit ratio			0.001	0.001	0.001
			(0.001)	(0.001)	(0.001)
Loan refinancing			0.663*	0.669*	0.671*
			(0.380)	(0.375)	(0.376)
Loan secured			0.468***	0.468***	0.499***
			(0.122)	(0.121)	(0.129)
Loan purpose			0.098	0.098	0.098
			(0.116)	(0.114)	(0.108)
Post07$_t$	0.143				
	(0.102)				
DomAff$_i$(0/1) × Post07$_t$				-0.054	
				(0.046)	
Observations	3,206	3,206	3,206	3,206	3,180
R-squared	0.847	0.865	0.866	0.866	0.867
Bank-level Controls	No	No	Yes	Yes	Yes
Loan-level Controls	No	No	Yes	Yes	Yes
Bank × Firm FE	Yes	Yes	Yes	Yes	Yes
FirmCountry × Time FE	No	Yes	Yes	Yes	Yes
FirmCountry × Industry × Time FE	No	No	No	No	Yes
BankCountry × Time FE	No	Yes	Yes	No	Yes
Firm × Time FE	No	Yes	Yes	Yes	No
Cluster	Bank	Bank	Bank	Bank	Bank

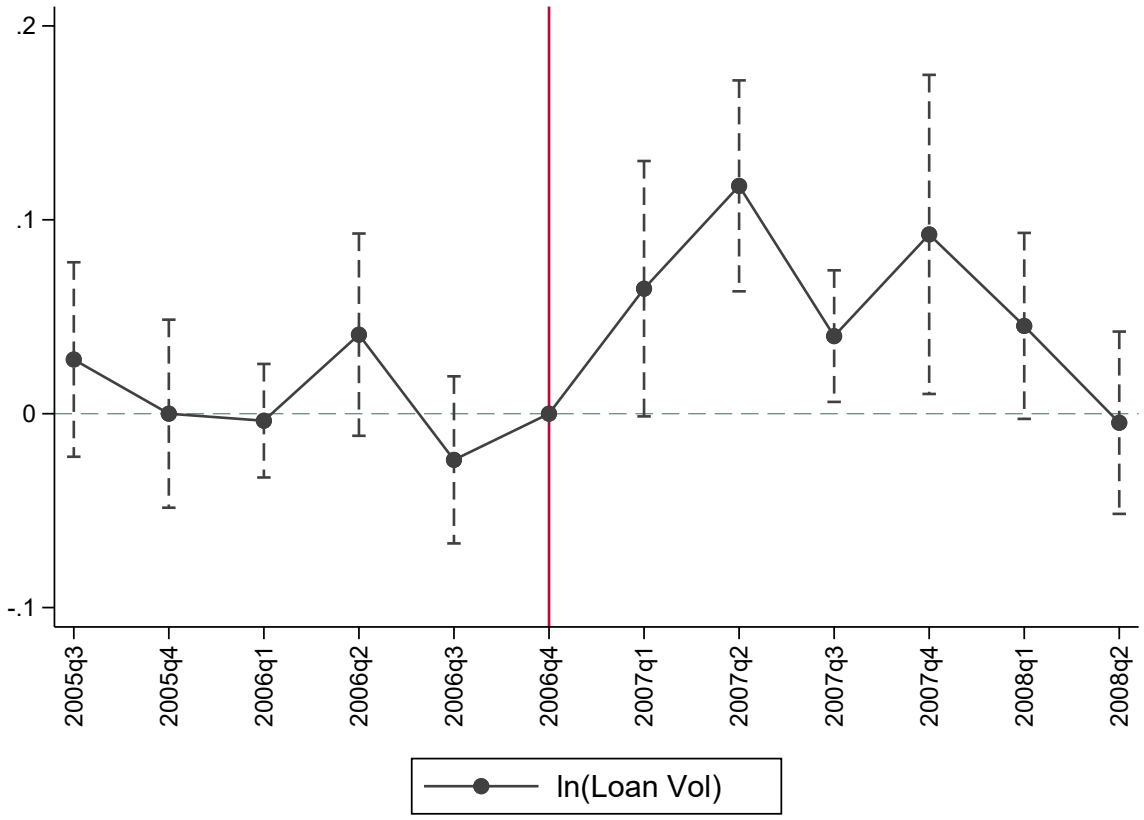


Figure 2: **Parallel Trend Assumption.** The figure is based on the following equation:

$$\log(L_{ijt}) = \sum_{\tau \neq Q4\ 2006} \beta_\tau \text{Affected}_i(0/1) \times \mathbf{1}\{\tau = t\} + \varepsilon_{ijt}\ ,$$

$\mathbf{1}\{\tau = t\}$ is a dummy variable that equals one in quarter t and 0 otherwise. Q4 2006, the quarter before the collateral framework shock, is excluded to estimate the dynamic effect. The dashed lines represent 90% confidence intervals, adjusted for bank level clustering.

7.3 Additional Results and Robustness

Table 7: **Loan Supply: Extensive and Total Margin.** This table presents the effect of the single list's introduction on credit supply. The sample is extended into a balanced panel of firm-bank pairs at the quarterly frequency, including zeros where there was no interaction in the firm-bank pair. The dependent variable in the first two columns, *Loan Vol*, is the loan issuance from lead bank i to firm j at quarter t. The dependent variable in the last two Column, *Pr Loan*, equals one if lead bank i extended a loan to firm j at quarter t. $Affected_i(0/1)$ is based on a median split of banks along the *Affected*-measure, see equation (2). $Post07_t$ indicates the single-list regime after January 2007. The control variables on bank and loan level are lagged by 4 quarters. ***, **, * denote significance at the 1, 5, and 10% level, respectively.

	(1)	(2)	(3)	(4)
VARIABLES	ln(Loan Vol)	ln(Loan Vol)	Pr(Loan)	Pr(Loan)
$\text{Affected}_i(0/1) \times \text{Post07}_t$	-0.051	0.067**	-0.008	0.010**
	(0.065)	(0.032)	(0.011)	(0.005)
Post07_t	-0.047		-0.008	
	(0.043)		(0.008)	
Observations	10,992	10,992	10,992	10,992
R-squared	0.001	0.949	0.001	0.947
Bank FE	Yes	Yes	Yes	Yes
BankCountry × Time FE	No	Yes	No	Yes
Firm × Time FE	No	Yes	No	Yes
Cluster	Bank	Bank	Bank	Bank

Table 8: **Interest Rate Spreads: Loan-Quarter Level.** This table presents the effect of the single list's introduction on loan spreads. *Affected$_i$(0/1)* is based on a median split of banks along the *Affected*-measure, see equation (2). *Post07$_t$* indicates the single-list regime after January 2007. The control variables on bank and loan level are lagged by 4 quarters. ***, **, * denote significance at the 1, 5, and 10% level, respectively.

	(1)	(2)	(3)	(4)	(5)
VARIABLES	Spread	Spread	Spread	Spread	Spread
Affected$_i(0/1) \times$ Post07$_t$	9.546	-14.221*	-16.233***	-10.970***	-15.321***
	(20.399)	(7.049)	(3.912)	(3.139)	(4.216)
ln(Total Assets)			-20.055	-7.392	-6.065
			(13.492)	(10.612)	(8.486)
Equity ratio			-2.444	0.774	0.756
			(4.612)	(2.561)	(3.069)
Return on Equity			-0.064	0.048	0.048
			(0.125)	(0.094)	(0.141)
Cash ratio			5.166*	4.347	6.174
			(2.912)	(2.634)	(3.801)
Securities ratio			0.925	0.661	0.861
			(1.059)	(0.700)	(1.081)
Deposit ratio			-0.126	-0.160	-0.243
			(0.284)	(0.192)	(0.229)
Loan refinancing			-26.588	-26.577	-27.685
			(25.604)	(25.235)	(25.114)
Loan secured			-21.629	-21.627	-23.439
			(15.451)	(15.271)	(16.342)
Loan purpose			17.235**	17.302**	15.903**
			(7.893)	(7.787)	(7.724)
Post07$_t$	-22.838**				
	(9.062)				
DomAff$_i(0/1) \times$ Post07$_t$				-14.086***	
				(4.844)	
Observations	3,206	3,206	3,206	3,206	3,180
R-squared	0.766	0.782	0.782	0.782	0.781
Bank-level Controls	No	No	Yes	Yes	Yes
Loan-level Controls	No	No	Yes	Yes	Yes
Bank × Firm FE	Yes	Yes	Yes	Yes	Yes
FirmCountry × Time FE	No	Yes	Yes	Yes	Yes
FirmCountry × Industry × Time FE	No	No	No	No	Yes
BankCountry × Time FE	No	Yes	Yes	No	Yes
Firm × Time FE	No	Yes	Yes	Yes	No
Cluster	Bank	Bank	Bank	Bank	Bank

Table 9: **Falsification Test: Foreign Banks.** This table presents the effect of the single list's introduction on credit supply. The analysis is based on data on the bank-loan-quarter level from Q1 2006 to Q4 2007. *Loan Vol* is the loan issuance from bank i to firm j at quarter t. *Affected$_i$(0/1)* is based on a median split of banks along the placebo measure (5). *Post07$_t$* indicates the single-list regime after January 2007. The control variables on bank and loan level are lagged by 4 quarters. Country-fixed effects are based on firm headquarters. ***, **, * denote significance at the 1, 5, and 10% level, respectively.

	(1)	(2)	(3)	(4)
VARIABLES	ln(Loan Vol)	ln(Loan Vol)	ln(Loan Vol)	ln(Loan Vol)
ForAff$_i$(0/1) × Post07$_t$	0.070	-0.079***	-0.016	0.009
	(0.076)	(0.023)	(0.088)	(0.074)
Observations	3,492	3,492	3,492	3,434
R-squared	0.857	0.860	0.861	0.862
Bank-level Controls	No	No	Yes	Yes
Loan-level Controls	No	No	Yes	Yes
Bank × Firm FE	Yes	Yes	Yes	Yes
Country × Time FE	No	Yes	Yes	Yes
Country × Industry × Time FE	No	No	No	Yes
Firm × Time FE	No	Yes	Yes	No
Cluster	Bank	Bank	Bank	Bank

Table 10: **Falsification Test: Credit Lines.** This table presents the effect of the single list's introduction on credit supply. The analysis is based on data on the bank-loan-quarter level from Q1 2006 to Q4 2007. *Loan Vol* is the loan issuance from bank i to firm j at quarter t. *Affected$_i$(0/1)* is based on a median split of banks along the placebo measure using (always ineligible) revolving credit lines. *Post07$_t$* indicates the single-list regime after January 2007. The control variables on bank and loan level are lagged by 4 quarters. Country-fixed effects are based on firm headquarters. ***, **, * denote significance at the 1, 5, and 10% level, respectively.

	(1)	(2)	(3)	(4)
VARIABLES	ln(Loan Vol)	ln(Loan Vol)	ln(Loan Vol)	ln(Loan Vol)
Affected$_i$(0/1) × Post07$_t$	-0.112	-0.030	-0.032*	-0.021
	(0.101)	(0.019)	(0.018)	(0.021)
Post07$_t$	0.144**			
	(0.060)			
Observations	1,826	1,826	1,826	1,818
R-squared	0.893	0.909	0.910	0.912
Bank-level Controls	No	No	Yes	Yes
Loan-level Controls	No	No	Yes	Yes
Bank × Firm FE	Yes	Yes	Yes	Yes
Country × Time FE	No	Yes	Yes	Yes
Country × Industry × Time FE	No	No	No	Yes
Firm × Time FE	No	Yes	Yes	No
Cluster	Bank	Bank	Bank	Bank

Table 11: **Announcement Effect.** This table presents the effect of the single list's announcement date on credit supply. *Loan Vol* is the loan issuance from bank i to firm j at quarter t. *Affected$_i$(0/1)* is based on a median split of banks along the *Affected*-measure, see equation (2). *Post05$_t$* indicates the announcement of the single-list regime after June 2005. The control variables on bank and loan level are lagged by 4 quarters. Country-fixed effects are based on firm headquarters. ***, **, * denote significance at the 1, 5, and 10% level, respectively.

	(1)	(2)	(3)	(4)
VARIABLES	ln(Loan Vol)	ln(Loan Vol)	ln(Loan Vol)	ln(Loan Vol)
Affected$_i$(0/1) × Post05$_t$	0.009	0.039	0.031	0.023
	(0.151)	(0.024)	(0.024)	(0.023)
Observations	3,372	3,372	3,372	3,351
R-squared	0.865	0.876	0.877	0.877
Bank-level Controls	No	No	Yes	Yes
Loan-level Controls	No	No	Yes	Yes
Bank × Firm FE	Yes	Yes	Yes	Yes
Country × Time FE	No	Yes	Yes	Yes
Country × Industry × Time FE	No	No	No	Yes
Firm × Time FE	No	Yes	Yes	No
Cluster	Bank	Bank	Bank	Bank

Table 12: **Lead Arranger and Participant Sample.** This table presents the effect of the single list's introduction on credit supply by lead arrangers *and* participating banks. *Loan Vol* is the loan issuance from bank i to firm j at quarter t. *Affected$_i$(0/1)* is based on a median split of banks along the *Affected*-measure, see equation (2). *Post07$_t$* indicates the single-list regime after January 2007. The control variables on bank and loan level are lagged by 4 quarters. Country-fixed effects are based on firm headquarters. ***, **, * denote significance at the 1, 5, and 10% level, respectively.

	(1)	(2)	(3)	(4)
VARIABLES	ln(Loan Vol)	ln(Loan Vol)	ln(Loan Vol)	ln(Loan Vol)
Affected$_i$(0/1) × Post07$_t$	0.051	0.048***	0.044***	0.023
	(0.050)	(0.013)	(0.016)	(0.019)
Observations	10,117	10,117	10,117	9,997
R-squared	0.857	0.862	0.863	0.864
Bank-level Controls	No	No	Yes	Yes
Loan-level Controls	No	No	Yes	Yes
Bank × Firm FE	Yes	Yes	Yes	Yes
Country × Time FE	No	Yes	Yes	Yes
Country × Industry × Time FE	No	No	No	Yes
Firm × Time FE	No	Yes	Yes	No
Cluster	Bank	Bank	Bank	Bank

7.4 Borrower Characteristics

Table 13: **Loan Supply: Geographical Distribution.** This table provides sample splits according to borrower location vis-a-vis banks. The analysis is based on data on the bank-loan-quarter level from Q1 2006 to Q4 2007. *Loan Vol* is the loan issuance from lead bank i to firm j at quarter t. *Affected$_i$(0/1)* is based on a median split of banks along the *Affected*-measure, see equation (2). *Post07$_t$* indicates the single-list regime after January 2007. The control variables on bank and loan level are lagged by 4 quarters. Country-fixed effects are based on firm headquarters. ***, **, * denote significance at the 1, 5, and 10% level, respectively.

VARIABLES	(1) Domestic ln(Loan Vol)	(2) Domestic ln(Loan Vol)	(3) Other EA ln(Loan Vol)	(4) Other EA ln(Loan Vol)	(5) Non EA ln(Loan Vol)	(6) Non EA ln(Loan Vol)
Affected$_i$(0/1) × Post07$_t$	0.311***	0.296***	0.019**	0.019**	0.015	0.015
	(0.032)	(0.030)	(0.008)	(0.007)	(0.016)	(0.016)
Observations	941	943	800	800	1,462	1,445
R-squared	0.893	0.893	0.867	0.867	0.838	0.839
Bank-level Controls	Yes	Yes	Yes	Yes	Yes	Yes
Loan-level Controls	Yes	Yes	Yes	Yes	Yes	Yes
Bank × Firm FE	Yes	Yes	Yes	Yes	Yes	Yes
Country × Time FE	Yes	Yes	Yes	Yes	Yes	Yes
Country × Industry × Time FE	No	Yes	No	Yes	No	Yes
Firm × Time FE	Yes	No	Yes	No	Yes	No
Cluster	Bank	Bank	Bank	Bank	Bank	Bank

VARIABLES	(1) Domestic Spread	(2) Domestic Spread	(3) Other EA Spread	(4) Other EA Spread	(5) Non EA Spread	(6) Non EA Spread
Affected$_i$(0/1) × Post07$_t$	-23.630***	-21.367**	-14.144*	-14.144*	0.695	0.702
	(7.560)	(9.689)	(7.634)	(7.558)	(0.960)	(0.952)
Observations	941	943	800	800	1,462	1,445
R-squared	0.699	0.700	0.737	0.737	0.830	0.829
Bank-level Controls	Yes	Yes	Yes	Yes	Yes	Yes
Loan-level Controls	Yes	Yes	Yes	Yes	Yes	Yes
Bank × Firm FE	Yes	Yes	Yes	Yes	Yes	Yes
Country × Time FE	Yes	Yes	Yes	Yes	Yes	Yes
Country × Industry × Time FE	No	Yes	No	Yes	No	Yes
Firm × Time FE	Yes	No	Yes	No	Yes	No
Cluster	Bank	Bank	Bank	Bank	Bank	Bank

Table 14: **Loan Supply: Borrower Characteristics.** This table provides a sample split according to borrower sector. The analysis is based on data on the bank-loan-quarter level from Q1 2006 to Q4 2007. *Loan Vol* is the loan issuance from bank i to firm j at quarter t. *Affected$_i$(0/1)* is based on a median split of banks along the *Affected*-measure, see equation (2). *Tradable* are firms active in tradable industries (SIC code 2000-3999). *Non-tradable* are firms active in non-tradable industries (SIC code 5000-5999,6500-6599, 7000-7099). *Post07$_t$* indicates the single-list regime after January 2007. The control variables on bank and loan level are lagged by 4 quarters. Country-fixed effects are based on firm headquarters. ***, **, * denote significance at the 1, 5, and 10% level, respectively.

	(1)	(2)	(3)	(4)
	Tradable	Tradable	Non Tradable	Non Tradable
VARIABLES	ln(Loan Vol)	ln(Loan Vol)	ln(Loan Vol)	ln(Loan Vol)
Affected$_i$(0/1) × Post07$_t$	0.014	0.014	0.104***	0.132***
	(0.023)	(0.023)	(0.024)	(0.023)
Observations	1,117	1,120	503	506
R-squared	0.881	0.881	0.763	0.765
Bank-level Controls	Yes	Yes	Yes	Yes
Loan-level Controls	Yes	Yes	Yes	Yes
Bank × Firm FE	Yes	Yes	Yes	Yes
Country × Time FE	Yes	Yes	Yes	Yes
Country × Industry × Time FE	No	Yes	No	Yes
Firm × Time FE	Yes	No	Yes	No
Cluster	Bank	Bank	Bank	Bank

Table 15: **Bank Risk Taking.** This table provides evidence on bank risk taking by estimating (6) using data from Q1 2006 to Q4 2007. *Affected$_i$ (0/1)* is based on a median split of banks along the *Affected*-measure, see equation (2). *Post07$_t$* indicates the single-list regime after January 2007. The control variables on bank and loan level are lagged by 4 quarters. Country-fixed effects are based on the bank headquarters. ***, **, * denote significance at the 1, 5, and 10% level, respectively.

	(1)	(2)	(3)
VARIABLES	D2D	D2D	D2D
Affected$_i$(0/1) × Post07$_t$	-0.036	-0.016*	-0.007**
	(0.033)	(0.008)	(0.002)
ln(Total Assets)			0.044***
			(0.009)
Equity ratio			0.028***
			(0.004)
Cash ratio			0.037***
			(0.007)
Security ratio			-0.001
			(0.000)
Deposit ratio			-0.001*
			(0.000)
Observations	245	245	245
R-squared	0.858	0.993	0.998
Bank-level Controls	No	No	Yes
Bank-Country × Time FE	No	Yes	Yes
Cluster	Bank	Bank	Bank

7.5 Firm Level Results

Table 16: **Firm Level: Loan Growth.** This table provides results at the firm-year level from 2005 to 2008. The treatment variable *Exposed$_j$ (0/1)* equals one for firms in the upper tercile of the *Exposure*-measure (7) and zero for firms in the lower tercile. *Post07$_t$* equals one after the collateral framework shock in January 2007, and zero otherwise. ***, **, *, $^+$ denote significance at the 1, 5, 10, and 15% level, respectively.

	(1)	(2)	(3)
VARIABLES	Δ ln(loan volume)	Δ ln(loan volume)	Δ ln(loan volume)
Exposed$_j$(0/1) $\times$Post07$_t$	0.768*	0.801$^+$	0.865*
	(0.420)	(0.507)	(0.498)
ln(Assets)$_{j,t-1}$			-1.984***
			(0.581)
Leverage$_{j,t-1}$			-7.028***
			(2.111)
Liquidity$_{j,t-1}$			-1.735
			(3.394)
Exposed$_j$ (0/1)	-0.677**		
	(0.288)		
Post07$_t$	-0.990***		
	(0.317)		
Observations	1,816	1,816	1,816
R-squared	0.006	0.173	0.196
Firm Controls	No	No	Yes
Firm FE	No	Yes	Yes
Industry $\times$ Year FE	No	Yes	Yes
Cluster	Firm	Firm	Firm

Table 17: **Firm Level: Tangible Assets.** This table provides results at the firm-year level from 2005 to 2008. The treatment variable *Exposed$_j$ (0/1)* equals one for firms in the upper tercile of the *Exposure*-measure (7) and zero for firms in the lower tercile. *Post07$_t$* equals one after the collateral framework shock in January 2007, and zero otherwise. ***, **, * denote significance at the 1, 5, and 10% level, respectively.

	(1)	(2)	(3)
VARIABLES	ln(Tangible assets)	ln(Tangible assets)	ln(Tangible assets)
Exposed$_j$(0/1) ×Post07$_t$	-0.026	0.120**	0.085**
	(0.153)	(0.047)	(0.037)
ln(Assets)$_{j,t-1}$			0.362***
			(0.045)
Leverage$_{j,t-1}$			-0.120
			(0.131)
Liquidity$_{j,t-1}$			0.247
			(0.217)
Exposed$_j$(0/1)	-0.432*		
	(0.224)		
Post07$_t$	0.116		
	(0.120)		
Observations	1,629	1,629	1,629
R-squared	0.010	0.986	0.988
Firm Controls	No	No	Yes
Firm FE	No	Yes	Yes
Industry × Year FE	No	Yes	Yes
Cluster	Firm	Firm	Firm

Table 18: **Firm Level: Employment.** This table provides results at the firm-year level from 2005 to 2008. The treatment variable *Exposed$_j$ (0/1)* equals one for firms in the upper tercile of the *Exposure*-measure (7) and zero for firms in the lower tercile. *Post07$_t$* equals one after the collateral framework shock in January 2007, and zero otherwise. ***, **, *, $^+$ denote significance at the 1, 5, 10, and 15% level, respectively.

	(1)	(2)	(3)
VARIABLES	ln(Employ)	ln(Employ)	ln(Employ)
Exposed$_j$(0/1) ×Post07$_t$	0.084	0.044*	0.036$^+$
	(0.091)	(0.026)	(0.025)
ln(Assets)$_{j,t-1}$			0.162***
			(0.035)
Leverage$_{j,t-1}$			-0.132
			(0.094)
Liquidity$_{j,t-1}$			0.078
			(0.123)
Exposed$_j$ (0/1)	-0.304**		
	(0.136)		
Post07$_t$	-0.128*		
	(0.073)		
Observations	1,390	1,390	1,390
R-squared	0.012	0.992	0.993
Firm Controls	No	No	Yes
Firm FE	No	Yes	Yes
Industry × Year FE	No	Yes	Yes
Cluster	Firm	Firm	Firm

Table 19: Variable Definitions

Variable	Source	Description
Loan volume	DealScan	Loan volume to firm j by bank i in quarter t
Spread	DealScan	Spread over LIBOR including annual fees in basis points
Maturity	DealScan	Maturity of syndicated loan in months
Lead arranger	DealScan	Indicator variable equal to one if a bank acts as lead arranger
Ln(volume)	DealScan	Logarithm of (one plus) the loan issuance from bank i to firm j at quarter t
ln(Total Assets)	CapitalIQ	Logarithm of one plus total assets
Loans ratio	CapitalIQ	Share of gross loans over total loans
Equity ratio	CapitalIQ	Share of equity over total assets (leverage ratio)
ROE (%)	CapitalIQ	Return on equity
Cash ratio	CapitalIQ	Share of cash and equivalents over total assets
Securities ratio	CapitalIQ	Share of investment securities over total assets
Deposit ratio	CapitalIQ	Share of deposits over total assets
Tradable	Compustat	Indicator equals one if firm j is active in tradable industries (SIC codes 2000-3999)
Non-tradable	Compustat	Indicator equals one if firm j is active in non-tradable industries (SIC codes 1500-1799, 5000-5999, 7000-7099)
Pr(Loan)	DealScan	Indicator variable that equals one if firm j obtains a bank loan in period t, and zero otherwise
ln(Total assets)	Compustat	Natural logarithm of one plus total assets
Leverage	Compustat	Ratio of long term debt to total assets
Liquidity	Compustat	Ratio of cash equivalents over total assets
Employment	Compustat	Number of employees, in thousands
PPE	Compustat	Plants, Property and Equipment
D2D	Compustat	Distance-to-default, computed over a one-year horizon

Appendix for "The Transmission of Bank Liquidity Shocks: Evidence from the Eurosystem Collateral Framework"

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September 29, 2023

A Subsidiary Level

In this section, we directly test for credit supply effects of the single list at the subsidiary level. We re-estimate (3) at the *subsidiary-level*:

$$ln(L_{kjt}) = \beta_1 \text{Affected}_k(0/1) \times \text{Post07}_t + \beta \text{X}_{i,t-4} + \mu_{kj} + \nu_{jt} + c_{jt} + \epsilon_{kjt} \ . \tag{9}$$

The median-split is now performed at the subsidiary level, such that a bank group i can have both affected and unaffected subsidiaries. Bank-firm fixed effects μ_{kj} are now defined at the subsidiary level, as is the clustering of standard errors. Since eligibility is restricted to loans involving at most two jurisdictions, we expect to observe significant effects at the subsidiary level as well.

Table A.1 shows the results of estimating the single list's effect on loan supply at the subsidiary level. Similar to the baseline specification, the coefficient of interest β_1 is significantly positive after including country $\times$ time and firm $\times$ time fixed effects and is robust to including loan-level controls and modifications in the fixed effect structure. Subsidiaries increase loan supply by 5.1% to 7.4%, depending on the specification: the effect size is slightly smaller than in the baseline but of comparable magnitude.

Table A.1: **Credit Supply: Subsidiary Level.** This table presents the effect of the single list's introduction on credit supply of subsidiaries. The analysis is based on data on the bank-loan-quarter level from Q1 2006 to Q4 2007. *Loan Vol* is the loan issuance from subsidiary s to firm j at quarter t. *Affected$_k$(0/1)* is based on a median split of subsidiaries along the subsidiary-level *Affected*-measure, see equation (1). *Post07*$_t$ indicates the single-list regime after January 2007. The loan-level control variables are lagged by 4 quarters. Country-fixed effects are based on borrower headquarters. ***, **, * denote significance at the 1, 5, and 10% level, respectively.

	(1)	(2)	(3)	(4)	(5)
VARIABLES	ln(Loan Vol)	ln(Loan Vol)	ln(Loan Vol)	ln(Loan Vol)	ln(Loan Vol)
Affected$_k$(0/1) × Post07$_t$	0.199	0.142	0.068**	0.067*	0.068**
	(0.125)	(0.156)	(0.034)	(0.035)	(0.033)
Post07$_t$	0.131				
	(0.080)				
DomAff$_k$(0/1) × Post07$_t$				0.057	
				(0.042)	
Observations	2,931	2,931	2,931	2,931	2,905
R-squared	0.850	0.860	0.864	0.864	0.865
Loan-level Controls	No	No	Yes	Yes	Yes
Subsidiary FE	Yes	Yes	Yes	Yes	Yes
Subsidiary × Firm FE	Yes	Yes	Yes	Yes	Yes
Country × Time FE	No	Yes	Yes	Yes	Yes
Country × Industry × Time FE	No	No	No	No	Yes
Firm × Time FE	No	Yes	Yes	Yes	No
Cluster	Subsidiary	Subsidiary	Subsidiary	Subsidiary	Subsidiary

	(1)	(2)	(3)	(4)	(5)
VARIABLES	Spread	Spread	Spread	Spread	Spread
Affected$_k$(0/1) × Post07$_t$	-3.169	-21.887***	-13.119*	-13.162*	-13.115*
	(15.541)	(7.404)	(7.150)	(7.125)	(7.045)
Post07$_t$	-24.008**				
	(11.541)				
DomAff$_k$(0/1) × Post07$_t$				2.496	
				(2.330)	
Observations	2,931	2,931	2,931	2,931	2,905
R-squared	0.773	0.782	0.784	0.784	0.783
Loan-level Controls	No	No	Yes	Yes	Yes
Subsidiary FE	Yes	Yes	Yes	Yes	Yes
Subsidiary × Firm FE	Yes	Yes	Yes	Yes	Yes
Country × Time FE	No	Yes	Yes	Yes	Yes
Country × Industry × Time FE	No	No	No	No	Yes
Firm × Time FE	No	Yes	Yes	Yes	No
Cluster	Subsidiary	Subsidiary	Subsidiary	Subsidiary	Subsidiary

B Alternative Affected-Measure

In this section, we present results using a robustness measure that is defined with respect to total assets at the bank level rather than total loan supply. To do so, we use *total assets* at the group level

$$\text{AffectedTA}_i \equiv \frac{\sum_{t\in\mathcal{T}}\sum_{j\in\mathcal{J}^{ea}} L_{kjt}}{TA_{\text{Q2 2005}}} \cdot \text{Affected}_k \ . \tag{10}$$

This measure obtains from multiplying the baseline measure (2) by the group-level ratio of euro area loans to total assets. Banks to which the euro area loan market is of smaller importance are thus down-weighted under the modified measure (10). This alleviates concerns that results are driven by a control group of banks that are overall less active on the syndicated loan market but would lend almost exclusively to domestic borrowers if they become active.

Table B.1: **Affected Defined Over Total Assets: Loan Supply.** This table presents the effect of the single list's introduction on credit supply. The analysis is based on data on the bank-loan-quarter level from Q1 2006 to Q4 2007. *Loan Vol* is the loan issuance from bank i to firm j at quarter t. *AffectedTA_i(0/1)* is based on a median split of banks along the modified *Affected*-measure, see equation (10). *Post07*$_t$ indicates the single-list regime after January 2007. The control variables on bank and loan level are lagged by 4 quarters. Country-fixed effects are based on borrower headquarters. ***, **, * denote significance at the 1, 5, and 10% level, respectively.

VARIABLES	(1) ln(Loan Vol)	(2) ln(Loan Vol)	(3) ln(Loan Vol)	(4) ln(Loan Vol)	(5) ln(Loan Vol)
Affected$_i$(0/1) × Post07$_t$	0.296**	0.117**	0.133***	0.100**	0.133**
	(0.133)	(0.046)	(0.048)	(0.043)	(0.052)
Post07$_t$	0.101				
	(0.084)				
DomAff$_i$(0/1) × Post07$_t$				-0.063	
				(0.044)	
Observations	3,187	3,187	3,187	3,187	3,161
R-squared	0.848	0.865	0.866	0.866	0.867
Bank-level Controls	No	No	Yes	Yes	Yes
Loan-level Controls	No	No	Yes	Yes	Yes
Bank × Firm FE	Yes	Yes	Yes	Yes	Yes
FirmCountry × Time FE	No	Yes	Yes	Yes	Yes
FirmCountry × Industry × Time FE	No	No	No	No	Yes
BankCountry × Time FE	No	Yes	Yes	No	Yes
Firm × Time FE	No	Yes	Yes	Yes	No
Cluster	Bank	Bank	Bank	Bank	Bank

VARIABLES	(1) Spread	(2) Spread	(3) Spread	(4) Spread	(5) Spread
Affected$_i$(0/1) × Post07$_t$	-17.456	-21.502***	-14.919***	-14.215***	-12.398***
	(16.077)	(6.360)	(2.676)	(2.349)	(3.064)
Post07$_t$	-12.315				
	(13.657)				
DomAff$_i$(0/1) × Post07$_t$				-10.934**	
				(4.179)	
Observations	3,187	3,187	3,187	3,187	3,161
R-squared	0.767	0.782	0.783	0.783	0.781
Bank-level Controls	No	No	Yes	Yes	Yes
Loan-level Controls	No	No	Yes	Yes	Yes
Bank × Firm FE	Yes	Yes	Yes	Yes	Yes
FirmCountry × Time FE	No	Yes	Yes	Yes	Yes
FirmCountry × Industry × Time FE	No	No	No	No	Yes
BankCountry × Time FE	No	Yes	Yes	No	Yes
Firm × Time FE	No	Yes	Yes	Yes	No
Cluster	Bank	Bank	Bank	Bank	Bank

Table B.2: **Affected Defined Over Total Assets: Geographical Distribution.** This table provides sample splits according to borrower location vis-a-vis banks. The analysis is based on data on the bank-loan-quarter level from Q1 2006 to Q4 2007. *Loan Vol* is the loan issuance from lead bank i to firm j at quarter t. *Affected$_i$(0/1)* is based on a median split of banks along the *Affected*-measure, see equation (2). *Post07$_t$* indicates the single-list regime after January 2007. The control variables on bank and loan level are lagged by 4 quarters. Country-fixed effects are based on borrower headquarters. ***, **, * denote significance at the 1, 5, and 10% level, respectively.

VARIABLES	(1) Domestic ln(Loan Vol)	(2) Domestic ln(Loan Vol)	(3) Other EA ln(Loan Vol)	(4) Other EA ln(Loan Vol)	(5) Non EA ln(Loan Vol)	(6) Non EA ln(Loan Vol)
Affected$_i$(0/1) × Post07$_t$	0.338***	0.320***	0.023***	0.023***	-0.011	-0.011
	(0.046)	(0.050)	(0.007)	(0.007)	(0.017)	(0.017)
Observations	935	937	789	789	1,460	1,443
R-squared	0.894	0.894	0.866	0.866	0.838	0.840
Bank-level Controls	Yes	Yes	Yes	Yes	Yes	Yes
Loan-level Controls	Yes	Yes	Yes	Yes	Yes	Yes
Bank × Firm FE	Yes	Yes	Yes	Yes	Yes	Yes
Country × Time FE	Yes	Yes	Yes	Yes	Yes	Yes
Country × Industry × Time FE	No	Yes	No	Yes	No	Yes
Firm × Time FE	Yes	No	Yes	No	Yes	No
Cluster	Bank	Bank	Bank	Bank	Bank	Bank

VARIABLES	(1) Domestic Spread	(2) Domestic Spread	(3) Other EA Spread	(4) Other EA Spread	(5) Non EA Spread	(6) Non EA Spread
Affected$_i$(0/1) × Post07$_t$	-17.681*	-14.967	-18.915***	-18.915***	-0.703	-0.708
	(8.766)	(12.427)	(6.474)	(6.409)	(0.940)	(0.936)
Observations	935	937	789	789	1,460	1,443
R-squared	0.697	0.698	0.739	0.739	0.830	0.829
Bank-level Controls	Yes	Yes	Yes	Yes	Yes	Yes
Loan-level Controls	Yes	Yes	Yes	Yes	Yes	Yes
Bank × Firm FE	Yes	Yes	Yes	Yes	Yes	Yes
Country × Time FE	Yes	Yes	Yes	Yes	Yes	Yes
Country × Industry × Time FE	No	Yes	No	Yes	No	Yes
Firm × Time FE	Yes	No	Yes	No	Yes	No
Cluster	Bank	Bank	Bank	Bank	Bank	Bank

C Excluding German Banks

To alleviate concerns that results are driven by German banks, we classify all non-German banks into *affected* and *unaffected* banks and re-estimate equation (3). Table C.1 shows that our baseline loan supply results as well as the geographical distribution of loan supply is robust to excluding German banks.

Table C.1: **Excluding German Banks: Loan Supply.** This table presents the effect of the single list's introduction on credit supply. The analysis is based on data on the bank-loan-quarter level from Q1 2006 to Q4 2007. *Loan Vol* is the loan issuance from bank i to firm j at quarter t. *AffectedTA$_i$(0/1)* is based on a median split of banks along the modified *Affected*-measure, see equation (10). *Post07*$_t$ indicates the single-list regime after January 2007. The control variables on bank and loan level are lagged by 4 quarters. Country-fixed effects are based on borrower headquarters. ***, **, * denote significance at the 1, 5, and 10% level, respectively.

VARIABLES	(1) ln(Loan Vol)	(2) ln(Loan Vol)	(3) ln(Loan Vol)	(4) ln(Loan Vol)	(5) ln(Loan Vol)
Affected$_i$(0/1) × Post07$_t$	0.196*	0.133***	0.222***	0.151***	0.233***
	(0.107)	(0.041)	(0.057)	(0.040)	(0.058)
Post07$_t$	0.167***				
	(0.052)				
DomAff$_i$(0/1) × Post07$_t$				-0.080*	
				(0.045)	
Observations	2,413	2,413	2,413	2,413	2,389
R-squared	0.849	0.869	0.870	0.870	0.871
Bank-level Controls	No	No	Yes	Yes	Yes
Loan-level Controls	No	No	Yes	Yes	Yes
Bank × Firm FE	Yes	Yes	Yes	Yes	Yes
FirmCountry × Time FE	No	Yes	Yes	Yes	Yes
FirmCountry × Industry × Time FE	No	No	No	No	Yes
BankCountry × Time FE	No	Yes	Yes	No	Yes
Firm × Time FE	No	Yes	Yes	Yes	No
Cluster	Bank	Bank	Bank	Bank	Bank

VARIABLES	(1) Spread	(2) Spread	(3) Spread	(4) Spread	(5) Spread
Affected$_i$(0/1) × Post07$_t$	6.003	-16.413**	-16.992***	-10.777***	-16.201***
	(20.514)	(7.318)	(4.142)	(2.964)	(4.139)
Post07$_t$	-20.368***				
	(6.777)				
DomAff$_i$(0/1) × Post07$_t$				-17.986**	
				(7.576)	
Observations	2,413	2,413	2,413	2,413	2,389
R-squared	0.768	0.785	0.785	0.785	0.783
Bank-level Controls	No	No	Yes	Yes	Yes
Loan-level Controls	No	No	Yes	Yes	Yes
Bank × Firm FE	Yes	Yes	Yes	Yes	Yes
FirmCountry × Time FE	No	Yes	Yes	Yes	Yes
FirmCountry × Industry × Time FE	No	No	No	No	Yes
BankCountry × Time FE	No	Yes	Yes	No	Yes
Firm × Time FE	No	Yes	Yes	Yes	No
Cluster	Bank	Bank	Bank	Bank	Bank

Table C.2: **Excluding German Banks: Geographical Distribution.** This table provides sample splits according to borrower location vis-a-vis banks. The analysis is based on data on the bank-loan-quarter level from Q1 2006 to Q4 2007. *Loan Vol* is the loan issuance from lead bank i to firm j at quarter t. *Affected$_i$(0/1)* is based on a median split of banks along the *Affected*-measure, see equation (2). *Post07$_t$* indicates the single-list regime after January 2007. The control variables on bank and loan level are lagged by 4 quarters. Country-fixed effects are based on borrower headquarters. ***, **, * denote significance at the 1, 5, and 10% level, respectively.

VARIABLES	(1) Domestic ln(Loan Vol)	(2) Domestic ln(Loan Vol)	(3) Other EA ln(Loan Vol)	(4) Other EA ln(Loan Vol)	(5) Non EA ln(Loan Vol)	(6) Non EA ln(Loan Vol)
Affected$_i$(0/1) × Post07$_t$	0.314***	0.321***	0.020**	0.020**	0.018	0.017
	(0.026)	(0.032)	(0.007)	(0.007)	(0.017)	(0.017)
Observations	716	718	682	682	1,014	990
R-squared	0.889	0.889	0.868	0.868	0.853	0.854
Bank-level Controls	Yes	Yes	Yes	Yes	Yes	Yes
Loan-level Controls	Yes	Yes	Yes	Yes	Yes	Yes
Bank × Firm FE	Yes	Yes	Yes	Yes	Yes	Yes
Country × Time FE	Yes	Yes	Yes	Yes	Yes	Yes
Country × Industry × Time FE	No	Yes	No	Yes	No	Yes
Firm × Time FE	Yes	No	Yes	No	Yes	No
Cluster	Bank	Bank	Bank	Bank	Bank	Bank

VARIABLES	(1) Domestic Spread	(2) Domestic Spread	(3) Other EA Spread	(4) Other EA Spread	(5) Non EA Spread	(6) Non EA Spread
Affected$_i$(0/1) × Post07$_t$	-44.194***	-43.922***	-12.558	-12.558	-0.148	-0.134
	(6.610)	(6.466)	(7.744)	(7.652)	(0.369)	(0.347)
Observations	716	718	682	682	1,014	990
R-squared	0.716	0.718	0.738	0.738	0.835	0.831
Bank-level Controls	Yes	Yes	Yes	Yes	Yes	Yes
Loan-level Controls	Yes	Yes	Yes	Yes	Yes	Yes
Bank × Firm FE	Yes	Yes	Yes	Yes	Yes	Yes
Country × Time FE	Yes	Yes	Yes	Yes	Yes	Yes
Country × Industry × Time FE	No	Yes	No	Yes	No	Yes
Firm × Time FE	Yes	No	Yes	No	Yes	No
Cluster	Bank	Bank	Bank	Bank	Bank	Bank