THREE ESSAYS IN EMPIRICAL FINANCE

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Summary

This doctoral dissertation is composed of three essays and it is submitted to the Department of Finance at the Norwegian School of Economics, in partial fulfillment of the requirements for the Doctor of Philosophy degree. The essays empirically investigate the following three issues: first, the reaction of the bond markets to the introduction of the bail-in scheme in the European banking system; second, the impact of the product market competition on profitability and on leverage; third, the effect of the U.S. Capital Purchase Program on banks' capital, lending and payout ratios. I provide a short summary of these three essays in the following.

Impact of Bail-in on Banks' Bond Yields and Market Discipline

The bail-in scheme is a mechanism that limits the involvement of taxpayers during banks' restructurings by limiting the possibility of equity and unsecured debt to access the rescue plans set up by governments in favor of distressed banks. In order to solve the crisis of several Spanish banks, in 2012, the top European authorities have reached the agreement about the institutionalization of the bail-in, while the final European level approval of the related Bank Recovery and Resolution Directive occurring in 2014.

My research investigates the main events concerning the introduction of the bail-in regulation by analyzing both the legislative process and the impositions of bail-in on specific distressed banks. I test if these heterogeneous and staggered events - which indicate a modified commitment of authorities towards the bail-in principle - induced the market participants to reprice existing bank bonds in a way that reflects an increased expectation of bail-in.

The empirical methodology elected for this test is a difference-in-differences framework that compares the yields of unsecured bonds with the ones of secured bonds, as the distinctive characteristic of a credible bail-in regulation is that it "*make(s) the bail-in debt de facto junior to debt not subject to bail*", which rises the cost of unsecured bonds (i.e., bailinable), compared to secured ones (i.e., non-bailinable) bonds.[1] I illustrate that positive (negative) indications of

[1] See Chan-Lau and Oura (2016).

commitment increased (reduced) the difference in yield spread between unsecured and secured bonds.

Further analyses suggest that these results are not driven by the possible generalized distress that may be generated by the bail-in impositions. In fact, placebo tests show that the bail-in impositions do not affect the cost difference between bonds with different exposures to defaults but belonging to the same category of bailinable bonds.

This research also introduces in the literature a study of the impact of bail-in on the market discipline. A set of triple-differencing tests document an increase of the correlation between a bank's risk and the yields of its securities. This result suggests that bail-in events increased investors' incentives to incorporate a bank's risk while pricing its securities, corroborating an improvement of the market discipline.

Competition, Profitability and Leverage. How Did Norwegian Firms React to China's Exports Shocks?

The established evidence of a negative profitability-leverage relation, according to Fama and French (2002), represents a critical discrepancy between the static Trade-Off Theory (TOT) and its empirical assessment. This discrepancy has been addressed both through a theoretical revision of the static TOT and through an empirical revision of its tests.

The trade-off dynamic inaction theory has revised the static TOT, for example, by acknowledging the presence of adjustment costs towards the equilibrium leverage. With this framework, the dynamic trade-off theory clarifies that the evidence of a negative profitability-leverage relation does not contradict the trade-off theory.

On the other hand, concerning the empirical revision of the static TOT's test, Xu (2012) emphasizes that an enhancement of the identification strategy is sufficient to solve the discrepancy. Xu (2012)'s intuition is that, since the predictions of TOT involve the expected profitability (rather than the lagged realized profitability normally used in the TOT's tests), better proxies of expected profitability are supposed to improve the TOT's tests. As new proxy for the expected profitability of domestic U.S. firms, Xu (2012) adopts the import competition, namely the product market

competition exerted by foreign producers against domestic U.S. firms. The use of this proxy builds on the evidence that import competition deteriorates profitability. By finding a positive relation between leverage and expected profitability, which corroborates the static TOT, Xu (2012) contrasts the conclusions of Fama and French (2002).

My paper contributes to the investigations about the profitability-leverage relation by nesting and extending these two revisions. It tests the static and dynamic trade-off theories by employing a measure of profitability that emphasizes the expectations of profitability, and it also tackles the endogeneity concerns of the previous empirical analyses.

Using the "double instrumental variable" approach (Becker and Woessman (2009)), the first stage predicts the exogenous competition from China where the instrument is the Chinese exports towards rich countries (Acemoglu et al. (2015)); the second stage predicts the decrease of Norwegian firms' profitability that is explained by the increases of exogenous competition from China; the third stage investigates how leverage reacts to the predicted profitability.

Concerning the tests of the static TOT, I find that profitability reduces leverage by decreasing assets while maintaining debt stable. Moreover, tests of the dynamic TOT illustrate a negative profitability-leverage relation at non-refinancing points, which corroborates the dynamic TOT. Nevertheless, I also find insignificant profitability-leverage relation at refinancing points, which does not corroborate the dynamic TOT.

Impact of the Capital Purchase Program on the Capital Ratio of U.S. Banks

Introduced in October 2008, the U.S. Capital Purchase Program (CPP) allowed the Treasury to acquire at a subsidized price preferred equity issued by U.S. banks, with a maximum possible expenditure of $250 billion. The original primary objective of this capital injection was to promote the capitalization of financial institutions.

This paper illustrates that the CPP has succeeded in increasing the capitalization by stimulating the equity issuances of the banks that had access to the program. I analyze this effect by means of a difference-in-differences approach, after illustrating that the parallel trend assumption is satisfied.

In addition, the paper shows that modifications of the payout or investment policies do not attenuate or reinforce the increase in capitalization. These results are robust to the implementation of an instrumental variable approach. In addition, I show that not only the preferred equity, but also the common equity has increased in response to the preferred equity infusions.

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Impact of Bail-in on Banks' Bond Yields and Market Discipline

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Abstract

The bail-in mechanism limits government's assistance to banks by restricting the access of equity and unsecured debt to rescue plans in favor of banks. I analyze the salient events regarding both the legislative process and the impositions of bail-in on specific distressed banks; I test if these indications of authorities' commitment towards the bail-in principle were credible enough to induce a repricing of existing bonds that reflects increased expectations of bail-in. Heterogeneous and staggered difference-in-differences tests illustrate that positive (negative) indications of commitment increased (reduced) the difference in yield between unsecured (i.e., bailinable) and secured (i.e., non-bailinable) bonds. Placebo tests suggest that the possible banking distresses induced by bail-in impositions do not drive these results. In fact, the bail-in does not affect the cost difference between bonds with the same bailinable status and different exposure to distress. A triple-differencing framework suggests that bail-in events increased investors' incentives to incorporate a bank's risk while pricing its securities, in line with an improvement of market discipline.

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1. Introduction

During the European sovereign debt crisis, in the attempt to reduce the involvement of taxpayers into exceptionally expensive assistance programs for banks and in order to incentivize investors to consider the risk-taking of a specific bank while pricing its securities, European policymakers have deeply amended the regulatory framework for the resolution of distressed financial institutions.

Acknowledging its vast scope, authors like Philippon and Salord (2017), Hadjiemmanuil (2015) or Cappiello (2015) have even recognized this legal reform as a "regime shift" for the European banking system, in particular for the fact that it institutionalizes the principle of the bail-in. Contained in the Bank Recovery and Resolution Directive (BRRD), the bail-in mechanism allows authorities to identify banks that are "failing or likely to fail" and, before the default and before any injection of public funds, to allocate a bank's losses to its unsecured (*bailinable*) debt and equity, while maintaining its secured (*non-bailinable*) debt intact. [2,3] Thus, the fundamental principle of the bail-in coexists with the possibility to support a distressed bank with public capital; however, the mechanism institutes strong legal constraints on public capital injections by subordinating them to the imposition of losses on a bank's investors.

In the context of this fundamental legal reform of banks' debt, this empirical research assesses for the first time (to the best of my knowledge) how tradable debt securities have reacted to the introduction of the bail-in mechanism. In particular, employing an event study in line with Acharya et al. (2016), I examine the effects of a set of "bail-in events" that includes the relevant steps regarding not only the legislative process (e.g., the approval of BRRD) but also the decisions of authorities to impose a bail-in on specific distressed banks (e.g., Bankia or Bank of Cyprus).

[2] Concerning the notion of "failing or likely to fail", Hadjiemmanuil (2017) describes fours triggers: first, balance-sheet insolvency; second, inability to repay debts and other liabilities when they fall due; third, a breach of regulatory requirements that is enough to motivate the withdrawal of the bank's authorization; fourth, the bank's need for "extraordinary public financial support" (BRRD, Art. 32(4)).

[3] Hadjiemmanuil (2015) describes the decision process for the imposition of the bail-in on specific distressed banks. The authorities participating to this process are the national and European banking supervisory authorities (European and national central banks) and political authorities (European Commission and national Finance Ministers).

This paper addresses two main questions. The first enquiry contributes to the discussion about the credibility of the new regime by testing whether and in which cases the bail-in events have induced market participants to adjust bond yields in a way that reflects an increased expectation of bail-in (Philippon and Salord (2017) Hadjiemmanuil (2015) Walter and White (2014), Cœuré (2015)). I illustrate that my results are driven by the legal specificity of the bail-in rather than by the possible deterioration of the financial stability that could coincide with (or result from) impositions of bail-ins. The second question is whether the bail-in events have increased the incentives of investors to consider a bank's risk while pricing its securities. This result would corroborate an increase of the market discipline, which is the main objective of the bail-in (Goodhart and Avgouleas (2014), Cœuré (2015), Philippon and Salord (2017), Hadjiemmanuil (2015)).

Concerning the first question, it is frequently argued that the bail-in regulation has a severe problem of credibility. The theory of Walter and White (2014) shows that the bail-in regulation is not credible because, given that authorities have large discretion in imposing bail-ins, they will avoid to mandate them in order to prevent bank runs. Hadjiemmanuil (2015) identifies the vast political discretion about the decision to mandate bail-ins as the critical determinant of the lack of credibility. Philippon and Salord (2017) list the credibility as the first "key challenge" for the bail-in regime because the BRRD gives authorities the right to impose the bail-in mechanism with very wide flexibility. They argue that the authorities need to further promote the credibility among market participants, for instance, by "seizing the opportunity" and deciding to impose this scheme on distressed financial institutions. Though destabilizing, these decisions represent the essential *indications of authorities' commitment* towards the bail-in that are supposed to progressively update markets' beliefs about the possibility of bail-ins for distressed banks.[4]

This paper examines whether the "bail-in events", which describe authorities' commitment to the bail-in, can modify the credibility of the bail-in. Specifically, my analyses investigate whether the events have altered bondholders beliefs in a way that has produced a repricing that follows

[4] Political institutions, in particular, have to bear large short-term costs in response to the imposition of bail-ins. For instance, the Financial Times explains that the Italian bail-in case in 2015 has "illustrated the severe loss of political capital imposed by retail losses".

the theoretical predictions about the bail-in's introduction, which are illustrated by Chan-Lau and Oura (2016). Thus, I measure if the bail-in events have increased the yield spread between unsecured bonds and secured bonds, as the distinctive characteristic of a credible bail-in regulation is that it "*make(s) the bail-in debt de facto junior to debt not subject to bail*", which rises the cost of unsecured bonds, compared to secured ones.[5] To visualize this increase in the cost difference between unsecured and secured bonds, Figure 1 provides an example. The graph illustrates the reaction of existing bonds to the bail-in event represented by the restructuring, in 2012, of a group of Spanish banks (Bankia, the third largest Spanish institutions, was the most prominent one among them).[6] In particular, Panel A in Figure 1 depicts the national daily averages of the yields of unsecured and secured bonds issued by Italian banks.[7] The plot indicates that, in the seven days before the event, the yield difference appears stable while, in response to the event, the difference exhibits a rapid positive reaction, after which, the spread remains steady in the subsequent seven days.

With a difference-in-differences approach (also referred to as Diff-in-Diff or D-D), I compare the reaction to the bail-in events of existing bailinable - unsecured - bonds with the reaction of existing non-bailinable - secured - bonds. I document that the yield spread between bailinable and non-bailinable instruments grows significantly - both statistically and economically - on the dates representing an increase of authorities' commitment to the bail-in regime. Interestingly, evidence illustrates that this yield spread decreases in the cases in which authorities display large flexibility in the application of the bail-in principle, as in the EU Commission's permission for a state aid (without bail-in provisions) in favor of the Italian bank Monte dei Paschi di Siena (MPS) or in the unconstitutionality verdict regarding the bail-in of the Austrian institution Hypo Alpe.

[5] See Chan-Lau and Oura (2016).

[6] This bail-in case is considered by Hadjiemmanuil (2015) as the crucial determinant for the inauguration of the project of the European "banking union". As such, this case is the first realization of the principles ratified in the EU Commission's proposal 280/2012, the official document that initiated the path of the banking union and that represents the strong political agreement behind the union (the document was approved by the ECB, Finance Ministers of the Eurozone (Eurogroup), the European Council and the European Commission).

[7] Figure 2 shows the reaction of the yield spreads of Italian, Spanish, French, British, Austrian and German institutions.

This paper recognizes that this change in the yield spread might have an alternative interpretation. For instance, the difference-in-differences estimates might be attributable to a generalized banking instability rather than to the legal specificity of the bail-in reform, which introduces a divergence between two specific categories of bonds, namely between unsecured and secured. In fact, it is conceivable that the yield spread between unsecured and secured bonds is not determined by the fact that unsecured bonds are bailinable while secured bonds are non-bailinable but, rather, by the fact that they are *junior* to the secured bonds. This lower seniority may be the determinant of the stronger reaction of the unsecured bonds to bail-ins and, specifically, to the possible generalized increase in default probability resulting from bail-ins.

My empirical methodology addresses this alternative interpretation in two ways. First, placebo tests suggest that the fact that unsecured bonds are junior to secured ones is not the driver of the main difference-in-difference's results. Specifically, I compare the yields of two subcategories of bonds that are both bailinable but one of the subcategories is junior to the other one and, consequently more exposed to possible distresses induced by bail-ins. The tests illustrate that, in response to bail-in events, the reaction of the cost difference between these two subcategories of bonds is insignificant, suggesting that the level of exposure to distress - proxied by seniority - is not *per se* a crucial driver. The example illustrated in Panel B of Figure 1 provides the graphical intuition behind this test. The figure depicts the national daily averages of the yields of junior unsecured and senior unsecured bonds issued by Italian banks, which are both bailinable. We notice that these two subcategories of bailinable debt do not react differently to the event even though one is junior to the other.

Second, I show that the spread between bailinable and non-bailinable bonds reacts also to events that do not produce a significant increase in banks' risk like, for instance, the events linked to the legislative process of the BRRD (Schafer et al. (2016)). This evidence corroborates the idea that the shock on the yield spread is not necessarily the consequence of a wide financial instability.

Concerning the second main hypothesis, about the market discipline, the primary objective of the bail-in is to reinforce creditors' incentives to take into account the risk of a specific bank while pricing its securities, thereby making more expensive the debt of banks with more risk-taking. Goodhart and Avgouleas (2014) and Gleeson (2012) predict that this attenuation of the "creditor inertia" is possible because the banking reform warns bondholders about the possibility

of orderly resolutions for the distressed banks; by virtue of the bail-in, these resolutions might be credibly realizable since it purportedly safeguards banks' going concern by minimizing the risk of systemic adverse disruptions that may, instead, result from complete liquidations.

Numerous authors (e.g., Acharya et al. (2016), Sironi (2003), Flannery and Sorescu (1996)) measure the increase of the market discipline with the increase of the risk premium component of banks' bond yields, which - in turn - has been proxied by the correlation of a bank's yield spread and its bank-specific default probability. In line with this literature, I investigate the impact of the bail-in events on market discipline by testing whether the correlation between a *bank's yield spread* and its *bank-specific default probability* is higher after the occurrence of the event, compared to before, with a measure of default probability calculated by Bloomberg.[8] In line with the triple-differencing model employed by Acharya et al. (2016) to study market discipline, this time-series growth of the correlation between yield spread and bank risk is measured by regressing the yields on the triple interaction comprehending the bank's default probability, the dummy variable for the occurrence of the events and the dummy variable for the bailinable status of the bond. The results of this triple-differencing approach illustrate that the bail-in legislation and its impositions increase the yield-risk correlation of bond yield spread, which corroborates an increase of the market discipline.

The sets of countries, banks and bail-in events feature a large heterogeneity and, by analyzing how the yield spread reactions are associated with the heterogeneity within these sets, the paper can establish some empirical regularities that contribute to the discussion about bail-in's consequences (Philippon and Salord (2017), Hadjiemmanuil (2015)).

For instance, I show that the events reflecting decisions and commitment of domestic authorities generally produce a bond repricing only for domestic banks. On the other hand, events resulting from negotiations between national and supranational authorities, by reflecting the commitment of authorities that is informative also for bail-ins in other countries, generate a bond repricing not only for banks in the country that has been the most directly affected by the bail-in

[8] The daily measure of bank-specific default probability is the Bloomberg's 1-year default probability. It is a comprehensive measure of default probability that uses the following nine bank-specific and time-varying inputs: CDS spread, the volatility of the stock price, the net income, non-performing loans, market-to-book ratio, total assets, short-term leverage, long-term leverage and loan losses reserves.

event, but also for banks in other countries. In addition, I illustrate that the impact of the bail-in has been stronger in countries with smaller fiscal capacity and for medium-large banks, while the effect has been smaller for the very large institutions.

The rest of the paper is organized as follows: Section 1 discusses the related literature; Section 2 presents the dataset, the timeline of the events and the descriptive statistics; Section 3 illustrates the models and the results relative to the difference-in-differences and the placebo difference-in-differences approaches; Section 4 presents the model and the results relative to the triple-differencing approach for the study of the market discipline; Section 5 provides some robustness checks; Section 6 concludes.

2. Related Literature

In very recent years, authors have started to contribute to a comprehensive empirical assessment of the bail-in regulation. The study of Conlon and Cotter (2014) describes which classes of security holders would have been impaired the most if the bail-in framework had been retrospectively applied during the European banking distress cases from 2008 to 2012. Their results show that holders of equity and subordinated bonds would have been the main losers from the 500 billion euro losses of the failed European banks. Beck et al. (2017) illustrates, with a quasi-natural experiment, that the bail-in of Banco Espirito Santo (BES) significantly deteriorated the credit supply for the non-financial firms receiving funding from banks that were exposed to the bail-in of BES; however, these firms were able to compensate this credit contraction with the funding from other institutions. Schafer et al. (2016) show that the impositions of bail-in on specific banks produced higher CDS spreads and lower stock prices, particularly for the countries with low fiscal capacity. They also show that the events relative to the legislative process of the bail-in do not generally have a significant impact on banks' CDS spreads. Their research is related to Neuberg et al. (2016) who use the CDS premium to extract the market-implied probability of government support, though not in an event study methodology.

My paper contributes to this literature in some respects. First, it introduces an event study investigating the reaction of different types of bonds featuring different levels of exposure towards

the risk of bail-in. This characteristic allows the analysis of the yield spread between bailinable and non-bailinable bonds, which - combined with the implementation of an event study framework - is apt to measure the effects of authorities' decisions on market expectations about the bail-in. Second, since the change in yield spread might be potentially motivated by the mere fact that secured bonds are senior to unsecured ones, I illustrate by means of placebo tests that the seniority *per se* is not a driver of the yield spread's increase in response to the approvals or the impositions of the bail-in. Third, while previous research has studied the CDS premium, I examine the reaction of the bond yields. The analysis of the bond yields allows to study a noticeably larger and more heterogeneous set of banks by including also banks that are not reference entities of any CDS contract. Moreover, the analysis of the bonds provides a more direct description of the effect of the bail-in on the banks' balance sheets (Arce et al. (2011)), which is the typical dimension of interest for regulators in the discussions concerning the consequences of the bail-in (Visco (2015), Cœuré (2015))[9]. Fourth, to enhance the identification of the commitment to the bail-in as the driver of bonds' repricing, I use a difference-in-difference approach with heterogeneous and staggered events, which allows a better control for confounding factors linked to bank-specific time-varying characteristics or to macroeconomic dynamics. Fifth, by investigating bail-in's effect on investors' incentives to incorporate a bank's risk while pricing its bonds, I test whether the reform has succeeded in increasing the market discipline, which is its primary objective.

A vast literature investigates banks' market discipline, though without examining the bail-in framework. Authors have measured the market discipline by means of the correlation between subordinated bonds prices or yields and banks' risk measures. Among them, Covitz et al. (2004), Jagtiani et al. (2002), DeYoung et al. (2001), Calomiris (1999) and Flannery (1998)) show that funding costs depend on banks' risk, but this relation might be insignificant for too-big-to-fail institutions and in periods of particular regulatory forbearance.

Other contributions focus on the question of whether the events related to the alteration of the government support can modify the yields-risk relationship, which is typically used as a proxy

[9] Numerous authors (Trapp (2009), Nashikkar et al. (2008), Bai and Collin-Dufresne (2013), Klingler and Lando (2015)) describe the existence of a stable difference between CDS spreads and bond spreads. Klingler and Lando (2015) even show that the relation between CDS spreads and bond spreads might be negative for the reference entities that have highly safe and liquid bonds.

for market discipline. Flannery and Sorescu (1996) show that, in the period after the bail-out of Continental Illinois (1984) and before the approval of the FDIC Improvement Act (1991), yield spreads were not reflecting the issuing bank's risk. Sironi (2003) shows that governments can alter the yield-risk relation by illustrating that the relation strengthens after the restrictions on public expenditures and on national monetary policies. Also Acharya et al. (2016), Santos (2014), Araten and Turner (2013), Baker and McArthur (2009) indicate that the higher government support in favor of the too-big-to-fail banks generates a lower yield and a lower market discipline.

This paper is related also to the literature examining the costs of specific resolution frameworks for financial institutions (Mishkin (1999), Freixas (1999), Eckbo (2010)) and to non-financial firms (Ang and Mauck (2011), Eckbo and Thorburn (2008), Cowenberg and Lubben (2011)). In addition, this work contributes to the literature analyzing the impact of banking regulatory events on the market expectations (e.g., Wagster (1996), Mamun et al. (2004), Yildirim et al. (2006), Armstrong et al. (2010), Bhat et al. (2011), Kolasinski (2011) Georgescu (2014), Bruno et al. (2015)).

3. Data

From Bloomberg, I select the bonds issued by Italian, Spanish, French, British, Austrian and German firms with a final maturity later than January 1, 2012, and earlier than January 1, 2016. I select only the bonds relative to the banking industry, and then I drop the observations without data about yield to maturity or 1-year default probability. With this sample selection procedure, I compose a dataset with 4,868 bonds for Italy, 541 for Spain, 3,050 for U.K., 10,433 for Germany, 2,001 for Austria and 2,863 for France. Each bank's name is manually assigned to the respective Bloomberg ticker.

Employing the same procedure used by the bond market event studies of Ederington et al. (2015) and Bessembinder et al. (2009), per each date and each bank this paper creates

representative bonds.[10] Specifically, I create a representative non-bailinable bond whose daily yield (and time-to-maturity) is the value-weighted average of the yields (and time-to-maturity) of all the active secured bonds. The weight of each secured bond depends on its value at issuance (where the sum of the weights of all active secured bonds for each bank is equal to one). This representative non-bailinable bond summarizes the information about "secured", "senior secured" and "asset backed" bonds.[11]

Analogously, I create a representative bailinable bond whose daily yield (and time-to-maturity) is the value-weighted average of the yields (and time-to-maturity) of all the active unsecured bonds.

This representative bailinable bond summarizes the information about "senior unsecured", "unsecured", "senior subordinated", "subordinated" and "junior subordinated" bonds. With this procedure, each financial institution has its pair of representative yields, although a subset of banks does not have contemporaneously both types of representative bonds.[12]

The final sample is composed of 30 Italian, 13 Spanish, 104 British, 65 German, 25 Austrian and 45 French financial institutions and a total of 37,262 bond-day observations analyzed in the days relative to the 19 bail-in events.

3.1 Information About Events

In line with previous studies about markets' reactions to the introduction of new banking reforms (e.g., Yildirim et al. (2006), Schafer et al. (2016), Acharya et al. (2016)), I compose the events' list by scanning official documents produced by competent authorities as well as the press reports; in particular, this paper has scanned the national parliaments' gazettes, the European

[10] The difference with the methodology of Ederington et al. (2015) and Bessembinder et al. (2009) is the fact that my research creates, per each bank and each date, two representative bonds, rather than one: a representative non-bailinable bond and a representative bailinable bond.

[11] The information about the seniority is provided by Bloomberg's "payment rank".

[12] However, as shown by the evidence relative to model (3), the results of the sample composed of banks with both categories of bonds are very similar to the results regarding the full sample.

Commission's press releases and all the Bloomberg's headlines from June 2012 to December 2015.[13] I have manually collected information regarding a set of 19 events containing all the bail-in cases of Bloomberg's headlines, the BRRD national transpositions of the countries in the sample and the cases of exceptions to the bail-in mechanism.[14] When I identify in the Bloomberg's headlines an article regarding cases of bail-in, I scrutinize as well the related articles provided by the "News" section of the Bloomberg terminal (which contains the articles from several journals (e.g., *Bloomberg News, Financial Times, Wall Street Journal*)); this scrutiny is intended to ascertain the specific timing of the event. The timeline of Appendix I chronologically lists the 19 bail-in events analyzed in this study, while Appendix II provides the description of each event.

3.2 Descriptive Statistics

Table 1 illustrates the descriptive statistics concerning the total assets, time to maturity and the bailinable status variable. We can notice that the bailinable bonds represent the 71% of the sample.

[13] This paper investigates the cases of bail-in from June 2012 because the path for the introduction of the bail-in and the wider project of the European "banking union" have been inaugurated in June 2012 (EU Commission Memorandum 280/2012 proposes the bail-in, and EU Commission Memorandum-12-413 proposes the "banking union"). Indeed, Hadjiemmanuil (2015) recognizes that the profound distress of important Spanish banks (May 2012) has convinced the EU leaders that a stable and persistent agreement was necessary to address resolutions like Bankia's one. Although before 2014 the bail-in and the "banking union" were not yet codified into detailed laws, the solid accord behind the EU Commission Memorandum 280/2012 (involving Finance Ministers of the Eurozone, European Council, ECB and European Commission) created a vast and very persuasive political agreement that has managed to create the preconditions for the application of the bail-in principles in several banking resolutions.

[14] The bail-in cases described by the Bloomberg headlines are identified by employing Bloomberg's search engine "Avanced news editor". Searching through "All media sources", I filter the news by using the string "bail-in"&"europe" in the "Banking" section of the database. The bail-in cases are not altered if I use the strings "bail-in"&"europe"&"bank" or "bail-in" and "bank". The paper includes the transpositions regarding the six EU countries analyzed in this paper excluding the British and German national approvals because they were redundant given that their national banking systems introduced the bail-in scheme before the European BRRD (2014) and before the EU Commission document 280/2012.
The prerequisite of the presence in Bloomberg's headlines represents a convenient threshold for defining the relevant bail-in cases.

Figure 3 depicts the time series of the monthly average yields of the bailinable and non-bailinable bonds. The time window starts from June 2012 and ends in January 2016. Both groups of yields show a general downward trend, but it seems clear that, in the middle of the year 2012, the difference between the yields increased sharply. This period may be related to the bail-in of Bankia (and other Spanish institutions). Another increase in yield spread takes place in 2014 and it might be presumably related to the approval of the BRRD. However, we should stress the idea that Figure 1 offers only a visual description of two unconditional monthly means and therefore we need to further investigate the yields with an appropriate statistical test, with a set of control variables and by differentiating across countries.

4. First Hypothesis: Bail-in's Expectations

The first hypothesis of this paper is that authorities' indications of commitment to the bail-in scheme have induced market participants to adjust bond yields in a way that reflects an increased expectation of bail-in. I test this hypothesis by measuring if the positive (negative) indications of commitment amplified (reduced) the difference in yield between existing unsecured and secured bonds. I gauge the impact of the bail-in events on the yield spread between unsecured and secured bonds because the characteristic feature of the bail-in is that it makes the former junior to the latter, thereby increasing their difference in costs (Chan-Lau and Oura (2016)).

The method elected for this analysis is a difference-in-differences estimation where the bailinable instruments represent the treated group, and the non-bailinable instruments are assumed to be the control group. The fact that the yield of the secured bonds might decline in response to the bail-in events is not a concern for my identification strategy because I am investigating the causal impact of the indications of commitment on the yield spread between unsecured and secured bonds.[15] The regression model is:

$$yld_{ijt} = \alpha + \alpha_j + \beta_1 \times bln_{ij} \times post_t + \delta_1 \times bln_{ij} + day_t + \delta_2 \times ttm_{it} + \varepsilon_{ijt} \quad (1)$$

[15] Unreported tables show that the bail-in events decreased the cost of non-bailinable debt.

The subscripts i, j and t refer to the bailinable status, the bank and the day, respectively. Thus, the units of observation relative to all the regressions performed using model (1) are the yields relative to a specific representative bond, a specific bank and a specific day. The bond-specific bailinable status is *bln*. It is valued zero if the bond is non-bailinable ("secured", "senior secured", "asset backed") and one if the bond is bailinable ("senior unsecured", "unsecured", "senior subordinated", "subordinated" and "junior subordinated").

The date-specific time dummy is *post*. It takes the value of zero in the seven days before the event and one in the day of the event.[16] The day fixed effect is *day*. It captures all the time-varying macroeconomic factors.[17] The time to maturity of the bond is *ttm*. The bank fixed effects α_j controls for bank-specific and time-invariant (within the event window) components in the bailinable and non-bailinable bond yield.[18]

The estimator of interest, β_1, describes the difference between two differences. The first one is the difference between a bailinable bond's yield on the day of the bail-in event and the respective average yield in the seven days before the bail-in event. The second one is the difference between a non-bailinable bond's yield on the day of the bail-in event and the respective average yield in the seven days before the bail-in event. This event study methodology is based on a constant yield model similar to the one used by Acharya at al. (2016).

[16] The fact that the time dummy is valued 1 in the day of the event is consistent with Schafer et al. (2016). In Appendix III, I also use windows of (-7; +2) and the results corroborate the first hypothesis - concerning the average yield spread reaction - by showing that the yield spread increases (decreases) in response to positive (negative) indications of commitment towards the bail-in. In addition, untabulated regression models use windows of (-6; 0), (-8; 0), (-7; +1), and their results are robust.

[17] Results do not change if I substitute the day fixed effect with a set of macro-variables, which are the spread of the national 10 years treasury bonds (relative to the German 10 years treasury bonds), the yield of national 10 years treasury bonds, the term spread (i.e., the spread between the yield of the national 10 years treasury bonds and the 6 months treasury bonds) and the price of the national stock market portfolio.

[18] The inclusion of the bank fixed effect is motivated, for instance, by the fact that small banks more likely have only bailinable bonds and, given that their small size is correlated with higher bond yields, the estimate of the interaction variable - which contains also the variable regarding the bailinable status of the bond - might be inconsistent. As a robustness check, I show that the results are consistent when I do not include the bank fixed effects.

In the tables of results, this paper presents the estimates of β_1 (also referred to as the D-D estimates). We can expect the estimate of β_1 to be positive in response to the events reflecting an increase in the authorities' commitment towards the bail-in principle (e.g., the imposition of the bail-in provisions on Bankia or the approval of the BRRD), which are further referred to as the "positive bail-in events". A positive estimate would indicate that the event has induced domestic - and often foreign - bond markets' participants to reprice bond yields in order to incorporate an increased expectation of bail-in in cases of resolutions. Symmetrically, I expect the estimate of β_1 to be negative in response to the events displaying a decreased commitment of authorities towards the fundamental bail-in principle, as in the case of EU Commission's permission for taxpayers' support in favor of the Italian bank Monte dei Paschi di Siena (MPS) or in the pronouncement of unconstitutionality regarding the bail-in of the Austrian bank Hypo Alpe. These cases are further referred to as the "negative bail-in events". Column (1) in Table 2 classifies all the events on the basis of the positive or negative commitment towards the bail-in scheme.

To complement the investigations about the first hypothesis, placebo tests address the question of whether the estimates of β_1, i.e., the reaction of the yield difference between bailinable and non-bailinable bonds, are crucially driven by the fact that bailinable bonds are junior to non-bailinable ones, rather than by the bailinable status. These regression models essentially replicate the previous difference-in-differences models, apart from the fact that they do not compare bailinable and non-bailinable bonds. Instead, they compare two subcategories that differ in seniority while being both included in the same broad category of bailinable debt. The bail-in rule (described by the BRRD (2014) and the EU Commission's Proposal 280/2012) indicates that the secured status of a liability is the relevant characteristic for excluding with certainty an instrument from future bail-ins. Therefore, an indication of authorities' commitment to this rule should not significantly affect the yield spread between two subcategories that have different seniorities and equal bailinable status. The regression model regarding the placebo tests is the following:

$$yld_{ijt} = \alpha + \alpha_j + \beta_2 \times blnplcb_{ij} \times post_t + \delta_3 \times blnplcb_{ij} + day_t + \delta_4 \times ttm_{jt} + u_{it} \quad (2)$$

The subscripts i, j and t refer to the bailinable status, the bank and the day, respectively. Thus, the units of observation relative to all regressions performed using model (2) are the yields relative to a specific representative bond, to a specific bank and to a specific day. The bond- and

bank-specific "placebo bailinable" status is *blnplcb*. It is valued zero if the representative bond is composed of bonds belonging to the subcategory of "senior unsecured" which is a type of senior bailinable debt; it is valued one if the representative bond is composed of bonds belonging to all other bailinable subcategories, namely "unsecured", "senior subordinated", "subordinated" and "junior subordinated".

A positive β_2 indicates that the indication of commitment to the bail-in regulation increases the yield spread of the senior bailinable bonds compared to the junior bailinable bonds. Instead, an insignificant β_2 would suggest that the bail-in rule - with its designation of the secured bonds as the non-bailinable instruments - is the relevant benchmark for markets' repricing activity, thereby suggesting that seniority *per se* is not a factor driving the repricing of the bonds.

4.1 Aggregated Difference-in-Differences and Placebo Tests

This sub-section provides a classification of the bail-in events according to whether the events reflect a positive or a negative indication of commitment towards the bail-in principle. In addition, by performing the regression models (1) and (2) on the aggregate sample that consists of all the banks in the six countries described in this research, this sub-section presents the estimates relative to the main difference-in-differences and to the placebo tests. This high level of aggregation intends to provide an overview of the results, while the focus on lower levels of aggregation characterizing next sub-sections allow to investigate the heterogeneity across countries and events and, thus, allow to establish a series of empirical regularities.

The column (1) of Table 2 classifies the 19 events in my sample based on whether an event represents an increase or, otherwise, a decrease of the authorities' commitment towards the bail-in scheme. The Appendix II describes the context in which the events are collocated. According to the first hypothesis, we should observe a positive difference-in-differences estimate for the positive events and a negative difference-in-differences estimate for the negative events. In addition, concerning the placebo difference-in-differences, we can expect insignificant coefficients for all the events, which corroborates the fact that seniority *per se* does not motivate the repricing of the bonds.

Panel A in Table 2 shows the relevant regression outputs from model (1) for the entire sample and for each one of the 19 events, where the approach of generating a regression output per each event is in line with the event studies of Shafer et al. (2016) and Acharya et al. (2016) and allows to verify the extent to which each event is in line with the hypotheses and which are the events with the strongest effect. Panel A contains the coefficient of interest β_1 - i.e., the difference-in-differences estimate - in addition to the number of observations and the adjusted R-squared. While the analyses proposed in this subsection serve as an introduction for the subsequent analyses, the coefficients already show a pattern that is in line with the first hypothesis. Although some events exhibit an insignificant difference-in-differences estimate, the reaction of the yield spread has been positive for the cases related to the bail-ins in Cyprus, in Portugal and in Greece and for the EU Parliament's approval of the BRRD. Interestingly, by observing the cases linked to the public support of MPS (December 2012) and to the verdict of unconstitutionality for the bail-in of Hypo Alpe (August 2015), we notice that the effect of authorities' actions on bond market's expectations operates also in the opposite direction: when the commitment decreases, the yield spread between unsecured and secured bonds reduces.

We notice that the adjusted R-squared is very high, even in comparison with other event studies. With a set of robustness checks, I show that the bank fixed effects are responsible for explaining most of the variation of the dependent variable. Indeed, when they are not included, the adjusted R-squared declines to approximately 10% (which is in line with other event studies) and the results are robust. The reason why the bank fixed effects explain such a large portion of the yields variability is due to the tight time window, which makes the fixed effects capture several crucial characteristics like the size, capital structure or the risk-taking.

Panel B illustrates the event-specific outputs of model (2), among which the placebo difference-in-differences estimates are of particular interest: the insignificant coefficients for all the events corroborates the idea that the fact that unsecured bonds are junior compared to secured ones does not explain the yield spread reaction in response to the events.

4.2 State-level Difference-in-Differences Tests

This sub-section uses the wide heterogeneity provided by the state-level analyses for studying with further detail the hypothesis that the bail-in events have induced market participants to reprice bonds according to the bail-in scheme. The state-level investigation of such hypothesis consists in performing the regression model (1) for each country and each event.

Additionally, this level of aggregation allow the analysis of the relation between the yield spread reaction and two covariates. Although this paper acknowledges that establishing an appropriate causal relation between these two covariates and bail-in's expectations goes beyond the scope of this research, these additional analyses allow to establish and discuss two empirical regularities that contribute to the debate about bail-in's effects.

The first covariate is based on the cross-country heterogeneity resulting from different fiscal capacities. A country's public debt can be correlated with bail-in's market reaction through several mechanism and in different directions. For instance, the banks of a country with small fiscal capacity might already have an extremely low probability of public support; thus, the bail-in - a policy that limits public supports - might have an impact on bond prices that is weaker in high-debt countries than in low-debt countries.

On the other hand, a negative correlation between fiscal capacity and bail-in's effect might arise for the fact that the bail-in regulation does not completely ban all the types of public support for banks. Importantly, the public support schemes for banks and the "deviations" from the bail-in principle remarkably depend on a country's fiscal capacity. For instance, such dependence may take three forms. First, the bail-in regulation allows (with the notion of "precautionary recapitalization" under the article 32(4)(d)) to decrease the probability that a bail-in is imposed on a distressed bank, by recurring to the national public finances. Second, a larger fiscal capacity facilitates the creation of support schemes in favor of the unsophisticated portion of unsecured bondholders of bailed-in banks. Third, a government with larger fiscal capacity can more easily invest its funds to indirectly support banks by supporting their borrowing firms (e.g., with the fiscal policy). In these three examples, the fiscal capacity mitigates bail-in's effect because it weakens the negative impact on unsecured bonds and transfers the costs of this mitigation on the public finances thus deteriorating the condition of investors whose securities are secured by a national guarantee.

The second covariate is based on the heterogeneity across bail-in events. This research analyzes a subset of bail-in events - such as the national transpositions of the BRRD or the Austrian Parliament's approval of the bail-in of Hypo Alpe - that directly affects a given country and whose specific occurrence involves only domestic authorities and does not reflect decisions of European authorities. It is possible to conjecture that the impact on markets' expectations exerted by such type of events is different compared to a second type of events that, requiring negotiations with authorities from supranational institutions, provide new information about the commitment of these supranational authorities. In particular, this different impact on market's expectations would be linked to the fact that a given supranational authority involved in a bail-in event might have a considerable decision power not only about a current bail-in event directly affecting a given country, but also in subsequent resolutions affecting banks in other countries. In this context, a given bail-in event may inform also about the commitment the supranational authorities will exhibit in cases of bank resolutions in countries that might not be the most directly affected by the given bail-in event.

Specifically, this paper distinguishes between *events involving supranational authorities* and *events involving only national authorities* on the basis of the presence of negotiations (detected in the official documents or in the news regarding the events) with the ECB, EU Commission, Eurogroup, IMF or EU Parliament. With regard to this classification, Appendix II provides information specific to each event.

4.2.1 Results for State-level Difference-in-Differences Tests

This subsection presents the results of the state-level difference-in-differences, which are designed to test the hypothesis postulating a positive difference-in-differences estimate for the positive events and a negative difference-in-differences estimate for the negative events. This finding would support the notion that markets have adjusted their expectations in a way that follows the commitment of the authorities. Column (1), from Table 3 to Table 13, describes the dichotomous variable that provides information about whether a specific event is a positive or a negative indication of commitment towards the bail-in's fundamental principle of imposing losses on classes of unsecured bondholders before public support. It is labelled as "Commitment".

In addition, this subsection investigates whether bail-in's repricing is associated with fiscal capacity and whether it covaries with the fact that a given event derives from interventions of supranational authorities or, alternatively, involves national authorities only. Column (2), from Table 3 to Table 13, provides information about the "Authority": events involving negotiations between national and supranational authorities are labelled as "Supranational", whereas events involving national authorities only are labelled as "National".

Concerning the fiscal capacity, this subsection investigates whether the repricing produced by the bail-in is contingent on the fiscal capacity of a given country. I explore this possible empirical regularity regarding countries' debt-to-GDP and bail-in's impact by displaying the difference-in-differences estimates per each country, where the countries are collocated in panels from A to E in ascending order according to their debt-to-GDP ratio during the bail-in event.[19]

The results of this subsection corroborate the hypothesis that positive (negative) indications of commitment generate an increase (decrease) of the yield spread. Concerning the heterogeneity across events, evidence suggest that events mandated only by national authorities generate a repricing only for the banks headquartered in the country whose domestic authorities have decided the bail-in event. On the other hand, events resulting from interventions of supranational authorities appear to produce a repricing not only in the country that is the most directly affected by the event but in foreign countries, too. Regarding the fiscal capacity, the difference-in-differences estimates illustrate that the reactions to the events are generally more intense for the countries with a higher debt-to-GDP ratio.[20]

Bail-in of Bankia and other Spanish banks: positive bail-in events

Table 3 illustrates the estimates of the events related to the distressed Spanish banks in 2012. This set of events contain positive bail-in events involving the European authorities. We observe

[19] The data about the debt-to-GDP are provided by Eurostat.

[20] I recognize that the fact that the fiscal capacity appears negatively associated with the bail-in's average reaction might be driven by the fact that average bank in states with low debt-to-GDP ratio may be closer to distress and hence to bail-in. However, the triple-differencing analyses in Section 5 show that the banks' risk is not the crucial driver of this empirical regularity, given that bail-in's repricing remains generally stronger for high debt countries even when we control for each bank's risk of default.

that the coefficients relative to Spain are always positive and significant, supporting the hypothesis that an indication of commitment induces a change in market's expectations about the bail-in. Interestingly, the shock was not confined only to Spanish banks but it positively impacted the yield spread relative to French and Italian bank, which is in line with the notion that events involving supranational authorities may affect also banks from countries that are not directly affected by the bail-in event.[21] In addition, we can notice that the states affected by these decisions have a relatively high debt-to-GDP.

MPS receives government support without bail-in: negative bail-in events

Table 4 shows the coefficients relative to the EU Commission's decision not to impose any bail-in provision on MPS in response to the external support provided by the Italian government.[22] This case is classified as a negative bail-in event that involves supranational authorities. We detect a negative and significant coefficient for the Italian banks, which corroborates the hypothesis that a negative indication of commitment induce market to reduce the yield spread between bailinable and non-bailinable bonds. We can notice that the repricing is not limited only to the Italian banking system, as illustrated by the negative coefficients regarding French and British banks. This effect is coherent with the fact that events resulting from negotiations with supranational authorities might generate a change in market expectations that concerns also other countries. Moreover, we can observe that the states reacting to this event do not generally have a large fiscal capacity.

Bail-in of SNS Reaal, Netherlands: positive bail-in event

[21] It is interesting also to notice that the difference-in-differences estimates for German banks exhibit a particularly large magnitude, even though they are insignificant in all of the 19 events - except for one - . This insignificance is motivated by the particularly large variance of the German yield spread, compared to the other countries.

[22] In the weeks before this event, markets participants were contemplating the possibility that bail-in provisions could be included in the plan to restructure MPS in response to the acquisition of external support. For instance, in late October Moody's (2012) explains that the unsecured bonds of MPS have to be downgraded because it envisages a heightened risk of imposition of mechanisms aiming at allocating losses on classes of unsecured bonds, in the eventuality of an external support.

Table 5 presents the estimates concerning the bail-in SNS Reaal in response to its nationalization. This circumstance is categorized as a positive bail-in event that involves supranational authorities. We can notice a significantly positive estimate for the Italian, French and British banks, which supports the hypothesis that a positive commitment induces an increase in the yield spread and it is in line with the fact that the involvement of European authorities is associated with an impact on multiple countries. Also in this case we can notice that the reaction is significant for countries that are not featured by a particularly large fiscal capacity.

Bail-in of Bank of Cyprus and Laiki: positive bail-in event

Table 6 illustrates the results regarding the bail-in of Bank of Cyprus and Laiki, which has even imposed losses to unsecured depositors. This case is a positive bail-in event that resulted from the negotiations between Cyprian government and European authorities. The coefficients are significantly positive in both events for the Italian, French and Spanish banking systems (also the Austrian and British banks exhibit a positive reaction in one of the events), which corroborates the hypothesis that a positive commitment generates an increase in the yield spread. Moreover, this result is coherent with the idea that the involvement of European authorities is correlated with a yield spread reaction in several countries and it is also in line with the fact that a large debt to GDP ratio is associated with a more significant reaction to the bail-in.

Legislative process of BRRD: positive bail-in events

Table 7 shows the estimates concerning the legislative process of the BRRD, the European directive mandating the bail-in in cases of banking resolution. This case is a positive bail-in event that derive from decisions of European authorities. The estimates are significantly positive for the EU Parliament's approval of the BRRD, while it is insignificant in the case of the EU Finance Ministers agreement on the BRRD proposal. These results are partially supporting the hypothesis of an increase in the yield spread. With regard to the parliamentary approval of the BRRD, the estimates are in line with the fact that the involvement of supranational authorities is associated with a reaction in several countries and, in addition, it is coherent with the idea that a larger debt-to-GDP is connected with a more intense yield-spread reaction.

Moreover, this evidence - similarly to subsequent events - shows that the spread reacts also to events linked to the legislative process, which do not produce an increased banking distress, as illustrated by Schafer et al. (2016). This finding supports the idea that the yield spread between bailinable and non-bailinable bonds reflect the legal specificity of the bail-in, rather than the increase in the default probability.

Bail-in of Banco Espirito Santo, Portugal: positive bail-in event

Table 8 presents the results regarding the bail-in of Banco Espirito Santo (BES), which is categorized as a positive bail-in event that results from negotiations between the Portuguese government and European institutions. The estimates are significantly positive for the Spanish, Italian and German banks. These estimates support the hypothesis of an increase in the yield spread and they are coherent with the notion that the intervention of supranational authorities may drive a propagation of the effect into multiple countries. In addition, the evidence partially supports the idea that a smaller fiscal capacity is correlated with a stronger reaction to the bail-in, even though we notice that the positive reaction of German banks seems not to corroborate this correlation.

Austrian Parliament's approval of Hypo Alpe's bail-in and BRRD: positive bail-in events

Table 9 illustrates the estimates concerning two approvals of the Austrian Parliament: one regards the imposition of the bail-in on Hypo Alpe and a second one transposes in Austria the EU directive BRRD. In these cases, we do not detect any intervention of supranational authorities. The coefficients are significantly positive for the Austrian banks, which not only support the hypothesis of an increase in the yield spread but they are also coherent with the notion that the intervention of national authorities only may be associated with bail-in effects only for the domestic banks.

Uncostitutionality of the bail-in of Hypo Alpe: negative bail-in events

Table 10 shows the coefficients concerning two negative bail-in events regarding the uncostitutionality verdict of Hypo Alpe's bail-in. We observe a negative but insignificant impact in the first event, which is interpretable in the light of the large uncertainty around the uncostitutionality decision that has been fostered by the Finance Minister's reiteration that the bail-in was going to be concluded anyways. The negative and significant coefficient relative to the second event, instead, corroborates the hypothesis that a negative bail-in event decreases the yield spread. In addition, this evidence is in consistent with the idea that an event decided by national authorities only is correlated with bail-in effects only for the domestic banks.

Law regarding the bail-in of Greek banks: positive bail-in event

Table 11 presents the results regarding the bail-in of Greek banks, which involved negotiations with supranational authorities. The coefficients are significantly positive for the three countries with the highest debt-to-GDP, namely Italy, Spain and France. These estimates are consistent with the fact that the events involving supranational authorities may be associated with a yield spread reaction for multiple countries.

France's transposition of BRRD: positive bail-in event

Table 12 illustrates the estimates regarding the national transposition of the BRRD in France, which is a positive event that did not entail any intervention of supranational authorities. The coefficient is significantly positive for the French banks, which not only support the hypothesis of an increase in the yield spread but they are also coherent with the notion that the intervention of national authorities only may be associated with bail-in effects only for the domestic banks.

Italy's transposition of BRRD and media coverage of bail-in: positive bail-in event

Table 13 presents the results concerning the Italian national transposition of the BRRD and the vast media coverage subsequent to the suicide of a retail unsecured bondholders. These are positive events that did not involve supranational authorities. The coefficients are significantly positive for the Italian banks, which not only support the hypothesis of an increase in the yield

spread but they are also coherent with the notion that the intervention of national authorities only may be associated with bail-in effects only for the domestic banks.

4 Region-level Difference-in-differences Analyses

The previous subsection has presented analyses at the lowest level of aggregation, namely the state level. However, all the analyses presented and discussed in the subsequent subsections - i.e., placebo difference-in-differences, the restricted difference-in-differences and the triple-differencing - require a higher level of aggregation for reasons linked to the number of observations. The placebo difference-in-differences test and the restricted difference-in-differences estimation entail the impossibility to use a significant part of the sample, with a reduction in observations of more than 40%, on average.[23] On the other hand, the triple-differencing analyses about the impact of bail-in on market discipline necessitate a higher number of observations compared to the difference-in-differences because, by comparing groups that are more narrowly defined, the triple-differencing may more easily incur an insufficient statistical power (Roberts and Whited (2012)).

Thus, instead of performing the regression models for each event and each country as in the state-level difference-in-differences, this subsection (and all subsequent ones) performs the regression models for each event and each group of countries, called *regions*. This paper defines two regions by splitting the sample of countries into two parts. Specifically, in the light of the evidence of the previous subsection showing that high debt states appear to react differently compared to low debt states, the sample of countries is split into two regions on the basis of their debt-to-GDP ratio. The median debt-to-GDP ratio during each bail-in event is used as the relevant

[23] The observations employed in the placebo difference-in-differences have to correspond to a bank that in a given day has to satisfy two conditions: holding at least a bond that is "senior unsecured" and holding at least a bond that is "unsecured", "senior subordinated", "subordinated" or "junior subordinated". The observations employed in the restricted difference-in-differences have to correspond to a bank that in a given day has to satisfy two conditions: holding at least a bond that is "secured", "senior secured" or "asset backed" and holding at least a bond that is "senior unsecured", "unsecured", "senior subordinated", "subordinated" or "junior subordinated".

threshold and, as a result, the *region with relatively high debt* contains Italy, Spain and France whereas the *region with relatively low debt region* contains U.K., Austria and Germany.[24]

4.1 Region-level Difference-in-Differences

Before showing and discussing the results relative to the region-level placebo and restricted difference-in-differences, it is worth to illustrate whether the region-level difference-in-differences estimates are coherent with the state-level difference-in-differences estimates. Thus, this subsection employs region-level difference-in-differences to test the hypothesis that the bail-in events have induced market participants to reprice bonds according to the bail-in scheme. The region-level investigation of such hypothesis consists in performing the regression model (1) for each region and each event. In principle, the expected results for this test are the same as the state-level difference-in-differences (whose results are shown from Table 3 to Table 13); however, the aggregation at region-level is supposed to largely attenuate the estimates of national bail-in events because the impact might not be large enough to compensate the noise due to the higher level of aggregation. In the previous section, we have observed the regularity that the bail-in impact is stronger for countries with relatively high debt and that it affects more countries in cases of events involving the supranational authorities. Thus, mechanically, we can expect significant difference-in-differences estimates, in particular, for the banks in the region countries with relatively high debt and for events involving supranational authorities.

Table 14 shows that the positive events involving European authorities exhibit positive and significant estimates, which is coherent with the results of the state-level difference-in-differences. The difference-in-differences estimates relative to the bail-in of Dutch bank SNS Reaal and to the EU Finance Ministers' approval of the BRRD are both insignificant; nevertheless, also these two insignificant estimates are in line with the results of the state-level difference-in-differences. Indeed, Table 5 shows that the impact of the bail-in of SNS Reaal has not been very intense for the high-

[24] The division of the countries between those with relatively high-debt and those with relatively low-debt is not altered if, as the relevant threshold, we choose the average debt-to-GDP of the six countries in this study or the average debt-to-GDP of the Europe-19 group.

debt countries while, instead, it has affected the banks in U.K., which is included among the low-debt countries. Concerning the EU Finance Ministers' approval of the BRRD, the insignificant coefficient is consistent with Table 7's evidence showing that this event did not induce the market to reprice bonds in all the countries.

It is interesting to notice the significantly negative estimate relative to the negative events linked to the public support of Italian MPS (December 2012) and to the uncostitutionality verdict in Austria (August 2015), which is in line with the results of Table 4 and Table 10. In addition, we observe that, apart from the events relative to the uncostitutionality verdict in Austria and to the transposition of the BRRD in Italy, the events involving national authorities only deliver insignificant estimates. We also notice that the banks in relatively low-debt countries generally exhibit insignificant results, apart from the aforementioned event linked to bail-in's uncostitutionality and to the bail-in of BES, which has significantly affected German banks, as shown by Table 8.

4.2 Placebo Difference-in-differences

This sub-section addresses the question of whether the difference-in-differences estimates can be attributed to the changes in the legal treatment of bailinable bonds, compared to non-bailinable ones. To address this point, this subsection employs the regression model (2) and, in particular, these regressions are performed for each region and each event. We can expect these placebo difference-in-differences estimates to be generally insignificant if seniority *per se* is not a significant driver of the changes in yields' spread.

Table 15 illustrates that all placebo difference-in-differences coefficients are insignificant, apart from the case relative to the bail-in of Greek banks. Thus, these results generally suggest that in the dates of the bail-in events significant changes in expectations involve the difference between bailinable and non-bailinable bonds, not the difference between two bailinable subcategories.

4.3 Restricted Difference-in-Differences

The difference-in-differences estimation defined by the model (1) regresses the vector of unsecured and secured bonds' yields, on the typical interaction between the time dummy and the treatment dummy that characterizes the difference-in-differences literature (Derrien and Kecskes (2013)). This sub-section offers an alternative specification with respect to the model (1) that provides a tighter control for bank- and day-specific factors by computing the yield spread as the difference between bailinable and non-bailinable bond yields of each bank and per each day. The model is:

$$unsecyld_{j\,t} - secyld_{j\,t} = \alpha + \alpha_j + \beta_3 \times post_t + \delta_5 \times difftm_{j\,t} + u_{i\,t} \tag{3}$$

In this specification, I regress the bank-specific and day-specific difference in yields between the unsecured and the secured bond, $(unsecyld - secyld)$, on the time dummy, *post* . I also control for the bank fixed effects and for the difference in maturities between unsecured and secured bonds, $difftm$. The units of observation relative to all the regressions performed using model (3) are the yields relative to a specific bank and to a specific day. If the standard assumptions regarding the difference-in-differences (Angrist and Pischke (2008)) hold in my setting, results should not be very different from the ones of model (1) displayed in Table 14.

As with the region-level difference-in-differences, we conjecture positive or negative estimates for states with relatively low fiscal capacity in response to the positive or negative events with supranational authorities and we expect significant estimates for low-debt countries in response to events involving only national authorities if the intensity of the impact is large enough.

Table 16 illustrates that the positive events involving supranational authorities generally deliver positive and significant estimates. The negative event linked to the government rescue of MPS produces a significantly negative estimate, like in the Table 14. The coefficients of the events involving only national authorities as well as the coefficients regarding the countries with relatively low debt. This set of outcomes generally indicate a strong consistency between this methodology and the model (1) that produced the results in Table 14.

4.4 Bail-in's Effects and Bank Size

From a policy assessment perspective, it is essential to assess whether the regulation was more effective for larger institutions. As argued by Goodhart, Avgouleas (2014) and by the ECB board (2015), the bail-in, with its emphasis on early intervention, orderly resolution and going concern, has been designed, in particular, to attenuate the "too-big-to-fail" phenomenon that has allowed large banks to be supported by disproportionate explicit and implicit public guarantees. In addition to this policy assessment, it is important to evaluate whether larger banks are more affected by the bail-in because this evaluation improves the econometric identification of the impact of bail-in on market discipline, which is examined in the subsequent section.

To test if the impact of the bail-in on the yield spread between bailinable and non-bailinable bonds is more intense for the large banks, I use the following triple-differencing approach:

$$\begin{aligned} yld_{ijt} = \alpha + \alpha_i + \beta_4 \times size_j \times bln_i \times post_t + \gamma_1 \times size_j \times bln_i + \gamma_2 \times size_j \times post_t \\ + \gamma_3 \times bln_i \times post_t + \delta_5 \times size_j + \delta_6 \times bln_i + day_t + \delta_7 \times ttm_{ijt} \\ + u_{ijt} \end{aligned} \tag{4}$$

The measure of bank's size is based on a bank's value of total assets - the results are robust when I use or the logarithm of total assets or the dummy variable relative to the ECB classification of "significant" institution - . The coefficient β_4 is the outcome of interest relative to model (4) and it is the D-D-D estimate presented in Table 17, for each region and each event. A positive β_4 indicates that a given bail-in event increases the yield spread more for a bank that is larger. Appendix IV provides further details about the interpretation of β_4.

In principle, if the introduction of the bail-in has, on average, decreased the support in favor of the large banks, we should expect a positive (negative) and significant D-D-D estimate in response to positive (negative) indications of commitment towards the bail-in. However, in line with the previous region-level analyses, the effect might be largely weakened by the noise due to the regional level of aggregation. Thus, we can expect significantly positive (negative) difference-in-differences estimates in response to the positive (negative) events especially for countries with relatively high debt and for events involving supranational authorities.

The outcomes in Table 17 show that the D-D-D estimates generally corroborate the hypothesis that the bail-in has affected more intensely the banks that are larger, on average, in

that we observe significantly positive estimates in several positive indications of commitment (although the coefficients are insignificant in some cases) and we detect a negative estimate relative to the public support for MPS without bail-in provisions.

5 Second Hypothesis: Bail-in's Effect on Market Discipline

The second hypothesis of this paper is that the authorities' indications of commitment to the bail-in have increased investors' incentives to incorporate a bank's risk while repricing its bonds, which would corroborate an increase of market discipline. Given that the literature on market discipline has typically gauged these incentives by means of the correlation between risk and yield, the elected empirical methodology is a triple-differencing model adding the dimension of banks' risk to the previous difference-in-differences regression. This model is reminiscent of the triple-differencing model employed by Acharya et al. (2016) to study market discipline.

$$\begin{aligned} yld_{ijt} = \alpha + \alpha_i + \beta_5 \times rsk_{jt} \times bln_i \times post_t + \gamma_1 \times rsk_{jt} \times bln_i + \gamma_2 \times rsk_{jt} \times post_t \\ + \gamma_3 \times bln_i \times post_t + \delta_5 \times rsk_{jt} + \delta_6 \times bln_i + day_t + \delta_7 \times ttm_{ijt} \\ + u_{ijt} \end{aligned} \tag{5}$$

The date-specific time dummy is *post*. It takes the value of zero in the seven days before the event and one in the day of the event.[25] The measure of bank risk, *rsk* , is the Bloomberg's 1-year default probability, which is a comprehensive daily measure of risk using data about the CDS spread, the volatility of the stock price, the net income, non-performing loans, market-to-book ratio, total assets, short-term leverage, long-term leverage and loan losses reserves.[26]

A positive β_5 indicates that the bail-in event increases the yield-risk sensitivity. Indeed, β_5 describes whether the risk premium component of bailinable bond yields increases in response to the event, while netting this time series increase with the response of the risk premium component

[25]In Appendix III, Table A14, I also use windows of (-7; +2) and the results corroborate the second hypothesis - concerning the market discipline - .

[26] As a robustness tests, I use a measure of risk that is lagged with respect to the yield and the results are consistent.

of non-bailinable bond yields. This netting intends to ensure that the effect on market discipline described by β_5 is largely attributable to the legal specificity of the bail-in and it introduction of a divergence between bailinable and non-bailinable. Appendix V provides further details about the interpretation of β_5.

5.1 Results Concerning Market Discipline

In this section, I investigate the impact on market discipline exerted by the list of bail-in events we have analyzed in the previous sections. I calculate the triple-differencing estimates relative to β_5 (also referred to as the D-D-D estimates) by performing the triple-differencing model (5) for each event and each region in order to ensure the appropriate statistical power. We expect significantly positive (negative) triple-differencing coefficients in response to the positive (negative) bail-in events, although the aggregation at region-level might strongly attenuate the effect on market discipline exerted by the bail-in events.

Table 18 illustrates that in the bail-in dates, the triple differencing estimates are statistically equal or greater than zero. In particular, for the high debt countries the coefficients are positive in the case of the first announcement of Bankia's bail-in, in the EU Parliament approval of the BRRD and in occasion of the exceptional media coverage about the bail-in in Italy. This evidence corroborates the existence of a weak positive impact on the market discipline. However, it is worth noticing that this effect is remarkably attenuated by the combination of two circumstances, as discussed in the next subsection.

5.2 Market Discipline and Banks' Size

As anticipated in the previous subsection, the triple-differencing estimates of Table 18 are attenuated by the concurrence of two circumstances. First, the banks with higher risk are also the

ones that are smaller, on average.[27] Second, smaller banks may exhibit a smaller increase in yield spread (between bailinable and non-bailinable bonds) in response to the bail-in, as shown in the previous section.

More precisely, these two circumstances weaken the triple-differencing estimation because a positive (negative) D-D-D coefficient can be interpreted with the fact that the increase in yield spread - between bailinable and non-bailinable bonds - in response to the bail-in event has been more positive (negative) for the riskier banks.[28] Thus, supposing that the "true" triple-differencing estimate is positive and significant - in case of positive events – is equivalent to the conjecture that the yield spread reaction is stronger for riskier banks. However, this possible stronger reaction is counterbalanced by the fact that the riskier banks are also the smaller ones, which are the ones that exhibit a weaker reaction to the bail-in events since they had a smaller public guarantee.

Ideally, to address this point, we should compare the triple-differencing estimates among banks that have the same size. However, we cannot impose clusters that are too narrow given that an enough high number of observations must be ensured in order to attain a sufficient statistical power. Thus, this subsection focuses on a set of banks that is more homogeneous in terms of size and, specifically, I focus on the banks that are larger than a given threshold determined by the size of the median bank or by the ECB's definition of "significant" institution.[29]

Table 19 shows the triple-differencing estimates specific to large banks in countries with relatively high debt and in countries with relatively low debt, where the large banks are the ones with total assets greater than the median institution. We notice that the coefficients are greater than the ones in Table 18. In particular, they are significantly positive in response to the bail-ins of Bankia and SNS Reaal and they are positive also in reaction to the agreement of the EU Finance Ministers about the BRRD proposal, the EU Parliament vote in favor of the BRRD, and during the exceptional media coverage about the bail-in in Italy. For robustness, Table 20 illustrates the

[27] Untabulated results show that by regressing the Bloomberg's 1-year default probability on measures of banks size (total assets, logarithm of total assets or the ECB definition of significant financial institution) the estimate relative to the size is always negative and significant.

[28] Appendix V discusses this interpretation of the triple-differencing estimate.

[29] The set of small banks are not included in this analysis because their statistical power is not enough. For instance, for countries with relatively high-debt, the number of banks with secured bonds is 4 on average, which is insufficient to ensure an appropriate statistical power.

region-level triple-differencing estimates relative to large banks, where the large banks are the ones classified by the ECB as significant institution. We observe that the estimates are greater than those in Table 18 and, in addition, they are comparable to the ones in Table 19.

The results in Table 19 and 20 appear to corroborate an increase of the market discipline for the set of large banks, as conjectured by Goodhart, Avgouleas (2014) and by the ECB board (2015), the DDD estimates of the large institutions suggest that they have been the target of a relatively higher growth in market discipline, compared to smaller banks.

6 Additional Tests

Results concerning Economic Significance

In order to provide an idea about the magnitude of the effect of bail-in events, this subsection illustrates the results concerning the economic significance of the state-level difference-in-differences coefficients. Table A15 in Appendix VII provides two parameters per each country: first, the ratio between the difference-in-differences estimate and the average difference in yields between bailinable and non-bailinable bonds in the seven days before the event; second, the ratio of the difference-in-differences estimate and the standard deviation of the aforementioned mean difference.

Results show that the average ratio between difference-in-differences estimate and the average difference is approximately 0.04 and that the average ratio between difference-in-differences estimate and standard deviation of the average difference is approximately 1.8 . This assessment illustrates a relevant economic significance.

Analyses without bank fixed effects

All the previous empirical analyses have included the bank fixed effects α_j to control for bank-specific and time-invariant components in the bailinable and non-bailinable bond yield. As a robustness check, this subsection tests the first hypothesis - concerning the average yield spread

reaction - , the placebo difference-in-differences and the second hypothesis - concerning the market discipline - without including the bank fixed effects.

Table A16 shows the outcomes of the region-level difference-in-differences, Table A17 displays the results concerning the placebo region-level difference-in-differences and in Table A18 we find the region-level triple-differencing estimates. We can notice that these coefficients are not dramatically different from the Tables 14, 15 and 18, respectively.

Lagged measure of default probability

In order to ensure that the default probability of a given bank is not affected by the occurrence of a bail-in event, this subsection uses a lagged measure of 1-year default probability instead of the contemporaneous value. Table A19 presents the results relative to this specification and we can notice that, compared to Table 18, there are more events in which there is a positive and significant reaction of the market discipline.

Triple-differencing for banks larger and smaller than 95th percentile

Some authors observe that the bail-in regulation might leave the authorities the discretion to impose weaker bail-in, especially in cases of distress of very large institutions (with the notion of precautionary recapitalizations, for instance). In this subsection, I investigate whether the very large banks display a specific reaction to the bail-in events. I implement the following triple-differencing model:

$$\begin{aligned} yld_{ijt} = \alpha + \alpha_i + \beta_6 \times 95per_j \times bln_i \times post_t + \gamma_1 \times 95per_j \times bln_i + \gamma_2 \times 95per_j \times post_t \\ + \gamma_3 \times bln_i \times post_t + \delta_5 \times 95per + \delta_6 \times bln_i + day_t + \delta_7 \times ttm_{ijt} \\ + u_{ijt} \end{aligned} \quad (6)$$

In this model $95per$ is the dummy variable that takes the value of 1 in case the bank is larger than the 95th percentile in a given region and a given event window. Table A20 presents the results of this triple-differencing and we observe that there are three bail-in events in which the difference-in-differences reaction of the banks in the top 5% has been weaker than the 95% of the banks.

Conclusions

This paper has investigated the impact of the bail-in regulations on the prices of banks bonds in six major European countries. It has examined the principal events regarding both the legislative process and the impositions of bail-in on specific banks. Difference-in-differences tests have illustrated that positive (negative) indications of commitment amplified (reduced) the difference in yield between unsecured (i.e., bailinable) and secured (i.e., non-bailinable) bonds. Placebo tests have highlighted that these results are not due to a general banking crisis. A triple-differencing framework has suggested that bail-in events increased investors' incentives to incorporate a bank's risk while pricing its securities, corroborating an expansion of market discipline.

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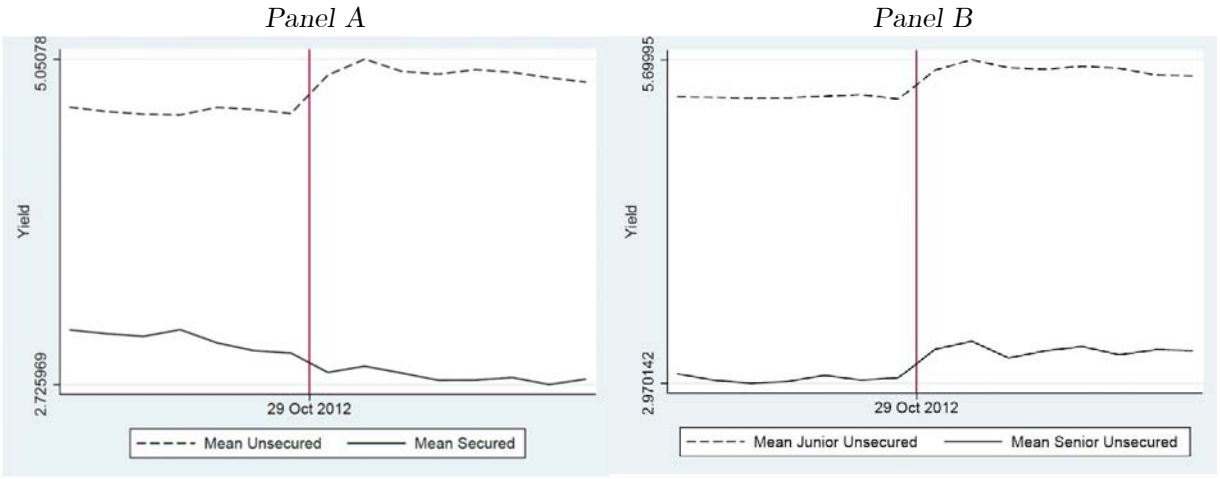
Figures

Figure 1. Reaction of Italian banks' bond yields to the bail-in of Bankia.



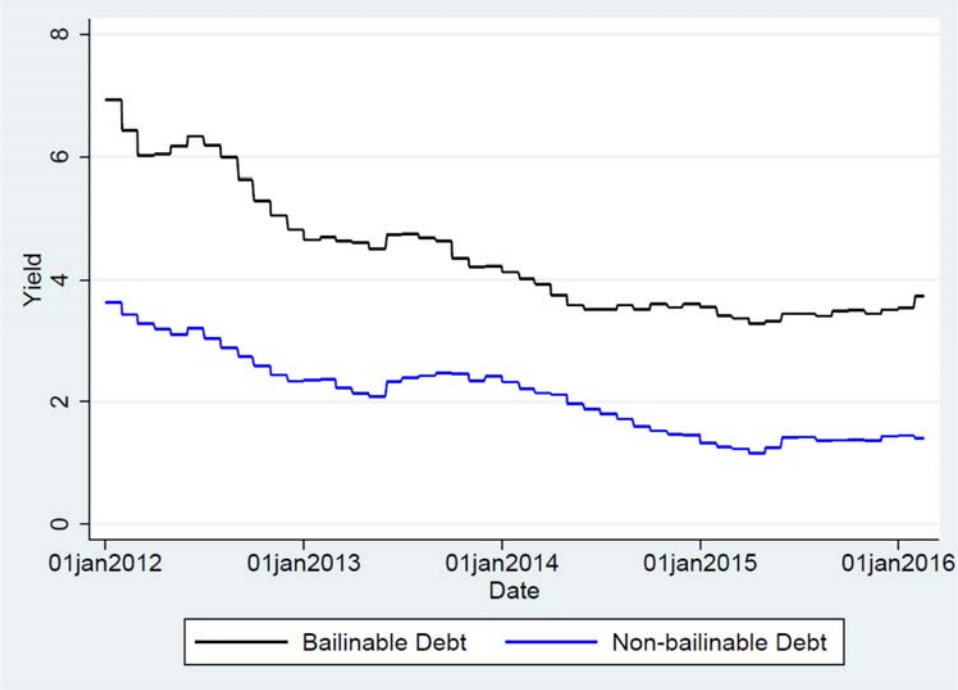
Panel A in Figure 1 depicts the national daily unconditional means of the yields of unsecured and secured bonds issued by Italian banks. The time window is (-7; +7) centered on Oct. 29, 2012 (Appendix II provides information about this bail-in event). The yield is expressed in percentage (%). The secured bonds comprehend the subcategories: "secured", "senior secured", "asset backed". The unsecured bonds comprehend the subcategories: "senior unsecured", "unsecured", "senior subordinated", "subordinated" and "junior subordinated".

Panel B in Figure 1 depicts the national daily unconditional means of the yields of junior unsecured and senior unsecured bonds issued by Italian banks. The time window is (-7; +7) centered on Oct. 29, 2012 (Appendix II provides information about this bail-in event). The yield is expressed in percentage (%). The senior unsecured bonds comprehend the subcategories: "senior unsecured". The junior unsecured bonds comprehend the subcategories: "unsecured", "senior subordinated", "subordinated" and "junior subordinated".

Figure 2. Reaction of bond yields spread to the bail-in of Bankia.

The graphs in Figure 2 plot the daily differences between the unconditional means of the yields of unsecured and the unconditional means of the yields of secured bonds. The time window is (-7; +7) centered on Oct. 29, 2012 (Appendix II provides information about this bail-in event). The yield is expressed in percentage (%). The secured bonds comprehend the subcategories: "secured", "senior secured", "asset backed". The unsecured bonds comprehend the subcategories: "senior unsecured", "unsecured", "senior subordinated", "subordinated" and "junior subordinated".

Figure 3. Time trends of the unconditional means of bond yields.
Figure 3 illustrates the monthly unconditional means of the bailinable bond yields and the monthly unconditional means of the non-bailinable bond yields. The time window starts in June 2012 and ends in January 2016. The dataset relative to this graph contain all the bonds of the six countries in my sample. The yield is expressed in percentage (%).



Tables

Table 1. Descriptive statistics relative to the variables used in the regression models.
This table illustrates the summary statistics for the entire sample relative to the total assets, time to maturity, the bailinable dummy variable (which take the value of one if the debt is unsecured and zero if the debt is secured) and the yield to maturity. The yield is expressed in percentage (%).

Variables	Mean	Median	St.Dev.	N
Tot. Assets (Mln Euro)	233,749	36,340	459,817	383,081
Time to Mat. (days)	2,905	2,263	2,036	383,081
Bailinable status	0.717	1.000	0.450	383,081
Yield to Mat.	4.118	3.086	9.792	383,081

Table 2. Difference-in-Differences and Placebo Difference-in-Differences for the entire sample. The D-D coefficient in Panel A is the estimate of β_1 relative to the model $yld_{ijt} = \alpha + \alpha_j + \beta_1 \times bln_{ij} \times post_t + \delta_1 \times bln_{ij} + day_t + \delta_2 \times ttm_{it} + \varepsilon_{ijt}$; N is the number of observations in the (-7; 0) window; the Adj.R^2 is the adjusted R-squared. The D-D coefficient in Panel B is the estimate of β_2 relative to the model $yld_{ijt} = \alpha + \alpha_j + \beta_1 \times blnplcb_{ij} \times post_t + \delta_1 \times blnplcb_{ij} + day_t + \delta_2 \times ttm_{it} + \varepsilon_{ijt}$. The variable *Commitment* describes whether the event indicates a positive or a negative commitment towards the bail-in principle. Appendix II provides information about these bail-in events. Standard errors are adjusted for both heteroscedasticity and within correlation clustered at the bank level. ***, **, and * indicate significance at the 1%, 5%, and 10% two-tailed levels, respectively.

		(1)	*Panel A* **Diff-in-Diff - Entire sample**			*Panel B* **Placebo - Entire sample**		
Date	**Event**	**Commitment**	**D-D**	N	Adj.R^2	**D-D**	N	Adj.R^2
10.07.12	Spanish bail-in plan	**Positive**	**-0.021**	1446	0.94	**0.008**	982	0.97
19.07.12	Germany vote Spain' rescue	**Positive**	**0.712**	1453	0.81	**0.917**	996	0.83
23.08.12	Spanish Gov. proposes bail-in	**Positive**	**0.015**	1464	0.98	**0.008**	1000	0.99
29.10.12	SAREB conversion details	**Positive**	**-0.047**	1512	0.98	**-0.05**	1000	0.99
18.12.12	EU: no bail-in for MPS	**Negative**	**-0.084****	1552	0.98	**-0.078**	991	0.99
01.02.13	Bail-in SNS Reaal	**Positive**	**-0.036**	1576	0.98	**-0.067**	1027	0.99
18.03.13	Cyprus rescue plan	**Positive**	**0.082****	1600	0.97	**0.062**	1040	0.99
02.04.13	Cyprus accord signed	**Positive**	**0.048***	1428	0.97	**0**	791	0.99
28.06.13	Finance Ministers back BRRD	**Positive**	**-0.105**	1664	0.96	**-0.095**	1072	0.97
15.04.14	EU Parliament backs proposal	**Positive**	**0.025***	2282	0.91	**0.016**	1413	0.85
08.07.14	Law for Hypo Alpe's bail-in	**Positive**	**0.022**	2343	0.92	**-0.006**	1472	0.83
05.08.14	BES bail-in	**Positive**	**0.051*****	2361	0.86	**0.003**	1491	0.73
22.09.14	Austrian BRRD transposition	**Positive**	**0.007**	2393	0.86	**0.024**	1513	0.72
03.07.15	Italian BRRD transposition	**Positive**	**0.024**	2586	0.7	**0.053**	1600	0.62
28.07.15	Uncostitutionality verdict	**Negative**	**0.048**	2600	0.65	**-0.007**	1608	0.57
05.08.15	Moody's downgrading	**Negative**	**-0.043****	2600	0.65	**0.047**	1612	0.57
12.08.15	Greek banks' bail-in	**Positive**	**0.035*****	2600	0.65	**0.002**	1616	0.57
14.09.15	French BRRD transposition	**Positive**	**0.036**	2600	0.66	**0.006**	1616	0.57
09.12.15	Bail-in media coverage	**Positive**	**0.048**	2648	0.66	**0.112**	1648	0.56

Table 3. Spanish banks' bail-in.

The D-D coefficient is the estimate of β_1 relative to the model $yld_{ijt} = \alpha + \alpha_j + \beta_1 \times bln_{ij} \times post_t + \delta_1 \times bln_{ij} + day_t + \delta_2 \times ttm_{it} + \varepsilon_{ijt}$; N is the number of observations in the (-7; 0) window; the Adj.R^2 is the adjusted R-squared. The variable *Commitment* describes whether the event indicates a positive or a negative commitment towards the bail-in principle. The variable *Authority* describes whether the negotiations regarding the event have involved only national authorities or supranational authorities, too. Appendix II provides information about these bail-in events. Standard errors are adjusted for both heteroscedasticity and within correlation clustered at the bank level. ***, **, and * indicate significance at the 1%, 5%, and 10% two-tailed levels, respectively.

		(1)	*(2)*	*Panel A* **Italy**			*Panel B* **Spain**			*Panel C* **France**			*Panel C* **U.K.**			*Panel D* **Austria**			*Panel E* **Germany**		
Date	**Event**	**Commitment**	**Authority**	**D-D**	N	Adj.R^2	**D-D**	N	Adj.R^2	**D-D**	N	Adj.R^2	**D-D**	N	Adj.R^2	**D-D**	N	Adj.R^2	**D-D**	N	Adj.R^2
10.07.12	Spanish bail-in plan	Positive	Supranational	**-0.08**	160	0.67	**0.10*** **	104	0.85	**0.03***	204	0.99	**0.56**	472	0.98	**0.02**	136	0.91	**-0.38**	370	0.95
19.07.12	Germany votes Spain' rescue	Positive	Supranational	**0.12*** **	160	0.86	**0.18***	104	0.88	**0.05*** **	206	0.99	**-0.04**	472	0.97	**0.11**	136	0.92	**3,26**	375	0.80
23.08.12	Spain initiates bail-in law	Positive	Supranational	**0.09** **	160	0.93	**0.06** **	104	0.88	**0.04*** **	204	0.99	**0.02**	480	0.97	**0.08**	136	0.83	**0.09**	380	0.99
29.10.12	Bail-in conversion details	Positive	Supranational	**0.10** **	160	0.98	**0.13*** **	104	0.85	**0.06** **	218	0.99	**-0.04**	496	0.96	**0.03**	144	0.85	**-0.33**	390	0.99

Table 4. Italian government supports Monte dei Paschi di Siena without bail-in provisions.

The D-D coefficient is the estimate of β_1 relative to the model $yld_{ijt} = \alpha + \alpha_j + \beta_1 \times bln_{ij} \times post_t + \delta_1 \times bln_{ij} + day_t + \delta_2 \times ttm_{it} + \varepsilon_{ijt}$; N is the number of observations in the (-7; 0) window; the Adj.R^2 is the adjusted R-squared. The variable *Commitment* describes whether the event indicates a positive or a negative commitment towards the bail-in principle. The variable *Authority* describes whether the negotiations regarding the event have involved only national authorities or supranational authorities, too. Appendix II provides information about these bail-in events. Standard errors are adjusted for both heteroscedasticity and within correlation clustered at the bank level. ***, **, and * indicate significance at the 1%, 5%, and 10% two-tailed levels, respectively.

	(1)	*(2)*	*Panel A* **Italy**			*Panel B* **Spain**			*Panel C* **France**			*Panel C* **U.K.**			*Panel D* **Austria**			*Panel E* **Germany**		
Event	**Commitment**	**Authority**	**D-D**	N	Adj.R^2	**D-D**	N	Adj.R^2	**D-D**	N	Adj.R^2	**D-D**	N	Adj.R^2	**D-D**	N	Adj.R^2	**D-D**	N	Adj.R^2
EU: no bail-in for MPS	Negative	Supranational	**-0.15*** **	160	0.99	**-0.07**	104	0.89	**-0.03***	234	0.99	**-0.08** **	512	0.99	**-0.08**	144	0.87	**-0.23**	398	0.99

Table 5. Bail-in of the Dutch bank SNS Reaal.

The D-D coefficient is the estimate of β_1 relative to the model $yld_{ijt} = \alpha + \alpha_j + \beta_1 \times bln_{ij} \times post_t + \delta_1 \times bln_{ij} + day_t + \delta_2 \times ttm_{it} + \varepsilon_{ijt}$; N is the number of observations in the (-7; 0) window; the Adj.R^2 is the adjusted R-squared. The variable *Commitment* describes whether the event indicates a positive or a negative commitment towards the bail-in principle. The variable *Authority* describes whether the negotiations regarding the event have involved only national authorities or supranational authorities, too. Appendix II provides information about these bail-in events. Standard errors are adjusted for both heteroscedasticity and within correlation clustered at the bank level. ***, **, and * indicate significance at the 1%, 5%, and 10% two-tailed levels, respectively.

	(1)	*(2)*	*Panel A* **Italy**			*Panel B* **Spain**			*Panel C* **France**			*Panel C* **U.K.**			*Panel D* **Austria**			*Panel E* **Germany**		
Event	**Commitment**	**Authority**	**D-D**	N	Adj.R^2	**D-D**	N	Adj.R^2	**D-D**	N	Adj.R^2	**D-D**	N	Adj.R^2	**D-D**	N	Adj.R^2	**D-D**	N	Adj.R^2
Bail-in SNS Reaal	Positive	Supranational	**0.06***	168	0.99	**0.03**	112	0.89	**0.01***	236	0.99	**0.03****	512	0.96	**-0.05**	144	0.84	**-0.20**	404	0.98

Table 6. Bail-in of Cyprian banks.

The D-D coefficient is the estimate of β_1 relative to the model $yld_{ijt} = \alpha + \alpha_j + \beta_1 \times bln_{ij} \times post_t + \delta_1 \times bln_{ij} + day_t + \delta_2 \times ttm_{it} + \varepsilon_{ijt}$; N is the number of observations in the (-7; 0) window; the Adj.R^2 is the adjusted R-squared. The variable *Commitment* describes whether the event indicates a positive or a negative commitment towards the bail-in principle. The variable *Authority* describes whether the negotiations regarding the event have involved only national authorities or supranational authorities, too. Appendix II provides information about these bail-in events. Standard errors are adjusted for both heteroscedasticity and within correlation clustered at the bank level. ***, **, and * indicate significance at the 1%, 5%, and 10% two-tailed levels, respectively.

	(1)	*(2)*	*Panel A* **Italy**			*Panel B* **Spain**			*Panel C* **France**			*Panel C* **U.K.**			*Panel D* **Austria**			*Panel E* **Germany**		
Event	**Commitment**	**Authority**	**D-D**	N	Adj.R^2	**D-D**	N	Adj.R^2	**D-D**	N	Adj.R^2	**D-D**	N	Adj.R^2	**D-D**	N	Adj.R^2	**D-D**	N	Adj.R^2
Cyprus rescue plan	Positive	Supranational	**0.10*** **	168	0.99	**0.10** **	112	0.89	**0.02***	238	0.99	**0.03**	520	0.94	**0.04*** **	144	0.87	**0.19**	418	0.98
Cyprus accord signed	Positive	Supranational	**0.11*** **	126	0.99	**0.06** **	84	0.90	**0.04*** **	216	0.99	**0.01***	535	0.96	**0.00**	108	0.89	**0.07**	359	0.98

Table 7. Approvals of BRRD at European level.

The D-D coefficient is the estimate of β_1 relative to the model $yld_{ijt} = \alpha + \alpha_j + \beta_1 \times bln_{ij} \times post_t + \delta_1 \times bln_{ij} + day_t + \delta_2 \times ttm_{it} + \varepsilon_{ijt}$; N is the number of observations in the (-7; 0) window; the Adj.R^2 is the adjusted R-squared. The variable *Commitment* describes whether the event indicates a positive or a negative commitment towards the bail-in principle. The variable *Authority* describes whether the negotiations regarding the event have involved only national authorities or supranational authorities, too. Appendix II provides information about these bail-in events. Standard errors are adjusted for both heteroscedasticity and within correlation clustered at the bank level. ***, **, and * indicate significance at the 1%, 5%, and 10% two-tailed levels, respectively.

	(1)	*(2)*	*Panel A* **Italy**			*Panel B* **Spain**			*Panel C* **France**			*Panel C* **U.K.**			*Panel D* **Austria**			*Panel E* **Germany**		
Event	**Commitment**	**Authority**	**D-D**	N	Adj.R^2	**D-D**	N	Adj.R^2	**D-D**	N	Adj.R^2	**D-D**	N	Adj.R^2	**D-D**	N	Adj.R^2	**D-D**	N	Adj.R^2
Finance Ministers approve BRRD	Positive	Supranational	**0.00**	168	0.94	**0.02**	112	0.86	**0.01**	237	0.99	**-0.02**	560	0.99	**0.01**	144	0.89	**0.00**	433	0.92
EU Parliament approve BRRD	Positive	Supranational	**0.10***	277	0.94	**0.04****	120	0.86	**0.03*****	308	0.99	**0.07**	722	0.99	**-0.02**	272	0.89	**0.00**	583	0.92

Table 8. BES Bail-in, Portugal.

The D-D coefficient is the estimate of β_1 relative to the model $yld_{ijt} = \alpha + \alpha_j + \beta_1 \times bln_{ij} \times post_t + \delta_1 \times bln_{ij} + day_t + \delta_2 \times ttm_{it} + \varepsilon_{ijt}$; N is the number of observations in the (-7; 0) window; the Adj.R^2 is the adjusted R-squared. The variable *Commitment* describes whether the event indicates a positive or a negative commitment towards the bail-in principle. The variable *Authority* describes whether the negotiations regarding the event have involved only national authorities or supranational authorities, too. Appendix II provides information about these bail-in events. Standard errors are adjusted for both heteroscedasticity and within correlation clustered at the bank level. ***, **, and * indicate significance at the 1%, 5%, and 10% two-tailed levels, respectively.

	(1)	*(2)*	*Panel A* **Italy**			*Panel B* **Spain**			*Panel C* **France**			*Panel C* **U.K.**			*Panel D* **Austria**			*Panel E* **Germany**		
Event	**Commitment**	**Authority**	**D-D**	N	Adj.R^2	**D-D**	N	Adj.R^2	**D-D**	N	Adj.R^2	**D-D**	N	Adj.R^2	**D-D**	N	Adj.R^2	**D-D**	N	Adj.R^2
BES bail-in	Positive	Supranational	**0.07****	301	0.97	**0.01***	120	0.84	**0.01**	313	0.99	**0.04**	760	0.99	**0.00**	280	0.88	**0.12***	587	0.85

Table 9. Austrian Parliament approvals for Hypo Alpe's bail-in and for the national transposition of the BRRD.

The D-D coefficient is the estimate of β_1 relative to the model $yld_{ijt} = \alpha + \alpha_j + \beta_1 \times bln_{ij} \times post_t + \delta_1 \times bln_{ij} + day_t + \delta_2 \times ttm_{it} + \varepsilon_{ijt}$; N is the number of observations in the (-7; 0) window; the Adj.R^2 is the adjusted R-squared. The variable *Commitment* describes whether the event indicates a positive or a negative commitment towards the bail-in principle. The variable *Authority* describes whether the negotiations regarding the event have involved only national authorities or supranational authorities, too. Appendix II provides information about these bail-in events. Standard errors are adjusted for both heteroscedasticity and within correlation clustered at the bank level. ***, **, and * indicate significance at the 1%, 5%, and 10% two-tailed levels, respectively.

	(1)	*(2)*	*Panel A* **Italy**			*Panel B* **Spain**			*Panel C* **France**			*Panel C* **U.K.**			*Panel D* **Austria**			*Panel E* **Germany**		
Event	**Commitment**	**Authority**	**D-D**	N	Adj.R^2	**D-D**	N	Adj.R^2	**D-D**	N	Adj.R^2	**D-D**	N	Adj.R^2	**D-D**	N	Adj.R^2	**D-D**	N	Adj.R^2
Law for Hypo Alpe's bail-in	Positive	National	**0.01**	296	0.97	**0.02**	120	0.84	**0.05***	317	0.99	**0.04**	743	0.99	**0.04****	280	0.90	**0.04**	587	0.91
Austrian BRRD transposition	Positive	National	**-0.01**	304	0.97	**0.01**	120	0.85	**0.00**	317	0.99	**-0.01**	776	0.99	**0.20***	280	0.88	**-0.04**	596	0.84

Table 10. Uncostitutionality verdict for the bail-in of Austrian bank Hypo Alpe.

The D-D coefficient is the estimate of β_1 relative to the model $yld_{ijt} = \alpha + \alpha_j + \beta_1 \times bln_{ij} \times post_t + \delta_1 \times bln_{ij} + day_t + \delta_2 \times ttm_{it} + \varepsilon_{ijt}$; N is the number of observations in the (-7; 0) window; the Adj.R^2 is the adjusted R-squared. The variable *Commitment* describes whether the event indicates a positive or a negative commitment towards the bail-in principle. The variable *Authority* describes whether the negotiations regarding the event have involved only national authorities or supranational authorities, too. Appendix II provides information about these bail-in events. Standard errors are adjusted for both heteroscedasticity and within correlation clustered at the bank level. ***, **, and * indicate significance at the 1%, 5%, and 10% two-tailed levels, respectively.

	(1)	*(2)*	*Panel A* **Italy**			*Panel B* **Spain**			*Panel C* **France**			*Panel C* **U.K.**			*Panel D* **Austria**			*Panel E* **Germany**		
Event	**Commitment**	**Authority**	**D-D**	N	Adj.R^2	**D-D**	N	Adj.R^2	**D-D**	N	Adj.R^2	**D-D**	N	Adj.R^2	**D-D**	N	Adj.R^2	**D-D**	N	Adj.R^2
Uncostitutionality of bail-in	Negative	National	**0.05**	304	0.98	**0.00**	136	0.83	**-0.01**	387	0.99	**0.00**	840	0.97	**-0.04**	296	0.83	**0.10**	637	0.63
Moody's downgrading	Negative	National	**-0.01**	304	0.99	**-0.01**	136	0.83	**-0.01**	388	0.99	**-0.01**	840	0.97	**-0.07***	296	0.82	**-0.05**	636	0.63

Table 11. Greek government agrees to prepare a law for the bail-in of Greek banks.

The D-D coefficient is the estimate of β_1 relative to the model $yld_{ijt} = \alpha + \alpha_j + \beta_1 \times bln_{ij} \times post_t + \delta_1 \times bln_{ij} + day_t + \delta_2 \times ttm_{it} + \varepsilon_{ijt}$; N is the number of observations in the (-7; 0) window; the Adj.R^2 is the adjusted R-squared. The variable *Commitment* describes whether the event indicates a positive or a negative commitment towards the bail-in principle. The variable *Authority* describes whether the negotiations regarding the event have involved only national authorities or supranational authorities, too. Appendix II provides information about these bail-in events. Standard errors are adjusted for both heteroscedasticity and within correlation clustered at the bank level. ***, **, and * indicate significance at the 1%, 5%, and 10% two-tailed levels, respectively.

	(1)	*(2)*	*Panel A* **Italy**			*Panel B* **Spain**			*Panel C* **France**			*Panel C* **U.K.**			*Panel D* **Austria**			*Panel E* **Germany**		
Event	**Commitment**	**Authority**	**D-D**	N	Adj.R^2	**D-D**	N	Adj.R^2	**D-D**	N	Adj.R^2	**D-D**	N	Adj.R^2	**D-D**	N	Adj.R^2	**D-D**	N	Adj.R^2
Greek banks' bail-in	Positive	Supranational	**0.03*** **	304	0.99	**0.02** **	136	0.83	**0.02** **	390	0.99	**-0.01**	840	0.96	**0.02**	296	0.82	**0.03**	634	0.64

Table 12. France's transposition of the BRRD.

The D-D coefficient is the estimate of β_1 relative to the model $yld_{ijt} = \alpha + \alpha_j + \beta_1 \times bln_{ij} \times post_t + \delta_1 \times bln_{ij} + day_t + \delta_2 \times ttm_{it} + \varepsilon_{ijt}$; N is the number of observations in the (-7; 0) window; the Adj.R^2 is the adjusted R-squared. The variable *Commitment* describes whether the event indicates a positive or a negative commitment towards the bail-in principle. The variable *Authority* describes whether the negotiations regarding the event have involved only national authorities or supranational authorities, too. Appendix II provides information about these bail-in events. Standard errors are adjusted for both heteroscedasticity and within correlation clustered at the bank level. ***, **, and * indicate significance at the 1%, 5%, and 10% two-tailed levels, respectively.

	(1)	*(2)*	*Panel A* **Italy**			*Panel B* **Spain**			*Panel C* **France**			*Panel C* **U.K.**			*Panel D* **Austria**			*Panel E* **Germany**		
Event	**Commitment**	**Authority**	**D-D**	N	Adj.R^2	**D-D**	N	Adj.R^2	**D-D**	N	Adj.R^2	**D-D**	N	Adj.R^2	**D-D**	N	Adj.R^2	**D-D**	N	Adj.R^2
French BRRD transposition	Positive	National	**0.07**	304	0.99	**0.01**	136	0.83	**0.03***	389	0.99	**0.01**	840	0.96	**-0.02**	296	0.83	**0.07**	635	0.65

Table 13. Italy's bail-in events.

The D-D coefficient is the estimate of β_1 relative to the model $yld_{ijt} = \alpha + \alpha_j + \beta_1 \times bln_{ij} \times post_t + \delta_1 \times bln_{ij} + day_t + \delta_2 \times ttm_{it} + \varepsilon_{ijt}$; N is the number of observations in the (-7; 0) window; the Adj.R^2 is the adjusted R-squared. The variable *Commitment* describes whether the event indicates a positive or a negative commitment towards the bail-in principle. The variable *Authority* describes whether the negotiations regarding the event have involved only national authorities or supranational authorities, too. Appendix II provides information about these bail-in events. Standard errors are adjusted for both heteroscedasticity and within correlation clustered at the bank level. ***, **, and * indicate significance at the 1%, 5%, and 10% two-tailed levels, respectively.

	(1)	*(2)*	*Panel A* **Italy**			*Panel B* **Spain**			*Panel C* **France**			*Panel C* **U.K.**			*Panel D* **Austria**			*Panel E* **Germany**		
Event	**Commitment**	**Authority**	**D-D**	N	Adj.R^2	**D-D**	N	Adj.R^2	**D-D**	N	Adj.R^2	**D-D**	N	Adj.R^2	**D-D**	N	Adj.R^2	**D-D**	N	Adj.R^2
Italian BRRD transposition	Positive	National	**0.02*** **	304	0.99	**-0.01**	136	0.84	**0.05**	382	0.99	**0.02**	834	0.97	**0.00**	296	0.85	**0.02**	634	0.69
Bail-in media coverage	Positive	National	**0.05*** **	304	0.98	**-0.19**	136	0.77	**0.01**	389	0.99	**0.03**	864	0.97	**0.02**	296	0.79	**0.24**	659	0.65

Table 14. Region-level difference-in-differences.

The D-D coefficient is the estimate of β_1 relative to the model $yld_{ijt} = \alpha + \alpha_j + \beta_1 \times bln_{ij} \times post_t + \delta_1 \times bln_{ij} + day_t + \delta_2 \times ttm_{it} + \varepsilon_{ijt}$; N is the number of observations in the (-7; 0) window; the Adj.R^2 is the adjusted R-squared. Appendix II provides information about these bail-in events. The group of countries with relatively high debt contains Italy, Spain and France. The group of countries with relatively high debt contains U.K., Austria and Germany. Standard errors are adjusted for both heteroscedasticity and within correlation clustered at the bank level. ***, **, and * indicate significance at the 1%, 5%, and 10% two-tailed levels, respectively.

		(1)	*(2)*	*Panel A* **High-debt countries**			*Panel B* **Low-debt countries**		
Date	**Event**	**Commitment**	**Authority**	**D-D**	N	Adj.R^2	**D-D**	N	Adj.R^2
7.12	Spanish bail-in plan	Positive	Supranational	**0.062***	468	0.91	**-0.11**	978	0.96
7.12	Germany votes Spain' rescue	Positive	Supranational	**0.066****	470	0.92	**0.454**	983	0.8
8.12	Spain initiates bail-in law	Positive	Supranational	**0.064*****	469	0.93	**0.004**	995	0.98
10.12	Bail-in conversion details	Positive	Supranational	**0.100*****	482	0.94	**-0.12**	1030	0.98
12.12	EU: no bail-in for MPS	Negative	Supranational	**-0.043***	498	0.96	**-0.10**	1054	0.98
2.13	Bail-in SNS Reaal	Positive	Supranational	**0.019**	516	0.96	**-0.06**	1060	0.98
3.13	Cyprus rescue plan	Positive	Supranational	**0.069*****	518	0.95	**0.081**	1082	0.97
4.13	Cyprus accord signed	Positive	Supranational	**0.114*****	426	0.95	**0.012**	1002	0.97
8.13	Finance Ministers approve BRRD	Positive	Supranational	**0.000**	517	0.97	**-0.15**	1147	0.96
4.14	EU Parliament approve BRRD	Positive	Supranational	**0.045***	705	0.96	**0.031**	1577	0.91
7.14	Law for Hypo Alpe's bail-in	Positive	National	**0.008**	733	0.97	**0.031**	1610	0.91
8.14	BES bail-in	Positive	Supranational	**0.043*****	734	0.97	**0.058***	1627	0.85
9.14	Austrian BRRD transposition	Positive	National	**0.001**	741	0.97	**0.011**	1652	0.85
7.15	Italian BRRD transposition	Positive	National	**0.032***	822	0.98	**0.02**	1764	0.69
7.15	Uncostitutionality of bail-in	Negative	National	**0.015**	827	0.98	**0.034**	1773	0.64
8.15	Moody's downgrading	Negative	National	**-0.01**	828	0.98	**-0.05***	1772	0.64
8.15	Greek banks' bail-in	Positive	Supranational	**0.026*****	830	0.98	**0.015**	1770	0.64
9.15	French BRRD transposition	Positive	National	**0.011**	830	0.98	**0.013**	1770	0.65
12.15	Bail-in media coverage	Positive	National	**-0.06**	829	0.98	**0.105**	1819	0.65

Table 15. Region-level Placebo difference-in-differences.

The D-D coefficient is the estimate of β_2 relative to the placebo diff-in-diff model $yld_{ijt} = \alpha + \alpha_j + \beta_2 \times blnplcb_{ij} \times post_t + \delta_1 \times blnplcb_{ij} + day_t + \delta_2 \times ttm_{it} + \varepsilon_{ijt}$; N is the number of observations in the (-7; 0) window; the Adj.R^2 is the adjusted R-squared. Appendix II provides information about these bail-in events. The group of countries with relatively high debt contains Italy, Spain and France. The group of countries with relatively high debt contains U.K., Austria and Germany. Standard errors are adjusted for both heteroscedasticity and within correlation clustered at the bank level. ***, **, and * indicate significance at the 1%, 5%, and 10% two-tailed levels, respectively.

		(1)	*(2)*	*Panel A* **High-debt countries**			*Panel B* **Low-debt countries**		
Date	**Event**	**Commitment**	**Authority**	**D-D**	N	Adj.R^2	**D-D**	N	Adj.R^2
7.12	Spanish bail-in plan	Positive	Supranational	**0.256**	286	0.72	**-0.14**	688	0.99
7.12	Germany votes Spain' rescue	Positive	Supranational	**-0.15**	296	0.75	**0.845**	693	0.83
8.12	Spain initiates bail-in law	Positive	Supranational	**0.053**	296	0.88	**-0.02**	696	0.99
10.12	Bail-in conversion details	Positive	Supranational	**0.051**	296	0.95	**-0.12**	696	0.99
12.12	EU: no bail-in for MPS	Negative	Supranational	**0.008**	286	0.96	**-0.11**	697	0.99
2.13	Bail-in SNS Reaal	Positive	Supranational	**0.027**	307	0.97	**-0.11**	712	0.99
3.13	Cyprus rescue plan	Positive	Supranational	**-0.02**	312	0.96	**0.094**	720	0.99
4.13	Cyprus accord signed	Positive	Supranational	**-0.01**	234	0.96	**0.016**	551	0.99
8.13	Finance Ministers approve BRRD	Positive	Supranational	**0.04**	312	0.94	**-0.14**	752	0.97
4.14	EU Parliament approve BRRD	Positive	Supranational	**0.000**	437	0.9	**0.006**	968	0.85
7.14	Law for Hypo Alpe's bail-in	Positive	National	**0.006**	472	0.9	**0.000**	984	0.83
8.14	BES bail-in	Positive	Supranational	**0.019**	475	0.9	**0.001**	1000	0.73
9.14	Austrian BRRD transposition	Positive	National	**0.05**	489	0.88	**0.02**	1008	0.72
7.15	Italian BRRD transposition	Positive	National	**0.006**	504	0.89	**0.075**	1080	0.62
7.15	Uncostitutionality of bail-in	Negative	National	**0.033**	504	0.87	**0.019**	1088	0.57
8.15	Moody's downgrading	Negative	National	**0.000**	504	0.87	**0.081**	1092	0.57
8.15	Greek banks' bail-in	Positive	Supranational	**0.017****	504	0.87	**-0.03**	1096	0.57
9.15	French BRRD transposition	Positive	National	**-0.01**	504	0.87	**0.07**	1096	0.57
12.15	Bail-in media coverage	Positive	National	**0.018**	504	0.88	**0.128**	1128	0.55

Table 16. Restricted Diff-in-Diff test for high-debt and low-debt countries.

The D-D coefficient is the estimate of β_3 relative to the restricted diff-in-diff model $unsecyld_{jt} - secyld_{jt} = \alpha + \alpha_j + \beta_3 \times post_t + \delta_2 \times difftm_{it} + \varepsilon_{ijt}$; N is the number of observations in the (-7; 0) window; the Adj.R^2 is the adjusted R-squared. Appendix II provides information about these bail-in events. The group of countries with relatively high debt contains Italy, Spain and France. The group of countries with relatively high debt contains U.K., Austria and Germany. Standard errors are adjusted for both heteroscedasticity and within correlation clustered at the bank level. ***, **, and * indicate significance at the 1%, 5%, and 10% two-tailed levels, respectively.

		(1)	*(2)*	*Panel A* **High-debt countries**			*Panel B* **Low-debt countries**		
Date	**Event**	**Commitment**	**Authority**	**D-D**	N	Adj.R^2	**D-D**	N	Adj.R^2
7.12	Spanish bail-in plan	Positive	Supranational	**0.102*** **	208	0.99	**0.011**	496	0.99
7.12	Germany votes Spain' rescue	Positive	Supranational	**0.173*** **	208	0.99	**0.063**	506	0.99
8.12	Spain initiates bail-in law	Positive	Supranational	**0.068***	208	0.99	**0.040***	512	0.99
10.12	Bail-in conversion details	Positive	Supranational	**0.150*** **	208	0.99	**0.000**	512	0.99
12.12	EU: no bail-in for MPS	Negative	Supranational	**-0.09** **	208	0.99	**-0.15**	514	0.99
2.13	Bail-in SNS Reaal	Positive	Supranational	**0.001**	208	0.99	**0.007**	528	0.99
3.13	Cyprus rescue plan	Positive	Supranational	**0.121*** **	208	0.99	**0.072**	544	0.99
4.13	Cyprus accord signed	Positive	Supranational	**0.091*** **	164	0.99	**0.034***	472	0.99
8.13	Finance Ministers approve BRRD	Positive	Supranational	**-0.01**	208	0.99	**0.018**	560	0.99
4.14	EU Parliament approve BRRD	Positive	Supranational	**0.043*** **	256	0.99	**0.001**	688	0.99
7.14	Law for Hypo Alpe's bail-in	Positive	National	**0.011**	256	0.99	**0.025**	688	0.99
8.14	BES bail-in	Positive	Supranational	**0.000**	266	0.99	**0.000**	688	0.99
9.14	Austrian BRRD transposition	Positive	National	**-0.03**	272	0.99	**0.121***	688	0.99
7.15	Italian BRRD transposition	Positive	National	**0.028**	288	0.98	**0.147**	704	0.99
7.15	Uncostitutionality of bail-in	Negative	National	**0.000**	288	0.99	**0.056**	704	0.99
8.15	Moody's downgrading	Negative	National	**0.000**	288	0.99	**-0.07**	704	0.99
8.15	Greek banks' bail-in	Positive	Supranational	**0.004***	252	0.99	**0.000**	616	0.99
9.15	French BRRD transposition	Positive	National	**0.014**	288	0.99	**-0.02**	704	0.99
12.15	Bail-in media coverage	Positive	National	**0.024**	288	0.99	**0.164**	704	0.99

Table 17. Bail-in impact and bank size. Region-level Triple-differencing.

The D-D-D coefficient is the estimate of β_4 relative to the model $yld_{i\,j\,t} = \alpha + \alpha_i + \beta_4 \times size_j \times bln_i \times post_t + \gamma_1 \times size_j \times bln_i + \gamma_2 \times size_j \times post_t + \gamma_3 \times bln_i \times post_t + \delta_5 \times size_j + \delta_6 \times bln_i + day_t + \delta_7 \times ttm_{i\,t} + u_{i\,j\,t}$; N is the number of observations in the (-7; 0) window; the Adj.R^2 is the adjusted R-squared. Appendix II provides information about these bail-in events. The group of countries with relatively high debt contains Italy, Spain and France. The group of countries with relatively high debt contains U.K., Austria and Germany. The size is measured by the bank's total assets. Standard errors are adjusted for both heteroscedasticity and within correlation clustered at the bank level. ***, **, and * indicate significance at the 1%, 5%, and 10% two-tailed levels, respectively.

		(1)	*(2)*	*Panel A* **High-debt countries**			*Panel B* **Low-debt countries**		
Date	**Event**	**Commitment**	**Authority**	**D-D-D**	N	Adj.R^2	**D-D-D**	N	Adj.R^2
7.12	Spanish bail-in plan	Positive	Supranational	**0,124***	468	0,95	**0,464**	978	0,96
7.12	Germany votes Spain' rescue	Positive	Supranational	**0,112****	470	0,95	**-1,261**	983	0,81
8.12	Spain initiates bail-in law	Positive	Supranational	**-0,051**	469	0,96	**0,279**	995	0,99
10.12	Bail-in conversion details	Positive	Supranational	**-0,021**	482	0,96	**0,424**	1030	0,98
12.12	EU: no bail-in for MPS	Negative	Supranational	**-0,072***	498	0,96	**-0,091**	1054	0,98
2.13	Bail-in SNS Reaal	Positive	Supranational	**0,016**	516	0,98	**0,276**	1060	0,98
3.13	Cyprus rescue plan	Positive	Supranational	**0,067*****	518	0,98	**0,253**	1082	0,98
4.13	Cyprus accord signed	Positive	Supranational	**0,051****	426	0,98	**0,355**	1002	0,97
8.13	Finance Ministers approve BRRD	Positive	Supranational	**-0,004**	517	0,99	**0,697**	1147	0,97
4.14	EU Parliament approve BRRD	Positive	Supranational	**-0,031**	705	0,97	**0,391**	1577	0,92
7.14	Law for Hypo Alpe's bail-in	Positive	National	**0,002**	733	0,97	**0,108**	1610	0,91
8.14	BES bail-in	Positive	Supranational	**0,006**	734	0,97	**0,295**	1627	0,86
9.14	Austrian BRRD transposition	Positive	National	**0,014**	741	0,97	**0,386**	1652	0,85
7.15	Italian BRRD transposition	Positive	National	**0,012**	822	0,99	**1,191**	1764	0,69
7.15	Uncostitutionality of bail-in	Negative	National	**0,039**	827	0,99	**1,047**	1773	0,64
8.15	Moody's downgrading	Negative	National	**0,035**	828	0,99	**1,047**	1772	0,64
8.15	Greek banks' bail-in	Positive	Supranational	**0,052****	830	0,99	**1,139**	1770	0,64
9.15	French BRRD transposition	Positive	National	**0,056***	830	0,98	**0,946**	1770	0,65
12.15	Bail-in media coverage	Positive	National	**0,087****	829	0,98	**0,081**	1819	0,65

Table 17. Triple-differencing model for high-debt and low-debt countries.

The D-D-D coefficient is the estimate of β_4 relative to the model $yld_{i\,j\,t} = \alpha + \alpha_i + \beta_4 \times rsk_{j\,t} \times bln_i \times post_t + \gamma_1 \times rsk_{j\,t} \times bln_i + \gamma_2 \times rsk_{j\,t} \times post_t + \gamma_3 \times bln_i \times post_t + \delta_5 \times rsk_{j\,t} + \delta_6 \times bln_i + day_t + \delta_7 \times ttm_{i\,t} + u_{i\,j\,t}$; N is the number of observations in the (-7; 0) window; the Adj.R^2 is the adjusted R-squared. Appendix II provides information about these bail-in events. The group of countries with relatively high debt contains Italy, Spain and France. The group of countries with relatively high debt contains U.K., Austria and Germany. Standard errors are adjusted for both heteroscedasticity and within correlation clustered at the bank level. ***, **, and * indicate significance at the 1%, 5%, and 10% two-tailed levels, respectively.

		(1)	*(2)*	*Panel A* **High-debt countries**			*Panel B* **Low-debt countries**		
Date	**Event**	**Commitment**	**Authority**	**D-D-D**	N	Adj.R^2	**D-D-D**	N	Adj.R^2
7.12	Spanish bail-in plan	Positive	Supranational	**0.050***	468	0.92	**0.017**	978	0.96
7.12	Germany votes Spain' rescue	Positive	Supranational	**0.010**	470	0.92	**-0.09**	983	0.8
8.12	Spain initiates bail-in law	Positive	Supranational	**0.000**	469	0.93	**0.009**	995	0.98
10.12	Bail-in conversion details	Positive	Supranational	**0.025**	482	0.94	**0.000**	1030	0.98
12.12	EU: no bail-in for MPS	Negative	Supranational	**0.000**	498	0.96	**0.000**	1054	0.98
2.13	Bail-in SNS Reaal	Positive	Supranational	**0.000**	516	0.96	**0.004**	1060	0.98
3.13	Cyprus rescue plan	Positive	Supranational	**0.000**	518	0.95	**0.003**	1082	0.97
4.13	Cyprus accord signed	Positive	Supranational	**0.000**	426	0.95	**0.000**	1002	0.97
8.13	Finance Ministers approve BRRD	Positive	Supranational	**0.000**	517	0.97	**0.01**	1147	0.96
4.14	EU Parliament approve BRRD	Positive	Supranational	**0.043****	705	0.96	**-0.01**	1577	0.91
7.14	Law for Hypo Alpe's bail-in	Positive	National	**0.002**	733	0.97	**0.008**	1610	0.91
8.14	BES bail-in	Positive	Supranational	**0.004**	734	0.97	**0.006**	1627	0.85
9.14	Austrian BRRD transposition	Positive	National	**0.000**	741	0.97	**0.03**	1652	0.85
7.15	Italian BRRD transposition	Positive	National	**0.000**	822	0.98	**0.009**	1764	0.69
7.15	Uncostitutionality of bail-in	Negative	National	**0.000**	827	0.98	**0.001**	1773	0.64
8.15	Moody's downgrading	Negative	National	**0.029**	828	0.98	**0.005**	1772	0.64
8.15	Greek banks' bail-in	Positive	Supranational	**0.018**	830	0.98	**0.000**	1770	0.64
9.15	French BRRD transposition	Positive	National	**-0.03**	830	0.98	**-0.02**	1770	0.65
12.15	Bail-in media coverage	Positive	National	**0.056***	829	0.98	**0.000**	1819	0.65

Table 18. Region-level triple-differencing for large banks.

A financial institution is defined "large" on the basis of the median size of financial institutions. The D-D-D coefficient is the estimate of β_4 relative to the model $yld_{i\,j\,t} = \alpha + \alpha_i + \beta_4 \times rsk_{j\,t} \times bln_i \times post_t + \gamma_1 \times rsk_{j\,t} \times bln_i + \gamma_2 \times rsk_{j\,t} \times post_t + \gamma_3 \times bln_i \times post_t + \delta_5 \times rsk_{j\,t} + \delta_6 \times bln_i + day_t + \delta_7 \times ttm_{i\,t} + u_{i\,j\,t}$; N is the number of observations in the (-7; 0) window; the Adj.R^2 is the adjusted R-squared. Appendix II provides information about these bail-in events. The group of countries with relatively high debt contains Italy, Spain and France. The group of countries with relatively high debt contains U.K., Austria and Germany. Standard errors are adjusted for both heteroscedasticity and within correlation clustered at the bank level. ***, **, and * indicate significance at the 1%, 5%, and 10% two-tailed levels, respectively.

		(1)	*(2)*	*Panel A* **Large banks in high-debt states**			*Panel B* **Large banks in low-debt states**		
Date	**Event**	**Commitment**	**Authority**	**D-D-D**	N	Adj.R^2	**D-D-D**	N	Adj.R^2
7.12	Spanish bail-in plan	Positive	Supranational	**0,062****	302	0,87	**0,047**	402	0,99
7.12	Germany votes Spain' rescue	Positive	Supranational	**0,015**	312	0,89	**0,004**	402	0,99
8.12	Spain initiates bail-in law	Positive	Supranational	**-0,03**	301	0,89	**0,004**	411	0,99
10.12	Bail-in conversion details	Positive	Supranational	**0,014**	306	0,90	**-0,07**	438	0,98
12.12	EU: no bail-in for MPS	Negative	Supranational	**0.007**	329	0,92	**-0,02**	438	0.99
2.13	Bail-in SNS Reaal	Positive	Supranational	**0,066***	332	0,90	**-0,00**	436	0,99
3.13	Cyprus rescue plan	Positive	Supranational	**0,000**	334	0,90	**0,023**	450	0,99
4.13	Cyprus accord signed	Positive	Supranational	**0,014**	288	0,90	**-0,03**	418	0,99
8.13	Finance Ministers approve BRRD	Positive	Supranational	**0,029***	357	0,92	**0,331**	467	0,89
4.14	EU Parliament approve BRRD	Positive	Supranational	**0,058*****	465	0,89	**-0,00**	664	0,90
7.14	Law for Hypo Alpe's bail-in	Positive	National	**0,005**	477	0,91	**-0,00**	683	0,90
8.14	BES bail-in	Positive	Supranational	**-0,00**	481	0,90	**-0,00**	690	0,81
9.14	Austrian BRRD transposition	Positive	National	**0,003**	484	0,90	**0,071*****	694	0,80
7.15	Italian BRRD transposition	Positive	National	**-0,00**	514	0,94	**0,079**	768	0,59
7.15	Uncostitutionality of bail-in	Negative	National	**0,017**	515	0,93	**0,033**	773	0,47
8.15	Moody's downgrading	Negative	National	**0,213**	516	0,94	**-0,00**	772	0,47
8.15	Greek banks' bail-in	Positive	Supranational	**0,008**	518	0,94	**-0,01**	770	0,47
9.15	French BRRD transposition	Positive	National	**-0,02**	518	0,94	**-0,09**	770	0,47
12.15	Bail-in media coverage	Positive	National	**0,036*****	517	0,93	**0,169**	795	0,59

Table 19. Region-level triple-differencing for large banks.

A financial institution is defined "large" on the basis of the ECB definition of significant institutions. The D-D-D coefficient is the estimate of β_4 relative to the model $yld_{i\,j\,t} = \alpha + \alpha_i + \beta_4 \times rsk_{j\,t} \times bln_i \times post_t + \gamma_1 \times rsk_{j\,t} \times bln_i + \gamma_2 \times rsk_{j\,t} \times post_t + \gamma_3 \times bln_i \times post_t + \delta_5 \times rsk_{j\,t} + \delta_6 \times bln_i + day_t + \delta_7 \times ttm_{i\,t} + u_{i\,j\,t}$; N is the number of observations in the (-7; 0) window; the Adj.R^2 is the adjusted R-squared. Appendix II provides information about these bail-in events. The group of countries with relatively high debt contains Italy, Spain and France. The group of countries with relatively high debt contains U.K., Austria and Germany. Standard errors are adjusted for both heteroscedasticity and within correlation clustered at the bank level. ***, **, and * indicate significance at the 1%, 5%, and 10% two-tailed levels, respectively.

		(1)	*(2)*	*Panel A* **Large banks in high-debt states**			*Panel B* **Large banks in low-debt states**		
Date	**Event**	**Commitment**	**Authority**	**D-D-D**	N	Adj.R^2	**D-D-D**	N	Adj.R^2
7.12	Spanish bail-in plan	Positive	Supranational	**0.083***	302	0.86	**0.02**	426	0.61
7.12	Germany votes Spain' rescue	Positive	Supranational	**0.000**	302	0.88	**-0.07**	431	0.59
8.12	Spain initiates bail-in law	Positive	Supranational	**-0.01**	301	0.9	**0.026**	435	0.58
10.12	Bail-in conversion details	Positive	Supranational	**0.012**	298	0.9	**0.01**	438	0.55
12.12	EU: no bail-in for MPS	Negative	Supranational	**0.001**	302	0.9	**-0.01**	438	0.54
2.13	Bail-in SNS Reaal	Positive	Supranational	**0.070***	308	0.9	**0.000**	436	0.55
3.13	Cyprus rescue plan	Positive	Supranational	**0.000**	310	0.89	**0.143**	434	0.53
4.13	Cyprus accord signed	Positive	Supranational	**0.016**	253	0.89	**0.179**	388	0.5
8.13	Finance Ministers approve BRRD	Positive	Supranational	**0.03**	309	0.92	**0.000**	435	0.51
4.14	EU Parliament approve BRRD	Positive	Supranational	**0.058*****	369	0.86	**0.000**	516	0.5
7.14	Law for Hypo Alpe's bail-in	Positive	National	**0.010****	373	0.86	**0.091**	515	0.49
8.14	BES bail-in	Positive	Supranational	**-0.01**	378	0.85	**-0.06**	515	0.49
9.14	Austrian BRRD transposition	Positive	National	**0.005**	380	0.84	**0.061**	516	0.49
7.15	Italian BRRD transposition	Positive	National	**0.000**	390	0.88	**0.56**	514	0.47
7.15	Uncostitutionality of bail-in	Negative	National	**0.015**	387	0.88	**0.264**	517	0.47
8.15	Moody's downgrading	Negative	National	**0.204**	388	0.89	**0.014**	516	0.47
8.15	Greek banks' bail-in	Positive	Supranational	**0.012**	390	0.89	**-1.43**	514	0.47
9.15	French BRRD transposition	Positive	National	**-0.02**	390	0.89	**-0.26**	514	0.47
12.15	Bail-in media coverage	Positive	National	**0.036*****	389	0.85	**0.543**	515	0.47

Appendix I

The following timeline presents all the events, the events' dates and the related articles. The sources can be FT (Financial Times), BN (Bloomberg News), EU Com. (European Commission's document), NG (National Gazzette), CS (Corriere della Sera).

Date	Event	Article's title	Source
10.07.2012	Spanish bail-in plan	Savers face losses in Spain bank rescue	FT
19.07.2012	Germany vote Spain' rescue	Spain bailout-backed	FT
23.08.2012	Spanish Gov. proposes bail-in	Spain bank rules push	FT
29.10.2012	SAREB conversion details	Bankia group to transfer Euro12 bln of foreclosed assets to SAREB	BN
18.12.2012	EU: no bail-in for MPS	EU commission's press release of 17 December 2012	EU Com.
01.02.2013	Bail-in SNS Reaal	Torrid week for European banks	FT
18.03.2013	Cyprus rescue plan	Cyprus in crisis over tax on bank deposits	FT
02.04.2012	Cyprus accord signed	Cyprus government spokesman says have finalized troika talks	BN
28.06.2013	Finance Ministers back BRRD	EU bank rules deal	FT
15.04.2014	EU Parliament approves BRRD	EU banking reforms mark the biggest shake-up	FT
08.07.2014	Law for Hypo-Alpe's bail-in	Austrian parliament approves hypo alpe law imposing bond losses	BN
05.08.2014	BES bail-in	BES knocked on bail-in	FT
22.09.2014	Austrian BRRD ratification	Austria Prepares to Put Senior Bank Creditors in Line for Losses	BN
03.07.2015	Italian BRRD ratification	Legge di delegazione europea 2014/59/UE	NG
28.07.2015	Austria's uncostitutionality verdict	Austrian Court says 2014 Hypo Alpe Law uncostitutional	BN
05.08.2015	Uncostitutionality causes downgrading	Moody's downgrades State of Carinthia's rating	BN
12.08.2015	Greek banks' bail-in	Greece Commits to Comprehensive Bank Plan	BN
14.09.2015	French BRRD ratification	Arrete du 11 septembre 2015 relatif au regime prudentiel	NG
09.12.2015	Bail-in media coverage	Perde 100mila euro col "salvabanche". Pensionato si suicida a Civitavecchia	CS

Appendix II

Bail-in of Bankia and other Spanish banks: positive bail-in events

In May 2012, the stock prices of Bankia and of other smaller Spanish banks experienced a strong and steady decline.

On July 10, 2012, the negotiations between Spanish government, Eurogroup and EU Commission produce the first proposal for the financial support of Bankia (and other banks) that contains the bail-in provision.

On July 19, 2012, the German government, a crucial political counterparty during Spanish negotiations, backed the agreed general program for financial aid.

On August 23, 2012, in order to implement the agreed project for bailing-in the distressed Spanish banks, the Spanish government starts the legislative process for the creation of a national bail-in regulation.

On October 29, 2012, after prolonged discussions with European Commission, ECB and International Monetary Fund (IMF), the Spanish government agrees on the details of the bail-in of Bankia (and other banks), sets up the bad bank (SAREB) and concretely receives the agreed funds.

Indication of commitment towards the bail-in mechanism: positive.

Authorities involved: Spanish and supranational.

MPS receives government support without bail-in: negative bail-in events

On December 17, 2012, the European Commission allowed the Italian government to support without any bail-in provision the distressed Monte dei Paschi di Siena (MPS), the third largest bank in Italy. This is classified as a negative bail-in event because it was a key evidence of the fact that the bail-in principle did not need to be imposed in any case of public support.

Indication of commitment towards the bail-in mechanism: negative.

Authorities involved: Italian and supranational.

Bail-in of SNS Reaal, Netherlands: positive bail-in event

The Dutch institution SNS Reaal, with less than 85 billion euros in assets, during 2012, was bearing very heavy losses and also the percentage of non-performing loans was unceasingly expanding.
On February 1, 2013, the Dutch government has nationalized the domestic institution SNS Reaal and, simultaneously, its shareholders and junior creditors lost their whole capital. This event is typically considered as reflecting the commitment of European authorities, given that the Dutch Finance Minister Dijsselbloem was also the president of the Eurogroup (which has a very prominent institutional role in the resolutions of EU banks) and was recognized as a strong advocate for the bail-in policy.[30]

Indication of commitment towards the bail-in mechanism: positive.

Authorities involved: Dutch and supranational.

Bail-in of Bank of Cyprus and Laiki: positive bail-in event

On March 18, 2013, after very intense discussions with the European Finance Ministers, the government of Cyprus declared that a likely condition for the government support was to include bail-in provisions in the form of losses for all unsecured debt and even deposits.
On April 2, 2013, Cyprus and EU officials concluded the negotiations and, therefore, a large part of the uncertainty linked to the program was solved. The involvement of a very large set of unsecured instruments was confirmed and even depositors with more than 100.000 euros had to bear haircuts.

Indication of commitment towards the bail-in mechanism: positive.

Authorities involved: Cyprian and supranational.

European Approval of BRRD: positive bail-in events

On August 28, 2013, EU Finance Ministers agreed on the proposal of BRRD to be presented in the European Parliament.
On April 14, 2014, the European Parliament votes the final approval of the BRRD proposal.

[30] For instance, the New York Times writes: "What makes this (bail-in) much more than a Dutch novelty is the new clout of Dutch Finance Minister Dijsselbloem".

Indication of commitment towards the bail-in mechanism: positive.

Authorities involved: European.

Bail-in of Banco Espirito Santo, Portugal: positive bail-in event

On August 4, 2014, Reuters announces that Banco Espirito Santo (also referred to as BES), has been transformed into a "bad bank" after intense negotiations between the Portuguese government and the European Union. The agreement imposes the junior creditors to become the creditors of a "bad bank", while a new "good bank" has to contain only the profitable part of the assets.

Indication of commitment towards the bail-in mechanism: positive.

Authorities involved: Portuguese and European.

Austrian Parliament's approval of Hypo Alpe's bail-in and BRRD: positive bail-in events

On July 8, 2014, after explicit requests from the Austrian government to let the national Parliament decide about the bail-in of Austrian financial institution Hypo Alpe, the national assembly approves the reorganization of the banks, which was the first step towards the bail-in of its creditors.

On September 22, 2014, the Austrian Parliament approves the law which transpose the EU directive BRRD.

Indication of commitment towards the bail-in mechanism: positive.

Authorities involved: Austrian.

Uncostitutionality of the bail-in of Hypo Alpe: negative bail-in events

On July 28, 2015, the Austrian Constitutional Court declares unconstitutional the bail-in of the financial institution Hypo Alpe because Carinthian regional government had previously provided explicit guarantees for a large portion of the debt. However, the interpretation of this statement

is ambiguous because the Federal Finance Minister continues to reiterate that the bail-in has to be entirely realized.[31] This is classified as a negative bail-in event.

On August 5, 2015, after the federal government's clarification that it recognizes as legitimate the guarantees of the Carinthian regional government in favor Hypo Alpe's creditors, Moody's certifies that the verdict of unconstitutionality has the legal basis to block the bail-in of the Austrian bank and, as a consequence, the rating agency even cuts the rating of the regional State of Carinthia.

Indication of commitment towards the bail-in mechanism: negative.

Authorities involved: Austrian.

Law regarding the bail-in of Greek banks: positive bail-in event

On August 12, 2015, as a precondition for the approval of the financial support from the European Commission, IMF and ECB, the Greek government prepares the banking law allowing the bail-in of its distressed banks. It is a positive bail-in event.

Indication of commitment towards the bail-in mechanism: positive.

Authorities involved: Greek and European.

France's transposition of BRRD: positive bail-in event

On September 11, 2015, the French Government approves of the Décret 2015-1160, which realizes the national transposition of the BRRD.

Indication of commitment towards the bail-in mechanism: positive.

Authorities involved: French.

Italy's transposition of BRRD and media coverage of bail-in: positive bail-in event

On July 2, 2015, the national Parliament votes the last approval for the Italian transposition of the BRRD. I analyze the first trading day after Italian Camera's transposition of the BRRD.

[31] Bloomberg writes: "Following the Constitutional Court's ruling, the Ministry of Finance indicated that it would have no impact on the creation of Heta (i.e., the bad bank) or the moratorium on debt repayments".

After the resolution of four small Italian banks, several demonstrations take place and, on December 9, 2015, a case of suicide among the unsophisticated investors occurs. This news generated a very intense and broad wave of information about the bail-in and the related risks for unsecured bondholders. The vast media coverage resulting from this event had reached the very large clientele of retail investors that, in Italy, hold 46% of the subordinated securities and 40% of unsecured senior debt issued by Italian banks. Given that the clientele of retail investors had profound difficulties in understanding all the novelties introduced by the bail-in (as claimed by national media and a Parliamentary Commission) this event might have changed the expectations about the legal treatment of unsecured bonds for the large class of unsophisticated unsecured bondholders.

Indication of commitment towards the bail-in mechanism: positive.

Authorities involved: Italian.

Appendix III

Table A3. Spanish banks' bail-in.

The D-D coefficient is the estimate of β_1 relative to the model $yld_{ijt} = \alpha + \alpha_j + \beta_1 \times bln_{ij} \times post_t + \delta_1 \times bln_{ij} + day_t + \delta_2 \times ttm_{it} + \varepsilon_{ijt}$; N is the number of observations in the (-7; +2) window; the Adj.R^2 is the adjusted R-squared. The variable *Commitment* describes whether the event indicates a positive or a negative commitment towards the bail-in principle. The variable *Authority* describes whether the negotiations regarding the event have involved only national authorities or supranational authorities, too. Appendix II provides information about these bail-in events. Standard errors are adjusted for both heteroscedasticity and within correlation clustered at the bank level. ***, **, and * indicate significance at the 1%, 5%, and 10% two-tailed levels, respectively.

		(1)	*(2)*	*Panel A* **Italy**			*Panel B* **Spain**			*Panel C* **France**			*Panel C* **U.K.**			*Panel D* **Austria**			*Panel E* **Germany**		
Date	**Event**	**Commitment**	**Authority**	**D-D**	N	Adj.R^2	**D-D**	N	Adj.R^2	**D-D**	N	Adj.R^2	**D-D**	N	Adj.R^2	**D-D**	N	Adj.R^2	**D-D**	N	Adj.R^2
10.07.12	Spanish bail-in plan	Positive	Supranational	**0.101**	200	0.8	**0.14*** **	130	0.85	**0.038***	256	0.99	**0.014**	590	0.97	**0.027**	170	0.91	**-0.232**	462	0.95
19.07.12	Germany votes Spain' rescue	Positive	Supranational	**0.149*** **	200	0.86	**0.202***	130	0.87	**0.079*** **	258	0.99	**-0.055**	590	0.97	**0.127**	170	0.91	**3.617**	468	0.8
23.08.12	Spanish Gov. proposes bail-in	Positive	Supranational	**0.101** **	200	0.93	**0.039**	130	0.88	**0.046*** **	256	0.99	**0.007**	600	0.97	**0.028**	170	0.83	**0.011**	474	0.98
29.10.12	Bail-in conversion details	Positive	Supranational	**0.091***	200	0.98	**0.081**	130	0.85	**0.07** **	270	0.99	**-0.027**	620	0.95	**0.02**	180	0.85	**-0.494**	487	0.98

Table A4. Italian government supports Monte dei Paschi di Siena without bail-in provisions.

The D-D coefficient is the estimate of β_1 relative to the model $yld_{ijt} = \alpha + \alpha_j + \beta_1 \times bln_{ij} \times post_t + \delta_1 \times bln_{ij} + day_t + \delta_2 \times ttm_{it} + \varepsilon_{ijt}$; N is the number of observations in the (-7; +2) window; the Adj.R^2 is the adjusted R-squared. The variable *Commitment* describes whether the event indicates a positive or a negative commitment towards the bail-in principle. The variable *Authority* describes whether the negotiations regarding the event have involved only national authorities or supranational authorities, too. Appendix II provides information about these bail-in events. Standard errors are adjusted for both heteroscedasticity and within correlation clustered at the bank level. ***, **, and * indicate significance at the 1%, 5%, and 10% two-tailed levels, respectively.

		(1)	*(2)*	*Panel A* **Italy**			*Panel B* **Spain**			*Panel C* **France**			*Panel C* **U.K.**			*Panel D* **Austria**			*Panel E* **Germany**		
Date	**Event**	**Commitment**	**Authority**	**D-D**	N	Adj.R^2	**D-D**	N	Adj.R^2	**D-D**	N	Adj.R^2	**D-D**	N	Adj.R^2	**D-D**	N	Adj.R^2	**D-D**	N	Adj.R^2
18.12.12	EU: no bail-in for MPS	Negative	Supranational	**-0.171*** **	200	0.98	**-0.095**	130	0.89	**-0.055**	293	0.99	**-0.083** **	640	0.96	**-0.083** **	180	0.86	**-0.269**	499	0.98

Table A5. Bail-in of the Dutch bank SNS Reaal.

The D-D coefficient is the estimate of β_1 relative to the model $yld_{ijt} = \alpha + \alpha_j + \beta_1 \times bln_{ij} \times post_t + \delta_1 \times bln_{ij} + day_t + \delta_2 \times ttm_{it} + \varepsilon_{ijt}$; N is the number of observations in the (-7; +2) window; the Adj.R^2 is the adjusted R-squared. The variable *Commitment* describes whether the event indicates a positive or a negative commitment towards the bail-in principle. The variable *Authority* describes whether the negotiations regarding the event have involved only national authorities or supranational authorities, too. Appendix II provides information about these bail-in events. Standard errors are adjusted for both heteroscedasticity and within correlation clustered at the bank level. ***, **, and * indicate significance at the 1%, 5%, and 10% two-tailed levels, respectively.

		(1)	*(2)*	*Panel A* **Italy**			*Panel B* **Spain**			*Panel C* **France**			*Panel C* **U.K.**			*Panel D* **Austria**			*Panel E* **Germany**		
Date	**Event**	**Commitment**	**Authority**	**D-D**	N	Adj.R^2	**D-D**	N	Adj.R^2	**D-D**	N	Adj.R^2	**D-D**	N	Adj.R^2	**D-D**	N	Adj.R^2	**D-D**	N	Adj.R^2
01.02.13	Bail-in SNS Reaal	Positive	Supranational	**0.11*** **	210	0.99	**0.013**	140	0.89	**0.026**	294	0.99	**0.046*** **	640	0.96	**-0.014**	180	0.86	**-0.196**	506	0.98

Table A6. Bail-in of Cyprian banks.

The D-D coefficient is the estimate of β_1 relative to the model $yld_{ijt} = \alpha + \alpha_j + \beta_1 \times bln_{ij} \times post_t + \delta_1 \times bln_{ij} + day_t + \delta_2 \times ttm_{it} + \varepsilon_{ijt}$; N is the number of observations in the (-7; +2) window; the Adj.R^2 is the adjusted R-squared. The variable *Commitment* describes whether the event indicates a positive or a negative commitment towards the bail-in principle. The variable *Authority* describes whether the negotiations regarding the event have involved only national authorities or supranational authorities, too. Appendix II provides information about these bail-in events. Standard errors are adjusted for both heteroscedasticity and within correlation clustered at the bank level. ***, **, and * indicate significance at the 1%, 5%, and 10% two-tailed levels, respectively.

		(1)	*(2)*	*Panel A* **Italy**			*Panel B* **Spain**			*Panel C* **France**			*Panel C* **U.K.**			*Panel D* **Austria**			*Panel E* **Germany**		
Date	**Event**	**Commitment**	**Authority**	**D-D**	N	Adj.R^2	**D-D**	N	Adj.R^2	**D-D**	N	Adj.R^2	**D-D**	N	Adj.R^2	**D-D**	N	Adj.R^2	**D-D**	N	Adj.R^2
18.03.13	Cyprus rescue plan	Positive	Supranational	**0.098*** **	210	0.99	**0.097** **	140	0.89	**0.017**	298	0.99	**0.054**	650	0.94	**0.053** **	180	0.87	**0.194**	522	0.97
02.04.13	Cyprus accord signed	Positive	Supranational	**0.11*** **	168	0.99	**0.042***	112	0.9	**0.042*** **	274	0.99	**0.01**	669	0.96	**0.076*** **	144	0.89	**0.189**	465	0.97

Table A7. Approvals of BRRD at European level.

The D-D coefficient is the estimate of β_1 relative to the model $yld_{ijt} = \alpha + \alpha_j + \beta_1 \times bln_{ij} \times post_t + \delta_1 \times bln_{ij} + day_t + \delta_2 \times ttm_{it} + \varepsilon_{ijt}$; N is the number of observations in the (-7; +2) window; the Adj.R^2 is the adjusted R-squared. The variable *Commitment* describes whether the event indicates a positive or a negative commitment towards the bail-in principle. The variable *Authority* describes whether the negotiations regarding the event have involved only national authorities or supranational authorities, too. Appendix II provides information about these bail-in events. Standard errors are adjusted for both heteroscedasticity and within correlation clustered at the bank level. ***, **, and * indicate significance at the 1%, 5%, and 10% two-tailed levels, respectively.

		(1)	*(2)*	*Panel A* **Italy**			*Panel B* **Spain**			*Panel C* **France**			*Panel C* **U.K.**			*Panel D* **Austria**			*Panel E* **Germany**		
Date	**Event**	**Commitment**	**Authority**	**D-D**	N	Adj.R^2	**D-D**	N	Adj.R^2	**D-D**	N	Adj.R^2	**D-D**	N	Adj.R^2	**D-D**	N	Adj.R^2	**D-D**	N	Adj.R^2
28.06.13	Finance Ministers approve BRRD	Positive	Supranational	**-0.014**	210	0.99	**-0.033**	140	0.9	**0.004**	295	0.99	**-0.015**	700	0.95	**0.013**	180	0.88	**-1.601**	555	0.96
15.04.14	EU Parliament approve BRRD	Positive	Supranational	**0.089***	347	0.94	**0.039****	150	0.86	**0.012**	385	0.99	**0.046**	904	0.98	**-0.027**	340	0.89	**0.022**	730	0.91

Table A8. BES Bail-in, Portugal.

The D-D coefficient is the estimate of β_1 relative to the model $yld_{ijt} = \alpha + \alpha_j + \beta_1 \times bln_{ij} \times post_t + \delta_1 \times bln_{ij} + day_t + \delta_2 \times ttm_{it} + \varepsilon_{ijt}$; N is the number of observations in the (-7; +2) window; the Adj.R^2 is the adjusted R-squared. The variable *Commitment* describes whether the event indicates a positive or a negative commitment towards the bail-in principle. The variable *Authority* describes whether the negotiations regarding the event have involved only national authorities or supranational authorities, too. Appendix II provides information about these bail-in events. Standard errors are adjusted for both heteroscedasticity and within correlation clustered at the bank level. ***, **, and * indicate significance at the 1%, 5%, and 10% two-tailed levels, respectively.

		(1)	*(2)*	*Panel A* **Italy**			*Panel B* **Spain**			*Panel C* **France**			*Panel C* **U.K.**			*Panel D* **Austria**			*Panel E* **Germany**		
Date	**Event**	**Commitment**	**Authority**	**D-D**	N	Adj.R^2	**D-D**	N	Adj.R^2	**D-D**	N	Adj.R^2	**D-D**	N	Adj.R^2	**D-D**	N	Adj.R^2	**D-D**	N	Adj.R^2
05.08.14	BES bail-in	Positive	Supranational	**0.107*** **	377	0.96	**0.036** **	150	0.84	**0.036** **	392	0.99	**0.068***	950	0.98	**0.078**	350	0.88	**0.177** **	734	0.85

Table A9. Austrian Parliament approvals for Hypo Alpe's bail-in and for the national transposition of the BRRD.

The D-D coefficient is the estimate of β_1 relative to the model $yld_{ijt} = \alpha + \alpha_j + \beta_1 \times bln_{ij} \times post_t + \delta_1 \times bln_{ij} + day_t + \delta_2 \times ttm_{it} + \varepsilon_{ijt}$; N is the number of observations in the (-7; +2) window; the Adj.R^2 is the adjusted R-squared. The variable *Commitment* describes whether the event indicates a positive or a negative commitment towards the bail-in principle. The variable *Authority* describes whether the negotiations regarding the event have involved only national authorities or supranational authorities, too. Appendix II provides information about these bail-in events. Standard errors are adjusted for both heteroscedasticity and within correlation clustered at the bank level. ***, **, and * indicate significance at the 1%, 5%, and 10% two-tailed levels, respectively.

		(1)	*(2)*	*Panel A* **Italy**			*Panel B* **Spain**			*Panel C* **France**			*Panel C* **U.K.**			*Panel D* **Austria**			*Panel E* **Germany**		
Date	**Event**	**Commitment**	**Authority**	**D-D**	N	Adj.R^2	**D-D**	N	Adj.R^2	**D-D**	N	Adj.R^2	**D-D**	N	Adj.R^2	**D-D**	N	Adj.R^2	**D-D**	N	Adj.R^2
08.07.14	Law for Hypo Alpe's bail-in	Positive	National	**0.007**	370	0.97	**0.034***	150	0.84	**0.04*****	395	0.99	**0.027***	929	0.99	**0.053***	350	0.9	**-0.004**	735	0.91
22.09.14	Austrian BRRD transposition	Positive	National	**0.007**	380	0.97	**-0.002**	150	0.84	**0.007**	398	0.99	**-0.003**	970	0.99	**0.183*****	350	0.87	**-0.061**	745	0.84

Table A10. Uncostitutionality verdict for the bail-in of Austrian bank Hypo Alpe.

The D-D coefficient is the estimate of β_1 relative to the model $yld_{ijt} = \alpha + \alpha_j + \beta_1 \times bln_{ij} \times post_t + \delta_1 \times bln_{ij} + day_t + \delta_2 \times ttm_{it} + \varepsilon_{ijt}$; N is the number of observations in the (-7; +2) window; the Adj.R^2 is the adjusted R-squared. The variable *Commitment* describes whether the event indicates a positive or a negative commitment towards the bail-in principle. The variable *Authority* describes whether the negotiations regarding the event have involved only national authorities or supranational authorities, too. Appendix II provides information about these bail-in events. Standard errors are adjusted for both heteroscedasticity and within correlation clustered at the bank level. ***, **, and * indicate significance at the 1%, 5%, and 10% two-tailed levels, respectively.

		(1)	*(2)*	*Panel A* **Italy**			*Panel B* **Spain**			*Panel C* **France**			*Panel C* **U.K.**			*Panel D* **Austria**			*Panel E* **Germany**		
Date	**Event**	**Commitment**	**Authority**	**D-D**	N	Adj.R^2	**D-D**	N	Adj.R^2	**D-D**	N	Adj.R^2	**D-D**	N	Adj.R^2	**D-D**	N	Adj.R^2	**D-D**	N	Adj.R^2
28.07.15	Uncostitutionality of bail-in	Negative	National	**0.095**	380	0.97	**-0.004**	170	0.83	**-0.019**	483	0.99	**0.018**	1050	0.96	**-0.037**	370	0.82	**0.116**	797	0.64
05.08.15	Moody's downgrading	Negative	National	**0.004**	380	0.99	**-0.008**	170	0.83	**-0.005**	486	0.99	**-0.006**	1050	0.96	**-0.053****	370	0.82	**-0.018**	794	0.64

Table A11. Greek government agrees to prepare a law for the bail-in of Greek banks.

The D-D coefficient is the estimate of β_1 relative to the model $yld_{ijt} = \alpha + \alpha_j + \beta_1 \times bln_{ij} \times post_t + \delta_1 \times bln_{ij} + day_t + \delta_2 \times ttm_{it} + \varepsilon_{ijt}$; N is the number of observations in the (-7; +2) window; the Adj.R^2 is the adjusted R-squared. The variable *Commitment* describes whether the event indicates a positive or a negative commitment towards the bail-in principle. The variable *Authority* describes whether the negotiations regarding the event have involved only national authorities or supranational authorities, too. Appendix II provides information about these bail-in events. Standard errors are adjusted for both heteroscedasticity and within correlation clustered at the bank level. ***, **, and * indicate significance at the 1%, 5%, and 10% two-tailed levels, respectively.

		(1)	*(2)*	*Panel A* **Italy**			*Panel B* **Spain**			*Panel C* **France**			*Panel C* **U.K.**			*Panel D* **Austria**			*Panel E* **Germany**		
Date	**Event**	**Commitment**	**Authority**	**D-D**	N	Adj.R^2	**D-D**	N	Adj.R^2	**D-D**	N	Adj.R^2	**D-D**	N	Adj.R^2	**D-D**	N	Adj.R^2	**D-D**	N	Adj.R^2
12.08.15	Greek banks' bail-in	Positive	Supranational	**0.026***	380	0.99	**0.025****	170	0.83	**0.019****	487	0.99	**0.001**	1050	0.96	**0.022**	370	0.81	**0.01**	793	0.64

Table A12. France's transposition of the BRRD.

The D-D coefficient is the estimate of β_1 relative to the model $yld_{ijt} = \alpha + \alpha_j + \beta_1 \times bln_{ij} \times post_t + \delta_1 \times bln_{ij} + day_t + \delta_2 \times ttm_{it} + \varepsilon_{ijt}$; N is the number of observations in the (-7; +2) window; the Adj.R^2 is the adjusted R-squared. The variable *Commitment* describes whether the event indicates a positive or a negative commitment towards the bail-in principle. The variable *Authority* describes whether the negotiations regarding the event have involved only national authorities or supranational authorities, too. Appendix II provides information about these bail-in events. Standard errors are adjusted for both heteroscedasticity and within correlation clustered at the bank level. ***, **, and * indicate significance at the 1%, 5%, and 10% two-tailed levels, respectively.

		(1)	*(2)*	*Panel A* **Italy**			*Panel B* **Spain**			*Panel C* **France**			*Panel C* **U.K.**			*Panel D* **Austria**			*Panel E* **Germany**		
Date	**Event**	**Commitment**	**Authority**	**D-D**	N	Adj.R^2	**D-D**	N	Adj.R^2	**D-D**	N	Adj.R^2	**D-D**	N	Adj.R^2	**D-D**	N	Adj.R^2	**D-D**	N	Adj.R^2
14.09.15	French BRRD transposition	Positive	National	**0.052***	380	0.99	**0.009**	170	0.83	**0.028***	486	0.99	**0.002**	1050	0.95	**-0.091**	370	0.82	**0.078**	794	0.65

Table A13. Italy's bail-in events.

The D-D coefficient is the estimate of β_1 relative to the model $yld_{ijt} = \alpha + \alpha_j + \beta_1 \times bln_{ij} \times post_t + \delta_1 \times bln_{ij} + day_t + \delta_2 \times ttm_{it} + \varepsilon_{ijt}$; N is the number of observations in the (-7; +2) window; the Adj.R^2 is the adjusted R-squared. The variable *Commitment* describes whether the event indicates a positive or a negative commitment towards the bail-in principle. The variable *Authority* describes whether the negotiations regarding the event have involved only national authorities or supranational authorities, too. Appendix II provides information about these bail-in events. Standard errors are adjusted for both heteroscedasticity and within correlation clustered at the bank level. ***, **, and * indicate significance at the 1%, 5%, and 10% two-tailed levels, respectively.

		(1)	*(2)*	*Panel A* **Italy**			*Panel B* **Spain**			*Panel C* **France**			*Panel C* **U.K.**			*Panel D* **Austria**			*Panel E* **Germany**		
Date	**Event**	**Commitment**	**Authority**	**D-D**	N	Adj.R^2	**D-D**	N	Adj.R^2	**D-D**	N	Adj.R^2	**D-D**	N	Adj.R^2	**D-D**	N	Adj.R^2	**D-D**	N	Adj.R^2
03.07.15	Italian BRRD transposition	Positive	National	**0.082*** **	380	0.98	**0.022**	170	0.84	**0.063** **	476	0.99	**0.056***	1044	0.96	**0.038**	370	0.85	**0.065**	794	0.68
09.12.15	Bail-in media coverage	Positive	National	**0.067*** **	380	0.98	**-0.187**	170	0.77	**-0.001**	486	0.99	**0.07** **	1080	0.97	**0.068**	370	0.79	**0.306**	824	0.65

Table A14. Triple-differencing with extended time window.

The D-D-D coefficient is the estimate of β_5 relative to the model $yld_{i\,j\,t} = \alpha + \alpha_i + \beta_5 \times rsk_{j\,t} \times bln_i \times post_t + \gamma_1 \times rsk_{j\,t} \times bln_i + \gamma_2 \times rsk_{j\,t} \times post_t + \gamma_3 \times bln_i \times post_t + \delta_5 \times rsk_{j\,t} + \delta_6 \times bln_i + day_t + \delta_7 \times ttm_{i\,t} + u_{i\,j\,t}$; N is the number of observations in the (-7; +2) window; the Adj.R^2 is the adjusted R-squared. Appendix II provides information about these bail-in events. The group of countries with relatively high debt contains Italy, Spain and France. The group of countries with relatively high debt contains U.K., Austria and Germany. Standard errors are adjusted for both heteroscedasticity and within correlation clustered at the bank level. ***, **, and * indicate significance at the 1%, 5%, and 10% two-tailed levels, respectively.

		(1)	*(2)*	*Panel A* **High-debt countries**			*Panel B* **Low-debt countries**		
Date	**Event**	**Commitment**	**Authority**	**D-D-D**	N	Adj.R^2	**D-D-D**	N	Adj.R^2
7.12	Spanish bail-in plan	Positive	Supranational	**0,049***	586	0,92	**0,014***	1222	0,95
7.12	Germany votes Spain' rescue	Positive	Supranational	**0,026**	588	0,92	**-0,105**	1228	0,81
8.12	Spain initiates bail-in law	Positive	Supranational	**-0,006**	586	0,93	**0,009**	1244	0,98
10.12	Bail-in conversion details	Positive	Supranational	**0,044**	600	0,94	**-0,003**	1287	0,98
12.12	EU: no bail-in for MPS	Negative	Supranational	**-0,004**	623	0,96	**-0,001**	1319	0,98
2.13	Bail-in SNS Reaal	Positive	Supranational	**0,001**	644	0,96	**0,004**	1326	0,98
3.13	Cyprus rescue plan	Positive	Supranational	**-0,002**	648	0,95	**0,007**	1352	0,97
4.13	Cyprus accord signed	Positive	Supranational	**0,006**	554	0,95	**-0,001**	1278	0,97
8.13	Finance Ministers approve BRRD	Positive	Supranational	**0,000**	645	0,97	**0,029**	1435	0,96
4.14	EU Parliament approve BRRD	Positive	Supranational	**0,048*****	882	0,96	**-0,01**	1974	0,91
7.14	Law for Hypo Alpe's bail-in	Positive	National	**0,017**	915	0,97	**0,006**	2014	0,91
8.14	BES bail-in	Positive	Supranational	**-0,002**	919	0,97	**0,017**	2034	0,85
9.14	Austrian BRRD transposition	Positive	National	**-0,005**	928	0,97	**0,01**	2065	0,85
7.15	Italian BRRD transposition	Positive	National	**-0,01**	1026	0,98	**0,008**	2208	0,69
7.15	Uncostitutionality of bail-in	Negative	National	**0,002**	1033	0,98	**0,001**	2217	0,65
8.15	Moody's downgrading	Negative	National	**0,039**	1036	0,98	**0,011**	2214	0,65
8.15	Greek banks' bail-in	Positive	Supranational	**0,009***	1037	0,98	**0,003**	2213	0,65
9.15	French BRRD transposition	Positive	National	**-0,011**	1036	0,98	**-0,041**	2214	0,66
12.15	Bail-in media coverage	Positive	National	**0,047***	1036	0,98	**0,042**	2274	0,66

Appendix IV

Interpretation of the triple-differencing estimate β_4

The triple differencing empirical model is:

$$yld_{ijt} = \alpha + \alpha_i + \beta_4 \times size_j \times bln_i \times post_t + \gamma_1 \times size_j \times bln_i + \gamma_2 \times size_j \times post_t + \gamma_3 \times bln_i \times post_t + \delta_5 \times size_j + \delta_6 \times bln_i + day_t + \delta_7 \times ttm_{ijt} + u_{ijt} \quad (4)$$

We can assume that bank risk can take only two values ($size = s = small$ or $size = l = large$), that *post* can take two values ($post = pre$ = before bail-in event or $post = post$ = after bail-in event), that *bln* can take two values ($bln = b$ = bailinable or $bln = n$ = non-bailinable) and that $E(u|bln, post, size, X) = 0$ (where X is the set of control variables in the DDD regression model). It can be shown (by calculating the expectations relative to the triple differencing empirical model) that the β_4 is the difference between two time-series changes in sensitivities:

$$\beta_4 = [(yld_{|l\ b\ post} - yld_{|l\ b\ pre}) - (yld_{|l\ n\ post} - yld_{|l\ n\ pre})] - [(yld_{|s\ b\ post} - yld_{|s\ b\ pre}) - (yld_{|s\ n\ post} - yld_{|s\ n\ pre})]$$

Where:

$(yld_{|l\ b\ post} - yld_{|l\ b\ pre})$ is a difference in expected values describing the time series reaction (to the occurrence of a bail-in event) of the yield of a bailinable bond in a large bank.

$(yld_{|l\ n\ post} - yld_{|l\ n\ pre})$ is a difference in expected values describing the time series reaction (to the occurrence of a bail-in event) of the yield of a non-bailinable bond in a large bank.

$(yld_{|s\ b\ post} - yld_{|s\ b\ pre})$ is a difference in expected values describing the time series reaction (to the occurrence of a bail-in event) of the yield of a bailinable bond in a small bank.

$(yld_{|s\ n\ post} - yld_{|s\ n\ pre})$ is a difference in expected values describing the time series reaction (to the occurrence of a bail-in event) of the yield of a non-bailinable bond in a small bank.

Appendix V

Interpretation of the triple-differencing estimate β_5

The triple differencing empirical model is:

$$yld_{ijt} = \alpha + \alpha_i + \beta_5 \times rsk_{jt} \times bln_i \times post_t + \gamma_1 \times rsk_{jt} \times bln_i + \gamma_2 \times rsk_{jt} \times post_t + \gamma_3 \times bln_i \times post_t + \delta_5 \times rsk_{jt} + \delta_6 \times bln_i + day_t + \delta_7 \times ttm_{ijt} + u_{ijt} \quad (5)$$

We can assume that bank risk can take only two values ($rsk = s = safe$ or $rsk = r = risky$), that *post* can take two values ($post = pre$ = before bail-in event or $post = post$ = after bail-in event), that *bln* can take two values ($bln = b$ = bailinable or $bln = n$ = non-bailinable) and that $E(u|bln, post, rsk, X) = 0$ (where X is the set of control variables in the DDD regression model). It can be shown (by calculating the expectations relative to the triple differencing empirical model) that the β_5 is the difference between two time-series changes in sensitivities:

$$\beta_5 = [(yld_{|r\ b\ post} - yld_{|s\ b\ post}) - (yld_{|r\ b\ pre} - yld_{|s\ b\ pre})] - [(yld_{|r\ n\ post} - yld_{|s\ n\ post}) - (yld_{|r\ n\ pre} - yld_{|s\ n\ pre})]$$

Where:

$(yld_{|r\ b\ post} - yld_{|s\ b\ post})$ is a difference in expected values describing the sensitivity of the yield of a bailinable bond to an increase in risk from s to r, after the bail-in event.

$(yld_{|r\ b\ pre} - yld_{|s\ b\ pre})$ is a difference in expected values describing the sensitivity of the yield of a bailinable bond to an increase in risk from s to r, before the bail-in event.

$(yld_{|r\ n\ post} - yld_{|s\ n\ post})$ is a difference in expected values describing the sensitivity of the yield of a non-bailinable bond to an increase in risk from s to r, after the bail-in event.

$(yld_{|r\ n\ pre} - yld_{|s\ n\ pre})$ is a difference in expected values describing the sensitivity of the yield of a non-bailinable bond to an increase in risk from s to r, before the bail-in event.

It is also interesting to notice an alternative interpretation of β_5 :

$$\beta_5 = [(yld_{|r\ b\ post} - yld_{|r\ b\ pre}) - (yld_{|r\ n\ post} - yld_{|r\ n\ pre})] - [(yld_{|s\ b\ post} - yld_{|s\ b\ pre}) - (yld_{|s\ n\ post} - yld_{|s\ n\ pre})]$$

Where:

$(yld_{|r\ b\ post} - yld_{|r\ b\ pre})$ is a difference in expected values describing the time series reaction (to the occurrence of a bail-in event) of the yield of a bailinable bond in a risky bank.

$(yld_{|r\ n\ post} - yld_{|r\ n\ pre})$ is a difference in expected values describing the time series reaction (to the occurrence of a bail-in event) of the yield of a non-bailinable bond in a risky bank.

$(yld_{|s\ b\ post} - yld_{|s\ b\ pre})$ is a difference in expected values describing the time series reaction (to the occurrence of a bail-in event) of the yield of a bailinable bond in a safe bank.

$(yld_{|s\ n\ post} - yld_{|s\ n\ pre})$ is a difference in expected values describing the time series reaction (to the occurrence of a bail-in event) of the yield of a non-bailinable bond in a safe bank.

Appendix VI

Table A15. Parameters regarding economic significance of State-level difference-in-differences.
$DD/(avg(D))$ is the ratio between the difference-in-differences estimate and the average difference in yields between bailinable and non-bailinable bonds in the seven days before the event; $DD/(sd(D))$ is the ratio of the difference-in-differences estimate and the standard deviation of the difference in means between bailinable and non-bailinable bonds in the seven days before the event.

	Panel A **Italy**		*Panel A* **Spain**		*Panel A* **France**		*Panel A* **U.K.**		*Panel A* **Austria**		*Panel A* **Germany**	
Date	$\frac{DD}{avg(D)}$	$\frac{DD}{sd(D)}$	$\frac{DD}{avg(D)}$	$\frac{DD}{sd(D)}$	$\frac{DD}{avg(D)}$	$\frac{DD}{sd(D)}$	$\frac{DD}{avg(D)}$	$\frac{DD}{sd(D)}$	$\frac{DD}{avg(D)}$	$\frac{DD}{sd(D)}$	$\frac{DD}{avg(D)}$	$\frac{DD}{sd(D)}$
10.07.12	0,05	1,74	0,05	1,33	0,01	2,06	0,01	0,23	0,03	1,19	-0,07	-2,67
19.07.12	0,05	1,73	0,08	2,11	0,02	4,41	-0,02	-0,98	0,12	1,24	0,51	2,77
23.08.12	0,03	1,49	0,02	1,46	0,01	1,10	0,00	-0,22	0,00	0,02	0,00	0,09
29.10.12	0,05	1,62	0,06	2,40	0,02	2,42	-0,02	-1,04	0,02	1,17	-0,04	-1,54
18.12.12	-0,06	-1,68	-0,04	-1,26	-0,01	-1,03	-0,03	-2,72	-0,06	-2,07	-0,03	-1,11
01.02.13	0,03	1,33	-0,01	-0,25	0,01	1,28	0,01	0,96	-0,04	-0,70	-0,04	-2,73
18.03.13	0,05	2,56	0,05	1,48	0,01	0,52	0,02	1,27	0,05	1,03	0,03	1,20
02.04.13	0,05	1,66	0,03	0,73	0,02	1,46	0,01	0,09	-0,01	-0,26	0,01	0,05
28.06.13	0,00	-0,21	-0,01	-0,80	-0,01	-0,99	-0,01	-1,62	0,01	0,20	-0,05	-0,67
15.04.14	0,07	4,82	0,02	1,83	0,04	1,02	0,01	1,04	-0,04	-0,99	-0,01	-0,41
08.07.14	-0,01	-0,69	0,01	1,87	0,05	1,54	0,02	1,68	0,03	1,09	0,01	1,10
05.08.14	0,05	3,03	0,01	1,43	0,02	0,61	0,02	0,24	0,00	-0,04	0,03	2,18
22.09.14	-0,01	-0,79	0,00	0,25	0,00	0,10	-0,01	-0,99	0,12	2,03	-0,01	-1,63
03.07.15	0,01	0,88	0,00	-0,23	0,05	1,81	0,01	0,67	0,00	0,27	0,00	0,11
28.07.15	0,05	5,10	0,00	-0,16	-0,02	-0,81	0,02	0,99	-0,02	-1,58	0,02	1,59
05.08.15	0,00	-1,15	-0,01	-1,10	-0,01	-0,69	-0,01	-0,58	-0,03	-2,21	-0,01	-0,70
12.08.15	0,01	1,62	0,01	1,28	0,01	0,41	-0,01	-0,85	0,00	-0,14	0,00	0,71
14.09.15	0,00	-0,51	0,00	1,26	0,02	0,97	0,00	0,28	-0,01	-1,04	0,00	-0,10
09.12.15	0,03	1,85	-0,12	-3,78	-0,02	-1,21	0,01	0,97	0,05	1,40	0,04	1,30

Appendix VII

Table A16. Region-level difference-in-differences without bank fixed effect.

The D-D coefficient is the estimate of β_1 relative to the model $yld_{i\,j\,t} = \alpha + \beta_1 \times bln_i \times post_t + \delta_6 \times bln_i + day_t + \delta_7 \times ttm_{i\,t} + u_{i\,j\,t}$; N is the number of observations in the (-7; 0) window; the Adj.R^2 is the adjusted R-squared. Appendix II provides information about these bail-in events. The group of countries with relatively high debt contains Italy, Spain and France. The group of countries with relatively high debt contains U.K., Austria and Germany. Standard errors are adjusted for both heteroscedasticity and within correlation clustered at the bank level. ***, **, and * indicate significance at the 1%, 5%, and 10% two-tailed levels, respectively.

		(1)	*(2)*	*Panel A* **High-debt countries**			*Panel B* **Low-debt countries**		
Date	**Event**	**Commitment**	**Authority**	**D-D**	N	Adj.R^2	**D-D**	N	Adj.R^2
7.12	Spanish bail-in plan	Positive	Supranational	**0,037***	468	0,1	**-0,057**	978	0,05
7.12	Germany votes Spain' rescue	Positive	Supranational	**0,034**	471	0,1	**1,124**	981	0,03
8.12	Spain initiates bail-in law	Positive	Supranational	**0,042***	469	0,08	**0,035**	995	0,01
10.12	Bail-in conversion details	Positive	Supranational	**0,119*****	482	0,07	**-0,144**	1030	0,01
12.12	EU: no bail-in for MPS	Negative	Supranational	**-0,029**	498	0,09	**-0,178***	1054	0,01
2.13	Bail-in SNS Reaal	Positive	Supranational	**-0,001**	516	0,09	**-0,042**	1060	0,01
3.13	Cyprus rescue plan	Positive	Supranational	**0,101****	518	0,1	**0,045**	1082	0,01
4.13	Cyprus accord signed	Positive	Supranational	**0,064***	426	0,14	**0,426**	1002	0,01
8.13	Finance Ministers approve BRRD	Positive	Supranational	**0,007**	517	0,11	**-0,199**	1147	0,01
4.14	EU Parliament approve BRRD	Positive	Supranational	**0,045****	705	0,11	**0,007**	1577	0,02
7.14	Law for Hypo Alpe's bail-in	Positive	National	**0,005**	733	0,12	**0,037**	1610	0,02
8.14	BES bail-in	Positive	Supranational	**0,068****	734	0,13	**0,047***	1627	0,04
9.14	Austrian BRRD transposition	Positive	National	**-0,016**	741	0,15	**0,006**	1652	0,04
7.15	Italian BRRD transposition	Positive	National	**0,03***	822	0,09	**0,000**	1764	0,01
7.15	Uncostitutionality of bail-in	Negative	National	**0,000**	827	0,1	**0,063**	1773	0,01
8.15	Moody's downgrading	Negative	National	**-0,016**	828	0,1	**-0,041**	1772	0,01
8.15	Greek banks' bail-in	Positive	Supranational	**0,026*****	830	0,09	**0,043*****	1770	0,01
9.15	French BRRD transposition	Positive	National	**0,026****	829	0,1	**0,021**	1771	0,01
12.15	Bail-in media coverage	Positive	National	**-0,069**	829	0,07	**0,113**	1819	0,01

Table A17. Region-level placebo tests without bank fixed effect.

The D-D coefficient is the estimate of β_2 relative to the placebo diff-in-diff model $yld_{ijt} = \alpha + \beta_2 \times blnplcb_{ij} \times post_t + \delta_1 \times blnplcb_{ij} + day_t + \delta_2 \times ttm_{it} + \varepsilon_{ijt}$; N is the number of observations in the (-7; 0) window; the Adj.R^2 is the adjusted R-squared. Appendix II provides information about these bail-in events. The group of countries with relatively high debt contains Italy, Spain and France. The group of countries with relatively high debt contains U.K., Austria and Germany. Standard errors are adjusted for both heteroscedasticity and within correlation clustered at the bank level. ***, **, and * indicate significance at the 1%, 5%, and 10% two-tailed levels, respectively.

		(1)	*(2)*	*Panel A* **High-debt countries**			*Panel B* **Low-debt countries**		
Date	**Event**	**Commitment**	**Authority**	**D-D**	N	Adj.R^2	**D-D**	N	Adj.R^2
7.12	Spanish bail-in plan	Positive	Supranational	**0,248**	286	0,14	**-0,095**	688	0,08
7.12	Germany votes Spain' rescue	Positive	Supranational	**-0,133**	296	0,15	**1,48**	692	0,05
8.12	Spain initiates bail-in law	Positive	Supranational	**0,052**	296	0,15	**-0,025**	696	0,02
10.12	Bail-in conversion details	Positive	Supranational	**0,053**	296	0,25	**-0,109**	696	0,02
12.12	EU: no bail-in for MPS	Negative	Supranational	**-0,038**	286	0,29	**-0,039**	697	0,02
2.13	Bail-in SNS Reaal	Positive	Supranational	**-0,004**	307	0,22	**-0,119**	712	0,03
3.13	Cyprus rescue plan	Positive	Supranational	**-0,025**	312	0,29	**0,094**	720	0,04
4.13	Cyprus accord signed	Positive	Supranational	**-0,016**	234	0,24	**-0,003**	551	0,04
8.13	Finance Ministers approve BRRD	Positive	Supranational	**0,039**	312	0,23	**-0,148**	752	0,02
4.14	EU Parliament approve BRRD	Positive	Supranational	**-0,003**	437	0,17	**0,006**	968	0,04
7.14	Law for Hypo Alpe's bail-in	Positive	National	**0,006**	472	0,2	**-0,01**	984	0,03
8.14	BES bail-in	Positive	Supranational	**-0,018**	475	0,19	**0,003**	1000	0,04
9.14	Austrian BRRD transposition	Positive	National	**0,006**	489	0,19	**0,016**	1008	0,04
7.15	Italian BRRD transposition	Positive	National	**0,007**	504	0,15	**0,072**	1080	0,02
7.15	Uncostitutionality of bail-in	Negative	National	**0,025**	504	0,18	**-0,021**	1088	0,01
8.15	Moody's downgrading	Negative	National	**-0,01**	504	0,19	**0,067**	1092	0,01
8.15	Greek banks' bail-in	Positive	Supranational	**0,036****	504	0,19	**-0,01**	1096	0,01
9.15	French BRRD transposition	Positive	National	**-0,012**	504	0,2	**0,015**	1096	0,01
12.15	Bail-in media coverage	Positive	National	**0,027**	504	0,19	**0,137**	1128	0,01

Table A18. Region-level triple-differencing without bank fixed effect.

The D-D-D coefficient is the estimate of β_5 relative to the model $yld_{ijt} = \alpha + \beta_5 \times rsk_{j\,t} \times bln_i \times post_t + \gamma_1 \times rsk_{j\,t} \times bln_i + \gamma_2 \times rsk_{j\,t} \times post_t + \gamma_3 \times bln_i \times post_t + \delta_5 \times rsk_{j\,t} + \delta_6 \times bln_i + day_t + \delta_7 \times ttm_{i\,t} + u_{i\,j\,t}$; N is the number of observations in the (-7; 0) window; the Adj.R^2 is the adjusted R-squared. Appendix II provides information about these bail-in events. The group of countries with relatively high debt contains Italy, Spain and France. The group of countries with relatively high debt contains U.K., Austria and Germany. Standard errors are adjusted for both heteroscedasticity and within correlation clustered at the bank level. ***, **, and * indicate significance at the 1%, 5%, and 10% two-tailed levels, respectively.

		(1)	*(2)*	*Panel A* **High-debt countries**			*Panel B* **Low-debt countries**		
Date	**Event**	**Commitment**	**Authority**	**D-D-D**	N	Adj.R^2	**D-D-D**	N	Adj.R^2
7.12	Spanish bail-in plan	Positive	Supranational	**0,041**	468	0,14	**0,011**	978	0,05
7.12	Germany votes Spain' rescue	Positive	Supranational	**-0,033**	471	0,14	**-0,108**	981	0,03
8.12	Spain initiates bail-in law	Positive	Supranational	**0,014**	469	0,10	**0,025**	995	0,01
10.12	Bail-in conversion details	Positive	Supranational	**0,02**	482	0,20	**-0,012**	1030	0,01
12.12	EU: no bail-in for MPS	Negative	Supranational	**-0,026**	498	0,29	**-0,01**	1054	0,01
2.13	Bail-in SNS Reaal	Positive	Supranational	**-0,021**	516	0,39	**0,007**	1060	0,01
3.13	Cyprus rescue plan	Positive	Supranational	**-0,004**	518	0,39	**-0,02**	1082	0,01
4.13	Cyprus accord signed	Positive	Supranational	**0,025***	426	0,39	**-0,016**	1002	0,01
8.13	Finance Ministers approve BRRD	Positive	Supranational	**-0,026**	517	0,48	**0,01**	1147	0,01
4.14	EU Parliament approve BRRD	Positive	Supranational	**0,213***	705	0,15	**-0,013**	1577	0,02
7.14	Law for Hypo Alpe's bail-in	Positive	National	**-0,211**	733	0,15	**0,018**	1610	0,02
8.14	BES bail-in	Positive	Supranational	**0,107***	734	0,14	**0,01**	1627	0,03
9.14	Austrian BRRD transposition	Positive	National	**0,311**	741	0,18	**0,06*****	1652	0,04
7.15	Italian BRRD transposition	Positive	National	**-0,33**	822	0,15	**0,021**	1764	0,01
7.15	Uncostitutionality of bail-in	Negative	National	**0,168**	827	0,15	**0,02**	1773	0,01
8.15	Moody's downgrading	Negative	National	**-0,429**	828	0,15	**0,013**	1772	0,01
8.15	Greek banks' bail-in	Positive	Supranational	**0,794**	830	0,13	**-0,003**	1770	0,01
9.15	French BRRD transposition	Positive	National	**0,185**	829	0,16	**-0,059**	1771	0,01
12.15	Bail-in media coverage	Positive	National	**0,323**	829	0,10	**0,074**	1819	0,05

Table A19. Region-level triple-differencing with lagged risk.

The D-D-D coefficient is the estimate of β_5 relative to the model $yld_{ijt} = \alpha + \alpha_j + \beta_5 \times rsk_{jt-1} \times bln_i \times post_t + \gamma_1 \times rsk_{jt-1} \times bln_i + \gamma_2 \times rsk_{jt-1} \times post_t + \gamma_3 \times bln_i \times post_t + \delta_5 \times rsk_{jt-1} + \delta_6 \times bln_i + day_t + \delta_7 \times ttm_{i\,t} + u_{i\,j\,t}$; N is the number of observations in the (-7; 0) window; the Adj.R^2 is the adjusted R-squared. Appendix II provides information about these bail-in events. The group of countries with relatively high debt contains Italy, Spain and France. The group of countries with relatively high debt contains U.K., Austria and Germany. Standard errors are adjusted for both heteroscedasticity and within correlation clustered at the bank level. ***, **, and * indicate significance at the 1%, 5%, and 10% two-tailed levels, respectively.

		(1)	*(2)*	*Panel A* **High-debt countries**			*Panel B* **Low-debt countries**		
Date	**Event**	**Commitment**	**Authority**	**D-D-D**	N	Adj.R^2	**D-D-D**	N	Adj.R^2
7.12	Spanish bail-in plan	Positive	Supranational	**0,032***	407	0,91	**0,017**	856	0,96
7.12	Germany votes Spain' rescue	Positive	Supranational	**0,034**	412	0,92	**-0,101**	858	0,8
8.12	Spain initiates bail-in law	Positive	Supranational	**0,025**	410	0,93	**0,007**	871	0,98
10.12	Bail-in conversion details	Positive	Supranational	**-0,115**	422	0,94	**-0,002**	901	0,98
12.12	EU: no bail-in for MPS	Negative	Supranational	**-0,003**	435	0,95	**0,004**	921	0,98
2.13	Bail-in SNS Reaal	Positive	Supranational	**0,006**	452	0,95	**0,003**	927	0,98
3.13	Cyprus rescue plan	Positive	Supranational	**-0,002**	453	0,95	**0,003**	947	0,97
4.13	Cyprus accord signed	Positive	Supranational	**3,703***	314	0,94	**-0,083**	815	0,97
8.13	Finance Ministers approve BRRD	Positive	Supranational	**0,013****	452	0,97	**0,03**	1004	0,96
4.14	EU Parliament approve BRRD	Positive	Supranational	**0,003**	616	0,96	**-0,011**	1379	0,91
7.14	Law for Hypo Alpe's bail-in	Positive	National	**-0,007*****	641	0,97	**0,006**	1409	0,91
8.14	BES bail-in	Positive	Supranational	**0,009****	637	0,96	**0,002**	1424	0,85
9.14	Austrian BRRD transposition	Positive	National	**-0,003**	648	0,97	**0,04**	1445	0,84
7.15	Italian BRRD transposition	Positive	National	**-0,004**	719	0,98	**0,005**	1543	0,68
7.15	Uncostitutionality of bail-in	Negative	National	**-0,003**	724	0,98	**0,003**	1551	0,63
8.15	Moody's downgrading	Negative	National	**0,002**	724	0,98	**0,006**	1551	0,63
8.15	Greek banks' bail-in	Positive	Supranational	**-0,02**	727	0,98	**-0,004**	1548	0,64
9.15	French BRRD transposition	Positive	National	**-0,013**	725	0,98	**-0,029**	1550	0,65
12.15	Bail-in media coverage	Positive	National	**0,03**	726	0,98	**-0,002**	1591	0,65

Table A20. Region-level triple-differencing with size; banks over/below 95 percentile.

The D-D-D coefficient is the estimate of β_6 relative to the model $yld_{ijt} = \alpha + \alpha_j + \beta_6 \times 95per_j \times bln_i \times post_t + \gamma_1 \times 95per_j \times bln_i + \gamma_2 \times 95per_j \times post_t + \gamma_3 \times bln_i \times post_t + \delta_5 \times 95per_j + \delta_6 \times bln_i + day_t + \delta_7 \times ttm_{i\,t} + u_{i\,j\,t}$; N is the number of observations in the (-7; 0) window; the Adj.R^2 is the adjusted R-squared. Appendix II provides information about these bail-in events. The dummy variable $95per$ takes the value of 1 when the bank is larger than the 95 percentile in a region, in a given event window. The group of countries with relatively high debt contains Italy, Spain and France. The group of countries with relatively high debt contains U.K., Austria and Germany. Standard errors are adjusted for both heteroscedasticity and within correlation clustered at the bank level. ***, **, and * indicate significance at the 1%, 5%, and 10% two-tailed levels, respectively.

		(1)	*(2)*	*Panel A* **Large banks in high-debt states**			*Panel B* **Large banks in low-debt states**		
Date	**Event**	**Commitment**	**Authority**	**D-D-D**	N	Adj.R^2	**D-D-D**	N	Adj.R^2
7.12	Spanish bail-in plan	Positive	Supranational	**D-D-D**	N	Adj.R2	**D-D-D**	N	Adj.R2
7.12	Germany votes Spain' rescue	Positive	Supranational	**0.112**	301	0.9	**0.018**	442	0.97
8.12	Spain initiates bail-in law	Positive	Supranational	**0.004**	303	0.91	**0.115***	441	0.99
10.12	Bail-in conversion details	Positive	Supranational	**0.027**	301	0.92	**-0.088**	451	0.98
12.12	EU: no bail-in for MPS	Negative	Supranational	**-0.056**	306	0.92	**-0.056**	470	0.98
2.13	Bail-in SNS Reaal	Positive	Supranational	**0.011**	307	0.94	**-0.014**	502	0.99
3.13	Cyprus rescue plan	Positive	Supranational	**-0.196****	308	0.93	**-0.078****	484	0.99
4.13	Cyprus accord signed	Positive	Supranational	**-0.055**	334	0.94	**-0.038**	482	0.99
8.13	Finance Ministers approve BRRD	Positive	Supranational	**0.033**	279	0.95	**-0.147*****	447	0.99
4.14	EU Parliament approve BRRD	Positive	Supranational	**0.004**	357	0.96	**2.165**	491	0.92
7.14	Law for Hypo Alpe's bail-in	Positive	National	**-0.005**	473	0.89	**-0.067**	700	0.9
8.14	BES bail-in	Positive	Supranational	**0.025**	478	0.91	**0.007**	722	0.9
9.14	Austrian BRRD transposition	Positive	National	**-0.033**	489	0.91	**0.006**	721	0.81
7.15	Italian BRRD transposition	Positive	National	**-0.026**	492	0.9	**-0.029**	733	0.8
7.15	Uncostitutionality of bail-in	Negative	National	**0.033**	521	0.94	**0.324**	786	0.66
8.15	Moody's downgrading	Negative	National	**-0.067**	523	0.93	**0.002**	797	0.61
8.15	Greek banks' bail-in	Positive	Supranational	**-0.055**	524	0.94	**0.002**	796	0.61
9.15	French BRRD transposition	Positive	National	**-0.003**	526	0.94	**0.177**	794	0.61
12.15	Bail-in media coverage	Positive	National	**0.058**	525	0.94	**-0.233**	795	0.62

Competition, Profitability and Leverage. How Did Norwegian Firms React to China's Exports Shocks?

Raffaele Giuliana*

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Abstract

For Fama and French (2002), the established evidence of negative profitability-leverage relation contradicts Trade-Off Theory (TOT). I test TOT under its static and dynamic versions using exogenous expected profitability. Using the "double instrumental variable" approach, the first stage predicts the exogenous competition from China where the instrument is the Chinese exports towards rich countries; the second stage predicts the decrease of Norwegian firms' profitability that is explained by the increases of exogenous competition from China; the third stage investigates how leverage reacts to the predicted profitability. Concerning the tests of the static TOT, I find that profitability reduces leverage because assets decrease, while debt remains stable. Moreover, tests of the dynamic TOT illustrate a negative profitability-leverage relation at non-refinancing points, which corroborates the dynamic TOT. I also find, at refinancing points, insignificant profitability-leverage relation, which does not corroborate the dynamic TOT.

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1. Introduction

In numerous corporate capital structure models, the relation between leverage and profitability represents a pivotal prediction. For instance, in Fama and French (2002) this relation has a central role for the empirical assessment of the merits of pecking order and trade-off theories (TOT). As explained by Graham and Leary (2011), the tests of trade-off models have focused on the *static* trade-off theory's prediction that "more profitable firms should more highly value the tax-shield benefits of debt". The current paper tests the hypotheses about the profitability-leverage relation by building on the trade-off theory's predictions. In doing so, it addresses the empirical concerns of the previous literature and encompasses predictions not only from the *static* but also from the more recent *dynamic* versions of the trade-off theory. I find that the leverage of Norwegian firms react negatively to expected profitability's shocks that are exogenous with respect to the leverage decisions; my results reject the *static* TOT and find mixed evidence for the *dynamic* TOT.

An established empirical literature tests the *static* TOT and finds a negative relation between realized profitability and leverage.[32] Fama and French (2002) find that book leverage is higher in less profitable firms and conclude that this evidence contradicts the trade-off theory. This discrepancy between the static trade-off theory and empirical evidence has been addressed both through a theoretical revision of the static models and through an empirical revision of its tests. The trade-off dynamic inaction models have revised and extended the static models, for instance, by acknowledging and modeling the presence of adjustment costs towards the equilibrium leverage.[33] With this framework, the dynamic trade-off theory explains how the evidence of a negative profitability-leverage relation does not contradict the trade-off theory. In addition, the recent contribution of Danis et al. (2014) empirically corroborates the dynamic inaction theory by finding that profitability is positively correlated with leverage when firms are at refinancing points.

On the other hand, concerning the empirical revision of the static TOT's test, another recent research emphasizes that a better identification strategy can be sufficient to solve the discrepancy

[32] For instance, Rajan and Zingales (1995), Baker and Wurgler (2002), Titman and Wessels (1988) and Myers (2003).

[33] According to the definition of Danis, Rettl and Whited (2014), it is the class of models that includes, for instance, Fisher et al. (1989), Strebulaev (2007) and Hennessy and Whited (2005). The trade-off dynamic inaction theories will also be referred to as dynamic trade-off theories or dynamic TOT.

between predictions and empirics. Xu (2012)'s intuition is that, since the crucial predictions of TOT involve the *expected* profitability (rather than the *lagged realized* profitability typically used in the tests of TOT), better proxies of expected profitability can improve the empirical assessment of TOT. As new proxy for the expected profitability of domestic U.S. firms, Xu (2012) adopts the import competition, namely the product market competition exerted by foreign producers against domestic U.S. firms. The use of this proxy builds on the evidence that import competition deteriorates profitability.[34] By finding a positive relation between leverage and expected profitability, which corroborates the static TOT, Xu (2012) contrasts the conclusions of Fama and French (2002).[35]

My paper contributes to the investigations about the profitability-leverage relation by nesting and extending these two revisions. It tests the static and dynamic trade-off theories by employing a measure of profitability that emphasizes the expectations of profitability, and it also tackles the endogeneity concerns of the previous empirical analyses.

Regarding the endogeneity, an analysis of the impact of import competition on capital structure must require that capital structure does not drive the import competition. Xu's contribution recognizes that a simple measure of import competition is endogenous with leverage and, thus, it uses the U.S. tariff policy as an exogenous shock.[36]

However, U.S. tariffs reveal a documented endogeneity problem. Indeed, previous contributions point out not only that the governments of large rich countries - such as the U.S. - have vast powers to impose which industries must be liberalized, but also that the government's tariffs policy is subject to a pervasive and costly lobbying activity.[37] Since firm's aversion to competition and firm's ability to lobby are crucially driven by specific profitability and capital structure patterns, it is difficult to argue that the treatment "liberalization in the U.S." is assigned to firms independently from their capital structures. There is anecdotal evidence that among

[34] Katics and Pedersen (1994), DeRosa and Goldstein (1981), Pagoulatos and Sorensen (1976).

[35] Xu (2012) is the only paper investigating the trade-off theory under the competition-profitability-leverage relations, to the best of my knowledge.

[36] For instance, the high leverage of an industry increases its vulnerability with respect to the aggressive competition and predatory pricing exerted by foreign firms, in line with Bolton and Scharfstein (1990) and Campello (2006).

[37] Krugman, Obsfeld, and Melitz (2012), Grossman and Helpman (1992) and Krishna, Mitra (2005).

finance authors this endogeneity is considered as a primary concern in the studies of the effects of import competition on corporate financing. The reason is that firms have different incentives for lobbying against liberalizations and these differences crucially depend on profitability, default probability, leverage, diversification and governance.[38] The circumstances regarding the "steel safeguards" - a U.S. protectionist measure in favor of steel producers - offer a prominent example of the relation between firm characteristics, lobbying incentives and government response. Liebman and Tomlin (2006) explain that, after China's entry in the U.S. steel market, American producers were facing a severe increase in leverage and a strong wave of defaults. After an expensive lobbying activity, the Bush administration decided to start and bargain with the trade partners. The negotiations allowed the rapid adoption of the "steel safeguards", which were later repealed, once the default risk has diminished.

This endogeneity concern interferes with our understanding of the impact of import competition on financing decisions. Hence, in order to predict an exogenous import competition, I use the imports shocks regarding Norway. This setting has the advantage of being based on a small open economy (Norwegian GDP is less than 1/34 of the U.S. GDP), where the lobbying activity of firms can scarcely influence the timing and extent of multilateral import tariffs and non-tariff barriers to trade (NTBs).

In addition, differently from previous literature, in this paper the source of shocks to imports does not consist only in the tariff changes, which represent only a portion of the barriers to trade. Indeed, as illustrated by Antras (2014), and Mansfield and Busch (1995), the non-tariff barriers to trade (NTBs) represent a crucial determinant of foreign competition. Implementing for the first time in the corporate finance literature the approach of Autor et al. (2013), the current analyses are not limited to the study of shocks resulting from tariffs decisions. In fact, my measure of exogenous competition uses all types of shocks to the Chinese productivity that made Chinese products more successful among rich countries' consumers. More precisely, the exogenous competition affecting Norwegian firms is *predicted* by the shocks to the supply of Chinese goods

[38] For instance, Lenway, Mork and Yeung (1996) explain that, in the steel industry, lobbyer firms follow very different paths compared to non-lobbyer firms. Lobbyers are less profitable, bigger, older, less diversified, less innovative, pay workers and CEO's more, have greater tenures for CEO's.

towards nine rich countries. Hence, these shocks allow to *exclude* the Chinese competition against Norwegian firms that is driven by Norwegian policies or other domestic idiosyncratic shocks (which can be driven by firms' preferences). In addition, to ensure a significant shock on the instrument, I use the years around China's access to the World Trade Organization (WTO) (December 2001) because it represented an exceptional shock for Chinese exports and because Norwegian firms had a scarce decision power about it. This very large shock ensures the fact that this instrument satisfies the "relevance condition" of the instrumental variable approach.

My analyses start with a series of tests of the *static* trade-off theory. In these tests, I address the aforementioned endogeneity issues by implementing the "double instrumental variable" model (or "three stages least squares") of Becker and Woessmann (2009), which extends the traditional two-stages instrumental variable framework by adding a further stage. Specifically, the first stage predicts the exogenous competition from China using as instrument the Chinese exports towards other rich countries (following Autor et al. (2013)). The second stage predicts the variation of Norwegian firms' profitability that is explained by the increases of exogenous competition from China calculated in the first stage. The third stage, investigating how leverage reacts to the predicted profitability, is the test of the static TOT. In line with the interpretation of Becker and Woessmann (2009), the "double instrumental variable" intends to ensure that the impact of competition on leverage passes through a precise channel - profitability - rather than through other channels like the technological innovation, which can be caused by the competition and that affects capital structure decisions.[39]

My results document a negative reaction of leverage to the predicted profitability. I also investigate the mechanism behind this negative response and show that a lower (higher) predicted profitability produces a decrease (increase) in the value of assets. For robustness, I show that the results do not change dramatically when I implement a two-stage instrumental variable framework that considers the (increments of) imports as the *proxy* for (decreases of) expected profitability.

[39] For instance, Bloom et al. (2016) show that the entrance of China has increased the investment in R&D for the European firms. Since the R&D intensity decreases the equilibrium leverage, a negative competition-leverage relation might be driven by the fact that the increase in competition entails an increase of R&D investments.

Furthermore, this paper extends the analyses of the previous empirical research by testing the *dynamic* inaction models. They recognize that the sign of profitability-leverage relation crucially depends on whether or not the firm is actively adjusting its capital structure. Specifically, these models provide two main predictions (Danis et al. (2014)). First, if the firm is not at adjustment points, we expect a negative profitability-leverage relation. Second, if the firm is at adjustment points, the profitability-leverage relation is positive. Results show a negative profitability-leverage relation at non-adjustment points, coherently with Fisher et al. (1989) and Hennessy and Whited (2005). On the other hand, at adjustment points, I find an insignificant reaction of leverage to exogenous expected profitability, which does not corroborate the second prediction of Danis et al. (2014).

The variability of adjustment costs is an additional element that contribute to describe the fact that the profitability-leverage relation depends on the occurrence of active adjustments. As argued by Brav (2009), firms with higher adjustment costs - i.e., private firms in his setting - undertake the active corrections of leverage less frequently; thus, the time series of these firms are expected to contain fewer observations in which the profitability-leverage relationship is positive. Since my sample contains both private and public firms, I test the prediction that public firms - i.e., firms with relatively low adjustment costs and more adjustment points - decrease leverage less than private firms in response to higher exogenous profitability. I find that public firms have an insignificant profitability-leverage relation, which is more positive than the negative reaction of private firms. In addition, it is important to notice that the main part of this paper analyzes *private* firms and the analysis of this sample allows to provide an investigation of the relation between exogenous profitability and leverage for private firms, which constitute the vast majority of the firms in the developed economy.[40]

This paper is not only particularly related to the tests of the TOT or to the empirical assessment of China's entrance into the WTO. It also contributes to a recent literature composed of key empirical studies, whose scrutiny illustrates that product market competition is a central driver of firms' funding costs and financing decisions (Hoberg and Phillips (2010), Hoberg and

[40] For instance, Michealy and Roberts (2012) and Brav (2009) show that, in the case of U.K., private firms account for 97% of the U.K.'s firms.

Phillips (2010), Hoberg and Phillips and Prabhala (2014), Peress (2010), Gaspar and Massa (2006), Hou and Robinson (2006), Irvine and Pontiff (2009)). Nonetheless, as pointed out by other recent works studying firms' investment choices (Valta (2012) and Fresard (2010)), the empirical scrutiny of these studies fail to address the concern of the endogenous impact of cash holdings and leverage on the product market choices of a firm and its competitors. However, similarly to Xu (2012)'s case, these recent papers use the U.S.A. import tariff policy, which is affected by lobbying concerns.

The rest of the paper is organized as follows: Section 2 describes the sample and present the benchmark test of the TOT with lagged realized profitability; Section 3 tests the static trade-off theory with the instrumented profitability; Section 4 tests the dynamic trade-off theory with the instrumented profitability; Section 5 concludes.

2.Sample description

The final sample consists of 14,005 manufacturing Norwegian private and public firms. They are part of an unbalanced panel dataset of 72,118 firm-year observations from 1998 to 2006. The Norwegian Corporate Accounts constitute the source for the annual information about financial statements and firms' ownership characteristics.[41] Berner et al. (2012) describe this dataset and its quality, which is warranted by the fact that an external auditor is typically required to verify the reports and by the fact that the data is collected for tax purposes - which ensures the presence of virtually all Norwegian firms -.

A second dataset is based on the Comtrade's sample. It contains the imports from China and from the rest of the world (for Norway and nine Other Rich Countries, also referred to as the ORC).[42]

By merging these two sources of data, I generate an "intermediate sample" of 145,689 observations (which considers only manufacturing firms and excludes utilities and financial firms). From this sample I eliminate observations with missing data concerning the total invested capital,

[41] All the data in NOK are converted into Dollars by means of the exchange rate provided by the Norwegian Central Bank. All the variables are winsorized at 1% level.

[42] See Appendix 1 for further details regarding all the steps for the creation of the dataset regarding the imports from China.

the number of employees or the indicator for being listed or non-listed (sample decreases to 119,960 obs.). I exclude observations with missing data concerning depreciation and sales (sample decreases to 105,659 obs.) and the observations without information on net property plant and equipment (sample decreases to 91,303 obs.). I include only firms with at least two years of contiguous balance sheet data (sample decreases to 72,118 obs.).

Table 1 and Table 2 contain the descriptive statistics of the relevant variables for Norwegian firms from 1998 to 2006. In particular, Panel A in Table 1 and Table 2 focuses on the private entities while Panels B illustrates the statistics relative to public corporations.

While the number of public firms appears low (more than 30 per year), this number is comparable with the one relative to important previous contributions regarding the effect of competition on corporate decisions. For instance, Khanna and Tice (2000), who study the impact of product market competition on capital expenditures (using data about the entrance of WalMart in specific market niches), consider 20 private firms and 38 public companies.

From Table 1, we notice that among Norwegian firms the leverage is higher for private firms (0.44 on average) than for public institutions (0.32 on average). Following Brav (2009), this evidence can be interpreted with the fact that equity is more expensive for private firms than for public firms. Hence, the relative cost of equity to debt is higher for private than for public firms. This condition implies that private firms rely more on debt financing relative to public firms. An additional characteristic is the fact that Norwegian public firms maintain a leverage ratio that is similar to American public firms, as illustrated by Xu (2012).

For public firms, the ratio of depreciation to assets (0.021 on average) is not different from the ratio in the previous literature. It is interesting to notice that the CapEx to assets ratio (0.066 on average), the size (10,840 on average) and the profitability appear lower among private firms relatively to public firms. This fact is coherent with the established evidence that, compared to similar firms, the firms going public are the ones that, on average, have a higher profitability, higher growth opportunities and larger size (Pagano and Panetta (1998)).

2.1 Effect of non-exogenous profitability on leverage

The main hypotheses are centered on investigating how profitability affects book leverage. As a benchmark case, it is worth to describe the relation between book leverage and profitability by investigating the following regression model, as it constitute a typical test of the static TOT:

$$Leverage_{jit} = \alpha_1 + \beta_1 \times Profitability_{ji(t-1)} + \gamma_1 \times X_{ji(t-1)} + u_{jit} \quad (1)$$

Leverage is the total book leverage gauged by the ratio of interest bearing debt divided by total assets. Profitability is measured by means of ROA (net income over total assets) and by means of profit margins (sum of pre-tax income, interest expense and depreciation, divided by sales). The specifications in Table 3 control for the same set of covariates used in the standard leverage regressions of the previous literature (Baker and Wurgler (2002) and Leary and Roberts (2005)): asset tangibility, firms' size and growth opportunities (proxied by capital expenditures to total assets (Brav (2009)). Year fixed effects control for the time trends in book leverage that are common across all firms. The inclusion of firm fixed effects controls for firm specific and time invariant components in book leverage (Lemmon, Roberts and Zender (2008)). Moreover, firm fixed effects decrease the concerns of time series correlations in book leverage due to firm or industry factors (Pedersen (2009)). Since this empirical model tests the leverage-profitability relation unconditionally with respect to the occurrence of refinancing, we consider specifications with firm fixed effects (not just with industry fixed effects) because they are more in line with the theory of Danis et al. (2014). Similarly to Xu (2012), we have to account for the fact that firms can vary the productive efficiency of their assets; thus, I control for depreciation to assets (Gildersleeve (1999)).[43]

The columns in Table 3 illustrate the outcomes relative to model (1), in the period from 1998 to 2006. We observe that the measures of profitability used in the previous literature are negatively correlated with leverage; thus, the coefficients of these benchmark models are consistent with established traditional tests of the static TOT (Fama and French (2002), Baker and Wurgler (2002)).

[43] In addition, these specifications account for capital-labor intensity to have a set of control variables that is consistent with the main regressions of this paper, which will involve the capital-labor intensity.

As discussed in the introduction, this paper enhances the empirical strategy of the traditional static TOT's tests. First, this paper recognizes that the trade-off theories focus on *expected* profitability, not on *realized* profitability. Thus, in line with Xu (2012), this paper enhances the traditional tests of the TOT by measuring profitability by means of a shock on future prospects that derives from import competition, which is a measure that gives strong emphasis on future prospects. Indeed, evidence suggests that import competition diminishes profitability in the long-run.[44]

Second, by using a measure of profitability that is by construction exogenous with respect to leverage, this study benefits from the use of a *contemporaneous* rather than lagged measure of profitability. Indeed, to address the endogeneity concerns,[45] traditional empirical tests of the TOT had to proxy *contemporaneous* profitability with *lagged* profitability.

In particular, this paper addresses endogeneity concerns, by instrumenting the profitability with the exogenous import competition using both a traditional instrumental variable approach and a "double instrumental variable" design, which consists of three stages: the first stage regression predicts the exogenous import competition from China where Chinese exports towards other rich countries is the instrument (following Autor et al. (2013)); the second stage predicts the decrease of Norwegian firms' profitability that is explained by the increases of exogenous import competition from China; the third stage investigates how leverage reacts to the predicted profitability.

3. Tests of Static Trade-Off Theory with exogenous imports

[44] For instance, competition can force firms to long and costly restructuring processes or it can increase the probability of default. See for instance Coucke and Sleuwaegen (2008), Bloom et al. (2012), Katics, Pedersen (1994), DeRosa, Goldstein (1981), Pagoulatos, Sorensen (1976).

[45] Hortascu et al. (2010) illustrate that consumers prefer to buy the goods that are produced by firms with lower risk of distress, which depends on leverage. Hopler and Titman (1994) show that higher leverage decreases profitability and sales, especially regarding specialized products. Hence, firms with a leverage that is high enough to increase the distress probability might deteriorate their current profits.

3.1 Import competition and import penetration

The import competition is the competitive threat that is generated by the expansion of foreign competitors' sales into the domestic markets. In particular, import competition increases for Norwegian industry *i* if it is experiencing an increment of the competition due to the increase of imports into Norway of the goods that are produced by foreign competitors and that constitute the output of Norwegian industry *i* . The intensity of the import competition from China is measured by the *import penetration* from China, *ChineseCompet.inNorway*. It is defined (similarly to Xu (2012) and Bertrand (2004)) as:

$$ChineseCompet.inNorway_{it} = \frac{Norw.ImportFromChina_{it}}{Norw.ImportFromWorld_{it} + Norw.Sales_{it}} \quad (2)$$

The Norwegian imports from China are the Dollar value of goods imported from China into Norway that represent the outputs of an industry *i* defined by the NACE system at the 4-digits level. The source of this data is the Comtrade database which provides the dollar value of imports for each product code identified at the 6-digits HS code. See Appendix II for further details on the construction of import penetration.

As argued in previous research, we need to predict a measure of import competition that has to be exogenous with respect to capital structure decisions. Indeed, the simple import penetration could produce inconsistent coefficients if it is used as explanatory variable for the capital structure decisions.[46] Moreover, there may be a problem of third confounding factor. An expansive monetary policy, by depreciating the domestic currency, may decrease external finance premium and, hence,

[46] As argued by Xu (2012), the main reason behind this inconsistency is that capital structure variables endogenously affect import competition by affecting firm's competition strategies (as described in Brader and Lewis (1986), Maksimovic (1988)) or firm's resilience to predatory pricing strategies (Bolton and Sharfstein (1990), Campello (2006)).

corporate leverage becomes cheaper (Bernanke and Gertler (1995)). This depreciation of the domestic currency also negatively affects the imports into Norway.[47]

To solve this endogeneity problem, Xu (2012) uses U.S.A.'s import tariff cuts and the dollar exchange rates as the two instruments for import penetration. Both of these instruments might be endogeous in Xu's setting because of companies' lobbying activity, which can drive both the import policy and the monetary policy. Furthermore, the dollar exchange rate depends on the monetary policy, which, in turn, affect corporates leverage.

Instead, this paper addresses this problem by applying in a small country the design inspired by Acemoglu et al. (2015), Balsvik et al. (2014) and Autor et al. (2013). This design consists in predicting the exogenous Norwegian imports from China by means of exogenous shock to the supply of Chinese goods towards rich countries.

3.2 Effect of Rich Countries' imports on Norwegian imports: first stage

The first stage predicts the exogenous Chinese import penetration into Norway by regressing industry-level Chinese import penetration into Norway on the Chinese import penetration into nine Other Rich Countries (this set is also referred to as the ORC and it includes: U.S.A., U.K., Germany, France, Italy, Canada, Australia, New Zealand, Sweden). This regression predicts exogenous imports from China that are explained only by the exports that Chinese competitors have been able to realize towards nine rich countries (other than Norway). This instrumental variable methodology addresses the endogeneity concerns under the assumption that the shocks that are endogenous with Norwegian firms' capital structure variable are not correlated across the nine rich countries, an assumption made in earlier studies (Autor et al., 2013). The regression model is:

[47] A large literature finds that the appreciation of domestic currencies creates an advantage for the foreign products (Berman, Martin, and Meyer (2009), Campa (2004), Bernard and Jensen (2004b), Forbes (2002), and Greenaway, Kneller, and Zhang (2007)).

$$ChineseCompet.inNorway_{it} = \alpha_3 + \beta_3 \times ChineseCompet.inORC_{it} + \delta_3 \times X_{ji(t-1)} + u_{jit} \quad (3)$$

This regression model controls for the same set of variables used in model (1) and its results are shown in the column "First Stage" of all subsequent tables. In particular, the column "First Stage" of Table 4 illustrates that the coefficient ChineseCompet.inORC - that is the estimate of β_3 relative to rich countries' imports from China - positively (and significantly) affect the exports towards Norway (as in Acemoglu et al. (2015), Balsvik et al. (2014) and Autor et al. (2013)). This means that the first stage predicts the imports from China (also referred to as Import Penetration Index, or IPI) that are explained by the "success" the Chinese products experienced in the markets of the nine rich countries.

3.3 Effect of exogenous import penetration on profitability: second stage

In this empirical analysis, it is important to investigate whether import competition significantly affects profitability. Previous studies have shown that the increase of foreign supply cuts the price-cost margins, market shares and profit margins[48]. Hence, also in the current sample we can expect to assess that import competition is negatively related to profitability. This hypothesis is tested by the following model for the period from 1998 to 2006:

$$Profitab_{jit} = \alpha_4 + \beta_4 \times \widehat{ChinaCompet.}inNorway_{jit} + \delta_4 \times X_{ji(t-1)} + u_{jit} \quad (4)$$

The dependent variable, i.e., the profitability of each bank-year pair, is the return on assets. The model controls for capital-labor intensity in order to characterize firms' production technology (Xu (2012)) and the same set of covariates used in the standard leverage regressions of previous

[48] Xu (2012), Katics, Pedersen (1994), DeRosa, Goldstein (1981), Pagoulatos, Sorensen (1976).

literature (Baker and Wurgler (2002) and Leary and Roberts (2005)).[49] Hence, we account for: asset tangibility, firms' size and growth opportunities (proxied by capital expenditures to total assets (Brav (2009)). Furthermore, I control for depreciation to assets and I also include year and firm fixed effects.[50] The column "Second stage" in all subsequent tables present the estimates of β_4 and, in particular, in Table 4 we verify that the exogenous increase of imports from China deteriorates Norwegian firms' profitability.

3.4 Tests of the Static Trade-Off Theory: Third Stage

In this section, we test the predictions of the static trade-off theory by using (as main regressor) the expected the profitability that has been predicted by exogenous import penetration. The following model is studied for the private firms in the years from 1998 to 2006.[51]

$$Leverage_{jit} = \alpha_5 + \beta_5 \times \widehat{Profitab}_{ji(t-1)} + \delta_5 \times X_{ji(t-1)} + u_{jit} \tag{5}$$

The set of controls contains growth opportunities, size and asset tangibility. Also year and firm fixed effects are included. The results in the Column (1) of Table 4 show that predicted profitability has a negative impact on leverage. Since the specification in Column (1) does not control also for firms' productive efficiency and for the weight of labor in their production technology, which are of fundamental importance in a study concerning the impact of competition from a country with relatively low wages like China. Thus, the specification in Column (2) controls

[49] We have to use the standard covariates of leverage regressions even though the dependent variable is profit margins, not leverage. These controls are necessary in order to solve simultaneous systems (Koopmans and Hood (1953)).

[50] According to Gildersleeve (1999), depreciation to assets allows to indicate whether the firm has a sufficient replacement of existing assets or whether it is in a cost-reducing phase.

[51] This paper regresses the models (5) and (4) using the Stata command ivreg in order to permit the statistical software to correct the standard errors (Roberts and Whited (2012)). OLS is used for the first stage model; although I recognize that the usage of OLS for the first stage might generate incorrect standard errors, Stata does not provide - to the best of my knowledge - a single command performing the double-instrumental variable approach of Becker and Woessman (2009).

also for depreciation to sales and capital-labor intensity. We observe in Column (2) that the coefficient of predicted profitability becomes insignificant. It is important to notice that, in line with the evidence Fama and French (2002) and Rajan and Zingales (1995), these coefficients regarding Norwegian private firms do not to corroborate the *static* trade-off theory's prediction that more profitable firms are supposed to have a higher leverage, as they can benefit more from the larger tax-shield offered by the additional leverage (Graham and Leary (2011)).

With the previous model, we have studied the response of leverage to *lagged* predicted profitability. However, my instrumental variable framework allows to gauge also the reaction of leverage to contemporaneous profitability because the literature has traditionally lagged profitability in order to address the endogeneity of the relation between leverage and contemporaneous profitability. Table 5 shows the results of the regression of leverage on contemporaneous predicted profitability. The model is:

$$Leverage_{jit} = \alpha_6 + \beta_6 \times \widehat{Profitab}_{jit} + \delta_6 \times X_{ji(t-1)} + u_{jit} \tag{6}$$

The results of the first and the second stages are presented in the relative columns of Table 5 and illustrate, again, that import penetration (of Chinese products) regarding nine rich countries has a positive and significant impact on the Norwegian import penetration and that exogenous Norwegian import penetration deteriorates profitability. Importantly, the significantly negative coefficients of the third stage, in Columns (1) and (2), suggest that the leverage of Norwegian private firms increases (decreases) in correspondence with exogenous profitability's reduction (growth). Thus, also this evidence suggests that the *static* trade-off theory is not confirmed in my sample. However, as anticipated in the introduction, the previous empirical investigations are not a conclusive test of the trade-off theory since, contrarily with respect to the *dynamic* trade-off theory, they do not account for the occurrence of capital structure's adjustments. The details will be discussed and analyzed in the next section. Instead, the next two sub-sections investigate, first, the mechanics of the negative coefficient and, second, the discrepancy between these results and the previous literature.

3.5 Debt issuances and asset growth

To have a better understanding of which mechanism drives the negative profitability-leverage relation, we should investigate the dynamics of specific variables that describe firms' behaviors regarding asset growth, net equity issuance and net debt issuance,. Therefore, the set of regression models is:

$$AssetGrowth_{jit} = \alpha_7 + \beta_7 \times \Delta\widehat{Profitab}_{jit} + \delta_7 \times \Delta X_{ji(t-1)} + u_{jit} \tag{7}$$

$$EquityIssues_{jit} = \alpha_8 + \beta_8 \times \Delta\widehat{Profitab}_{jit} + \delta_8 \times \Delta X_{ji(t-1)} + u_{jit} \tag{8}$$

$$DebtIssues_{jit} = \alpha_9 + \beta_9 \times \Delta\widehat{Profitab}_{jit} + \delta_9 \times \Delta X_{ji(t-1)} + u_{jit} \tag{9}$$

In order to examine these choices, I specify a change regression model where the dependent variables are defined following Xu (2012)'s definitions: asset growth (annual change in logarithm of assets), net debt issues (annual changes in debt minus cash divided by lagged assets), net equity issues (annual change in total equity minus retained earnings over lagged assets). The key regressor is the change of profitability that is predicted by the following second-stage regression:

$$\Delta Profitabil_{jit} = \beta_{10} \times \Delta\widehat{ChinaCompet.inNorway}_{jit} + \delta_{10} \times \Delta X_{ji(t-1)} + u_{jit} \tag{10}$$

The results of the first and second stages are presented in the relative columns of Table 6. The control variables are the lagged annual changes of the covariates' set characterizing previous regressions. I control for the lagged equity over lagged total assets since it is necessary to account for the cumulative impact of past capital structure decisions. The results of the third stages are illustrated in columns (1), (2) and (3) of Table 6. In order to provide a description of the effect of exogenous imports on profitability growth, Figure 1 plots the distribution of firm-year pairs across different levels of predicted profitability changes. It is interesting to notice that, in this sample

consisting of Norwegian private manufacturing firms, the exogenous shocks to imports have almost always (in 99.17% of the cases) generated a positive change in the predicted profitability.[52]

Column (1) illustrates that the relation of exogenous profitability shocks and net debt issuance is insignificant, which suggests that private firms do not correct their debt when expected profitability changes, although these changes might have modified the target leverage. The reaction of asset growth is positive, which means that firms decrease their assets when profitability decreases for reasons linked to the increase of competition. This result is reminiscent of the evidence in Fresard and Valta (2015); they show that firms react to increased product market threat by decreasing their assets (more precisely they decrease capital expenditure). The reaction of equity is positive, which suggests that the increase of the assets side of balance sheet is reflected into an increase of equity, in the liability side.

3.6 Effect of import penetration on leverage

Results relative to models (5) and (6) have shown that Norwegian private firms exhibit a negative or insignificant relation between exogenous profitability and leverage. On the other hand, Xu (2012) - the only other paper testing the static trade-off theory with exogenous shocks on import competition - finds a positive profitability-leverage relation in a sample of American listed companies. This section is intended to discuss the discrepancy between the current paper and Xu (2012)'s contribution not only by presenting the possible determinants of the discrepancy but also by performing tests that aim at gradually removing part of such determinants and observe whether this removal reduces the differences in results.

One can identify three general determinants for this discrepancy. The first is the difference in the countries analyzed in the two papers. For instance, the fact that Norway has only marginal powers, compared to the U.S.A., in shaping the details of China's entrance into the WTO (which enhances the exogeneity of the profitability shocks) creates a fundamental difference between the

[52] This result does not imply that the entrance of China into the WTO has been a negative news for the almost entirety of the Norwegian private manufacturing firms. This result shows that the portion of imports growth from China that has been motivated by an increase of the value of Chinese products into rich countries' markets has generated a negative impact on Norwegian firms' profitability.

two analyses. A second determinant might be the fact that, differently from previous research, the results in previous subsections are relative to private firms only, which typically have different patterns in capital structure choices compared to public entities (Brav (2009)). A third possible determinant is the fact that the current paper is based on a double instrumental variable approach in order to ensure that the effect of competition on leverage has a specific channel, i.e., profitability, through which it determines capital structure decisions, thereby excluding dimensions that have a decisive impact on leverage, such as the technological progress.

This subsection removes the second and third determinants by implementing an empirical analysis that more tightly follows Xu (2012)'s analysis, which - differently from the current paper - studies public firms only and regresses leverage directly on predicted imports, thereby assuming that import penetration is itself the proxy of expected profitability.

More precisely, the empirical model in Xu (2012) is a two-stages least-squares approach that, in the second stage, regresses leverage on the imports that are predicted by a first stage. In the current paper, the regression model for the first stage is the specification (3) while the regression model for the second stage is the following one:

$$Leverage_{jit} = \beta_{11} \times \widehat{ChinaCompet.inNorway}_{jit-1} + \delta_{11} \times X_{ji(t-1)} + u_{jit} \tag{11}$$

Since this model is testing the leverage-profitability relation unconditionally with respect to the occurrence of refinancing, we consider specifications with firm fixed effects (not just with industry fixed effects) because they are more in line with the theory of Danis et al. (2014). Columns of Table 7 illustrate the outcomes under multiple specifications depending on an increasing set of covariates. The specification in Column (1) contains asset tangibility, growth opportunities and expected profitability as regressors. The results show that leverage has an insignificantly positive reaction to import competition.

The specification in Column (2) controls also for the depreciation to assets, capital-labor intensity and we observe that the sign of the coefficient for import competition becomes significantly positive. According to Xu (2012), we can interpret this finding as a *negative reaction of leverage to expected profitability*, which is coherent with the previous results of the double-IV

model relative to the Table 6. In order to add a specification that is more comparable to Xu (2012), in Column 3, I run a specification in which the industry fixed effects substitute the firm fixed effects. The results show an insignificant leverage-competition relation.

To increase the comparability with the previous research, which analyzes public firms only, Table 8 provides results for the subsample of Norwegian listed entities. We observe that competition's coefficients are insignificantly negative both with firm fixed effect and with industry fixed effects. These results suggest that even if we use a two-stages least-square approach, we focus on public firm only and we use the industry fixed effect, my analyses do not to corroborate the negative competition-leverage relation evidenced by Xu (2012) and interpreted as a positive profitability-leverage relationship. The Tables 8 and 9 suggest that the residual discrepancy between the results of the current paper and the ones in the previous literature can be explained essentially by factors that are related to the differences between Norway and the U.S.A..

A first factor may be related to the Norwegian import policy. Indeed, given that Norway is a small economy, compared to the U.S.A., the Norwegian firms' preferences about import policy are supposed to have a weaker influence over the decisions about the industries to be liberalized (Grossman and Helpman (1992)). Some types of businesses are prepared than others to increase investments in the most innovative and complex areas of production. Bloom et al. (2012) suggest that businesses with an ability to increase innovation are more likely to survive after an initial shock of competition and, therefore, have a lower aversion for import tariff cuts. This lower aversion can be translated into the fact that the set of liberalized industries used by studies about the U.S.A. might not be random. For instance, firms with a strong ability to expand the most innovative areas of production can have a lower aversion to the liberalization and, at the same time, have a lower target leverage ratio, given that they have lower tangibility and higher R&D, compared to firms that, instead, have stronger aversion to liberalization.

Another factor explaining the positive profitability-leverage reaction of American firms may be a faster reaction of American firms, compared to Norwegian counterparts, in adjusting their debt to reach a new target leverage. This faster reaction may be attributed to the fact that U.S.A.'s capital markets are able to offer a higher adjustment speed, which would be in line with the evidence that U.S.A.'s equity market has lower trading costs than the Norwegian one (Domowitz and Madhavan (2001)).

4. Tests of Dynamic Trade-Off Models

Hitherto, the leverage regression using contemporaneous profitability shocks has illustrated that leverage increases in response to profitability cuts. The mechanics of this movement show that Norwegian firms do not retire debt while assets decrease, which is reflected into a decline of retained earnings. These steps represented a method to test the hypotheses that firms follow the static trade-off theory.

In this section, instead, we test the predictions elaborated by the dynamic inaction models. These models give strong emphasis on the fact that the relation has to be positive *conditionally* on the fact that the firm is actively implementing costly adjustments of capital structure. Indeed, the time series of each firm is constituted by periods of in which leverage fluctuates in-between the thresholds of the inactivity region and by periods of adjusting activity, where firms undertake costly corrections of capital structure.[53]

To propose a preliminary description of how the leverage-profitability relationship depends on adjustments, we can check whether firms with different adjustment costs have different a relationship. The intuition is the following: as argued by Brav (2009), firms with higher adjustment costs - i.e., private firms in his setting - undertake the active corrections of leverage less frequently; thus, we can expect that the time series of these firms contain fewer observations in which the profitability-leverage relationship is positive. Symmetrically, firms with lower adjustment costs - i.e., public firms - should have more adjustment activity and, thus, more observations in which the profitability-leverage relationship is positive. Since my sample contains both private and public firms, I test the prediction that public firms - i.e., firms with relatively low adjustment costs and more adjustment points - exhibit a more positive profitability-leverage relation compared to private firms. The following model is studied for the public firms in the years from 1998 to 2006:

$$Leverage_{jit} = \alpha_{12} + \beta_{12} \times \widehat{Profitability}_{jit} + \delta_{12} \times X_{ji(t-1)} + u_{jit} \qquad (12)$$

[53] See Strabulaev and Whited (2012)

The outcomes in Table 9 show that public entities have an insignificant profitability-leverage relation, while private firms have a significantly negative profitability-leverage relation, in line with Table 5. The positive and significant t-statistic relative to the difference between the estimate of public and private firms corroborate the prediction that public entities, which have more adjustment activity than private ones, have a leverage that correlates less negatively with profitability. The second stage's outcomes in Table 9 verify that exogenous imports from China have a negative impact on profit margins for public and private firms.[54]

For a more appropriate empirical test of the dynamic trade-off theory, I examine two specific predictions discussed by Danis et al. (2014) that characterize the profitability-leverage relation depending on whether the firm is in adjustment or, alternatively, non-adjustment points. The adjustment points are defined as the firm-year observations in which there is a sufficient refinancing activity, that is the concurrence of a net debt issuance and a net equity retirement.

It is important to motivate why the debt reductions are not eligible as adjustment points. Danis et al. (2014) argues that dynamic trade off models are difficult to be examined using their predictions about debt reductions. Indeed, these models normally do not consider debt reductions as an optimizing behavior, apart from the moments close to default or to strategic renegotiations, although evidence suggest that half of the leverage decreasing recapitalizations are implemented by firms that are not in distress (Kisser and Rapushi (2017)).

The specification relative to this approach is the following:

$$Leverage_{jit} = \alpha + \beta \times \widehat{Profitab}_{jit} + \gamma \times Ref_{jnt} \times \widehat{Profitab}_{jnt} + \delta \times X_{ji(t-1)} + u_{jit} \qquad (13)$$

The dummy variable *Ref* identifies the refinancing points. They are the firm-year observations exceeding the thresholds of 5% for the debt issues (defined as the annual changes in long term debt minus cash changes, divided by assets) and the level of 5% for the net equity retirements

[54] There is a limitation in the analysis of this heterogeneity: the low number of observations does not allow the matching of private firms with firms that are similar but public. However, this paper controls for size, growth opportunities, depreciation to assets, capital labor intensity and tangibility.

(defined as the dividends net of new equity issues, divided by assets).[55] Importantly, the inclusion of an interaction between profitability and refinancing allows us to separate the profitability-leverage correlation at refinancings from the one at non-refinancings. This separation is crucial for tightly testing the dynamic trade off theory of Danis et al. (2014), which makes different predictions depending on whether refinancing is occurring or not. First, they predict a significantly negative profitability-leverage relation in the non-refinancing periods. This means that they predict a negative sign for (β), which is the coefficient of profitability at non-refinancing points. Second, concerning cross-sectional models, they predict a positive relation at refinancing points. Thus, we expect a positive sign for ($\beta + \gamma$) that is the sum of the coefficient of profitability at refinancings and the coefficient of the interaction variable between profitability and the occurrence of refinancing (this interaction describes the differencial impact of profitability between refinancing point and non-refinancing points).

The specifications in Table 10 test these predictions. The results show that the exogenous profitability has a negative impact on leverage at the non-refinancing points. This evidence corroborate the dynamic trade-off theory. In addition, concerning the second hypothesis, in Table 10 the crucial examination is relative to the Wald test, which aims to assess whether the null that the sum of the coefficients ($\beta + \gamma$) is equal to zero. Column (1) shows the outcomes of the specification with only the most basic controls of the leverage regression, that is size, growth opportunities and tangibility. The p-value relative to the Wald-test is very large and, hence, we cannot reject the null hypothesis that profitability has no impact on leverage.

The results in Column (1) might potentially be biased because they do not control for depreciation to assets and capital-labor intensity. However, even when we control for these two covariates, Column (2) confirms that we cannot reject the null hypothesis that the impact of profitability at refinancing points is insignificant. Hence, differently from the evidence of Danis et al. (2014) regarding U.S.A.'s public firms, my analyses only corroborate the first prediction of the dynamic TOT, while they find no support for the second prediction for which the cross-sectional profitability-leverage relation is positive at refinancing points.

[55] We cannot include the stock repurchases because the dataset does not provide information about them.

5. Conclusions

Static Trade-Off Theory (TOT) of capital structure predicts that profitability increases the advantage of debt by increasing its tax-shield benefit. For Fama and French (2002), the established evidence of negative profitability-leverage relation contradicts TOT. In this paper, I test TOT under its static and dynamic versions by using an exogenous expected profitability. By means of a double IV approach, the first stage predicts the exogenous competition from China where Chinese exports towards other rich countries is the instrument (following Autor et al. (2013)); the second stage predicts the Norwegian firms' profitability by means of the increases of exogenous competition from China; the third stage analyzes the response of leverage to the predicted profitability. When I focus on the tests of the static TOT, I find that leverage increases when predicted profitability drops. This response is driven by the assets' decrease and the retained earnings' decrease. On the other hand, debt is not adapted to the lowered level of profitability. Moreover, I introduce tests of the dynamic TOT in the literature concerning competition-profitability-leverage. With the "double instrumental variable" approach, I find a negative profitability-leverage relation at non-refinancing points, which corroborates the dynamic TOT. However, I also find, at refinancing points, insignificant profitability-leverage relation, which does not corroborate the dynamic TOT.

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Appendix I

Imports are listed at the 6-digits Harmonized System (HS) product code, which are provided by Comtrade. I associate the 6-digits HS codes to the relative NACE (revision 1.1) industry codes by means of the conversion tables of RAMON's database. The NACE industries that have data on imports span from 0100 to 3800, which concerns the primary and the manufacturing industries.

By merging these two datasets, I eliminate 2,044,571 firm-year observation because the initial Norwegian Corporate Accounts contains the universe of Norwegian industries, including the NACE codes from 3810 to 9999 whose outputs are not the tangible products described by Comtrade. The other two reasons for this decrease of observations are: first, my initial Norwegian Corporate Accounts dataset (which spans from 1995 to 2007) contained more years than my imports dataset (which spans from 1996 to 2006); second, some firms have missing data for which concerns the NACE code.

Appendix II

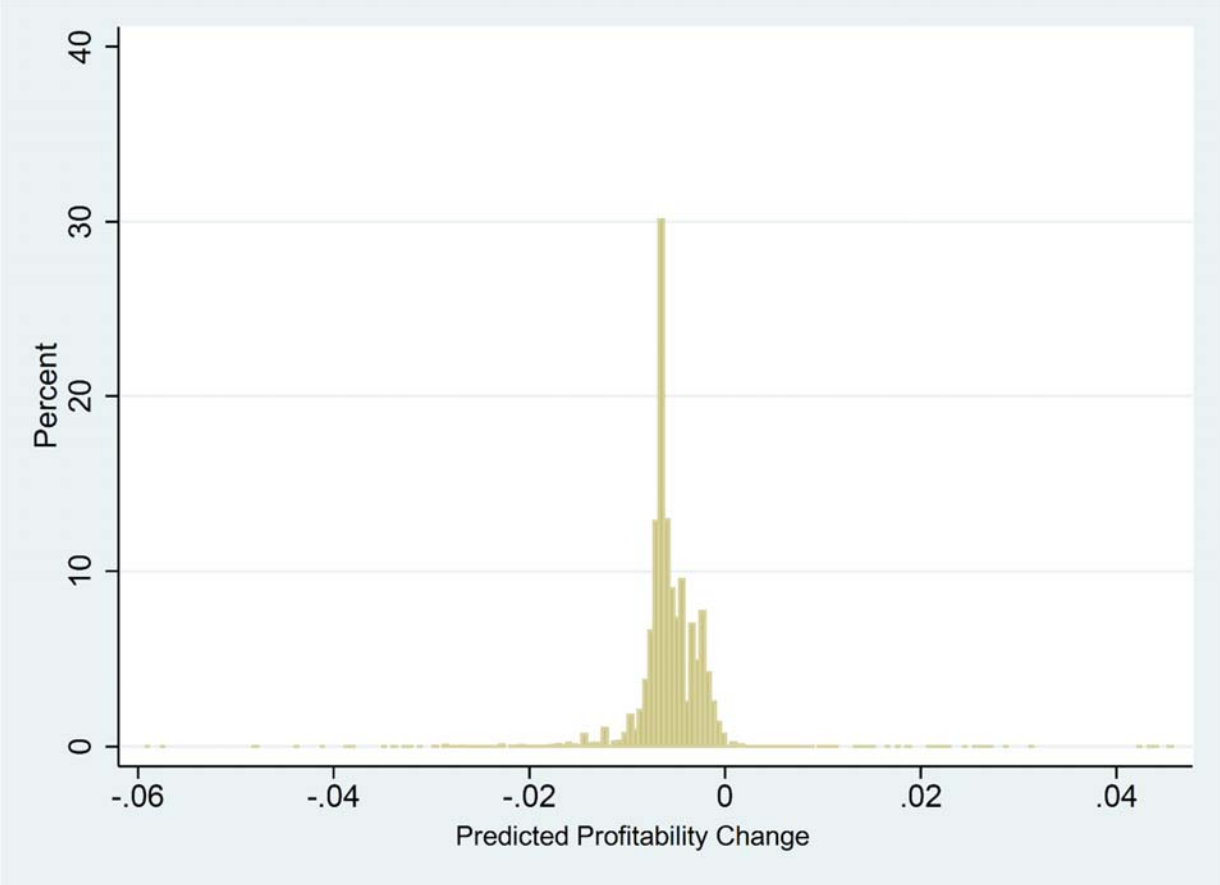
The Norwegian imports are the Dollar value of goods imported from the whole world in Norway that are the outputs of an industry i defined by the NACE system at the 4-digit level. The source of this data is the Comtrade database.

Total sales are the Dollar value of products that have been sold by Norwegian industry i defined by the NACE system at the 4-digit level. The source of this information is the Norwegian Corporate Accounts' database, which is discussed by Berner, Mjos and Olving (2012).

The NACE (revision 1.1) codes that are involved are from 0100 to 3800, which concerns the primary and the manufacturing industries. The conversion tables from HS6 to NACE are provided by the RAMON's database.

Figures

Figure 1. Distribution of the change in ROA predicted by the exogenous change in the Chinese competition towards Norwegian private firms. The sample period is from 1998 to 2006.



Tables

Table 1. Descriptive statistics. The sample period is from 1998 to 2006.
Total leverage is defined as total interest bearing debt over total assets; short-term leverage is defined as short-term interest bearing debt over total assets; long-term leverage is defined as long-term interest bearing debt over total assets; depretiation to assets is a measure of operating efficiency and it is defined as depretiation divided by sales; profit margin is the sum of pre-tax income, interest expense and depreciation, divided by sales; Capex to assets is the measure of growth opportunities; log sales is the measure of firm size.

Panel A. Private firms

Year	Tot.Leverage	Short Lev.	Long Lev.	Depr./Assets	ROA	CapX/Assets	LogSales
1998	0,479	0,233	0,233	0,054	0,020	0,049	10,740
1999	0,455	0,204	0,238	0,059	0,013	0,067	10,673
2000	0,441	0,197	0,232	0,056	0,009	0,070	10,885
2001	0,454	0,214	0,228	0,059	0,008	0,073	11,017
2002	0,474	0,230	0,232	0,059	0,012	0,079	10,919
2003	0,452	0,210	0,234	0,059	0,021	0,078	10,808
2004	0,466	0,233	0,225	0,056	0,053	0,068	10,806
2005	0,403	0,168	0,226	0,052	0,049	0,060	10,781
2006	0,392	0,174	0,210	0,048	0,061	0,053	10,935
Total	0,446	0,207	0,229	0,045	0,027	0,066	10,840

Panel B. Public firms

Year	Tot.Leverage	Short Lev.	Long Lev.	Depr./Assets	ROA	CapX/Assets	LogSales
1998	0,331	0,113	0,214	0,027	0,016	0,012	14,404
1999	0,312	0,114	0,202	0,025	0,053	0,054	14,394
2000	0,312	0,152	0,163	0,104	0,019	0,032	13,854
2001	0,372	0,134	0,242	0,022	0,027	0,028	14,216
2002	0,376	0,148	0,238	0,024	0,010	0,036	14,086
2003	0,336	0,146	0,196	0,020	0,049	0,028	13,825
2004	0,334	0,176	0,165	0,018	0,039	0,025	13,307
2005	0,277	0,125	0,154	0,019	0,100	0,027	13,405
2006	0,314	0,147	0,177	0,013	0,076	0,017	13,376
Total	0,326	0,137	0,197	0,021	0,051	0,026	13,835

Table 2. Descriptive statistics.
The sample period is from 1998 to 2006. Capital-labor intensity is defined as total invested capital over number of employees; IPI is the import penetration and it is defined as total imports from China over the sum of total imports from the world and total Norwegian sales (see the text for further details), asset tangibility is defined as fixed assets over assets.

Panel A. Private firms

Year	Cap-labor int.	Tangibility	IPI	Firms' number
1998	649,241	0,286	0,015	7892
1999	899,556	0,282	0,017	8365
2000	1012,915	0,272	0,022	8266
2001	1009,986	0,268	0,022	7931
2002	1073,969	0,263	0,033	7821
2003	1324,287	0,259	0,033	7777
2004	1308,011	0,243	0,033	7866
2005	1324,082	0,234	0,035	8243
2006	1557,382	0,222	0,036	7957
Total	1129,033	0,259	0,027	72118

Panel B. Public firms

Year	Cap-labor int.	Tangibility	IPI	Firms' number
1998	10530,340	0,218	0,010	30
1999	9045,796	0,181	0,013	32
2000	26449,310	0,130	0,016	30
2001	20263,840	0,175	0,017	31
2002	15418,650	0,156	0,031	30
2003	29424,960	0,121	0,028	30
2004	43347,980	0,105	0,034	32
2005	28225,650	0,098	0,036	35
2006	32061,580	0,089	0,034	32
Total	24542,890	0,138	0,025	282

Table 3. Impact of non-exogenous profitability on leverage.
Private firms from the dataset on Norwegian Corporate Accounts. The sample period is from 1998 to 2006. The model is $Leverage_{jit} = \alpha_1 + \beta_1 \times Profitability_{ji(t-1)} + \gamma_1 \times X_{ji(t-1)} + u_{jit}$. The dependent variable is leverage (total interest bearing debt divided by assets). The variables are: profit margins (sum of pre-tax income, interest expense and depreciation, divided by sales), ROA (EBITDA over assets), asset tangibility (fixed assets over assets), depreciation to assets (depreciation over assets), firm size (logarithm of sales), capex to assets (capital expenditures over assets), capital-labor intensity (total invested capital over number of employees). The standard errors are clustered at firm level. The symbols *, **, *** refer to estimates significantly different from zero at the 10%, 5% and 1% confidence levels.

	(1)	*(2)*	*(3)*	*(4)*
	Leverage	Leverage	Leverage	Leverage
ROA	-0.141***	-0.142***		
	(0.00)	(0.00)		
Profit Margin			-0.017**	-0.017**
			(0.02)	(0.02)
Tangibility	0.144***	0.135***	0.188***	0.183***
	(0.00)	(0.00)	(0.00)	(0.00)
Size	-0.011**	-0.006	-0.023***	-0.019***
	(0.04)	(0.37)	(0.00)	(0.00)
CapEx.To.Assets	-0.047**	-0.042**	-0.089***	-0.086***
	(0.01)	(0.02)	(0.00)	(0.00)
Depr.To.Assets		0.076*		0.047
		(0.08)		(0.28)
Cap.Lab.Int.		0.000		0.000
		(0.50)		(0.96)
Firm FE	YES	YES	YES	YES
Year FE	YES	YES	YES	YES
R^2	0.10	0.11	0.08	0.08
N	72118	72118	72118	72118

Table 4. Impact of lagged exogenous profitability on leverage.
The regression involves private firms from the dataset on Norwegian Corporate Accounts. The sample period is from 1998 to 2006. The first stage model is $ChineseCompet.inNorway_{it} = \alpha_3 + \beta_3 \times ChineseCompet.inORC_{it} + \delta_3 \times X_{ji(t-1)} + u_{jit}$. The second stage model is $Profitab_{jit} = \alpha_4 + \beta_4 \times \widehat{ChinaCompet.inNorway}_{jit} + \delta_4 \times X_{ji(t-1)} + u_{jit}$. The third stage model is $Leverage_{jit} = \alpha_5 + \beta_5 \times \widehat{Profitab}_{ji(t-1)} + \delta_5 \times X_{ji(t-1)} + u_{jit}$. The variables are: ROA (earning before interest and taxes, divided by assets), asset tangibility (fixed assets over assets), depreciation to assets (depreciation over assets), firm size (logarithm of sales), capex to assets (capital expenditures over assets), capital-labor intensity (total invested capital over number of employees). ChineseCompet.Norway is the measure of the import penetration of Chinese products into Norway, ChineseCompet.inORC is the measure of import penetration of Chinese products into nine rich countries. The standard errors are clustered at firm level. The symbols *, **, *** refer to estimates significantly different from zero at the 10%, 5% and 1% confidence levels.

	First Stage	*Second Stage*	*(1)*	*(2)*
	ChineseCompet.Norway	ROA	Leverage	Leverage
Lagged Pred. ROA			-0.013*	-0.015
Pred. ChineseCompet.Norway		-0.003**		
ChineseCompet.inORC	0.091***			
Tangibility	0.000	0.056	0.173***	0.172***
Size	1.665	-0.045	-0.023***	-0.034**
CapEx.To.Assets	0.823	-0.045**	-0.116**	-0.092**
Depr.To.Assets	0.345	0.023		0.073**
Cap.Lab.Int.	0.087	0.043**		0.019
Firm FE	YES	YES	YES	YES
Year FE	YES	YES	YES	YES
R^2	0.01	0.01	0.10	0.11
N	72118	72118	72118	72118

Table 5. Impact of predicted expected profitability on leverage.

Private firms from the dataset on Norwegian Corporate Accounts. The sample period is from 1998 to 2006. The dependent variable is leverage (total interest bearing debt divided by assets). The first stage is $ChineseCompet.inNorway_{it} = \alpha_3 + \beta_3 \times ChineseCompet.inORC_{it} + \delta_3 \times X_{ji(t-1)} + u_{jit}$. The second stage model is $Profitab_{jit} = \alpha_4 + \beta_4 \times \widehat{ChinaCompet.inNorway}_{jit} + \delta_4 \times X_{ji(t-1)} + u_{jit}$. The third stage model is $Leverage_{jit} = \alpha_5 + \beta_5 \times \widehat{Profitab}_{jit} + \delta_5 \times X_{ji(t-1)} + u_{jit}$. The variables are: ROA (earning before interest and taxes, divided by assets), asset tangibility (fixed assets over assets), depreciation to assets (depreciation over assets), firm size (logarithm of sales), capex to assets (capital expenditures over assets), capital-labor intensity (total invested capital over number of employees). ChineseCompet.Norway is the measure of the import penetration of Chinese products into Norway, ChineseCompet.inORC is the measure of the import penetration of Chinese products into nine rich countries. The standard errors are clustered at firm level. The symbols *, **, *** refer to estimates significantly different from zero at the 10%, 5% and 1% confidence levels.

	First Stage	*Second Stage*	*(1)*	*(2)*
	ChineseCompet.Norway	ROA	Leverage	Leverage
Pred. ROA			-0.081*	-0.044*
Pred. ChineseCompet.Norway		-0.003**		
ChineseCompet.inORC	0.086***			
Controls	YES	YES	NO	YES
Firm FE	YES	YES	YES	YES
Year FE	YES	YES	YES	YES
R^2	0.01	0.01	0.11	0.12
N	72118	72118	72118	72118

Table 6. Impact of changes of expected profitability on flow variables.
The regression involves private firms from the dataset on Norwegian Corporate Accounts. The sample period is from 1998 to 2006. The first stage is $\Delta ChineseCompet.inNorway_{it} = \alpha_3 + \beta_3 \times \Delta ChineseCompet.inORC_{it} + \delta_3 \times \Delta X_{ji(t-1)} + u_{jit}$. The second stage model is $\Delta Profitab_{jit} = \alpha_{10} + \beta_{10} \times \Delta \widehat{ChinaCompet.inNorway_{jit}} + \delta_{10} \times \Delta X_{ji(t-1)} + u_{jit}$. The third stage model is $Variables_{jit} = \alpha + \beta \times \Delta \widehat{Profitab}_{jit} + \delta \times \Delta X_{ji(t-1)} + u_{jit}$. The dependent variables in the third stages are: asset growth (annual change in logarithm of assets), net debt issues (annual changes in debt minus cash divided by lagged assets), net equity issues (annual change in total equity minus retained earnings over lagged assets). The variables are: annual change of ROA, annual changes of standard control variables and equity over assets. ChineseCompet.Norway Chg. is the measure of changes in import penetration of Chinese products into Norway, ChineseCompet.inORC is the measure of the import penetration of Chinese products into nine rich countries. The standard errors are clustered at firm level. The symbols *, **, *** refer to estimates significantly different from zero at the 10%, 5% and 1% confidence levels.

	First Stage	*Second Stage*	*(1)*	*(2)*	*(3)*
	ChineseCompet.Norway Chg.	ROA Chg	Debt issue	Asset growth	Equity growth
Pred. ROA Chg			-0.422	0.234**	0.549*
			(0.78)	(0.04)	(0.07)
Pred.ChineseCompet.Norway Chg.		-0.004*			
		(0.07)			
ChineseCompet.inORC Chg.	0.102**				
	(0.04)				
Controls	YES	YES	YES	YES	YES
Firm FE	YES	YES	YES	YES	YES
Year FE	YES	YES	YES	YES	YES
R^2	0.01	0.01	0.05	0.02	0.02
N	59060	59060	59060	59060	59060

Table 7. Impact of lagged exogenous import penetration on leverage.
The regression involves private firms from the dataset on Norwegian Corporate Accounts. The sample period is from 1998 to 2006. The first stage model is $ChineseCompet.inNorway_{it} = \alpha_3 + \beta_3 \times ChineseCompet.inORC_{it} + \delta_3 \times X_{ji(t-1)} + u_{jit}$. The second stage model is $Leverage_{jit} = \alpha_{11} + \beta_{11} \times \widehat{ChineseCompet.inNorway}_{it-1} + \delta_{11} \times X_{ji(t-1)} + u_{jit}$. The variables are: asset tangibility (fixed assets over assets), depreciation to assets (depreciation over assets), firm size (logarithm of sales), capex to assets (capital expenditures over assets), capital-labor intensity (total invested capital over number of employees). ChineseCompet.Norway is the measure of the import penetration of Chinese products into Norway, ChineseCompet.inORC is the measure of the import penetration of Chinese products into nine rich countries. The standard errors are clustered at firm level. The symbols *, **, *** refer to estimates significantly different from zero at the 10%, 5% and 1% confidence levels.

	First Stage	*(1)*	*(2)*	*(3)*
	ChineseCompet.Norway	Leverage	Leverage	Leverage
Lag.Pred.ChineseCompet.Norway		0.117	0.121*	-0.065
ChineseCompet.inORC	0.086***			
Tangibility	0.000	0.173**	0.175***	0.194**
Size	0.346	-0.026***	-0.022***	-0.032***
CapEx.To.Assets	0.634	-0.089***	-0.086***	-0.334***
Depr.To.Assets	0.823		0.052	0.095***
Cap.Lab.Int.	0.103		-0.000	-0.000
Firm FE	YES	YES	YES	NO
Industry FE	NO	NO	NO	YES
Year FE	YES	YES	YES	YES
R^2	0.01	0.11	0.12	0.14
N	72118	72118	72118	72118

Table 8. Impact of lagged expected profitability on leverage.
The regression involves public firms from the dataset on Norwegian Corporate Accounts. The sample period is from 1998 to 2006. The first stage model is $ChineseCompet.inNorway_{it} = \alpha_3 + \beta_3 \times ChineseCompet.inORC_{it} + \delta_3 \times X_{ji(t-1)} + u_{jit}$. The second stage model is $Leverage_{jit} = \alpha_{11} + \beta_{11} \times \widehat{ChineseCompet.inNorway}_{it-1} + \delta_{11} \times X_{ji(t-1)} + u_{jit}$. The variables are: asset tangibility (fixed assets over assets), depreciation to assets (depreciation over assets), firm size (logarithm of sales), capex to assets (capital expenditures over assets), capital-labor intensity (total invested capital over number of employees). ChineseCompet.Norway is the measure of the import penetration of Chinese products into Norway, ChineseCompet.inORC is the measure of the import penetration of Chinese products into nine rich countries. The standard errors are clustered at firm level. The symbols *, **, *** refer to estimates significantly different from zero at the 10%, 5% and 1% confidence levels.

	First Stage	*(1)*	*(2)*	*(3)*
	ChineseCompet.Norway	Leverage	Leverage	Leverage
Lag.Pred.ChineseCompet.Norway		-0.119	-0.056	-0.242
ChineseCompet.inORC	0.089*			
Tangibility	0.000	-0.007	-0.063	-0.143
Size	0.432	0.021*	0.045***	0.041***
CapEx.To.Assets	0.765	0.044	-0.003	-0.040
Depr.To.Assets	0.786		0.118***	0.130**
Cap.Lab.Int.	0.102		0.000	0.000***
Firm FE	YES	YES	YES	NO
Industry FE	NO	NO	NO	YES
Year FE	YES	YES	YES	YES
R^2	0.01	0.5	0.7	0.7
N	282	282	282	282

Table 9. Impact of profitability on leverage.
The regression involves public firms from the dataset on Norwegian Corporate Accounts. The sample period is from 1998 to 2006. The variables are: ROA (earning before interest and taxes, divided by assets), asset tangibility (fixed assets over assets), depreciation to assets (depreciation over assets), firm size (logarithm of sales), capex to assets (capital expenditures over assets), capital-labor intensity (total invested capital over number of employees). ChineseCompet.Norway is the measure of the import penetration of Chinese products into Norway, ChineseCompet.inORC is the measure of the import penetration of Chinese products into nine rich countries. The standard errors are clustered at firm level. The symbols *, **, *** refer to estimates significantly different from zero at the 10%, 5% and 1% confidence levels.

	Public firms		Private firms		
	Second Stage	*Third stage*	*Second Stage*	*Third stage*	*T-test*
	ROA	Leverage	ROA	Leverage	Public - Private
Pred. ROA		-0.020		-0.044*	**2.104****
Pred. ChineseCompet.Norway	-0.002*		-0.003**		
Controls	YES	YES	YES	YES	
Firm FE	YES	YES	YES	YES	
Year FE	YES	YES	YES	YES	
R^2	0.01	0.04	0.01	0.12	
N	282	282	72118	72118	

Table 10. Impact of predicted expected profitability on leverage at refinancing points.
The variables are: ROA (earning before interest and taxes, divided by assets), Refinancing dummy (it equal one if the firm-year observation exceeds 5% of long term debt issues and 5% of net equity retirement to shareholders, see the text for further details), asset tangibility (fixed assets over assets), depreciation to assets (depreciation over assets), firm size (logarithm of sales), capex to assets (capital expenditures over assets), capital-labor intensity (total invested capital over number of employees). The first stage is $ChineseCompet.inNorway_{it} = \alpha_3 + \beta_3 \times ChineseCompet.inORC_{it} + \delta_3 \times X_{ji(t-1)} + u_{jit}$. The second stage model is $Profitab_{jit} = \alpha_4 + \beta_4 \times \widehat{ChinaCompet.inNorway}_{jit} + \delta_4 \times X_{ji(t-1)} + u_{jit}$. The third stage model is $Leverage_{jit} = \alpha + \beta \times \widehat{Profitab}_{jit} + \gamma \times Ref_{jnt} \times \widehat{Profitab}_{jnt} + \delta \times X_{ji(t-1)} + u_{jit}$ The Wald test has the null hypothesis that the sum $(\beta + \gamma)$ is zero. The standard errors are clustered at firm level. The symbols *, **, *** refer to estimates significantly different from zero at the 10%, 5% and 1% confidence levels.

	First Stage	*Second Stage*	*(1)*	*(2)*
	ChineseCompet.Norway	ROA	Leverage	Leverage
Pred. ROA			-0.032**	-0.037*
			(0.04)	(0.07)
Pred. ChineseCompet.Norway		-0.007**		
		(0.04)		
ChineseCompet.inORC	0.079**			
	(0.03)			
Ref	0.047	-0.053**	0.072**	0.076***
	(0.27)	(0.04)	(0.04)	(0.00)
Pred. ROA x Ref			0.043*	0.032**
			(0.08)	(0.06)
HP sum = 0			0.14	0.19
Controls	YES	YES	NO	YES
Industry FE	YES	YES	YES	YES
Year FE	YES	YES	YES	YES
R^2	0.01	0.01	0.12	0.12
N	72118	72118	72118	72118

Impact of the Capital Purchase Program on the Capital Ratio of U.S. Banks

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Abstract

This paper illustrates that the U.S. Capital Purchase Program (October 2008) has effectively expanded banks' capitalization by increasing their equity issuances. This impact is analyzed by means of a difference-in-differences framework, after illustrating that the parallel trend assumption is satisfied. In addition, the paper shows that the improvement of banks capitalization has not been attenuated nor reinforced by modifications of the payout or investment policies that may have been resulting from the Capital Purchase Program. These results are robust to the implementation of an instrumental variable approach. In addition, I show that not only the preferred equity, but also the common equity has increased in response to the preferred equity infusions.

1. Introduction

The stability of the banking system strongly hinges on the levels of capitalization the financial institutions are able to maintain, especially during the macroeconomic contractions (Jarrow (2013), Blum (2008)). To ensure a sufficient bank capitalization, policymakers have both prescribed capital requirements (Basel I, II, III) and, particularly during the financial crises of the last decade, they have created unprecedentedly expensive schemes that explicitly sustain financial institutions using several different mechanisms.

The most prominent example is the U.S. Emergency Economic Stabilization Act (EESA), which generated the Capital Purchase Program (CPP). Introduced in October 2008, the Capital Purchase Program allowed the Treasury to acquire at a subsidized price preferred equity issued by banks, with an expenditure ceiling of $250 billion (more than 1,7% of GDP). In order to participate and remain into the program, banks had to receive the Treasury's authorization, which was significantly politically motivated (Duchin and Sosyura (2014)), in addition to the obligation to pay the buyer with dividends that were lower but close to market valuation. A third condition was the limitation of the managerial compensations and of the payouts to common equity, even though the latter restriction could have been removed through approvals provided by the Treasury (Pratt and Grabowski (2009), Treasury Department (2009)). Since the original fundamental objective of the plan was officially to increase banks' capitalization in order to restore the confidence in the network of financial institutions (Massad (2013)), the natural question posed by authors like Hosh and Kashyap (2010) was: "will the U.S. bank recapitalization succeed?"

This enquiry constitutes an open empirical question. In particular, although the original objective was the recapitalization and stabilization of the banks, the positive shocks on capital represented by the infusion of new equity might have been substantially counterbalanced by excessive expansions of the investments and of the payout policy.

Concerning the investments, it is worth noticing that a very broad group of major lawmakers and their electorate even considered the expansion of investments as the necessary goal for a public program like the CPP (Warren et al. (2009)). In fact, at the peak of the financial crisis, the economy in the U.S.A. was experiencing the largest decline in GDP since the World War, the unemployment rate was at its highest record in almost three decades and firms were experiencing

a generalized credit crunch. In this context, the priority for voters and politicians was to exert strong pressure on the Treasury and on banking regulators in order to ensure that taxpayers' money was not retained inside the banks but, rather, transmitted to the "real economy" for funding new projects.

According to Acharya and Yorulmazer (2007), public rescue programs like the CPP can excessively expand banks' assets and risk-taking under the assumption that the acceptance into such programs, being often related to political decisions, might signal an increased probability of bail-out for a specific bank also in future distress cases. This signal deteriorates investors' monitoring of protected banks, exacerbates moral hazard and, hence, reinforces banks' incentives to relax the net present value (NPV) requirements for funding new loans.

Another possible mechanism behind the expansion of investment might be linked to the debt over-hang problem discussed by Myers (1977). The infusion of capital might have increased the equity ratio and, hence, decreased the proportion of debtholders claims. If this decrease were large enough, it could have allowed the equity-holders to have enough expected revenue to accept a portion of the productive projects abandoned during the crisis' debt over-hang.

Also the payout policy represented an important element of uncertainty that could have facilitated or hindered the objective of increasing banks' capital ratio. It is possible to conjecture that the limits on the payout policy have decreased the dividends payments or stock repurchases for the banks that were authorized to receive CPP funds. However, the concern of a dividends policy limiting capitalization might be reinforced by findings such as the one of Acharya et al. (2011), which illustrates that large banks, even in a highly distressed condition, have strongly increased dividends during the 2008 financial crisis and that these expansions have deteriorate their capitalization. For instance, they show that even Lehman Brothers considerably expanded its dividends from $95 million in 2008Q2 to $118 million in 2008Q3 right before its bankruptcy. In line with Lehman Brothers's behavior, Merrill Lynch approximately doubled its dividends in 2008Q4 compared to the previous year and Bear Stearns enlarged dividends from $36 million in 2007Q4 to $47 million in 2008Q1. Acharya et al. (2011) argues that the implicit too-big-to-fail guarantee can be the main driver of this high - an in several cases increased - payout ratio in periods of profound crisis. If we combine the evidence of Acharya et al. (2011) with the findings of Bayazitova and Shivdasani (2012) that large institutions have considerably larger probability

of being accepted into the CPP, it is possible to empirically observe that the payout ratio of CPP institutions react more positively (or less negatively) to the crisis compared to institutions that did not access the CPP.

This paper investigates whether a stimulus plan like the CPP has been effective in increasing banks' equity ratio by contributing to the exploration of this question with a natural experiment framework (difference-in-differences) and with analyses concerning three drivers of equity ratio (equity issuances, payout policy and illiquid investments) and two important subcomponents of equity (i.e., common and preferred stock).[56] The examination of these drivers is particularly important also to understand whether the objective of recapitalizing banks through equity issuances has been reinforced or attenuated by illiquid investments or dividends payouts.

This study compares the reaction to CPP's introduction of banks accepted into the program (also referred to as the *CPP banks*, which constitute the treated group) with the reaction of institutions that did not have access to the program (also referred to as the *non-CPP banks*, which constitute the control group). In addition, this study implements a difference-in-differences estimation in which the treatment dummy is the prediction of a first-stage using an Instrumental Variable approach. This procedure addresses the endogeneity concerns related to the fact that the authorization into the CPP might be determined by variables like the bank's distress, which might affect the dependent variables and create a confounding effect.

I show that the CPP banks significantly increased the equity to assets ratio (Tier 1 total capital ratio) compared to institutions that did not have access to the CPP while, importantly, their ratios displayed a clear parallel trend before 2008Q4, that is before CPP's introduction. Further evidence corroborates the hypothesis that this expansion is crucially driven by the equity issuances and that the CPP did not significantly affect the banks' behavior in terms of dividends payouts. Moreover, analyses illustrate that, in reaction to the CPP, banks did not increase their illiquid investments.

In addition, this paper attempts to discern whether banks' equity issuances are exclusively driven by the preferred stocks bought by the Treasury or, alternatively, whether CPP has triggered a beneficial effect by prompting also an increase of the common equity. My findings illustrate that

[56] Investments, payout policy and equity issuances are the three fundamental drivers of the equity ratio in the studies about how banks adjust their capitalization (e.g., MAG (2010), Gerali and Angelini (2013)).

not only the preferred equity ratio but also the common equity ratio increased in reaction to the CPP. This expansion of the common equity ratio might be reflecting an endogenous response: since the CPP funds decrease the stock volatility (Huerta et al. (2011)), and since firms with lower equity volatility have lower seasoned common equity offering (SEO) underpricing (Drucker and Puri (1999), Altinkilic and Hansen (2000) and Corwin (2003)), we can expect that CPP funds increase the SEO. On the other hand, the increase of the common equity ratio might be compatible with a "regulatory requirement" effect: even though the regulation does not explicitly impose higher requirements to the CPP banks, for redeeming the CPP capital, *from June 2009*, the Federal Reserve Guidance on TARP Repayments imposed the CPP banks to "demonstrate" the ability to access to common equity markets. Supporting the hypothesis that banks expanded their common equity ratio in order to fulfil the necessary requirement for redeeming the preferred stocks, I find that the reaction of equity ratio is positive only starting *from June 2009*.

This paper is organized as follows: section 2 provides the institutional background regarding the CPP; section 3 discusses the related literature; section 4 presents the data; section 4 describes the summary statistics with a particular focus on the parallel trends of capital ratio and its determinants; section 6 perform the difference-in-differences analyses and the additional instrumental variable approach; section 7 concludes.

2. Capital Purchase Program (CPP)

In October 2008, regulators created the Capital Purchase Program (CPP). It allowed to use up to $250 billion for buying banks' preferred stocks. The Capital Purchase Program was limited to "healthy banks" and this definition was the outcome of an evaluation partially based on the Camels ratings, which is a supervisory rating system accounting for six bank features: Capital adequacy, Asset quality, Management, Earnings, Liquidity and Sensitivity to market risk. This system provides five rating classes and the probability of CPP authorization, officially, should have been increasing in the safety of the bank.

However, Pana and Wilson (2013) argue that the vast discretion and confidentiality concerning the authorization's decision is the driver of this large political interference. Analyzing the likelihood of a bank receiving CPP capitals, Bayazitova and Shivdasani (2012) underline that

the size is the most important factor for the authorization, while the capital ratio is not a significant explanatory variable. This evidence is in line with the finding of higher leniency for large institutions, which is supported, among others, by the works of Ioannidou (2005) and Lambert (2016). Duchin and Sosyura (2014), Duchin and Sosyura (2012)) demonstrate that the decision of authorizing a bank is largely motivated by its political connections.

For CPP banks, the direct costs related to the preferred stock are in the form of dividends of five percent for the first five years and nine percent thereafter. In addition, the CPP funds entailed high indirect costs due to the government restrictions on dividends, stock repurchases and managerial compensations (Pratt and Grabowski (2010), Treasury Department (2009)). In particular, if the dividends of the preferred stock were not paid, the dividends and the repurchases in favor of the equity holders were prohibited. In addition, for three years starting from the issuance of the preferred stock, the increase of common dividends per share was subject to the consent of the Treasury. The equity stock repurchases needed a Treasury's consent, unless they were "in connection with any benefit plan consistent with best practice", which is a specification that contributed to increase the discretion of the regulators (Pratt and Grabowski (2010)).

3. Related literature

This paper is related to the large literature regarding the impact of equity on banks' lending. Using panel-regression methodologies Hancock and Wilcox (1993, 1994) show that positive shocks on banks' capital induced banks with capital shortfalls to expand their lending, even though the effect is modest. In addition, they show that this relation is not constant over decades: for instance, it has been stronger in the 1990s than in the 1980s. Similar results are corroborated also by the contribution of Lown and Morgan (2006) who use a VAR model and find a small impact of bank capital ratio shocks on lending. Also Berrospide and Edge (2010)'s evidence confirms these small effects on lending. These results are in contrast with the ones offered by the scatterplot of Adrian and Shin (2007) showing a very large effect of capital ratio. The latter results are very important from a policy perspective as they are the main motivation behind the additional increase of the capital ratio requirements imposed by the Basel accord. Brei et al. (2013) use a large dataset composed of 14 important advanced countries for the period from 1995 to 2010 and they study

the impact of capitalization on lending. They show that, while capital shocks expand lending in normal times, during a crisis institutions increase lending in response to capital shock only if their capital ratio exceeds a critical level. Boyson et al. (2014) shows that during the U.S. financial crisis and before the capital injections, banks fund themselves with newly issued equity rather than assets' fire sales.

Bernanke and Lown (1991) demonstrate that the lack of equity is a significant determinant of a credit crunch and they disentangle its effect from the effects caused by demand factors, such as a weakened state of borrowers' balance sheets. In addition, they study the effects of a credit crunch on firms' investments finding a significant, although weak, impact.

Berger and Roman (2014) study the effect of the CPP on borrower firms' behaviors and show that it increased the job creation while reducing business and personal bankruptcies. A vast banking literature has examined the banks' reaction in response to the CPP in terms of lending and risk-taking. Puddu and Walchli (2013), focusing on loans to small business, illustrate that CPP banks provide a large additional amount of lending compared to non-TARP banks. Black and Hazelwood (2013) focus on the risk-taking of a sample of 81 institutions and illustrate that commercial and industrial loans have expanded for small CPP banks, but they declined for large CPP banks, compared to banks non-participating to the program. Employing a large sample of listed institutions, Duchin and Sosyura (2014) show that CPP banks initiated riskier loans. The latter study seems the closest contribution, in that they also use a difference-in-differences approach to study banks' total lending. The current paper contributes to this debate by describing whether the effect of preferred stock on equity ratio has been reinforced or attenuated by investments, dividends payouts or common equity and by describing the impact of CPP on banks' total lending.[57]

An important group of contributions regarding the CPP has employed event study methodologies. Veronesi and Zingales (2010) illustrate that that CPP equity had the consequence of shifting wealth to the creditors of the CPP recipients creating a cost for taxpayers roughly between $20 billion and $40 billion. Acharya et al. (2016) underline that the access to the CPP

[57] This paper studies the impact on total lending for average values of loan-to-income; Duchin and Sosyura (2014), the only paper studying the effect on total lending, find estimates that are conditional on a value of loan-to-income equal to zero, while the average value in their dataset is 2,000.

has deteriorated the market discipline of financial firms compared to non-financial firms. Comparing the reaction of the preferred stock of taxpayers' and the trust preferred stockholders, Kim and Stock (2010) find that the latter had a disproportionate advantage from CPP because they are senior to the former.

In addition, several authors illustrate that banks' size and political connections are crucial drivers of the probability of receiving the CPP's approval (Bayazitova and Shivdasani (2012), Croci et al (2015) and Duchin and Sosyura (2014)).

4. Data

The quarterly information about banks' balance sheet, income statement and cash-flow statement is based on the Compustat database for financial institutions, which comprehends the institutions that are traded on the NYSE, AMEX and NASDAQ. I initially consider the period between 2004Q1 and 2013Q4 as this ensures the necessary granularity regarding the cash-flow statements. Starting with a total of 23,120 observations over the period from 2004Q1 to 2013Q4, I then focus on banks that are headquartered in the U.S (this step reduces the sample to 21,303 observations). The empirical analyses do not consider observations with negative total assets or stock sales, observations with missing values for total assets, payout ratio, stock sales or preferred equity. This exclusion reduce the sample to 18,154 bank-quarter observations. Since we focus on the period between 2007Q1 and 2010Q4, that is the four years around the quarter of CPP introduction - namely, 2008Q4 -, observations decline to a level of 7,534 (663 banks). Concerning the data about the Capital Purchase Program, using data provided by the U.S. Treasury Department, I have manually collected the information about which banks gained the authorization to receive Treasury funds in exchange for preferred stocks.

The total capital ratio (also referred to as the total equity ratio) is defined as the ratio of the book value of total equity (i.e., total Tier 1 capital) over total assets. The changes in equity ratio are the respective quarterly changes. Concerning the equity ratio, this paper uses the non risk-weighted assets, in line with the generality of the banking papers that do not specifically investigate the bank's risk taking. Furthermore, the importance of non-risk weighted capital ratio is underlined

by the fact that Basel I, II, III impose key leverage requirements that are based on non-risk-weighted assets.

In order to gauge the equity issuances, Compustat offers a measure aggregating cash-flows from the issuances of preferred and common equity. Nonetheless, this paper provides also an analysis separating preferred from common equity by investigating the preferred and common equity ratios. The variable used to describe the increase of investment in illiquid assets is the sum of net expenses for loans, net investments, net expenses for capital expenditures and acquisitions, minus the net short-term investments. The component describing bank's payout policy is constructed as dividends divided by income.

5. Parallel Trends and Descriptive Statistics

This section illustrates the quarterly averages of the main variables of interest in this paper (changes in equity ratio, total equity issuances, investment in illiquid assets and the payout ratio) by dividing banks based on their access to the CPP. The graphs of this section display clear parallel trends, which constitute a necessary condition for the causal interpretation of the difference-in-differences estimations - the main analyses in this paper - .

Figure 1 shows that the total capital ratio of the CPP institutions has the same level and the same trend as the ratio relative to non-CPP institutions, before 2008Q4. A very strong shock has affected only the CPP banks exactly in the quarter 2008Q4, and it expanded their capital ratio also in the subsequent quarters.

Figure 2 gives an intuition about whether the total equity issuances are the driver of the equity ratio's shock. It compares the quarterly averages of the CPP banks' total equity issuances with the corresponding cash-flow value regarding non-CPP banks. We can observe that the two trends and the two levels are very similar in the period before the introduction of the CPP. From 2008Q4, institutions accepted into the CPP sharply amplified the weight of the new equity issuances as a funding source.

Figure 3 allows us to investigate the reaction of the investment in illiquid assets and, like for the case of equity issues, we can observe a distinct parallel trend between the two quarterly

averages before the CPP. However, the introduction of the CPP seems not to generate a change in the difference between the two means.

With Figure 4, we can graphically investigate also the trends of the payout ratio. They exhibits a parallel trend before 2008Q4 and, even though we can observe a decrease for the CPP banks that is not parallel with the corresponding data of non-CPP institutions, the introduction of CPP did not significantly affect the difference between the treated and control groups, as we will see in the results of the main difference-in-differences estimations.

The finding that these variables had parallel trends before 2008Q4 attenuates the possible concerns that causes non-ascribable to the CPP may have been motivating the large differential shocks between treated and control groups that we see in the changes of equity ratio and in the equity issuances. We can notice, for instance, that there is an absence of differential reactions even in the crisis periods characterizing the three quarters before the introduction of the CPP (the period from 2008Q1). To provide a summary of the variables contained in the analyses of this paper, Table 1 shows the mean, median, standard deviation and number of observations relative to all the banks in my final sample (from 2007Q1 to 2010Q4).

6.Main Hypotheses and Difference-in-differences Models

This paper investigates two main questions. The first is whether the introduction of the CPP has increased the total capital ratio. The second investigates whether investments and payout ratio reinforced or attenuated the impact of equity issuances on change in equity ratio. Given that the authorization to access the CPP funds was largely driven by political considerations and given that these political considerations seemed having had an effect on the dependent variables only starting from the introduction of the CPP (this second condition is visible by means of the parallel trends of the graphs from Figure 1 to Figure 4), the difference-in-differences framework is the method chosen for testing the hypotheses.

6.1 Impact on Equity Ratio

The first question is investigated by comparing the reaction of the CPP banks' change in total capital ratio with the reaction of the non-CPP banks' change in total capital ratio. The related difference-in-differences regression model is:

$$\frac{Tot.\,Eq._{\cdot it}}{Assets_{it}} = \alpha + \beta_1 \times CPP_i \times post2008Q4_t + \delta_1 \times CPP_i + \gamma_1 \times post2008Q4_t + X_{it-1} + M_{t-1} + \varepsilon_{it} \qquad (1)$$

The dependent variable is the ratio of total equity to assets. The group dummy CPP_i is the indicator taking the value of one if a bank has been authorized to receive the CPP funds. The time dummy $post2008Q4_t$ takes the value of one in the quarters ending after the introduction of the CPP. The control variables are indicated by X_{it} and consider the lagged levels of profitability (ROA), the accounting measure of risk (percentage of non-performing loans (NPL) over assets, in line with Jimenez et al. (2013)), the level of intangible assets (intangibles over assets) and the accounting measure of growth opportunities (growth of interest income (Brav (2010)). M_t is the vector of macroeconomic control variables and it comprehend the quarter fixed effects, the GDP growth and the CPI inflation index. The main coefficient of interest is β_1 , the difference-in-differences estimate. A positive coefficient is interpreted as an increase of the difference between the CPP banks' change in total capital ratio and the non-CPP banks' change in total capital ratio. Table 2 illustrates the outcomes of regressions without the macroeconomic and firm-specific control variables. Importantly, Column 1 shows that the impact of the CPP has been beneficial for the total equity ratio. This finding addresses the enquiry of Hosh and Kashyap (2010); "will the U.S. bank recapitalization succeed?", which was particularly relevant given that the crucial objective of the plan was to increase banks' capitalization in order to restore the confidence in the banking system.

6.2 Impact on Determinants of Equity Ratio

I investigate the second question - about CPP's impact on equity issuances, investments and payout ratio - by substituting the dependent variable of the empirical model (1). The dependent variables are the investment in illiquid assets (scaled by total assets), the cash raised by the equity issuances (scaled by total assets) and the payout ratio (dividends divided by income). The difference-in-differences specifications are:

$$\frac{Eq.\,Issuan._{it}}{Assets_{it}} = \alpha + \beta_2 \times CPP_i \times post2008Q4_t + \delta_2 \times CPP_i + \delta_2 \times post2008Q4_t + X_{it-1} + M_{t-1} + \varepsilon_{it} \quad (2)$$

$$\frac{Invest._{it}}{Assets_{it}} = \alpha + \beta_3 \times CPP_i \times post2008Q4_t + \delta_3 \times CPP_i + \delta_3 \times post2008Q4_t + X_{it-1} + M_{t-1} + \varepsilon_{it} \quad (3)$$

$$\frac{Divid._{it}}{Income_{it}} = \alpha + \beta_4 \times CPP_i \times post2008Q4_t + \delta_4 \times CPP_i + \delta_4 \times post2008Q4_t + X_{it-1} + M_{t-1} + \varepsilon_{it} \quad (4)$$

The coefficients of interest in these specifications are the β's , the difference-in-differences estimates. Concerning the equity issuances, the hypothesis is that the CPP has allowed the CPP banks to increase the total equity issuances more than the non-CPP banks. Hence, we expect a positive β_2.

Concerning the investments, the null hypothesis is that β_3 is zero, which means that the CPP did not have a significant differential impact on the net investment on illiquid assets. This result would be in line with the fact that the CPP's primary objective was to recapitalize U.S. banks (Massad (2013)). In addition, this result would be consistent with Brei et al. (2013)'s finding that exogenous shocks to bank capital positively affects lending only if the capital ratio exceeds a given threshold. Concerning the payout ratio, the null hypothesis is that β_4 is zero, meaning that the equity infusions of CPP did not increase or decrease the payout ratio. This estimate would be in line with the idea that the Treasury has successfully avoided the adverse scenario in which the banks accessing the CPP conveyed a significant portion of the funds to the amplification of the payout ratio rather than stimulating capitalization.

In Table 2 , columns 2-4 illustrate that the cash from equity issuances has significantly increased for CPP banks, compared to the non-CPP ones and that the investment and payout policies of the authorized banks is not statistically different from the ones of non-CPP banks. Table 3 investigates the aforementioned hypotheses regarding equity ratio, equity issuances, investments and payout ratio by introducing the bank-specific and time-specific control variables; we can observe that results are robust to this change in specifications.

6.3 Instrumental Variable Framework

This subsection introduce an Instrumental Variable approach that is intended to address the endogeneity concerns linked to the fact that the CPP's approval might be driven by variables like

the bank's distress condition, which might influence the dependent variables and create a biased estimate. In the first stage of the IV approach, I predict the CPP authorization by means of the size of the bank in the quarter of CPP's introduction (i.e., 2008Q4). The first stage regression has the following specification:

$$CPP_{it} = \alpha + \beta_5(size_{it}) + X_{it-1} + \varepsilon_{it} \tag{5}$$

This regression is performed only in the quarter 2008Q4 and it uses the bank size as instrumental variable given that this variable satisfies two essential conditions for an instrument. The first is that the instrument is relevant, meaning that it is a significant predictor of the authorization to use the CPP funds. The column 1 of Table 4 illustrates the results relative to the first stage model (5) and we observe that the positive and significant estimate relative to banks' size in 2008Q4 corroborates this first fundamental condition for an instrumental variable approach. The intuition behind this result is that regulators and politicians have stronger motives for bailing out a large bank (both for the too-big-to-fail considerations and for the superior ability to lobby), compared to small institutions. This aspect is supported, among others, by the works of Bayazitova and Shivdasani (2011), Ioannidou (2005) and Lambert (2016).

The second condition is that the size affects the dependent variable only through the channel of the CPP authorization (exclusion restriction condition). My evidence provides support about this condition in two ways. First, I provide a placebo difference-in-differences test using the size of 2008Q4 (and not the CPP authorization) and it shows that the treatment dummy delivers insignificant estimates. This test supports the idea that size *per se* does not have an impact on the main dependent variable (i.e., equity ratio) and, instead, we will see in the subsequent Table 5 that only the part of size's variability that is correlated with the CPP's approval is able to affect the equity ratio. Second, in a falsification test, I illustrate that the size does not affect the accounting measure of banks' distress (i.e., the portion of non-performing loans), which represented the main concern, since the CPP's approval is officially based on banks' CAMEL rating that could be correlated with the equity ratio. The results of the placebo difference-in-differences and of the falsification tests are presented in columns 2 and 3 of Table 4. The model specifications relative to the Instrumental Variable approach are the following ones:

$$\frac{Tot.Eq._{\cdot it}}{Assets_{it}} = \alpha + \beta_6 \times \widehat{CPP_i} \times post2008Q4_t + \delta_6 \times \widehat{CPP_i} + \gamma_6 \times post2008Q4_t + X_{it} + M_t + \varepsilon_{it} \tag{6}$$

$$\frac{Eq.\,Issuan._{it}}{Assets_{it}} = \alpha + \beta_7 \times \widehat{CPP_i} \times post2008Q4_t + \delta_7 \times \widehat{CPP_i} + \delta_7 \times post2008Q4_t + X_{it} + M_t + \varepsilon_{it} \quad (7)$$

$$\frac{Invest._{it}}{Assets_{it}} = \alpha + \beta_8 \times \widehat{CPP_i} \times post2008Q4_t + \delta_8 \times \widehat{CPP_i} + \delta_8 \times post2008Q4_t + X_{it} + M_t + \varepsilon_{it} \quad (8)$$

$$\frac{Divid._{it}}{Income_{it}} = \alpha + \beta_9 \times \widehat{CPP_i} \times post2008Q4_t + \delta_9 \times \widehat{CPP_i} + \delta_9 \times post2008Q4_t + X_{it} + M_t + \varepsilon_{it} \quad (9)$$

Columns 1-4 of Table 5 illustrate the results regarding the second stages and they confirm the results of the original difference-in-differences tests relative to the models from (1) to (4).

6.4 Drivers of Equity Issuances

This section addressed the question of whether banks' equity issuances are entirely determined by the preferred stocks purchased by the government or, alternatively, whether the CPP has triggered an expansion of common equity.

$$\frac{Pref.\,Eq._{it}}{Assets_{it}} = \alpha + \beta_{10} \times \widehat{CPP_i} \times post2008Q4_t + \delta_{10} \times \widehat{CPP_i} + \gamma_{10} \times post2008Q4_t + X_{it} + M_t + \varepsilon_{it} \quad (10)$$

$$\frac{Com.\,Eq._{it}}{Assets_{it}} = \alpha + \beta_{11} \times \widehat{CPP_i} \times post2008Q4_t + \delta_{11} \times \widehat{CPP_i} + \gamma_{11} \times post2008Q4_t + X_{it} + M_t + \varepsilon_{it} \quad (11)$$

Table 6 shows that both preferred equity ratio but common equity ratio significantly increased in reaction to the CPP.

An eventual increase of common equity ratio would be in line with two hypotheses: the endogenous response hypothesis and the regulatory requirement hypothesis. The endogenous response hypothesis is based on the fact that CPP banks might have benefited from a reduced stock volatility which decrease the underpricing of their seasoned common equity offerings. On the other hand, the interest behind this result is that a possible increase of the common equity ratio is compatible also with the regulation's requirements for redeeming the CPP capital (Federal Reserve Guidance on TARP Repayments (2009)). From June 2009, this regulation imposed the CPP banks to "demonstrate" access to common equity markets. Therefore, we can expect that if the increase of the common equity ratio characterizes the period after June 2009, then it is more likely that the banks were raising the equity ratio for reasons linked to the regulation, with respect to the alternative hypothesis of an endogenous response. The evidence in Table 7 shows that before

June 2009 the difference-in-differences estimate is insignificant, while it is significantly positive in the quarter 2009Q2. This result is more in line with the regulatory requirement hypothesis.

Conclusions

This paper illustrates, with a natural experiment framework, that the U.S. Capital Purchase Program has effectively increased the equity issuances and expanded U.S. banks' equity ratio. This capitalization's improvement has not been attenuated by a rise in the payout policy or by a growth of the investments in illiquid assets. I address the concerns of endogeneity by combining the difference-in-differences framework with the instrumental variable approach and the results are robust. In addition, I show that not only the preferred equity but also the common equity ratio has increased in response to the preferred equity infusions.

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Figures

Figure 1 . Mean of Changes in Eq./As. for CPP and non-CPP banks.

This figure shows the changes in the total capital ratio (also referred to as the total equity ratio), defined as the ratio of the book value of total equity (i.e., total Tier 1 capital) over total assets. The sample period is from 2007Q1 to 2010Q4.

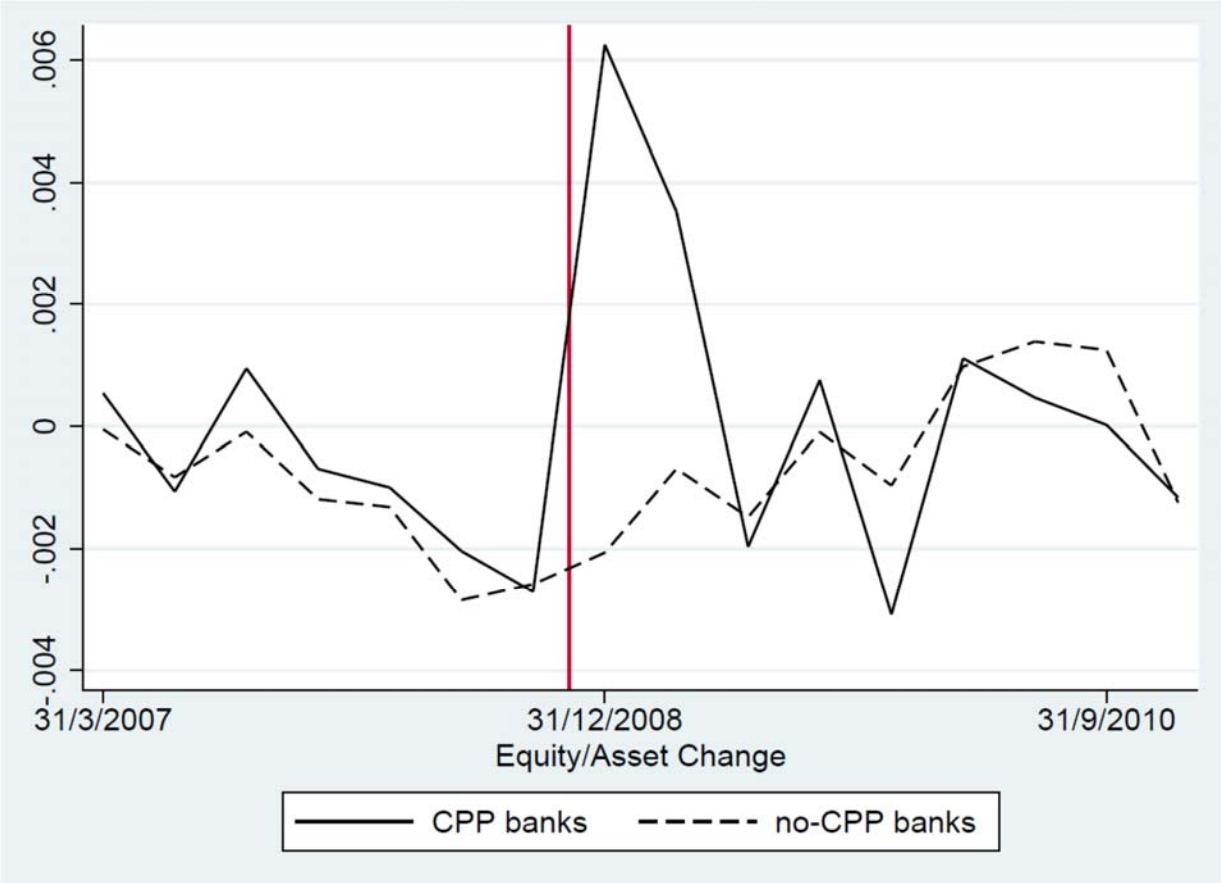


Figure 2 . Mean of total equity issuances (scaled by total assets) for CPP and non-CPP banks.
This figure shows the total equity issuances, defined as the sum of common and preferred equity issuances. The sample period is from 2007Q1 to 2010Q4.

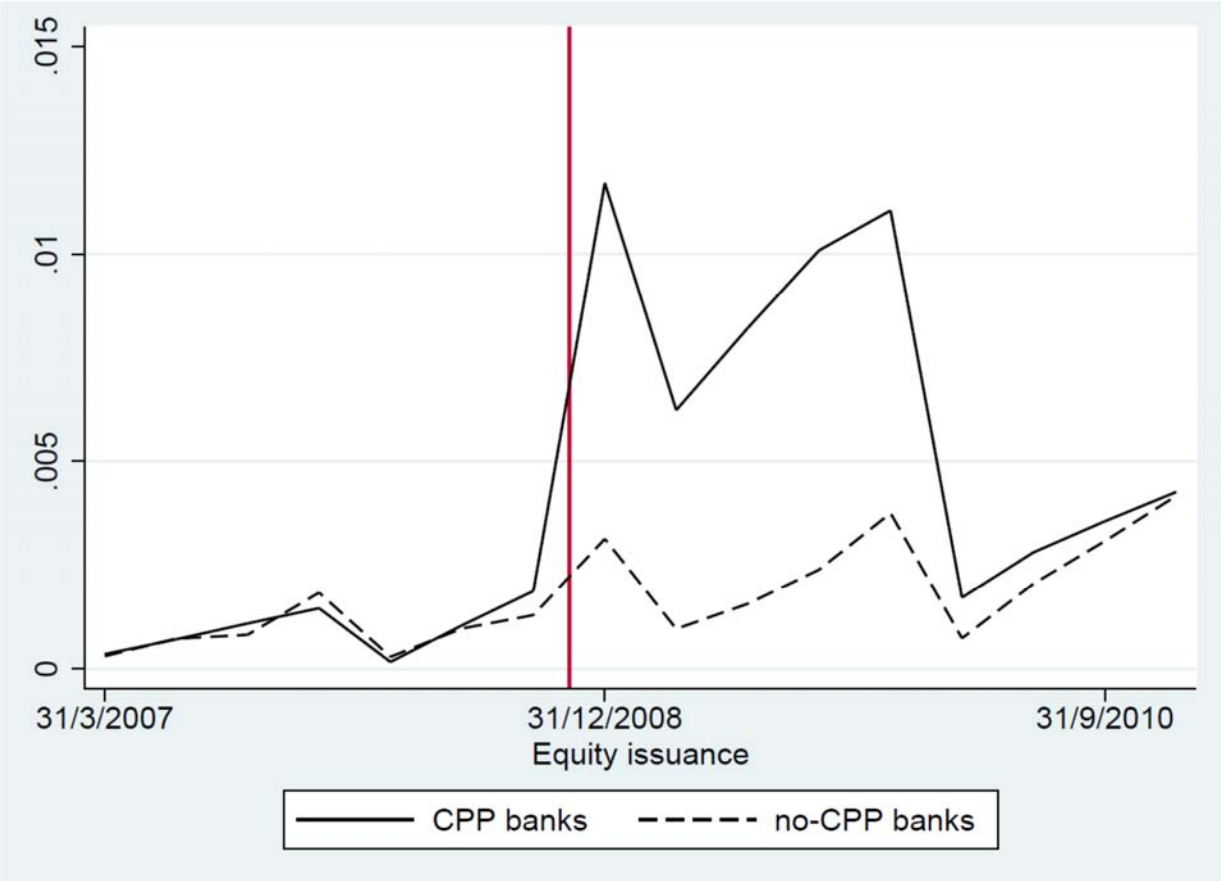


Figure 3 . Mean of investment in illiquid assets (scaled by total assets) for CPP and non-CPP banks.
This figure shows the investment in illiquid assets, which is the additive inverse of the net cash-flow from investing activity. It is the sum of net expenses for loans, net investments, net expenses for capital expenditures and acquisitions, minus the net short-term investments. The sample period is from 2007Q1 to 2010Q4.

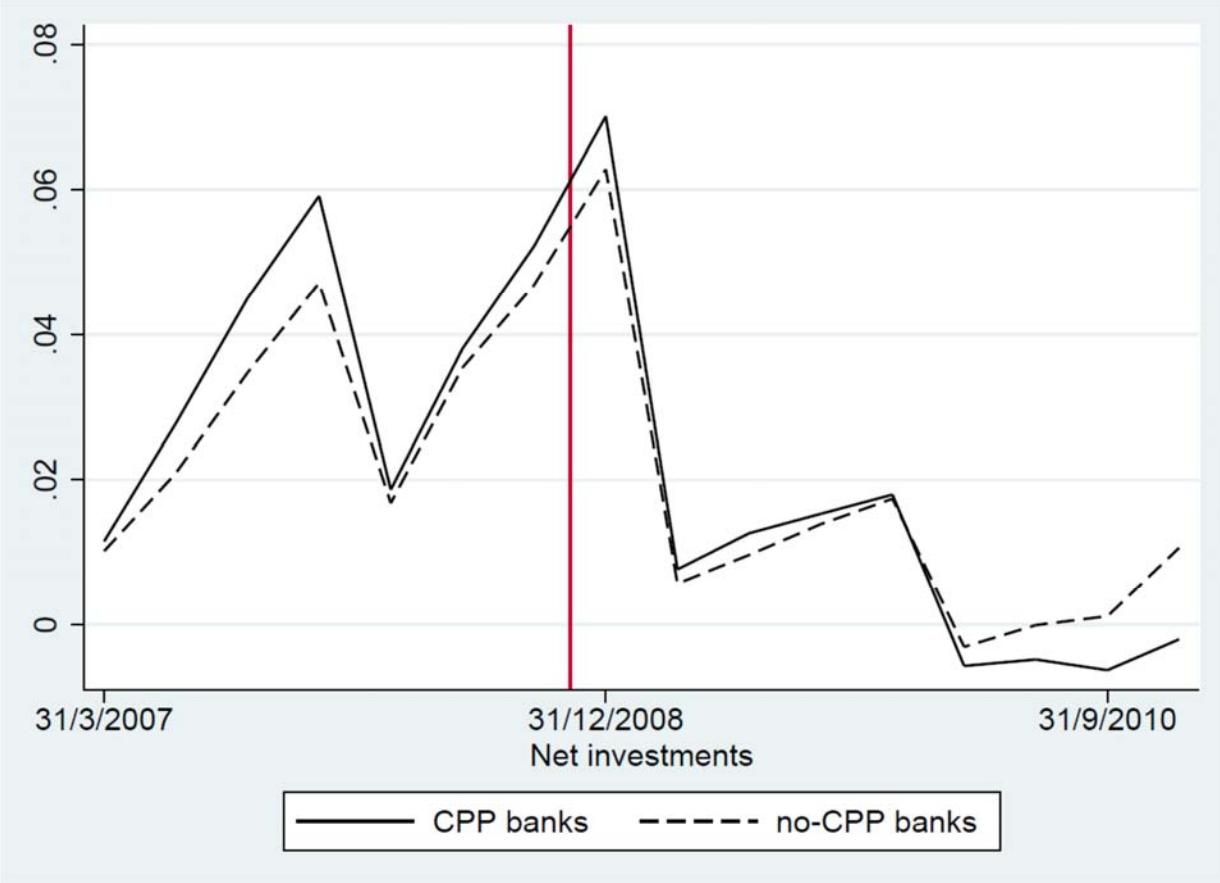
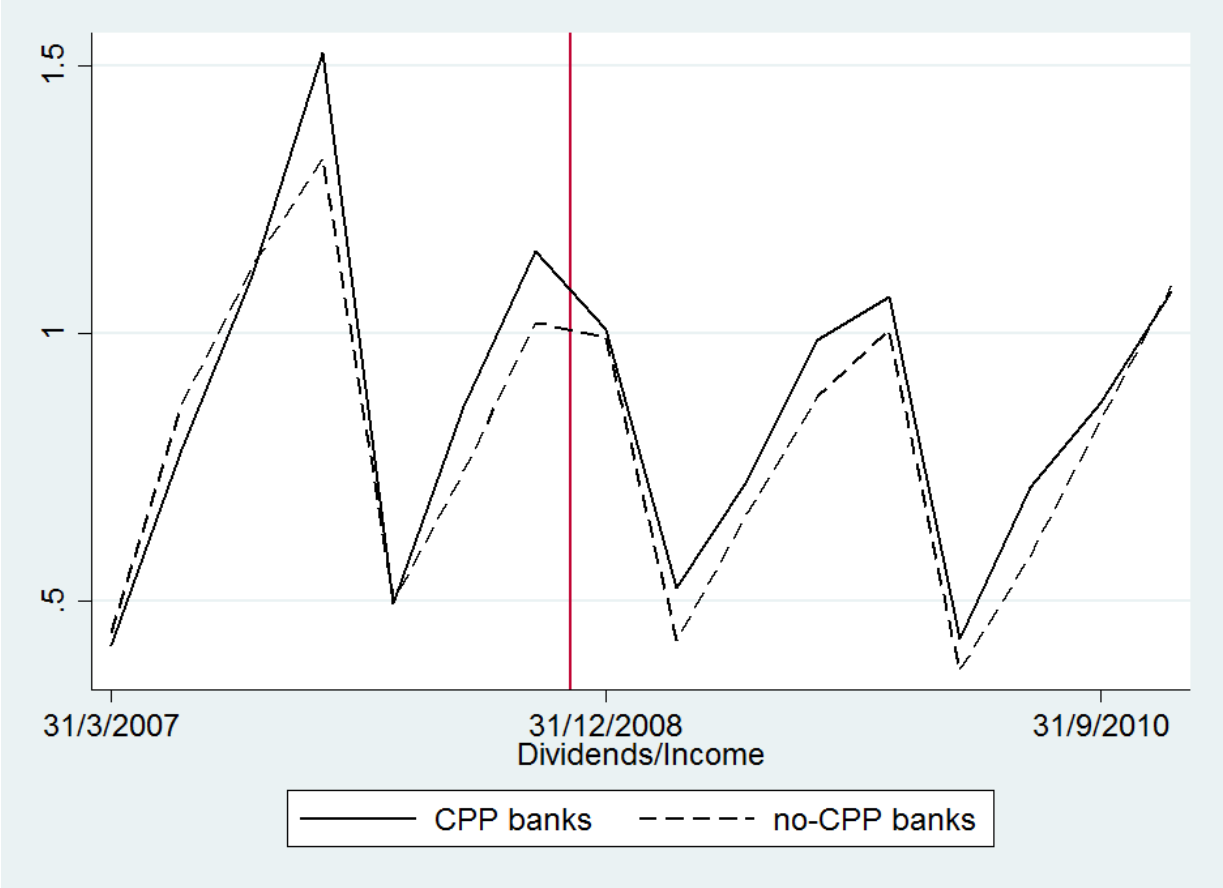


Figure 4 . Mean of payout ratio (scaled by total assets) for CPP and non-CPP banks.
This figure shows the payout ratio, which is dividends over income. The sample period is from 2007Q1 to 2010Q4.



Tables

Table 1 . Descriptive Statistics.
This table illustrates the summary statistics for the entire sample (from 2007Q1 to 2010Q4) relative to total assets (in $million), changes in equity over assets, net investments in illiquid assets (over assets), dividends (over income), total equity issuances, ROA, non-performing loans (over assets), intangible assets (over assets), growth of interest income.

Statistic	**Tot. As.**	**Eq./As. Change**	**Invest.**	**Divid./Income**	**Eq. Iss.**	**ROA**	**NPL**	**Intang./As.**	**Growth Op.**
Mean	7,354	0.000	0.021	0.838	0.003	0.000	0.020	0.014	0.012
Median	1,366	0.000	0.014	0.557	0.000	0.002	0.013	0.007	0.009
St.Dev.	18,436	0.008	0.051	1.003	0.007	0.007	0.019	0.017	0.053
N	7,534	7,534	7,534	7,534	7,534	7,534	7,534	7,534	7,534

Table 2 . Difference-in-Differences estimations without controls.

The columns of this table contain the output of the following regression model (from 2007Q1 to 2010Q4):

$$DependentVar. = \alpha + \beta \times CPP_i \times post2008Q4_t + \delta \times CPP_i + \gamma \times post2008Q4_t + \varepsilon_{it}$$

The dependent variables are: changes in total equity ratio, total equity issuances (over assets), net investments in illiquid assets (over assets), dividends (over income). The independent variables include: the diff-in-diff interaction between the CPP bank status and the post-2008Q4 status. N is the number of observations. Standard errors are adjusted for both heteroscedasticity and within correlation clustered at the bank level. ***, **, and * indicate significance at the 1%, 5%, and 10% two-tailed levels, respectively.

	(1)	*(2)*	*(3)*	*(4)*
	Eq./As. Change	**Eq. Iss.**	**Invest.**	**Divid./Income**
CPP*post08Q4	**0.001****	**0.004*****	**0.008**	**0.001**
post08Q4	0.001***	0.001***	-0.020***	-0.001***
CPP	0.000*	0.003	0.068	0.002
Adj.R^2	0.01	0.11	0.06	0.01
N	7,534	7,534	7,534	7,534

Table 3 . Difference-in-Differences estimations with controls.

The columns of this table contain the output of the following regression model (from 2007Q1 to 2010Q4):

$$DependentVar. = \alpha + \beta \times CPP_i \times post2008Q4_t + \delta \times CPP_i + \gamma \times post2008Q4_t + X_{it-1} + M_{t-1} + \varepsilon_{it}$$

The dependent variables are: changes in total equity ratio, total equity issuances (over assets), net investments in illiquid assets (over assets), dividends (over income). The independent variables include: the diff-in-diff interaction between the CPP bank status and the post-2008Q4 status, ROA, non-performing loans (over assets), intangible assets (over assets), growth of interest income, quarter fixed effects, CPI and GDP. N is the number of observations. Standard errors are adjusted for both heteroscedasticity and within correlation clustered at the bank level. ***, **, and * indicate significance at the 1%, 5%, and 10% two-tailed levels, respectively.

	(1)	*(2)*	*(3)*	*(4)*
	Eq./As. Change	**Eq. Iss.**	**Invest.**	**Divid./Income**
CPP*post08Q4	**0.001*** **	**0.004*** **	**0.002**	**0.046**
post08Q4	0.004***	-0.001**	0.029***	0.002
CPP	0.002	0.002	-0.004	0.011
L.ROA	0.039*	-0.034**	0.132	5.855***
L.(NPL/As.)	-0.042***	0.007	1.087***	-12.943***
L.(Intang./As.)	-0.012**	0.032***	0.212***	2.931**
L.(Growth Op.)	0.006***	0.004***	-0.068***	-0.476**
L.CPI	-0.051***	0.008*	-0.327***	1.974***
L.GDP	0.000***	-0.000***	0.000***	0.000
Adj.R^2	0.02	0.17	0.24	0.14
N	7,534	7,534	7,534	7,534

Table 4 . First Stage regression and placebo Difference-in-Differences estimations.

Columns 1 and 2 of this table contain the output of the following regression model (only in 2008Q4): $DependentVar. = \alpha + \beta_5(size_{it}) + X_{it} + M_t + \varepsilon_{it}$ The dependent variables are: the CPP bank status, non-performing loans (over assets).

Column 3 of this table contain the output of the following regression model (from 2007Q1 to 2010Q4): $\frac{Tot.\,Eq._{it}}{Assets_{it}} = \alpha + \beta \times size08q4_i \times post2008Q4_t + \delta \times size08q4_i + \gamma \times post2008Q4_t + X_{it} + M_t + \varepsilon_{it}$

The independent variables include: bank's size in 2008Q4, the diff-in-diff interaction between bank's size in 2008Q4 and the post-2008Q4 status, ROA, non-performing loans (over assets), intangible assets (over assets), growth of interest income, quarter fixed effects, CPI and GDP. N is the number of observations. Standard errors are adjusted for both heteroscedasticity and within correlation clustered at the bank level. ***, **, and * indicate significance at the 1%, 5%, and 10% two-tailed levels, respectively.

	(1)	*(2)*	*(3)*
	First stage	**Placebo test**	**Falsification test**
	CPP	**NPL/As.**	**Eq./As. Change**
Size2008Q4	**0.033****	**0.000**	0.000***
Size2008Q4*post08Q4			**0.000**
post08Q4			0.003***
ROA	-1.449	-0.598***	0.038
(NPL/As.)	-2.281		-0.039***
Intang./As.	5.592***	-0.120***	-0.032***
Growth Op.	-0.334	-0.102***	0.007***
CPI	0.000	0.000	-0.066***
GDP	0.000	0.000	0.000***
Adj.R^2	0.06	0.40	0.17
N	523	523	7,534

Table 5 . Second stage, Difference-in-Differences estimations with controls.

The columns of this table contain the output of the following regression model (from 2007Q1 to 2010Q4):

$$DependentVar. = \alpha + \beta \times \widehat{CPP_i} \times post2008Q4_t + \delta \times \widehat{CPP_i} + \gamma \times post2008Q4_t + X_{it-1} + M_{t-1} + \varepsilon_{it}$$

The dependent variables are: changes in total equity ratio, total equity issuances (over assets), net investments in illiquid assets (over assets), dividends (over income). The independent variables include: the diff-in-diff interaction between the CPP bank status and the post-2008Q4 status, ROA, non-performing loans (over assets), intangible assets (over assets), growth of interest income, quarter fixed effects, CPI and GDP. N is the number of observations. Standard errors are adjusted for both heteroscedasticity and within correlation clustered at the bank level. ***, **, and * indicate significance at the 1%, 5%, and 10% two-tailed levels, respectively.

	(1)	*(2)*	*(3)*	*(4)*
	Eq./As. Change	**Eq. Iss.**	**Invest.**	**Divid./Income**
CPP.pr.*post08Q4	**0.006***	**0.016*****	**0.047**	**-1.2205**
post08Q4	0.002	-0.006***	0.011	0.622**
CPP.pr.	0.013***	0.006**	0.080**	-0.003***
L.ROA	0.038	-0.033**	0.126	4.051***
L.(NPL/As.)	-0.042***	0.012	1.068***	-13.751**
L.(Intang./As.)	-0.027***	0.028***	0.161**	1.232
L.(Growth Op.)	0.007***	0.005***	-0.066***	0.546***
L.CPI	-0.051***	0.006	-0.323***	-2.249***
L.GDP	0.000***	-0.000***	0.000***	0.000
Adj.R^2	0.02	0.14	0.25	0.14
N	7,534	7,534	7,534	7,534

Table 6 . Second stage, Difference-in-Differences estimations with controls (from 2007Q1 to 2010Q4).
The columns of this table contain the output of the following regression model (from 2007Q1 to 2010Q4):

$$DependentVar. = \alpha + \beta \times \widehat{CPP_i} \times post2008Q4_t + \delta \times \widehat{CPP_i} + \gamma \times post2008Q4_t + X_{it-1} + M_{t-1} + \varepsilon_{it}$$

The dependent variables are: changes in common equity ratio, changes in preferred equity ratio. The independent variables include: the diff-in-diff interaction between the CPP bank status and the post-2008Q4 status, ROA, non-performing loans (over assets), intangible assets (over assets), growth of interest income, quarter fixed effects, CPI and GDP. N is the number of observations. Standard errors are adjusted for both heteroscedasticity and within correlation clustered at the bank level. ***, **, and * indicate significance at the 1%, 5%, and 10% two-tailed levels, respectively.

	(1)	*(2)*
	(Comm.Eq./As.) Change	**(Pref.Eq./As.) Change**
CPP.pr.*post08Q4	**0.007***	**0.003***
post08Q4	0.002	0.001**
CPP.pr.	0.013***	0.001
L.ROA	0.057**	0.028***
L.(NPL/As.)	-0.030***	0.009***
L.(Intang./As.)	-0.040***	-0.013***
L.(Growth Op.)	0.009***	0.001
L.CPI	-0.040***	0.011***
L.GDP	0.000***	0.000***
Adj.R^2	0.11	0.09
N	7,534	7,534

Table 7 . Second stage, Difference-in-Differences estimations with controls.
The dependent variables is: changes in common equity ratio. The independent variables include: the diff-in-diff interaction between the CPP bank status and the post-2009Q1 status, the diff-in-diff interaction between the CPP bank status and the post-2009Q2 status, ROA, non-performing loans (over assets), intangible assets (over assets), growth of interest income, quarter fixed effects, CPI and GDP. N is the number of observations. Standard errors are adjusted for both heteroscedasticity and within correlation clustered at the bank level. ***, **, and * indicate significance at the 1%, 5%, and 10% two-tailed levels, respectively.

	(1)	*(2)*
	(Comm.Eq./As.) Change	**(Pref.Eq./As.) Change**
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CPP.pr.*post09Q1	**0.009**	
post09Q1	-0.001	
CPP.pr.*post09Q2		**0.039*** **
post09Q2		-0.014***
CPP.pr.	0.009***	0.010***
L.ROA	0.021	0.026
L.(NPL/As.)	-0.070***	-0.071***
L.(Intang./As.)	-0.035***	-0.040***
L.(Growth Op.)	0.007***	0.006***
L.CPI	-0.046***	-0.040***
L.GDP	0.000***	0.000
Adj.R^2	0.16	0.14
N	4360	4842