On the Nexus between Sovereign Risk and Banking Crises

Franco Fiordelisi[1]
University of Essex, UK

Claudia Girardone[2]
University of Essex, UK

Federica Minnucci[3]
University of Rome Tor Vergata, Italy

Ornella Ricci[4]
University of Roma Tre, Italy

Abstract: The sovereign debt crisis in the euro area highlighted the close connections between the financial health of banks and sovereigns and was associated with higher funding costs and lower private sector credit. In this study, we analyse the dynamics of the co-movement between sovereign and bank credit default swaps (CDS) spreads over five sub-periods over 2010-2018 and evaluate the effects of the announcement and introduction of the Single Resolution Mechanism (SRM). Our evidence demonstrates that the new bail-in regime, which ensures that troubled banks' private debtholders absorb their losses first, before public money could be used to bail them out, significantly reduced the interconnections between sovereign and banking sector risks.

Keywords: Bail-in; Banking crises; Single Resolution Mechanism; Sovereign-Bank Nexus; European Banking.

JEL Codes: G14, G21, G28.

Acknowledgments: We would like to thank Nicola Cetorelli, Mariassunta Giannetti, Iftekhar Hasan, David Marques-Ibanez, Marco Pagano, George Pennacchi, Klaus Schaeck, Jon Williams, Anjan Thakor, and participants at the 2017 International Rome Conference in Money Banking and Finance, the Financial Intermediation Network of European Studies (FINEST) 2018 summer workshop for their helpful comments. This research did not receive any specific grant from funding agencies in the public, commercial, or not-for-profit sectors.

[a] Wivenhoe Park, Colchester CO4 3SQ, UK; +44 (0) 1206 872260; franco.fiordelisi@essex.ac.uk
[b] Wivenhoe Park, Colchester CO4 3SQ, UK; +44 (0) 1206 874156; cgirard@essex.ac.uk
[c] Via Columbia, 2, 00133, Rome, Italy; (39) 067 2595814; federica.minnucci@uniroma2.it
[d] Via S. D'Amico 77, 00145 Rome, Italy; (39) 0657 335 708; ornella.ricci@uniroma3.it

1. Introduction

The tight interconnections in the financial markets between banks and sovereigns have triggered a reduction in market confidence that affected banks' funding costs and increased the risk of crowding out lending to the private sector (EBA, 2013; Dell'Ariccia et al., 2018). Banks are major investors in the sovereign bonds market for a variety of reasons, not least because of regulatory incentives in terms of lower capital and liquidity regulatory requirements (ESRB, 2015; Buch et al., 2016). Historical ties between the sovereign and the domestic banking sector have resulted in regulation treating sovereigns as nominally risk-free. Gros (2017) observes that although banks could satisfy the liquidity coverage ratio using any asset that can quickly be converted into cash, regulations make government bonds de facto the main asset to be used for this purpose. In addition, holding government bonds is important for banks to access the central bank liquidity and they are used in interbank collateralised operations (Allegret et al., 2017). Data on aggregated and country-by-country sovereign exposures of the euro area banking sector reveal that in most countries banks' exposure to domestic sovereign debt exceeded their sovereign counterparts in the euro area, thereby confirming the presence of a pronounced home bias.

In the aftermath of the global financial and economic crises, European Union (EU) governments implemented a wide set of measures aimed at restoring stability in the banking sector, including recapitalizations, asset relief interventions, and liquidity measures other than guarantees (European Commission, 2015). A new structure called a "Banking Union" was also created to unify supervision, reduce the negative feedback between the public sector and banks, and limit fragmentation of markets in Europe. The European Single Resolution Mechanism (SMR) is the second of three pillars of the banking union and aims to ensure an orderly

resolution of failing banks minimizing the impact on the taxpayers and the real economy.[5] It was introduced in 2014 together with the BRRD, i.e. the Banking Recovery and Resolution Directive providing a key bail-in resolution tool that shifts the burden of bank rescue operations from the public finances to the private sector (banks' shareholders and creditors).[6] The SRM applies to all banks that are supervised by the European Central Bank (ECB) and consists of: (i) a Single Resolution Board, a European resolution authority that decides on the central management of future banking crises; and (ii) a Single Resolution Fund (SRF) financed by the banks established in member states.

Since the mid-2010s, a significant body of academic literature has emerged that investigates the joint dynamics of sovereign and banking risks (e.g. Molyneux and Wilson, 2018; Clifton et al., 2017; Goddard, et al., 2018; McKillop et al., 2016). A number of studies focused on the self-enforcing feedback cycle where Eurozone banks, that are heavy buyers of government bonds, suffered significant losses when markets lost confidence in the government's ability to pay back its debt, making them more likely to need a bailout. Much interest has been directed towards understanding the drivers of this relationship and the channels through which sovereign risk can affect bank risk, and vice versa (Singh et al., 2016; Gros, 2017). Yet none of these studies, to the best of our knowledge, investigates the effect of the introduction of the new bail-in framework on the interconnections between the banking sector and sovereigns. This paper

[5] The three pillars of the banking union are: a Single Supervisory Mechanism (SSM), which confers the role of direct banking supervision to the European Central Bank, with the aim to ensure that the largest banks in Europe are independently supervised under common rules; ii) the Single Resolution Mechanism (SRM), which provides common resolution procedures in order to resolve banking crises in an orderly manner and to restore the viability of banking institutions; and iii) a European Deposit Insurance Scheme (EDIS), which aims to provide a stronger and more homogeneous degree of insurance for retail depositors. Most published studies tend to focus on the first pillar (e.g., Carboni et al., 2017).

[6] The SRM was introduced by Regulation EU No. 806/2014 together with the BRRD No. 2014/59/EU and were adopted on 15th July 2014 and 15th May 2014, respectively.

offers a timely investigation that adds new evidence to the literature on the European sovereign debt crisis and resolution regimes.

Specifically, in this paper we empirically examine the co-movement between sovereign and bank CDS over three different phases: pre, during and post bail-in. In the analysis we also take into account of Draghi's pledge to do 'whatever it takes' to preserve the euro. Draghi's commitment to the single currency may have facilitated the start of a new self-reinforcing cycle of slow recovery. Our key hypothesis is that the introduction of the bail-in mechanism had the effect of significantly reducing the degree of interconnectedness between banks and governments' credit risk. The changes in co-movement between the CDS of individual European banks and sovereign CDS over the five sub-periods, are measured using the five-year CDS spreads on senior debt of all European banks and the sovereign five-year CDS spreads on senior debt. In line with our prediction, our findings suggest that the new bail-in regime significantly decreased the interconnection between sovereign and banking sector dynamics. By contributing novel insights into the impact of the bail-in tool, our study can be useful in the designing of the next steps in the European banking regulation and resolution framework aimed at preserving banking sector resilience and limiting the consequences of financial distress.

The rest of this paper is organized as follows. Section 2 reviews the relevant literature and develops our key research hypotheses; Section 3 describes data and methodology; Section 4 discusses the results, and Section 5 presents our robustness checks. Section 6 concludes and offers some policy recommendations.

2. Literature Review and Research Hypothesis

2.1 The dynamics between banks and sovereign risk: A bird's eye view

In recent years, several studies have investigated the channels through which sovereign and bank risk intertwine, and the drivers of the relationship (Kraussl et al., 2016; Singh et al., 2016; Acharya et al., 2014). Banks are typically heavy buyers of home sovereign bonds but any loss of value of government debt affects their funding costs by weakening their balance sheets. In particular, it lowers profitability and increases riskiness making alternative funding more costly and harder to obtain. It also reduces the value of the collateral that banks use to raise funds in the money markets and with their central bank. Besides, banks can be heavily penalized if sovereign rating downgrades translate into lower domestic banks' ratings, a situation that could impair their access to wholesale markets. Banks would also lose in terms of funding benefits that derive from implicit and explicit government safety nets if the state that should intervene in case of distress to preserve financial stability is perceived as weaker (BIS, 2011). Even foreign banks may be affected either directly, if they hold debt of the distressed sovereign; or indirectly, because of cross-border exposures or contagion across sovereign debt markets.

Reinhard and Rogoff (2011) observe that historically a high occurrence of global banking crises has been associated with a high incidence of sovereign defaults on external debt. However, a crisis can also originate in the banking system and leak into the public sector particularly if a country's fiscal position is affected by bailout costs following a government's intervention to support large distressed banks (e.g. Correa and Sapriza, 2014; Kraussl et al., 2016). Other market factors can also be at play that decrease tax revenues, as financial instability affects not just financial and real asset prices but also the overall economy by, for example, increasing unemployment. In Europe, in the aftermath of the global financial crisis, central banks' and

governments' interventions were exceptionally high in an attempt to mitigate risks to financial stability and at the same time supporting the economic activity. As a consequence, public finances suffered a marked deterioration leading to the euro area sovereign debt crisis. With the worsening of the crisis, concerns associated with the interconnectedness between sovereigns and banks increased sharply and post-crisis reforms did not seem sufficient to restore the so much needed credibility and confidence in the euro zone.

The conditions described above, irrespective of how and where they originate, can trigger a self-fulfilling feedback loop between weak banks and sovereign fragility that can be exceptionally dangerous and spiral out of control, so much that some authors have referred to it as a *diabolic* loop (Brunnermeier et al., 2011 and Reichlin, 2013; Bedendo and Colla, 2015, among others). Recent studies provide empirical evidence of this two-way feedback between financial and sovereign credit risk highlighting that bank bailouts transmit risk from banks to sovereigns, leading to a rise in sovereign credit risk and an increase in correlation between sovereign CDS and bank CDS (Acharya et al., 2014; Erce, 2015; Gros, 2017). In a recent theoretical contribution, Fahri and Tirole (2018) suggest that the banking union, with centralized EU supervision, can soften this *deadly embrace*. The implicit bailout protection provided by the government to domestic banks has a higher value in times of crisis and gives incentives to banks to increase risk and diversify "as little as supervision allows them to do". At the same time, governments can obtain assistance or debt forgiveness by other countries, trying to prevent spillovers on their own economy and society. This can lead to lax bank supervision by national supervisors, turning a blind eye on undiversified bank portfolios, while a central unique supervisor should be less prone to this kind of perverse incentive.

2.2 Selected empirical studies on the interconnections between sovereigns and the banking system

In the empirical literature, the interconnections between sovereigns and the banking system have been extensively analysed using different perspectives. Several authors (e.g. González, 2015; Beuselinck et al., 2017; Gibson et al., 2016 and Cabrera et al., 2016) explored the interrelations between banks' stock performance and the deterioration of governments' financial position. Gibson et al. (2016) in particular, examine the impact of sovereign stress, as reflected in both sovereign spreads and sovereign ratings, on bank share prices for a group of five euro area stressed countries. They find that shocks to sovereign spreads fed through to sovereign ratings, which impacted banks' equity prices. Equally, Cabrera et al. (2016) find a significant negative reaction of banks' stocks to news concerning government financial difficulties.

Other studies (Acharya et al., 2018; Allen et., al, 2017; Altavilla et al., 2017; Drago and Gallo, 2017; Almeida et al., 2017; Popov et al., 2015; Gennaioli et al., 2014) look at the impact of sovereign distress on bank lending and on firms' cost of debt, and typically find significant effects on the real economy. Using a panel of emerging and developed countries in the pre-crisis period (1980-2005), Gennaioli et al. (2014) find that government defaults lead to larger declines in private credit in countries where financial institutions are more developed (as measured by a score on "creditor rights") and banks are allowed to be more leveraged and hold more government bonds. More recently, Acharya et al. (2018) measure the relative importance of the three main channels through which the sovereign debt crisis may affect bank lending. Using syndicated loan data between 2006 and 2012, the authors show a credit crunch phenomenon

hitting European firms having pre-crisis lending relationships with banks that suffered from the sovereign debt crisis. Real effects are found in terms of lower employment growth rates, lower levels of investments, and lower sales growth rates. These are mainly due to the 'balance-sheet hit' channel (i.e., the value decreases of banks' pre-existing sovereign debt holdings during the crisis) and the risk-shifting channel (i.e., the incentive to further increase risky holdings, especially for weakly capitalized banks with significant pre-existing sovereign debt exposures). Conversely, the moral suasion channel (i.e., the implicit or explicit pressure by governments on domestic banks in order to increase sovereign bond holdings to face difficulties in refinancing their debt) does not seem to have significantly affected corporate lending.

Focusing on the determinants of banks' sovereign exposures and their effects on lending during and after the crisis, Altavilla et al. (2017) show that banks' sovereign exposures significantly amplified the impact of sovereign stress on bank lending. More precisely, they show that effects of sovereign distress on corporate lending are transferred also cross-border due to a decrease in lending by foreign subsidiaries of stressed-country banks to firms in non-stressed countries. From a different perspective, Drago and Gallo (2017) analyze the impact of sovereign rating changes on European corporate loan spreads highlighting an important transmission channel of the potential negative effects deriving from sovereign rating changes on firms' cost of debt. They find that sovereign downgrades lead to significant increases in the bank loans spread to domestic firms and that this in turn leads to higher firms' borrowing cost. Almeida et al. (2017) find evidence that following a sovereign rating downgrade, firms reduce their investment and reliance on credit markets due to a rising cost of debt. While Popov and Van Horen (2015) found that the syndicated lending of banks located in non-stressed countries, but with significant holdings of sovereign bonds of peripheral countries, decreased considerably during the euro area

sovereign debt crisis. Interestingly, Arslanalp et al. (2014) explore the role of contingent government liabilities, such as explicit deposit insurance programs or implicit guarantees on other liabilities stemming from potential government intervention aimed either at avoiding bank bailouts or to restore confidence. The authors propose a method to construct a contingent liability index (CLI) for a banking sector that allows to track potential government liabilities related to bank failures. Their findings highlight an increase in contingent liabilities related to bank failures from 2006 to 2013 that is related to a sizeable increase in sovereign CDS, particularly during the crisis period and for emerging markets.

On cross-border spillover effects deriving from financial distress during the Eurozone crisis, Pagano and Sedunov (2016) shows empirically that the systemic risk of a country's banking sector and the risk of sovereign governments are intertwined: banks' aggregate systemic risk exposure can affect the probability of a country's default and this effect is stronger during a crisis period. The authors find evidence of spillovers to occur on a cross-border basis through the financial sector that works as an indirect channel in destabilizing a foreign country's domestic sovereign debt markets. Employing data from the IMF's Coordinated Portfolio Investment Survey (CPIS) between end-2009 and end-2011, Beck et al. (2016) find that foreign (non-euro area) investors disproportionately reduced their holdings of bond securities of stressed euro area countries during the sovereign debt crisis. Their findings suggest that capital flight to non-stressed euro area countries was the main contributor to the excessive volatility in intra-euro area financial debt flows. With regard to the systemic risk of European banks during the euro sovereign debt crisis, Black et al. (2016) find that systemic risk was largely due to sovereign default spread in a study of globally systemically important banks and using a hypothetical distress insurance premium as a measure of systemic risk.

2.2.1 The impact of the Banking Union implementation on the sovereign-bank feedback loop

The empirical literature has also begun to provide evidence on the impact of the banking union's implementation on the feedback loop between sovereign and bank risks. Recent studies by Schäfer et al. (2017); Neuberg et al. (2018); Giuliana (2019); Fiordelisi et al. (2020) focus on investors' reaction to bail-in announcements, and usually find a decrease in investors' expectations about bailout interventions hence, concluding in favor of bail-in credibility. Specifically, Schaefer et al. (2017) estimate the stock price and credit default swap (CDS) reaction to several actual bail-in episodes (i.e. Danish Bank Amagerbanken, Dutch Bank SNS Real, Cyprus banks and Portuguese bank Banco Espirito Santo) and to regulatory announcements related to the BRRD from June 2013 to April 2014. The authors find evidence of a risk premia increase for all banks (due to the investors' expectations of no future government interventions) suggesting that the new bail-in mechanism reduces bailout expectations. Similar results for the reaction of stock prices have been found in Fiordelisi et al. (2020), considering a larger set of regulatory announcements – dating back to 2010, when the European Commission first released its new crisis management plan – and a wider sample of banking institutions, located not only in the euro area, but also in EU countries outside the monetary union.

Neuberg et al. (2018) estimate bail-in expectations by exploiting a 2014 change in the International Swaps and Derivatives Association (ISDA) definition of credit default swaps (CDS) for European banks, updated in order to cover losses from government interventions and related bail-in events. The authors consider the difference between the old and the new CDS spreads (called *basis*) as the market price of protection against losses from certain government actions. The main results show that the basis experienced an initial downward trend from 2014 to

2016. However, this decrease in bail-in expectations has been followed by an upward trend in the basis, suggesting a reversal in the credibility of the bail-in instrument. The authors also explore the relationship between changes in average sovereign CDS spreads and changes in the average relative basis (controlling for several other variables), but they do not find significant results.

Giuliana (2019) explores the reaction to the bail-in introduction focusing on debt markets, considering the difference in yields between banks' bail-inable and non-bail-inable bonds. The main result is that the yield spread between bail-inable and non-bail-inable bonds grows significantly after events signaling an increase in authorities' commitment to bail-in (both real bail-in cases, such as the Cyprus rescue plan, and regulatory announcements, such as the BRRD approval). Several robustness checks exclude that this change in spread is due to a generic rise in bank instability rather than to a widening of bail-in expectations.

To our knowledge, there are no papers investigating the effect of the introduction of the new bail-in mechanism on the interconnections between the banking sector and sovereigns, measured by the co-movement effects between bank CDS and sovereign CDS. A recent paper by Fratzscher and Rieth (2019) focuses on this co-movement using a system of simultaneous equations identified through heteroskedasticity. However, this study analyses the impact of bank bailout policies and ECB unconventional monetary policy but does not consider the effect of the bail-in introduction. Results provide evidence that sovereign risk was the most important driver of the sovereign-bank risk nexus and that there were large spillovers between core and periphery countries in the euro area. Furthermore, bank rescue policies, through capital injections, debt guarantees, or deposit guarantees have reduced both bank and sovereign credit risks. At the same time, non-standard monetary policy measures lowered these risks in most - but not all - cases.

2.3 Main Research hypothesis

The present study complements the different strands of empirical literature reviewed above and tests the effects of the announcement and introduction of the bail-in regime that holds shareholders and bondholders responsible for a bank's risk in case of failure. In particular, we identify the linkages between bank CDS and sovereign CDS in the pre-, during- and post-bail in phases. We conjecture that by reducing the negative effect of banking crises on public finances, a bail-in has the effect of decreasing the interconnection between banks and sovereign risk as measured by the co-movement between the CDS spreads of banks and sovereign countries. This should strengthen market discipline, increase the resilience of the banking sector to financial distress and avoid the deterioration of governments' public finances. Most importantly, it should weaken the interconnection between banking sector and sovereign risk (Correa and Sapriza, 2014; De Bruyckere et al., 2016). Therefore, our research hypothesis can be formulated as follows:

H1 The nexus between sovereign distress and banking crisis significantly decreased following the introduction of the bail-in regime

Acharya et al. (2014) find evidence of a positive co-movement between sovereign and bank credit risk during the post-bailout, i.e. a sovereign-bank feedback loop. In this study, we hypothesize that during the post bail-in phase this co-movement effect is reduced. This would provide evidence of the bail-in mechanism as an effective crisis management tool that can reduce the interconnection between the sovereign and banks' credit risk, rendering the financial and economic system more stable to exogenous shocks. To verify this effect empirically, we also create a control sample using data from US and Japan's banking institutions, since for these

countries there was no 'treatment' in terms of policy changes in the resolution framework during the adoption of the new bail-in mechanism in Europe (see, for more details, Section 3).

3. Data and Methodology

3.1 Data Sources

Sovereign and bank CDS data are collected from *Bloomberg*. We employ five-year CDS contracts on senior debt securities because they are typically more liquid than other maturities, as observed e.g. in Black et al. (2016). Acharya et al. (2014) also note that the standardization and liquidity of CDS rates have important advantages over bond yield spreads. The sample includes the five largest European banking sectors (France, Germany, Italy, Spain and the UK) and both EU core and peripheral countries are covered. Only banks' CDS with relevant observations in each sub-period are included in the sample to address the variation of the coefficients of the model to the same banks over the pre-, during- and post-bail-in phases. Table 1 reports the list of banks included in the main sample as well as in the control group (US and Japanese banks).

[Insert Table 1 about here]

The sample spans from 1 January 2010 to 30 September 2018 and can be split into five main phases as shown in Figure 1.

[Insert Figure 1 about here]

The timeline includes an initial phase, the *pre-bail-in* that spans from 1 January 2010, to 5 January 2011, the day before the European Commission (EC)'s statement proposing for the first time to extend national resolution regimes to include a debt write-down tool. The next phase is the *during-bail-in* (from 6th January 2011 to 14th April 2014), that ends the day before the official approval of the new EC's policy. To separate the effects of the recent sovereign debt

crisis on European banks' CDS, we split this phase into two sub-periods: from 6th January 2011 to 25th July 2012 and from 26th July 2012 up to 14th April 2014. The date of the 'whatever it takes' Draghi's speech is chosen as cutting point as it reflects the ECB's commitments to preserve the single currency. Finally, the *post-bail-in period* covering the implementation phase (from 15th April 2014 to 30th September 2018). This phase is also divided into two different sub-phases (from 15th April 2014 to 31st December 2015 and from 1st January 2016 to 30th September 2018 respectively) in order to isolate the period when the Single Resolution Mechanism become fully operational, from 1st January 2016. The announcements dealing with the introduction of the bail-in as a new crisis management tool are collected from the EC's institutional website, *Banking Crisis Management* press releases. More details regarding the EC's policy announcements are provided in Appendix C.

3.2 Methodological issues

3.2.1 Baseline model

Following Acharya et al. (2014), we employ a linear regression model to test the theoretical prediction of a significant reduction in the co-movement between the credit risk of the sovereign and that of the banking sector, during the post-bailout phase. The model allows us to estimate the effects on banks' credit risk, derived from changes in sovereign CDS where the banks are based over the five different periods, as shown in Equation (1):

$$\Delta Bank\_CDS_{ijt} = \alpha \mid \beta \Delta Sov\_CDS_{jt} \mid \sum mkt_{controls} \mid \sum bank_{controls} \mid \mu_t \mid \theta_t \mid \varepsilon_{ijt} \quad (1)$$

where $\Delta BankCDS_{ijt}$ is the daily change in the natural logarithm of the CDS rate of bank i headquartered in country j from day t to $t+1$; $\Delta SovCDS_{jt}$ is the daily change in the natural

logarithm of the sovereign CDS of country *j*. We include a wide set of control variables at both the market and the bank level. At the market level, we consider daily values for the *VIX* index. As suggested in Longstaff et al. (2011), we control for the main global factors governing changes in CDS spreads, which are the US stock market returns (captured by the MSCI US index) and changes in the spread between BB and BBB industrial bond indexes (measured by the difference between the USD US Industrial BBB Zero Coupon Yield 5 Year and the USD US Industrial BB Zero Coupon Yield 5 Year indexes, available in Bloomberg). At the bank level, following Acharya et al. (2014), we consider daily equity returns. In addition, we control for the following balance sheet variables, available at the year level: size (i.e., the natural log of total assets, *ln_ta*); capitalization (i.e., the ratio between total equity and total assets, *eta*); profitability (measured by the Return on Assets, *roa*); holding of domestic sovereign bonds (i.e., the ratio of domestic sovereign bonds to total assets, *dom_gov_bond_ta*). We also include bank and time (monthly) fixed effects.

The coefficient of interest is β that identifies the intensity of the correlation between banks' and sovereigns' CDS spreads. We calculate standard errors clustered at the bank level. Since we have few clusters in our sample, we run some robustness checks. First, as suggested by Petersen (2009), we increase the number of groups by clustering on two dimensions simultaneously (i.e., bank and time): in such a way, we have 20 banks and 117 months, rather than just 20 banks. Second, we perform a wild cluster bootstrap of the regression errors, as suggested by Cameron et al. (2008)[7] and implemented in several recent finance papers (e.g., Brown et al., 2009; Dick-Nielsen et al., 2012). Thus, in each table of results, we include a footnote referring to the p-value of our coefficients of interest after bootstrapping.

[7] We thank an anonymous referee for this suggestion.

The summary statistics on the variables employed in the model described above are reported in Table 2 for the whole period (Panel A) and before and after the bail-in approval (15 April 2014, Panel B).

[Insert Table 2 about here]

For the purposes of our analysis, the most important control variable is the ratio between domestic government bonds and total assets. This is because, with respect to the bail-in introduction, the reduction of sovereign bond holdings maybe an alternative explanation for the decrease in the co-movement between bank and sovereign CDS. However, running a t-test of difference in mean for the periods before and after the bail-in introduction (15 April 2014), we find that the sovereign bond holdings, on average, is increased rather than reduced for European banks (moving from 3.7% before the BRRD approval to 4.4% after). This finding is consistent with other studies (e.g. Altavilla et al., 2017) and confirms that the variation in sovereign exposures should not be considered as an alternative factor affecting the loop between banks and sovereigns.

For our research hypothesis to be supported, a significant reaction to the announcement by the EC of the official approval of the bail-in mechanism should be observed. Specifically, the variable $\Delta SovCDS_{ijt}$ should have a considerably lower impact on changes in banks' CDS during the post bail-in implementation phase. This is due to the absence of a government safety net and financial support to the banking sector in case of financial distress.

This baseline model enables us to identify which announcement related to the new bail-in regime was more effective in decreasing the correlation between bank and sovereign CDS. On a theoretical basis, we expect that the announcement of the new bail-in mechanism (15 April 2014) was more relevant than its effective implementation (since January 2016). If this is confirmed by

the data, we can use the 15 April 2014 as the treatment date for the difference-in-difference estimation explained in the next section. Overall, the baseline model provides us with important preliminary results on the bail-in effect over the nexus between bank and sovereign risks.

3.2.2 Identification Strategy

We employ a difference-in-difference (DID) estimation framework to investigate whether treated banks, i.e. European banks after the bail-in official approval by the EC, react differently than their untreated (pre- bail-in and non-European) counterparts. DID estimations are based on the parallel trends assumption that in the absence of the treatment (the introduction of the bail-in), the average outcomes (in our case changes in bank risk) for both treated and control groups would have followed parallel paths over time.

We use as control group US and Japanese banks with liquid CDS available in Bloomberg. The resulting control sample includes 11 banks and spans from 2010 to 2018 so that to isolate the effect of the sub-prime crisis on US banks' CDS. For completeness, in Figure 2 we report the CDS trends for European banks and for the banks included in the control group for the whole investigated period. We observe that European, US, and Japanese banks' average CDS have followed a parallel trend from the beginning of the sample to April 2014, considering also the higher intensity for US banks during the most acute phase of the financial crisis and for European banks during the sovereign debt crisis, especially before the pre-bail-in introduction.

[Insert Figure 2 about here]

Further, we identify the effect of the bail-in adoption on the relationship between sovereigns and banks CDS by estimating the following regression model:

$$\Delta Bank\_CDS_{ijt} = \alpha + \beta EU + \gamma post + \tau \Delta Sov\_CDS_{jt} + \rho EU * post + \delta EU * \Delta Sov_{CDS_{jt}} + \vartheta EU * \Delta Sov_{CDS_{jt}} + \pi EU * post * \Delta Sov_{CDS_{jt}} + \sum mkt_{controls} + \sum bank_{controls} + \theta_t + \varepsilon_{ijt} \quad (2)$$

In Equation (2) the dependent variable is the daily change in the natural logarithm of bank CDS spreads measured at time *t* in country *j* for bank *i*. The model is a traditional DID model with all interaction terms. *EU* takes the value of 1 for all European banks (treated banks), and 0 for both US and Japanese banks. *Post* takes the value of 1 after the bail-in approval (i.e., from 15 April 2014 onward), and 0 before the bail-in approval (i.e., up to 14 April 2014). The coefficient π provides information about the causal effect of the bail-in approval on banks' CDS: a positive coefficient indicates an increase in the co-movement between bank and sovereign CDS because of the "bail-in treatment", while a negative slop reveals a reduction. We also use a different specification in which we include bank fixed effects; in this case, it is not possible to consider the EU dummy (which is time invariant), but we can include bank fixed effects to consider potential unobservable variables, which are firm-specific and time invariant. We use the same robustness checks as in previous models to overcome the problem of few clusters.

Although there have been other regulatory reforms in banking (e.g. the launch of new Basel 3 regulatory tools, as liquidity and leverage ratios, the development of regular stress test exercises) both in the US and Europe during the time period analyzed in the paper (2010-2018), we discuss in Appendix B why these reforms cannot be reasonably considered as confounding factors in our identification.

4. Empirical results

Table 3 reports the results obtained through the application of the model described in Equation (1). The estimates for the whole period under investigation (January 2010 to September 2018) are shown in Panel A and provide evidence of a strong interconnections between bank and sovereign CDS. In Column (1), we include market controls and bank fixed effects; in Column (2), we add controls at the bank level and cluster the standard errors at the bank level; in Column (3), we also incorporate monthly fixed effects and standard errors are clustered at both bank and time levels. In Panel B of Table 3, we report our main findings related to the impact of sovereign credit risk changes on bank CDS spreads over five different sub-periods as illustrated in Figure 1 (above).

In the pre-bail in period (column 1), we find evidence of a positive and statistically significant relationship between bank and sovereign credit risk. We only report the complete models with both market and bank control variables, including also bank and monthly fixed effects. However, our findings are substantially the same using more parsimonious specifications. These results suggest a significant degree of association between sovereigns and banks, *prior* to the policy announcement on the launch by the EC of a consultation on technical details relating to the definition of the new crisis management framework for the European banking sector.

During the bail-in phase, from the EC's proposal to introduce a debt write down tool to the day before the official approval of BRRD, we explore in detail the sovereign-bank interconnectedness by distinguishing between two periods. Results reported in column (2) show that from 6th January 2011 to 25th July 2012, the bank-sovereign CDS co-movements increased compared to the previous period, as shown by the magnitude of β that is positive and statistically

significant at the 1 per cent level. An explanation of the increase in the correlation between sovereign and bank credit risk during this timeframe is that throughout this period the Eurozone and, indeed, the entire European Union, had suffered from the sovereign debt crisis during which banks' CDS spreads peaked sharply; on this regard, it is to be considered the preponderant banks' balance sheets exposure to home sovereigns, as highlighted by the European Banking Authority (2014). In the aftermath of Draghi's speech on 26th July 2012 (column 3), we find that the bank-sovereign CDS correlation is still positive and statistically significant, although the intensity of this co-movement is reduced.

Finally, the effects of sovereign CDS on bank CDS in the aftermath of the BRRD introduction are also analysed. Results reveal that the coefficient of the independent variable *ΔSovCDS* remains positive and statistically significant during the entire post-bail-in period, however the intensity of the co-movement between bank CDS and sovereign CDS declines considerably, compared to the value of the coefficient in the pre-bail-in period. This empirical evidence has important policy implications since while throughout the period covering the recent sovereign debt crisis an increase in sovereign CDS determines a strong increase in bank CDS, during the post-bail-in period an equal increase in sovereign CDS seems to be associated to a considerably lower increase in bank CDS.

Results explained above highlight that there is a sovereign-bank interconnectedness throughout all the periods analysed, although significant variations are found in the intensity of the sovereign-bank credit risk co-movement over each sub-period. More generally, the magnitude of the coefficient provides important information on the effectiveness of bail-in introduction. During the post-bail-in period there is still a significant correlation between bank and sovereign credit risk, mainly due to the presence in our sample of available CDS referring to

large institutions, i.e. too-big-to-fail institutions, characterized by relevant links with their respective sovereigns in the previous years. Overall, we find some preliminary evidence in favour of our research hypothesis. In addition, and consistently with our expectations it seems that the announcement date determining the largest reduction in the nexus between the bank and sovereign risk is the 15th April 2014.

Finally, one may raise some doubts about the comparison of coefficients' magnitude across different regression models. For this reason, we also report results from a model including interaction terms between our main variable of interest, measuring change in sovereign credit risk, and categorical variables indicating the periods before, during and post bail-in (post bail-in is the omitted one). Results are reported in Table 3, Panel C and confirm that the co-movement between bank and sovereign CDS was stronger in the pre bail-in and in the during bail-in phases rather than in the post bail-in period.

Table 4 provides results from the application of the DID approach that allows us to verify whether treated banks i.e. EU banks after the bail-in approval on 15 April 2014, react differently compared to untreated banks. The table shows that the bank-sovereign CDS co-movement coefficient (*ΔSovCDS*) remains positive and statistically significant at the 1% level after the bail-in approval. Models 1 and 2 are classical DID models in which we consider all possible interaction terms from Equation (2). The coefficient for *EU*×*PostBail-in* is negative and statistically significant at the 1% level providing evidence of a general market perception of the lower risks associated with the banking sector. The negative and statistically significant coefficient for the treatment effect *EU*×*PostBail-in* × *ΔlnSovCDS* indicates that treated European banks (i.e., after 15th April 2014) after the bail-in approval become less sensitive to sovereign CDS spread.

These findings hold also for the model with monthly and bank fixed effects (Model 3).

5. Robustness checks

On 22 September 2014 the ISDA changed the terms of the CDS contracts on European banks, by adding government intervention and bail-in as possible default events that would trigger the payment of the protection leg. In our study we used time-series of CDS contracts compliant with the new 2014 definitions since they are available. However, in order to make sure that our results are not biased by this change, we re-estimate all our main models excluding one month before and one month after the change.

All models are reported in Appendix A and show that our results remain substantially unaltered.

6. Conclusions

In the wake of the global financial crisis, central banks and governments' interventions were exceptionally high in an attempt to mitigate risks to financial stability and at the same time supporting the economic activity. As a consequence, public finances experienced a financial degradation leading to the euro area sovereign debt crisis. With the worsening of the crisis, concerns associated with the interconnectedness between sovereigns and banks increased. This paper contributes to the strand of literature analysing the determinants of the co-movement between sovereign and bank credit risk proxied by CDS spreads. It provides empirical evidence on the reduction of bank-sovereign interconnectedness in the aftermath of the official approval of the EC's Banking Recovery and Resolution Directive introducing the bail-in resolution tool.

Following Acharya et al. (2014)'s model, the entire timeframe, starting from 1 January 2010 and ending 30 September 2018, is divided into five phases. After controlling for market-wide volatility results, we provide evidence of the existence of bank-sovereign credit risk interconnections in Europe despite a shifting intensity from peaks observed before the BRRD official approval in April 2014, to the considerably lower coefficients during the post-bail-in phase. More precisely, results suggest that the bail-in introduction represents a turning point in the bank-sovereign credit risk co-movement in the EU. The adoption of the counterfactual analysis extended to Japan and US banks' CDS provides further support for the decreasing intercorrelation between banks' and sovereigns' credit risk in the EU, showing a reduction in bank-sovereign CDS co-movement for treated European banks.

In terms of policy implications, this paper offers some interesting insights on the interconnection between sovereign and bank credit risk. First, results obtained during the post-bail-in period highlight that the introduction of this key resolution tool, by avoiding public bail-out interventions, is effective in reducing credit risk interlinkages between sovereign and banks. Nevertheless, the fact that the co-movements between sovereign and bank CDS spreads remain positive and significant seem to confirm that the issue has not been completely solved. Therefore, results suggest the need to intervene also on persisting transmission channels, namely the sovereign bond holding channel, provided that there is still no measure adopted, in order to avoid excessive sovereign bond holdings directly affecting banks' balance sheets. The interconnections between sovereigns and banks determine the amplification of shocks leading to financial instability and the introduction of the bail-in resolution regime should strengthen market discipline, thereby increasing the resilience of the banking sector to financial distress. If this is the case, the vicious cycle could convert into what could be defined as a holy loop, i.e. a

virtuous spiral that self-fulfils to economic recovery. However, as recently observed by Gros (2017) and Dell'Ariccia et al. (2018) the sovereign-bank nexus still limits credibility and reforms are needed that should incentivise the private sector to hold more domestic sovereign debt.

References

Acharya V.V., Eisert T., Eufinger C. and Hirsch C. (2018). "Real Effects of the Sovereign Debt Crisis in Europe: Evidence from Syndicated Loans", The Review of Financial Studies, 31, 2855-2896.

Acharya V., Drechsler I. and Schnabl P. (2014) "A Pyrrhic Victory? Bank Bailouts and Sovereign Credit Risk", The Journal of Finance, 69, 2689-2739

Akhigbe A., Martin A.D. and Whyte A.M. (2016) "Dodd-Frank and Risk in the Financial Services Industry", Review of Quantitative Finance and Accounting, 47, 395–415.

Allegret J. P., Raymond H. and Rharrabti H. (2017) "The Impact of the European Sovereign Debt Crisis on Banks Stocks. Some Evidence of Shift Contagion in Europe" Journal of Banking and Finance, 74, 24–37.

Allen, F., Jackowicz, K., Kowalewski, O., and L. Kozłowski (2017) "Bank lending, crises, and changing ownership structure in Central and Eastern European countries", Journal of Corporate Finance, 42, 494-515.

Almeida H., Cunha I., Ferreira M.A. and Restrepo F. (2017) "The Real Effects of Credit Ratings: The Sovereign Ceiling Channel", The Journal of Finance, LXXII, No. 1.

Altavilla C., Pagano M. and Simonelli S. (2017) "Bank Exposures and Sovereign Stress Transmission", Review of Finance, 2103–2139.

Ari A. (2016), Sovereign Risk and Bank Risk-Taking, European Central Bank Working Paper Series No. 1894.

Arslanalp S. and Liaob Y. (2014) "Banking Sector Contingent Liabilities and Sovereign Risk", Journal of Empirical Finance, 29, 316–330.

Balasubramnian B. and Cyree K.B. (2014) "Has Market Discipline on Banks Improved after the Dodd–Frank Act?", Journal of Banking & Finance, 41, 155–166.

Baum C.F., Schäfer D. and Stephan A. (2016) "Credit Rating Agency Downgrades and the Eurozone Sovereign Debt Crises", Journal of Financial Stability, 24, 117–131.

Beck R., Georgiadis G., and Gräb J. (2016) "The Geography of the Great Rebalancing in Euro Area Bond Markets During the Sovereign Debt Crisis", Journal of Empirical Finance, 38, 449–460.

Bedendo M., and Colla P. (2015) "Sovereign and corporate credit risk: Evidence from the Eurozone", Journal of Corporate Finance, 33, 34-52.

Beuselinck C., Cao L., Deloof M., and X. Xia (2017) "The value of government ownership during the global financial crisis", Journal of Corporate Finance, 42, 481-493.

Black L., Correa R., Huang X. and Zhou H. (2016) "The Systemic Risk of European Banks During the Financial and Sovereign Debt Crises", Journal of Banking & Finance, 63, 107–125.

Brown M., Jappelli T., Pagano M. (2009) "Information sharing and credit: Firm-level evidence from transition countries", Journal of Financial Intermediation, 18, 151–172.

Buch C. M., Koetter M. and Ohls J. (2016) "Banks and Sovereign risk: A Granular View", Journal of Financial Stability, 25, 1–15.

Cabrera M., Dwyer G. P., Samartin-Saénz M. (2016), "Government Finances and Bank Bailouts: Evidence from European Stock Markets", Journal of Empirical Finance, 39, 169-179.

Cameron A.C., Gelbach J.B., Miller D.L. (2008) "Bootstrap-based improvements for inference with clustered standard errors", Review of Economics and Statistics, 90, 414-427.

Carboni M., Fiordelisi F., Ricci O. and Stentella Lopes F.S. (2017) "Surprised or Not Surprised? The Investors' Reaction to the Comprehensive Assessment Preceding the Launch of the Banking Union", Journal of Banking & Finance 74, 122-132.

Chen V., Godwin A. and Ramsay I. (2016), "Cross-Border Cooperation In Bank Resolution: A Framework For Asia Singapore", Journal of Legal Studies, 1-28.

Clifton J., García-Olalla M., and Molyneux P. (2017). "Introduction to the special issue: new perspectives on regulating banks after the global financial crisis", Journal of Economic Policy Reform, 20, 193-198.

Correa R. and Sapriza H. (2014) "Sovereign Debt Crises", International Finance Discussion Papers No. 1104.

De Bruyckere V., Gerhardt M., Schepens G. and Vander Vennet R. (2013), "Bank-Sovereign risk spillover in the European debt crisis", Journal of Banking & Finance, 37, 4793-4809.

Dell'Ariccia G., Martinez Peria M.S., Igan D., Awadzi E.A., Dobler M. and Sandri D. (2018), Trade-Offs In Bank Resolutions, IMF Staff Discussion Note, 2018/02.

Dick-Nielsen J., Feldh P., Lando D. (2012) "Corporate bond liquidity before and after the onset of the subprime crisis", Journal of Financial Economics, 103, 471-492.

Drago D. and Gallo R. (2017) "The Impact of Sovereign Rating Changes on European Syndicated Loan Spreads: The Role of the Rating-Based Regulation", Journal of International Money and Finance, 73, 213–231.

EBA (2013) Risk Assessment of the European Banking System, European Banking Authority.

EBA (2014) Results of 2014 EU-Wide stress test, European Banking Authority.

Erce A. (2015) Bank and Sovereign Risk Feedback Loops, European Stability Mechanisms, Working Paper No. 1.

ESRB (2015) Report on the Regulatory Treatment of Sovereign Exposures.

European Commission (EC) (2015) "Competition State Aid brief".

Farhi E., Tirole J. (2018), "Deadly Embrace. Sovereign and Financial Balance Sheets Doom Loops" Review of economic studies, 85, 1781-1823

Fiordelisi F., Minnucci F., Previati D., Ricci O. (2020). "Bail-in regulation and stock market reaction", Economics Letters, 186, January, 108801

Financial Stability Board (2014) "Key Attributes of Effective Resolution Regimes for Financial Institutions".

Fratzscher M., Rieth M. (2019). "Monetary Policy, Bank Bailouts and the Sovereign-Bank Risk Nexus in the Euro Area", Review of Finance 23, 745–775.

Gao Y., Liao S., Wang X. (2018), "Capital Markets' Assessment of the Economic Impact of the Dodd–Frank Act on Systemically Important Financial Firms" Journal of Banking & Finance, 86, 204–223.

Gennaioli N., Martin A., Rossi S. (2014) "Sovereign Default, Domestic Banks, and Financial Institutions", The Journal of Finance, 69, 819-866.

Gibson H. D., Hall S. G. and Tavlas G. S. (2016) "How the Euro-Area Sovereign-Debt Crisis Led to a Collapse in Bank Equity Prices", Journal of Financial Stability, 26, 266–275.

Giuliana, R. (2019), "Impact of Bail-In on Banks' Bond Yields and Market Discipline" (January 8, 2019). Available at SSRN: https://ssrn.com/abstract=2935259 or http://dx.doi.org/10.2139/ssrn.2935259

Goddard J., Molyneux P., and Wilson J.O.S. (2018). "Banking in Europe: Integration, Reform and the Road to a Banking Union". In Berger, A., Molyneux, P. and Wilson, J.O.S. (eds), *Oxford Handbook of Banking, 3rd Edition*. Oxford: Oxford University Press.

González V.M., (2015). "The financial crisis and corporate debt maturity: The role of banking structure", Journal of Corporate Finance, 35, 310-328.

Gros D. (2017) "Banks as Buyers of Last Resort for Government Bonds?" CEPS Policy Insights, No. 2017/43, November.

IMF (2017) "Japan Financial System Stability Assessment" Country Report No. 17/244.

Kraussl R., Lehnert T., Stefanova D. (2016) "The European Sovereign Debt Crisis: What We Have Learned?", Journal of Empirical Finance, 38, 363–373.

McKillop D., Goddard, J., and Wilson J.O.S. (2016). "Regulatory Change and Capital Adjustment of US Credit Unions", Journal of Financial Services Research, 50, 29-55.

Molyneux P., and Wilson J.O.S. (2017). "Contemporary issues in banking", The British Accounting Review, 49, 117-120.

Neuberg R., Glasserman P., Kay B., and Rajan S. (2018), "The Market-Implied Probability of Government Support for Distressed European Banks (November 23, 2018). OFR WP 16-10; Columbia Business School Research Paper No. 16-73. Available at SSRN: https://ssrn.com/abstract=2851177 or http://dx.doi.org/10.2139/ssrn.2851177

Pagano M. S., Sedunov J. (2016) "A Comprehensive Approach to Measuring the Relation Between Systemic Risk Exposure and Sovereign Debt", Journal of Financial Stability 23, 62–78.

Petersen M.A. (2009) "Estimating Standard Errors in Finance Panel Data Sets: Comparing Approaches", The Review of Financial Studies, 22, 435-480.

Popov A. And Van Horen N. (2015) "Exporting Sovereign Stress: Evidence from Syndicated Bank Lending during the Euro Area Sovereign Debt Crisis", Review of Finance, 19, 1825–1866.

Reinhart C.M., Rogoff, K.S. (2011), “From Financial Crash to Debt Crisis”, American Economic Review, 101, 1676-1706.

Schaefer A., Schnabel I., Weder B. (2017). “Bail-in expectations for European banks: Actions speak louder than words”. Discussion paper, CEPR No. DP11061.

Singh M.K, Gomez-Puig M. and Sosvilla-Rivero (2016) “Sovereign-Bank Linkages: Quantifying Directional Intensity of Risk Transfers in EMU Countries”, Journal of International Money and Finance 63,137–164.

Table 1

List of sampled banks

Table 1 presents the 20 banks included in the cross-sectional analysis and the 11 banks added in the control group. The home country for each bank is also reported. Only banks with liquid CDS and with sufficient observations for all control variables are included in the sample.

Banks	Country
Danske Bank	Denmark
BNP Paribas	France
Crédit Agricole	France
Société Générale	France
Commerzbank	Germany
Deutsche Bank	Germany
Intesa Sanpaolo	Italy
Mediobanca	Italy
Monte dei Paschi di Siena	Italy
Unicredit	Italy
ING	Netherlands
Banco Comercial Portugues	Portugal
BBVA	Spain
Banco Popular	Spain
Banco Santander	Spain
Svenska Handelsbanken	Sweden
Barclays Bank	United Kingdom
HSBC Bank	United Kingdom
Lloyds Bank	United Kingdom
Royal Bank of Scotland	United Kingdom

Banks	Country
Mizuho	Japan
MUFG (Bank of Tokyo-Mitsubishi)	Japan
Nomura	Japan
Sumitomo Mitsui	Japan
Bank of America	United States
Charles Schwab Corp	United States
Citigroup	United States
Goldman Sachs	United States
JPMorgan Chase	United States
Morgan Stanley	United States
Wells Fargo	United States

Source: Bloomberg.

Table 2

Descriptive statistics

The table reports the summary statistics for the variables used in our models. All ratios are winsorized at the 1st and 99th percentile (except the ratio of domestic government bonds over total assets, winsorized at the 5th and 95th percentile).

Panel A - Summary statistics over the whole investigated period

VARIABLE	Obs.	Mean	Std. Dev.	Min.	Max
EUROPEAN BANKS					
CDS	30,128	170.3381	159.6177	16.7330	1739.0510
SOV_CDS	30,128	117.2632	139.1205	8.4340	1483.8460
EQ_RET	30,128	0.0001	0.0282	-0.3923	0.4080
LN_TA	30,128	13.5748	1.0570	11.1537	15.0905
E_TA	30,128	0.0544	0.0191	0.0247	0.1265
DOM_GOV_BOND_TA	30,128	0.0397	0.0350	0.0004	0.1240
ROA	30,128	0.0022	0.0064	-0.0314	0.0152
JAPANESE BANKS					
CDS	4,307	121.3239	77.3582	39.5180	493.6670
SOV_CDS	4,307	70.2028	26.4057	31.8300	157.2090
EQ_RET	4,307	0.0005	0.0216	-0.1284	0.1107
LN_TA	4,307	19.4436	1.5306	17.0279	21.2771
E_TA	4,307	0.0507	0.0126	0.0247	0.0660
DOM_GOV_BOND_TA	4,307	0.0648	0.0436	0.0045	0.1240
ROA	4,307	0.0036	0.0073	-0.0314	0.0088
US BANKS					
CDS	11,363	117.0082	81.1523	33.3430	665.5320
SOV_CDS	11,363	136.0280	57.4208	65.3230	479.6800
EQ_RET	11,363	0.0004	0.0268	-0.4947	0.3228
LN_TA	11,363	14.0662	0.7332	11.2310	14.7797
E_TA	11,363	0.0960	0.0151	0.0605	0.1265
DOM_GOV_BOND_TA	11,363	0.0583	0.0360	0.0034	0.1424
ROA	11,363	0.0107	0.0054	-0.0042	0.0200
MARKET CONTROLS					
VIX_INDEX	45,798	19.0388	7.7747	9.1400	56.6500
MSCI_US_ADJ CLOSE	45,798	47.8417	29.1448	12.3894	179.8339
CB_SPREAD	45,798	1.6843	1.0141	-0.2460	6.7750

Source: Bloomberg Professional, Datastream, SNL Financial, banks' websites.

Panel B - Summary statistics before and after bail-in approval (15 April 2014)

EUROPE	PRE BAIL-IN		POST BAIL-IN		TEST OF DIFF
	OBS.	MEAN	OBS.	MEAN	P-VALUE
CDS	18,580	204.100	11,548	116.018	0.0000
SOV_CDS	18,580	147.878	11,548	68.005	0.0000
EQ_RET	18,580	0.000	11,548	-0.000	0.1783
LN_TA	18,580	13.626	11,548	13.493	0.0000
E_TA	18,580	0.050	11,548	0.061	0.0000
DOM_GOV_BOND_TA	18,580	0.037	11,548	0.044	0.0000
ROA	18,580	0.002	11,548	0.003	0.0000

UNITED STATES	PRE BAIL-IN		POST BAIL-IN		TEST OF DIFF
	OBS.	MEAN	OBS.	MEAN	P-VALUE
CDS	6,640	151.203	4,723	68.934	0.0000
SOV_CDS	6,640	142.281	4,723	127.236	0.0000
EQ_RET	6,640	0.000	4,723	0.000	0.9940
LN_TA	6,640	13.938	4,723	14.246	0.0000
E_TA	6,640	0.089	4,723	0.105	0.0000
DOM_GOV_BOND_TA	6,640	0.054	4,723	0.064	0.0000
ROA	6,640	0.009	4,723	0.013	0.0000

JAPAN	PRE BAIL-IN		POST BAIL-IN		TEST OF DIFF
	OBS.	MEAN	OBS.	MEAN	P-VALUE
CDS	3,231	139.429	1,076	66.958	0.0000
SOV_CDS	3,231	79.266	1,076	42.989	0.0000
EQ_RET	3,231	0.000	1,076	0.001	0.8820
LN_TA	3,231	19.378	1,076	19.639	0.0000
E_TA	3,231	0.049	1,076	0.054	0.0000
DOM_GOV_BOND_TA	3,231	0.069	1,076	0.053	0.0000
ROA	3,231	0.003	1,076	0.007	0.0000

Note: CDS= CDS spreads; SOV_CDS = sovereign CDS; EQ_RET= Equity returns; LN_TA= natural logarithm of total assets; E_TA= equity to total assets ratio; DOM_GOV_BOND_TA= domestic sovereign bonds to total assets ratio; ROA= return on assets.

Table 3

Co-movement between bank and sovereign credit risk

This table shows the effect of sovereign CDS spreads on bank credit risk (Equation 1) throughout the whole investigated period (January 2010 – September 2018) and over different subperiods analysed. The *pre-bail-in* period goes from 01/01/2010 to 05/01/2011 (before there was the first EU official announcement). The *bail-in* period goes from the first announcement to the final approval of the BRRD and it is divided before and after Draghi's '*Whatever it takes*' speech (from 06/01/2011 to 25/07/2012 and from 26/07/2012 to 14/04/2014). The *post-bail-in* period goes from the final approval of the BRRD to the end of the sample, and it is divided before and after the date the Single Resolution Mechanism became operational (from 15/04/2014 to 31/12/2015 and from 01/01/2016 to 30/09/2018). ***, **, and * indicate statistical significance at the 1%, 5%, and 10% level, respectively.

Panel A – Whole period (January 2010 – September 2018)

	(1)	(2)	(3)
VARIABLES	ΔBank_CDS	ΔBank_CDS	ΔBank_CDS
ΔSov_CDS	0.37633***	0.37637***	0.35232***
	(0.02680)	(0.02687)	(0.03409)
VIX_index	0.00095***	0.00094***	0.00184***
	(0.00003)	(0.00003)	(0.00034)
MSCI_adjclose	-0.00003***	-0.00003***	0.00003
	(0.00000)	(0.00001)	(0.00052)
CB_spread	-0.00630***	-0.00616***	-0.02247***
	(0.00026)	(0.00027)	(0.00753)
eq_ret		-0.04953	-0.04497
		(0.03192)	(0.03570)
ln_ta		0.00033	0.00194*
		(0.00104)	(0.00097)
e_ta		0.00636	0.01175
		(0.02179)	(0.01660)
dom_gov_bond_ta		0.01753	0.00604
		(0.01190)	(0.00768)
Roa		0.08192**	0.03861
		(0.03407)	(0.02797)
Constant	-0.00563***	-0.01107	-0.02553
	(0.00052)	(0.01483)	(0.03444)
Observations	30,128	30,128	30,128
R-squared	0.18191	0.18350	0.22416
Cluster SE	Bank	Bank	Bank & Time
Bank Fixed Effects	Yes	Yes	Yes
Time Effects	No	No	Yes

Inference with cluster-robust standard errors is based on the assumption that the number of clusters is large; in Models (1) and (2) we have 20 clusters only (banks). As a robustness check, we bootstrap standard errors as suggested by Cameron et al. (2008) and the significance of our main interest variable (ΔSov_CDS) is confirmed (the t-stat is always greater than 14, keeping the significance level at less than 1%). In Model (3) we cluster standard errors by both bank (20) and month (117), as suggested by Petersen (2009).

Panel B – Different subperiods

	Pre-bail-in	During- bail-in		Post-bail-in	
	(1)	(2)	(3)	(4)	(5)
	1-Jan-10	6-Jan-2011	26-Jul-12	15-Apr-14	1-Jan-16
	to 5-Jan-11	to 25-Jul-12	to 14-Apr-14	to 31-Dec-15	to 30-Sep-18
	ΔBank_CDS	ΔBank_CDS	ΔBank_CDS	ΔBank_CDS	ΔBank_CDS
ΔSov_CDS	0.41009***	0.55729***	0.41333***	0.18138***	0.17206**
	(0.05188)	(0.04795)	(0.07538)	(0.05755)	(0.06458)
VIX_index	0.00236***	0.00140**	0.00254**	0.00120	0.00053
	(0.00044)	(0.00061)	(0.00117)	(0.00103)	(0.00089)
MSCI_adjclose	0.00220*	-0.00036	0.00050	-0.00118	-0.00039
	(0.00125)	(0.00192)	(0.00145)	(0.00176)	(0.00079)
CB_spread	-0.01420	-0.02467***	-0.02455**	0.00789	0.04569
	(0.00855)	(0.00845)	(0.00962)	(0.02486)	(0.03264)
eq_ret	-0.05643	0.01794	-0.05838	-0.04742	-0.08309
	(0.04673)	(0.03686)	(0.03894)	(0.05893)	(0.07491)
ln_ta	0.00111	0.00337	-0.00879	0.01064	-0.00085
	(0.00668)	(0.00996)	(0.00825)	(0.01061)	(0.00245)
e_ta	-0.02860	-0.11155	-0.02862	0.19249	0.12637
	(0.15227)	(0.08069)	(0.07099)	(0.13400)	(0.24864)
dom_gov_bond_ta	0.03073	-0.06342**	0.05548**	0.01319	-0.01267
	(0.03939)	(0.02499)	(0.02033)	(0.02057)	(0.02610)
Roa	0.38154	-0.12534	0.15097**	-0.19216***	-0.31109
	(0.24417)	(0.13789)	(0.06014)	(0.06595)	(0.27699)
Constant	-0.09785	-0.00693	0.10057	-0.11881	-0.00580
	(0.10676)	(0.10207)	(0.13878)	(0.20245)	(0.08375)
Observations	7,307	5,468	5,805	5,346	6,202
R-squared	0.32843	0.38553	0.25187	0.07385	0.14367
Cluster SE	Bank & Time	Bank & Time	Bank & Time	Bank & Time	Bank & Time
Bank Fixed Effects	Yes	Yes	Yes	Yes	Yes
Time Effects	Yes	Yes	Yes	Yes	Yes

Panel C – Interaction model

VARIABLES	(1) ΔBank_CDS	(2) ΔBank_CDS	(3) ΔBank_CDS
ΔSov_CDS	0.19307***	0.19352***	0.17618***
	(0.04868)	(0.04850)	(0.05311)
pre_bailin	0.00064	0.00081	-0.01969***
	(0.00057)	(0.00071)	(0.00259)
dur_bailin	-0.00009	0.00009	-0.01271***
	(0.00059)	(0.00060)	(0.00108)
ΔSov_CDS*pre_bailin	0.25160***	0.25040***	0.23563***
	(0.06469)	(0.06417)	(0.07339)
ΔSov_CDS* dur_bailin	0.32234***	0.32242***	0.32744***
	(0.06226)	(0.06162)	(0.07167)
VIXIndex	0.00090***	0.00089***	0.00168***
	(0.00003)	(0.00003)	(0.00032)
MSCI_adjclose	-0.00003***	-0.00003***	-0.00002
	(0.00001)	(0.00001)	(0.00054)
CB_spread	-0.00608***	-0.00595***	-0.01855**
	(0.00025)	(0.00024)	(0.00677)
eq_ret		-0.04910	-0.04544
		(0.02934)	(0.03473)
ln_ta		0.00040	0.00183*
		(0.00103)	(0.00092)
e_ta		0.00857	0.00989
		(0.02763)	(0.01861)
dom_gov_bond_ta		0.01839	0.00484
		(0.01117)	(0.00899)
Roa		0.04665	0.03357
		(0.03388)	(0.03056)
Constant	-0.00492***	-0.01173	-0.01513
	(0.00101)	(0.01493)	(0.03265)
Observations	30,128	30,128	30,128
R-squared	0.20286	0.20438	0.24419
Cluster SE	Bank	Bank	Bank & Time
Bank Fixed Effects	Yes	Yes	Yes
Time Effects	No	No	Yes

Inference with cluster-robust standard errors is based on the assumption that the number of clusters is large; in Models (1) and (2) we have 20 clusters only (banks). As a robustness check, we bootstrap standard errors as suggested by Cameron et al. (2008) and the significance of our main interest variables is confirmed (the t-stat is always greater than 3.8 for ΔSov_CDS*pre_bailin and 5.1 for ΔSov_CDS*dur_bailin, keeping their significance level at 1%). In Model (3) we cluster standard errors by both bank (20) and month (117), as suggested by Petersen (2009).

Table 4

Results from Difference-in-Difference approach

This table shows the results from the application of the DID model described in Equation (2) on banks' CDS, in which the main interest variable is represented by *EU×PostBail-in ×ΔSovCDS*.
***, **, and * indicate statistical significance at the 1%, 5%, and 10% level, respectively.

	(1)	(2)	(3)
VARIABLES	ΔBank_CDS	ΔBank_CDS	ΔBank_CDS
ΔSov_CDS	0.38571***	0.38329***	0.34617***
	(0.04658)	(0.04588)	(0.05467)
EU	0.00159***	0.00191***	
	(0.00016)	(0.00023)	
POST	0.00135***	0.00126***	0.00862***
	(0.00037)	(0.00038)	(0.00121)
*EU*POST*	-0.00098***	-0.00091***	-0.00088
	(0.00023)	(0.00025)	(0.00120)
EU* ΔSov_CDS	0.09189	0.09410	0.10840*
	(0.05938)	(0.05877)	(0.06314)
POST *ΔSov_CDS	-0.07477**	-0.07312**	-0.05964
	(0.03197)	(0.03153)	(0.06547)
*EU*POST* *ΔSov_CDS	-0.20944***	-0.21050***	-0.21463**
	(0.06915)	(0.06875)	(0.08041)
VIXIndex	0.00086***	0.00084***	0.00182***
	(0.00003)	(0.00003)	(0.00029)
MSCI_adjclose	-0.00003***	-0.00004***	0.00009
	(0.00001)	(0.00001)	(0.00045)
CB_spread	-0.00552***	-0.00540***	-0.01515***
	(0.00026)	(0.00026)	(0.00550)
eq_ret		-0.04929**	-0.04593*
		(0.02074)	(0.02462)
ln_ta		0.00002	0.00251**
		(0.00006)	(0.00094)
e_ta		0.00101	-0.00151
		(0.00494)	(0.01076)
dom_gov_bond_ta		0.00215	0.00237
		(0.00245)	(0.00597)
Roa		0.04064*	0.04962**
		(0.02093)	(0.02430)
Constant	-0.00652***	-0.00711***	-0.05215
	(0.00053)	(0.00141)	(0.03192)
Observations	45,798	45,798	45,798
R-squared	0.18406	0.18555	0.21628
Cluster SE	Bank	Bank	Bank & Time
Bank Fixed Effects	No	No	Yes
Time Effects	No	No	Yes

Inference with cluster-robust standard errors is based on the assumption that the number of clusters is large; in Models (1) and (2) we have 31 clusters only (banks). As a robustness check, we bootstrap standard errors as suggested by Cameron et al. (2008) and the significance of our main interest variable (*EU*POST* *ΔSov_CDS) is confirmed (the p-value is 0.011 for Model (1) and 0.005 for Model (2)). In Model (3) we cluster standard errors by both bank (20) and month (117), as suggested by Petersen (2009).

Figure 1

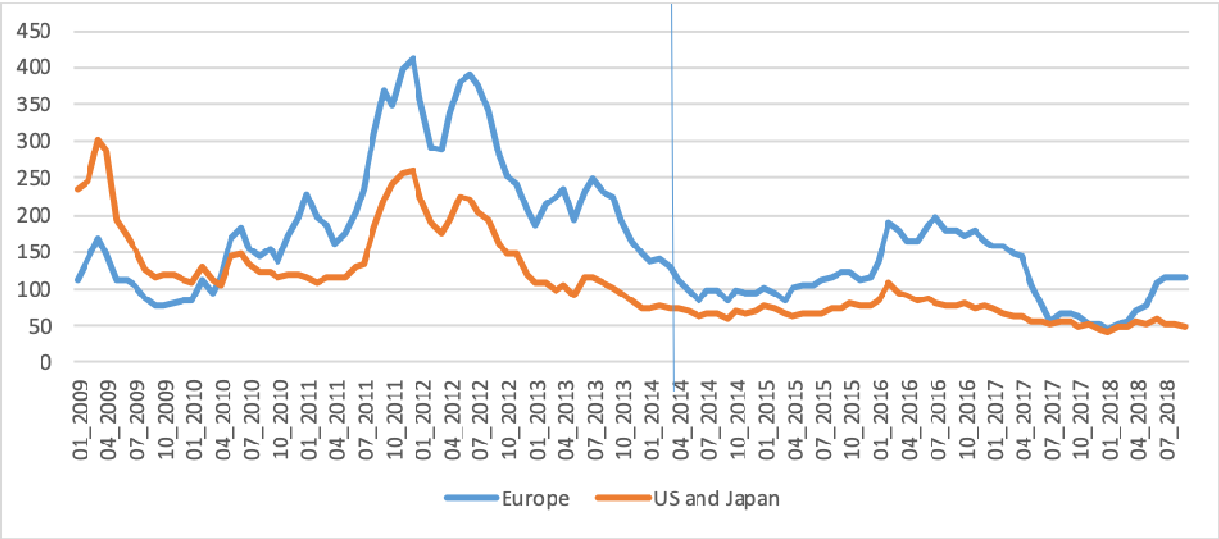
Bail-in timeline

Pre-bail-in	**During- bail-in period**		**Post-bail-in period**	
1-Jan-10	6-Jan-2011	26-Jul-12	15-Apr-14	1-Jan-16
The Eurozone crisis broke out in the first half of 2010	EC made a statement proposing to extend national resolution regimes to include a debt write down tool.	Mario Draghi's *Whatever it takes* speech	The new policy announced in January 2011 the BRRD is officially approved by the European Commission	The Single Resolution Mechanism became fully operational

Figure 2

European, US and Japan banks' average CDS trends

In this figure, we report CDS trends for European banks and for the banks included in the control group from 2009 to 2018. It illustrates that European, US, and Japanese banks' average CDS have followed a parallel trend before the BRRD official approval by the European Commission in April 2014.



Appendix A

Table 3A

Co-movement between bank and sovereign credit risk

This table shows the effect of sovereign CDS spreads on bank credit risk (Equation 1) throughout the whole investigated period (January 2010 – September 2018) and over different subperiods analysed. The *pre-bail-in* period goes from 01/01/2010 to 05/01/2011 (before there was the first EU official announcement. The *bail-in* period goes from the first announcement to the final approval of the BRRD and it is divided before and after Draghi's '*Whatever it takes*' speech (from 06/01/2011 to 26/07/2012 and from 26/07/2012 to 14/04/2014). The *post-bail-in* period goes from the final approval of the BRRD to the end of the sample, and it is divided before and after the date the Single Resolution Mechanism became operational (from 15/04/2014 to 01/01/2016 and from 02/01/2016 to 30/09/2018). In order to consider the 22/09/2014 ISDA change in CDS contracts, we exclude one month before and one month after this date. ***, **, and * indicate statistical significance at the 1%, 5%, and 10% level, respectively.

Panel A – Whole period (January 2010 – September 2018)

	(1)	(2)	(3)
VARIABLES	ΔBank_CDS	ΔBank_CDS	ΔBank_CDS
ΔSov_CDS	0.38358***	0.38358***	0.35931***
	(0.02729)	(0.02738)	(0.03421)
VIX_index	0.00094***	0.00092***	0.00180***
	(0.00003)	(0.00003)	(0.00034)
MSCI_adjclose	-0.00003***	-0.00003***	-0.00001
	(0.00000)	(0.00001)	(0.00052)
CB_spread	-0.00620***	-0.00606***	-0.02182***
	(0.00025)	(0.00026)	(0.00749)
eq_ret		-0.04696	-0.04244
		(0.03142)	(0.03539)
ln_ta		0.00038	0.00200*
		(0.00108)	(0.00098)
e_ta		0.00572	0.01088
		(0.02169)	(0.01657)
dom_gov_bond_ta		0.01746	0.00612
		(0.01228)	(0.00816)
Roa		0.08563**	0.04171
		(0.03420)	(0.02850)
Constant	-0.00560***	-0.01172	-0.02452
	(0.00049)	(0.01537)	(0.03465)
Observations	29,589	29,589	29,589
R-squared	0.18704	0.18852	0.22981
Cluster SE	Bank	Bank	Bank & Time
Bank Fixed Effects	Yes	Yes	Yes
Time Effects	No	No	Yes

Inference with cluster-robust standard errors is based on the assumption that the number of clusters is large; in Models (1) and (2) we have 20 clusters only (banks). As a robustness check, we bootstrap standard errors as suggested by Cameron et al. (2008) and the significance of our main interest variable (ΔSov_CDS) is confirmed (the t-stat is always greater than 14, keeping the significance level at less than 1%). In Model (3) we cluster standard errors by both bank (20) and month (116), as suggested by Petersen (2009).

Panel B – Interaction model

VARIABLES	(1) ΔBank_CDS	(2) ΔBank_CDS	(3) ΔBank_CDS
ΔSov_CDS	0.19533***	0.19566***	0.17685***
	(0.04958)	(0.04946)	(0.05483)
pre_bailin	0.00072	0.00088	-0.01947***
	(0.00059)	(0.00074)	(0.00255)
dur_bailin	-0.00002	0.00017	-0.01266***
	(0.00059)	(0.00062)	(0.00110)
ΔSov_CDS*pre_bailin	0.24950***	0.24844***	0.23549***
	(0.06524)	(0.06476)	(0.07457)
ΔSov_CDS* dur_bailin	0.32026***	0.32044***	0.32715***
	(0.06275)	(0.06218)	(0.07288)
VIXIndex	0.00089***	0.00088***	0.00165***
	(0.00003)	(0.00003)	(0.00032)
MSCI_adjclose	-0.00003***	-0.00003***	-0.00007
	(0.00001)	(0.00001)	(0.00055)
CB_spread	-0.00601***	-0.00588***	-0.01814**
	(0.00024)	(0.00024)	(0.00680)
eq_ret		-0.04689	-0.04321
		(0.02900)	(0.03433)
ln_ta		0.00043	0.00188*
		(0.00106)	(0.00091)
e_ta		0.00807	0.00884
		(0.02757)	(0.01880)
dom_gov_bond_ta		0.01814	0.00471
		(0.01146)	(0.00922)
Roa		0.05069	0.03746
		(0.03409)	(0.02985)
Constant	-0.00499***	-0.01211	-0.01333
	(0.00101)	(0.01550)	(0.03282)
Observations	29,589	29,589	29,589
R-squared	0.20699	0.20842	0.24915
Cluster SE	Bank	Bank	Bank & Time
Bank Fixed Effects	Yes	Yes	Yes
Time Effects	No	No	Yes

Inference with cluster-robust standard errors is based on the assumption that the number of clusters is large; in Models (1) and (2) we have 20 clusters only (banks). As a robustness check, we bootstrap standard errors as suggested by Cameron et al. (2008) and the significance of our main interest variable (ΔSov_CDS) is confirmed (the t-stat is always greater than 3.8 for ΔSov_CDS*pre_bailin and 5.1 for ΔSov_CDS*dur_bailin, keeping their significance level at 1%). In Model (3) we cluster standard errors by both bank (20) and month (116), as suggested by Petersen (2009).

Table 4A

Results from Difference-in-Difference approach

This table shows the results from the application of the DID model described in Equation (2) on banks' CDS, in which the main interest variable is represented by *EU×PostBail-in ×ΔSovCDS*. In order to consider the 22/09/2014 ISDA change in CDS contracts, we exclude one month before and one month after this date.
***, **, and * indicate statistical significance at the 1%, 5%, and 10% level, respectively.

	(1)	(2)	(3)
VARIABLES	ΔBank_CDS	ΔBank_CDS	ΔBank_CDS
ΔSov_CDS	0.38599***	0.38362***	0.34685***
	(0.04659)	(0.04590)	(0.05472)
EU	0.00159***	0.00199***	
	(0.00016)	(0.00024)	
POST	0.00157***	0.00148***	0.00872***
	(0.00037)	(0.00038)	(0.00122)
*EU*POST*	-0.00117***	-0.00110***	-0.00109
	(0.00022)	(0.00024)	(0.00123)
EU* ΔSov_CDS	0.09182	0.09399	0.10824*
	(0.05939)	(0.05879)	(0.06316)
POST *ΔSov_CDS	-0.08069**	-0.07930**	-0.06775
	(0.03246)	(0.03199)	(0.06849)
*EU*POST* *ΔSov_CDS	-0.20143***	-0.20236***	-0.20612**
	(0.06983)	(0.06943)	(0.08112)
VIXIndex	0.00084***	0.00083***	0.00178***
	(0.00003)	(0.00003)	(0.00029)
MSCI_adjclose	-0.00004***	-0.00004***	0.00003
	(0.00001)	(0.00001)	(0.00046)
CB_spread	-0.00544***	-0.00531***	-0.01468**
	(0.00026)	(0.00026)	(0.00552)
eq_ret		-0.04777**	-0.04428*
		(0.02049)	(0.02452)
ln_ta		0.00005	0.00241**
		(0.00006)	(0.00093)
e_ta		0.00047	-0.00381
		(0.00489)	(0.01024)
dom_gov_bond_ta		0.00244	0.00198
		(0.00257)	(0.00614)
roa		0.04427**	0.05507**
		(0.02141)	(0.02565)
Constant	-0.00642***	-0.00746***	-0.04797
	(0.00053)	(0.00134)	(0.03192)
Observations	44,944	44,944	44,944
R-squared	0.18686	0.18829	0.21963
Cluster SE	Bank	Bank	Bank & Time
Bank Fixed Effects	No	No	Yes
Time Effects	No	No	Yes

Inference with cluster-robust standard errors is based on the assumption that the number of clusters is large; in Models (1) and (2) we have 31 clusters only (banks). As a robustness check, we bootstrap standard errors as suggested by Cameron et al. (2008) and the significance of our main interest variable (*EU*POST* *ΔSov_CDS) is confirmed (the p-value is 0.007 for Model (1) and 0.012 for Model (2). In Model (3) we cluster standard errors by both bank (20) and month (116), as suggested by Petersen (2009).

Appendix B
Regulatory reforms in Europe and US: confounding effects

During the time period analyzed in the paper (2010-2018), various regulatory reforms in banking have been implemented both in the US and Europe that may be confounding factors in our identification. We discuss each of them in this Appendix and suggest that they do not influence the link between sovereign and bank risk. Furthermore, we show that these reforms have different implementation timings.

Focusing on the liquidity ratios, the Basel 3 framework introduced two new tools: the Liquidity Coverage Ratio (LCR) and the Net Stable Funding Ratio (NSFR). LCR is the ratio of a bank's high-quality liquid assets (unencumbered high-quality assets with a high potential to be converted easily and quickly into cash) and its total net cash flows (difference between expected out-flows and expected inflows of cash) over a 30-day stress period. Initially published by the Basel Committee in December 2010, the LCR was endorsed in January 2013. The European Union implemented the LCR when the EBA recommended it in December 2013: specifically, the European legislator introduced an observation period until 2015 and, based on the banks' reporting and the European Banking Authority (EBA) recommendation in December 2013, LCR became a binding quantitative rule for all banks from October 2015. In the US, the Federal Reserve Board, the Federal Deposit Insurance Corporation, and the Office of the Comptroller of the Currency issued, in October 2014, a final document imposing an LCR framework (more stringent than Basel's) to large banks. We argue that European banks may have increased their investment in Government bonds from 2014 to fulfill the LCR requirement thus intensifying the link between sovereign and bank risk and this is the opposite effect of the link predicted from the bail-in regulation launch (i.e. a decreasing the link between sovereign and bank risks).

The second liquidity ratio is the NSFR, which relates a bank's available stable funding to its required stable funding. The available stable funding is the portion of its capital and liabilities instruments that remain with the institution for more than one year. Each item is weighted by a factor that can be equal to 100% (funding sources fully available in more than a year), 95% (well divided retail deposits),

90% (demand deposits and/or term deposits with residual maturities of less than one year provided by retail and SME customers) and 50% (secured and unsecured funding with a residual maturity of less than one year). Required stable funds are those required to hold given the liquidity characteristics and residual maturities of banks' assets and the contingent liquidity risk arising from its off-balance sheet exposures. Each item is weighted by a factor ranging from 100% (illiquid assets or exposures to be entirely financed by stable funding) and 0% (liquid assets no needing to be financed). Although the NFSR was launched, together with the LCR, its implementation (expected from January 2018) has been delayed in many countries (as the US, the EU, Switzerland and Japan) and less than half of the G20 members had implemented the rules in a timely manner. We argue that NFSR cannot be considered a confounding reform: NSFR has not yet been introduced in Europe and the US, and the weighting factors are based on the residual maturity of liability items rather than the seniority or subordination

The higher capital requirements imposed by Basel 3 and stress test exercises may also be considered as confounding effects. A number of studies (Gropp, Most, Ongena, and Wix 2018, Kim and Santomero, 1988, Thakor, 1996) show that treated banks increase their capital ratios by reducing their risk-weighted assets (restrictions on asset composition) and by reducing lending to corporate and retail customers: similarly to the LCR, we argue that European banks may increase their investment in Government bonds from 2015 to fulfill the Basel 3 higher capital requirements thus increasing the link between sovereign and bank risk and this is the opposite effect of the link predicted from the bail-in regulation launch (i.e. a decreasing the link between sovereign and bank risks).

Finally, we also illustrate that the US bail-in framework is different from the European framework. The banking resolution framework in the US was reformed by the Dodd Frank Act, enacted in 2010, previously announced in 2009. Consequently, we observe that the US resolution reforms occurred before they did in Europe (the BRRD was proposed in 2012 entering into force since January 2016). This is the first reason for expecting that the US banking system, from 2013, was not treated by a bail-in regulation, and it can be used as a control group in our identification strategy. Second, there are important differences between the EU and US systems in resolving a defaulting bank: the European

regulation aims at the going concern principle for a financial intermediary, while the defaulting bank in the US will be closed by selling its assets and its remaining liabilities to a new holding company. In the US, the Dodd Frank Act in Title II introduces the Orderly Liquidation Authority (OLA). Within OLA, the resolution of a defaulting bank is used as part of a liquidation procedure for the holding company (\closed bank" process), while, article 43(2)(a, b) BRRD provides an \open bank" bail-in process. This means that the Eurozone banks Investors shall bear the total burden of the risk of a bank failure since the banks declared failing should use investors' money to cover the losses and restore equity. Instead, investors in defaulting US banks will become investors of a "healthy" new company and only after this movement they could be converted into equity. So, we can claim that the investors' treatment in case of a troubled bank is different between Eurozone (under BRRD framework) and the USA (under Dodd Frank Act). Moreover, the US Federal Deposit Insurance Corporation ensures deposits up to 250 thousand US dollars, while in the EU, the deposit insurance is 100 thousand euros.

Appendix C
European Commission - Press Releases

This Appendix reports the policy announcements by the European commission related to the introduction of the new bail-in resolution tool.

DATE	CONTENT
31/12/2015	***Single Resolution Mechanism to come into effect for the Banking Union****: The Single Resolution Mechanism (SRM) will become fully operational on 1 January 2016. The SRM implements the EU-wide Bank Recovery and Resolution Directive (BRRD) in the euro area. The full resolution powers of the Single Resolution Board (SRB) will also apply as of 1 January 2016. The SRM will bolster the resilience of the financial system and help avoid future crises by providing for the timely and effective resolution of cross-border and domestic banks. The SRM Regulation establishes the framework for Member States participating in the Banking Union when banks need to be resolved.* *Commissioner Jonathan Hill, responsible for Financial Stability, Financial Services and Capital Markets Union said: " As of 1st January, the Single Resolution Mechanism will now also be in place. This means that we now have a system for resolving banks and of paying for resolution so that taxpayers will be protected from having to bail out banks if they go bust. No longer will the mistakes of banks have to be borne on the shoulders of the many."*
01/01/2015	***The Bank Recovery and Resolution Directive (BRRD) applies in all Member States:*** *A single rulebook for the resolution of banks and large investment firms in all EU Member States is set to enter into force as of 1 January 2015. The new rules will harmonise and improve the tools for dealing with bank crises across the EU. They will also ensure shareholders and creditors of the banks pay their share of the costs through a "bail-in" mechanism.*
15/04/2014	***The European Parliament adopts the Bank Recovery and Resolution Directive:*** *On 15 April 2014 the European Parliament adopted the Bank Recovery and Resolution Directive (BRRD), proposed by the Commission on June 2012. The BRRD sets new rules for all 28 Member States to put an end to the old paradigm of bank bail-outs, which cost taxpayers' hundreds of billions of euros in the crisis.*
10/07/2013	***Commission proposes Single Resolution Mechanism for the Banking Union:*** *The European Commission has today proposed a Single Resolution Mechanism (SRM) for the Banking Union. The mechanism would complement the Single Supervisory Mechanism (SSM) which, once operational in late 2014, will see the European Central Bank (ECB) directly to supervise banks in the euro area and in other Member States which decide to join the Banking Union. The Single Resolution Mechanism would ensure that – not withstanding stronger supervision - if a bank subject to the SSM faced serious difficulties, its resolution could be managed efficiently with minimal costs to taxpayers and the real economy. The proposed SRM would apply the substantive rules of bank recovery and resolution. Commission President José Manuel Barroso said: "… Today's proposal complements that with a strong and integrated single system for dealing with failing banks. We cannot eliminate the risk of future bank failures, but with the Single Resolution Mechanism and the Resolution Fund it should be banks themselves – and not European taxpayers – who should shoulder the burden of losses in the future."*
06/06/2012	***New crisis management measures to avoid future bank bail-outs:*** *The proposals adopted today by the European Commission for EU-wide rules for bank recovery and resolution will ensure that in the future authorities will have the means to intervene decisively both before problems occur and early on in the process if they do. Furthermore, if the financial situation of a bank deteriorates beyond repair, the proposal ensures that a bank's critical function can be rescued while the costs of restructuring and resolving failing banks fall upon the bank's owners and creditors and not on taxpayers.* ***Harmonised resolution tools and powers*** *will ensure that national authorities in all Member States have a common toolkit and roadmap to manage the failure of banks. The interference in the rights of shareholders and creditors which the tools entail is justified by the overriding need to protect financial stability, depositors and taxpayers, and is supported by safeguards to ensure that the resolution tools are not improperly used.* *The main resolution tools are the following:* • *The sale of business tool whereby the authorities would sell all or part of the failing bank to another bank;*

	• *The bridge institution tool which consists of identifying the good assets or essential functions of the bank and separating them into a new bank (bridge bank) which would be sold to another entity. The old bank with the bad or non-essential functions would then be liquidated under normal insolvency proceedings;* • *The asset separation tool whereby the bad assets of the bank are put into an asset management vehicle. This tool cleans the balance sheet of a bank. In order to prevent this tool from being used solely as a state aid measure, the framework prescribes that it may be used only in conjunction with another tool (bridge bank, sale of business or write-down). This ensures that while the bank receives support, it also undergoes restructuring;* • *The bail-in tool whereby the bank would be recapitalised with shareholders wiped out or diluted, and creditors would have their claims reduced or converted to shares. An institution for which a private acquirer could not be found, or which could be complicated to split up, could thus continue to provide essential services without the need for bail-out by public funds, and authorities would have time to reorganise it or wind down parts of its business in an orderly manner. To this end, banks would be required to have a minimum percentage of their total liabilities in the shape of instruments eligible for bail-in. If triggered, they would be written down in a pre-defined order in terms of seniority of claims in order for the institution to regain viability.*
06/01/2011	***Commission seeks views on possible EU framework to deal with future bank failures:*** *Following the publication of a Communication on 20 October 2010 on a European crisis management framework for the financial sector, the European Commission has today launched a consultation on technical details underpinning that framework. This consultation seeks input on the technical details underpinning the policy issues identified in the Communication of 20 October 2010. These include common and effective tools and powers to deal with failing banks at an early stage; among these, resolution tools empower authorities to take the necessary action, where bank failure cannot be avoided, to manage that failure in an orderly way such as powers to transfer assets and liabilities of a failing bank to another institution or to a bridge bank, and to write down debt of a failing bank to strengthen its financial position and allow it to continue as a going concern subject to appropriate restructuring. The consultation asks stakeholders their view on the effectiveness of these possible powers and tools, i.e.* ***Fair burden sharing*** *by means of financing mechanisms which avoid use of taxpayer funds. This might include possible mechanisms to write down appropriate classes of the debt of a failing bank to ensure that its creditors bear losses. Any such proposals would not apply to existing bank debt currently in issue. It also includes setting up resolution funds financed by bank contributions. In particular, the Consultation seeks views on how a mechanism for debt write down (or "bail-in") might be best achieved, and on the feasibility of merging deposit guarantee funds with resolution funds.*
20/10/2010	***Commission sets out its plans for a new EU framework for crisis management in the financial sector:*** *Today, the European Commission sets out its plans for an EU framework for crisis management in the financial sector. These pave the way for legislation due by spring 2011 which will create a comprehensive crisis management framework for banks and investment firms. The new framework described in the Communication will be broad-ranging and aims to equip authorities with common and effective tools and powers to tackle bank crises at the earliest possible moment and avoid costs for taxpayers. The toolbox of measures will include:* • ***Preparatory and preventative measures*** *such as a requirement for institutions and authorities to prepare for recovery (i.e. dealing with serious difficulties faced by a bank) and resolution plans to ensure adequate planning for financial stress or failure, (such plans are called "living wills");* • ***Powers to take early action to remedy problems before they become severe*** *such as powers for supervisors to require the replacement of management, or to require an institution to implement a recovery plan or to divest itself of activities or business lines that pose an excessive risk to its financial soundness;* • ***Resolution tools****, such as powers to affect the takeover of a failing bank or firm by a sound institution, or to transfer all or part of its business to a temporary bridge bank, which would enable authorities to ensure the continuity of essential services and to manage the failure in an orderly way.*

Source: European Commission institutional website, Banking Crisis Management press releases.