

Item #9

SEMINAR IN LAW & ECONOMICS

Professors Louis Kaplow and Steven Shavell

Tuesday, April 2, 2019

Hauser Hall 102, 5-6:30 PM

LAW, LIQUIDITY & LENDING

Guilherme de Oliveira

*Katharina Pistor**

Presenting

Law, Liquidity & Lending

The Experience of Eurozone Banks 2002-2010*

Guilherme de Oliveira[†] and Katharina Pistor[‡]

2 April 2019

DRAFT PAPER – PLEASE DO NOT QUOTE OR CIRCULATE WITHOUT PERMISSION OF THE
AUTHORS

This paper seeks to understand the impact of law on liquidity and lending. Building on the Legal Theory of Finance (LTF), one of us has developed in separate work (Pistor, 2013), we argue that both law and power are endogenous to finance. LTF suggests that institutions of private law, including contracts and collateral law, are key for organizing financial relations in good time. In times of crisis, however, the private commitments made earlier, can bring the financial system to the abyss. Power can rescue the system from its tendency to self-destroy by relaxing the full force of the law *ex post*. We apply this framework to examine the development of lending markets after the introduction of the Euro in twelve member-states of the European Union *prior to* the onset of the global financial crisis in 2007. The Euro replaced domestic currencies in the member states that joined the Eurozone. Critically, it also introduced a new monetary regime, which expanded access to central bank liquidity for banks in most Eurozone member states as compared to their previous domestic monetary regime. We investigate the impact this regime change had on lending behavior in the syndicated loan market. We find that, by and large, it does not. National backstopping prowess, not changes in the monetary regime, explains lending patterns in the Eurozone even in boom times. Far from mitigating structural differences, the ECB's monetary policy seems to have deepened them long before the onset of the global financial crisis and the subsequent European debt crisis, which almost tore the monetary union apart.

* Financial support by the Institute for New Economic Thinking (INET) is gratefully acknowledged.

[†] Former post-doctoral scholar, Columbia Law School, Center on Global Legal Transformation.

[‡] Edwin B. Parker Professor of Comparative Law, Columbia Law School and Director, Center on Global Legal Transformation.

I. Introduction

The introduction of the Euro has been a huge experiment in monetary and financial regime change. In 1999, eleven sovereign countries relinquished their domestic currencies and accepted the Euro as well as monetary governance by a new institution, the European Central Bank (ECB). Four additional countries have joined since.⁴ Many economists warned at the time that conditions for a monetary union were not ripe and that imposing a single currency on countries with very different economic and financial conditions was a highly risky undertaking (Feldstein, 1997; Spolaore, 2013). In a bold political move with an uncertain balance of economic benefits and cost (Feldstein, 1997), monetary union proceeded nonetheless. As many observers have suggested, monetary union at the time was the prize for German re-unification, with the expectation that it would lead to political union over time (Spolaore, 2013). With the benefit of hindsight, the political costs appear as the greatest costs of the premature monetary union and a full political union remains as elusive as ever. While the Euro has survived its first major crisis, its ultimate success and failure depends on whether it has contributed at least to monetary and financial integration. The results of our analysis in this paper suggest that it has not.

This paper examines the impact of the introduction of the Euro on lending behavior by banks in the Eurozone. In an ideal world, we would have examined the lending relations of all banks. Unfortunately, data for such an analysis are not available, or at least not outside the ECB's own research department.⁵ As a second best, we use data from syndicated loan markets. Happily, syndicated loans are the most important source of funding for non-financial firms (Cai et al., 2017; Lin et al., 2012) and their importance has increased substantially since the 1980s (Burietz et al, 2017; Gadanecz, 2004; Popov and Van Horen, 2013). The exposure of banks to syndicated loans is estimated to represent up to 18% of total loans outstanding in the period

⁴ The 11 countries that joined at the outset were: Austria, Belgium, Finland, France, Germany, Ireland, Italy, Luxembourg, Netherlands, Portugal and Spain. Greece joined in 2001, just one year before the cash changeover, followed by Slovenia in 2007, Cyprus and Malta in 2008, Slovakia in 2009, Estonia in 2011, Latvia in 2014 and Lithuania in 2015. See https://ec.europa.eu/info/business-economy-euro/euro-area/what-euro-area_en for details.

⁵ Access to this data set is available only by co-authoring with insider of this department.

from 2000 to 2010 globally (Brei and Gadanez, 2012), and up to 20% of corporate debt issuance in Europe (Burietz et al, 2017).⁶ Loan syndication has also become quite common in lending to emerging markets, and to public and private entities alike as syndication allows for greater risk diversification. For the purpose of this study, we limit our analysis to banks that are headquartered (as a parent or a subsidiary) in one of the member states of the Eurozone, but we include their participation in loan syndicates anywhere in the world.

The first years after introducing the new currency seemed to prove wrong the Euro's naysayers. Credit expanded throughout the Eurozone and the costs of lending converged. More banks from more countries expanded their lending operations and joined loan syndicates; the number of connections (links) among banks increased and loan syndicates seemed to be willing to take on greater risk by extending loans. What is less clear is, whether these changes went beyond superficial change and contributed to the structural convergence of financial markets in the member states, which most commentators of monetary integration had deemed critical for the Euro's success. Our data suggest that this did not happen. To the contrary, the banks that should have benefited most from the new monetary regime in the form of greater access to central-bank liquidity, did not make much headway between 2002 and 2007 in comparison to banks from G10 countries that entered the Eurozone as dominant players in lending markets.

II. Monetary Regime Change and Financial Market Development

The introduction of the Euro offers a unique window into the effects of law on lending, because it imposed a new regulatory regime in many different countries with a legacy of different financial systems and monetary regimes. While major efforts had been made to align monetary policy and to foster the convergence of financial systems in the prospective members states prior to 1999, actual convergence remained incomplete by the time the currency was introduced as a book currency in 1999 and completed with the introduction of coins and paper money in 2002. The new monetary regime also allows us to take a closer look at the interaction

⁶ Burietz et al. quote data Thompson Reuters for the period from 1992 to 2013. Their data show the market in the US and Europe (not, however, in Asia) quadrupled between 1992 and 2007 (when it peaked), with total loans outstanding in 2007 amounting to about US 1.7 trillion each in Europe and the US.

liquidity management in good times and backstopping financial intermediaries or assets in bad times. During the global financial crisis, most major central banks acted not only as “lender”, but also as “dealers” of last resort in the financial crisis, raising doubts as to whether the line drawing between liquidity management and rescue operations is as clear as often asserted. In the Eurozone, these two functions remained in separate hands until the introduction of the European Banking Union in 2018, that is after the global financial crisis. The ECB’s powers were, for the most part, confined to liquidity management, with backstopping powers remaining in the hands of domestic institutions.

The ECB was established as the guardian of the new currency with a single mandate, namely price stability.⁷ During the period under investigation, the ECB had no supervisory powers over the banks located within the Eurozone. These regulatory and supervisory functions were left firmly in the hands of the member states, although the European Union (EU) had made great efforts to standardize financial regulation.⁸ Only after the global financial crisis was a Banking Union created, which placed all banks headquartered in the Eurozone (only) with more than Euro 30 billion in assets under ECB supervision.⁹ Neither did the ECB have explicit powers to rescue banks, even in times of crisis. Liquidity support for domestic banks remained in the hands of sovereign governments within a framework that closely resembles the Basel Concordat. This structural separation of liquidity management as part of ordinary monetary policy and crisis-related liquidity boosts and bailouts on the other, opens a unique window to analyze the *ex ante* effect of central-bank liquidity and bailouts on lending.

The special status of the ECB, however, does not stop here. Unlike most other central banks, the ECB does not have a safe sovereign debt instrument, such as the US Treasury bill, at its disposal for conducting ordinary monetary policy. As is well known and as has become painfully obvious during the European debt crisis, the Eurozone does not have Eurobonds. indeed the Maastricht Treaty explicitly prohibited the ECB from acquiring sovereign debt of any

⁷ For a critique of this single mandata regime, see Tooze (2019), *supra*.

⁸ These efforts go back to the late 1990s and include, among others, the Capital Requirements Directive (Directive 2000/12/EC of 2000; recast in 2006, revised in 2009 and 2010); the Directive on Financial Markets and Instruments (Directive 2004/39/EC; MiFiD; revised as MIFID-II/MIFIR in 2018).

⁹ Art. 6 Council Regulation 1024/2013 of 15 October 2013 on the Prudential Supervision of Credit Institutions.

of Euro member states in *primary* markets.¹⁰ Fearing that it might otherwise monetize the fiscal deficit of member states, the ECB was only allowed to trade in secondary markets in member state sovereign debt. The ECB was therefore forced to identify another financial instrument it could use to effectively transmit monetary policy throughout the Eurozone despite its structural differences (Galvenius and Mercier, 2011). The ECB did not settle on a single instrument, but instead used a broad range of private and public assets the ECB anointed as central-bank eligible assets that can be used as collateral in lending operations, subject only to a differentiated haircut regime (Cheun et al., 2009). At the outset of the monetary union, the ECB stipulated only very general *collateral guidelines* to the national central banks (NCBs), which are in charge of implementing ECB guidelines and policies within in their respective jurisdictions. The ECB adopted a more comprehensive set of collateral guidelines only in 2004, and further refined and tightened them in the period from 2005 to 2007 (Eberl und Weber, 2014). Over time, the marketability of assets became a critical condition for an asset's central-bank eligibility and other assets were gradually phased out.

III. Literature Review

This paper builds on and extends earlier work by one of us (Pistor) with Rainer Haselmann and Vikrant Vig on “How law affects lending” (Haselmann et al., 2009). The relevant channel through which law affects lending we identified in that paper was creditor protection for *individual* borrowers in the form of collateral especially for movable assets or personal property. In contrast, bankruptcy law, which provides a collective resolution regime to avoid a run on assets when a debtor is in distress or defaults, had little impact on lending behavior.

The present paper also investigates the role of law on lending, but rather than focusing on legal rules that directly shape the relation between borrowers and lenders, we focus on how a shift in the monetary regime, which alters access to central bank liquidity in good times might affect lending behavior by banks with very different histories of monetary policy, financial

¹⁰ Art 123 of the Treaty on the Functioning of the European Union (which incorporates the provisions of the Maastricht Treaty). For an interpretation of this provision, see the decision by the Court of Justice of the European Union (CJEU) in Case C-62/14 of 16 June 2015, available at <http://curia.europa.eu/juris>.

market structure, and government backstopping power. In doing so, the paper joins an ongoing debate about the political economy of liquidity.¹¹ Following Minsky (1986) and Mehrling (2011), we define liquidity as the ability to shift, realize or sell assets without suffering substantial loss. It is the ability to sell an asset on demand, whether for another private asset or for cash, that is, legal tender.

As Minsky noted, anybody can issue a debt instrument (IOU), but not all will find takers (Minsky, 1986). In normal times, a perhaps surprisingly large number of issuers do so, and success begets success. As access to credit expands, more lenders take greater risks, and in this fashion, a credit-based financial system tends to drift endogenously from “hedge” to “speculative” and ultimately to “Ponzi” (Minsky, 1986). These different stages reflect the probability that an outstanding debt will have to be refinanced upon maturity: it is low when creditors lend conservatively, higher when some take on greater risk, and becomes the new normal when everybody relies on the ability to easily refinance. In this late stage of financial fragility, the system can easily succumb to bad news about increasing default rates, and certainly to a major event, such as a bank failure. Indeed, the bankruptcy of Lehman Brother results in a sudden stop on access to refinancing to virtually everybody (Claessens et al, 2010). Liquidity drained from the system and a flight to safety set in, with holders of private debt looking for safety in other private parties with bigger balance sheets, and when this proved illusory, to the US Fed as the lender and dealer of last resort (Mehrling 2011).

In fact, a growing stream of papers discusses the vital role of the central banks’ collateral frameworks for financial markets (Bindseil et al., 2017; Jobst and Ugolini, 2014; Nyborg, 2016; Pozsar, 2014). Cheun et al. (2009) suggest that the choice of the collateral framework for the Euro era was not market neutral, because every country had different collateral regimes in place prior to joining the Eurozone. They do, however, argue, that the ECB’s collateral policy advanced the project of monetary integration by improving access to liquidity for all. Further, they offer strong evidence that European banks have pledged riskier

¹¹ See only Perry Mehrling’s recent blog, “It is all about Liquidity”, available at <http://www.perrymehrling.com/2019/03/liquidity-changes-everything/> and Adam Tooze “What are Central Banks for?” *Social Europe*, 18 March 2019.

collateral since the introduction of the Euro, presumably because the ECB's expansive collateral guidelines offered many banks direct access to central bank liquidity for the first time.

Indeed, there is evidence that the ECB's collateral policy induced banks to access central bank liquidity with private assets, thus freeing up sovereign debt as collateral in private lending activities. Available data suggest that from 2002 to 2006, government bonds fell from 47% to 21% of all the collateral that was pledged in ECB liquidity operations. Meanwhile, asset-backed securities (ABSs) increased from 6% in 2004 to 28% in 2008. Thus, the ECB's collateral framework seems to have enhanced overall access to liquidity, including for less financially-sound banks. Liquidity was further expanded during the crisis, when the ECB lowered its own thresholds for central bank eligible assets to provide additional liquidity to the market (Eberl and Weber, 2014). Existing studies suggest that these interventions helped banks (Drechsler et al., 2016) and economies (Eichler and Hielscher, 2012) with greater risk exposure.

Our paper also speaks to literatures about changes in lending behavior in times of crisis. Nirei et al (2016), for example, conclude that the contraction of syndicated loans during a crisis occurs typically on the extensive margin rather than on the intensive margin, while Popov and Van Horen (2013) find, in the context of the US subprime mortgage crisis, a bias on the part of participating banks to take flight to their home jurisdiction by cutting back on cross-border lending. Another interesting finding by Hale and Obstfeld (2016) along the same lines is that between 2002 and 2007 lending by *non-Eurozone* banks to borrowers in the Eurozone crisis countries (such as Greece, Ireland, Iceland, Portugal and Spain, or GIIPS) contracted. According to them, banks from core countries of the Eurozone stepped into the void they left. Indeed, Hale and Obstfeld (2016) speculate about banks fearing that the inclusion of a non-Eurozone bank in loan syndicates may have decreased the likelihood of a future government bailout.

The rest of the paper is structured as follows. Section IV summarizes our analytical framework and develops a set of hypotheses for testing the impact the ECB's collateral framework may have had on lending behavior in the syndicated loan market. In the sections that follow, we summarize the core features of the syndicated loan market (V) describe the data we have used (VI) and present our core findings (VII).

IV. The Legal Theory of Finance

Our analysis of the ECB collateral regime is motivated by the legal theory of finance (LTF). LTF is an inductive theory about financial markets that was developed on the basis of detailed cases studies of global and domestic debt markets in the decades that preceded the financial crisis (Pistor, 2013a and b). At the heart of the LTF are five interwoven propositions.

- First, financial markets do not exist independently of the contracts, private rules, and public laws which create and support them. Put differently: contrary to the assumptions embedded within conventional law and finance scholarship, the law is *endogenous* to finance.
- Second, these legal constructions invariably emanate from both public and private sources: making financial markets *hybrid* systems.
- Third, the extent to which market participants will be required to strictly adhere to these legal constructions is a function of their position relative to the apex of the system. The financial system is thus inherently *hierarchical*.
- Fourth, while law is indispensable for the scaling of financial markets, it can potentially be a significant source of financial *instability*. If all contracts will be enforced relentlessly when circumstances have changed, the financial system will suffer an *endogenous* meltdown.
- Fifth, this outcome can be avoided only by an ex post intervention that relaxes or even suspends the existing commitments and/or legal rules. Law is inherently incomplete (Pistor and Xu, 2003); but it can also be made elastic.

Many students of finance agree that law is an important ingredient for financial markets, including equity and debt markets. In particular, a voluminous empirical literature on “law and finance” has shown that better protection of investor right, including shareholder and creditor rights, is associated with more developed financial markets (La Porta et al., 1998; 2008). This literature, however, overlooks several critical dimensions of law’s role *in* finance (Pistor 2013b). First, financial assets and intermediaries are made of law, of contract, property,

collateral, trust, and corporate law, that is, institutions of private law, which are malleable. They can be used to fashion new assets and intermediaries as well as to arbitrage around public law constraints (Pistor, 2019). Second, the desire to make financial assets scalable means that assets must be cloaked in legal devices that make them more credible. The tighter the legal commitments the greater the scalability, but also, the likelier that legal commitments will destabilize the financial systems if and when actual circumstances deviate from the assumptions under which these commitments were made. Third, law governs more than just relations among private parties to financial contracts; it also governs the relation between private parties and public power. Law establishes the conditions for accessing central bank liquidity in good times, and determines the boundaries of central-bank emergency power in times of crisis. In contrast, bank bail outs by other means, such as by ad hoc legislation, is less constrained.

With the help of LTF, we can identify critical junctures in the financial system: the sources of and the conditions for accessing liquidity; the proximity of actors to the apex of the financial system; and the point where law meets raw power in finance. A critical source of liquidity is private contracts: the contractual provisions that determine the payment schedule, due date, margin and collateral calls. How much creditors are willing to lend and on what condition in turn is determined by monetary policy. Central banks control the expansion and contraction of liquidity and thereby purposefully affect private credit markets (Bindseil et al., 2017; Jobst and Ugolini, 2014; Nyborg, 2016; Pozsar, 2014). This is the case, whether or not they use private or public debt instruments to convey monetary policy goals. The use of private assets, however, may have greater effects and effects, which may be difficult to predict at the outset. The reason is that private actors, not the Treasury or the central bank determine the supply of these assets; they can therefore manufacture a central bank “put”. Further, extending access to the central bank beyond an anointed group of primary dealers implies that many more intermediaries gain access to central bank liquidity. The expansion of central bank

liquidity should have a strong and positive affect on lending behavior; and the greater the effects of the regime change for a given bank, the greater the impact on its lending behavior.¹²

LTF portrays finance as a single-peak, hierarchical system. However, as will be further discussed below, the Euro-system was structured as a relatively flat system with a twin-peak with crisis management and the power over the elasticity of law split between the ECB and domestic authorities. It follows that from the perspective of individual banks it was difficult to predict, where they might find salvation in times of crisis. A central question for this research project therefore was, whether the ECB liquidity regime or home country with potent bail-out capacity would have a greater impact on lending behavior.

V. Syndicated Loans

A syndicated loan is a loan extended by two or more creditors to a borrower, whereby the various creditors assume specific rights and obligations vis-à-vis one another. Typically, the syndicate of creditors is put together by a lead manager or ‘arranger’ (Burietz et al., 2017; Gadanez, 2004; Lin et al., 2012; Nirei et al., 2016). The arranger may underwrite a loan in full or in part and seek contributions for the remainder from others. Whereas in the past the lead manager often made a substantial financial commitment himself, modern financing techniques, including securitization, mean that in many syndicated loans at most few creditors will hold a significant chunk of the loan.

The relation between the arranger and other participants varies considerably; syndicated loans are contractual by nature and therefore highly malleable. In plain-vanilla syndicated structure, a borrower will appoint the arranger – often, but not necessarily after receiving several banks submits bids in a competitive process. Once the arranger gets its mandate from the borrower, it will negotiate with it the basic conditions of the loan, including amount, maturity, and purpose (Gadanez, 2004). This negotiation will also determine whether

¹² For a similar intuition using data from the outbreak of a disease that devastated French vineyards in the 19th century, see Vincent Bignon and Clemens Jobst. 2017. "The real economic benefits of easy central bank access: Evidence from the Great French Wine Blight." *VOX, CEPR Policy Portal*, 30 April 2017.

the loan will be extended as a term or a revolver loan, that is, as a one shot deal or as a revolving longer term lending arrangement. The arranger may also discuss with the borrower other potential participants in the syndicate. In the alternative, the arranger gets to sell or assign the loan to others as he sees fit. This can take several forms, by assigning the loan in whole or in parts to other creditors with the borrower's explicit approval, by 'novation', that is by a new contract between the original borrower and the new creditor; or by equitable assignments, which does not require approval by the borrower. Depending on these choices, the other participants may become either direct creditors to the borrower, sub-contractors to the arranger who maintains the only direct relation to the borrower, or investors in a securitization structure (Mugarura, 2016). The risk the arranger faces varies considerably with these different arrangements.

Our data does not allow us to carefully parse the different types of syndicated loans in our data base. For the purpose of our analysis, we assume a simple structure, in which the arranger carries the borrower's primary default risk and the other participants owe him a contractual obligation to pay their share and carry a proportionate credit risk. This follows similar practices in the treatment of syndicated loans in the economics literature (Gadanecz, 2004; Gadanecz et al., 2011).

Syndicated loans diversify risks that are associated with lending, including interest-rate and default risks. Moreover, as Nirei et al. (2016) has shown, counterparty and contagion risk help explain the choice of syndicate structure as well as the number of junior banks that an arranger invites to the syndicate (see also Gadanecz 2004, p. 78). Others have pointed out that rather than diversifying risk, loan syndication implies that banks have more investments in common. Perhaps, they might stabilize each other, but common investments might also operate as a contagion channel (Leitner, 2005).

While the syndicated loan market is of interest in its own right, there are good reasons why many students of contemporary credit markets are using syndicated loan data to study credit markets in general. Thomson Reuters and Dealogic data on syndicated loans are the "only comprehensive and accessible source[s] of data on the geographical composition of borrowing and lending by individual banks" (Hale and Obstfeld 2016, p. 134). Moreover,

syndicated loan markets tend to be large, whereas smaller loans may depend on relational or social variables that are almost impossible to observe and control for (Qian and Strahan 2007, p. 2813). Syndicated loans are also more transparent than other types of lending, and more sensitive to shocks than generic longer-term loans (Chui et al., 2010). The US subprime crisis is a case in point; available data suggest that syndicated loans have been highly responsive to liquidity shocks. After Lehman went bust, “gross syndicated lending declined by 67% in developed economies” (Chui et al, 2010, p. 41), and the international syndicated loan market was back to pre-crisis conditions only by early 2011 (Gadanecz, 2011). The consensus in the literature is therefore that syndicated loans are a good proxy for the bank lending behavior (Nirei et al., 2016; Kapan and Minoiu, 2013).

Nonetheless, generalizing about financial markets through the lenses of the syndicated loans market alone should be treated with some caution. In particular, the effect of financial regulation may be much more pronounced in syndicated loan structure with the participation of major banks than in simpler credit relations. Qian and Strahan (2007, p. 2806), for example, recognized that their findings “reflect the effects of cross-country differences in laws and institutions on financial contracts between relatively large (and often foreign) banks and large borrowers.” We also cannot rule out that syndicated loan markets react differently to changes in the monetary liquidity regime than other loans, but for the purpose of this analysis we assume that they do.

VI. The ECB Collateral Framework

We now turn to the ECB’s monetary tool kit, its collateral framework. As a principal matter, central banks lend only against collateral to protect themselves, to implement their monetary policy mandate, but also to calm markets in times of crisis. Some central banks accept safe assets only, in particular, sovereign debt (Treasury bills) or quasi-government (agency bonds) as collateral; others accept a whole range of assets.

The countries that are now members of the Eurozone had remarkably different collateral regimes in place prior to the crisis. Some accepted a range of different assets as collateral in

central bank lending transactions, while others limited access to only a few. In Belgium and Luxembourg, for example, only government securities and trade bills (private bills of exchange with effective guarantees by a chain of endorsers) were central bank eligible (Papadia and Välimäki, 2011). The central banks of the US, the UK, and Canada, were even stricter and excluded private assets altogether (Papadia and Välimäki, 2011). In contrast, the central banks of other prospective Euro members were more 'liberal'. The Dutch central bank, for example, accepted government securities, central bank's certificate of deposit, certain private loans, bonds listed on the Amsterdam stock exchange (AMSX), equities listed on the AMSX, and even certain foreign government bonds. Similarly, the Austrian central bank accepted government securities, bonds listed on the Austrian stock exchange, gold, bills of exchange, promissory notes, foreign bills, foreign exchange, as well as warehouse warrants. For a complete list of central bank eligible securities in countries that eventually adopted the Euro (Table 2 in the Appendix).

Having no government security at its disposal and being legally constrained in using sovereign debt of its member states, the ECB decided to employ collateralized *private debt* with short maturities for conducting its monetary policy (Bindseil et al, 2017; Cheun et al., 2009; Jobst and Ugolini, 2014). By the same token, the ECB's collateral guidelines became a critical tool for conducting monetary policy as well as for managing the elasticity of lending in private markets (Bindseil et al., 2017). From the outset, the ECB accepted a wide range of private assets as collateral in ordinary open-market operations. To ensure that it would reach financial intermediation throughout the entire Eurozone, it also opened its doors to many more banks. The comparison with the US is instructive. Whereas the US Federal Reserve transacts only with 21 primary dealers, over 1,700 banks have access to the ECB's regular tender operations, and over 1,900 to its marginal lending facilities (Bindseil et al., 2017, Table 2 at p. 19).¹³

The ECB collateral framework was designed in response to the structural differences in the organization of financial markets and access by financial intermediaries to different types of collateral in mind. This spoke for a relatively open collateral framework at the outset with

¹³ In practice, only a few hundred banks have taken advantage of access to central bank lending. Still, the numbers are much higher than in the US, or that they were earlier in several Euro member states.

streamlining occurring only over time. Figure 1 outlines the main changes in asset eligibility between 2000 and 2014. The first set of collateral guidelines was issued in 1999, which left substantial discretion to individual NCBs in accepting non-marketable assets as collateral. Over time, these assets were phased out and a new regime was established that favored marketable over non-marketable assets and created a single list of assets that were ranked not by type, but by relative risk. To this end, the 2004 guidelines distinguished between “tier-1” and “tier-2” collateral. Tier-1 assets comprised four asset categories with different haircuts applied to each: Central government debt and debt issued by central banks (Category 1); local and regional government debt, jumbo covered bonds (*Pfandbriefe*), agency and supra-national agency debt (Category 2); conventional covered bonds, bank bonds, corporate debt instruments (Category 3); and asset backed securities (Category 4) (ECB, 2004). Tier-2 debt comprised of debt that National Central Banks accepted at their own discretion.

Between 2005 and 2007, the ECB developed a single list of ‘marketable’ assets that were deemed central-bank eligible, but subject to risk-adjusted ‘haircuts’; the two-tier system was phased out on 31 May 2008. Individual NCBs could still lend on a case-by-case basis to non-marketable assets, but only as an exception to the rule, and non-marketable assets issued by entities from outside the Eurozone were no longer accepted. Further, equity securities, which the central banks of Spain, the Netherlands, and Portugal had previously acquired, were deemed no longer central bank eligible; conversely, other assets, which had been eligible only in some jurisdictions, became eligible throughout the Eurozone (Bindseil et al., 2017). Given our cut-off date, we do not examine the changes in the collateral framework during the crisis, but note that, like other central banks, the ECB substantially relaxed its collateral framework during the period.¹⁴

VII. Applying the Analytical Framework

¹⁴ However, the ECB also threatened individual member states, including Ireland and Greece, that it might no longer roll over their sovereign debt. [Hellwig]

In order to investigate the impact of the new monetary regime, or more precisely, the collateral framework on lending behavior, we investigate the participation of banks that are located in one of the Eurozone's member states in loan syndicates between 2002 and 2007. According to the goals of monetary integration, the new monetary regime was supposed to have the following effects:

- A positive effect on overall lending, especially for banks that previously faced a highly restrictive collateral regime.
- A higher participation rate of peripheral banks in lending networks.
- A reduction in the importance of the banks' origin, or G10, effect, which captures the bail-out capacity of some banks' home country.

As a result, we should observe a flattening of the hierarchy among banks and greater reliance by creditor banks on ECB liquidity provisioning than on home country bail outs not only in crisis, but already in good times.

Data

Our data base includes banks that were headquartered in one of the twelve Eurozone member states by 2002¹⁵ and that participated in loan syndications between January 2002 and March 2010. We use syndicated-loan data obtained from DealScan, and data on bank's legal incorporation from Bankscope. As discussed, we are interested in the factors that drive lending markets. The relevant unit of analysis is the activities of a single bank (B) per month in syndicated loan structures. We follow Cai et al. (2017) in using monthly loan portfolios B participated in over the previous 12 months to calculate the connections and degree centrality among all banks.

To get a handle on the factors that shape lending, we construct two *independent* variables: *G10* and *Public Only*, where G10 captures a country's backstopping prowess, and *Public Only* stands for the most restrictive central bank liquidity rules prior to the introduction

¹⁵12 member states with 11 central banks, because Belgium and Luxembourg were under the same monetary authority (see Table 2).

of the Euro and includes countries that only accepted public debt as central-bank eligible collateral. The exact definition of these two variables is in

Table 1.

We use the bank's home country's membership in the G10 as a proxy for banks' relation to Public Power. The G10 includes the largest financial markets and the major central banks in the world (Alexander, 2008; Gale and Obstfeld, 2016). We also note that the G10 has greatly influenced global financial regulation through its influence over the Basel Committee on Banking Supervision ('Basel Committee') and the Committee on Payment and Settlement Systems and the Committee on the Global Financial System (Goodhart, 2011; Alexander, 2008). LTF suggests that especially in times of severe crises, power and not law determines the probability of survival with possible *ex ante* effects. This would mean banks from G10 countries should be more likely to expand lending activities, to take on additional risks, and to dominate the syndicated loan market by occupying central positions, than others.

We pitch G10 against the change in the collateral regime that came with the introduction of the Euro. The collateral regime stands for a different legal framework for accessing central bank liquidity in good times, that is, as part of ordinary monetary operations and central bank governance over credit in the economy. The critical variable for measuring the impact of legal change on lending is *Public Only*, which measures the difference between access to central bank prior to and after the introduction of the Euro. As noted earlier, in several prospective EU member-countries, only public assets were accepted as collateral. Banks from these countries therefore experienced the greatest expansion in access to liquidity. Other countries already had private assets in their collateral pool. Banks from these countries experienced the smallest expansion of eligible assets and by implication access to liquidity. For ease of exposition, we divide these countries into two groups: Countries, whose central banks accepted *only* public assets as eligible collateral, meaning that liquidity expansion is high (*Public Only*), and those that accepted a range of assets, including public and private, already prior to the introduction of the Euro (*Non-Public*), meaning that their liquidity expansion is low.

Table 1 gives further details about the change of asset eligibility.

We regress these variables against our outcome variables, all of which capture the role of specific banks in the syndicate loan market. Specifically

1. *Bank Power* captures the frequency with which a bank manages to generate business, keeping in mind that the arranger of a syndicated loan tends to be the borrower's relational bank.
2. *Lending* captures the total lending volume (on a logarithmic scale) by a bank in all syndicates.
3. The variable *Connections* stands for the number of connections a bank establishes with other banks via a common syndicate.¹⁶
4. *Degree Centrality* is the ratio of the connections the bank has with other banks relative to all banks in a common syndicate. This variable measures the relative importance of a given bank in the whole syndicated loan ecosystem.
5. *Revolver* is the proportion of revolver loans relative to all loans, the remainder being term loans. We conjecture that *Revolver* loans indicate a greater willingness to take risks vis-à-vis a borrower.

We hypothesize that for monetary and financial integration to be successful, *Public Only* should have a significant and positive impact in the period under investigation. Further, the increase in *Bank Power*, *Lending*, *Connections*, *Degree Centrality* and *Revolver* should be especially pronounced for banks from countries that experienced the greatest liquidity shock from the introduction of the Euro. We are, of course, aware that the time period under investigation falls into one of the greatest credit booms in all times. A positive sign for any of our outcome variables alone will therefore not be taken as proof of a hypothesis. Rather, we are looking for substantial convergence among banks with different monetary legacies and/or power backgrounds.

¹⁶ The variable is inspired by Nirei et al. (2016).

Results

We begin with an analysis based on descriptive statistics to see whether at least on the surface the ECB collateral framework had the intended effect of flattening lending relations in the Eurozone. Only in the next step will we proceed to the regression analysis, which allows us to control for the direct effect the two main independent variables may have on the outcome variables.

Descriptive analysis

Tables 3 to 7 present the evolution of the total impact of *G10* and *Public Only* on the outcome variables. Table 3 shows that all banks seem to have increased their *Bank Power*. The broader collateral framework introduced by the Euro seems to have allowed all banks to expand their lending beyond from their previous base. Indeed, given the degree of change in access to central bank liquidity as measured by *Public Only*, there was some convergence between G10 and non-G10 countries in *Bank Power*. Put differently, more banks from non-G10 countries syndicated more loans over time. The same result holds true when we control for G10 status: banks from countries with different pre-euro collateral frameworks show some signs of convergence on *Bank Power*.

However, the results are quite different for *Lending*. Table 4 shows that, given *Public Only*, there was no convergence whatsoever in *Lending*. We obtain the same results when holding *G10* constant. All banks seem to have maintained their relative level of lending irrespective of the new liquidity regime. Somewhat surprisingly, this suggests that the new ECB collateral framework did not have much of an impact on the monthly lending by individual banks in the syndicated loan market.

Table 5 shows that, given *Public Only*, *Connections* converged somewhat between G10 and non-G10 banks, which suggests (as predicted) a flattening of the hierarchy. Yet, somewhat surprisingly, banks that were more affected by the new ECB collateral framework seem to have *decreased*, not increased, the number of connections with other banks.

Table 6 includes similar results for *Degree Centrality*. This remains constant and the relative positions are stable across the two main independent variables. It thus offers no sign of

convergence or change in the relative position of banks that were active in the syndicated loan market.

Finally, Table 7 shows no evidence of convergence among the Eurozone banks with respect to risk aversion. *Revolver* remains more or less constant across the period. Note that among G10 countries, banks in *Public Only* countries have a somewhat larger share of *Revolver* than their counterparts in non-*Public countries*. However, this may only indicate that banks from non-*Public* have a more diverse set of customers.

Overall, these descriptive results suggest that after 2002 banks expanded their lending business from their existing customer base.¹⁷ Further, the importance of G10, though largely stable across the five outcome variables, seems to have declined in relation to some. A very generous interpretation might suggest that on the surface, the Euro has spurred some degree of financial integration. This result is consistent with the desire of European leaders to use the ECB as a mechanism for integrating European financial markets (Bindseil et al., 2017; Cheun et al., 2009; Spolaore, 2013). Nonetheless, the lack of convergence in *Degree Centrality* seems to indicate that the relative importance of each bank in the market remained unchanged. In other words, the new monetary regime does not seem to have had much effect on the structure of lending markets in the Eurozone. Looking at the number of *Connections* one might even conclude that, if anything, the introduction of the Euro strengthened existing relations among the already dominant banks rather than creating opportunities for banks on the periphery. We also do not find that banks were willing to take more risks, as *Revolver* does not show any change between 2002 and 2007.

Regression Analysis

For our regression analysis, the critical observation is the volume of syndicated-loans a given bank issued in a given month. We employ a set of seemingly-unrelated regressions (SUR) for three reasons.¹⁸ SUR means that a system of (in this case) four regressions is estimated, letting each regression impact the other three. This method allows us to analyze the impact of

¹⁷ Note that we assume that borrowers select arrangers who then go out and find other banks to participate in the loan syndicate.

¹⁸ SUR has been used to analyze analogous problems in the interbank market (Cocco et al., 2009).

G10 and of *Public Only* on the five outcome variables of interest *Bank Power*, *Lending*, *Connections* and *Centrality*.¹⁹ Since *G10* and *Public Only* are country-level variables, they can be treated as exogenous variables from the perspective of each bank. This allows us to assert a causal effect for the two main independent variables on each of the four outcome variables.

For this analysis, we need to control for other characteristics that are related to the syndicated-loan portfolio of a given bank, as discussed in the descriptive analysis. The following regressions are simultaneously estimated:

$$\left\{ \begin{array}{l} \text{Bank Power}_{b,m} = \beta_0 + \beta_1 G10_b + \beta_2 \text{Public Only}_b + \sum \beta_1 x_{b,m} + \varepsilon_{b,m} \\ \text{Lending}_{b,m} = \beta_0 + \beta_1 G10_b + \beta_2 \text{Public Only}_b + \sum \beta_1 x_{b,m} + \varepsilon_{b,m} \\ \text{Connections}_{b,m} = \beta_0 + \beta_1 G10_b + \beta_2 \text{Public Only}_b + \sum \beta_1 x_{b,m} + \varepsilon_{b,m} \\ \text{Degree Centrality}_{b,m} = \beta_0 + \beta_1 G10_b + \beta_2 \text{Public Only}_b + \sum \beta_1 x_{b,m} + \varepsilon_{b,m} \\ \text{Revolver}_{b,m} = \beta_0 + \beta_1 G10_b + \beta_2 \text{Public Only}_b + \sum \beta_1 x_{b,m} + \varepsilon_{b,m} \end{array} \right.$$

Hence, the observation level of the regressions is the portfolio of bank *b* in month *m*. The *x*'s in the sums refer to the extra control variables included to increase the robustness of the regressions (see

¹⁹The default group in each regression consists of non-G10 banks whose central bank, before the Euro, accepted both private and public assets as collateral.

Table 1 for details). Note that the subscripts of *G10* and *Public Only* do not have m , i.e. they are time *invariant*.

We break down the SUR analysis by years to see how the relation between the main independent variables and the outcome variables varies over time, but we also conduct a SUR analysis with all years included.

Table 8 confirms our earlier results based on descriptive statistics alone: there seems to be little sign of financial integration. Specifically, *Lending* is systematically higher for G10 banks, and this is statistically significant at the 1% percent level. G10 banks also have a higher *Degree Centrality*. In fact, banks in countries that should have been affected the most by the new collateral framework seem to have suffered a penalty in *Degree Centrality*. In this regard, the direct impact of *G10* and *Public Only* is different from the total impact we found in the descriptive analysis (which was neutral not negative). In terms of risk profile, *G10* has a positive impact in *Revolver*. This result is consistent with *G10* banks having a better implicit liquidity guarantee.

We also conducted several robustness checks. First, we excluded Germany, an country that widely regarded as the exceptional economy within the European Union (Spolaore, 2013). Now, the remaining banks very much look alike and the “penalty” for *Public Only* in *Degree Centrality* disappears. As noted earlier, Germany had a very restrictive monetary policy prior to the Euro and German banks while also displaying a high level of degree centrality. Banks from Germany retained their Degree Centrality after the introduction of the Euro, apparently benefiting from greater access to central bank liquidity. We also ran a robustness test removing Spain from the analysis, because it had accumulated more private debt than any other of the *Public Only* countries. However, this did not change our results.

Finally, we re-classifying (counterfactually) Italy as a non-G10 country. We id so, because Italy’s economy has been weak as compared to many other G10 countries, and markets may have understood that the country’s backtopping prowess was compromised. Table 9 shows with this re-classification, *G10* increases *Bank Power*, *Lending*, *Connections*, *Degree Centrality* and *Revolver*. However, *Public Only*’s impact on *Degree Centrality* disappears and *Lending* is increased significantly. We also find that the impact of *G10* weakens over time, whereas the

impact of *Public Only* strengthens from 2005 onwards. We interpret these results to suggest that our *G10* variable captures not simply a legacy effect (a country's long term membership in the G10), but the perception of a government's actual prowess in lending market.

Finally, in Table 10, we take a closer look at banks that were more successful relative to others in arranging syndicate loans to see, whether we can relate their behavior to the other variables we have identified. When we take banks that belong to the top 25% in *Bank Power* in a given year or quarter, we essentially obtain the same results as the baseline SUR analysis. That is, banks with a bigger lending capacity prior to the introduction of the Euro seem to have been driving the lending market also under the new monetary regime. When we remove the top 25% in *Bank Power*, *Public Only* systematically increases *Lending*, but decreases *Connections*. That is, banks from *Public Only* countries create syndicated loans from their customer base less frequently; they seem to lend more but in smaller syndicates.

Discussion

The descriptive analysis gives us a comprehensive, although not necessarily causal impact of a given variable on another. The regression analysis, with exogenous independent variables, lets us see the direct, causal impact of the independent variables on outcome variables. Generalizing from the results of these two analyses, we can say that *on the surface* there were signs pointing towards convergence of lending behavior in the syndicated loan market across the Eurozone. In particular, the descriptive analysis points towards convergence in the arrangement of syndicates. However, our regression analysis suggests that only *Degree Centrality* had a causal impact. Somewhat counter-intuitively given the ambitions of the monetary union, banks from countries that should have benefited most from the ECB collateral framework remained less central for the entire period under investigation. Equally interesting, the riskier *Revolver* loans seemed to have been arranged more often by banks with a powerful backstop (G10) rather than with a greater liquidity shock. The baseline results seem to be driven systematically by banks that arrange syndicates more often. These results change dramatically when changing the status of Italy from a G10 to a non-G10 country, suggesting that Italy does not fit the profile of the remaining G10 in the sample.

Our findings suggest that the convergence in financial markets spurred by the introduction of the Euro may have been far more nuanced than previously thought, even during the first years after the introduction of the Euro. More banks across Europe participated international syndicated loan markets but without challenging the dominance of the legacy banks. The introduction of the Euro seems to have made banks that were peripheral in 2002 even more peripheral over time. As discussed, changing the *G10* classification of Italy changes some of our results; but even then, *G10* has a positive effect on *Revolver*, that is, the core banks of Europe showed a higher propensity to grant riskier loans than banks from the periphery.

Conclusion

In this paper, we examine lending behavior of banks headquartered in the Eurozone between 2002 and 2007, a period that is widely regarded as a success story for the Euro. During this period, the ECB used collateral guidelines to ensure broad access to central bank liquidity throughout the monetary union, while also beginning to curtail the use of non-marketable assets as collateral in central bank lending operations. We would have expected a substantial positive effect in the expansion of lending and the participation in syndicated loan markets especially for banks from countries that previously had less access to central bank liquidity. We also would have expected that monetary union together with greater access to central-bank liquidity even from peripheral banks should have mitigated the effect of a country's *G10* membership. In fact, we find that this legal regime change has had little effect on the patterns of lending in the syndicated loan market.

We note, however, that given the limitations of our data set, we were unable to analyze the structure of the syndicated loans in detail to assess the effect on the monetary regime change on contract design. From the perspective of our analytical framework (LTF), this is unfortunate, because it limits our ability to draw inferences about the explanatory powers of this theory for evolving syndicated loan market in the Eurozone. Our results do suggest, however, that the relative importance of backstopping prowess (*G10*) and access to liquidity (*Public Only*) may have to be reconsidered, and not only for the Eurozone. Recall that LTF predicts that power rears its head primarily in the context of financial crises. In contrast, in the

Eurozone, power never seized to influence the lending behavior of private banks. Perhaps this is only a reflection of path dependency. The period we investigate is admittedly relatively short; absent the global crisis, banks may have eventually followed the guidance of the ECB's monetary guidance more than betting on the backstopping prowess of their respective home country. But we note that even in 2007, 8 years after the official introduction of the Euro and in the midst of a global credit boom, we do not find a strong trend in this direction. This result urges more future research about the effects of implicit guarantees as compared to regularized access to liquidity in the Eurozone and beyond.

Literature

- Adrian, Tobias, and Markus Brunnermeier. 2016. "CoVaR." *American Economic Review*, 106(7): 1705-1741.
- Alexander, Kern. 2008. "Global Financial Standard Setting, the G10 Committees, and International Economic Law." *Brooklyn Journal of International Law*, 34: 861-881.
- Alston, Lee. 1983. "Farm Foreclosures in the United States During the Interwar Period." *Journal of Economic History*, 43(4): 885-903.
- Alston, Lee. 1984. "Farm Foreclosure Moratorium Legislation: A Lesson from the Past." *American Economic Review*, 74(3): 445-457.
- Arellano, M., and Bond, S.. 1991. "Some tests of specification for panel data." *The Review of Economic Studies*, 58: 277-297.
- Argyridou-Dimitriou, Christiana, Pany Karamanou, Lena Cleanthous-Petoussi. 2002. "Implementation of monetary policy in Cyprus" In "The Cyprus Economy: Historical Review, Prospects, Challenges" edited by Athanasios Orphanides and George Syrichas.
- Arteta, C., and G. Hale, 2008. "Sovereign Debt Crises and Credit to the Private Sector." *Journal of International Economics*, 74: 53-69.
- Bindseil, Ulrich. 2013. "Central Bank Collateral, Asset Fire Sales, Regulation and Liquidity." ECB Working Paper Series No. 1610.
- Bindseil, Ulrich, G. Dragu, A. Daring, and J. von Landesberger. 2016. "Asset liquidity, central bank collateral, and banks' liability structure." Unpublished.
- Bindseil, Ulrich, Marco Corsi, Benjamin Sahel and Ad Visser. 2017. "The Eurosystem collateral framework explained." ECB Occasional Paper Series No. 189.
- Bignon, Vincent, and Clemens Jobst. 2017. "Economic Crises and the Eligibility for the Lender of Last Resort: Evidence from the 19th century France." *Banque de France Working Paper Series No. 618*.
- Bolton, Patrick, and Howard Rosenthal. 2002. "Political Intervention in Debt Contracts." *Journal of Political Economy*, 110(5): 1103-1134.

- Bordo, Michael D.. 2014. "Rules for a lender of last resort: An historical perspective." *Journal of Economic Dynamics Control*, 110(5): 1103-1134.
- Borsani, Cristina, Karl Hug and Thomas J. Jordan. 2008. "Modernising the tools of monetary policy" In "The Swiss National Bank 1907 – 2007" edited by Ulrich Kohli, 282-294. Zurich: Swiss National Bank.
- Brauning, Falk, and Falko Fecht. 2017. "Relationship Lending in the Interbank Market and the Price of Liquidity." *Review of Finance*: 33-75.
- Brei, Michael, and Blaise Gadanecz. 2012. "Have public bailouts made banks' loan books safer?" *BIS Quarterly Review*, September.
- Brunnermeier, Markus, Andrew Crockett, Charles Goodhart, Avinash D. Persaud, and Hyun Song Shin. 2009. *The Fundamental Principles of Financial Regulation*. Geneva and London: International Center for Monetary and Banking Studies, Centre for Economic Policy Research.
- Burietz, Aurore, Kim Oosterlinck, and Ariane Szafarz. 2017. "Europe vs. the U.S.: A new look at the syndicated loan pricing puzzle." *Economics Letters* 160: 50-53.
- Caballero, Ricardo J., and Alp Simsek. 2013. "Fire Sales in a Model of Complexity." *The Journal of Finance*, LXVIII(6): 2549-2587.
- Cai, Jian, Frederik Eidam, Anthony Saunders and Sascha Steffen. 2017. "Syndication, Interconnectedness, and Systemic Risk." Mimeo.
- Calomiris, Charles W., Mauricio Larrain, Jose Liberti and Jason Sturgess. 2017. "How collateral laws shape lending and sectoral activity." *Journal of Financial Economics*, 123: 163-188.
- Cassola, Nuno, and Francois Koulischer. 2015. "The Collateral Channel of Open Market Operations." Unpublished.
- Cheun, Samuel, Isabel von Koppen-Mertes and Benedict Weller. 2009. "The Collateral Frameworks of the Eurosystem, the Federal Reserve and the Bank of England and the Financial Market Turmoil." *European Central Bank Occasional Paper Series*, No 107.

Choi, Stephen J., and Mitu Gulati. 2016. "The Pricing of Non-Price Terms in Sovereign Bonds: The Case of the Greek Guarantees." *Journal of Law, Finance and Accounting*, 1: 1-40.

Choi, Stephen J., Mitu Gulati, and Eric A. Posner. 2013. "The Dynamics of Contract Evolution." *NYU Law Review*, 88(1): 1-50.

Chui, Michael, Dietrich Domanski, Peter Kugler and Jimmy Shek. 2010. "The collapse of international bank finance during the crisis: evidence from syndicated loan markets." *BIS Quarterly Review*, September.

Cocco, Joao F., Francisco J. Gomes, and Nuno C. Martins. 2009. "Lending relationships in the interbank market." *J. Finan. Intermediation* 18: 24-48.

Crosignani, M., M. Faria-e-Castro, and L. Fonseca. 2015. "The Portuguese Banking System during the Sovereign Debt Crisis," *Banco de Portugal Economic Studies* (1): 43-80.

Dicks, David L., and Paolo Fulghieri. 2017. "Uncertainty Aversion and Systemic Risk." Unpublished mimeo on file with the author.

Drechsler, Itamar, Thomas Drechsel, David Marquez-Ibanez, and Philipp Schnabl. 2016. "Who Borrows from the Lender of Last Resort?" *The Journal of Finance*, LXXI(5): 1933-1974.

Eberl, Jakob, and Christopher Weber. 2014. "ECB Collateral Criteria: A Narrative Database 2001-2013." *Ifo Working Paper* No. 174.

Eichler, Stefan, and Kai Hielscher. 2012. "Does the ECB act as a lender of last resort during the subprime lending crisis? Evidence from monetary policy reaction models." *Journal of International Money and Finance* 31: 552-568.

Feldstein, Martin. 1997. "The Political Economy of the European Economic and Monetary Union: Political Sources of an Economic Liability." *Journal of Economic Perspectives*, 11 (4): 23-42.

Gadanecz, Blaise. 2004. "The syndicated loan market: structure, development and implications" *BIS Quarterly Review*, December.

Gadanecz, Blaise, Alper Kara and Philip Molyneux. 2011. "The value of repeat lending." *BIS Working Papers* No 350.

- Galvenius, M., and P. Mercier. 2011. "The Story of the Eurosystem." In *The Concrete Euro: Implementing Monetary Policy in the Euro Area*, edited by Paul Mercier and Francesco Papadia. Oxford: Oxford University Press.
- Goodhart, Charles. 2011. *The Basel Committee on Banking Supervision: A History of the Early Years, 1974-1997*. Cambridge, MA: Cambridge University Press.
- Hale, Galina, and Maurice Obstfeld. 2016. "The Euro and the Geography of International Debt Flows." *Journal of the European Economic Association*, 14(1): 115-144.
- Haselmann, Rainer, Katharina Pistor and Vikrant Vig. 2010. "How Law Affects Lending." *Review of Financial Studies*, 23(2): 549-580.
- Jackson, Matthew. 2008. *Social and Economic Networks*. Mimeo: Princeton University Press.
- Jobst, Clemens, and Stefano Ugolini. 2014. "The Coevolution of Money Markets and Monetary Policy, 1815-2008." Unpublished.
- Kapan, Tumer, and Camelia Minoiu. 2013. "Balance Sheet Strength and Bank Lending During the Global Financial Crisis." IMF Working Paper WP/13/102.
- Klausner, Michael. 1995. "Corporations, Corporate Law, and Networks of Contracts." *Virginia Law Review*, 81(3): 757-852.
- Knight, Frank H.. 1921. *Risk, Uncertainty and Profit*. Houghton Mifflin: Boston.
- Leitner, Yaron. 2005. "Financial Networks: Contagion, Commitment, and Private Sector Bailouts." *Journal of Finance*, LX(6): 2925-2953.
- Lin, Chen, Yue Ma, Paul Malatesta, and Yuhai Xuan. 2012. "Corporate Ownership Structure and Bank Loan Syndicate Structure." *Journal of Financial Economics*, 104: 1-22.
- Mercier, Paul, and Francesco Papadia. 2011. *The Concrete Euro*. New York, NY: Oxford University Press.
- Minoiu, Camelia, and Javier A. Reyes. 2013. "A network analysis of global banking: 1978-2010." *Journal of Financial Stability*, 9: 168-184.
- Nather, Maria. 2017. "Core-periphery Formation in Interbank Markets." Unpublished.

Nirei, Makoto, Vladyslav Sushko and Julian Caballero. 2016. "Bank Capital Shock Propagation via Syndicated Interconnectedness." *Computational Economics*, 47: 67-96.

North, Douglass C.. 1991. "Institutions." *The Journal of Economic Perspectives*, 5(1): 97-112.

Nougayrede, Delphine. 2017. "Towards a Global Financial Register?". Unpublished.

Nyborg, Kjell G. 2016. *Collateral Frameworks: The Open Secret of Central Banks*. Cambridge, UK: Cambridge University Press.

Popov, Alexander and Neeltje Van Horen. 2013. "The impact of sovereign debt exposure on bank lending: Evidence from the European debt crisis." DNB Working Paper No.382.

Qian, Jun, and Philip E. Strahan. 2007. "How Laws and Institutions Shape Financial Contracts: The Case of Bank Loans." *The Journal of Finance*, LXII(6): 2803-2834.

OECD. 2002. "Forty Years' Experience with the OECD Code of Liberalisation of Capital Movements." Organization for Economic Co-Operation and Development Report.

Pistor, Katharina. 2013 a. "A Legal Theory of Finance." *Journal of Comparative Economics*, 41: 315-330.

Pistor, Katharina. 2013. "Law in Finance." *Journal of Comparative Economics*, 41 (2):311-315.

Pozsar, Zoltan. 2014. "Shadow Banking: The Money View." Office of Financial Research Working Paper 14-04.

Spolaore, Enrico. 2013. "What is European Integration Really About? A Political Guide for Economists." *Journal of Economic Perspectives*, 27(3): 124-144.

Thibaut, Duprey, and Le Mathias. 2015. "Bankscope dataset: getting started." Mimeo.

Tirole, Jean. 2011. "Illiquidity and All Its Friends." *Journal of Economic Literature*, 49(2): 287-325.

Toth, Daniel S. Z.. 1999. "Repo Markets: Experiences and opportunities in Hungary" NBH Occasional Papers 5.

Trichet, Jean-Claude. 2010. "State of the Union: The Financial Crisis and the ECB's Response between 2007 and 2009." *Journal of Common Market Studies*, 48: 7-19.

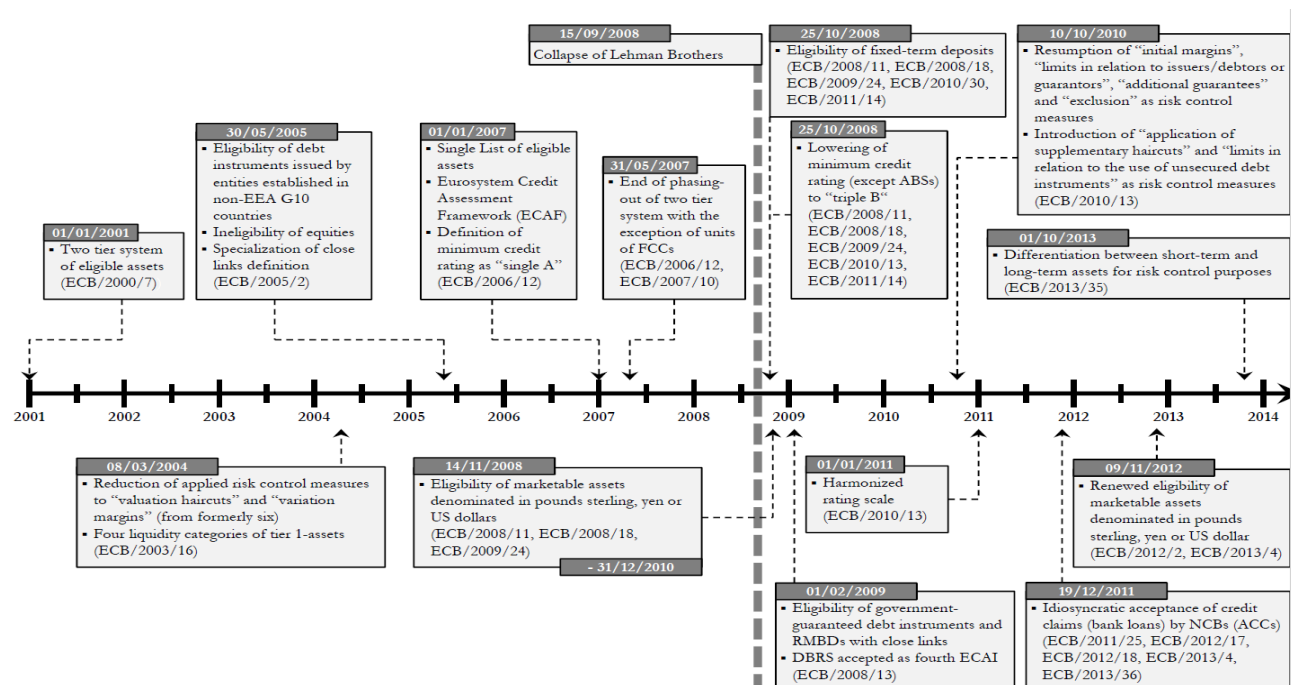
in 't Veld, Daan, and Iman van Lelyveld. 2014. "Finding the core: Network structure in interbank markets." *Journal of Banking Finance*, 49: 27-40.

van der Leij, Marco, Daan in 't Veld and Cars Hommes. 2016. "The formation of a core-periphery structure in heterogeneous financial networks." De Nederlandsche Bank Working Paper No. 528.

Ugolini, Piero. 1996. "National Bank of Poland : The Road to Indirect Instruments." Washington, DC: International Monetary Fund.

Eberl, Jakob, and Christopher Weber. 2014. "ECB Collateral Criteria: A Narrative Database 2001-2013." *Ifo Working Paper* 174.

Figure 1 - Asset eligibility in the ECB collateral framework (2000-2014)



Source: Eberl and Weber, 2014.

Table 1 - Variables and definitions

| Variable | Definition |
|------------------------------------|---|
| Outcome Variables | |
| <i>Bank Power</i> | Number of months in the previous year in which the bank was the arranger of a new syndicated loan. |
| <i>Lending</i> | Total lending, in logarithmic scale, conceded by the bank in all syndicates. |
| <i>Connections</i> | Number of connections of the bank established with other banks, European or not, via commonsyndicates. |
| <i>Degree Centrality</i> | Degree centrality of the bank given the connections established with other banks, European or not, via common syndicates. Definition of degree centrality: proportion of all possible connections that the bank actually establishes. |
| <i>Revolver</i> | Proportion of revolver loans relative to all syndicated loans the bank participates in. |
| Main Independent Variables | |
| <i>G10</i> | 1 if bank is headquartered in one of the G10 countries, 0 otherwise. |
| <i>Public Only</i> | 1 if the bank is headquartered in one of the EU countries whose central bank only accepted public debt as collateral in its refinancing operations prior to the Euro, 0 otherwise. |
| Other Independent Variables | |
| <i>Avg. Bank Allocation</i> | Average bank's share across all syndicates. |
| <i>Avg. All-in-fees</i> | Average base points, including all fees, of the syndicates in which the bank participates. |
| <i>Avg. Maturity</i> | Average maturity, in days, of the syndicates in which the bank participates. |
| <i>Subsidiary</i> | 1 if the bank is incorporated as a subsidiary, 0 otherwise. |

Variables from or elaborated from Thomson Reuters Dealscan: *Bank Power*, *Lending*, *Connections*, *Degree Centrality*, *Avg. Bank Allocation*, *Avg. All-in-fees*, *Avg. Maturity* and *Subsidiary*.

Variable from or elaborated from Bankscope: *Subsidiary*.

Variables elaborated by the authors: *G10* and *Public Only*.

12 founding member-states of the Eurozone: Austria, Belgium, Finland, France, Germany, Greece, Ireland, Italy, Luxembourg, Netherlands, Portugal and Spain.

G10 countries in the Eurozone: Belgium, France, Germany, Italy and the Netherlands.

Countries with 1 in *Public Only*: Belgium, Greece, Italy, Ireland, Luxembourg and Spain.

Two sources were used in the elaboration of *Public Only*: Mercier and Papadia (2011) and the amendment to the Guideline ECB/2000/7 on December 1, 2013. Mercier and Papadia (2011, p. 133) provide a list of all categories of assets that national central banks accepted as collateral in their liquidity operations before the Euro. Then, we selected the marketable assets and classified them according to liquidity categories for tier-one assets in Box 8 of the ECB general

Table 2 - Eligible securities at each National Central Bank (NCB) in 1995.

| Country | Eligible collateral |
|------------------------|---|
| Belgium and Luxembourg | Government securities and trade bills. |
| Germany | Government securities, bank bonds, and trade bills. |
| Greece | Government securities and trade bills. |
| Spain | Government debt and central bank certificates of deposit. |
| France | T-bills, commercial paper and medium-term notes issued by banks or by other entities, bank loans, and government securities. |
| Ireland | Government securities. |
| Italy | Government securities. |
| Netherlands | Government securities, central bank certificates of deposit, private loans, bonds listed on the <u>AMSX</u> , equities listed on the <u>AMSX</u> , and certain foreign government bonds (also in foreign currencies). |
| Austria | Government securities, bonds listed on the stock exchange, gold, bills of exchange, promissory notes, foreign bills, foreign exchange, and warehouse warrants. |
| Portugal | Government securities, central bank certificates of deposit, and private bonds and bills. |
| Finland | T-bills, certain government bonds, central bank certificates of deposit, bank certificates of deposits, and government bonds. |

Source: Table 2.4 from Mercier and Papadia (2011, p. 133).

Two sources were used in the elaboration of *Public Only*: this table and the amendment to the Guideline ECB/2000/7 on December 1, 2013. This table displays all categories of securities that national central banks accepted as collateral in their liquidity operations before the Euro. Then, we selected the marketable assets and classified them according to liquidity categories for tier-one assets in Box 8 of the ECB general framework in 2003. Some of the assets suit more than one liquidity category. In that case, we included the assets in every suitable category. We chose the marketable assets because the non-marketable assets were eventually discontinued in 2007, when the ECB eliminated the second-tier assets.

Table 3 - Monthly average of *Bank Power*

| BankPower | 2002 | 2003 | 2004 | 2005 | 2006 | 2007 |
|--------------------------------|-------------|-------------|-------------|-------------|-------------|-------------|
| Non-G10 and Non-Public | 1.11 | 1.47 | 2.11 | 2.33 | 2.84 | 3.98 |
| Non-G10 and Public Only | 2.32 | 2.57 | 3.22 | 3.91 | 4.10 | 3.95 |
| G10 and Non-Public | 2.96 | 3.59 | 3.73 | 4.99 | 5.37 | 5.32 |
| G10 andPublicOnly | 1.37 | 1.72 | 2.10 | 2.63 | 3.25 | 3.04 |

Table 4 - Monthly average of *Lending*

| Lending | 2002 | 2003 | 2004 | 2005 | 2006 | 2007 |
|--------------------------------|-------------|-------------|-------------|-------------|-------------|-------------|
| Non-G10 and Non-Public | 21.46 | 21.51 | 21.60 | 21.59 | 21.55 | 21.60 |
| Non-G10 and Public Only | 22.10 | 22.55 | 22.34 | 22.35 | 22.50 | 22.69 |
| G10 and Non-Public | 22.69 | 22.71 | 22.66 | 22.70 | 22.78 | 22.64 |
| G10 and Public Only | 22.39 | 22.39 | 22.40 | 22.24 | 22.64 | 22.54 |

Table 5 - Monthly average of *Connections*

| Connections | 2002 | 2003 | 2004 | 2005 | 2006 | 2007 |
|--------------------------------|-------------|-------------|-------------|-------------|-------------|-------------|
| Non-G10 and Non-Public | 40.98 | 40.02 | 42.11 | 41.93 | 43.21 | 42.89 |
| Non-G10 and Public Only | 40.67 | 42.03 | 39.75 | 40.69 | 40.57 | 38.64 |
| G10 and Non-Public | 43.64 | 48.44 | 44.60 | 47.82 | 46.65 | 47.69 |
| G10 and Public Only | 35.86 | 37.03 | 34.97 | 32.76 | 37.33 | 34.75 |

Table 6 - Monthly average of *Degree Centrality*

| Degree Centrality | 2002 | 2003 | 2004 | 2005 | 2006 | 2007 |
|-------------------------|-------|-------|-------|-------|-------|-------|
| Non-G10 and Non-Public | 0.023 | 0.023 | 0.024 | 0.023 | 0.024 | 0.025 |
| Non-G10 and Public Only | 0.024 | 0.026 | 0.025 | 0.024 | 0.024 | 0.023 |
| G10 and Non-Public | 0.040 | 0.046 | 0.039 | 0.044 | 0.044 | 0.045 |
| G10 and Public Only | 0.026 | 0.026 | 0.023 | 0.021 | 0.029 | 0.025 |

Table 7 - Monthly average of *Revolver*

| Revolver | 2002 | 2003 | 2004 | 2005 | 2006 | 2007 |
|--------------------------------|-------------|-------------|-------------|-------------|-------------|-------------|
| Non-G10 and Non-Public | 0.42 | 0.43 | 0.42 | 0.45 | 0.43 | 0.35 |
| Non-G10 and Public Only | 0.34 | 0.39 | 0.39 | 0.34 | 0.38 | 0.34 |
| G10 and Non-Public | 0.46 | 0.45 | 0.51 | 0.50 | 0.47 | 0.44 |
| G10 and Public Only | 0.50 | 0.47 | 0.45 | 0.54 | 0.49 | 0.50 |

Table 8 - SUR regressions result

| Variables | Years | | | | | | |
|------------------------|----------|----------|----------|----------|----------|-----------|-----------|
| Bank Power | 2002 | 2003 | 2004 | 2005 | 2006 | 2007 | All years |
| G10 | 0.618 | 0.489 | 0.314 | 0.774 | 1.034 | 0.111 | 0.606 |
| Public Only | -0.337 | -0.630 | -0.312 | -0.486 | -0.275 | -1.362* | -0.487 |
| Lending | 2002 | 2003 | 2004 | 2005 | 2006 | 2007 | All years |
| G10 | 0.927*** | 0.356 | 0.608*** | 0.670*** | 0.766*** | 0.528** | 0.637*** |
| Public Only | 0.001 | -0.096 | -0.101 | -0.053 | 0.328 | 0.243 | 0.049 |
| Connections | 2002 | 2003 | 2004 | 2005 | 2006 | 2007 | All years |
| G10 | 1.573 | 3.028 | 1.175 | 1.990 | 1.948 | 0.298 | 1.717 |
| Public Only | -3.447 | -5.825 | -6.489 | -8.173 | -7.839 | -10.392** | -6.966 |
| Degree Centrality | 2002 | 2003 | 2004 | 2005 | 2006 | 2007 | All years |
| G10 | 0.015** | 0.011* | 0.009 | 0.013** | 0.018*** | 0.011* | 0.013** |
| Public Only | -0.011 | -0.016** | -0.011* | -0.011 | -0.008 | -0.015* | -0.012* |
| Revolver | 2002 | 2003 | 2004 | 2005 | 2006 | 2007 | All years |
| G10 | 0.123*** | 0.094** | 0.115*** | 0.136*** | 0.112*** | 0.136*** | 0.116*** |
| Public Only | 0.061 | 0.036 | 0.007 | -0.012 | 0.012 | 0.003 | 0.015 |
| Number of Observations | 1188 | 1240 | 1291 | 1303 | 1394 | 677 | 7093 |

***, ** and * indicate that the coefficient is significant at 10%, 5% and 1% significance level. Observation level: syndicated-loans portfolio of the lender in a given month. The dependent variables of the SUR regression are *Bank Power*, *Lending*, *Connections*, *Degree Centrality* and *Revolver*. Every SUR regression has *G10* and *Public Only* besides the extra control variables described in Figure 1 - Asset eligibility in the ECB collateral framework (2000-2014)

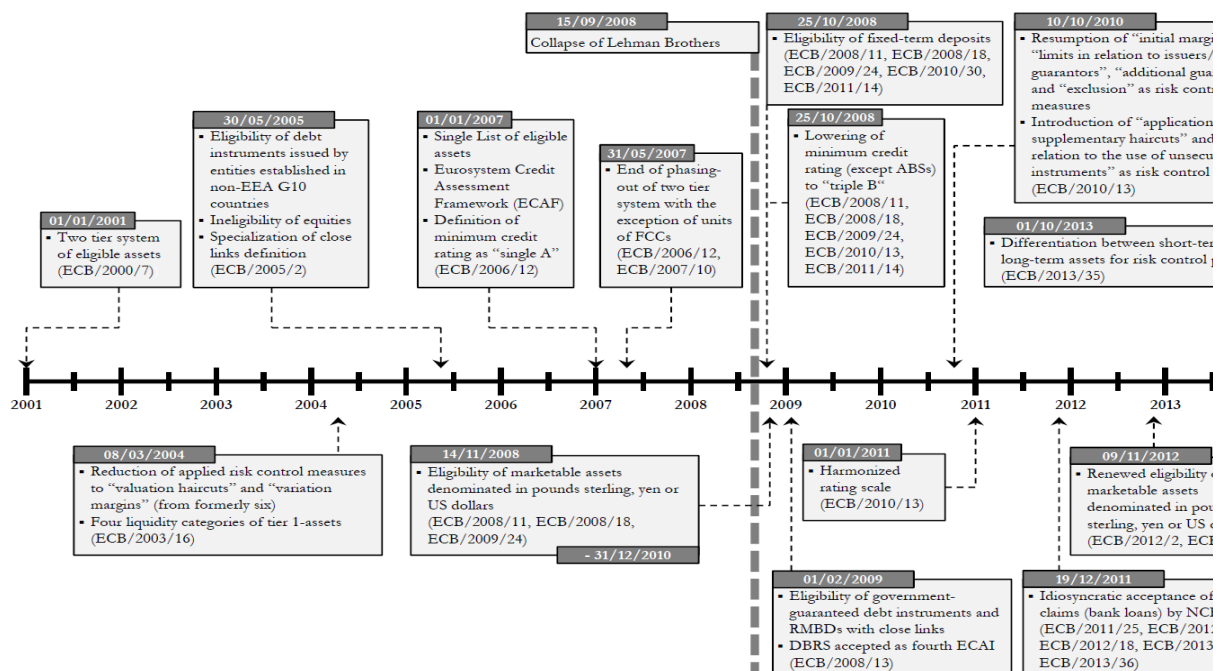


Table 9 - SUR regressions result – Italy as a non-G10 member

| Variables | Years | | | | | | |
|------------------------|----------|----------|----------|----------|----------|----------|-----------|
| Bank Power | 2002 | 2003 | 2004 | 2005 | 2006 | 2007 | All years |
| G10 | 1.562** | 1.723** | 1.609* | 2.406** | 2.271** | 1.295 | 1.858** |
| Public Only | 0.518 | 0.381 | 0.722 | 0.879 | 0.938 | -0.435 | 0.597 |
| Lending | 2002 | 2003 | 2004 | 2005 | 2006 | 2007 | All years |
| G10 | 1.264*** | 0.737** | 1.036*** | 1.068*** | 1.206*** | 1.047*** | 1.030*** |
| Public Only | 0.597** | 0.296 | 0.442 | 0.454 | 0.908*** | 0.842*** | 0.563** |
| Connections | 2002 | 2003 | 2004 | 2005 | 2006 | 2007 | All years |
| G10 | 6.549 | 11.824** | 5.962 | 9.609* | 11.611** | 5.093 | 8.533* |
| Public Only | 0.367 | 1.210 | -2.660 | -2.413 | -0.626 | -6.709 | -1.682 |
| Degree Centrality | 2002 | 2003 | 2004 | 2005 | 2006 | 2007 | All years |
| G10 | 0.026*** | 0.028*** | 0.020** | 0.028*** | 0.032*** | 0.022** | 0.026*** |
| Public Only | 0.002 | -0.000 | 0.000 | 0.004 | 0.008 | -0.003 | 0.002 |
| Revolver | 2002 | 2003 | 2004 | 2005 | 2006 | 2007 | All years |
| G10 | 0.077 | 0.115** | 0.144** | 0.089* | 0.111** | 0.120** | 0.107*** |
| Public Only | 0.082 | 0.087 | 0.074 | 0.008 | 0.053 | 0.046 | 0.053 |
| Number of Observations | 1188 | 1240 | 1291 | 1303 | 1394 | 677 | 7093 |

***, ** and * indicate that the coefficient is significant at 10%, 5% and 1% significance level. Observation level: syndicated-loans portfolio of the lender in a given month. The dependent variables of the SUR regression are *Bank Power, Lending, Connections, Degree Centrality* and *Revolver*. Every SUR regression has *G10* and *Public Only* besides the extra control variables described in Figure 1 - Asset eligibility in the ECB collateral framework (2000-2014)

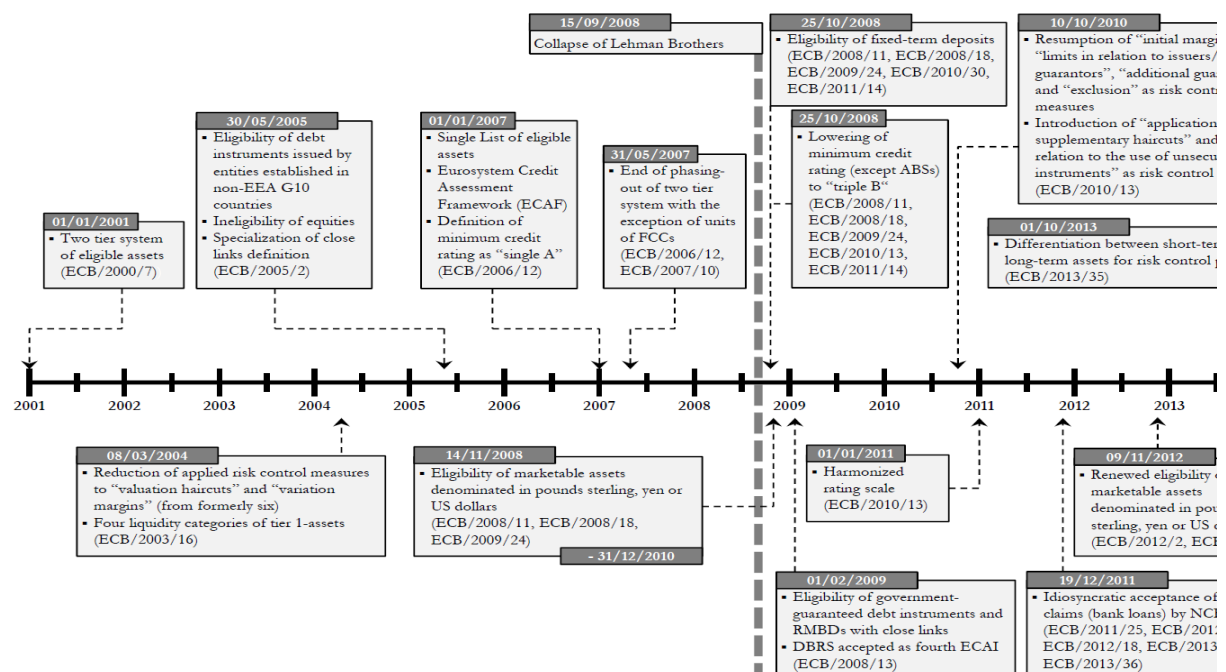


Table 10 - SUR regressions result – Only banks in the top 25% of *Bank Power*

| Variables | Years | | | | | | |
|-------------------|----------|----------|----------|--------|----------|----------|-----------|
| Bank Power | 2002 | 2003 | 2004 | 2005 | 2006 | 2007 | All years |
| G10 | 1.893* | 0.731 | 0.412 | 0.921 | 0.874 | 0.484 | 0.844 |
| Public Only | 0.210 | -1.502 | -0.672 | -0.479 | 0.178 | -0.839 | -0.511 |
| Lending | 2002 | 2003 | 2004 | 2005 | 2006 | 2007 | All years |
| G10 | 1.213*** | 0.451 | 0.722*** | 0.529* | 0.680*** | 0.800*** | 0.679*** |
| Public Only | -0.017 | -0.419 | -0.067 | -0.295 | -0.063 | 0.112 | -0.141 |
| Connections | 2002 | 2003 | 2004 | 2005 | 2006 | 2007 | All years |
| G10 | 12.293* | 5.518 | 2.200 | 5.228 | 2.614 | 7.816 | 4.941 |
| Public Only | 3.376 | -10.422 | -6.068 | -5.425 | -6.290 | -3.980 | -5.480 |
| Degree Centrality | 2002 | 2003 | 2004 | 2005 | 2006 | 2007 | All years |
| G10 | 0.044** | 0.019 | 0.016* | 0.020* | 0.022** | 0.021** | 0.021** |
| Public Only | -0.012 | -0.032** | -0.018 | -0.018 | -0.015 | -0.015 | -0.019* |
| Revolver | 2002 | 2003 | 2004 | 2005 | 2006 | 2007 | All years |
| G10 | 0.094** | 0.076 | 0.115** | 0.081* | 0.027 | 0.076 | 0.072* |
| Public Only | 0.029 | 0.015 | -0.026 | -0.025 | -0.010 | -0.013 | -0.007 |
| Number of | 429 | 631 | 756 | 717 | 819 | 411 | 3763 |
| Observations | | | | | | | |

***, ** and * indicate that the coefficient is significant at 10%, 5% and 1% significance level. Observation level: syndicated-loans portfolio of the lender in a given month. The dependent variables of the SUR regression are *Bank Power*, *Lending*, *Connections*, *Degree Centrality* and *Revolver*. Every SUR regression has *G10* and *Public Only* besides the extra control variables described in Figure 1 - Asset eligibility in the ECB collateral framework (2000-2014)

