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## Real effects of financial market integration: Evidence from an ECB collateral framework change

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# Real Effects of Financial Market Integration: Evidence from an ECB Collateral Framework Change\*

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## Abstract

Does central bank collateral policy contribute to financial market integration? We address this question by exploiting that, in 2007, the European Central Bank replaced national collateral frameworks by a single list. Under the single list regime, euro area banks could pledge all euro area bank loans as collateral, not only domestic loans as before the framework change. Banks holding a large share of newly eligible cross-border bank loans increase loan supply compared to banks with smaller holdings to such loans. The additional credit supply is predominately targeted at previously eligible domestic borrowers, suggesting only a small effect on financial integration. However, we find evidence that firms which are highly exposed to affected banks experience a relaxation of borrowing constraints and increase their real activity. The effects of harmonized collateral policy, thus, closely resemble the effects of expansionary credit policy, while it was less successful in stimulating direct cross-border lending.

**JEL classification:** E44, E58, G21

**Keywords:** Collateral Policy, Bank Lending Channel, Financial Integration, Real Effects

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# 1 Introduction

In currency unions with incomplete fiscal and financial market integration, such as the euro area, asymmetric shocks can quickly develop into fully-fledged economic crises. The lack of flexible exchange rates and other risk-sharing mechanisms between union members has been associated with a divergence of private sector funding costs between core and periphery borrowers during the financial crisis of 2008 and the sovereign debt crisis in 2011. To reduce likelihood and severity of such crises, policymakers have aimed at increasing financial market integration in the euro area, with a focus on the banking system, whose failure to withstand disruptions was at the heart of the 2008 and 2011 crises (Martin and Philippon 2017).<sup>1</sup> However, there is limited knowledge about the microeconomics of financial market integration and it remains an open question which instruments can contribute to its successful implementation. This paper studies harmonized collateral policy as one candidate instrument to facilitate financial market integration. Using an ECB collateral framework change that added cross-border bank loans to the list of eligible assets, we examine the effects of integrated collateral policy on bank lending behavior, cross-border credit supply, bank risk-taking, and real effects on private sector borrowers.<sup>2</sup>

Specifically, in January 2007, and therefore unrelated to the financial crisis starting to unfold in late 2007, the ECB introduced a *single list* specifying which assets banks can use as collateral in refinancing operations. Prior to the change, under the *NCB regime*, each national central bank specified different collateral rules: banks could at most pledge domestic loans, such that banks were effectively facing country-specific pools of eligible assets in refinancing operations with their respective NCB. Under the single list regime, the ECB continued to implement monetary policy through NCBs, but on collateral criteria determined by the ECB for all euro area banks. Notably, banks were able to pledge loans extended to borrowers in the whole euro area, but not to borrowers outside the euro area under the single list regime.

Using loan-level data from the euro area syndicated loan market, we document three effects

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<sup>1</sup>The 2008 financial crisis manifested itself in Europe through dry-ups for periphery banks funding themselves through the interbank market. In contrast, bank holdings of risky domestic sovereign debt were an important driver of the 2011 debt crisis. In this context, the objective of a financial market union is to make local private sector funding conditions independent from the local banking system's health. Martinez, Philippon, and Sihvonen (2019) show that a financial market union defined along these lines improves cross-country risk-sharing. See also the discussion in Constâncio (2014).

<sup>2</sup>Doerr and Schaz (2021) focus on the role of geographic loan diversification for financial and macroeconomic stabilization and do not consider the potential role played by central bank policies.

of harmonizing collateral policy. First, banks with a high exposure to cross-border euro area loans increase their credit supply by 10.6% and reduce loan spreads by 12 basis points compared to a control group of unaffected banks once loan demand is controlled for.<sup>3</sup> Second, the supply of additional credit is primarily extended to previously eligible domestic firms. Third, the positive funding shock to firms exposed to affected banks has real effects: their employment, sales growth, and tangible investment increases significantly after the framework change.<sup>4</sup>

We focus on cross-border syndicated bank loans, which were generally ineligible as collateral in the NCB regime.<sup>5</sup> Combining data from DealScan, Compustat Global and CapitalIQ, we construct a measure of bank-level exposure to the framework change based on their lending history to *non-domestic* euro area borrowers prior to the framework change.<sup>6</sup> In our baseline specification, we then use a median split along the *Affected*-measure to classify banks into affected and unaffected banks. Using this classification, we employ a standard difference-in-differences approach and compare changes in the lending of affected banks relative to the control group of unaffected banks. The identifying assumption is that unaffected banks provide a counterfactual for the lending of affected banks in the absence of a framework change.

A possible argument against the causal interpretation of the estimated effects is that the treatment lacks random assignment. Instead, it might be based on a variable that affects treated and control groups differentially and correlates with the framework change, for example large banks being more active internationally. To tackle such endogeneity concerns, 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. Hence, banks would face different investment opportunities after the framework change. 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 (2008).<sup>7</sup>

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<sup>3</sup>This increase in credit supply after an increase in collateral availability is consistent with Koulischer and Struyven (2014), who propose a model where banks use risky assets as collateral.

<sup>4</sup>The focus on a non-crisis episode allows us to cleanly interpret the single list's introduction as a positive funding shock to the real sector. In contrast, during financial crises, firm credit conditions typically are tighter than justified by firm fundamentals alone (Gilchrist and Zakrajšek 2012). It is therefore conceptually difficult to attribute the real effects of expansionary unconventional monetary policy to temporarily high deviations of credit conditions from firm fundamentals or to firm fundamentals itself. Our analysis can overcome this issue by focusing on the period prior to the financial crisis.

<sup>5</sup>Syndicated bank loans make up three quarters of total cross-border loans in the euro area, see Doerr and Schaz (2021).

<sup>6</sup>In Italy, Belgium, Ireland, and Finland, domestic bank loans could not be pledged either. We show that including these newly eligible domestic loans in the affected measure does not change the results.

<sup>7</sup>We also show that the effect estimated size hardly changes when using country  $\times$  industry  $\times$  quarter fixed

The framework change in January 2007 could have coincided with other events that affect bank lending. As long as these events affect both the treatment and control group the same way, they are taken care of by the difference-in-differences setup. If this was not the case our results could be biased. The financial crisis unfolding after the burst of the US subprime bubble in the third quarter of 2007 is a possible confounding event. While we argue that this framework change is a crisis-unrelated policy change, Puri, Rocholl, and Steffen (2011) show that European banks exposed to U.S. sub-prime market cut their lending already ahead of the outburst of the financial crisis. Since affected banks are the ones more active on the European syndicated loan market, they might also be more active internationally, which would then sharply decrease lending to the corporate sector during the financial crisis (Chodorow-Reich 2014). In contrast to this narrative, we expect the framework change to stimulate loan issuance of affected banks. Therefore, the financial crisis would at most bias the results downwards. Indeed, we see the most pronounced effects in 2007. To further corroborate our finding of a positive effect on loan supply by affected banks, we test for differential pre-trends, present two falsification tests using non euro area banks and an always ineligible asset class (revolving credit lines) as placebo treatment indicators, and show that results are robust to various alternative specifications of our baseline treatment indicator.

As a second step, we study the role of borrower characteristics for banks' loan supply decision. We first consider borrower location to test whether direct cross-border lending increases under the single list regime. 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.<sup>8</sup> We find no evidence of additional credit supply to non euro area firms. There are several potential explanations for this finding: first, affected banks experience an increase in their liquidity and funding position, similar to an income or wealth effect, and expand loan issuance to firms with whom they already are in a relationship. Second, the cross-border eligibility might increase secondary market demand for these loans, which banks anticipate at loan issuance.<sup>9</sup> Third, there might be an increase in competition through cross-border eligibility, which drives down yields and increases loan supply

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effects as in spirit of Degryse et al. (2019) instead of firm  $\times$  quarter fixed effects.

<sup>8</sup>The limited uptake in direct cross-border lending is consistent with country-level results reported in Hoffmann, Maslov, and Sørensen (2022).

<sup>9</sup>Tabakis and Tamura (2013) argue that the secondary market for syndicated loans is relatively developed and liquid, compared to other non-marketable asset classes.

by incumbent domestic banks. Irrespective of which of these explanations drives our findings, the single list's introduction can be interpreted as a positive funding shock to domestic firms akin to expansionary credit policy.

Using the interpretation as a positive funding shock to the real sector, we then test which firms are experiencing the largest credit inflows and how this affects their real activity as a third and final step. To do so, we show that banks increase loan supply to riskier borrowers (measured by the loan-volume weighted distance-to-default à la Merton 1974). An alternative interpretation of this finding is that banks extend loans to borrowing constrained firms (Farremensa and Ljungqvist 2015). At the firm level, we furthermore show that firms with a large exposure to affected banks increase their tangible investment, number of employees, total sales, and debt outstanding. Overall, our results are in line with standard theories of credit supply and borrowing constraints: upon experiencing an increase in funding conditions, banks' additional credit supply is directed to their marginal borrowers, which are located in their home market where they have a comparative advantage over international competitors. The marginal loan is issued to more risky and, therefore, credit-constrained borrowers, who use the additional credit supply to increase their real activity.

Lastly, we demonstrate that the transmission of harmonized collateral policy depends on bank characteristics (the share of newly eligible other euro area loans in their loan portfolio) rather than on firm characteristics (loans from other euro area banks relative to total loans). If using an exposure measure based on the *share of foreign lenders* at the firm-level, we do not find any significant effect on lending or real activity. This stresses the role played by financial intermediation and borrower-lender relationships when it comes to improving loan market integration across countries.

**Related Literature** This paper is related to three strands of literature. First, we contribute to a series of papers studying the role of cross-border banking for international financial integration, which traditionally uses country-level data. Giannetti and Laeven (2012) find that the international credit supply increases when funding cost in the lender's home market decreases. Focusing on the euro's introduction, Spiegel (2009) examines the effect of a monetary union on borrower-lender relationships. Hoffmann, Maslov, and Sørensen (2022) argue that bank-firm relationships remained confined to the domestic level and financial market integration was re-



stricted to the interbank market in the years following the euro's inception. This combination resulted in sudden stops for periphery banks as borrower fundamentals deteriorated in the wake of the financial crisis (see also Bruche and Suarez 2010). Since we only find a relatively small increase in new cross-border lending, our results are consistent with this strand of literature.

Second, we expand the literature on the effects of unconventional monetary policy on credit supply to the real sector. Van Bakkum, 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 a collateral framework change linked to the 2012 Additional Credit Claims (ACC) program has an positive impact on credit volumes supplied to firms in France. Mésonnier, O'Donnell, and Toutain (2021) document that such eligibility translates also into a relative reduction in rates for newly eligible bank loans. Chen et al. (2022) use security level data from China to establish a pledgeability premium on corporate bonds. Grosse-Rueschkamp, Steffen, and Streitz (2019) find a capital structure effect of central bank balance sheet policy at the firm level. Their estimated effect of QE eligibility on firms is similar to the effects we find. Cahn, Duquerroy, and Mullins (2022) use the ECB's very long term refinancing operations to study credit supply to single- and multi-bank firms. Our paper is the first to document the real effects of expansionary unconventional monetary policy at the firm level in *normal times*. The analysis of Pelizzon et al. (2019) stands out in this context since they are not using unconventional policy measures but make use of the ECB's discretion in adding formally eligible securities to the list of eligible assets. Focusing on corporate bonds, they find that eligibility reduces secondary market yields and increases bond issuance at the firm level.

We are also contributing to the literature on the bank lending channel, which expanded considerably based on the seminal contribution by Kashyap and Stein (2000). Our paper stresses the role of bank characteristics for the transmission of (unconventional) monetary policy through the bank lending channel. Gambacorta (2005) and Jiménez et al. (2014) use bank-level data to show that bank heterogeneity affects the pass-through of conventional interest policy. Delis and Kouretas (2011) establish risk-taking effects of conventional interest rate policy that are similar to our findings. Adelino and Ferreira (2016) use credit rating downgrades as a *negative* shock to bank funding conditions and find a strong negative effect on loan supply. Similarly, Acharya et al. (2018) establish a negative effect of bank exposures to risky euro area government

bonds on loan supply. In both cases, negative shocks affecting banks are transmitted via the bank balance sheet to the non-financial sector. Arce, Mayordomo, and Gimeno (2020) 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. The underlying mechanism through financial intermediaries’ fundamentals is similar to the single list’s transmission mechanism documented in our paper.

The remainder of our paper is organized as follows. Section 2 describes the institutional setting and the collateral framework change. 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.<sup>10</sup> The single list came into effect on 1 January 2007. Prior the change, the eligibility of collateral 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 the NCBs, allowing them to incorporate peculiarities of the respective domestic banking sector in the collateral framework.<sup>11</sup> Country-specific collateral pools induce loan market segmentation along two dimensions: banks, depending on their respective locations, had a different collateral pool at their disposal. At the same time, firms were potentially subject to different creditor pools: foreign banks might find holding cross-border loans that can not be pledged as collateral less attractive. In addition, there is a negative effect on secondary market demand for loans if only a subset of euro area banks is willing to pay collateral premia on them.

Under the (still operational) single list regime, the ECB directly specifies eligible assets for all euro area banks, even though banks still interact with their respective NCB. Among other

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<sup>10</sup>The official announcement on 22 July 2005 contained details on the inclusion of bank loans, see ECB (2005).

<sup>11</sup>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 eligibility of credit claims, such as syndicated loans, as collateral in the Eurosystem.

things, the single list regime established the eligibility of (syndicated) bank loans located in the euro area.<sup>12</sup> This modification drastically increased the fungibility of loans as collateral since, prior to the framework change, only NCBs 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 NCB. Notably, the expansion of the set of eligible assets was not achieved by a relaxation of minimum rating requirements, which is in contrast with the ECB's expansionary policy measures during the financial crisis of 2008 and the euro area debt crisis of 2011 (Nyborg 2017).

The ECB's practice prior to the single list's announcement in 2005 suggests that, at least during normal times, implementing policy in a monetary union does not require a harmonized collateral framework. In fact, the ECB Monthly Bulletin (2006) explicitly states the following policy 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.

According to the ECB, the single list serves a dual purpose. First, it is intended to increase financial integration within the euro area. Second, it is necessary to ensure an effective pass-through of interest rate policy via the bank lending channel by making collateral abundant. The role of collateral for monetary policy transmission has been established by Kashyap and

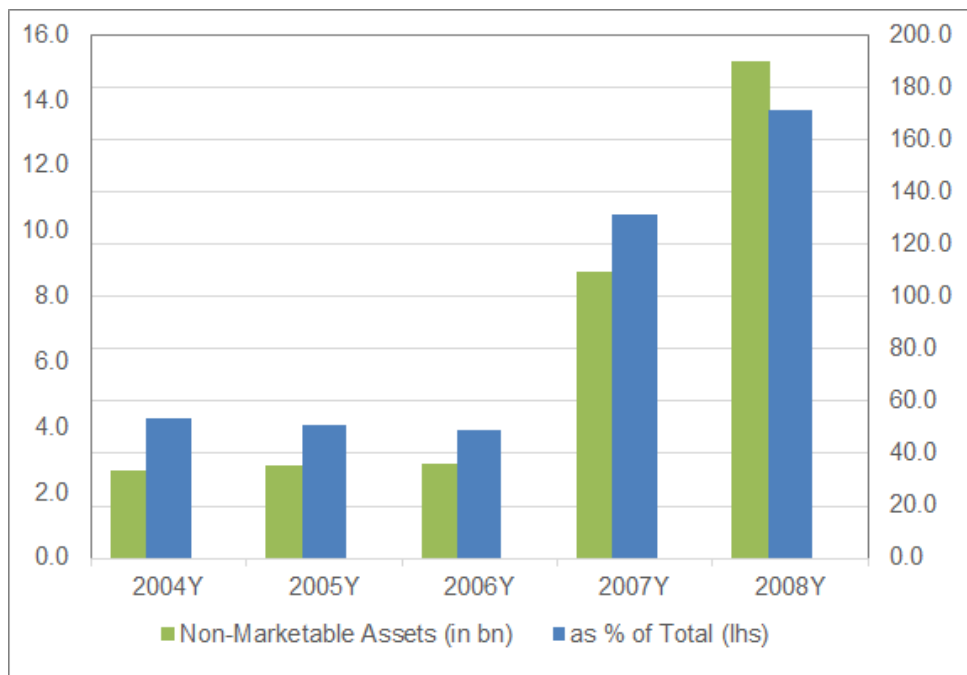
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<sup>12</sup>In the syndicated loan market, different banks form a syndicate to jointly lend to a single borrower. The syndicate includes one lead bank and a number of participating banks. Lead arrangers are those members of a syndicate typically negotiate 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.

Stein (2000) and Jiménez et al. (2012), while Koulischer and Struyven (2014) study collateral policy through the lenses of a model with financially constrained banks. While our results have implications for both policy objectives, the novelty of our analysis is the financial integration dimension, which has not received much attention so far.

To achieve both objectives, collateral policy needs to change banks' pledging behavior which in turn will 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 and the share in 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%.

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 clearly does not provide a bank-specific analysis of pledging behavior, collateral demand or loan supply, we argue that it is sufficient to observe an *aggregate* increase in the collateral usage of syndicated loans for at least two (non mutually exclusive) reasons: *first*,

even if banks do not intend to pledge a specific loan, they might still increase loan supply if the loan can be sold at favorable conditions on the secondary market to another bank that needs collateral. *Second*, banks can issue and hold eligible loans for precautionary reasons, for example to self-insure against large liquidity shocks. In both cases, it is reasonable to assume that banks increase loan origination if these loans are eligible as collateral.

### 3 Empirical Strategy

We use a standard difference-in-differences set-up to compare the lending behavior of banks with different euro area loan issuance histories prior to the single list's introduction. 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 the role of firm fundamentals and their geographic location for banks' credit supply, we test to which extent the positive shock to bank funding conditions has real effects on firm-level employment, investment, and leverage.

**Identifying Affected Banks** Banks are classified into *affected* and *unaffected* based on the share of loans issued to other euro area borrowers - firms headquartered in another euro area member state. Assuming that the framework change 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. Taking the subsidiary structure into account is therefore important in our context, since eligibility was determined nationally under the NCB-regime. 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 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 German subsidiary bank, the set of newly eligible countries is given

by  $C_k^{new} = C^{ea} \setminus \{DE\}$ , since bank loans were already eligible under the NCB-regime in Germany. In contrast, for an Italian subsidiary bank, we simply have  $C_k^{new} = C^{ea}$ . The subsidiary-level *Affected*-measure is then given by

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

where  $L_{kjt}$  are loan issuances by subsidiary bank  $k$  to firm  $j$  at time  $t$ . Second, we aggregate the subsidiary-level *Affected*-measure to the group level, weighted by the subsidiary shares in the group-level loan portfolio:

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

The set of pre-announcement dates is denoted by  $\mathcal{T} = [\text{Q1 2003}, \text{Q2 2005}]$ , while  $\mathcal{J}^{EA}$  is the set of all euro area firms in our sample. We perform a sample split of banks along the affected measure (2),

$$\text{Affected}(0/1)_i \equiv \mathbf{1}\{\text{Affected}_i \geq Q_{0.5}(\text{Affected}_i)\},$$

and interpret all banks with an above-median share of other euro area loans in their portfolio as affected.<sup>13</sup>

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

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

Here,  $\text{Post07}_t$  indicates the single list regime.<sup>14</sup>  $\mathbf{X}_{i,t-4}$  is a vector of loan and bank level controls, which are lagged by 4 quarters.  $\mu_{ij}$  denotes bank  $\times$  firm,  $\nu_{jt}$  denotes firm  $\times$  quarter, and  $c_{jt}$  denotes country  $\times$  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

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<sup>13</sup>This identification strategy is common in the literature, see for example Huber (2018), Van Bakkum, Gabarro, and Irani (2018), Grosse-Rueschkamp, Steffen, and Streit (2019) or Berg et al. (2022).

<sup>14</sup>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.

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 sample.

The coefficient  $\beta_1$  measures how affected banks respond to the framework change relative to the control group. We expect  $\beta_1 > 0$ , as a larger share of eligible loans should stimulate credit supply after the framework change. 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 change.

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 affects affected and unaffected banks differentially and correlates with the framework change. To address these concerns, we include bank level controls for size, leverage, profitability, loan ratio, cash ratio, and deposit ratio. In Panel B of Table 2, we show that banks do not significantly differ along any of these dimensions.

*Third*, the pool of potential borrowers might not be orthogonal to a banks' actual loan portfolio. In other words, borrower pools might differ for affected and unaffected banks, and hence banks would face different lending opportunities after the framework change. 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).

**Additional Results: Extensive Margin and Spreads** To alleviate concerns that banks simply change the frequency of new loan issuances, we also consider the extensive and total margin of credit supply. This could become relevant in the context of collateral eligibility if more frequent but smaller loan sizes render the loan ineligible. We operationalize this by adding

zeros to all bank-firm-quarter triples where there was no loan issuance, which yields a balanced panel. For the total margin, we directly estimate this as in (3). 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 extensive margin would then indicate an increase in credit supply, since banks interact with firms more often *and* supply more credit if they interact.

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:

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

Since we expect affected banks to increase their credit supply, the coefficient  $\beta_1$  should be negative when using spreads as dependent variable.

**Robustness** To corroborate the validity of our main findings, we re-estimate our baseline specification using different samples and definitions of the *Affected*-measure. As a first step, we re-estimate (3) at the *subsidiary-level*:

$$\ln(1 + L_{kjt}) = \beta_1 \text{Affected}_k(0/1) \times \text{Post07}_t + \beta X_{i,t-4} + \mu_{kj} + \nu_{jt} + c_{jt} + \epsilon_{kjt} . \quad (5)$$

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  $\mu_{kj}$  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.

We also show that the result does not depend on specifying the *Affected*-measure with respect to euro area loans. Specifically, we use *total assets* at the group level

$$\text{AffectedTA}_i \equiv \frac{\sum_{t \in \mathcal{T}} \sum_{j \in \mathcal{J}^{ea}} L_{kjt}}{TA_{Q2\ 2005}} \cdot \text{Affected}_k . \quad (6)$$

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 (6). 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.

We also conduct two *falsification tests* exploiting that the framework change 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

$$\text{Foreign-Affected}_i \equiv \frac{\sum_{t \in \mathcal{T}} \sum_{j \in \mathcal{J}} L_{kjt}}{\sum_{k \in \mathcal{K}^i} \sum_{t \in \mathcal{T}} \sum_{j \in \mathcal{J}} L_{kjt}} \cdot \text{Foreign-Affected}_k, \quad (7)$$

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 framework change 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).<sup>15</sup> For both placebo measures, there should be no significant effects on loan supply.

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,

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<sup>15</sup>Using an ineligible asset class to conduct a falsification test is in line with Van Bakkum, Gabarro, and Irani (2018).

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  $\beta_1$  to be smaller once participant banks are included.

**Borrower Characteristics** Having established the positive credit supply effect of the single list, we then study whether the single list induced direct cross-border lending. To do so, we split our sample into three groups, 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.

To test whether certain firm types are receiving a particularly high share of additional credit, we employ two complementary approaches. First, we perform a sample splits 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 and use the firm-level distance-to-default (Merton 1974) instead of loan supply as dependent variable. The distance-to-default serves both as a measure of default risk and provides also a reliable identification of borrowing constrained firms (Farremensa and Ljungqvist 2015). 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 associated with each loan extended by bank  $i$  to firm  $j$  at quarter  $t$ :

$$D2D_{jt} = \gamma_1 \text{Affected}_i(0/1) \times \text{Post07}_t + \gamma X_{i,t-4} + \mu_{ij} + \nu_{jt} + c_{jt} + \epsilon_{ijt} . \quad (8)$$

Since the distance-to-default is a firm specific measure, we define country-quarter fixed effects based on the bank headquarter in (8).

**Firm Level** At the firm level, our analysis is based on an annual data. The firm-level exposure measure is given by

$$\text{Exposed}_j = \frac{\sum_{i \in \mathcal{I}} \sum_{t \in \mathcal{T}} \mathbf{1}\{i \in \mathcal{I}^{Affected}\} L_{ijt}}{\sum_{i \in \mathcal{I}} \sum_{t \in \mathcal{T}} L_{ijt}}, \quad (9)$$

where  $\mathcal{I}^{Affected}$  is the set of affected banks according to the affected-measure (2). We estimate the following regression at the firm-year level:

$$y_{jt} = \delta_1 \text{Exposed}_j \times \text{Post}_{07,t} + \delta X_{j,t-1} + \chi_{jt} + c_{jt} + t + \mu_j + \epsilon_{jt} \quad (10)$$

We trace the collateral-induced credit expansion at the firm level by using  $pr(Loan)_{jt}$  as dependent variable. This is an indicator variable equal to one if firm  $j$  obtains a bank loan in the respective year  $t$ , and zero otherwise.  $X_{j,t-1}$  is a vector of time-varying firm level controls to capture loan demand, which consists of log of total assets, leverage and liquidity ratio (defined as cash over total assets), all lagged by one year.  $\mu_j$  are firm,  $\chi_{jt}$  industry  $\times$  year, and  $c_{jt}$  country  $\times$  year fixed effects. The sample period from 2006 to 2008 allows for one year before and two years after the framework change. The coefficient of interest,  $\delta_1$ , measures the probability of obtaining a loan if the firm  $j$  has a lending relationship with an affected bank. We expect  $\delta_1 > 0$ , in line with the positive effect found at the firm-bank 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 time-varying loan demand per country and industry, respectively. In a similar fashion, we use the log of one plus additional bank loans as a continuous measure of credit supply at the firm level and expect to find similar effects.

To test whether the positive credit supply shock translates into real outcomes at the firm level, we estimate (10) using  $\Delta \ln(PPE)$ ,  $\ln(Employ)$ ,  $\Delta \ln(Sales)$  and  $\Delta \ln(Debt)$ . The relative change in property, plants, and equipment is a standard proxy for tangible investment. Sales growth and the number of employees approximate real activity at the firm level in a similar way. We also include the change in debt outstanding to put the increase in real activity in relation to the increase in debt-financing. In this case, the coefficient of interest,  $\delta_1$ , measures the impact on real outcomes if firm  $j$  has a large exposure to affected banks. We expect  $\delta_1 > 0$ , since firms increase both their real activity and their debt issuance if they are facing increased credit supply

from affected banks.

In a final step, we demonstrate that financial intermediaries crucially shape the transmission of the single list regime. To do so, we construct a firm-level exposure measure based on loans obtained from *other euro area* banks instead of loans obtained from affected banks:

$$\text{ExposedOEA}_j = \frac{\sum_{i \in \mathcal{I}^{EA}} \sum_{t \in \mathcal{T}} \mathbf{1}\{i \neq j\} L_{ijt}}{\sum_{i \in \mathcal{I}^{EA}} \sum_{t \in \mathcal{T}} L_{ijt}}, \quad (11)$$

where  $\mathcal{I}^{EA}$  is the set of all euro area banks. Re-estimating equation (10) with the exposure measure (11) for the probability of obtaining a loan, loan take-up, spreads, and real variables, a positive effect of the single list’s introduction would indicate higher financial market integration.

## 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 2 presents summary statistics for all euro-area banks in the period prior to the framework change (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 2 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 before the framework change was announced (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** Lastly, 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, 1192 of which have a pre-framework relationship with an affected euro area bank, and 603 of which have not. Variables are winsorized at the 1st and 99th percentile. As customary, financials (SIC codes 6000-6999) are dropped. Panel A of

Table 3 shows summary statistics for the full sample while Panel B establishes that more and less exposed firms did not differ significantly along any dimension we use as a control or outcome variable in 2006, the last year prior to the framework change.

## 5 Results

We present the results in four steps. In Section 5.1, we demonstrate that banks affected by the collateral framework change 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 lion's share of additional credit supply is directed at previously eligible domestic loans, while there is limited new cross-border loan issuance. Section 5.3 also sheds light on borrower fundamentals and demonstrates that affected banks respond to the harmonized collateral framework by lending towards riskier and more credit-constrained firms as measured by their distance-to-default. Section 5.4 presents loan growth and real effects at the firm level.

### 5.1 Baseline Specification

Table 4 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 harmonizing collateral policy in January 2007. Both the coefficient of interest and the  $Post07_t$  indicator 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, significant at the 1% level: affected banks increase their lending after the framework change by 11.5%, relative to unaffected banks.

As column (3) shows, adding a set of loan and bank level control variables that refine the comparison between treatment and control group does not materially affect our main result. 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 and Jiménez

et al. 2020). Banks with a higher cash 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.

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. Those banks were therefore affected more strongly by the introduction of the single list. It is equal to zero for banks located in countries where the respective NCBs accepted domestic bank loans (AT, DE, ES, FR, IR, NL). Column (4) shows that interacting  $DomAff_i(0/1)$  with the treatment indicator yields no significant result. Furthermore, the estimated effect barely changes relative to column (3). In column (5), we replace firm  $\times$  quarter fixed effects by country  $\times$  industry  $\times$  quarter fixed effects (Degryse et al. 2019) barely changes results. Overall, the magnitude of the estimated effect is similar to Van Bakkum, Gabarro, and Irani (2018), who also use an empirical design involving median splits of banks along a related exposure measure.

**Parallel Trend Assumption** The identifying assumption relies on unaffected banks providing a valid counterfactual for lending in the absence of a collateral framework change. To detect different pre-trends, 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 coefficient estimates hovering around zero and statistically insignificant. After the announcement, 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 monetary policy stance in the early 2000s, they are canceled out by the difference-in-differences approach.

## 5.2 Additional Results and Robustness

We furthermore robustness checks to corroborate the baseline credit supply effects identified in the previous section.

**Additional Results** In Table 5, we show the extensive and total margin, complementing our baseline results at the intensive margin (Table 4). Controlling for loan demand and adding bank country  $\times$  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 6 shows that using loan spreads as a measure of bank credit supply yields similar results to using loan supply. 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 -12 basis points is comparable to Pelizzon et al. (2019) 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.

**Robustness** Table 7 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  $\beta_1$  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 8 shows that defining the *Affected*-measure with respect to total assets does not materially affect our results: the estimated effect size is less significant but similar in magnitude to the baseline specification. Table 9 and Table 10 show that, for both falsification tests, the coefficients on *Foreign-Affected* $_i(0/1) \times Post07_t$  and *Placebo-Affected* $_i(0/1) \times Post07_t$  are insignificant or even negative across all specifications.

Table 11 presents results of using an announcement treatment indicator, which therefore takes on the value of zero until Q2 2005 and a value of one after Q3 2005: banks might have anticipated which type of loans would become eligible under the single list regime once it was announced in July 2005. While this does not affect the transmission mechanism of the single list regime, it would incentivize the issuance of eligible loans already in the run-up to the framework change and should result in a less pronounced implementation effect. However, we find no significant effect across all specifications, which suggests that the announcement date did not play a relevant role in banks’ lending decisions. 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 4, the effect size is around 50% smaller, but still significant at the 1% level.

### 5.3 Borrower Characteristics

**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 single list's effect is an order of magnitude larger (0.311) for firms headquartered in the affected banks' home country. This result obtains also under a very stringent fixed effect structure and is also robust to using firm  $\times$  industry  $\times$  time fixed effects. The effect on direct cross-border lending is still positive and significant, but relatively small (0.019). There is no significant effect on lending to firms outside the euro area.

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. There is also no effect on loan spreads to non-euro area borrowers. The absence of large international lending effects imply that the single list was operating similar to an expansionary credit policy: banks affected by the framework change experience and increase in their liquidity position and predominately increase their credit supply where they have a comparative advantage over their international competitors.

**Firm Sector** Having demonstrated how the inclusion of syndicated bank loans increases credit supply, we now take a closer look at the firms benefiting from this credit expansion. We provide two complementary empirical 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).<sup>16</sup> The coefficient on  $Affected_{0i}(0/1) \times Post07_t$  is positive and significant for non-tradables (column 2), but insignificant for tradables.

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<sup>16</sup>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).

This result is consistent with Berg et al. (2022), who show that the positive funding 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.

**Fundamentals and Bank Risk Taking** 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 framework change for affected banks: the riskiness of the loan portfolio increases. This result is consistent with risk-taking effects reported in Van Bakkum, 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.

#### 5.4 Firm Level Results

We now present results at the firm level that establish an increase in loan take-up and real activity by firms with a large exposure to affected banks.

**Loan Take-Up** Table 16 presents the results on loan take-up. We restrict the sample to firms with available balance sheet data. Robust standard errors are clustered at the firm level. Across specifications, the main effect is positive and significant. Column (1) includes firm and country  $\times$  year fixed effects. The coefficient of interest is positive and significant. In column (2) the highly restrictive specification with firm as well as industry  $\times$  year and country  $\times$  year fixed effects are added to control for unobservable time-variant factors at the industry- and country-year level. We find a positive treatment effect, significant at the 5% level: a one standard-deviation increase in the *Exposed*-ratio increases the loan take-up by 58% ( $0.46 \times 1.18 = 0.58$ ). When adding firm level controls in column (3), the coefficient remains significant and becomes even larger. The effect of controls on the loan take-up is also noteworthy: it is significantly smaller for larger firms, highly levered firms, and those with a larger liquidity position.

**Real Effects** In Table 17, we show how the framework change translates into real effects for firms with an above median exposure to affected banks. All specifications include firm level

control variables such as the log of total assets and the leverage ratio, lagged by one year. Our results show that larger firms experience a significantly lower growth in tangible capital, total sales, and total debt, consistent with the notion that large firms have grown closer to their optimal scale. The effect of total assets on the number of employees is naturally positive, since both variables are effectively approximating firm size. The leverage ratio has a negative effect on debt growth, suggesting that highly indebted firms find it more difficult or less profitable to further increase their debt financing. Interacting the firm level *Exposed<sub>j</sub>*-measure with the *Post07<sub>t</sub>*-indicator variable is positive and significant for all outcome variables. In unreported results, we did 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 contained the onset of the financial crisis. This suggests that the real effects of the ECB’s expansionary credit policy were not short-lived and restricted to periods of overall benign credit conditions.

**The Role of Intermediaries** Lastly, we provide evidence that the pass-through of harmonized collateral policy to the firm sector is crucially shaped by financial intermediaries’ debtor portfolio rather than firms’ creditor portfolio. Specifically, estimating the effect of the single list on loan supply with the exposure measure equation (11), which is based on the share of other euro area creditors *at the firm level* does not yield any significant results. Table 18 shows that the coefficient on the treatment variable interacted with the *Post07<sub>t</sub>*-indicator is considerably smaller and insignificant across all specifications. At the same time, the effect of firm level controls hardly changes under this alternative exposure measure. Taken together with the results on borrower location at the loan-level (Table 13), this can be interpreted as the absence of *additional* financial market integration under the single list regime. It is helpful to conceptually contrast our findings with *marketable assets* which might be relevant in the context of central bank asset purchases. Even though there was no comparable policy change that could be used to test the effects of collateral policy on bond issuances, the borrower-lender relationship is arguably less important for bonds than for bank loans. Facilitating financial market integration might therefore be more difficult to achieve in highly bank dependent credit markets such as the euro area.

## 6 Conclusion

In this paper, we discussed the effects of harmonized collateral policy as an instrument to increase financial market integration in a currency union. Using a collateral policy change by the ECB as exogenous source of variation, 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 10% compared to unaffected banks. Firms in relationship with affected banks in turn experience growth in loan growth, size, employment, and investment. Our focus on collateral policy in normal times is exceptional for the literature on unconventional monetary policy and allows us to study borrower characteristics in a period where lending standards are not decoupled from firm fundamentals.

Our results furthermore suggest that the inclusion of cross-border bank loans stimulates direct cross-border lending to a small extent. Instead, the single list induced banks to increase lending domestically, which - from the real sector's point of view - operates similar to expansionary central bank credit policy. 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. However, our setup does not allow us to draw conclusions on the overall desirability of the real effects induced by the single list. An evaluation of the net effect would require either a staggered framework introduction or a second policy change, which would enable us to evaluate the role of the macroeconomic environment. However, since the ECB so far did not switch back to a segmented collateral framework (and is unlikely to do so in the future), these effects are infeasible to test with our loan-level data approach.

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## 7 Tables and Figures

### 7.1 Summary Statistics

This subsection presents summary statistics at the loan, bank, and firm level. All variables are defined in Table 19.

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
<i>Of which</i>					
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: 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 framework change Q1 2006 - Q4 2006.

<i>Panel A: Full Sample</i>						
	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	
Affected <sub><i>i</i></sub> (%)	61.36	36.89	0.00	100.00	35	
Affected <sub><i>i</i></sub> (0/1)	0.46	0.51	0.00	1.00	35	

<i>Panel B: Univariate t-tests</i>						
	Less Affected		More Affected		Diff.	t-stat.
	Mean	N	Mean	N		
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 3: **Summary Statistics: Firm Level.** This table presents summary statistics for the firm cross-section in 2005-2006, the years prior to the framework change. *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 and is defined - as all other ratios - with respect to total assets and indicated in percent. 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 framework change.

<i>Panel A: Full Sample</i>						
	Mean	SD	Min	Max	Count	
ln(Loan Amount)	4.19	3.69	0.00	12.28	581	
ln(Total Assets)	8.48	1.81	4.61	15.47	565	
CAPEX ratio	20.78	12.95	2.88	60.09	537	
Investment ratio	32.87	23.83	0.70	95.40	548	
Leverage ratio	38.32	17.19	2.04	83.70	563	
Liquidity ratio	3.70	6.21	-25.26	19.66	567	
Market to book ratio	1.56	0.55	0.81	3.34	329	
Return on assets (%)	8.11	5.23	-5.04	22.47	540	
Dividend payout ratio	0.23	0.35	0.00	1.44	405	
Sales ratio	85.50	94.93	2.22	1,826.72	568	
Wages ratio	10.09	16.33	0.01	104.31	126	
Employment (thousands)	22.14	33.37	0.03	137.00	471	
Exposed $_j$ (0/1)	0.39	0.49	0.00	1.00	581	
Exposed $_j$ (%)	46.05	32.49	0.00	100.00	581	

<i>Panel B: Univariate t-tests</i>						
	Less Exposed		More Exposed		Diff.	t-stat.
	Mean	N	Mean	N		
ln(Loan amount)	4.19	352	4.18	229	0.019	0.060
ln(Total assets)	8.57	340	8.35	225	0.221	1.426
CAPEX ratio	20.19	331	21.72	206	-1.538	-1.339
Investment ratio	32.91	336	32.81	212	0.099	0.048
Leverage ratio	37.74	339	39.21	224	-1.469	-0.992
Liquidity ratio	3.18	342	4.51	225	-1.335**	-2.515
Market to book ratio	1.49	201	1.67	128	-0.187***	-3.029
Return on assets (%)	7.95	330	8.38	210	-0.429	-0.929
Dividend payout ratio	0.23	245	0.23	160	-0.005	-0.146
Sales ratio	89.97	343	78.69	225	11.281	1.386
Wages ratio	12.65	81	5.49	45	7.160**	2.403
Employment (thousands)	26.13	284	16.08	187	10.045***	3.228

## 7.2 Baseline Results

Table 4: **Loan Supply: Bank-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 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.

VARIABLES	(1) ln(Loan Vol)	(2) ln(Loan Vol)	(3) ln(Loan Vol)	(4) ln(Loan Vol)	(5) ln(Loan Vol)
$Affected_i(0/1) \times Post07_t$	0.184 (0.146)	0.115*** (0.041)	0.106*** (0.035)	0.110*** (0.033)	0.106*** (0.033)
ln(Total Assets)			0.033 (0.044)	0.050 (0.034)	0.046 (0.064)
Equity ratio			-0.010 (0.011)	-0.009 (0.011)	-0.007 (0.017)
Return on Equity			-0.000 (0.000)	-0.000 (0.000)	-0.000 (0.001)
Cash ratio			-0.006** (0.003)	-0.005* (0.003)	-0.005 (0.004)
Securities ratio			-0.001 (0.001)	-0.000 (0.001)	-0.001 (0.001)
Deposit ratio			0.001 (0.001)	0.001 (0.001)	0.001 (0.001)
Loan refinancing			0.670* (0.375)	0.669* (0.375)	0.677* (0.372)
Loan secured			0.468*** (0.121)	0.468*** (0.121)	0.500*** (0.128)
Loan purpose			0.098 (0.114)	0.098 (0.114)	0.096 (0.106)
$Post07_t$	0.143 (0.102)				
$DomAff_i(0/1) \times Post07_t$				-0.054 (0.046)	
Observations	3,209	3,206	3,209	3,209	3,183
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 $\times$ Firm FE	Yes	Yes	Yes	Yes	Yes
FirmCountry $\times$ Time FE	No	Yes	Yes	Yes	Yes
BankCountry $\times$ Time FE	No	Yes	Yes	No	No
Firm $\times$ Time FE	No	Yes	Yes	Yes	No
FirmCountry $\times$ Industry $\times$ Time FE	No	No	No	No	Yes
Cluster	Bank	Bank	Bank	Bank	Bank

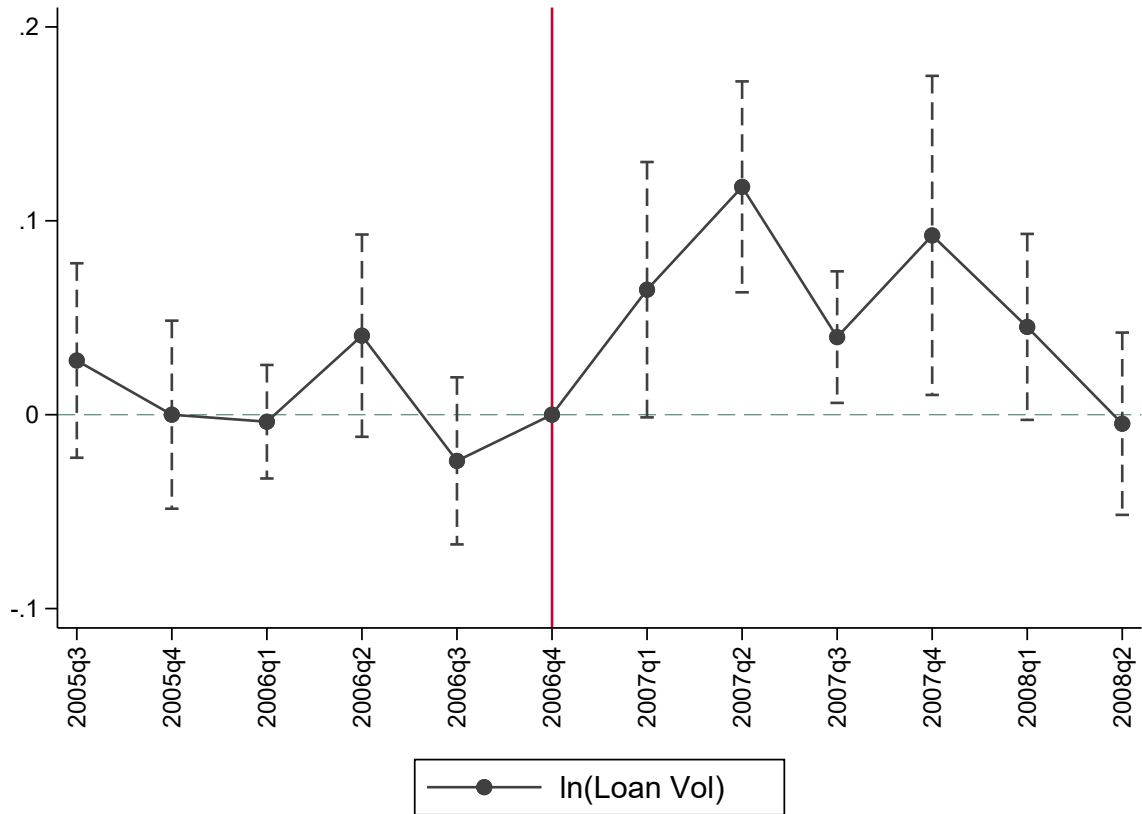


Figure 2: **Parallel Trend Assumption.** The figure is based on the following equation:

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

$\mathbf{1}\{\tau = t\}$  is a dummy variable that equals one in quarter  $t$  and 0 otherwise. Q4 2006, the quarter before the framework change, 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 5: **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 (2).  $Post07_t$  indicates the single-list regime after January 2007. The control variables on bank and loan level are lagged by 4 quarters. Bank country fixed effects are based on banks headquarters. \*\*\*, \*\*, \* denote significance at the 1, 5, and 10% level, respectively.

VARIABLES	(1) ln(Loan Vol)	(2) ln(Loan Vol)	(3) Pr(Loan)	(4) Pr(Loan)
$Affected_i(0/1) \times Post07_t$	-0.051 (0.065)	0.067** (0.032)	-0.008 (0.011)	0.010** (0.005)
$Post07_t$	-0.047 (0.043)		-0.008 (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 $\times$ Time FE	No	Yes	No	Yes
Firm $\times$ Time FE	No	Yes	No	Yes
Cluster	Bank	Bank	Bank	Bank

Table 6: **Alternative Measure: Interest Rate Spreads.** 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 (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.

VARIABLES	(1) Spread	(2) Spread	(3) Spread	(4) Spread	(5) Spread
$Affected_i(0/1) \times Post07_t$	7.884 (19.979)	-14.221* (7.049)	-11.971*** (3.292)	-10.985*** (3.199)	-12.117*** (3.766)
$\ln(\text{Total Assets})$			-11.570 (9.558)	-7.131 (10.465)	-3.896 (4.964)
Equity ratio			0.491 (2.310)	0.805 (2.557)	2.527* (1.436)
Return on Equity			0.100 (0.112)	0.059 (0.093)	0.137 (0.146)
Cash ratio			4.056 (2.400)	4.308 (2.596)	4.493* (2.602)
Securities ratio			0.603 (0.680)	0.658 (0.690)	0.513 (0.636)
Deposit ratio			-0.154 (0.186)	-0.162 (0.192)	-0.258* (0.152)
Loan refinancing			-26.476 (25.218)	-26.576 (25.236)	-27.481 (24.748)
Loan secured			-21.620 (15.267)	-21.627 (15.272)	-23.422 (16.153)
Loan purpose			17.291** (7.795)	17.301** (7.788)	16.012** (7.573)
$Post07_t$	-22.838** (9.062)				
$DomAff_i(0/1) \times Post07_t$				-14.041*** (4.818)	
Observations	3,209	3,206	3,209	3,209	3,183
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 $\times$ Firm FE	Yes	Yes	Yes	Yes	Yes
FirmCountry $\times$ Time FE	No	Yes	Yes	Yes	Yes
BankCountry $\times$ Time FE	No	Yes	Yes	No	No
Firm $\times$ Time FE	No	Yes	Yes	Yes	No
FirmCountry $\times$ Industry $\times$ Time FE	No	No	No	No	Yes
Cluster	Bank	Bank	Bank	Bank	Bank

Table 7: **Robustness: 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 (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.

VARIABLES	(1) ln(Loan Vol)	(2) ln(Loan Vol)	(3) ln(Loan Vol)	(4) ln(Loan Vol)
$Affected_k(0/1) \times Post07_t$	0.178 (0.132)	0.074** (0.033)	0.051* (0.026)	0.051** (0.025)
$Post07_t$	0.131 (0.080)			
Observations	2,721	2,721	2,721	2,695
R-squared	0.850	0.865	0.865	0.866
Loan-level Controls	No	No	Yes	Yes
Subsidiary $\times$ Firm FE	Yes	Yes	Yes	Yes
Country $\times$ Time FE	No	Yes	Yes	Yes
Country $\times$ Industry $\times$ Time FE	No	No	No	Yes
Firm $\times$ Time FE	No	Yes	Yes	No
Cluster	Subsidiary	Subsidiary	Subsidiary	Subsidiary

Table 8: **Robustness: Affected Defined Over Total Assets.** 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 (6).  $Post07_t$  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)
$AffectedTA_i(0/1) \times Post07_t$	0.028 (0.134)	0.063 (0.056)	0.088* (0.045)	0.089* (0.045)
Observations	3,190	3,190	3,190	3,164
R-squared	0.860	0.865	0.867	0.867
Bank-level Controls	No	No	Yes	Yes
Loan-level Controls	No	No	Yes	Yes
Bank $\times$ Firm FE	Yes	Yes	Yes	Yes
Country $\times$ Time FE	No	Yes	Yes	Yes
Firm $\times$ Time FE	No	Yes	Yes	No
Cluster	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 (7).  $Post07_t$  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)
$ForAff_i(0/1) \times Post07_t$	0.070 (0.076)	-0.079*** (0.023)	-0.016 (0.088)	0.009 (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 $\times$ Firm FE	Yes	Yes	Yes	Yes
Country $\times$ Time FE	No	Yes	Yes	Yes
Country $\times$ Industry $\times$ Time FE	No	No	No	Yes
Firm $\times$ 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 a placebo measure computed as in (2), but using (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 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)
$Affected_i(0/1) \times Post07_t$	-0.112 (0.101)	-0.030 (0.019)	-0.032* (0.018)	-0.021 (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 $\times$ Firm FE	Yes	Yes	Yes	Yes
Country $\times$ Time FE	No	Yes	Yes	Yes
Country $\times$ Industry $\times$ Time FE	No	No	No	Yes
Firm $\times$ 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 (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 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)
$Affected_i(0/1) \times Post05_t$	0.009 (0.151)	0.039 (0.024)	0.031 (0.024)	0.023 (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 $\times$ Firm FE	Yes	Yes	Yes	Yes
Country $\times$ Time FE	No	Yes	Yes	Yes
Country $\times$ Industry $\times$ Time FE	No	No	No	Yes
Firm $\times$ 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 (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) ln(Loan Vol)	(2) ln(Loan Vol)	(3) ln(Loan Vol)	(4) ln(Loan Vol)
$Affected_i(0/1) \times Post07_t$	0.051 (0.050)	0.048*** (0.013)	0.044*** (0.016)	0.023 (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 $\times$ Firm FE	Yes	Yes	Yes	Yes
Country $\times$ Time FE	No	Yes	Yes	Yes
Country $\times$ Industry $\times$ Time FE	No	No	No	Yes
Firm $\times$ 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<sub>i</sub>(0/1)* is based on a median split of banks along the affected measure (2). *Post07<sub>t</sub>* 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 headquaters. \*\*\*, \*\*, \* 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 <sub>i</sub> (0/1) × Post07 <sub>t</sub>	0.311*** (0.032)	0.296*** (0.030)	0.019*** (0.008)	0.019*** (0.007)	0.015 (0.016)	0.015 (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 <sub>i</sub> (0/1) × Post07 <sub>t</sub>	-23.630*** (7.560)	-21.367*** (9.689)	-14.144* (7.634)	-14.144* (7.558)	0.695 (0.960)	0.702 (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: Firm Sector.** 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 (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 borrower headquarters. \*\*\*, \*\*, \* denote significance at the 1, 5, and 10% level, respectively.

VARIABLES	(1) Tradable ln(Loan Vol)	(2) Non Tradable ln(Loan Vol)
$Affected_i(0/1) \times Post07_t$	0.113 (0.114)	0.156*** (0.023)
Observations	1,177	539
R-squared	0.872	0.773
Bank $\times$ Firm FE	Yes	Yes
Country $\times$ Time FE	Yes	Yes
Firm $\times$ Time FE	Yes	Yes
Cluster	Bank	Bank

Table 15: **Bank Risk Taking.** This table provides evidence on bank risk taking by estimating (8). The analysis is based on data on the bank-loan-quarter level from Q1 2006 to Q4 2007.  $D2D$  is the distance-to-default of firm  $j$  at quarter  $t$ .  $Affected_i(0/1)$  is based on a median split of banks along the affected measure (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 banks' respective headquarters. \*\*\*, \*\*, \* denote significance at the 1, 5, and 10% level, respectively.

VARIABLES	(1) D2D	(2) D2D	(3) D2D
$Affected_i(0/1) \times Post07_t$	-0.036 (0.033)	-0.016* (0.008)	-0.007** (0.002)
$\ln(\text{Total Assets})$			0.044*** (0.009)
Equity ratio			0.028*** (0.004)
Return on Equity			0.000 (0.000)
Cash ratio			0.037*** (0.007)
Security ratio			-0.001 (0.000)
Deposit ratio			-0.001* (0.000)
Loan refinancing			0.016 (0.012)
Loan secured			0.008 (0.006)
Loan purpose			-0.006* (0.003)
Observations	245	245	245
R-squared	0.858	0.993	0.998
Bank-level Controls	No	No	Yes
Bank $\times$ Firm FE	Yes	Yes	Yes
Bank-Country $\times$ Time FE	No	Yes	Yes
Cluster	Bank	Bank	Bank

## 7.5 Firm-Level Results

Table 16: **Firm Level: Loan Growth.** This table provides results on loan growth at the firm-year level from 2005 to 2008. The dependent variable is  $\Delta \ln(\text{Loan Vol})$ , the first difference in the natural logarithm of loan issuance to firm  $j$ , cumulated over all banks in year  $t$ . The treatment variable  $\text{Exposed}_j(\%)$  is based on (9).  $\text{Post07}_t$  equals one after the implementation of the framework change in January 2007, and zero otherwise. Country-fixed effects are based on the firms' respective headquarters. \*\*\*, \*\*, \* denote significance at the 1, 5, and 10% level, respectively.

VARIABLES	(1) $\Delta \ln(\text{LoanVol})$	(2) $\Delta \ln(\text{LoanVol})$	(3) $\Delta \ln(\text{LoanVol})$
$\text{Exposed}_j(\%) \times \text{Post07}_t$	1.184** (0.556)	1.161** (0.578)	1.378** (0.676)
$\ln(\text{Assets})_{f,t-1}$			-1.011* (0.544)
$\text{Leverage}_{f,t-1}$			-10.783*** (2.233)
$\text{Liquidity}_{f,t-1}$			-7.164* (3.755)
Observations	1,395	1,395	1,395
R-squared	0.188	0.235	0.341
Firm Controls	No	No	Yes
Firm FE	Yes	Yes	Yes
Year FE	Yes	No	No
Country $\times$ Year FE	No	Yes	Yes
Industry $\times$ Year FE	No	No	Yes
Cluster	Firm	Firm	Firm

Table 17: **Firm Level: Real Effects.** This table provides results on real firm activity at the firm-year level from 2005 to 2008. The dependent variables are the logged number of employees, investment as measured by log PPI, the log sales, as well as asset growth. The treatment variable  $Exposed_j(\%)$  is based on (9).  $Post07_t$  equals one after the implementation of the framework change in January 2007, and zero otherwise. \*\*\*, \*\*, \* denote significance at the 1, 5, and 10% level, respectively.

VARIABLES	(1) ln(Employ)	(2) ln(Tangible assets)	(3) ln(Sales)	(4) Asset growth
$Exposed_j(\%) \times Post07_t$	0.060** (0.027)	0.083* (0.045)	0.056* (0.030)	0.059* (0.035)
Observations	1,209	1,452	1,489	1,504
R-squared	0.990	0.981	0.984	0.567
Firm Controls	Yes	Yes	Yes	Yes
Firm FE	Yes	Yes	Yes	Yes
Year FE	Yes	Yes	Yes	Yes
Cluster	Firm	Firm	Firm	Firm

Table 18: **Firm Level: Exposure to Foreign Banks.** This table provides results on loan take-up and volumes at the firm-year level from 2005 to 2008. In the upper panel, the dependent variable is  $pr(Loan)$ , an indicator variable equal to one if firm  $j$  obtains a bank loan in the respective year  $t$ , and zero otherwise. In the lower panel,  $Loan\ Vol$  is the loan issuance to firm  $j$ , cumulated over all banks. The treatment variable  $Exposed_j(\%)$  is based on (11).  $Post07_t$  equals one after the implementation of the framework change in January 2007, and zero otherwise. \*\*\*, \*\*, \* denote significance at the 1, 5, and 10% level, respectively.

VARIABLES	(1) pr(Loan)	(2) pr(Loan)	(3) pr(Loan)
$Exposed_j(\%) \times Post07_t$	0.078 (0.106)	0.018 (0.152)	0.047 (0.160)
$\ln(Assets)_{f,t-1}$			-0.082 (0.087)
Leverage $_{f,t-1}$			-0.467 (0.293)
Liquidity $_{f,t-1}$			-0.771** (0.357)
Observations	922	922	922
R-squared	0.424	0.551	0.557
Firm Controls	No	No	Yes
Firm FE	Yes	Yes	Yes
Year FE	Yes	No	No
Industry $\times$ Year FE	No	Yes	Yes
Cluster	Firm	Firm	Firm

VARIABLES	(1) ln(Loan Vol)	(2) ln(Loan Vol)	(3) ln(Loan Vol)
$Exposed_j(\%) \times Post07_t$	0.882 (0.881)	0.284 (1.301)	0.542 (1.381)
$\ln(Assets)_{f,t-1}$			-0.816 (0.761)
Leverage $_{f,t-1}$			-3.974 (2.501)
Liquidity $_{f,t-1}$			-6.507** (3.002)
Observations	922	922	922
R-squared	0.427	0.545	0.550
Firm Controls	No	No	Yes
Firm FE	Yes	Yes	Yes
Year FE	Yes	No	No
Industry $\times$ 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