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

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Abstract

This paper studies the effects of harmonizing collateral policy in a monetary union. In 2007, the European Central Bank replaced national collateral lists with a single list specifying which assets euro area banks can pledge as collateral. Banks holding newly eligible assets experience a reduction in their cost of funding and increase loan supply compared to banks without such assets. The effect is driven by core banks increasing credit supply to riskier and less productive firms located in periphery countries. These firms in turn experience growth in employment and investment. Our results suggest that a harmonized collateral framework facilitates cross-border lending to borrowing-constrained firms and, thereby, increases financial market integration in a monetary union.

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1 Introduction

In currency unions with incomplete fiscal and financial market integration, such as the euro area, asymmetric shocks can easily 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.[1]

One particular set of measures is the implementation of a *banking union* which, among other things, aims at making local private sector funding conditions independent from the local banking system's health.[2] However, there is limited knowledge about which instruments can contribute to a successful implementation of a banking union. This paper studies *harmonized collateral policy* as one potential component of a banking union. Using an ECB collateral framework change as a quasi-natural experiment, we shed light on the transmission channels of financial market integration to private sector funding conditions, capital flow dynamics within a currency union, and real effects on private sector borrowers.

Specifically, in January 2007, and therefore unrelated to the financial crisis of 2008, the ECB introduced a single list specifying which assets banks can use as collateral in refinancing operations. Prior to the change, each national central bank specified different collateral rules, such that banks were effectively facing country-specific pools of eligible assets in refinancing operations with their respective national central bank. Using loan-level data from the euro area syndicated loan market, we document four effects of harmonizing collateral pools. *First*, banks with a high exposure to *foreign euro area* loans increase their credit supply by 8.3% compared to unaffected banks, once loan demand is controlled for. This effect is particularly pronounced for funding-constrained banks and absent for unconstrained banks, giving rise to interpreting the single list's introduction as a positive funding shock to affected banks. *Second*, additional credit supply is primarily targeted at riskier firms and firms active in the non-tradable sec-

[1] 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. See also the discussion in Martin and Philippon (2017).

[2] Martinez, Philippon, and Sihvonen (2019) show that a banking union defined along these lines improves cross-country risk-sharing.

tor. *Third*, affected core banks exhibit a *flight abroad* effect (Giannetti and Laeven (2012)), especially increasing lending towards borrowers located in the periphery, also referred to as GIIPS-countries.[3] *Fourth*, firms in relationship with highly exposed banks increase employment and investment. The latter effect is particularly pronounced for higher-risk borrowers, underscoring the notion that the single list policy relaxed corporate borrowing constraints by deepening the pool of potential creditors.

In order to fix ideas, we set up a three dates model of collateral policy in a monetary union subject to regional imbalances. There are two regions, core and periphery, with an identical set of investment objects. Regions differ with respect to the funding of the (region-specific) banking sector at $t = 0$. Specifically, periphery banks are unable to finance all domestic projects, while core banks are endowed with excess funds. We assume that projects require additional funds in $t = 1$ and are inefficiently liquidated if this funding can not be supplied. To supply funds, banks have to tap central bank facilities, which is only possible if the project is eligible with the respective NCB. Consequently, projects in the periphery that are subject to high funding needs in the interim period (i.e., projects with low fundamentals) will have a negative net present value to core banks. The model predicts that due to the possibility of refinancing projects in the interim period via central bank repos, *riskier periphery projects* experience an increase in *credit supply from core banks* after the introduction of a single list.

To test these predictions, we focus on bank loans, the eligibility of which varied significantly across the euro area prior to 2007. At most, only loans held from domestic firms were eligible, and both terms and maximum amounts differed. After the introduction of the single collateral list, eligibility was streamlined, and euro area banks could pledge bank loans which had originated in the whole euro area as collateral. We classify banks into *affected* and *unaffected* to account for the different exposure to other, non-domestic, euro area borrowers in their syndicated loan portfolio prior to the framework change. Using this classification, we employ a standard difference-in-differences approach and compare changes in the lending of affected banks which actively issue loans to firms in other euro area countries on the syndicated loan market (treated) relative to a control group of unaffected banks which are less active in euro area cross-border lending (control). The identifying assumption is that unaffected banks provide a counter-factual for the lending of the banks affected in the absence of a framework change.

A possible argument against the causal interpretation of the estimated effects is that the

[3]GIIPS are Greece, Ireland, Italy, Portugal, Spain.

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. To tackle such endogeneity concerns, we include bank level control variables for size, leverage profitability, and for a bank's liquidity position on both the asset and the liability side. Another concern is that the borrower pool is not orthogonal to a banks' loan portfolio. In other words, borrowers might differ for affected and unaffected banks, and hence banks would face different investment opportunities after the framework change. To address this concern, we add firm $\times$ quarter fixed effects in the most stringent specification, which absorb any time-varying difference in firm-specific factors such as loan demand, along the lines of Khwaja and Mian (2008).

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 in 2008/09 is such a possible confounding event. While we argue that this framework change is a crisis-unrelated policy change, research has shown that European banks exposed to U.S. sub-prime market cut their lending already well ahead of the start of the financial crisis (Puri, Rocholl, and Steffen (2011); Huber (2018)). Since affected banks are the ones more active on the European syndicated loan market, they might also be more active internationally. While affected and unaffected banks do not significantly differ along many dimensions (e.g. size, leverage, liquidity), we also address this concern by keeping the event window very short. As a robustness check, we restrict the analysis to Q1 2006 -Q2 2008, four quarters before and after the framework change; the results remain unchanged.[4] In addition, it might be that banks self-select into the treatment group by anticipating the framework change. While the ECB's changeover to a single collateral framework was announced two years in advance, the details of the assets to be included were not publicly known before the announcement date. Lastly, we confirm the parallel trend assumption using parametric tests: loan issuance between affected and unaffected banks did not differ systematically in the period prior to the framework policy change.

Related Literature This paper is related to two broad strands of literature. First, we contribute to a series of papers studying the role of cross-border banking for international financial

[4]This confounding event would at most bias the results downward. Banks affected by the financial crisis usually decrease lending to the corporate sector (Chodorow-Reich (2014)), while we expect the framework change to stimulate loan issuance of affected banks.

integration. 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, Kalemli-Ozcan, Papaioannou, and Peydró (2010) provide an analysis of the determinants of financial integration, while 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 restricted 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. Their analysis puts an emphasis on small firms, while firms participating in the syndicated loan market are typically larger and more likely to be active internationally. Bruche and Suarez (2010) study adverse consequences of sudden stops on the interbank market in financially fragmented regions. On a more general level, the role of banks in facilitating cross-border capital flows is also discussed in Lane (2013) and Unger (2017). We show that a harmonized collateral framework can facilitate cross-border lending to borrowing-constrained firms and, thereby, increase financial market integration in a monetary union.

Second, we expand the literature on the effects of collateral policy through the bank lending channel, which can conceptually be divided into two steps: banks and the real sector. Van Bekkum, Gabarro, and Irani (2018) document that changes in collateral eligibility concerning residential mortgage backed securities affects bank lending behaviour 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 new loans issued to eligible firms. Focusing on firm-level effects, Pelizzon et al. (2019) find that eligibility in the Eurosystem collateral framework has quantifiable effects on debt financing decisions of firms which issued newly eligible bonds. Grosse-Rueschkamp, Steffen, and Streitz (2019) find a capital structure effect of (unconventional) monetary policy at the firm level. To the best of our knowledge, this paper is the first to document real effects of collateral policy on the firm level, both in terms of employment and investment.

The remainder of our paper is organized as follows. Section 2 presents the institutional setting and describes the collateral framework change. A simple model of collateral frameworks in a segmented currency union is laid out in Section 3. Based on the model, Section 4 lays out

the empirical strategy, while details on our data and variables are shown in Section 5. Section 6 presents the results, while Section 7 presents several robustness checks. Section 8 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 to obtain central bank funding. 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 fulfilling euro area-wide eligibility criteria. Tier-two assets fulfilled eligibility criteria specified by *national central banks* (NCB) set, allowing to incorporate peculiarities of the respective domestic banking sector in the collateral framework.[5] The ECB's practice prior to the single list's announcement in 2005 suggests that, during "normal" times, implementing policy in a monetary union does not require a harmonized collateral framework. This softens endogeneity concerns when interpreting the single list's introduction as an (asset-specific) funding shock to banks. Given the macroeconomic environment and the ECB's policy stance, the single list can be interpreted as policy instrument to increase financial integration that is orthogonal to monetary policy effects through the bank lending channel.

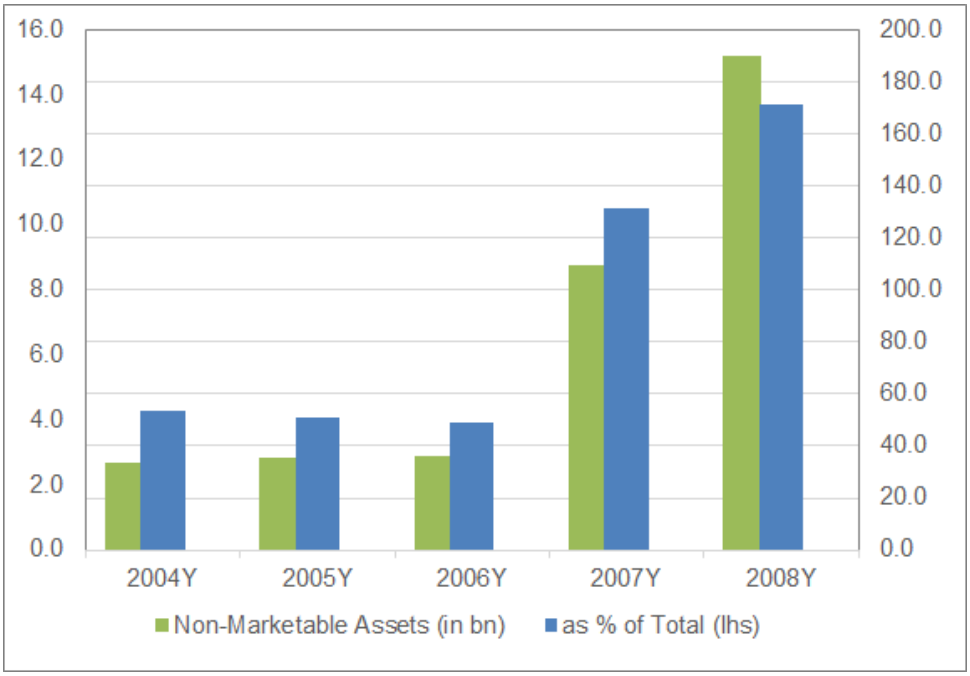
Country-specific collateral pools induce loan market segmentation along two dimensions: banks, depending on their respective locations, had a different collateral pool at their disposal. At the same time, firms were subject to different creditor pools, since foreign banks might find holding loans from the host country less attractive if the foreign bank can not pledge such a loan as collateral. To address this drawback, the ECB introduced a single list of eligible collateral to replace the two-tier-system. Consequently, certain asset classes stopped being eligible, such as equities in Spain, Netherlands and Portugal, while other asset classes became eligible throughout the euro area.

In particular, the introduction of the single collateral list established the eligibility of (syndicated) bank loans located in the euro area.[6] Prior to the framework change, the NBCs of Germany, Austria, Spain and France accepted bank loans to domestic companies as collateral, while cross-border loans were not accepted. Other NCBs did not accept any bank loans as collateral - neither domestic nor cross-border. The key novelty of the harmonized collateral

[5]For a detailed review of the Eurosystem Collateral Framework, see Bindseil et al. (2017).
[6]The official announcement on 22 July 2005 contained details on the inclusion of bank loans (see ECB (2005)).

framework was that not only domestic but also bank loans originated to other euro area borrowers could now be pledged as a collateral for ECB refinancing operations. Restrictions apply, among others, on the quality of the loans and the minimum loan amount. Importantly, these criteria apply also to a syndicated member's share in a syndicated loan, which is the focus of our analysis.

Figure 1: Non-Marketable Assets Pledged as Collateral



Notes: Right axis shows "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)). Left axis displays the share of pledged non-marketable assets. Annual values are averaged over each year, respectively, but unavailable at higher frequencies. *Source*: ECB collateral data.

We argue that this policy change induced a change in bank's pledging behavior, which then in turn also affects their loan supply decisions. Figure 1 provides suggestive evidence along these lines. Specifically, it shows the use of non-marketable assets, which includes mostly bank loans, as collateral in ECB refinancing operations. Before 2007, both the absolute amount and the share in total collateral use was stagnant at around 35 bn EUR or 4%, respectively. By the end of 2007, after collateral policy was harmonized and included cross-border bank loans, the use of non-marketable assets more than doubled to 109 bn, and its share in the total use of collateral increased to almost 11%. The trend continued in 2008, as 14% of total collateral was made up of non-marketable assets, corresponding to 190 bn EUR in absolute values.

3 A Simple Analytical Framework

Consider a three-dates setting with two regions, core (C) and periphery (P). In each region, there is a banking sector and a mass-one continuum of investment projects. Deposit markets, i.e., banks' funding conditions, are completely segmented between core and periphery. The endowment of core banks is given by an interest rate elastic function $c(r^C)$, while periphery banks are endowed with $p(r^P)$, where r^C and r^P denote funding costs of banks in each region, respectively.[7] Available endowment increases in the interest rate paid on deposits $\frac{\partial p}{\partial r^P} > 0$, $\frac{\partial c}{\partial r^C} > 0$. We abstract from heterogeneity within each banking region and can therefore think of two representative banks. Furthermore, there are no capital controls, so banks can freely finance projects in both regions. We assume a *mild home bias*: banks only extend cross-border loans if there are no positive NPV projects domestically. Banks' financing decision and the implied cross-region capital flows will be affected by the eligibility of loans as collateral.

Core-Periphery Heterogeneity and Credit Supply While banks are homogeneous within each region, we follow the literature on cross-border banking in the euro area (Spiegel (2009)) and assume heterogeneity in banks' funding conditions. Specifically, if $p(r) > c(r)$ for all r, core banks have a funding advantage over periphery banks. In addition, we assume that $c(1) > 1 > p(1)$. This will give rise to capital flows from core to periphery following the harmonization of collateral policy.

There are various interpretation of heterogeneous endowments, which ultimately deliver the same testable implications of harmonizing collateral policy. Giannetti and Laeven (2012) argue that cross-country heterogeneity in bank funding conditions drives international credit flows. In particular, banks that experience an improvement of funding conditions exhibit a flight-abroad affect and supply more credit internationally. Regional variations in banks' funding conditions have effects on bank lending, as shown by Becker (2007) at the US county level.

Technology Investment projects, also referred to as firms, indexed by j, require a fixed-size investment in $t = 0$, normalized to one. If a project is successful, it yields a payoff $\overline{R}$ at $t = 2$. In spirit of Holmström and Tirole (1998), projects require additional funds in the interim period $t = 1$, with probability π, which can be interpreted as liquidity shock. If banks do not grant funding to firms, the project is (inefficiently) liquidated and yields no payoff. To close the

[7] These funding cost can also be interpreted as banks' cost of capital, which in turn constrain banks' ability to extend deposits and credit. This does not change the model's testable implications.

model, we assume that banks have access to a storage technology that yields zero net run, but can not be liquidated in $t = 1$.

Timeline

$t = 0$ Projects require a fixed-size investment of one unit.

$t = 1$ With probability π, the project is hit by a liquidity shock and requires investment of k^j. If this investment can not be funded, the project is terminated and yields no payoff.

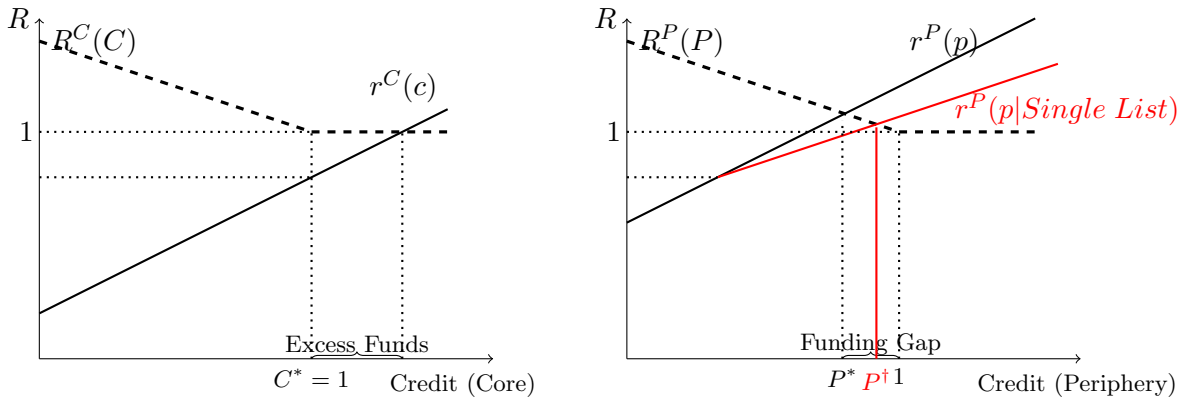
$t = 2$ Projects that are still operated yield $\overline{R}$.

Liquidity Shocks, Investment Returns, Credit Demand Banks can neither liquidate their storage nor withdraw funds from other projects. We also assume that it is not possible to attract new deposits in the interim period, so that the only way to finance the projects' funding requirement is to borrow from the central bank in exchange for collateral, which resembles a collateral-driven repo. This assumption reflects the idea that banks in this model are *funding constrained*. Projects are heterogeneous in their funding requirement κ^j in the interim period. For notational convenience, let the firm index j also represents a "quality ordering" of firms in the sense that the liquidity shock κ^j satisfies $\frac{\partial \kappa^j}{\partial j} > 0$ with $\lim_{j \to 0} = 0$ and $\lim_{j \to 1} = \kappa^+$. The highest-quality firms do not receive a liquidity shock, while the funding requirement reaches some finite limit for projects of lowest quality. The pledging behavior of banks implied in this assumption is consistent with empirical evidence: the collateral portfolio accepted by the central bank is slanted toward riskier loans, since riskier projects require larger refinancing through repos.

If a bank can pledge a loan as collateral, its (gross) return is given by $R^j = (1 - \pi)\overline{R} + \pi(\overline{R} - \kappa^j) = \overline{R} - \pi\kappa^j$. We will assume that *(i)*, $\kappa^+ < \frac{\overline{R}-1}{\pi}$, which implies that all projects have a positive NPV if they can be pledged as collateral and, *(ii)*, $(1 - \pi)\overline{R} < 1$, implying a negative NPV if they can not be pledged. It follows as a by-product of this assumption that repos are over-collateralized for all j in the sense that the repo size κ^j is smaller than the pledged collateral's payoff $\overline{R}$, which is a distinguishing feature of central bank lending.

We denote the resulting *credit demand functions* by $R(P)$ and $R(C)$, respectively. These functions map the return of the marginal project (R^j) into the share of projects offering a higher return (j). These functions satisfy $\frac{\partial P}{\partial R^P} < 0$ and $\frac{\partial C}{\partial R^C} < 0$ by construction, and furthermore $R^C > 1$ for all C and $R^P > 1$ for all P.

Figure 2: Credit Market Equilibrium



Equilibrium Credit Supply In the absence of a single list, core banks finance all projects in the core and invest $C(1) - 1$ into the storage technology, since periphery loans have a negative net present value to them. In the periphery, banks finance projects until their endowment is exhausted. The cutoff project that just receives financing is denoted by κ^P and is implicitly pinned down by the credit market equilibrium condition $R^P(P^*) = r^P(P^*)$, which is satisfied by a unique $0 < P^* < 1$ due to the monotonicity assumptions on credit supply and demand. Figure 2 provides graphical intuition for the credit market equilibrium in both regions, where credit supply in the periphery absent a single list is indicated by the black solid line in the right panel. The funding gap in the periphery is given by $1 - P^*$.

The introduction of a single list induces core banks to reallocate investment from the storage technology to periphery loans, i.e., core banks exhibit a flight-abroad effect and there is a credit flow from core to periphery. Credit supply in the periphery now exhibits a smaller slope to the right of $r^C(1)$ due to the mild home bias assumption on banks. This is represented by the red line in the left panel of Figure 2. Equilibrium credit supply P^{SL} in the periphery is now given by $P^{SL} = \min\{P^\dagger, 1\}$. If excess funds $C(1) - 1$ are sufficiently large, the financing gap in the periphery is completely filled by additional credit supply from core banks. If excess core funds are smaller than the funding gap, there is still a flight-abroad but some periphery projects remain unfunded.

Testable Implications Interpreting banks in the model as being active on the international syndicated loan market, our theoretical framework predicts that

I. harmonizing collateral policy increases credit supply by funding-constrained banks,

II. harmonizing collateral frameworks induces capital flows from core to periphery,

III. high-risk borrowers in the periphery experience a relaxation of credit constraints and increase investment/employment.

Discussion There are two special cases of this framework that are worth discussing. First, consider the case where endowment of banks does not depend on the interest rate they are paying on their liabilities, i.e., the credit supply curve is vertical. As long as $p < 1 < c$, this setting implies that periphery firms face a funding gap absent harmonized collateral policy, which will be closed (at least partially), once the single list is introduced. The other extreme case obtains if credit supply is perfectly interest rate elastic and satisfies $r^C \leq 1 < r^P$, i.e., the credit supply curve is horizontal. Lower quality periphery projects (with $R^j < r^P$) remain unfunded, while core banks would be willing to finance these projects if they can use periphery loans as collateral. In both cases, the testable hypotheses are identical to the general case of interest rate elastic credit supply.

Since our simple framework focuses on banks' credit supply decision, it does not deliver specific predictions regarding firms' investment and employment. Adding these adjustment margins to the model does not add conceptually interesting effects, but is notationally more intensive. Furthermore, we abstract from modeling a control group of banks that is not active on the syndicated loan market, which is of course a crucial step in the empirical analysis, but again does not add economic intuition to our framework. Similarly, all banks in our model are funding-constrained by construction, since banks can only raise funds in the interim period by pledging loans as collateral. The case of unconstrained banks obtains when removing the liquidity shock during the interim period, which can reflect the sale of other assets (slack liquidity constraint) or issuing debt at negligible costs (slack equity constraint). The NPV of all projects would be positive for all banks in this case by the assumption $\overline{R} > 1$ and banks would not react to collateral eligibility of their assets. Indeed, we do not find sizable credit supply effects of (liquidity- or equity-) unconstrained banks in the data.

It should be noted that the introduction of the single list is a policy directly targeted at banks and affects two conceptually distinct aspects of financial market integration. The first (unmodeled) aspect is a deepening of collateral pools available to each bank, which can have a positive impact on financial stability.[8] Second, and more importantly to our analysis, the single list deepens the pool of potential lenders for borrowers in the non-financial sector,

[8]The ECB (2006) states that *"by increasing the liquidity of an entire asset class, such as bank loans, the single list of collateral promotes the smooth functioning of the euro area financial system."*

which (partially) equates funding conditions and, thereby, creates a level playing field for the non-financial sector across regions. In our model, this is represented by banks' decision to extend credit to two firms with identical fundamentals, but located in different regions (core and periphery).

4 Empirical Strategy

To test the model's predictions, we use a difference-in-differences set-up and compare the lending behavior of banks with different euro area loan portfolios before and after the introduction of the single list. We present results that allow us to interpret the single list as a *positive shock* to funding conditions of banks with a large share of (newly eligible) euro area loans on their balance sheet. Our results furthermore suggest that the ensuing credit supply effects are *collateral-driven*, since affected banks primarily responded by increasing lending in other euro area countries. This flight-abroad effect is consistent with our simple analytical framework. We then test to which extent the positive shock to bank funding conditions can be traced at the firm level, and evaluate potential real effects on investment and employment.

4.1 Bank-Firm Level

We classify banks into *affected* (treated) and *unaffected* (control) to account for different exposure to other euro area borrowers - firms headquartered in another euro area member state - in the banks' syndicated loan issuance. Assuming that the framework change is more important for banks which were already actively issuing loans to other euro area borrowers, we identify such banks according to their issuance history: First, we cumulate bank i's issuance by euro area borrower origin (excluding domestic) over the period prior to the collateral framework change, from Q1 2003 to Q2 2005.[9] We then cumulate the total loan issuance of bank i over the same period. The resulting ratio is the exposure measure $Affected(\%)_{05,i}$, the ratio of bank i's loan issuance to other euro area borrowers over its total loan issuance in the period Q1 2003 to Q2 2005.[10] We test the hypothesis from our simple analytical framework using the following

[9] We use the issuance history up to Q2 2005, which covers the period before the official announcement of the inclusion of bank claims into the single collateral list on July 2005.

[10] Our results are robust to defining the *Affected*-ratio over total assets instead of total loan issuance (see Table 20). This alleviates concerns that results are driven by banks that are not very active on the syndicated loan market but lend (almost) exclusively to domestic borrowers.

baseline specification at the bank-firm-quarter level:

$$ln(1 + y_{ijt}) = \beta_1 \text{Affected}(\%)_{05,i} \times \text{Post07}_t + \beta \text{X}_{i,t-4} + \mu_{ij} + \mu_{jt} + \nu_{jt} + \epsilon_{ijt} \ , \quad (1)$$

where y_{ijt} are loan issuances in million USD to firm j provided by bank i (as lead or participating bank) at time t. *Affected(%)*$_{05,i}$ is equal to the share of euro area loans excluding domestic loans in bank i's total syndicated loan portfolio. *Post07*$_t$ is equal to one after the framework change was implemented in January 2007.[11] $X_{i,t-4}$ is a vector of bank level controls for size, leverage, profitability, and a bank's liquidity position, both on the asset (cash ratio) and on the liability side (deposits ratio), all lagged by 4 quarter. μ_{ij} denotes bank $\times$ firm, μ_{jt} denotes firm $\times$ quarter, and ν_{jt} denotes country $\times$ quarter fixed effects.

The coefficient of interest, β_1, measures how affected banks respond to the framework change relative to the control group. We expect $\beta_1 > 0$, as lower funding costs for affected banks stimulates loan issuances after the framework change. We cluster standard errors on 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 (unaffected) provide a counter-factual for banks more actively lending to euro area firms (affected) in the absence of a framework change.

To support our interpretation of the single list's introduction as an (asset-specific) shock to banks' funding conditions, we estimate Equation (1) on the sub-sample of equity-constrained banks as measured by their Tier1-equity ratio. The estimated credit supply effect for affected *and constrained* banks is almost three times larger than in the full sample, while affected *but unconstrained* banks exhibit and (statistically insignificant) effect of almost zero. We obtain similar results when using the ratio of securities over total assets as a proxy for liquidity constraints to subset banks.

In line with hypothesis III, we explicitly take borrower characteristics into account when estimating the effect of harmonized collateral policy on loan supply. We first investigate the existence of a flight abroad effect by taking into account the geographical distribution of affected banks' loan portfolios. Second, we test whether these funds were flowing into riskier and less-productive borrowers. To maintain the bank-firm-level specification, we subset borrowers (i)

[11] 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) as event date. Using the announcement date as a robustness, we find no significant effect on bank lending.

according to the standard deviation of ROA as a direct measure of firm risk and (ii) into non-tradable and tradable goods producers, following the analysis of Schneider and Tornell (2004)

Confounding Factors In the baseline specification the event window is relatively short (Q1 2006 - Q2 2008), including four quarters before and six quarters after the framework change, to exclude potential confounding events. The financial crisis in 2008/09 is such a possible confounding event. While we argue that the collateral framework change is a crisis-unrelated policy change, some papers have shown that European banks exposed to U.S. sub-prime market cut their lending already prior to the start of the financial crisis (Puri, Rocholl, and Steffen (2011) and Huber (2018)). 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, this confounding event would at most bias the results downwards. Furthermore, when shortening the event window to the period Q1 2006 - Q4 2007 as a robustness check in Table 13, the results remain unchanged.

For a causal interpretation of the estimated effects, two additional concerns need to be dismissed. First, our treatment is lacking random assignment, and could be based instead on a variable that affects treated and control group differentially and correlates with the framework change. To address this, we include bank level control variables for size, leverage profitability, and bank's liquidity position, both on the asset and on the liability side. Second, the potential borrower pool is not orthogonal to a banks' 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 identifying loan supply, as we compare the lending of affected and not affected banks to the same borrower, absorbing loan demand, similar to Khwaja and Mian (2008).

Finally, 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, funding conditions, and asset composition. In Table 4, we show that banks do not significantly differ along any of these dimensions. Additionally, we exploit the fact that the framework change is

relevant only for banks headquartered in the euro area. We build a placebo group of affected banks residing outside the euro area, but inside the EU, which are active in the euro area. We then run this *falsification test*, confirming that the framework change does not have an impact on the placebo group of lenders residing *outside the euro area* but active on the euro area syndicated loan market and, thereby, qualify as *Affected*. We also confirm the parallel trend assumption through a parametric test. Loan issuance between the affected and the unaffected banks did not differ systematically in the period prior to the harmonization of collateral policy.

4.2 Firm Level

At the firm level, our analysis is based on an annual data. Our setup is related to Pelizzon et al. (2019) and Grosse-Rueschkamp, Steffen, and Streitz (2019). Building on their results, we test whether firms with a prior relationship to affected banks experience a credit expansion. In the following, we only consider banks with an above median share of euro area loans in their syndicated loan portfolio to be "affected" banks. We estimate the following regression at the firm-year level:

$$y_{jt} = \delta_1 \text{ Affected}_j \times \text{Post}_{07,t} + \delta \text{X}_{j,t-1} + \mu_{dt} + \mu_{ct} + \mu_j + \epsilon_{jt} \tag{2}$$

To test for a credit expansion on the firm level due to the collateral framework change, the dependent variable is $pr(Loan)_{jt}$, an indicator variable equal to one if firm j obtains a bank loan in the respective year t, and zero otherwise. The treatment group indicator $Affected_j$ equals one if a firm has a lending relationship with an affected bank in 2006, prior to the implementation of the framework change, and zero otherwise. $Post07_t$ equals one after the implementation of the framework change in 2007, 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, all lagged by one year. μ_j denote firm fixed effects, μ_{dt} denote industry $\times$ year, and μ_{ct} denote 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, δ_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.

Related to hypothesis III, we use the five-year standard-deviation of loan-financed firm j's ROA from year t-5 to t-1 as dependent variable $ln(\sigma(ROA_j)^{5y})$ to examine the role of borrower characteristics in the bank lending decision after the collateral framework change. This measure is consistent with the definition of firm risk-taking behavior in Heider, Saidi, and Schepens (2019). Estimating Equation 2 with this firm quality measure as dependent variable complements the approach of sub-sampling borrowers into high/low risk firms in the bank-firm-level analysis.

We then test whether this additional credit translates into real outcomes in terms of employment and investment on the firm level. The dependent variables are *ln(Employees)*, the log of the number of employees at firm j in year t and *ln(Investment)* the log of investment, respectively. In this case, the coefficient of interest, δ_1, measures the impact on real outcomes if firm j has a lending relationship with an affected bank. We expect $\delta_1 > 0$, since firms increase both their number of employees and investment if they are facing increased credit supply from affected banks.

5 Data

Lending Data We analyze bank's lending behavior using Dealscan data on the syndicated loan market.[12] In this market, different banks form a syndicate to then jointly lend to a single borrower. The lending syndicate includes one lead bank and a number of participating banks. Lead arrangers are those members of a syndicate typically responsible for traditional bank duties, including negotiating conditions of deals, due diligence, and monitoring (Ivashina and Scharfstein 2010). Participants are usually not in direct contact with the borrower, but merely supply credit. We consider both lending by lead arrangers and participants to capture total loan supply on the syndicated loan market, based also on recent work by Blickle et al. (2020).[13] Also, we restrict the sample to loans by banks to non-financial firms and consider lending only by commercial, savings, cooperative and investment banks.

We decompose syndicated loan deals into loan portions provided by each lender to obtain granular loan level data. Whenever Dealscan provides information on lending shares of each

[12] Tabakis and Tamura (2013) provide an excellent overview of the pro and cons of using different types of credit claims, and specifically syndicated loans, as collateral in the Eurosystem.

[13] In their paper *The Myth of the Lead Arranger*, they find that lead arrangers sell their entire loan share for 27 percent of term loans and 48 percent of Term B loans, typically shortly after syndication.

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. 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 transactions happening when a syndicated loan is issued, disregarding its maturity profile. We hence only account for flows on a bank-firm-quarter level. Table 1 presents summary statistics on the bank-firm-quarter level over the sample period Q1 2006 to Q2 2008. The average loan issuance to firm j amounts to 169.46 million, the average spread over LIBOR to 120 basis points, and the average maturity of the loans to 5 years. Half of the loans in our sample have at least one designated lead arranger. The share of issued loans to euro area firms as well as to domestic firms amounts to 24 % over total loan issuance. Domestic firms are defined as firms which have their headquarters in the same country as the corresponding bank. Overall, 46% of firms in the sample are headquartered in the euro area.

Firm Variables Next, to control for firm-characteristics, we obtain annual firm accounting data for European firms from Compustat. We aggregate the Dealscan bank-firm-quarter to the firm-year level to 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. Financial firms (SIC codes 6000-6999) are dropped. Table 3 shows summary statistics. The average firm with an relationship to affected banks obtains loans with a larger volume, has more total assets, a higher market to book ratio and a higher dividend payout. Also, they employ more people and invest more.

Financial Variables To control for bank characteristics, we match the banks included in the DealScan database with bank balance sheet data from CapitalIQ (SNL financial's).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 the asset side, banks hold on average 66% loans and 32% securities over total assets. On the funding side, deposits make up 42% and equity 5.2% of total assets on average. The Return on Equity (ROE) amounts to 11.3% on average across the sample period.

Table 4 presents evidence on the difference in bank characteristics between the treatment (affected) and control (unaffected) groups 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 and cash, but have a slightly higher loans-to-asset ratio (66.6 % vs 64.4%). On the funding side, affected banks rely more on deposits (44.7% vs 38.0%). Similarly, banks affected hold more securities (35.3% vs 26.9%), significant at the 5% level. It is important to highlight that such cross-sectional differences between treatment and control banks are no threat to the identification strategy, as they are differenced out in the difference-in-differences setup.

6 Results

We present the results in three steps. In Section 6.1, we demonstrate that banks affected by the collateral framework change increase their lending and that this effect is primarily driven by funding-constrained banks as measured by their equity and liquidity characteristics. The analysis is carried out at the bank-firm-quarter level. This allows us to include firm-quarter fixed effects throughout all specifications, which is a rigorous way of addressing the concern that affected and unaffected banks face different loan demand after the collateral framework change. Furthermore, we provide evidence on the validity of the parallel trend assumption using a parametric test.

In Section 6.2, we shed light on the characteristics of newly issued loans and find that affected banks respond to the harmonized collateral framework by lending towards more risky borrowers. We provide two complementary specifications by (i) using the volatility of firms'

ROA in banks' loan portfolios and (ii) focusing on borrowers in the non-tradable sector. Section 6.3 presents evidence that the framework change impacts the geographical distribution of banks' loan portfolios: especially affected banks headquartered in core countries increase lending towards the rest of the euro area. We also shed light on borrower characteristics and risk-taking of affected banks. Section 6.4 evaluates the impact of collateral policy on the firm level: we find that firms with a relationship to affected banks experience an increase in loan take-up, employment and investment.

6.1 Effect of a Collateral Framework Change on Bank Lending

Table 5 presents the results from estimating Equation (1). Conditional on the firm receiving a loan, the dependent variable is log of one plus loan issuance. Each column includes increasingly stringent levels of fixed effects. Specifically, column (1) includes bank × firm fixed effects, which compares lending of affected banks versus unaffected banks to the same firm before and after harmonizing collateral policy in January 2007. The coefficient of interest is positive but insignificant, while the $Post07_t$ indicator variable is positive and significant at the 10% level. Both affected and unaffected banks increase lending after the framework change. In Column (2), time-varying differences across banks driven by firms operating in different countries are taken care of by including country × quarter fixed effects. In addition, we add firm × quarter fixed effects to control for time-varying differences across banks driven by firms, i.e. loan demand.

We find a positive treatment effect, significant at the 5% level: banks with more exposure towards (newly eligible) other euro area loans increase their lending after the framework change. This result is also economically significant. A one-standard-deviation increase in a bank's affected ratio (13.80 percentage points) translates into a increase in bank lending of 8.3% ($0.006 \times 13.80 = 0.0828$). In Column (3), we add bank level control variables to refine the comparison between treatment and control group. We include the log of assets, the leverage ratio, return on equity (ROE), cash, securities and deposits over total assets as a proxy of a banks' liquidity situation, all lagged by 4 quarters. These control variables are typically considered relevant for the transmission of monetary policy through the bank-lending channel (Kashyap and Stein (2000) and Jiménez et al. (2020)). The magnitude of the difference-in-differences estimate increases slightly and translates into a 9.7% increase in bank lending.

Parallel Trend Assumption: Parametric Test The identifying assumption relies on unaffected banks providing a valid counterfactual for lending in the absence of a collateral framework change. In this section, we perform a parametric test of the parallel trends assumption for the baseline specification. Figure 3 plots coefficient estimates of the effect of an increase in collateral availability on euro area bank lending over time. We consider a 10-quarter event window, spanning 4 quarters before the implementation in January 2007 to 6 quarters thereafter. Specifically, we estimate

$$l_{ijt} = \sum_{k \neq 2006q4} \beta_k \text{Affected}_i \times \mathbf{1}[k = t] + \varepsilon_{ijt}, \tag{3}$$

where l_{ijt} is log loan issuance provided by bank i to firm j at time t; $\mathbf{1}[k = t]$ is a dummy variable that equals one in quarter t and 0 otherwise. We exclude 2006q4, the quarter before the framework change happened, to estimate the dynamic effect. Furthermore, we control for firm $\times$ quarter fixed effects. In this case, we define $Affected_{05,i}(0/1)$ as an indicator variable that equals one for affected banks, defined as banks which have an above-median share of euro area loan issuance prior to the announcement of the framework change in July 2005. The control group are banks which are less affected by the framework change. The dashed lines represent 90% confidence intervals, adjusted for bank level clustering.

The parametric test does not reject the null hypothesis of different pre-trends in loan issuance between affected and not affected banks, with coefficient estimates being close to zero. 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 towards international lending in the early 2000s, they are canceled out by the difference-in-differences approach.

Constrained Banks To support our argument that affected banks' lending behavior is indeed driven by the opportunity to pledge cross-country loans after the policy change, we focus on a subset of funding-constrained banks. We consider both equity and liquidity constraints. The closer a bank is to either constraint, the less likely it is to obtain funding on private markets at conditions similar the ECB's main refinancing rate. Those banks should therefore benefit more strongly from harmonized collateral policy if they have newly eligible loans on their balance sheet - in other words if they are affected. We operationalize liquidity constraints in terms of

asset side liquidity and compute the share of securities holdings over total assets. The equity constraint is specified in terms of the tier1-equity ratio. In both cases, constrained banks are those with a below-median ratio of securities/total assets or a tier1-equity.

Columns (1) and (2) of Table 6 present the results for liquidity constrained banks, while columns (3) and (4) show equity-constrained banks. In both cases, the effect size is considerably larger for constrained banks. The difference is particularly pronounced for equity-constrained banks: the estimated effect doubles in magnitude compared to the full sample (see Table 15), while affected but unconstrained banks do not increase loan supply at all.

6.2 Bank Risk Taking and Borrower Characteristics

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 approaches to test the simple framework's prediction that in particular high-risk borrowers are subject to funding inflows.

Bank Risk Taking In Table 7, we estimate Equation (1) using a measure of bank ex ante risk taking as dependent variable. Specifically, $ln(\sigma(ROA_j)^{5y})$ is defined as the five-year standard-deviation of loan-financed firm j's ROA from year $t-5$ to $t-1$.[14] In Column (1), we only include bank fixed effects. The estimate is positive but insignificant. The $Post07_t$ indicator variable is negative and significant at the 5% level. Both affected and unaffected banks decrease their risk-taking after the framework change. Once we add country $\times$ year fixed effects to remove unobserved time-varying country factors of firms in Column (2), the estimate turns positive and significant at the 5% level: affected banks finance riskier firms after the framework change. This effect is also economically relevant. A one-standard-deviation increase in the bank's affected ratio (12.903 percentage points) translates to an 19.1% increase in ROA volatility ($0.015 \times 12.903 = 0.191$). In Column (3), we add bank level controls, which leave the difference-in-difference estimate almost unchanged. These results suggest that post-framework change, loan issuance by affected banks was directed particularly to riskier borrowers

Borrower Characteristics Table 8 presents results from estimating Equation (1) on two different sample splits. Columns (1) and (2) split the sample according to firms active in the tradable or the non-tradable sector. We classify firms based on firm j's primary SIC code

[14] This definition is standard in the literature, see for example Heider, Saidi, and Schepens (2019).

reported in Dealscan following Müller and Verner (2021) and Giannetti and Jang (2020).[15] The coefficient on the $Affected_{05,i}$ variable is positive but insignificant for firms active in the tradable sector. In contrast, affected banks increase their loan issuance to firms active in the non-tradable sector. This result is significant at the 5% level. In Column (3) and (4), we split the borrower sample into bottom and top half according to their ROA volatility. We do not find significant results on lending to safer borrowers (Column 3). Vis-à-vis riskier borrowers (Column 4), affected banks significantly increase their loan issuance.

6.3 Flight Abroad Effect

The results so far indicate that banks holding newly eligible euro area loans significantly increase their lending towards riskier borrowers after the framework change, compared to banks without such an exposure. We now investigate the differential capital flow dynamics within the euro area by looking at the geographical distribution of affected banks and at borrower characteristics.

Our theoretical framework predicts that core banks (with a large equity endowment) increase credit supply towards periphery borrowers, which had access to a relatively shallow lender pool prior to the single list's introduction. Table 9 investigates whether similar patterns can be observed within the euro area. When looking at the geographical distribution of loans, we differentiate between loan issuance of core- and GIIPS-lenders vis-à-vis a certain group of borrowers. In this case, we also add banks' country-time fixed effects to control for time-varying differences across banks driven by factors at the level of their home countries.

First, we run the specification for banks located in the core (Column 1 to 4) and find a positive and significant treatment effect across different geographies. Affected core banks more active in the euro area syndicated loan market decrease lending to domestic borrowers (Column 1). At the same time, they increase lending to other euro area borrowers (Column 2) and especially to borrowers located in the GIIPS countries (Column 3). These results are statistically significant at the 1% level. We do not find evidence for an effect on lending to foreign borrowers (Column 4). In Column (5) to (7), we look at banks located in the GIIPS. We do not find a difference in lending of affected GIIPS banks to domestic (Column 5) or other euro area borrowers (Column 6), relative to unaffected GIIPS banks. Affected GIIPS banks increase lending towards borrowers located in foreign markets. This result is weakly significant,

[15]The tradable sector includes manufacturing (SIC code 2000-3999), and the non tradable sector includes construction (SIC code 1500-1799), whole and retail services (SIC code 5000-5999) as well as accommodation (SIC code 7000-7099).

at the 10% level (Column 7).

These results reflect a flight abroad effect (Giannetti and Laeven (2012)) in the euro area: affected core euro area banks, which experienced a reduction in their funding costs due to the framework change, decrease their domestic loan issuance, and increase their loan issuance towards borrowers located in the rest of the euro area and especially in the periphery. At the same time, we can exclude the following alternative explanation: by including loans originated in the euro area into the list of eligible assets, euro area borrowers could have increased in attractiveness for affected banks. In this case, one should expect an increase in lending to other euro area borrowers from both core and GIIPS banks. However, the evidence does not support this hypothesis. Instead, the framework change seems to exacerbate the flight abroad effect, as capital was flowing from core to GIIPS countries.

6.4 Firm Level: Real Effects

We now turn to the firm level. Consistent with the simple theoretical framework, the empirical analysis suggests an increase in loan take-up and positive real effects at the firm level in response to the framework change. We show that a relationship to affected banks increases firms' probability of taking up a loan, consistent with the results found on the bank-firm level in Section 6.1. Furthermore riskier firms in relationship with affected banks increase employment and investment.

Loan Take-Up Table 10 presents the results on loan take-up. The dependent variable $pr(Loan)$ is an indicator variable equal to one if firm j obtains a bank loan in the respective year t. 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 10% level: relative to the control group, firms with a relationship to affected banks increase their probability of obtaining a loan by 8.4% after the framework change. When adding firm level controls in Column (3), the coefficient remains virtually unchanged. We also take care of a sample bias by showing the results only for firms with multiple bank relations

(Column 4).

Employment and Investment In Table 11, we use $ln(Employees)_{j,t}$, firm j's number of employees in year t, as a proxy for real activity. All specifications include firm level control variables such as the log of total assets and the leverage ratio, lagged by one year. Column (1) does not include any fixed effects, the interaction term of interest is positive but insignificant. The $Post07_t$-indicator variable is negative and highly significant. Both firms with and without a relationship to affected banks experience a decrease in lending after the framework change. Column (2) includes firm and year fixed effects to take care of unobservable firm factors and common time trends. The interaction term of interest turns positive and is highly significant. Firms with a relationship to affected banks experience a larger increase in employment than firms without such a relationship.

In Column (3) and (4), we split the sample into risky/safe borrowers, defined as firms located in the top/bottom half in terms of their five-year ROA standard-deviation from year $t-5$ to $t-1$. In Column (5) and (6), we split the sample of borrowers into firms active in the tradable sector, and in the non-tradable sector. Overall, the evidence provided suggests that especially risky and less productive borrowers with a relationship to affected banks increase their employment, as opposed to firms without such a relationship. Using $ln(Investment)_{j,t}$, firm j's capital expenditure in year t as dependent variable in Table 12 yields rather muted results. We do not find any significant results for the full sample (Columns 1 and 2). Only when splitting borrowers according to their riskiness and their productivity, we obtain similar results compared to using employment as dependent variable. Especially risky and less productive borrowers with a relationship to affected banks increase their investment, as opposed to firms without such a relationship. These results are significant at the 10% level.

7 Robustness

This section presents several robustness checks to corroborate the main findings presented in Section 6.

Confounding Factors The first threat to the identification is that the framework change in January 2007 coincides with other events that affect bank lending. As long as these events affect both the treatment and control group the same way, they are differenced out by the difference-

in-differences setup. If this was not the case, our results could be biased. The financial crisis in 2008/09 is such a possible confounding event. While we argue that this framework change has been crisis-unrelated, the literature has shown that European banks exposed to U.S. sub-prime market have cut their lending already ahead of the financial crisis (Puri, Rocholl, and Steffen 2011 and Huber 2018). Since affected banks are more active on the (cross-border) European syndicated loan market, they might also be more active internationally. We address this by shortening the event window to the time period Q1 2006 - Q4 2007, four quarters before and after the framework change. Table 14 presents the results. Compared to our baseline estimates in Table 5, the magnitude and significance of the interaction term remains almost unchanged. In economic terms, a one-standard-deviation increase in a bank's affected ratio (13.75 percentage points) translates now into a increase in bank lending by 6.9% (=0.005 $\times$ 13.80). In Column (3), we add bank level control variables, such as the log of assets, the leverage ratio, return on equity (ROE), cash, securities and deposits over total assets as a proxy of a banks' liquidity situation, all lagged by 4 quarters. The magnitude of the difference-in-differences estimate increases slightly.

Country Specific Treatment Effects Second, our analysis so far focuses on the key novelty of the ECB framework change in 2007: with the introduction of the single list, loans originated in other euro area countries can be pledged as collateral for ECB refinancing operations. There are several countries however, which could not even pledge domestic loans before the framework change (BE, FI, FR, GR, IR, IT, LU, NL, PT, SL). Banks headquartered in these countries could therefore profit disproportionally from the harmonized collateral framework. In this sense, the results in our baseline specification (Section 6) can be interpreted as a lower bound of the effect size.

To take the heterogeneous treatment of domestic loans prior to the framework change into account, we provide two complementary approaches. First, we redefine the exposure measure taking into consideration country-specific differences in treatment. For countries that where already accepting domestic bank loans as collateral, such as Germany, our treatment definition does not change. By contrast, our treatment definition for Italy reads now as follows: Italian banks are classified as *Affected* if they were actively issuing loans both to firms located in Italy and in other euro area countries, relative to a control group of unaffected Italian banks which were less active on the syndicated loan market overall. Given that the amount of potential

pledgeable assets increases more drastically after the framework change, we expect stronger credit supply effects for those banks compared to the baseline. As shown in Table 14, the estimated treatment effects hardly change relative to the baseline specification, but increase in statistical significance.

Second, related to the redefinition of the *Affected*-measure, we define an indicator variable capturing the treatment of domestic bank loans prior to the single list in Table 15. $DomesticAffected_{05,i}$ equals one for banks located in countries where the respective national banks *did not accept* domestic bank loans as collateral 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 national banks accepted domestic bank loans (ES, FR, DE, AT). Interacting this dummy with the $Post07_t$ treatment indicator yields a significantly positive coefficient. However, the coefficient is smaller than the coefficient on newly eligible *other euro area* loans, suggesting that the heterogeneous treatment effect is neither driving our results on capital flows, nor quantitatively dominating banks' lending decision. The coefficient on the three-way interaction term between both *Affected*-measures and the treatment indicator is very small and statistically insignificant.

Anticipation Effect Third, we check if there is evidence of any anticipation effect at play (Table 16). The idea behind it is that banks might have anticipated the framework change as soon as it was announced in July 2005, piling eligible loans on their balance sheet in the run-up to the framework change. If this was the case, the coefficient of interest should be less pronounced.

Therefore, we cumulate the loan issuance from Q1 2004 to Q4 2006, up to the last quarter prior to the implementation date. $Affected_{06,i}$ is equal to one for banks which have an above-median share of euro area loan issuance (excluding domestic) over total loan issuance in the period Q1 2004 to Q4 2006, prior to the implementation date in January 2007. Affected banks increase their lending in a significant and positive way across specifications. In Column (3) we apply the most demanding fixed effects structure. The interaction term of interest is positive and significant at the 5% level. A one-standard-deviation increase in a bank's affected06 ratio (11.485 percentage points) leads to a increase in bank lending of 8.2% (=0.007 $\times$ 11.49). In Column (4), we add bank-controls, and the estimate increases slightly to 9.2% (=0.008 $\times$ 11.49). This is similar in magnitude to the baseline estimate in the baseline (Table 5), and does not

provide evidence for an anticipation effect.

Table 17 addresses the concern that the framework change was announced in July 2005, but implemented only one and a half year later. We modify the post indicator variable, which now takes on the value of 0 up until Q2 2005 and a value of 1 starting from Q3 2005. The sample period is now Q1 2004 to Q4 2007. We find no effect across all specifications, which suggests that the announcement date did not play a significant role in banks' lending decisions.

Falsification Test Fourth, to corroborate our findings further, we run a falsification test using non euro area lenders. The reasoning behind here is that any changes in the monetary and collateral policy of the ECB should not have any direct impact on the lending decisions of banks headquartered outside the euro area. To test this, we build a group of *placebo affected banks*, consisting of non euro area banks, which are actively lending to euro area firms. The procedure is similar to the affected variable. We define $Placebo_{05,i}(\%)$ as the share of euro area loan issuance over total loan issuance by non euro area banks (the placebo banks) in the period Q1 2003 to Q2 2005. Table 18 presents the results. In line with this hypothesis, the coefficient is insignificant across specifications. We find no effect.

Lead Arranger Sample Fifth, we show that the results are robust to banks being lead arrangers in a syndicate only (Table 19). Prior literature has highlighted that lead arrangers are in direct contact with the borrower, performing due diligence and monitor the borrower (Ivashina and Scharfstein 2010). There might hence be a different role of lead arrangers vs participants in a syndicate. Therefore, we restrict the sample to the sample of lead-arranger banks only. Compared to the baseline results in Table 5, the difference-in-difference estimate are similar in magnitude and significance across specifications. Column (3) presents the most stringent fixed effects structure, taking care of time-varying differences across banks driven by firms, i.e., loan demand. The interaction term of interest is positive and significant at the 5% level. A one-standard-deviation increase in a lead arranger bank's affected ratio (13.87 percentage points) translates now to a increase in bank lending of 7.2% ($0.005 \times 13.87 = 0.072$). In Column (4) we add bank-controls, which decreases the statistical significance of the estimate, but not its magnitude. Hence, being a lead arranger only leaves the main results virtually unchanged.

Variable Definitions Sixth, we provide evidence that results do not depend on how bank i's exposure to other euro area loans prior to the announcement of the framework change is defined. By defining our exposure measure through the issuance history, we face two issues. First, this can mean that a bank which is not very active in the syndicated loan market, but solely lends to (non-domestic) euro area borrowers ends up being classified as "affected". For this reason, we define bank i's exposure to euro area loans in terms of a bank i's total assets over the period Q2 2003 to Q2 2005 in Table 20. The estimated interaction term of interest remains positive and significant at the 5% level. Second, instead of the *share* of exposure, it can be that the *level* of exposure is of more interest to the bank. Therefore, in Table 21, we define bank i's exposure to euro area loans at one point in time: the quarter prior to the announcement of the framework change in July 2005. Eligible (log) is the log of one plus the amount of euro area loans of bank i's syndicated loan issuance in Q2 2005. In this case, the treatment group are big (affected) banks, which issue more, as opposed to small (unaffected) banks. Indeed, this variable definition does not take into account bank size, which might be the underlying explanation why the results are the most significant (at the 1% level) compared to other definitions. Overall, none of these alternative definitions change the main finding.

8 Conclusion

This paper shows how harmonized collateral policy contributes to financial market integration and cross-border capital flows in a currency union. Our results contribute to an understanding of the instruments that can improve financial market integration of a currency union and how these instruments affect the real economy. In particular, the single collateral list can be interpreted as part of a banking union, a facility that aims at making private sector funding conditions independent of the local banking system's health. Guided by a simple theoretical framework and 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 8.3% compared to unaffected banks. This effect is particularly pronounced for core banks experiencing a *flight-abroad* effect: they extend credit to riskier and less productive firms in other euro area countries, in particular to firms located the periphery. Firms in relationship with affected banks in turn experience growth in employment and investment.

It should be noted that the credit supply effects studied in this paper operate through the pledgeability of assets, which itself is only one component of credit supply. Therefore, it would be unreasonable to assume that the inclusion of the single list is sufficient to implement a banking union in the sense of making private sector funding conditions independent of the local banking system. Indeed, the financial crisis of 2008 and the sovereign debt crisis of 2011 revealed that there was still a considerable home bias in the European banking system and banks in several European countries, in particular Ireland and Spain, experienced a sudden stop with drastic consequences for private borrowers. Nevertheless, the increase in direct lending from core banks to periphery firms circumvents - to some extent - the intermediation of credit by run-prone periphery banks.

Furthermore, while our focus on collateral policy in "normal" times is exceptional for the literature on unconventional monetary policy, it does not permit conclusions whether harmonizing collateral frameworks is beneficial overall. Since the additional credit supply was primarily affecting riskier borrowers in the non-tradable sector, which is associated with pronounced boom-bust patterns (Müller and Verner 2021), the policy change might have contributed to fuelling an unsustainable credit boom. An evaluation of the net effect would require a triple-diff setup, which can in principle take into account the macroeconomic environment at two distinct policy changes. 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 impossible to test with our approach based on loan-level data.

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9 Table and Figures

9.1 Summary Statistics

Table 1: **Summary Statistics: Bank-Loan-Quarter Level.** This table presents summary statistics on the bank-firm-quarter level. *Loan volume (mn)* are all issued syndicated loans by bank i (as lead or participating bank) to firm j in a quarter t. The sample period is Q1 2006 to Q2 2008. The *all-in-drawn spread* is calculated as the sum of the spread over LIBOR including annual fees. *Share of lead arrangers* is the number of lead arrangers in all loan issuances. *Share of euro area firms* is an indicator variable equal to one if the firm is headquartered in the euro area. *Domestic over total loan issuance* is the share of domestic loan over total loan issuance, where a domestic loan is a loan to a firm which has the same headquarter location as the bank. *Euro area over total loan issuance* is the share of euro area loan over total loan issuance, excluding domestic loans.

	mean	sd	min	max	count
Loan amount (mn)	171.13	699.11	0.17	16,112.07	1,208
All-in-drawn spread (bps)	120.37	97.99	5.00	600.00	924
Maturity (months)	65.08	48.22	3.00	408.00	1,182
Share of lead arrangers	0.54	0.50	0.00	1.00	1,208
Share of euro area firms	0.45	0.50	0.00	1.00	1,208
Domestic over total loan issuance	24.06	22.77	0.00	100.00	1,208
Euro area over total loan issuance	24.34	17.57	0.00	100.00	1,208

Table 2: **Summary Statistics: Bank Level.** This table presents summary statistics for all euro area banks included in the sample for the pre-framework period, Q1 to Q4 2006. *Ln(total assets)* is the natural logarithm of total assets plus one. *Loans ratio* is gross loans over total assets. *Equity ratio* is equity over total assets. *ROE* is bank i's return on equity. *Cash ratio* is cash and equivalents over total assets. *Securities ratio* is investment securities over total assets. *Deposit ratio* is deposits over total assets. *Affected*$_{05,i}$*(%)* is bank i's share of loan issuance to euro area borrowers (excl. domestic) over total syndicated loan issuance. *Affected*$_{05,i}$*(0/1)* is an indicator variable equal to one for banks which have an above median share of loan issuance to euro area (excl. domestic) borrowers in their overall syndicated loan issuance. *Eligible*$_{05,i}$*(log)* is the natural logarithm of (one plus) bank i's issuance of syndicated loans to other euro area borrowers (excl. domestic) in Q2 2005. *Eligible*$_{05,i}$*(0/1)* is an indicator variable equal to one for banks which have an above median share of loan issuance to other euro area borrowers (excl. domestic) in Q2 2005.

	mean	min	max	count
ln(total assets)	11.2	9.0	13.7	62
Loans ratio	65.7	38.5	88.4	62
Equity ratio	5.2	1.0	15.2	62
ROE, in (%)	11.3	-0.9	23.8	62
Cash ratio	1.5	0.0	14.4	62
Securities ratio	32.1	8.3	96.5	62
Deposit ratio	42.1	2.2	81.0	62
Affected (%)	20.2	0.0	100.0	62
Affected (0/1)	0.4	0.0	1.0	62
Eligible (mn)	384.2	0.0	3,955.6	62
Eligible (0/1)	0.2	0.0	1.0	62

Table 3: **Summary Statistics: Firm Level.** This table presents summary statistics on the firm-year level. The sample period is 2006 to 2008. *Affected*$_{06,j}$ *(0/1)* is an indicator variable equal to one if firm j has a relationship with an affected bank in 2006, before the framework change, and zero otherwise. *Ln(Loan volume)* is the natural logarithm plus one of all issued syndicated loans aggregated to firm j in year t. *ln(Total assets)* is the natural logarithm of firm j's total assets. *Leverage* is the ratio of firm j's long term debt to total assets. *Liquidity* is the ratio of firm j's cash flow over total assets. *Employment* is the number of firm j's employees, in thousand. *Ln(Investment)* is the natural logarithm of firm j's capital expenditure.

	Unaffected		Affected	
	mean	sd	mean	sd
Affected$_j$ (0/1)	0.00	0.00	1.00	0.00
ln(Loan amount)	1.70	2.23	2.59	2.83
ln(Total Assets)	7.95	1.62	9.31	2.11
Leverage	0.39	0.19	0.34	0.17
Liquidity (internal finance)	0.01	0.10	0.04	0.07
Market to book ratio	1.33	0.50	1.42	0.62
Return on assets	0.07	0.06	0.08	0.06
Dividend payout ratio	0.22	0.39	0.29	0.33
Employment (th)	12.57	22.46	27.77	41.32
ln(Investment)	4.94	2.07	6.48	2.30

Table 4: **Bank-Level: Characteristics of Affected and Unaffected Banks.** This table presents the difference-in-mean estimates between affected and unaffected banks. Affected (unaffected) banks refer to banks which exhibit an above (below) median share of loan issuances to euro area borrowers (excl. domestic) over total loan issuance prior to July 2005. All variables are defined in Section 9.5. The last column shows the (absolute value of) the univariate t-statistics for a test of equal means between both groups in the period prior to the framework change Q1-Q4 2006.

	Affected		**Unaffected**			
	Mean	N	Mean	N	Diff.	t-stat.
ln(total assets)	11.12	38	11.33	24	-0.210	-0.652
Equity ratio	5.02	38	5.49	24	-0.470	-0.681
Loans ratio	66.55	38	64.42	24	2.129	0.740
Cash ratio	1.38	38	1.60	24	-0.227	-0.382
Securities ratio	35.33	38	26.87	24	8.459*	2.000
Deposit ratio	44.69	38	37.98	24	6.710	1.207
ROE, in (%)	11.13	38	11.52	24	-0.387	-0.244

9.2 Bank-Firm Level Results

Table 5: **Loan Supply: Bank-Firm Level.** This table provides results of difference-in-difference regressions analyzing the volume of loan issuances before versus after the ECB's collateral framework change. The analysis is based on data on the firm-bank-quarter level. The sample period is Q1 2006 to Q2 2008. *Loan volume* is the loan issuance from bank i (as lead arranger or participant) to firm j at quarter t. *Affected*$_{05,i}$*(%)* is the ratio of euro area (excl. domestic) over total loan issuance in the period Q1 2003 to Q2 2005. *Post07*$_t$ is an indicator variable equal to one after the framework change was implemented in January 2007. The control variables are lagged by 4 quarters and defined as in Section 9.5. The regressions further include bank × firm, country × quarter, and firm × quarter fixed effects, where indicated. Country-fixed effects are based on the borrowers' respective headquarters. Reported standard errors are in parentheses, clustered at the bank level. ***, **, * denote significance at the 1, 5, and 10% level, respectively.

	(1)	(2)	(3)
VARIABLES	ln(1 + loan volume)	ln(1 + loan volume)	ln(1 + loan volume)
Affected$_{05,i}$(%) × Post07$_t$	0.002	0.006**	0.007**
	(0.006)	(0.002)	(0.003)
ln(Total assets)			-0.323
			(0.222)
Equity ratio			-0.008
			(0.030)
ROE			-0.001
			(0.001)
Cash ratio			-0.013
			(0.010)
Liquidity ratio			-0.003
			(0.003)
Deposit ratio			0.003
			(0.005)
Post07$_t$	0.289*		
	(0.156)		
Observations	1,208	1,208	1,208
R-squared	0.693	0.975	0.975
Bank-level Controls	No	No	Yes
Bank × Firm FE	Yes	Yes	Yes
Country × Time FE	No	Yes	Yes
Firm × Time FE	No	Yes	Yes
Cluster	Bank	Bank	Bank

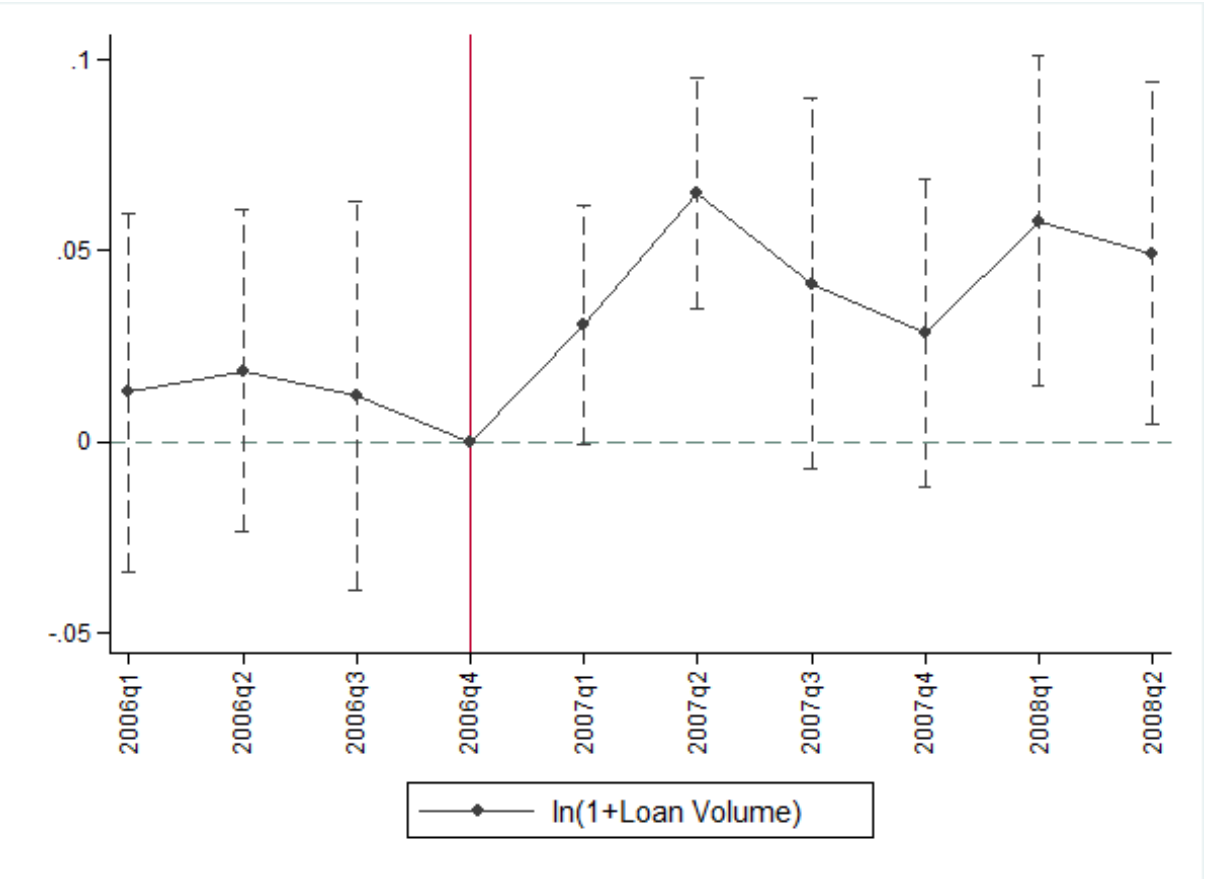

Figure 3: **Parallel Trend Assumption.** The figure is based on the following equation:

$$y_{ijt} = \sum_{k \neq 2006q4} \beta_k \text{Affected}_{05,i}(0/1) \times \mathbf{1}[k = t] + \varepsilon_{ijt} \ ,$$

where y_{ijt} is log loan issuance provided by bank i to firm j at quarter t; $\mathbf{1}[k = t]$ 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 regression includes firm $\times$ quarter fixed effects. In this case, *Affected*$_{05,i}$*(0/1)* is an indicator variable that equals one for affected banks, defined as banks which have an above-median share of euro area loan issuance prior to the announcement of the framework change in July 2005. The dashed lines represent 90% confidence intervals, adjusted for bank level clustering.

Table 6: **Loan Supply: Bank Characteristics.** This table provides results of difference-in-difference regressions analyzing the volume of loan issuances before versus after the ECB's collateral framework change. The analysis is based on data on the firm-bank level. The sample period is Q1 2006 to Q2 2008. *Loan volume* is the loan issuance from bank i to firm j at time t. *Affected*$_{05,i}$*(0/1)* is an indicator variable equal to one for bank which have an above-median share of euro area loan issuance (excl. domestic) over total loan issuance over the period Q1 2003 to Q2 2005. *Post07*$_t$ is an indicator variable equal to one after the framework change was implemented in January 2007. In Column (1) the sample is limited to constrained banks, defined as banks which have a securities to total assets ratio below the 50th percentile in 2006. In Column (2), the sample is limited to banks which are unconstrained, which are all the other banks. In Column (3), the sample is limited to constrained banks, defined as banks which have a Tier1-ratio below the 50th percentile in 2006. In Column (4), the sample is limited to banks which are unconstrained, which are all the other banks. The regressions further include firm × bank, country × quarter, and firm × quarter fixed effects, where indicated. Reported standard errors are in parentheses, clustered at the bank level. ***, **, * denote significance at the 1, 5, and 10% level, respectively.

	Securities		Tier1ratio	
	(1)	(2)	(3)	(4)
	Constrained	Unconstrained	Constrained	Unconstrained
VARIABLES	ln(1 + loan volume)	ln(1 + loan volume)	ln(1 + loan volume)	ln(1 + loan volume)
Affected$_{05}$(0/1) × Post$_{07}$	0.229*	0.120	0.389*	0.010
	(0.125)	(0.101)	(0.186)	(0.114)
Observations	546	431	528	375
R-squared	0.976	0.980	0.983	0.977
Bank × Firm FE	Yes	Yes	Yes	Yes
Country × Time FE	Yes	Yes	Yes	Yes
Firm × Time FE	Yes	Yes	Yes	Yes
Cluster	Bank	Bank	Bank	Bank

Table 7: **Bank Risk Taking.** This table provides results of difference-in-difference regressions analyzing the ex-ante risk taking behaviour of banks pre- and post collateral framework change. The analysis is based on data on the firm-bank level. The sample period is Q1 2006 to Q2 2008. The dependent variable is the logged five-year standard-deviation of loan-financed firm j's ROA from year *t-5* to *t-1*. *Affected*$_{05,i}$*(%)* is the ratio of euro area (excl. domestic) over total loan issuance in the period Q1 2003 to Q2 2005. $Post07_t$ is an indicator variable equal to one after the framework change got implemented in January 2007. The regressions further include bank, quarter × time, and country × year, where indicated. Reported standard errors are in parentheses, clustered at the bank level. ***, **, * denote significance at the 1, 5, and 10% level, respectively.

VARIABLES	(1) $\ln(\sigma(ROA_f)^{5y})$	(2) $\ln(\sigma(ROA_f)^{5y})$	(3) $\ln(\sigma(ROA_f)^{5y})$
Affected$_{05,i}$(%) × Post07$_t$	0.009	0.015**	0.017**
	(0.006)	(0.006)	(0.008)
ln(Total assets)			0.068
			(0.277)
Equity ratio			0.077
			(0.081)
ROE			0.002
			(0.004)
Cash ratio			0.138***
			(0.036)
Liquidity ratio			-0.011
			(0.007)
Deposit ratio			-0.006
			(0.008)
Post07$_t$	-0.526**		
	(0.238)		
Observations	1,367	1,367	1,367
R-squared	0.044	0.375	0.384
Bank FE	Yes	Yes	Yes
Quarter × Year FE	Yes	Yes	Yes
Country × Year FE	No	Yes	Yes
Cluster	Bank	Bank	Bank

Table 8: **Loan Supply: Borrower Characteristics.** This table provides results of difference-in-difference regressions analyzing borrower characteristics pre- and post collateral framework change. The analysis is based on data on the firm-bank level. The sample period is Q1 2006 to Q2 2008. *Loan volume* is the loan issuance from bank i (as lead arranger or participant) to firm j at time t. *Affected*$_{05,i}$*(%)* is the ratio of euro area (excl. domestic) over total loan issuance in the period Q1 2003 to Q2 2005. *Post07*$_t$ is an indicator variable equal to one after the framework change was implemented in January 2007. *Tradable* are firms active in tradable industries (SIC code 2000-3999). *Non-tradable* are firms active in non-tradable industries (SIC code 1500-1799, 5000-5999, 7000-7099). *Top-half Volatility* are firms above the median of their logged five-year standard-deviation of their ROA from year $t-5$ to $t-1$, *Bottom-half Volatility* are all firms below the median. The regressions further include bank × firm, bank × time, and firm × time fixed effects, where indicated. Bank-country fixed effects are based on the bank's respective headquarters. Reported standard errors are in parentheses, clustered at the bank level. ***, **, * denote significance at the 1, 5, and 10% level, respectively.

	(1)	(2)	(3)	(4)
	Tradable	Non Tradable	Bottom-half Volatility	Top-half Volatility
VARIABLES	ln(1 + loan volume)	ln(1 + loan volume)	ln(1 + loan volume)	ln(1 + loan volume)
Affected$_{05,i}$(%) × Post07$_t$	0.003	0.010**	0.004	0.015*
	(0.005)	(0.004)	(0.004)	(0.008)
Observations	658	420	300	292
R-squared	0.853	0.830	0.861	0.921
Bank × Firm FE	Yes	Yes	Yes	Yes
Country × Time FE	Yes	Yes	Yes	Yes
Cluster	Bank	Bank	Bank	Bank

Table 9: **Loan Supply: Geographical Distribution.** This table provides results of difference-in-difference regressions analyzing the volume of loan issuances of Core and GIIPS banks vis-a-vis domestic, euro area and foreign borrowers pre- and post collateral framework change. The analysis is based on data on the firm-bank-quarter level. The sample period is Q3 2005 to Q2 2008. *Loan volume* is the loan issuance from bank i (as lead arranger or participant) to firm j at time t. $Affected_{05,i}(\%)$ is the ratio of bank i's euro area (excluding domestic) over total loan issuance in the period Q1 2003 to Q2 2005. $Post07_t$ is an indicator variable equal to one after the framework change was implemented in January 2007. In Column (1) - (4), the sample is limited to euro area bank headquartered in the "core" countries (DE, FR, AT, NL, BE, FI, LU). In Column (1) only domestic borrowers are included, In Column (2) only borrowers located in other countries of the euro area are included. In Column (3) the sample includes only borrowers located in the GIIPS. In Column (4) only foreign borrowers are included, which are located outside the euro area. In Column (5) - (7), the sample is limited to euro area banks headquartered in GIIPS countries (GR, IT, IE, PT, ES). Domestic borrowers are included in Column (5). Borrowers located in other euro area countries are included in Column (6) and outside the euro area in Column (7). The regressions further include bank × firm, bank-country × time, and firm × time fixed effects, where indicated. Bank-country fixed effects are based on the bank's respective headquarters. Reported standard errors are in parentheses, clustered at the bank level. ***, **, * denote significance at the 1, 5, and 10% level, respectively.

	(1)	(2)	(3)	(4)	(5)	(6)	(7)
	Core - domestic	Core - eanotdomestic	Core - giips	Core - foreign	GIIPS - domestic	GIIPS - eanotdomestic	GIIPS - foreign
VARIABLES	ln(1 + loan volume)	ln(1 + loan volume)	ln(1 + loan volume)	ln(1 + loan volume)	ln(1 + loan volume)	ln(1 + loan volume)	ln(1 + loan volume)
$Affected_{05,i}(\%) \times Post07_t$	-0.005*	0.008***	0.009***	0.002	0.006	-0.008	0.027*
	(0.003)	(0.002)	(0.001)	(0.003)	(0.006)	(0.011)	(0.015)
Observations	440	323	75	1,299	180	38	66
R-squared	0.976	0.989	0.975	0.962	0.976	0.971	0.996
Bank × Firm FE	Yes	Yes	Yes	Yes	Yes	Yes	Yes
Country × Time FE	Yes	Yes	Yes	Yes	Yes	Yes	Yes
Firm × Time FE	Yes	Yes	Yes	Yes	Yes	Yes	Yes
Cluster	Bank	Bank	Bank	Bank	Bank	Bank	Bank

9.3 Firm-Level Results

Table 10: **Firm Level: Loan Take-Up.** This table provides results of difference-in-difference regressions analyzing the effects of collateral policy on loan financing. The analysis is based on data on the firm-year level and the sample period is 2006 to 2008. 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. The treatment indicator *Affected*$_{06,j}$*(0/1)* equals one if firm j has a relationship with an affected bank in 2006 (before the framework change) and equals zero otherwise. *Post07*$_t$ equals one after the implementation of the framework change in January 2007, and zero otherwise. The regressions include time-varying firm level controls [*ln(Total assets)*$_{j,t-1}$, *Leverage*$_{j,t-1}$, *Liquidity*$_{j,t-1}$], all lagged by one year. All variables are defined in the appendix. The regressions further include firm, year, industry × year, and country × year fixed effects, where indicated. Reported standard errors are in parentheses, clustered at the firm level. ***, **, * denote significance at the 1, 5, and 10% level, respectively.

VARIABLES	(1) pr(Loan)	(2) pr(Loan)	(3) pr(Loan)
Affected$_{06,j}$(0/1) × Post07$_t$	0.103***	0.161***	0.084*
	(0.032)	(0.039)	(0.050)
Affected$_{06,j}$	-0.023**		
	(0.009)		
Post07$_t$	-0.787***		
	(0.027)		
Observations	1,490	1,490	1,490
R-squared	0.403	0.669	0.795
Firm Controls	Yes	Yes	Yes
Firm FE	No	Yes	Yes
Year FE	No	Yes	No
Country × Year FE	No	No	Yes
Industry × Year FE	No	No	Yes
Cluster	Firm	Firm	Firm

Table 11: **Firm Level: Employment.** This table provides results of difference-in-difference regressions analyzing the effects of collateral policy on firm level employment. The analysis is based on data on the firm-year level and the sample period is 2006 to 2008. The dependent variable is *ln(Employees)*, the natural logarithm of firm j's number of employees in year t. The treatment indicator $Affected_{06,j}$ *(0/1)* equals one if firm j has a relationship with an affected bank in 2006 (before the framework change) and equals zero otherwise. $Post07_t$ equals one after the implementation of the framework change in January 2007, and zero otherwise. The sample is limited to borrowers located in the top (Column 2) and the bottom (Column 3) 25% according to their ROA volatility. The sample is limited to borrowers active in the non-tradable sector (Column 4) or the tradable sector (Column 5). The regressions include time-varying firm level controls [$ln(Total\ assets)_{j,t-1}$, $Leverage_{j,t-1}$], all lagged by one year. All variables are defined in the appendix. The regressions further include firm fixed effects and year fixed effects, where indicated. Reported standard errors are in parentheses, clustered at the firm level. ***, **, * denote significance at the 1, 5, and 10% level, respectively.

	(1)	(2)	(3)	(4)	(5)
	All	Risky	Safe	Not tradable	Tradable
VARIABLES	ln(No of employees)	ln(No of employees)	ln(No of employees)	ln(No of employees)	ln(No of employees)
$\text{Affected}_{06,j}(0/1) \times \text{Post07}_t$	0.061***	0.079	-0.000	0.175***	0.020
	(0.022)	(0.056)	(0.042)	(0.064)	(0.031)
Observations	2,012	294	315	242	758
R-squared	0.990	0.994	0.997	0.990	0.985
Firm Controls	Yes	Yes	Yes	Yes	Yes
Firm FE	Yes	Yes	Yes	Yes	Yes
Year FE	Yes	Yes	Yes	Yes	Yes
Cluster	Firm	Firm	Firm	Firm	Firm

Table 12: **Firm Level: Investment.** This table provides results of difference-in-difference regressions analyzing the effects of collateral policy on firm level investment. The analysis is based on data on the firm-year level and the sample period is 2006 to 2008. The dependent variable is *ln(Investment)*, the natural logarithm of firm j's Capital Expenditure (CAPEX) in year t. The treatment indicator $Affected_{06,j}$ *(0/1)* equals one if firm j has a relationship with an affected bank in 2006 (before the framework change) and equals zero otherwise. $Post07_t$ equals one after the implementation of the framework change in January 2007, and zero otherwise. The sample is limited to borrowers located in the top (Column 2) and the bottom (Column 3) 25% according to their ROA volatility. The sample is limited to borrowers active in the non-tradable sector (Column 4) or the tradable sector (Column 5). The regressions include time-varying firm level controls [$ln(Total\ assets)_{j,t-1}$, $Leverage_{j,t-1}$], all lagged by one year. All variables are defined in the appendix. The regressions further include firm fixed effects and year fixed effects, where indicated. Reported standard errors are in parentheses, clustered at the firm level. ***, **, * denote significance at the 1, 5, and 10% level, respectively.

	(1)	(2)	(3)	(4)	(5)
	All	Risky	Safe	Not tradable	Tradable
VARIABLES	ln(Investment)	ln(Investment)	ln(Investment)	ln(Investment)	ln(Investment)
$Affected_{06,j}(0/1) \times Post07_t$	0.072	-0.037	-0.040	0.238*	-0.025
	(0.058)	(0.103)	(0.106)	(0.127)	(0.062)
Observations	2,461	334	355	318	926
R-squared	0.975	0.989	0.982	0.974	0.981
Firm Controls	Yes	Yes	Yes	Yes	Yes
Firm FE	Yes	Yes	Yes	Yes	Yes
Year FE	Yes	Yes	Yes	Yes	Yes
Cluster	Firm	Firm	Firm	Firm	Firm

9.4 Robustness Checks

Table 13: **Robustness: Event Window [Q1 2006 - Q4 2007].** This table provides results of difference-in-difference regressions analyzing the volume of loan issuances before versus after the collateral framework change. The analysis is based on data on the firm-bank-quarter level. The sample period is Q1 2006 to Q4 2007. *Loan volume* is the loan issuance from bank i (as lead arranger or participant) to firm j at quarter t. *Affected*$_{05,i}$*(%)* is the ratio of euro area (excl. domestic) over total loan issuance in the period Q1 2003 to Q2 2005. *Post07*$_t$ is an indicator variable equal to one after the framework change was implemented in January 2007. The control variables are lagged by 4 quarters and defined in Section 9.5. The regressions further include firm × bank, country × quarter and firm × quarter fixed effects, where indicated. Country fixed effects refer to the borrowers' respective headquarters. Reported standard errors are in parentheses, clustered at the bank level. ***, **, * denote significance at the 1, 5, and 10% level, respectively.

	(1)	(2)	(3)
VARIABLES	ln(1 + loan volume)	ln(1 + loan volume)	ln(1 + loan volume)
Affected$_{05,i}$(%) × Post07$_t$	0.004	0.005**	0.006**
	(0.004)	(0.002)	(0.003)
ln(Total assets)			-0.078
			(0.220)
Equity ratio			-0.029
			(0.052)
ROE			-0.001
			(0.002)
Cash ratio			-0.010
			(0.011)
Liquidity ratio			-0.003
			(0.003)
Deposit ratio			0.007
			(0.006)
Observations	812	812	812
R-squared	0.886	0.979	0.979
Bank × Firm FE	Yes	Yes	Yes
Country × Time FE	Yes	Yes	Yes
Firm × Time FE	No	Yes	Yes
Cluster	Bank	Bank	Bank

Table 14: **Robustness: Country-Specific Eligible Assets.** This table provides results of difference-in-difference regressions analyzing the volume of loan issuances before versus after the collateral framework change. The analysis is based on data on the firm-bank-quarter level. The sample period is Q1 2006 to Q4 2007. *Loan volume* is the loan issuance from bank i (as lead arranger or participant) to firm j at quarter t. *AffectedCS$_{05,i}$(%)* is the ratio of country specific eligible assets over total loan issuance in the period Q1 2003 to Q2 2005. *Post07$_t$* is an indicator variable equal to one after the framework change was implemented in January 2007. The control variables are lagged by 4 quarters and defined in Section 9.5. The regressions further include firm × bank, country × quarter and firm × quarter fixed effects, where indicated. Country fixed effects refer to the borrowers' respective headquarters. Reported standard errors are in parentheses, clustered at the bank level. ***, **, * denote significance at the 1, 5, and 10% level, respectively.

	(1)	(2)	(3)	(4)
VARIABLES	ln(1 + loan volume)	ln(1 + loan volume)	ln(1 + loan volume)	ln(1 + loan volume)
AffectedCS$_{05,i}$(%) × Post07$_t$	0.004	0.009***	0.006***	0.008***
	(0.003)	(0.002)	(0.002)	(0.002)
ln(Total assets)				-0.431**
				(0.205)
Equity ratio				-0.015
				(0.025)
ROE				-0.001
				(0.001)
Cash ratio				-0.014
				(0.010)
Liquidity ratio				-0.004
				(0.003)
Deposit ratio				0.005
				(0.005)
Post07$_t$	0.178			
	(0.144)			
Observations	1,208	1,208	1,208	1,208
R-squared	0.693	0.878	0.975	0.976
Bank-level Controls	No	No	No	Yes
Bank × Firm FE	Yes	Yes	Yes	Yes
Country × Time FE	No	Yes	Yes	Yes
Firm × Time FE	No	No	Yes	Yes
Cluster	Bank	Bank	Bank	Bank

Table 15: **Robustness: Domestic Affected (0/1).** This table provides results of difference-in-difference regressions analyzing the volume of loan issuances before versus after the ECB's collateral framework change. The analysis is based on data on the firm-bank-time level. The sample period is Q1 2006 to Q2 2008. *Loan volume* is the loan issuance from bank i (as lead arranger or participant) to firm j at time t. $Affected_{05,i}(0/1)$ is an indicator variable equal to one for banks which have an above-median share of euro area loan issuance (excl. domestic) over total loan issuance over the period Q1 2003 to Q2 2005. *Domestic* $Affected_{05,i}(0/1)$ 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). $Post07_t$ is an indicator variable equal to one after the framework change was implemented in January 2007. The control variables are lagged by 4 quarters and defined in Section 9.5. The regressions further include firm × bank, country × quarter and firm × quarter fixed effects, where indicated. Country fixed effects refer to the borrowers' respective headquarters. Reported standard errors are in parentheses, clustered at the bank level. ***, **, * denote significance at the 1, 5, and 10% level, respectively.

VARIABLES	(1) ln(1 + loan volume)	(2) ln(1 + loan volume)	(3) ln(1 + loan volume)	(4) ln(1 + loan volume)
Domestic Affected × Affected × Post07	0.555***	0.095	-0.002	0.005
	(0.203)	(0.133)	(0.125)	(0.116)
$Affected_{05,i}(0/1) \times Post07_t$	-0.217	0.085	0.211*	0.243**
	(0.159)	(0.121)	(0.116)	(0.119)
$Domestic\ Affected_{05,i}(0/1) \times Post07_t$	-0.178	0.185	0.154*	0.179**
	(0.127)	(0.120)	(0.090)	(0.076)
ln(Total assets)				-0.380*
				(0.191)
Equity ratio				-0.008
				(0.023)
ROE				-0.001
				(0.001)
Cash ratio				-0.015
				(0.010)
Liquidity ratio				-0.003
				(0.002)
Deposit ratio				0.003
				(0.004)
$Post07_t$	0.358***			
	(0.109)			
Observations	1,208	1,208	1,208	1,208
R-squared	0.695	0.878	0.976	0.976
Bank-level Controls	No	No	No	Yes
Bank × Firm FE	Yes	Yes	Yes	Yes
Country × Time FE	No	Yes	Yes	Yes
Firm × Time FE	No	No	Yes	Yes
Cluster	Bank	Bank	Bank	Bank

Table 16: **Robustness: Anticipation Effect.** This table provides results of difference-in-difference regressions analyzing the volume of loan issuances before versus after the ECB's collateral framework change. The analysis is based on data on the firm-bank-time level. The sample period is Q1 2006 to Q2 2008. $Affected_{06,i}(\%)$ is the ratio of euro area (excl. domestic) over total loan issuance in the period Q1 2004 to Q4 2006, prior to the implementation date in January 2007. $Post07_t$ is an indicator variable equal to one after the framework change was implemented in January 2007. The control variables are lagged by 4 quarters and defined in Section 9.5. The regressions further include firm × bank, country × quarter and firm × quarter fixed effects, where indicated. Country fixed effects refer to the borrowers' respective headquarters. Reported standard errors are in parentheses, clustered at the bank level. ***, **, * denote significance at the 1, 5, and 10% level, respectively.

	(1)	(2)	(3)
VARIABLES	ln(1 + loan volume)	ln(1 + loan volume)	ln(1 + loan volume)
$\text{Affected}_{06,i}(\%) \times \text{Post07}_t$	0.005	0.007**	0.008**
	(0.004)	(0.003)	(0.003)
ln(Total assets)			-0.298
			(0.215)
Equity ratio			-0.009
			(0.030)
ROE			-0.001
			(0.001)
Cash ratio			-0.014
			(0.010)
Liquidity ratio			-0.002
			(0.003)
Deposit ratio			0.003
			(0.005)
Observations	1,208	1,208	1,208
R-squared	0.877	0.975	0.975
Bank × Firm FE	Yes	Yes	Yes
Country × Time FE	Yes	-	-
Firm × Time FE	No	Yes	Yes
Cluster	Bank	Bank	Bank

Table 17: **Robustness: Announcement Date vs. Implementation Date.** This table provides results of difference-in-difference regressions analyzing the volume of loan issuances before versus after the ECB's collateral framework change when it was announced in July 2005. The analysis is based on data on the firm-bank-time level. The sample period is Q2 2004 to Q4 2006, 4 quarter before and 6 quarter after the announcement. $Affected_{05,i}(0/1)$ is an indicator variable equal to one for banks which have an above-median share of euro area loan issuance (excl. domestic) over total loan issuance over the period Q1 2003 to Q2 2005. $Post05_t$ is an indicator variable equal to one after the framework change got announced in July 2005. The control variables are lagged by 4 quarters and defined in Section 9.5. The regressions further include firm × bank, country × quarter and firm × quarter fixed effects, where indicated. Country fixed effects refer to the borrowers' respective headquarters. Reported standard errors are in parentheses, clustered at the bank level. ***, **, * denote significance at the 1, 5, and 10% level, respectively.

	(1)	(2)	(3)	(4)
VARIABLES	ln(1 + loan volume)	ln(1 + loan volume)	ln(1 + loan volume)	ln(1 + loan volume)
Affected$_{05,i}$(%) × Post05$_t$	0.001	0.002	-0.001	-0.001
	(0.004)	(0.002)	(0.002)	(0.002)
ln(Total assets)				-0.069
				(0.178)
Equity ratio				-0.010
				(0.032)
ROE				0.000
				(0.001)
Cash ratio				-0.003
				(0.004)
Liquidity ratio				0.002
				(0.002)
Deposit ratio				0.001
				(0.002)
post 2005	0.054			
	(0.086)			
Observations	2,074	2,074	2,074	2,074
R-squared	0.725	0.841	0.976	0.976
Bank × Firm FE	Yes	Yes	Yes	Yes
Country × Time FE	No	Yes	Yes	Yes
Firm × Time FE	No	No	Yes	Yes
Cluster	Bank	Bank	Bank	Bank

Table 18: **Robustness: Falsification Test.** This table provides results of difference-in-difference regressions analyzing the volume of loan issuances before versus after the ECB's collateral framework change for banks located outside the euro area (but inside the EU). The analysis is based on data on the firm-bank-time level. The sample period is Q1 2006 to Q2 2008. Here, group of "placebo" banks is defined as non-euro-area banks which are actively lending to euro area borrowers. $Placebo_{05,i}(\%)$ is the share of euro area loan issuance over total loan issuance by this placebo group of banks in the period Q1 2003 to Q2 2005. *Post07* is an indicator variable equal to one after the framework change was implemented in January 2007. The control variables are lagged by 4 quarters and defined in Section 9.5. The regressions further include firm × bank, country × quarter and firm × quarter fixed effects, where indicated. Country fixed effects refer to the borrowers' respective headquarters. Reported standard errors are in parentheses, clustered at the bank level. ***, **, * denote significance at the 1, 5, and 10% level, respectively.

VARIABLES	(1) ln(1 + loan volume)	(2) ln(1 + loan volume)	(3) ln(1 + loan volume)
$\text{Placebo}_{05,i}(\%) \times \text{Post07}_t$	0.044	0.067	-0.027
	(0.196)	(0.144)	(0.078)
Post07_t	0.336***		
	(0.101)		
Observations	804	804	804
R-squared	0.679	0.890	0.982
Bank-level controls	Yes	Yes	Yes
Bank × Firm FE	Yes	Yes	Yes
Country × Time FE	No	Yes	Yes
Firm × Time FE	No	No	Yes
Cluster	Bank	Bank	Bank

Table 19: **Robustness: Lead Arranger Sample.** This table provides results of difference-in-difference regressions analyzing the volume of loan issuances before versus after the ECB's collateral framework change. The analysis is based on data on the firm-bank-time level, where only banks acting as lead arrangers are considered. The sample period is Q1 2006 to Q2 2008. $Affected_{05,i}(0/1)$ is an indicator variable equal to one for banks which have an above-median share of euro area loan issuance (excl. domestic) over total loan issuance over the period Q1 2003 to Q2 2005. $Post07_t$ is an indicator variable equal to one after the framework change was implemented in January 2007. The regressions further include firm × bank, country × quarter and firm × quarter fixed effects, where indicated. Country fixed effects refer to the borrowers' respective headquarters. Reported standard errors are in parentheses, clustered at the bank level. ***, **, * denote significance at the 1, 5, and 10% level, respectively.

	(1)	(2)	(3)	(4)
VARIABLES	ln(1 + loan volume)	ln(1 + loan volume)	ln(1 + loan volume)	ln(1 + loan volume)
Affected$_{05,i}$(%) × Post07$_t$	0.002	0.006*	0.005**	0.007*
	(0.007)	(0.004)	(0.002)	(0.003)
ln(Total assets)				-0.467
				(0.310)
Equity ratio				-0.039
				(0.037)
ROE				-0.001
				(0.001)
Cash ratio				-0.021
				(0.017)
Liquidity ratio				-0.002
				(0.003)
Deposit ratio				0.006
				(0.008)
Post07$_t$	0.382*			
	(0.190)			
Observations	834	834	834	834
R-squared	0.641	0.896	0.969	0.970
Bank × Firm FE	Yes	Yes	Yes	Yes
Country × Time FE	No	Yes	Yes	Yes
Firm × Time FE	No	No	Yes	Yes
Cluster	Bank	Bank	Bank	Bank

Table 20: **Robustness: Affected Defined Over Total Assets (%).** This table provides results of difference-in-difference regressions analyzing the volume of loan issuances before versus after the ECB's collateral framework change. The analysis is based on data on the firm-bank level. The sample period is Q1 2006 to Q2 2008. *Loan volume* is the loan issuance from bank i (as lead arranger or participant) to firm j at time t. *Affected over* $TA_{05,i}$ is the share of bank i's euro area loan issuance (excl. domestic) over bank i*'s* total assets in the period Q1 2003 to Q2 2005, prior to the announcement of the framework change in July 2005. $Post07_t$ is an indicator variable equal to one after the framework change was implemented in January 2007. The control variables are lagged by 4 quarters and defined in Section 9.5. The regressions further include firm × bank, country × quarter and firm × quarter fixed effects, where indicated. Country fixed effects refer to the borrowers' respective headquarters. Reported standard errors are in parentheses, clustered at the bank level. ***, **, * denote significance at the 1, 5, and 10% level, respectively.

	(1)	(2)	(3)
VARIABLES	ln(1 + loan volume)	ln(1 + loan volume)	ln(1 + loan volume)
Affected over TA_{05} × post	0.020	0.028*	0.028*
	(0.027)	(0.014)	(0.014)
ln(Total assets)			-0.204
			(0.181)
Equity ratio			-0.035
			(0.046)
ROE			-0.000
			(0.002)
Cash ratio			-0.014
			(0.012)
Deposit ratio			0.002
			(0.005)
Observations	1,059	1,059	1,059
R-squared	0.879	0.974	0.975
Bank × Firm FE	Yes	Yes	Yes
Country × Time FE	Yes	Yes	Yes
Firm × Time FE	No	Yes	Yes
Cluster	Bank	Bank	Bank

Table 21: **Robustness: Eligible (log).** This table provides results of difference-in-difference regressions analyzing the volume of loan issuances before versus after the ECB's collateral framework change. The analysis is based on data on the firm-bank-time level. The sample period is Q1 2006 to Q2 2008. *Loan volume* is the loan issuance from bank i (as lead arranger or participant) to firm j at quarter t. $Eligible_{05,i}(log)$ is the log of one plus bank i's euro area loan issuances (excl. domestic) in Q2 2005. $Post07_t$ is an indicator variable equal to one after the framework change was implemented in January 2007. The control variables are lagged by 4 quarters and defined in Section 9.5. The regressions further include firm × bank, country × quarter and firm × quarter fixed effects, where indicated. Country fixed effects refer to the borrowers' respective headquarters. Reported standard errors are in parentheses, clustered at the bank level. ***, **, * denote significance at the 1, 5, and 10% level, respectively.

	(1)	(2)	(3)	(4)
VARIABLES	ln(1 + loan volume)	ln(1 + loan volume)	ln(1 + loan volume)	ln(1 + loan volume)
$Eligible_{05}$ (log)	0.020	0.051*	0.066***	0.066***
	(0.035)	(0.027)	(0.024)	(0.023)
ln(Total assets)				-0.204
				(0.187)
Equity ratio				-0.022
				(0.031)
ROE				-0.001
				(0.001)
Cash ratio				-0.011
				(0.010)
Deposit ratio				0.001
				(0.004)
$Post07_t$	0.206			
	(0.214)			
Observations	1,208	1,208	1,208	1,208
R-squared	0.693	0.877	0.976	0.976
Bank × Firm FE	Yes	Yes	Yes	Yes
Country × Time FE	No	Yes	Yes	Yes
Firm × Time FE	No	No	Yes	Yes
Cluster	Bank	Bank	Bank	Bank

9.5 Variable Definitions

All CapitalIQ data are based on the SNL Financial database.

Variable	Source	Description
Loan volume (mn USD)	Dealscan	Total loan volume in million USD to firm j by bank i in quarter t
All-in-drawn spread (bp)	Dealscan	The sum of the spread over LIBOR including annual fees in basis points (bps)
Maturity (months)	Dealscan	Maturity of syndicated loan in months
Share of lead arrangers	Dealscan	Indicator variable equal to one if a bank acts as lead arranger
Share of euro area firms	Dealscan	Indicator variable equal to one if a firms' headquarter is located in the euro area
Domestic over total loan issuance	Dealscan	Share of domestic loans over total syndicated loans, where "domestic loans" are loans given to a firm which has the same headquarter location as the bank.
Euro area over total loan issuance	Dealscan	Share of euro area loans over total syndicated loans, where "euro area loans" are loans given to a firm which has its headquarters in the euro area.
ln(Total Assets)	CapitalIQ	The natural logarithm of total assets plus one.
Loans ratio	CapitalIQ	Share of gross loans over total loans
Equity ratio	CapitalIQ	Share of equity over total assets (leverage ratio)
ROE (%)	CapitalIQ	Bank i's 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
Ln(volume)	Dealscan	Natural logarithm of (one plus) the loan issuance from bank i (as lead arranger or participant) to firm j at quarter t
Constrained-Securities	CapitalIQ	Indicator variable equal to one if bank i's securities to total assets ratio is below the 50th percentile in 2006, and zero otherwise
Constrained-Tier1Ratio	CapitalIQ	Indicator variable equal to one if bank i's Tier1Ratio is below the 50th percentile in 2006, and zero otherwise
$\text{Affected}_{05,i}$ (%)	Dealscan	Share of bank i's euro area (excluding domestic) over total syndicated loan issuance in the period Q1 2003 to Q2 2005
$\text{Affected}_{05,i}$ (0/1)	Dealscan	Indicator variable equal to one for banks which have an above median share of euro area (excl. domestic) over total syndicated loan issuance in the period Q1 2003 to Q2 2005
$\text{AffectedoverTA}_{05,i}$ (%)	Dealscan	Share of bank i's euro area (excluding domestic) over total assets in the period Q1 2003 to Q2 2005
$\text{Affected}_{06,j}$ (0/1)	Dealscan	Indicator variable equal to one if firm j has a relationship with an "affected" bank in 2006
$\text{Eligible}_{05,i}$ (log)	Dealscan	Natural logarithm of (one plus) bank i's euro area (excl. domestic) loan issuance in Q2 2005
$\text{Eligible}_{05,i}$ (0/1)	Dealscan	Indicator variable equal to one for banks which have an above median share of euro area (excl. domestic) loan issuance in Q2 2005
Post07_t		An indicator equal to one after the framework change was implemented in January 2007, and zero otherwise
Post05_t		An indicator equal to one after the framework change was announced in June 2005, and zero otherwise

$\ln(\sigma(ROA_j)^{5y})$	Dealscan/Compustat	Logged five-year standard deviation of loan-financed firm j's ROA from year *t-5* to *t-1*
Tradable	Dealscan/Compustat	Indicator variable equal to one if firm j is active in tradable industries (SIC codes 2000-3999)
Non-tradable	Dealscan/Compustat	Indicator variable equal to one if firm j is active in non-tradable industries (SIC codes 1500-1799, 5000-5999, 7000-7099)
Private	Dealscan/Compustat	Indicator variable equal to one if firm j is a private firm
Public	Dealscan/Compustat	Indicator variable equal to one if firm j is a public firm
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 firm j's total assets
Leverage	Compustat	Ratio of firm j's long term debt to total assets
Liquidity	Compustat	Ratio of firm j's cash flow over total assets
Employment	Compustat	Number of firm j's employees, in thousand
ln(Employment)	Compustat	Natural logarithm of the number of firm j's employees
Investment	Compustat	Firm j's Capital expenditure, CAPEX
ln(Investment)	Compustat	Logarithm of firm j's capital expenditure