International bank lending and corporate debt structure

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Abstract

Using a cross-country firm-bank dataset, we study the impact of a bank credit supply shock on firms' access to credit lines and term loans. For identification, we examine how firms' debt structure evolves after an unexpected increase in bank capital requirements by the European Banking Authority (EBA), which did not affect firms' demand for finance. Consistent with a "home bias" in bank lending, we find that the EU firms maintain a smooth access to bank credit, while their US counterparts experience constraints in accessing bank credit lines. In addition, we show that US firms are able to secure credit lines from non-bank financial institutions. These results suggest that diversified domestic loan markets, in which banks and non-bank financial institutions lend to corporations, can help overcome cuts in cross-border bank funding.

Key words: Credit lines; term loans; bank capital requirements; firm-level data; non-bank lenders

JEL: G21, G32, F32, F34

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1 Introduction

Large firms raise a substantial fraction of their syndicated loans from foreign financial institutions (Figure 1, Panel A). This strong dependency on foreign lenders implies that corporates may experience a sharp tightening in credit conditions during episodes of financial turmoil (Popov and Udell (2012) and Ongena et al. (2015)). The recent financial crisis, as well as previous crises, have highlighted that switching to alternative sources of funding when bank lending is impaired may not be easy. Although bonds and loans co-exist (Bensanko and Kanatas (1993); Diamond (1991)), only a subset of high-quality firms manages to switch to bonds after banking crises (Goel and Zemel (2018)). Similarly, Fernández et al. (2018) find that non-bank credit only partially substitutes for bank loans in bank-dependent firms after the onset of the global financial crisis, with some variation across different countries. Problems are compounded as foreign lenders play a prominent role in both the provision of term loans and credit lines (Figure 1, Panel B). They serve different purposes, as term loans fund specific business needs (eg capital expenditures) while credit lines are facilities that help firms to smooth liquidity shocks. And both are equally important, as underscored by the fact that each typically represents around half of the syndicated loans originations (Figure 2).

Motivated by these considerations we ask the following questions: Do firms maintain uninterrupted access to both types of loans when their foreign creditors are hit by a liquidity shock? Can firms find alternative sources when bank credit conditions tighten? In this paper, we shed light on these questions by investigating the impact of an unexpected increase in bank capital requirements on firms' access to term loans and credit lines, using a cross-country sample of bank-dependent public firms. In doing so, we examine whether firms experience constraints in securing loans from banks hit by a capital requirements increase. In addition, we investigate whether firms dependent on foreign-headquartered banks are hit harder, which would be consistent with previous findings underscoring that international loans are particularly fickle. Finally, we analyze if bank retrenchment effectively constraints

firms' access to credit, or whether they can overcome cuts in borrowing by issuing corporate bonds or securing loans from non-bank financial institutions.

For identification we use an unexpected increase in bank capital requirements that affected only (a subset of) European Union (EU) banks, which allows us to isolate a supply shock to bank credit, independent on contemporaneous changes in firms' demand for finance. Specifically, we use deal-level (syndicated loan and bond) data to enhance the corporate debt structure, including the composition of bank creditors. Using firm-bank matched data for 2005-2014 we exploit the October 2011 EBA announcement, which increased the minimum Core Tier 1 ratio to 9% by the end of 2011 and to 10% by the end of 2012, triggered international deleveraging among EU banks.[1] The increase, which we call, "the EBA capital exercise", was sizable, and left unaffected some EU, and all non-EU banks.[2] Importantly, the EBA capital requirements were set on a consolidated basis, so the affected banks could opt to shy away from their domestic or international corporate customers. In particular for US firms, credit from EU banks was an important source of funding. Specifically, EU banks accounted for 15% of the outstanding (syndicated) loans to US firms.

We carry out a difference-in-differences analysis to estimate how this regulatory change affected firms' corporate debt structure. Our data span a pre-policy (2010Q2–2011Q2) and a post-policy period (2012Q3–2013Q3). On this basis, we identify the exogenous effect of a reduction in bank lending on corporate debt structure. We define two groups: treated firms with half of the European bank loans coming from EBA-affected banks, and the control group, comprising the rest of firms with outstanding loans from European banks. Therefore, we exploit that not all firms are affected in the same way, and the identification comes from cross-sectional differences in firms' exposures to EBA-affected banks. Our identification assumption is that the EBA capital exercise did not affect treated firms' demand for financing,

[1] Throughout the paper we mention that the requirement is imposed on EU banks, although it also affect banks in the European Economic Association (EEA), which includes the EU countries plus Iceland, Liechtenstein, and Norway.

[2] This explains its appeal as an opportunity for analyzing domestic credit flows (Gropp et al. (2018)), or banks' decisions to grant collateralized rather than uncollateralized loans (Degryse et al. (2020)).

relative to the control group.

To conduct the analysis, we construct a cross-country panel of bank-dependent firms, defined as those with at least one outstanding loan at the onset of the EBA capital exercise. We further narrow the sample removing firms that do not have an outstanding loan vis-à-vis European banks. This way we further make our treated and control group similar. Additionally, we select firms that disclose financial information, that is public firms and other large private companies. We end up with a sample of 2,830 firms, of which 1,117 are incorporated in the EU, 1,415 in the US, and 215 in other advanced economies. Hence, the final sample is very well suited to exploring a reduction in international bank credit, triggered by the tightening of bank capital requirements in the EU.

We summarize our main results, which are robust to several tests, as follows. First, treated firms decrease their bank borrowing, relative to the control group. However, only US firms experienced constraints in access to loans from EU banks, and EU firms' bank borrowing remains resilient. The resilience of bank borrowing by EU firms reflects the sample selection used in the paper, which focuses on large firms.[3] Second, inspecting the constraints in bank borrowing by US firms, we find that they concentrate in credit lines: US treated firms experience a decrease in bank credit lines relative to the control group. However, US treated do not display any signs of constraints in accessing term loans, which experience a similar increase relative to control firms. Third, we find that US treated firms raise their non-bank credit lines, relative to the control group. Firms also experience a small but quantitatively less important increase in bond borrowing, while term loans provided by non-banks do not grow. Taken together, our main conclusion is that US firms are able to smooth the contraction in bank credit lines by resorting to non-bank financial intermediaries.

Our study further documents that the US firms hit by the cut in EU bank lending and switching to non-bank loans modify their capital structures: the bank borrowing to

[3]Previous research has shown that EU banks cut back credit to small and medium-size enterprises (SMEs) in Europe (see for example, Acharya et al. (2018); Balduzzi et al. (2018); Bentolila et al. (2018); Dwenger et al. (2020) and Farinha et al. (2019)). SMEs tend to carry the highest risk weights in internal ratings-based approach that banks use for lending purposes.

total assets share decreases, while the share of credit from non-bank financial intermediaries rises. This finding potentially implies that funding activity becomes more fragile, as banks generally have a more stable funding structure than do non-banks. Indeed, most non-bank financial institutions active in the syndicated loan market rely on wholesale funding and lack customer deposits, which may lead them to cut credit in the case of market-wide liquidity stress faster than banks do (Cornett et al. (2011)). This finding can be seen as an unintended consequence of the EBA policy intervention across borders.

Our paper makes three main contributions to the literature. First, we add to the literature investigating how shocks to bank lending impact on corporate financial decisions. Becker and Ivashina (2014) show that bond issuance increases relative to bank financing when lending standards tighten. Goel and Zemel (2018) document financial frictions, and show that only high-quality firms switch to bonds when bank credit supply stalls. Fernández et al. (2018) show that non-bank private debt can partially substitute the contraction in bank credit, in particular in countries with strong creditor rights. We go beyond these studies and analyze separately the evolution of bank term loans and credit lines (including undrawn commitments), and show that a significant share of the contraction in international bank lending relates to credit lines rather than term loans offering new insights. In addition, we underscore the ability of non-bank financial institutions to cushion a reduction in international bank lending, showing that they compensate the dry up of bank credit lines.

Second, we add to research delving into the transmission of international bank lending shocks using bank-firm data. Popov and Udell (2012) and Ongena et al. (2015) show that SMEs face the tightening of credit by their foreign banks when these experience a negative shock. Focusing on large corporates, we document a similar tightening of credit conditions, which, however, exclusively concerns bank credit lines.

Third, we offer new insights on the ability of financial institutions to provide liquidity insurance to corporates. Previous research showing that deposit-taking institutions are well-suited to provide liquidity insurance to corporates, since deposit flows and credit line

drawdowns typically move in opposite directions (Kashyap et al. (2002)). We show that non-bank financial institutions, with no deposits but other sight liabilities, also provide liquidity insurance to corporates and smooth the decrease in bank credit line origination.

The remainder of the paper is structured as follows. Section 2 describes the data and presents summary statistics. Section 3 discusses institutional aspects concerning corporate borrowing and develops testable hypotheses. Section 4 describes our methodology. Section 5 presents the main empirical results. Section 6 provides robustness checks, and section 7 discusses the implications. Section 8 concludes.

2 Data

2.1 Data description

We construct a firm-level quarterly panel for the period 2009Q3 to 2014Q1 by combining two data sources. We first obtain firms' financial statements from Capital IQ, including balance sheets, cash flow statements, income statements, key financial ratios, and reference data (sector, country of incorporation, etc). To enhance the capital structures that companies disclose in their financial statements, we retrieve information about 223,211 bonds and 229,608 syndicated loans by non-financial firms from Refinitiv SDC Platinum. In the syndicated loan data, we include both term loans and (potentially undrawn) credit lines. We exclude bridge loans, as they may expire before their original maturity date. To classify loans as term loans or credit lines, we use the description of the tranche facility provided by Refinitiv. Term loans include term financing for project finance or capital expenditures. Credit lines are all revolving line facilities, receivables, trade finance instruments (letters of credit), and liquidity lines. When the tranche simultaneously provides term financing and a credit line (around 1% of the observations), we split them pro-rata. We use the bond and syndicated loan data to generate firm-level credit stocks. Specifically, we produce three measures of outstanding debt: (1) bonds (2) loans by banks and (3) loans by non-bank financial

intermediaries (non-banks).

We analyze borrowers (firms) and lenders (banks and non-banks) on a consolidated basis, so an international loan is one in which the (ultimate) parent of the borrower and the lender are located in different countries. The reason why we consolidate all loans at the ultimate parent of the lender is that the EBA capital requirements were set on a consolidated basis.[4] Additionally we consolidate all loans and bonds at the ultimate parent of borrower to avoid biases as firms may borrow through SPVs incorporated overseas (Avdjiev et al. (2016)).[5]

Throughout the analysis we focus on the lead arranger, as they are in charge of monitoring borrowers and attracting investors (Sufi (2007)). When a loan has several lead arrangers, we treat each as a different lender. We classify lead arrangers as banks or non-banks according to their funding structure, following the post-crisis definition of the shadow banking system (Pozsar et al. (2012); FSB (2011a); FSB (2011b)). Consequently, banks are deposit-taking institutions and other lenders relying on stable funding (eg saving banks). Non-banks include the rest of the lenders, the majority of which are investment banks (security-broker dealers).[6] To implement this classification, we use the NAICS and the TRBC system. Banks are those under NAICS code 5221, as are other banks that are not investment banks in the TRBC.[7]

We construct the list of creditors of each firm derived from syndicated loans, defined as those lenders with an outstanding loan to a firm. To assess if a loan is outstanding, we use issuance and maturity date. This measure of firm-bank dependency is therefore bilateral and time-varying. Using such list of creditors of each firm in each quarter, we impose three filters to define a homogeneous sample of bank-dependent firms. First, we define a firm as bank-dependent if it has an outstanding loan vis-á-vis a lead arranger banks. Second, we

[4]Additionally, many bank affiliates are subject to individual capital requirements.

[5]We do not observe loans or bonds issued by independent affiliates, ie listed firms

[6]The group of non-bank lenders includes financial institutions subject to bank-like capital requirements but that do not take deposits. See Claessens et al. (2012) for a discussion.

[7]NAICS stands for the North American Industry Classification Scheme, which superseded the SIC in 1987. The NAICS maps the UN International Standard Industrial Classification of All Economic Activities (ISIC). TRBC stands for the Thomson Reuters Business Classification, which is a market-based system classifying firms into 10 economic sectors, 136 industries, and 837 activities. Appendix C provides further details on the sectoral classification of financial intermediaries.

keep companies that have at least one outstanding loan vis-á-vis lead bank headquartered in the EU. This controls for potential assortative matching between firms and banks. This may be particularly important for non-EU firms, as those not borrowing from EBA banks may be very different –perhaps having a more regional focus. Third, we select only listed companies, or those that already disclose financial information.

We merge the firm-level measures of credit stocks with the accounting data from Capital IQ using firms' ISINs and LEIs, which uniquely identify them in both. Following normal selection criteria used in the literature, we control for the potential influence of outliers by excluding observations in the 1% upper and lower tails of the distribution of the regression variables. Our final sample includes 2,830 firms, of which 1,177 are based in the EEA, 1,415 are based in the US, and 215 are based in other developed economies.

2.2 Sample analysis

In Table 1 we report descriptive statistics for the whole sample (Panel A), for firms heavily dependent on EBA banks (ie affected by the capital exercise) as of 2011Q3 (Panel B), and for the rest of firms dependent on European banks (control group).[8] We winsorize the variables at 1% and 99%. The average firm in our sample has a leverage ratio of 30.3% with a median of 28.2%. In addition, the firms in our sample have relatively many tangible assets, with mean tangible assets of 34.6% and median tangible assets of 28.2%. At the foot of the table we report p-values for the tests of equality of medians for the two groups in panels B and C. We observe that with the exception of assets, treated and control firms are similar across a number of financial indicators. These statistics help us inspect residual differences between the two groups.

Figure 2 shows the similar relative importance of credit lines and term loans raised by firms. Examining the expected use of proceeds at origination, we observe they differ in their purpose. Term loans are arranged for specific uses (eg to finance capital expenditures, as

[8] In Appendix A, we define all variables and provide the relevant data sources.

shown in Figure 3), while credit lines allow firms to secure liquidity and exploit business opportunities as they arise (Lins et al. (2010)). This is reflected in the lack of detail in the intended use of credit lines at origination; often they are raised for "general corporate purposes."

3 Institutional background and hypotheses

3.1 Firms' financial choices

Understanding basic institutional aspects of corporate borrowing is important to explore the role domestic credit markets may play in international bank lending. A key insight is that large firms raise debt from three major sources: bond markets, bank lenders, and non-bank lenders.

Bond issuance may not attenuate an adverse shock to bank credit for two reasons. The first, which is well known, is that loan markets better satisfy the funding needs of companies that are smaller, more opaque, or riskier (Faulkender and Petersen (2006), Blackwell and Kidwell (1988), Diamond (1991), Chemmanur and Fulghieri (1994), Cantillo and Wright (2000)). This reflects, respectively, that loans have lower flotation costs than bonds (eg no need to register a security), loan markets better address informational asymmetries between borrowers and lenders, and loan markets better handle liquidation and renegotiation in case of distress. Bond markets are appealing to large and public firms, as they can help raise large amounts of funds.[9] Consequently, switching from loans to bonds when bank credit is interrupted is difficult for many companies, including large ones and public ones (Goel and Zemel (2018)), especially if they lack previous market experience (Hale and Santos (2008)).

The second reason, often neglected, is that a significant fraction of bank loans are not term financing, but are credit line commitments, also known as revolving loans. Firms

[9] An additional appealing characteristic of the bond market is that they give more financial flexibility to make investment decisions, which implies that creditors do not actively monitor how companies use the proceeds during the length of the debt contract (Rajan (1992)).

typically secure credit lines as a liquidity insurance, which eventually allows them to exploit potential business opportunities as they arise (Lins et al. (2010)). Credit lines do not imply an effective disbursement at origination. Providing credit lines has been one of the traditional functions of banks, as these have an advantage in smoothing liquidity demand on the asset side via credit lines–and on the liability side via sight deposits (Kashyap et al. (2002)). Bond markets, on the other hand, provide term financing and therefore are not a good alternative to credit lines.

In summary, these aspects suggest that bond markets may not fully smooth a cut in bank credit when it dries up. Non-banks may be a viable alternative, in particular as are major providers of credit lines. Figure 4 shows the fraction of loans granted to non-US corporates (Panel A) and US corporates (Panel B), split by type of instrument and lender into four categories: bank term loans, bank credit lines, non-bank term loans, and non-bank credit lines. We observe that for US corporate borrowing, non-banks provide around 20% of all credit lines. Thus, they may be in a good position to attenuate a bank funding shock.

3.2 The EBA capital exercise

The EBA capital exercise in October 2011 was aimed at restoring confidence in the EU banking sector by ensuring that banks were adequately capitalized to mitigate unexpected losses. The focus was primarily on banks' exposure to sovereigns. Specifically, the EBA decision required 61 banks to raise their Core Tier 1 capital ratio to 9% by June 2012. This exercise occurred in the backdrop of adverse developments in European capital markets following the sovereign debt crisis.

The capital exercise banks were selected to build additional capital buffers based on total assets, while leaving requirements unchanged for all other banks. In each country, the EBA sorted banks in descending order of their market share by total assets, such that the exercise covered at least 50% of the national banking sector. The EBA capital exercise was unexpectedly announced soon after the stress tests conducted in July 2011 (Mésonnier and

Monks (2015); Gropp et al. (2018) and Degryse et al. (2020)).

The appealing characteristic of this quasi-natural policy experiment is that there are cross-sectional differences in the degree of firms' exposure to EBA-affected banks. That is, some European bank-dependent firms have not borrowed much from EBA banks. Consequently, we can test if firms that heavily depend on banks subject to the EBA requirements (treatment group) experienced a change in their liabilities relative to those lightly exposed and with some borrowing from European banks (control group). We assume that the EBA capital exercise did not impair the demand for finance of the treated (EBA–dependent firms), relative to the control group. We exploit a policy shift that only affected (a subset of) EU banks that had outstanding loans vis-á-vis some US firms.

3.3 Hypotheses

We start by exploring the impact of an increase in bank capital requirements on access to bank credit of EU and non-EU firms. A large and growing body of literature shows that banking shocks are transmitted internationally (Giannetti and Laeven (2012), Cetorelli and Goldberg (2011), De Haas and Van Horen (2012) and De Haas and Van Horen (2013)). In addition, research using firm-bank data on SMEs argues that this can impact on their access to bank credit (Popov and Udell (2012)) and Ongena et al. (2015)). This expectation is enhanced by some features of the EBA capital exercise, which we use to identify the shock to the supply of international bank credit. Specifically, the initiative aimed at ensuring that bank adjustments did not contract the flow of lending to the EU's real economy" (EBA (2011)). Motivated by these considerations, we expect the EBA capital exercise to affect more heavily firms incorporated outside the EU than their EU counterparts.

Second we explore the channel through which the increase in bank capital requirements can negatively impact on corporates' access to bank credit. Specifically, we investigate whether banks cut credit lines, term loans, or both. Two aspects may condition their choice, and pull the final outcome in different directions. For one, term loans imply an effective

disbursement, whereas credit lines constitute contingent liquidity. But banks can sell term loans in the secondary market, while credit lines are highly illiquid and are rarely sold after origination (Bord and Santos (2012)) therefore exposing banks to stronger pipeline risks. Therefore, whether banks prefer to cut term loans or credit lines remains an empirical issue.

Finally, our expectation is that certain non-bank financial intermediaries can provide credit lines if banks cut them. Specifically, investment banks borrow in wholesale funding markets, so they are heavily exposed to liquidity risks on the liability side. This reliance on short-term funding makes them similar to deposit-taking institutions and enables them to provide credit lines (Kashyap et al. (2002)). In contrast, bond markets are unlikely to smooth a cut in bank credit if it concentrates in credit lines, as they provide term financing and not contingent liquidity.

4 Empirical strategy

4.1 Baseline model

Our empirical model examines how firms' liabilities change around the EBA capital exercise. To identify the effects of a policy shift, we need to analyze a supply shock to bank credit which is uncorrelated to firms' demand for finance. Tackling this issue is challenging because many shocks to bank credit are large enough to impair the overall demand for credit. For example, the cut in lending triggered by the Great Financial Crisis (GFC) impaired economic activity and depressed the corporate demand for finance. These shocks can also affect the relative demand for specific sources of credit. After the GFC, bank funding costs rose, so corporates' demand for bank credit decreased relative to market-based finance; and the spike in economic uncertainty could have pushed the demand for credit lines up, relative to term loans.

To address these issues, we use the exogenous increase in capital requirements by the EBA in 2011Q3, and we test whether firms that depend on banks subject to the EBA

requirements experience a change in lending composition relative to those firms which had borrowed from European, but had light exposures. Figure 5 shows the time–line of our differences-in-differences analysis, based on the timing of the EBA capital exercise.

Additionally, we recognize that corporate bond markets in the majority of jurisdictions are characterized by small size and liquidity (CGFS (2019), BIS (2016), Bhatia et al. (2019)). In these jurisdictions the lack of substitution from bank loans toward bonds may just signal that markets lack depth and not that corporate bond markets cannot per se smooth cuts in bank credit. To identify the role of corporate bond markets, we focus the analysis on US firms, as they have access to a deep and liquid bond market. Finally, to mitigate endogeneity concerns further, we include all firm variables at their levels before the bank EBA capital exercise.

We estimate our regressions using a difference-in-difference method to identify how bank capital requirements affect corporate debt structure. Formally, we estimate the following equation:

$$F_{ijt}^{X} = \alpha_i + \beta_1 Treated_i + \beta_2 Post_t + \beta_3 Treated_i * Post_t + \beta_4 Controls_{it} + \varepsilon_{ijt} \tag{4.1}$$

where F_{it}^{X} denotes the stock of liabilities of type X for firm i in country j at quarter t. α_i is a vector capturing firm-specific intercepts, and ε_{ijt} is the disturbance term. In line with Gropp et al. (2018), we measure a firm's i dependence on credit supply from EBA–affected banks prior to the capital exercise using the share of outstanding loans vis-à-vis EBA banks:

$$Share_i^{EBA} = \frac{\sum_{q=2010Q2}^{2011Q2} F_{i,q}^{B-EBA}}{\sum_{q=2010Q2}^{2011Q2} F_{i,q}^{B-EU}} \tag{4.2}$$

where $Share_i^{EBA}$ is a firm-specific and time-invariant metric that takes higher values for firms heavily dependent on EBA–affected banks. We use it to define the treatment variable $Treated_i$, which is a binary variable that equals 1 if half of the firm's $Share_i^{EBA}$ is above 50%,

and 0 otherwise. By using this approach, we seek to include in the treatment group firms with high dependence on EBA affected banks. The control group is made up of firms with below-average dependence on credit supply from EBA-affected banks, which also depend on EU banks.[10]

We date the EBA announcement in 2011Q3, because we use quarterly data and the decision was taken in October 2011. We define a pre-EBA capital exercise period that includes the four quarters before the announcement (2010Q2-2011Q2). The exercise ended in 2012Q2. Hence, $Post_t$ equals 1 for observations in the post-capital exercise period (2012Q2-2013Q2), and 0 in the pre-capital exercise. To prevent problems related to serial correlation we cluster standard errors at the firm level, and we collapse the average of all quarterly observations in the pre-treatment period and do the same for the treatment period (Bertrand et al. (2004)).[11]

The coefficient of interest is β_3, which measures the difference in lending X between treated and control firms in the post-EBA period. Put differently, the point estimate measures how the EBA exercise affects borrowing by firms dependent on EBA-affected banks, relative to firms less dependent on EBA-affected banks. Furthermore, we include firm-fixed effects, which effectively remove time-invariant unobserved heterogeneity impact on the demand for finance (including the sector of incorporation) between treated and control firms. The country and industry-specific differences are absorbed by the more granular firm-fixed effects.

To ease interpretation of the results, we standardize the dependent variable with its average value in 2010Q2. Consequently, the coefficient β_3 measures the percentage change experienced by the stock of liabilities of type X among treated firms, relative to the control group, after the EBA capital exercise.

[10] In this benchmark measure, the denominator does not include credit from non-EU banks. In robustness tests we show that the results are robust to alternative definitions, although by construction lowers the dependency on EBA banks.

[11] We experimented with models that incorporate time fixed effects and absorb the term $Post$. The results, which are reported in the online appendix, remain both qualitatively and quantitatively the same.

The effect of the EBA capital exercise, β_3, is well identified under one assumption, namely that the measures of firms' liabilities we use as dependent variable (eg, bank credit) exhibit a common trend across treated and control firms. The patterns observed pre-EBA capital exercise are reassuring: in all instances, the evolution is similar for treated and control firms, as we graphically depict in the results section. Furthermore, economic reasoning suggests that the assumption is sensible, as firms typically satisfy their financing needs by increasing borrowing at the extensive margin. Rapid changes from loan to bond markets are unlikely, as these decisions reflect companies' life-cycle (Berger and Udell (1998)). Furthermore, firms have limited incentives to stop borrowing from a lender, as longer lending relationships lower their funding costs (Berger and Udell (1995), Elyasiani and Goldberg (2004)).

Last, we include additional controls that influence firms' choices of external financing: firm size (total assets), and ratio of tangible to total assets. These are the two dimensions in which treated and control firms differ, according to the summary statistics in Table 1. Size accounts for the fact that larger firms typically have better access to external financing as they are less likely to be financially constrained (Mizen and Tsoukas (2014); Almeida et al. (2017); Bose et al. (2019)). In addition, we include the ratio of tangible assets to total assets, which proxies for firms' ability to pledge collateral for external financing.

4.2 Firms' access to bank credit and bank capital requirements

To examine whether the EBA exercise affects firms incorporated outside the EU more heavily than their EU counterparts, we estimate regressions splitting our firms into those incorporated in the EU, those incorporated outside the EU, and those incorporated in the United States.

$$F^B_{ijt} = \alpha_i + \beta_1 Treated_i + \beta_2 Post_t + \beta_3 Treated_i * Post_t + \beta_4 Controls_{it} + \varepsilon_{ijt} \tag{4.3}$$

where the dependent variable is the stock of bank liabilities, so that F_{it}^{X} equals F_{it}^{B}. $Post_t$ captures the general increase/decrease in bank credit around the EBA capital exercise. $Treated_i$ accounts for time-invariant differences in bank credit between treated and control firms.[12] Our interest lies in the interaction between $Treated{*}Post$, which shows the relative evolution of bank credit between treated and control firms around the EBA capital exercise. Obtaining a negative coefficient β_3 in the subsample of US firms would support the hypothesis that bank credit contracts when foreign bank creditors need to deleverage.

It is important to remember that our identification comes from comparing the stocks of firm liabilities and not stocks of bank claims. Consequently, our only assumption is that the relative demand for bank credit among firms exposed to EBA-affected banks, and for the control group, did not change around the EBA capital exercise. Under this assumption, any change in the growth of bank credit reflects the impact of the EBA capital exercise.

4.3 Channels of international transmission

To quantify the extent to which banks delevarage via different channels, we focus exclusively on US firms, adapting equation 4.1 and removing the subscript country j accordingly:

$$F_{it}^{X} = \alpha_i + \beta_1 Treated_i + \beta_2 Post_t + \beta_3 Treated_i * Post_t + \beta_4 Controls_{it} + \varepsilon_{it} \tag{4.4}$$

where the dependent variable is in turn the stock of bank term loans (F_{it}^{B-T}) and credit lines F_{it}^{B-CL}. A negative coefficient β_3 for $Treated{*}Post$ in the regressions signals that a particular type of bank claim contracts. For example, if we find that β_3 is negative when using bank credit lines as the dependent variable, this indicates that banks cut credit lines overseas when they need to deleverage. Once again, we analyze stocks of firm liabilities and not changes in banks' claims. Consequently, the identification assumption is that treated

[12] This variable is absorbed by the firm fixed effects.

firms do not alter their demand for bank term loans (or credit lines), relative to the control group, around the EBA capital exercise.

4.4 Credit substitution: bonds and non-bank loans

To identify a potential switch across financing choices, we estimate equation 4.3 using as dependent variables four stocks of credit, F_{it}^{X}: non-bank credit, F_{it}^{NB}; bonds, F_{it}^{Bonds}; non-bank term loans, F_{it}^{NB-T}; and non-bank credit lines, F_{it}^{NB-CL}.[13]

A positive coefficient for β_3 in $Treated*Post$ in the relevant regression signals that this type of financial claim expands. Here the identification assumption is that the demand for the type of financial claim (eg bonds) among the treated does not change around the EBA capital exercise, relative to the control group. Under this assumption, any change in the use of the specific instrument reflects the impact of the EBA capital exercise.

5 Results

5.1 Firms' access to bank credit and bank capital requirements

Our first question relates to whether firms suffer a cut in bank credit when their foreign creditors struggle to deleverage. Figure 6 provides a visual inspection of the evolution of bank credit by EU (Panel A) and US firms (Panel B) around the EBA capital exercise.[14] The blue line represents the stock of bank credit for firms highly dependent on EBA banks (treated group), while the red line represents the rest of the firms (control group). The stock of bank credit is indexed at 100 in 2011Q2, and the two dashed vertical lines in each panel mark 2011Q2 and 2012Q2, which are, respectively, the quarters immediately before and after the capital exercise. Three patterns emerge. First, treated and control firms exhibit a common trend before the capital exercise, as bank credit experiences a general increase.

[13] Non-bank credit is the sum of bonds, non-bank term loans, and non-bank credit lines.

[14] Specifically, it plots its evolution four quarters before its beginning, in 2011Q2, and after its end in 2012Q2.

Second, EU treated and control firms also exhibit a common trend post-capital exercise, as bank borrowing decreases for both groups, probably reflecting the lower demand for credit. Consistent with our hypothesis, bank borrowing by US firms changes after the EBA capital exercise: it shrinks for firms dependent on EBA banks, and keeps on increasing for the rest. This suggests that US firms face credit constrains in access to lending from EU banks.

To explore the earlier question formally, we begin by estimating models of credit supply for firms with different exposures to EBA-affected banks. Table 2 shows the results from the estimation of equation 4.1. We report coefficient estimates and t-statistics with standard errors clustered at the firm-level.

Our key variable of interest is the interaction between the firm-level $Treated$ dummy and the time dummy $Post$ ($Treated$*$Post$). Controlling for firm characteristics, industry differences, and country differences, we find a negative but insignificant coefficient for the whole sample in column 1. This finding, however, masks the heterogeneity across different firm locations. When we split our sample between EU and US firms, the results underscore significant differences. Specifically, bank credit to EU firms remains resilient (column 2). While bank credit to US firms increases ($Post$ is positive) signaling an increase in their demand for funds, there is a decoupling between the treated and the control group. The coefficient of $Treated$*$Post$ is indeed negative, underscoring that US treated firms faced credit constrains in borrowing from EU banks (column 3).

The negative effect on bank credit to US firms is not only statistically significant, but also it is economically important. Specifically, the policy change leads to a 18% reduction in bank borrowing for US firms dependent on EBA-affected banks, relative to the control group. To give a sense of its importance, this totally offsets the growth in bank borrowing experienced by US firms after the EBA capital exercise, which is given by the coefficient of $Post$.

This finding supports earlier research showing that the deleveraging of the financial sector through the reinforcement of the banks' capital positions is likely to reduce bank lending

(Brun et al. (2017); Jiménez et al. (2017) and Gropp et al. (2018)). In addition, given that we rely on a sample made up by large corporates, our results highlight the banks cut credit to US firms, and shield domestic corporates (Peek and Rosengren (1997); Cetorelli and Goldberg (2011); De Haas and Van Horen (2012); Popov and Udell (2012)). However, we base our analysis using a novel policy shift. Therefore, consistent with our expectations and findings from prior studies, negative policy shocks adversely affect banks' supply of credit.

5.2 Channels of international transmission

In this section, we formally explore how the EBA capital exercise affects credit lines and term loans. In other words, our aim is to understand whether the constraints in access to bank credit by US firms occurs through cuts to credit lines or term loans. We begin by providing graphical evidence on the evolution of different types of finance. In Figure 7 we visually inspect the evolution of the stock of bank term loans (panel A) and bank credit lines (panel B). The Figure supports the common pre-trend assumption of bank credit lines and term loans, as the dynamics of treated and control firms are similar before the EBA capital exercise, exhibiting a gradual increase. After the EBA capital exercise, the stock of bank credit lines among treated firms decreases, but control firms experience an increase. In contrast, post-EBA the capital exercise dynamics of bank term loans are more similar for treated and control firms, although the growth of term loans among treated firms seems smoother. All together, banks' deleveraging after the EBA capital exercise concentrates on credit lines, and there are no signs of credit constrains in access to term loans.

In our formal analysis, we estimate equation 4.3 and report the results in Table 3. For reference, column 1 shows the results when we consider all types of loans (already reported in column 3 of Table 2), while columns 2 and 3 report bank term loans and credit lines, respectively. When we use bank term loans as a dependent variable (column 2), the interaction term is not statistically significant, which suggests that the evolution of bank term loans for EBA-dependent firms (the treated) and the control group do not differ. In contrast, treated

firms experience a contraction in bank credit lines, as the coefficient of the interaction term is negative and statistically significant (column 3). The effect is economically important: after the EBA capital exercise, treated firms witness a reduction of 18% in credit lines, relative to the control group.

In summary, our results so far suggest that firms associated with banks that were exposed to the EBA capital exercise experience a decline in credit lines. This new result complements earlier work and highlights the role of international lending shocks in affecting firms' financing mix.

5.3 Credit substitution: bonds and non-bank loans

We now consider whether bond markets or non-bank lenders can smooth the reduction in international bank credit that US firms experience. Figure 7 plots the evolution of total credit (panel A), which is the sum of bank and non-bank credit plus a breakdown into its three components: bonds (panel B), non-bank term loans (panel C), and non-bank credit lines (panel D). The blue and red lines stand for the stock of credit for the treated and control groups, respectively. The Figure supports the common pre-trend assumption (in the four panels both lines increase), signalling that treated and control firms experience a similar growth in total credit, as well as in the three components of non-bank credit. Post-EBA capital exercise, the pattern of total credit is also very similar for treated and control firms. We do not observe notable changes in bond borrowing (panel B), although treated firms seem to increase it slightly relative to control firms. We do not see any differences in borrowing from non-bank term loans (panel C). In the three cases, the red and the blue lines increase to a similar extent, which signals that the post-EBA capital exercise evolution is similar for treated and control firms.[15] We show non-bank credit lines in panel D, which exhibit a different pattern: post-EBA capital exercise, treated firms significantly increase their reliance on non-bank credit lines. As the blue line increases, the red line (representing

[15]There are some differences, however, in the reliance that treated and control firms have on non-bank term loans, which is higher for control firms.

control firms) remains relatively flat.

We estimate equation 4.3 for total credit and the three components of non-bank credit. Table 4 presents the estimates of various types of non-bank credit. In the first column, we report point estimates using total credit as a dependent variable, and in the subsequent columns, we rely on bonds, non-bank term loans and non-bank credit lines. Firms heavily dependent on EBA-affected banks do not seem to face a reduction in total credit as the insignificant coefficient for the interaction term $Treated*Post$ in column 1 shows. This finding underscores that treated firms increase their non-bank borrowing, when they experience a cut in their bank credit lines (highlighted in column 3 of Table 3).

Moving to column 2, we find that treated firms marginally increase their bond borrowing. This is evident from the coefficient of the interaction term, which is positive and statistically significant (an increase of 11%, relative to control firms).[16] There is no notable difference in non-bank term loans, as the coefficient in column 3 is statistically insignificant. The main change occurs in treated firms' reliance on non-bank credit lines, shown in column 4. The interaction term is negative and highly significant. Furthermore, the economic impact is large, as the increase in non-bank credit line borrowing relative to control firms is 64%. The main conclusion is that, after experiencing a cut in bank credit, firms increase their reliance on non-bank credit lines.

Finally, we explore if the substitution is broad or restricted to firms with previous access to these sources. We hypothesize that the latter occurs, as a lack of previous experience prevents firms from accessing the bond market (Hale and Santos (2008)). Similarly, the evidence suggests that a lack of previous lending relationships limits access to credit lines (Berger and Udell (1995)). Empirically, we analyze the evolution of bonds, non-bank term loans, and non-bank credit lines for two subsets of firms: those with previous access to each source of financing (the intensive margin, Panel A in Table 5), and those with no prior market experience (the extensive margin, Panel B in Table 5). We find that firms with previous

[16]This result is however feeble, as it does not hold in the robustness checks conducted in Section 6.

experience increase their borrowing, relative to the control group. Specifically, borrowing through credit lines from non-banks increases by 80% relative to the control group. The rise in bond borrowing is 10%. Panel B shows that treated companies without previous bond market access (column 1) or non-bank borrowing (columns 2 and 3), are not able to improve their borrowing relative to the control group. The main message is that the growth in non-bank credit lines we identify for treated firms, relative to control firms, holds for firms that could tap public markets in the past.

6 Robustness checks

6.1 EBA dependency

In our main results, we define treated firms as those that have more than half of their outstanding loans from European banks vis-à-vis EBA-affected banks. To ensure that the results are not driven by the way we split our sample, we use a continuous variable ($Share_i^{EBA}$) to indicate treatment.[17] The modified equation we estimate is the following:

$$F_{it}^X = \alpha_i + \beta_1 Share_i^{EBA} + \beta_2 Post_t + \beta_3 Share_i^{EBA} * Post_t + \beta_4 Controls_{it} + \varepsilon_{it} \tag{6.1}$$

Table 6 shows the results. Panel A reports the analysis when we use total bank credit, bank term loans, and credit lines as dependent variables (columns 1, 2, and 3, respectively). The results are broadly consistent with the ones we obtain using the categorical variable, and they indicate that the contraction in bank credit concentrates in credit lines. In Panel B we summarize the main findings of the impact of firms' reliance on non-bank credit. Column 1 reports the impact on bond financing, and columns 2 and 3 non-bank term loans and credit lines. The results confirm the main analysis. Relative to control firms, treated firms increase

[17] This variable is firm specific and time invariant, so it is absorbed by the firm fixed effects.

their borrowing from non-bank credit lines. There are no notable differences in terms of bond financing, or non-bank term loans. In sum, our results are robust to an alternative definition of the treated group.

6.2 Timing: the European debt crisis

One potential concern about the EBA capital exercise is that the contraction of bank credit (and subsequent expansion of non-bank loans) for EBA-dependent firms may reflect the impact of the European debt crisis on banks' lending policies. To better isolate how bank capital requirements related to sovereign-debt problems affect the flow of credit, we create a new measure of EBA dependency that excludes loans from Greece, Ireland, Italy, Portugal and Spain (GIIPS) banks. The rationale stems from the fact that the sovereign debt crisis most affected banks in the periphery of Europe, which experienced deleveraging pressures during the first half of 2011 (Farinha et al. (2019)). Thus, we create a new measure of EBA dependency that excludes loans from GIIPS banks, $Share_i^{EBA-Ex}$:

$$Share_i^{EBA-Ex} = \frac{\sum_{q=2010Q2}^{2011Q2} F_{i,q}^{B-EBA-Ex}}{\sum_{q=2010Q2}^{2011Q2} F_{i,q}^{B-EU}} \tag{6.2}$$

$Share_i^{EBA-Ex}$ takes higher values for firms exposed to banks in non-GIIPS countries. We estimate the following equation:

$$F_{it}^{X} = \alpha_i + \beta_1 Share_i^{EBA-Ex} + \beta_2 Post_t + \beta_3 Share_i^{EBA-Ex} * Post_t + \beta_4 Controls_{it} + \varepsilon_{it} \tag{6.3}$$

We rerun all the regressions using the new measure of EBA dependency, which excludes the above-mentioned loans. We report the results in Table 7. We find that our main results hold, and we conclude that the contraction in bank credit, as well as the increase in non-bank loans, reflects how bank capital requirements affect the flow of credit rather than the impact of the European debt crisis.

6.3 Unrated firms

Next we confirm that our findings are not driven by differences in ratings between treated and control firms. This can be one potential concern, as the risk-weight of corporate loans depends on the borrower's rating.[18]

We recover Standard and Poor's and Moody's credit ratings in 2013Q11. Our sample includes firms of different rating categories, but the group of unrated firms is the only one large enough to run a subsample estimation. The number of cross-sectional units decreases substantially, and the sample includes only 475 firms.

The results, reported in Table 8, remain largely unchanged, as we find a decrease in borrowing for treated firms relative to the control group. This is underscored by the negative and statistically significant interaction term *Post*Treated* in column 3 of Panel A, which reflects a 22% decrease. We also find that treated firms increase their borrowing through non-bank credit lines relative to the control group. In column 3 of Panel B, the interaction term is positive and statistically significant, and it signals a strong increase of 42%. We conclude that our main findings hold when we use a sample of unrated firms.

6.4 Other tests

We carry out two additional tests. First, we run the models without the firm-level attributes (total assets and the tangible assets ratio), as their inclusion reduces the number of firms covered due to missing values. This test allows us to analyze the full set of cross-sectional units. Second, we estimate the models with time fixed effects to control for business cycle effects. The results for both tests, which are shown in the appendix for the sake of brevity, confirm our conclusions.

[18]Specifically, the risk-weights by rating are: AAA to AA-, 20%; A+ to A-, 50%; BBB+ to BB-, 100%; below BB-, 150%; and unrated firms, 100%.

7 Implications

7.1 Impact on firms' capital structure

Next, we explore if firms' capital structure changes as a result of bank deleveraging pressures, and non-bank financial intermediaries gain prominence relative to banks. To address this issue, we modify our dependent variables and construct ratios of debt liabilities to total assets. We winsorize them at 1% and 90%. [19]

We present the results in table 9. In Panel A we find that treated US firms reduce the proportion of bank credit lines to total assets. To ascertain the magnitude, we find that the introduction of the capital exercise led to a decline in bank loans relative to total debt by 12 percentage points. Further, in column 3 of Panel B we show that after the EBA capital exercise firms increase the credit lines from non-bank financial intermediaries as a proportion of their total debt. The effect is economically meaningful because after the policy, non-bank debt rises by 23 percentage points. Finally, in column 1 we do not find a significant changes in firms' bond financing relative to total debt.

Investment banks provide the majority of credit lines, and those investment banks have strong maturity mismatches between assets and liabilities.[20] We conclude that access to liquidity may be more uncertain, because intermediaries with shorter-term liabilities are more vulnerable (Cornett et al. (2011)) to simultaneous runs in short-term liabilities and credit line drawdowns (Ivashina and Scharfstein (2010)).

7.2 Financial intermediation in the US

Because European banks are important in the US corporate loan market, the EBA capital exercise had the potential to modify its structure and boost the share of non-bank financial intermediaries. Now we examine if the EBA capital exercise allowed non-bank financial

[19] We choose the 90th percentile because the ratios are bounded at zero and are highly non-normal.

[20] Few of the rest of lenders in the non-bank group, which includes private equity firms, insurance companies, pension funds, CLOs and Business Development Companies, extend them.

intermediaries to gain importance in the US corporate loan market, relative to EBA banks, exploring their evolution in the league table of syndicated loans to US corporations.[21]

League tables rank lead arrangers in loan markets according to the number or total amount of loans. Lower values (a higher position in the ranking) indicate that a lender is important in the US corporate loan market.

To test our hypothesis, we construct a panel of top 50 lead arrangers in the US corporate loan market, tracking them over four periods of time (from-to): 2009Q3-2010Q2,2010Q3-2011Q2,2011Q4-2012Q3,2012Q4-2013Q3. By defining this narrow window exactly around the EBA capital exercise, we isolate other contemporaneous changes in the demand for financing, as well as other supply factors. Next, we classify lenders into three groups: EBA banks, other banks, and non-bank lenders. Finally, we estimate the following equation:

$$Rank_{it} = \alpha_i + \beta_1 EBA_i * Post_t + \beta_2 non - bank_i * Post_t + \varepsilon_{it} \tag{7.1}$$

where $Rank_{it}$ is the ranking in the league table of lender i at time t. It ranges between 1 (most important lender) and 50. α_i denotes the lender fixed-effects. EBA_i equals 1 for banks subject to the EBA capital exercise, and 0 otherwise. $non - bank_i$ equals 1 for non-bank lenders, and 0 otherwise. $Post_t$ equals 1 for observations in the two periods after the EBA capital exercise, and 0 otherwise. ε_{it} is the disturbance term.

The results in Table 10 indicate that EBA banks lost importance in the US corporate loan market after the capital exercise, as the sign of the interaction term between $Post_t$ and EBA_i is positive in column 1 (which ranks lenders by number of loans) and in column 2 (which ranks them by the total amount). Non-bank lenders gain importance according to the total amount lent (column 2), as the sign of the interaction term is positive and statistically significant in column 2. In addition, they remain similar, in terms of the number of loans, which suggests that they engage in larger transactions.

[21] This is not covered in our previous analysis, as we only examined the funding structure of the sample of US corporates that had loans vis-á-vis EBA banks (and this sample represents only a fraction of the US corporate loan market).

Therefore, the evidence is consistent with a change in the structure of the U.S. corporate loan market due to the EBA capital exercise. When EBA banks retrench, non-bank lenders fill the void. However, we acknowledge that the rise (decline) of non-banks (EBA banks) could also be related to other contemporaneous changes in supply and demand.

8 Conclusion

Using a cross-country sample of bank-dependent public firms from several advanced economies, we study how firms' funding mix is affected when foreign banks are hit by a liquidity shock. In doing so we distinguish between the two major sources of bank loans: term loans, and credit lines. For identification we examine how firms' liabilities vis-à-vis banks, non-bank lenders, and bond markets evolve after the EBA increased capital requirements on a consolidated level in 2011.

We find that the EBA capital exercise triggered a change in US firms' composition of corporate debt, while European firms were left unaffected. The implication of this finding is that EU banks prioritized their domestic customers, which is not surprising given banks' "financial home bias." Yet, when we distinguish among different types of credit, we find that the constraints concerned only US firms' borrowing of credit lines. In contrast, access to term loans by US firms remained resilient. Finally, we show that US firms were able to smooth the shock by securing credit lines from US investment banks, and did not increase their borrowing from corporate bond markets.

Our results suggest that non-bank financial institutions smooth shocks in bank financing. The general lesson is that a diversified loan market may be key to achieving a robust structure for corporate financing.

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9 Figures

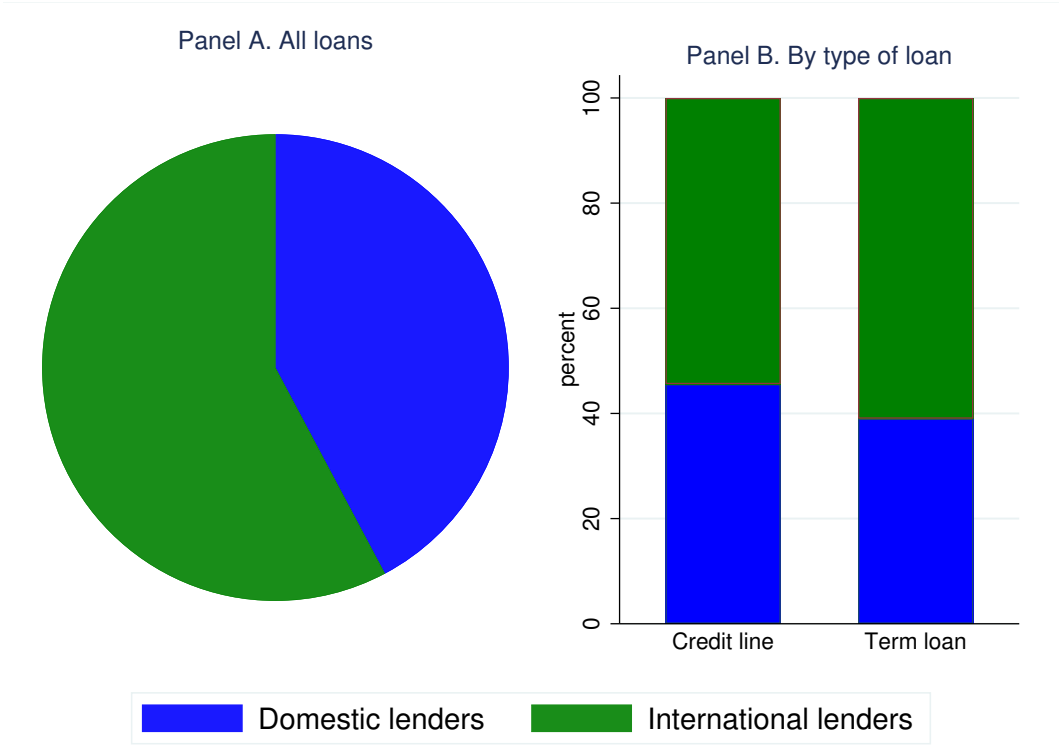

Figure 1: **Corporate borrowing and foreign lenders:** number of loans originated arranged by domestic and foreign lead arrangers (banks and non-banks), 1990-2018. Firms borrow from foreign lenders when their country of incorporation differs. Their location is defined using the headquarters of the ultimate parent.

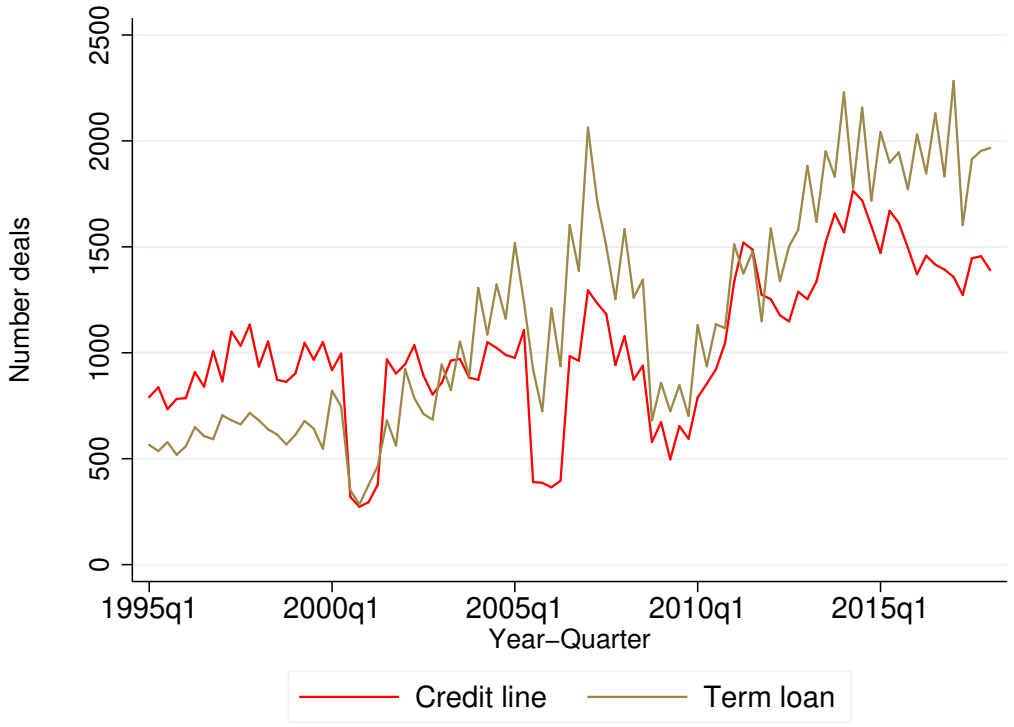

Figure 2: **Origination of credit lines and term loans.** number of loans originated per quarter, for term loans and credit lines.

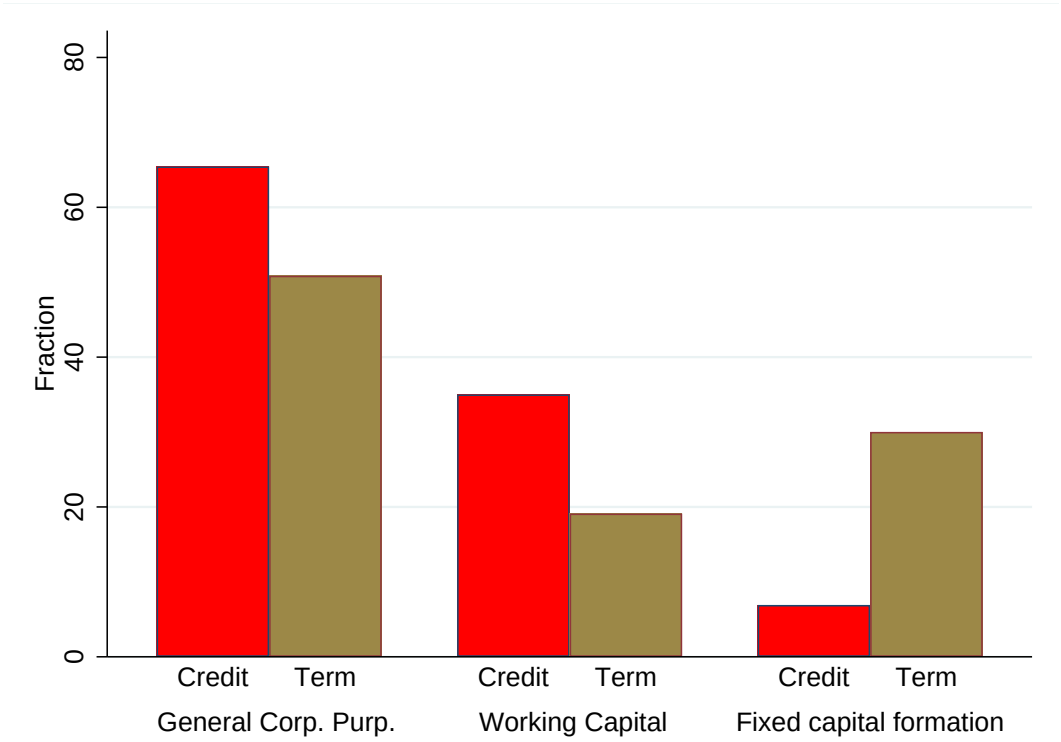

Figure 3: **Use of proceeds, by loan type.** This figure shows the use of proceeds of term loans and credit lines, grouped into three categories: general corporate purposes, working capital, and fixed capital formation. Loans secured for refinancing or to finance buyouts are not included.

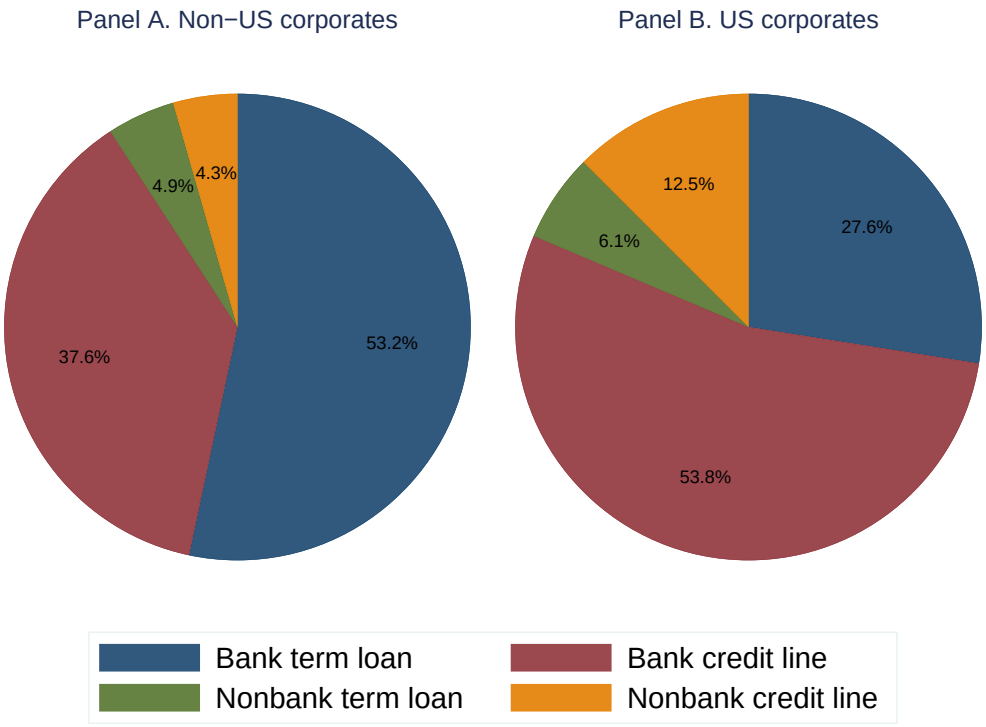

Figure 4: **Nonbanks and credit line originator.** Fraction of term loans and credit lines originated by banks and non-banks, Panel A shows loans to non-US corporates, and Panel B shows loans to US corporates.

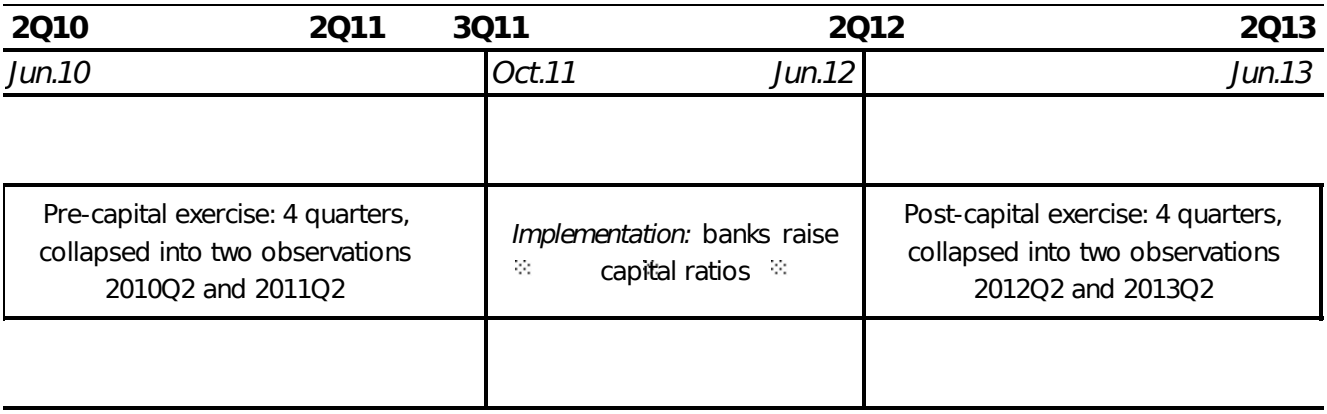

Figure 5: **Time line EBA capital exercise.** This figure shows the time line of the EBA capital exercise. The EBA announced in October 2011 that some EU banks should raise their capital ratios by June 2012. We define the pre-capital exercise period as the four quarters before the announcement. Since we use quarterly data, we date it in 2011Q3. The post-capital exercise period includes the four quarters after June 2012, that is, 2012Q2-2013Q2.

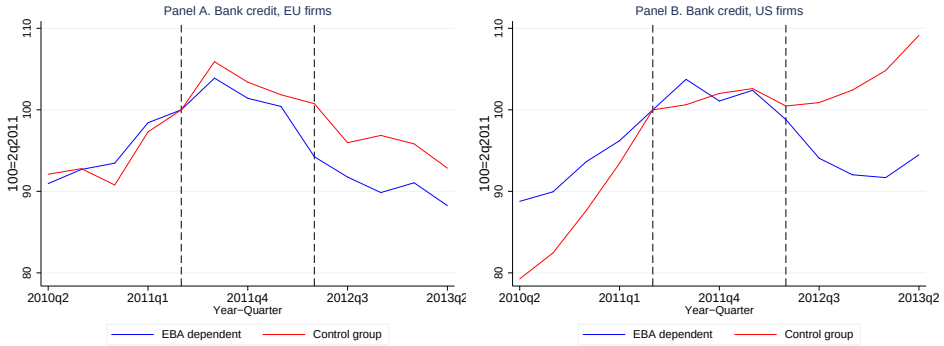

Figure 6: **Bank credit to EU and US firms.** This figure shows the stock of bank liabilities of firms dependent on EBA banks (more than half of the loans vis-á-vis them, blue line) and the control group (red line), four quarters before (2011Q2) and after (2012Q2) the EBA capital exercise. The panel on the left shows the time evolution for firms headquartered in the EU, whereas the bottom panel shows the evolution for US firms. The two dashed vertical lines in each panel mark 2011Q2 and 2012Q2, which are the quarters immediately before and after the capital exercise.

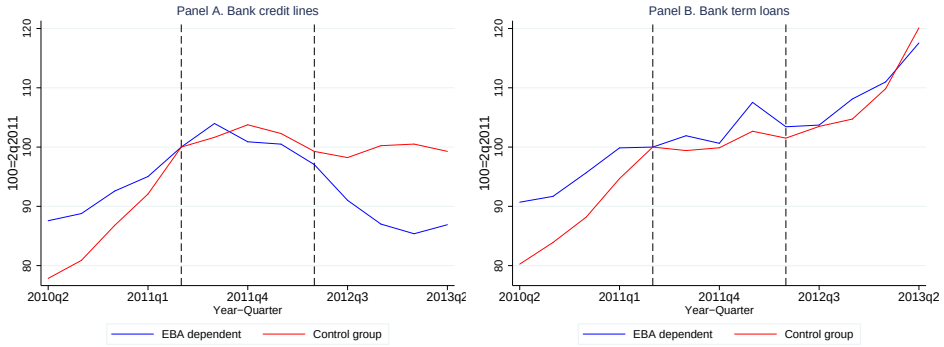

Figure 7: **Bank credit lines and term loans, US firms.** This figure shows the stock of bank credit lines (panel A) and term loans (B) for firms dependent on EBA banks (more than half of the loans vis-á-vis them, blue line) and the control group (red line), four quarters before (2011Q2) and after (2012Q2) the EBA capital exercise. The two dashed vertical lines in each panel mark 2011Q2 and 2012Q2, which are the quarters immediately before and after the capital exercise.

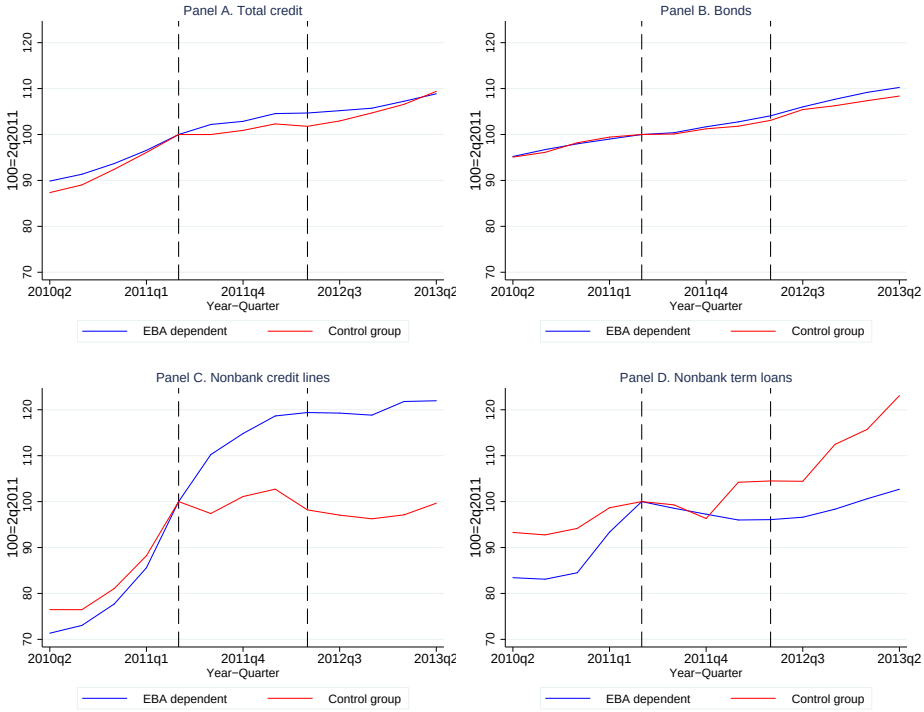

Figure 8: **Non-bank credit, US firms:** This figure shows the stock of total credit (panel A), which is the sum of bank and non-bank credit; and the three components of non-bank credit: bond markets (panel B), non-bank term loans (panel C), and non-bank credit lines (panel D). Each panel depicts firms dependent on EBA banks (more than half of the loans vis-á-vis them, blue line) and the control group (red line), four quarters before (2011Q2) and after (2012Q2) the EBA capital exercise. The two dashed vertical lines in each panel mark 2011Q2 and 2012Q2, which are the quarters immediately before and after the capital exercise.

10 Tables

Table 1: **Summary statistics.** Panel A reports summary statistics for the whole sample. Panel B reports statistics for firms dependent on EBA-affected banks. Panel C shows statistics for firms dependent on nonEBA-affected banks. At the foot of the table we report p-values for the tests of the median of the variables reported in panels B and C. Stars, ***, **, and *, indicate significance levels at 1%, 5%, and 10%, respectively

Panel A: Full sample

	Assets	Tangible assets	Leverage	Net worth	Current ratio	EBITDA y-o-y growth	Altman score
mean	10,555	35.1	30.3	38.3	1.8	37.0	1.6
p25	1,051	12.3	17.4	27.1	1.0	- 15.9	0.9
p50	2,880	28.8	28.3	39.0	1.4	9.4	1.5
p75	8,698	55.3	40.4	51.8	2.1	41.4	2.2

Panel B: Treated: EBA dependent

	Assets	Tangible assets	Leverage	Net worth	Current ratio	EBITDA y-o-y growth	Altman score
mean	11,309	35.4	29.2	39.1	1.8	36.5	1.6
p25	1,042	12.0	16.7	27.6	1.0	- 15.5	0.9
p50	2,939	28.2	27.2	39.6	1.4	9.7	1.5
p75	9,244	57.4	39.6	52.7	2.0	41.8	2.2

Panel C: Control group

	Assets	Tangible assets	Leverage	Net worth	Current ratio	EBITDA y-o-y growth	Altman score
mean	8,681	34.1	32.8	36.3	1.8	38.1	1.6
p25	1,063	13.2	19.8	25.1	1.1	- 16.5	1.0
p50	2,719	30.3	31.0	37.0	1.5	8.8	1.5
p75	7,386	51.4	41.8	50.0	2.1	41.1	2.2
p-value	0.08	0.15	1	0.00	0.14	0.33	0.48

Table 2: **International impact of a capital requirements tightening.** All specifications are estimated using the difference-in-differences estimator. The dependent variable is the stock of bank credit. Treated equals 1 if half the firm's bank loans are from banks subject to EBA requirements, and 0 otherwise. Post equals 1 for observations in the post-EBA period. All regressions include firm, country and sector fixed effects. The figures in parentheses are robust t-statistics. The standard errors are clustered at the firm level. Statistical significance is denoted at 1% (***), 5% (**), and 10% (*).

	(1) ALL	(2) EU	(3) US
Total assets (log)	0.19	−0.58	0.25
	(0.27)	(−0.71)	(0.51)
Tangible assets	0.05	−0.03	0.05
	(0.51)	(−0.33)	(0.58)
Post	0.14**	−0.03	0.19***
	(2.40)	(−0.38)	(2.79)
Post*Treated	−0.08	−0.05	−0.18**
	(−1.24)	(−0.45)	(−2.42)
Observations	6583	2549	3359
Number of clusters	1773	686	907
R-squared	0.860	0.889	0.896

Table 3: **Channels of international adjustment. Term loans and credit lines.** All specifications are estimated using the difference-in-differences estimator. The dependent variables are stock of bank credit (column 1), bank term loans (column 2) and bank credit lines (column 3). Treated equals 1 if half the firm's bank loans are from banks subject to EBA requirements, and 0 otherwise. Post equals 1 for observations in the post-EBA period. All regressions include firm, country and sector fixed effects. The figures in parentheses are robust t-statistics. The standard errors are clustered at the firm level. Statistical significance is denoted at 1% (***), 5% (**), and 10% (*).

	(1) Bank-Loans	(2) Bank-Term	(3) Bank-Lines
Total assets (log)	0.25	−0.24	0.57
	(0.51)	(−0.47)	(0.66)
Tangible assets	0.05	−0.05	0.12
	(0.58)	(−0.61)	(0.99)
Post	0.19***	0.33***	0.10
	(2.79)	(2.72)	(1.49)
Post*Treated	−0.18**	−0.20	−0.18**
	(−2.42)	(−1.51)	(−1.98)
Observations	3359	3359	3359
Number of clusters	907	907	907
R-squared	0.896	0.908	0.848

Table 4: **Non-bank credit.** All specifications are estimated using the difference-in-differences estimator. The dependent variables are stock of bank credit (column 1), bonds (column 2) non-bank term loans (column 3) and non-bank credit lines. Treated equals 1 if half the firm's bank loans are from banks subject to EBA requirements, and 0 otherwise. Post equals 1 for observations in the post-EBA period. All regressions include firm, country and sector fixed effects. The figures in parentheses are robust t-statistics. The standard errors are clustered at the firm level. Statistical significance is denoted at 1% (***), 5% (**) and 10% (*).

	(1) Credit	(2) Bond	(3) Non-bank Term	(4) Non-bank Lines
Total assets (log)	0.77***	2.42**	−0.76	3.01
	(3.10)	(2.06)	(−1.00)	(1.56)
Tangible assets	0.08	−0.01	0.21	0.10
	(1.09)	(−0.14)	(0.83)	(0.45)
Post	0.18***	0.04	0.46*	0.05
	(3.36)	(1.01)	(1.72)	(0.48)
Post*Treated	−0.02	0.08**	−0.26	0.64***
	(−0.31)	(2.49)	(−0.93)	(3.57)
Observations	3359	3359	3359	3359
Number of clusters	907	907	907	907
R-squared	0.951	0.977	0.902	0.833

Table 5: **Intensive and extensive borrowing margin.** All specifications are estimated using the difference-in-differences estimator. The dependent variables are bonds (column 1), bonds (column 2) non-bank term loans (column 3) and non-bank credit lines. Post equals 1 for observations in the post-EBA period. All regressions include firm, country and sector fixed effects. The figures in parentheses are robust t-statistics. The standard errors are clustered at the firm level. Statistical significance is denoted at 1% (***), 5% (**) and 10% (*).

Panel A. Recurrent borrowers, intensive margin: The sample of firms includes only those with outstanding bonds (column 1) and non-bank loans (columns 2 and 3) as of 2011Q2.

	(1) Bond	(2) Non-bank Term	(3) Non-bank Lines
Total assets (log)	2.82**	−0.80	2.95
	(2.10)	(−1.03)	(1.49)
Tangible assets	0.02	0.38	0.14
	(0.19)	(0.88)	(0.37)
Post	0.04	0.62*	0.10
	(0.89)	(1.70)	(0.72)
Post*Treated	0.10**	−0.39	0.80***
	(2.54)	(−1.02)	(3.45)
Observations	2506	2559	2559
Number of clusters	662	679	679
R-squared	0.977	0.901	0.828

Panel B. Inexperienced borrowers, extensive margin: The sample of firms includes only those without outstanding bonds (column 1) and non-bank loans (columns 2 and 3) as of 2011Q2.

	(1) Bond	(2) Non-bank Term	(3) Non-bank Lines
Total assets (log)	0.03	0.01	0.04
	(0.74)	(0.05)	(0.16)
Tangible assets	−0.00	0.03	0.03
	(−0.01)	(0.72)	(1.19)
Post	0.02*	0.03	−0.03
	(1.78)	(0.98)	(−1.27)
Post*Treated	−0.01	0.04	0.03
	(−0.59)	(0.71)	(1.05)
Observations	853	800	800
Number of clusters	245	228	228
R-squared	0.142	0.109	0.358

Table 6: **Alternative measure of EBA-bank dependency.** All specifications are estimated using the difference-in-differences estimator. In panel A the dependent variable is bank credit. In panel B the dependent variables are bond (column 1), non-bank term loan (column 2) and non-bank credit lines (column 3). EBAshare is the share of loans from both EBA- and non-EBA-affected banks prior to the capital exercise over the total borrowing in the same time period. Post equals 1 for observations in the post-EBA period. All regressions include firm, country and sector fixed effects. The figures in parentheses are robust t-statistics. The standard errors are clustered at the firm level. Statistical significance is denoted at 1% (***), 5% (**), and 10% (*).

Panel A. International impact of bank deleveraging

	(1) ALL	(2) EU	(3) US
Total assets (log)	0.14	−0.59	0.23
	(0.20)	(−0.72)	(0.48)
Tangible assets	0.04	−0.03	0.04
	(0.39)	(−0.39)	(0.50)
Post	0.14*	−0.09	0.19***
	(1.86)	(−0.81)	(2.63)
Post=1 × EBAShare	−0.12	0.02	−0.21**
	(−1.48)	(0.13)	(−2.40)
Observations	6310	2480	3235
Number of clusters	1702	668	875
R-squared	0.863	0.889	0.896

Panel B. Non-bank credit to US firms

	(1) Bond	(2) Non-bank Term	(3) Non-bank Lines
Total assets (log)	2.42**	−0.77	3.05
	(2.06)	(−0.99)	(1.57)
Tangible assets	−0.01	0.24	0.09
	(−0.18)	(0.89)	(0.39)
Post	0.05	0.45**	0.16
	(0.93)	(2.01)	(1.24)
Post=1×EBAShare	0.06	−0.27	0.50**
	(1.46)	(−1.14)	(2.36)
Observations	3235	3235	3235
Number of clusters	875	875	875
R-squared	0.977	0.902	0.832

Table 7: **Timing the European debt crisis.** All specifications are estimated using the difference-in-differences estimator. In panel A the dependent variable is bank credit. In panel B the dependent variables are bond (column 1), non-bank term loan (column 2) and non-bank credit lines (column 3). Post equals 1 for observations in the post-EBA period. All regressions include firm, country and sector fixed effects. The figures in parentheses are robust t-statistics. The standard errors are clustered at the firm level. Statistical significance is denoted at 1% (***), 5% (**), and 10% (*).

Panel A. International impact of bank deleveraging

	(1) ALL	(2) EU	(3) US
Total assets (log)	0.19	−0.58	0.23
	(0.27)	(−0.71)	(0.49)
Tangible assets	0.05	−0.03	0.05
	(0.49)	(−0.34)	(0.64)
Post	0.12**	−0.01	0.15***
	(2.33)	(−0.13)	(2.81)
Post*Treated	−0.06	−0.07	−0.14**
	(−0.99)	(−0.65)	(−2.04)
Observations	6583	2549	3359
Number of clusters	1773	686	907
R-squared	0.860	0.889	0.895

Panel B. Non-bank credit to US firms

	(1) Bond	(2) Non-bank Term	(3) Non-bank Lines
Total assets (log)	2.42**	−0.78	2.99
	(2.06)	(−1.02)	(1.56)
Tangible assets	−0.01	0.22	0.10
	(−0.14)	(0.87)	(0.44)
Post	0.04	0.35*	0.14
	(1.03)	(1.87)	(1.37)
Post*Treated	0.08**	−0.13	0.64***
	(2.16)	(−0.59)	(3.19)
Observations	3359	3359	3359
Number of clusters	907	907	907
R-squared	0.977	0.901	0.833

Table 8: **Unrated borrowers.** All specifications are estimated using the difference-in-differences estimator. In panel A the dependent variables are bank credit (column 1), bank term loans (column 2) and bank credit lines (column 3). In panel B the dependent variables are bond (column 1), non-bank term loan (column 2) and non-bank credit lines (column 3). Post equals 1 for observations in the post-EBA period. All regressions include firm, country and sector fixed effects. The figures in parentheses are robust t-statistics. The standard errors are clustered at the firm level. Statistical significance is denoted at 1% (***), 5% (**), and 10% (*).

Panel A. International impact of bank deleveraging

	(1) Bank-Loans	(2) Bank-Term	(3) Bank-Lines
Total assets (log)	0.14	0.55	−0.14
	(0.18)	(1.41)	(−0.11)
Tangible assets	0.06	−0.11	0.19
	(0.66)	(−1.19)	(1.29)
Post	0.16**	0.07	0.23**
	(2.06)	(0.76)	(2.24)
Post*Treated	−0.13	−0.01	−0.22*
	(−1.47)	(−0.05)	(−1.79)
Observations	1765	1765	1765
Number of clusters	475	475	475
R-squared	0.884	0.904	0.857

Panel B. Non-bank credit to US firms

	(1) Bond	(2) Non-bank Term	(3) Non-bank Lines
Total assets (log)	1.09*	1.03	5.27
	(1.90)	(1.12)	(1.42)
Tangible assets	0.03	0.03	0.07
	(0.61)	(0.13)	(0.26)
Post	0.07**	0.01	0.03
	(2.27)	(0.03)	(0.15)
Post*Treated	0.03	0.04	0.42*
	(0.66)	(0.12)	(1.81)
Observations	1765	1765	1765
Number of clusters	475	475	475
R-squared	0.988	0.954	0.780

Table 9: **Firms' capital structure.** All specifications are estimated using the difference-in-differences estimator. In panel A the dependent variables are bank credit to total assets (column 1), bank term loans to total assets (column 2) and bank credit lines to total assets (column 3). In panel B the dependent variables are bonds to total assets (column 1), non-bank term loans to total assets (column 2) and non-bank credit lines to total assets (column 3). Post equals 1 for observations in the post-EBA period. All regressions include firm, country and sector fixed effects. The figures in parentheses are robust t-statistics. The standard errors are clustered at the firm level. Statistical significance is denoted at 1% (***), 5% (**), and 10% (*).

Panel A. Non-bank credit to US firms

	(1) Bank-Loans	(2) Bank-Term	(3) Bank-Lines
Total assets (log)	−0.12**	−0.12	−0.13*
	(−2.03)	(−1.55)	(−1.72)
Tangible assets	0.08	−0.07	0.16*
	(0.60)	(−0.43)	(1.69)
Post	0.01	0.02	0.00
	(0.19)	(0.32)	(0.08)
Post*Treated	−0.09	−0.06	−0.12*
	(−1.53)	(−0.65)	(−1.92)
Observations	3359	3359	3359
Number of clusters	907	907	907
R-squared	0.770	0.797	0.755

Panel B. Non-bank credit to US firms

	(1) Bond	(2) Non-bank Term	(3) Non-bank Lines
Total assets (log)	−0.34***	−0.15	−0.06
	(−3.49)	(−1.12)	(−0.31)
Tangible assets	0.04	−0.01	0.13
	(0.44)	(−0.02)	(0.94)
Post	0.08**	0.02	−0.17*
	(2.24)	(0.12)	(−1.68)
Post*Treated	0.00	0.00	0.23*
	(0.09)	(0.00)	(1.87)
Observations	3359	3359	3359
Number of clusters	907	907	907
R-squared	0.932	0.780	0.718

Table 10: **League table of lead arrangers in the US corporate loan market.** The dependent variable is the ranking in the league table of lender i at time t. The ranking ranges between 1 (most important lender) to 50 (least important). A negative sign signals that the importance in the ranking has increased. All specifications are estimated using the difference-in-differences estimator. EBA bank equals 1 if the bank was subject to the EBA requirements, and 0 otherwise. Non-bank equals 1 if the lender is a non-bank. Post equals 1 for observations in the post-EBA period. In column 1 the dependent variable is a ranking based on the number of loans. In column 2 the ranking is constructed using the total amount arranged by the lender. All regressions include firm, country and sector fixed effects. The figures in parentheses are robust t-statistics. Statistical significance is denoted at 1% (***), 5% (**), and 10% (*).

	(1) Count	(2) Amount
Post*EBA bank	2.28*	2.52**
	(1.89)	(2.38)
Post*Non-bank	0.74	−1.86*
	(0.64)	(−1.92)
Observations	197	197
Number of clusters	58	58
R-squared	0.000	0.000