



## **CefES-DEMS WORKING PAPER SERIES**

**Deposit Insurance and Banks' Deposit Rates:  
Evidence from the 2009 EU Policy Change**

**Matteo Gatti and Tommaso Oliviero**

**No. 419 – September 2019**

**Center for European Studies  
Department of Economics, Management and Statistics  
University of Milano – Bicocca  
Piazza Ateneo Nuovo 1 – 2016 Milan, Italy  
<http://www.cefes-dems.unimib.it/>**

# Deposit Insurance and Banks' Deposit Rates: Evidence from the 2009 EU Policy Change \*

Matteo Gatti<sup>†</sup>      Tommaso Oliviero<sup>‡</sup>

August 19, 2019

## Abstract

Deposit insurance is one of the main pillars of banking regulation meant to safeguard financial stability. In early 2009, the EU increased the minimum deposit insurance limit from €20,000 to €100,000 per bank account with the goal of achieving greater stability in the financial markets. Italy had already set a limit of €103,291 in 1994. We evaluate the impact of the new directive on the banks' average interest rate on customer deposits by comparing banks in the Eurozone countries to those in Italy, before and after the policy change. The comparability between the two groups of banks is improved by means of a propensity score matching. We find that the increase in the deposit insurance limit led to a significant decrease in the cost of funding per unit of customer deposit and that the effect is stronger for riskier banks, suggesting that the policy reduced the risk premium demanded by depositors.

**Keywords:** Deposit Insurance, Average Deposit Interest Rate, Cost of Deposit Funding

**JEL Classification Numbers:** G21, G28

---

\*We thank Domenico Curcio, Leonardo Gambacorta, Niels Johannesen, Agnese Leonello, Francesco Molteni, Steven Ongena, Lorenzo Pandolfi, Evi Pappa, Annalisa Scognamiglio, Saverio Simonelli, Davide Tomio, Alberto Zazzaro, and seminar participants at the EUI May Forum (May 2017), the SIE Annual Meeting (October 2017), and the FEBS 2018 Conference (June 2018), the first CefES International Conference on European Studies (June 2019) for helpful comments on various drafts of this paper. All remaining errors are our own.

<sup>†</sup>European University Institute. E-mail: [matteo.gatti@eui.eu](mailto:matteo.gatti@eui.eu).

<sup>‡</sup>Corresponding author. University of Naples Federico II and CSEF. E-mail: [tommaso.oliviero@unina.it](mailto:tommaso.oliviero@unina.it).

# 1 Introduction

Deposit insurance is a widely employed measure intended to protect depositors, in part or in full, against the risk of insolvency. In the aftermath of the financial crisis and in order to protect the stability of their national banking systems, governments either adopted a deposit insurance scheme or redesigned the existing one by extending its scope and coverage (Demirguc-Kunt *et al.*, 2015). Thus, the World Bank reported an increase in the number of countries that have some form of explicit deposit insurance scheme from 93 in 2013 to over 107 in 2016 (Anginer and Bertay, 2019). For example, the U.S. government temporarily increased its deposit insurance coverage from \$100,000 to \$250,000 in October 2008 and then made the change permanent in July 2010. Similarly, the European Union raised its deposit insurance limit from €20,000 to €100,000 in March 2009 as a first step towards the creation of a common regulatory environment within the European Banking Union.

The increases in deposit insurance limits are consistent with the theoretical foundation of an explicit deposit insurance as a bound on financial instability and, in particular, as a measure to avoid bank runs (Diamond and Dybvig, 1983). In view of the fact that banks are mainly financed by deposits - they constitute about 60% of total bank assets in Europe and the U.S. - and that they play a vital role in the real economy, increasing deposit safety was crucial in reducing liquidity risk in distressed financial markets.

Beyond the short-run impact on financial stability, regulators have sought a more comprehensive understanding of the potential benefits and costs associated with increasing deposit insurance limits. The increase in the coverage limit impacts not only financial stability, but also the demand and supply of deposits. An increase in coverage may therefore affect the equilibrium interest rate on deposits and consequently banks' cost of funding (Davila and Goldstein, 2015; Cooper and Ross, 2002). While there is a long-standing debate in the literature regarding the impact of deposit insurance on the banks' cost of deposit funding, there are few attempts in the related empirical literature that use a quasi-experimental setting to examine the issue. This paper attempts to fill the gap.

We empirically evaluate the effect of the aforementioned March 2009 raising of EU deposit insurance coverage on banks' average deposit interest rates. In particular, we exploit a unique

feature of the European change in policy, namely that Italian banks were already subject to a national deposit insurance limit of €103,291 which had been in place since 1994, well before the new European regime. Italian banks were therefore unaffected by the new EU policy. This allows us to employ a difference-in-differences (diff-in-diff) strategy by comparing Italian banks to those operating in the rest of the Eurozone. We argue that the empirical results offer a reliable estimate of the causal effect of the increase in deposit insurance on banks' average deposit rates and deposit amounts. We find that the increase in the deposit insurance limit led to a decrease in the cost of funding per unit of deposits for Eurozone banks relative to banks in Italy of between 0.3 and 0.7 percentage points. This effect is sizeable in terms of its macroeconomic implications. Indeed, Gambacorta and Shin (2018) recently showed that a lower cost of debt financing for banks implies a lower cost of equity and ultimately translates into large increases in bank lending.

We consider bank-level data provided by Bankscope (Bureau Van Dijk). In the treatment group, we consider banks operating in the European countries that jointly satisfy the following criteria: 1) they were part of the Eurozone since the introduction of the euro as the single currency in January 2002; 2) they were subject to an increase in deposit insurance limits between September 30th, 2008 and June 30th, 2009, and no further increase subsequently. The rationale for criterion 1) is that, given time fixed effects in all the regressions, we choose to select all countries that are subject to the same monetary authority. The rationale for criterion 2) relates to our decision to limit the analysis to the two years subsequent to the policy (2009 and 2010) in order to reduce the risk of confounding policy changes or other exogenous events at the country level in the post-treatment years. The banks that operate in Italy were chosen for the control group not only because they were unaffected by the 2009/14/EC Directive, but also because, as documented in Laeven and Valencia (2010), the Italian government did not adopt any specific policy response to the 2008 financial crisis. Furthermore, up until the 2011 sovereign debt crisis,<sup>1</sup> the Italian government did not intervene with any kind of extraordinary measure in order to directly assist its banks, such as capital injections or asset guarantees.

---

<sup>1</sup>For all practical purposes, the 2011 sovereign debt crisis was unexpected at the end of 2010, which is clearly demonstrated by the yield on Italian government bonds. To avoid the confounding effects of the sovereign debt crisis in our setting, we decided not to continue our empirical investigation beyond 2010.

We first estimate the impact of an increase in the deposit insurance limit using a diff-in-diff model, in which observations are weighted by individual bank size (measured by total assets). We consider for the dependent variable both interest rate expenses divided by total deposits, as a measure of average deposit interest rate, and the logarithm of total customers' deposits. By weighting each observation by the bank's total assets and including time and country fixed effects, the results can be interpreted as the macroeconomic impact of the policy. We find that there is a decrease in banks' average deposit interest rates of about 0.3 percentage points in treated countries relative to Italy and a relative increase in the total amount of bank deposits.

To extend the findings, we also estimate an unweighted diff-in-diff regression in which the unit of observation is at the bank level. This strategy allows us to include bank fixed effects in the regression analysis together with time fixed effects. Given that the sample of banks in the treatment and control groups is heterogenous along various dimensions, we strove for a sample of banks operating in the treated countries that is directly comparable to banks operating in Italy. To this end, we use a propensity score matching to identify banks within the treated countries that are comparable in terms of ex-ante observable characteristics to banks operating in Italy. The results from the diff-in-diff estimation performed on the matched sample confirm that the policy had a negative and sizeable impact on the average interest rates paid by banks on customer deposits (about 0.7 percentage points).

To further investigate the economic mechanism behind this finding, we exploit heterogeneities at the bank level. In particular, we find that the results for deposit rates are primarily driven by the riskier financial institutions. The empirical results suggest that an increase in deposit insurance coverage negatively impacts per unit cost of deposit funding and has either a positive or zero impact on the amount of deposits. Given that equilibrium movements are the results of changes in both the demand and supply of deposits, we conclude that the dominant effect is an increase in the supply of deposits and a reduction in the demand for deposits among the riskier banks. This conclusion is consistent with the predictions of the related theoretical literature.

On the supply side, depositors increase their supply of deposits following an increase in the deposit insurance limit, since they are willing to accept a lower interest rate for a given

amount of deposits. In the absence of a direct impact of deposit insurance on banks' risk-taking due to moral-hazard incentives, the increase in the deposit insurance limit should result in a lower deposit risk premium demanded by depositors (Bartholdy *et al.*, 2003). On the demand side, banks may either reduce or increase the deposit interest rate for a given level of deposits, depending on the set of assumptions regarding their incentives to take on risk. We distinguish between two groups of predictions in the literature. In the first, and in the wake of the seminal paper by Diamond and Dybvig (1983), Cooper and Ross (2002) study optimal deposit insurance limits in a setting where banks provide insurance to depositors in the form of deposit contracts. Since liquidity shocks faced by depositors constitute private information, late depositors can mimic the earlier ones and trigger a bank run. Cooper and Ross (2002) find that as the deposit insurance limit increases, depositors invest less in monitoring banks. As a consequence, and in the presence of moral hazard, banks increase the riskiness of their investments and their demand for deposits. Moreover, Matutes and Vives (2000) develop a model of banking competition based on Diamond (1984)'s delegated monitoring model and find that an increase in deposit insurance limits leads to an increase in the elasticity of the supply of deposits, thus increasing competition among the banks in the deposit market, which leads banks to pay a higher deposit rate for a given amount of deposits. In the second group, and if ex-ante deposit insurance premia are taken into account, larger deposit insurance coverage should decrease the banks' returns since less funds can be profitably invested. Since premia increase with the level of deposit insurance, banks can pass these costs through to depositors and offer lower deposit rates per unit of deposits. As highlighted by Cooper and Ross (2002), the overall effect of the increase in the deposit insurance limit on banks' demand for deposits crucially depends on how it affects banks' risk-taking. Using our selected matched sample, we are able to study how a bank's realised risk responded to the increase in the deposit insurance limit in 2009. We find that treated banks did not show a significant difference in the Z-score relative to control banks, although we observe an increase in the ratio of Non-Performing Loans to Total Assets after 2009. At the same time, we find an increase, though not significant, in bank equity capitalisation. Taken together, these results suggest that there is no substantial change in individual bank risk in response to the increase in the deposit insurance limit. This result is

consistent with the recent evidence provided by Anginer *et al.* (2014) who find that the effect of deposit insurance on risk-taking is dominated by its stabilisation effect in turbulent times.

In addition to contributing to the debate regarding the impact of deposit insurance on banks' cost of deposit funding due to the resulting movements in the demand and supply of deposits, the findings also complement the recent empirical literature that focuses on the impact of deposit insurance on financial stability. Demirguc-Kunt and Detragiache (2002) show that countries with an explicit deposit insurance system are associated with greater likelihood of a financial crisis, particularly when bank interest rates have been deregulated. In contrast, Dewenter *et al.* (2018) show that even in the presence of relatively homogenous banks, increases in deposit insurance limits have large effects on bank risk-taking in countries with weaker legal institutions. Our focus on the Eurozone naturally means that we are analysing a set of countries with relatively strong institutions and as a consequence we expect there to be less effect on risk. More recently, within-country studies have found a positive impact of deposit insurance on banks' risk-taking (see Lambert *et al.* (2017) for the USA and Chernykh and Cole (2011) for Russia). Finally, the paper contributes to the recent empirical evidence that depositors do indeed react to changes in deposit insurance limits (Iyer *et al.*, 2017) and to changes in deposit insurance credibility (Bonfim and Santos, 2018; Peia and Vranceanu, 2017).

The rest of the paper is organized as follows: Section 2 provides a description of the empirical setting and of the data; Section 3 reports the results of the cross-country level analysis; and Section 4 reports the results of the bank-level analysis. Section 5 concludes.

## **2 Institutional Setting and Data**

### **2.1 The 2009/14/EC Directive**

Directive 94/19/EC, which was signed on May 30th, 1994, instituted an harmonized minimum level of deposit insurance on all deposits in the EU. Article 7 of the directive required all member states to put in place a deposit guarantee scheme that would cover up to at least €20,000 per depositor in the case that an insured bank could not redeem his deposit.<sup>2</sup> The €20,000 limit

---

<sup>2</sup><http://eur-lex.europa.eu/LexUriServ/LexUriServ.do?uri=CELEX:31994L0019:EN:HTML>.

introduced by the 94/19/EC directive represented a first step towards the integration of European financial regulation, while at the same time leaving member countries with some level of discretion. Thus member countries could and did impose higher deposit insurance limits as they saw fit.

In response to the instability in the wake of the financial crisis, the floor was then raised on March 11th, 2009 to €100,000 by the 2009/14/EC directive, whose goal was to enhance deposit protection and prevent liquidity issues from exacerbating banking instability. At the same time, the new directive supported the harmonization of the deposit insurance limits across Europe, a step toward the creation of the upcoming European banking union and of a European common deposit insurance scheme.

The actual convergence towards the €100,000 limit started a couple of months before the implementation of the 2009/14/EC directive. During the fourth quarter of 2008 and the first quarter of 2009 most European governments had already raised the limit of their deposit insurance coverage to €100,000. This increase was not however uniform across countries, ranging from no increase in Italy, to an increase of €100,000 in Luxembourg and differing in the timing of the increase.

The uniqueness of the European case lies in the heterogeneity of the increase in deposit insurance limits among otherwise similar European countries. Thus, Eurozone countries shared a common currency and integrated markets for goods and services, but not a common banking union. Since not in all European countries was the deposit insurance limit raised, nor were all part of the Eurozone, we restricted the sample to a subset of the most homogeneous countries. We selected European countries that satisfied both of the following criteria: 1) membership in the Euro area since the introduction of the euro as the single currency in January 2002; 2) their deposit insurance limit was raised between September 30th, 2008 and June 30th, 2009, with no additional increase in subsequent years. This selection strategy made it possible to compare banks in countries that were ex-ante very similar to one another before the increase in the deposit insurance limit. Table 1 shows those countries that satisfy both of the conditions and their deposit insurance limits in 2008.<sup>3</sup>

---

<sup>3</sup>We do not have information on the main dependent variable, namely interest expenses per unit of customer deposits, for banks operating in Finland and Luxembourg, although they were part of the Eurozone since the



*Insert Table 1 here*

Data on deposit insurance limits and their evolution through time have been collected from different sources. The main source of this data was a database assembled by Demirguc-Kunt *et al.* (2015). However, the database did not provide the exact date of when the deposit insurance limit was changed and so we supplemented the information using data available from various national deposit insurers in order to obtain the exact date and amount of the change.

## 2.2 Data Sources

Data was obtained from Bankscope, a Bureau Van Dijk (BVD) dataset that contains yearly bank-level information with a global coverage. Bankscope obtains balance sheet information from Fitch Solutions, the primary distributor of Fitch Rating content, and it also provides summary reports, peer analysis and aggregated data reports. We focus on bank-level data for all banks that were active between 2006 and 2010 in the EU countries listed in Table 1. We downloaded annual rather than quarterly data, since far fewer banks report quarterly data and they are less representative of the banking system in the respective country. The sample was restricted to banks with a consolidation code of C1, U1 or C2 and does not include banks with a consolidation code of U2. Codes C1 and C2 identify banks that report a consolidated financial statement that includes its controlled subsidiaries or branches, either with no unconsolidated companion (C1) or with an unconsolidated companion (C2). The financial statements of banks with code U1 include subsidiaries or branches with no consolidated companion.<sup>4</sup>

We further restrict the sample by considering only banks whose core business is credit intermediation, i.e. raising funds through deposits and lending them out as credit. We proceed in two steps, by first restricting the sample to banks labelled either as bank holding companies, commercial banks, cooperative banks or saving banks as the peer group classification and then

---

introduction of the euro as a single currency. Banks in those countries are not part of the sample.

<sup>4</sup>This selection criterion was used in order to maximize the data coverage of the main dependent variable (the ratio of interest expenses on customer deposits to total deposits) in our final dataset. Indeed, if we had initially selected financial statements with the code U2 rather than C2, we would have lost observations for all major banks operating in Austria, Belgium, Germany and Ireland and some of the major banks in the other Eurozone countries. We checked the robustness of the baseline results to our selection criterion by repeating the main regression analyses after imputing to the final sample of banks the unconsolidated balance sheet items (U2) of total customer deposits, total assets and average interest rates (when available) for banks with consolidation code C2. The results are available on request.

screening manually those banks according to their primary business line. Financial institutions whose main focus is on other activities, such as credit factoring and leasing, were dropped.<sup>5</sup>

We complemented the bank-level information from Bankscope with some country-level data publicly available from the OECD database, such as GDP growth, unemployment rate and public debt to GDP ratio. Finally, we added information on the level of covered deposits as a proportion of those deposits that are eligible for deposit insurance. We refer to this ratio as the Covered-to-Eligible (CtE) ratio, which is defined as the ratio of covered deposits in a particular country to the total amount of eligible deposits:  $CtE = \frac{\text{Covered Deposits}}{\text{Eligible Deposits}}$ . The greater its value, the higher is the proportion of deposits covered by national deposit insurance. The CtE ratio provides information on the potential effect on a country's banking system of a change in the deposit insurance limit: a low CtE ratio means that the amount of uncovered deposits is high and that a small change in the deposit insurance limit could turn uncovered deposits into covered ones. In other words, the lower is the CtE ratio, the greater is the amount of deposits that becomes covered after the change. Since European banks are not obligated to provide this information, we were forced to use estimates from a European Commission report by Cariboni and Ubaldi (2008) on a country-level basis. These estimates are based on a survey of all EU member states in 2005.

Table 2 presents country-level summary statistics on some key variables for the European countries (treatment), in which the deposit insurance limit was increased following the 2009/14/EC Directive and for Italy (control).

*Insert Table 2 here*

The statistics are computed as the mean for the pre-treatment years, i.e. 2006-2008. The control group's statistics include only Italy. Column (3) in Table 2 displays the mean difference between the average values in Columns (2) and (1). The average deposit rate is measured by the interest expenses per unit of customer deposit of each bank weighted by each bank's total assets within each country-year. The cost of deposit funding (per unit of deposit) is an implicit

---

<sup>5</sup>The initial sample consists of 200 banks operating in Austria, 30 banks in Belgium, 160 in France, 657 in Germany, 10 in Greece, 9 in Ireland, 451 in Italy, 22 in the Netherlands, 21 in Portugal and 100 in Spain.

measure of the average interest rate on deposits.<sup>6</sup> The weighted average deposit rate in Italy is significantly lower than in the European countries, perhaps reflecting *ex-ante* differences in deposit insurance regime. The Growth Rate of Total Deposits is measured as the annual average growth rate in the total amount of bank deposits aggregated by country. While average deposit rates in Italy are lower than in other countries before the policy was implemented, there is no significant difference in the growth rate of total deposits. Similarly, there is no difference in the growth rate of GDP and in the average unemployment rate, suggesting that the countries in our sample were experiencing similar macroeconomic trends before the policy change. Italy's public debt to GDP ratio is larger than the average of other Eurozone countries. For this reason, we restrict the analysis to the years 2006-2010, before the 2011 sovereign debt crisis affected some European countries, including Italy. The CtE ratio is larger in Italy than in the other European countries, suggesting that the amount of deposits below the limit is larger in Italy than in the rest of Europe. This finding is consistent with the higher deposit insurance limit in Italy than in other countries, since more eligible deposits are indeed covered by insurance, suggesting that the 2009/14/EC Directive indeed increased the insurance coverage in Eurozone countries. Finally, the banking sector in Italy is slightly more competitive than in the rest of the sample countries. Thus, the average ratio of deposits held by the top 25 institutions (ranked by average total assets during the period 2006-2008) is about 9 percentage points lower in Italy, suggesting less concentration in the deposit market, although the difference is not statistically different from zero.

In the next section, we estimate the impact of the increase in deposit insurance on the average (weighted) deposit interest rate and total customer deposits at the country level in a diff-in-diff analysis. The country fixed effects make it possible to de-mean the dependent variables and to exploit the within-country variation over time. The time fixed effects, on the other hand, make it possible to control for time factors that affect all Eurozone countries.

---

<sup>6</sup>A similar approximation was used recently by Gambacorta and Shin (2018) who measure the average cost of funds for a sample of banks by using the ratio between interest expenses and total interest-bearing liabilities (source: Bankscope). In line with our definition, differences in the cost of funds are captured by the average rate of interest the bank pays on its deposits and other interest-bearing liabilities. Demirgüç-Kunt and Huizinga (2004) also use this variable as an implicit measure of bank interest rates.

### 3 Country-Level Analysis

In this section, we provide preliminary cross-country evidence based on bank-level data. Since treatment occurs at the country level, we first run a cross-country analysis, weighting bank-level data by a bank's total assets within each country and imposing country fixed effects. The assumption underlying the analysis is that Italian banks were already subject to higher deposit insurance in 2009, thus providing a valid counterfactual to the trends of the other European banks absent the treatment. To study the causal impact of the EU directive in a diff-in-diff setting, we estimate the following equation:

$$y_{ict} = \gamma_c + \lambda_t + \delta(T_c \cdot post_t) + \epsilon_{ict} \quad (1)$$

where  $y_{ict}$  is the outcome variable of interest for bank  $i$  at time  $t$  in country  $c$ . We consider both average deposit rates and the log of total deposits for this variable.  $\gamma_c$  captures the country fixed effect and  $\lambda_t$  captures the time trends.  $T_c$  is a dummy variable that equals 0 if country  $c$  is Italy and 1 otherwise, while  $post_t$  is a time dummy that equals 1 in the post-reform period (after 2008).  $\delta$  is the causal effect of interest. Notice that the estimates in this section are from weighted regressions, in which the observation of a bank is weighted by its total assets. This allows us to interpret the empirical estimates as a country-level effect of the policy. The results are in fact equivalent to a regression of weighted average deposit rates and weighted log of deposits at the  $\{c, t\}$  level. The results in Column (1) of Table 3 show that the increase in the deposit insurance limit is followed by a reduction in average deposit rates of approximately 0.36 percentage points in treated countries relative to Italy (significant at the 5.9% level).<sup>7</sup>

Column (3) shows that the increase in the deposit insurance limit is followed by a relative increase in total deposits of approximately 12.5%. The difference in the number of observations in the two columns reflects the fact that the average deposit rate is not observable for many of

---

<sup>7</sup>Our empirical results refer to changes in average deposit interest rates that cannot be directly linked to deposit interest rates charged on insured vs uninsured deposit accounts. However, Cannas *et al.* (2014) provide evidence of a substantial increase in the CtE deposit ratio for EU countries in 2011 with respect to 2005. The average CtE deposit ratio reached a level of about 70% for the Eurozone countries in our sample in 2011 and remained stable for Italy over the same period. Interestingly, the average CtE ratio for Eurozone countries in 2011 converged to the level of Italy. In light of this aggregate figure, our identified changes in the average deposit interest rates for Eurozone countries after 2008 can be, at least partially, imputed to a change in the share of insured to uninsured deposits.

the banks in the sample.<sup>8</sup>

*Insert Table 3 here*

We also estimate the unweighted version of the regression in Equation 1 for average deposit rates (Column 2) and logged deposits (Column 4). In the unweighted version, the reduction in average deposit rates is stronger in magnitude and more precisely estimated, while the impact on total deposits is negative though not statistically significant. The comparison of the estimation results between the weighted and non-weighted regressions suggests that the drop in average deposit rates is greater for smaller banks, while the increase in deposits is greater for larger banks.<sup>9</sup>

The reliability of a diff-in-diff analysis naturally hinges on the parallel trend assumption, namely that the relative trends in deposit rates between treatment and control groups would have remained unchanged if there had not been any policy change. We provide an indirect test of this assumption by estimating the following equation:

$$y_{ict} = \gamma_c + \lambda_t + \sum_{\tau=2006}^{2007} \gamma_{\tau} T_c \mathbf{1}(t = \tau) + \sum_{\tau=2009}^{2010} \gamma_{\tau} T_c \mathbf{1}(t = \tau) + \epsilon_{ict} \quad (2)$$

where, unlike in Equation 1,  $\gamma_{\tau}$  are time-varying coefficients for the relationship between the outcome and  $T_c$  normalized relative to 2008, the year immediately prior to the policy change. Results are presented graphically in Figure 1. Estimates for Equation 2 are from a weighted regression with standard errors clustered at the country level.

*Insert Figure 1 here*

Figure 1 presents two plots, each reporting the estimate from the above regression of the two different outcome variables: the average deposit rate (top panel) and the log of deposits (bottom panel). Each coefficient is normalized with respect to the estimated  $\gamma_{\tau=0}$ , where 0 is the value for 2008 and the reported confidence intervals are at the 90% level. The plots show that there is

---

<sup>8</sup>If we repeat the analysis employing only banks for which the deposit rate is observable, the results are practically unchanged.

<sup>9</sup>The results in Table 3 are robust to the inclusion in Equation 1 of additional control variables measured at country level, such as GDP growth rate, unemployment rate and ratio of public debt to GDP. The robustness tests are not reported here, but are available upon request.

no statistically significant difference between the trends in either average deposit rates or total amount of deposits in 2006 and 2007 (pre-period). Consistent with the results displayed in Table 3 and after controlling for country and time fixed effects, the average deposit interest rates decrease significantly in the treated countries relative to Italy after 2008, while the opposite occurs for total amount of deposits.

Taken together, the results indicate that the equilibrium reaction of average deposit rates (a price decrease) and of deposit amounts (a quantity increase) can be explained by a significant increase in supply of deposits following the increase in the deposit insurance limit. Since risk is being transferred away from depositors to the lender of last resort, deposits become more attractive relative to other investments, inducing depositors to increase their supply until the risk-adjusted return equals that of other asset classes (Sharpe, 1994).

We consider the country-level analysis to be preliminary evidence of the macroeconomic changes caused by the increase in deposit insurance. To dig deeper into the identification of the effects of the EU policy change and to explain the economic mechanisms behind the empirical findings, we focus on a bank-level analysis in the following sections.

## 4 Bank-Level Analysis

In this section, we focus on bank-level data which provides a better understanding of the effects of an increase in deposit insurance limits on banks' average deposit rates and deposit amounts. In particular, we present results for the following empirical specification:

$$y_{ict} = \gamma_i + \lambda_t + \delta(T_c \cdot post_t) + \epsilon_{ict} \quad (3)$$

where, unlike in Equation 1, we include bank fixed effects to control for unobservable time-invariant bank characteristics (such as an individual bank's business model). Furthermore, we cluster standard errors at bank level and, unlike in the cross-country analysis, we give equal weight to each observation in the regression estimations. The estimation results for Equation 3 are presented in Table 4. The results in Column (1) and (2) are consistent with those for Equation 1 in Table 3.

*Insert Table 4 here*

However, these results must be interpreted with caution. Summary statistics reported in Table 5 at the bank level for the treatment and control groups for the pre-period suggest strong unbalancing with respect to important variables that measure size, performance and risk including Total Assets, Total Deposits to Total Assets ratio, Tier One Capital to Total Assets ratio, Non-Performing Loans (NPLs) to Total Assets ratio, Return on Assets (ROA) and Z-score.<sup>10</sup>

*Insert Table 5 here*

These pre-period differences in observable characteristics may potentially bias the empirical estimates of the coefficient of interest. In order to isolate the impact of the policy change, we seek a sample of banks that are *ex-ante* comparable and that run on parallel trends in the pre-period. Therefore, in the next section, we build a sample of banks in the treated countries that is directly comparable to the sample of Italian banks by using a strategy based on the propensity score matching.

#### **4.1 Propensity Score Matching**

As previously mentioned, banks in the control group differ from treated banks in key financial variables. Therefore, a diff-in-diff analysis using Italian banks as a control group may lead to biased results. Differences in covariates between treated and control banks before the deposit insurance policy was implemented could affect the results since the control banks may not constitute a valid counterfactual for treated banks absent the treatment. In order to reduce this potential bias, we first run a propensity score matching that restricts the analysis to a more homogenous sample of treated and control banks and then use that subset in the empirical analysis.

In order to proceed with the matching strategy, we first average bank characteristics during the pre-treatment period (2006-2008) since we wish to match treated banks with control banks in the years that preceded the policy change. We then restrict the control group according to

---

<sup>10</sup>Following Laeven and Levine (2009), Z-score is calculated as the return on assets plus the capital-asset ratio divided by the standard deviation of asset returns in order to measure the distance from insolvency.

the most relevant balance sheet variables. Finally, we match every bank in the control group with a bank in the treatment group that has the closest score, i.e. the same probability of being treated. We take their differences into account when estimating the following probit regression at the bank  $i$  - country  $c$  level:

$$M_{ic} = \alpha + \beta_1 Ta_{ic} + \beta_2 Tier1_{ic} + \beta_3 NPLs_{ic} + \beta_4 Dep_{ic} + \epsilon_{ic} \quad (4)$$

where  $M_{ic}$  is a dummy that equals 1 if bank  $i$  in country  $c$  is treated and 0 otherwise.  $Ta_{ic}$  is Total Assets,  $Tier1_{ic}$  is Tier One Capital divided by total assets,  $NPLs_{ic}$  is the ratio of Non-Performing Loans to Total Assets and  $Dep_{ic}$  is the ratio of Total Deposits to Total Assets. Matching is then carried out using a nearest neighbour approach with a caliper equal to 0.005. In other words, the propensity scores of two matched banks cannot differ by more than this value.<sup>11</sup> Finally, the matching is done without replacement, so that there is a unique match between a bank in the treatment group and a bank in the control group.

Table 6 shows the post-matching summary statistics of the treated group and the control group in the years 2006-2008. The two matched samples each contain 48 banks. The two groups do not show any significant differences in size (measured by Total Assets), capitalization (measured by the ratio of Tier 1 Capital to Total Assets), business model (measured by the ratio of Total Deposits to Total Assets) and risk (measured by the ratio of NPLs to Total Assets). Although not directly used as regressors in the probit regression in Equation 4, the two samples do not show any significant differences in performance (measured by ROA) or distance from insolvency (measured by the log of the Z-score). This result reinforces the comparability of the two groups in terms of *ex-ante* observables. We finally observe that average deposit rates in the matched treated sample are greater on average than the matched control group. The difference of about 2.4 p.p. is consistent with a deposit insurance limit that is higher for the

---

<sup>11</sup>In the benchmark procedure, the caliper threshold was chosen to minimize the dissimilarities between the control and treatment groups of banks and to maximize the sample size. In the appendix, we provide a discussion of this choice and provide a robustness exercise with a more conservative caliper of 0.001. The main results remain unchanged in this case.



control banks than for the treated ones in the years 2006-2008. This difference cannot however be completely attributed to different deposit insurance regimes. In fact, there may still be differences in unobservable characteristics at bank level that may explain the difference in the average cost of funding during the period 2006-2008. In order to control for the potential impact of unobservable characteristics we rely on time variation which makes it possible to include bank fixed effects in the model. Therefore in what follows, we can rely on a diff-in-diff strategy that exploits the variation generated by the 2009 EU policy change.

*Insert Table 6 here*

Notice that the matching procedure was implemented without any restrictions on the initial sample of candidates to be matched. The final matched treatment and control samples are characterized by a significantly lower average of Total Assets than those of the largest European banks. It is in fact desirable to have fewer large banks in the sample since they may have been subject to direct government intervention in the aftermath of the global financial crisis. This situation enhances the internal validity of our strategy. As a further check, we compared the matched sample of banks to the list of banks provided by Laeven and Valencia (2010),<sup>12</sup> in order to verify that none of the banks had been subject to nationalization, recapitalization or some other purchase or guarantee program implemented by a national government prior to 2009.<sup>13</sup>

## **4.2 Empirical Results**

Having obtained two matched samples of comparable banks, we can now estimate Equation 3. Table 7 shows the estimation results for both average deposit rates and log of total bank deposits. Consistent with the results for the unmatched sample, we find a decrease in average deposit rates of approximately 78 basis points (Column 1). In contrast to the previous results, the effect on total deposits is now positive, but no longer statistically significant (Column 2).<sup>14</sup>

---

<sup>12</sup>We refer to Tables A.1 and A.3.

<sup>13</sup>The only exception is Aegon Bank N.V. located in the Netherlands, which had been recapitalised. We decided to keep this bank in the sample and performed a robustness check (not shown here, but available upon request) after which we excluded it from the sample.

<sup>14</sup>As a robustness check, to control for the potential relationship between current and predetermined average deposit rates and amounts, we provide an additional test by augmenting the baseline model in Equation 3 with the

*Insert Table 7 here*

We also test for the absence of pre-trends in the matched sample in order to assess our parallel trend assumption. Figure 2 indeed shows similar trends in the outcome variables before the policy change in 2008. The upper graph shows that the difference in average deposit rates between the treatment and control groups before treatment relative to 2008 is not significantly different from zero. In contrast, and consistent with the results presented in Table 7, the difference decreases significantly in the years after the policy was introduced.

*Insert Figure 2 here*

### **4.3 Impact on Risk**

In order to clearly interpret the results, we also estimate the impact of deposit insurance on bank risk-taking. The empirical literature has discussed the effects of higher deposit insurance limits on financial stability. While Lambert *et al.* (2017) provide evidence that deposit insurance is associated with greater risk-taking, Anginer *et al.* (2014) show that the higher risk induced by the moral hazard effect is dominated by the market stabilization effect in periods of greater financial distress. Given that the 2009 EU policy change occurred in the aftermath of the global financial crisis, it is not ex-ante clear which effect dominated in our setting.

In the following analysis, we show the effect of an increase in the deposit insurance limit on banks' realised risk after 2008. We estimate Equation 3 using alternative measures of risk as dependant variables. Following Celerier *et al.* (2018), we employ three measures of bank risk: the Z-score, which is inversely related to the probability of default (the greater the Z-score, the safer is the bank); the share of NPLs within Total Assets, which captures changes in the riskiness of the bank loan portfolio; and the ratio of Tier 1 Capital to Total Assets which captures changes in the bank's degree of capitalization. Estimation results are shown in Table 8.

*Insert Table 8 here*

---

lagged dependent variable(s). That is, we estimate a version of the model in which we add the lagged values of average deposit rates and amounts as additional control variables. The results in Table 17 show that the results are robust to this check since the coefficients of interest are only marginally affected in magnitude and significance.

We do not find a significant increase in the Z-scores for banks that operate in treated countries relative to the control banks as a consequence of the increase in the deposit insurance limit. At the same time, there is a significant increase in NPLs and a positive, though not significant, effect on the level of capitalization. We interpret this result as evidence that banks in treated countries experienced an increase in the risk of their loan portfolios; however they responded by increasing their capitalization. The statistically insignificant effect on Z-scores suggests that the overall bank level risk did not change as a result of the increase in the deposit insurance limit.

#### **4.4 Interpretation of the Results**

The empirical findings indicate that the 2009 increase in the deposit insurance limit was followed by a significant decline in average deposit interest rates and by a not-significant change in total deposits and risk. The findings reveal that when the deposit insurance limit is increased, the average deposit interest rate decreases, that is, the banks' per unit cost of deposit funding is reduced.<sup>15</sup> These findings can be explained by a joint shift in the supply and demand of deposits, as banks and depositors reacted to a change in the riskiness of the deposit contract.

The interpretation of the results is in line with the theoretical predictions. With respect to depositors, the results are consistent with an outward shift in the supply of deposits. An increase in deposit insurance limits moves risk away from depositors who now face lower risk in the event of default. Since depositors allocate their funds by comparing risk-adjusted returns in different asset classes (Sharpe, 1994), deposits become more attractive as their risk-adjusted return increases. Depositors will thus increase their supply of deposits as long as the risk-adjusted returns on deposits are higher than returns in other asset classes. An increase in the supply of deposits lowers the return on deposits until the risk-adjusted return on deposits again equals that in other asset classes. Moreover, an increase in deposit insurance limits makes depositors less risk-sensitive since they are more protected in the event of bank default. Since

---

<sup>15</sup>The detected decline in average interest rate may potentially be correlated with changes in the maturity structure of deposits. Unfortunately, we cannot distinguish between the marginal interest rates offered on deposit contracts with different maturities, nor between interest rates offered on insured vs uninsured deposits. This type of analysis would require proprietary information on deposit accounts and interest rates charged on each account which is, unfortunately, not accessible.

depositors are now less risk-sensitive, they invest less effort in monitoring and are willing to increase their supply of deposits (Cooper and Ross, 2002). In light of these arguments, and keeping demand constant, an outward shift in supply of deposits will result in lower deposit rates and an increase in total deposits.

With respect to the banks, the reaction to a higher deposit insurance limit can be twofold. On the one hand, a higher deposit insurance limit makes deposits a relatively more expensive source of funding. Banks are charged with a higher deposit insurance premium, which is needed to fund larger deposit insurance payouts in the event of a bank default. As deposits become more expensive, banks will only partially pass-through higher costs to depositors, which will decrease the demand for deposits. On the other hand, an increase in deposit insurance limits can also encourage banks to increase deposit interest rates. Since depositors are now less risk-sensitive and expend less effort to monitor banks, deposits become a less expensive source of funding for banks, which leads them to increase their demand for deposits (Cooper and Ross, 2002). Moreover, higher deposit insurance limits may also raise the elasticity of supply of deposits, forcing banks to compete more actively for deposits by offering higher deposit rates (Matutes and Vives, 1996).

The empirical results show a significant decrease in average deposit rates and a non-significant increase in total deposits. This is consistent with an increase in supply of deposits by depositors and a contemporaneous decrease in demand for deposits by banks. The increase in the deposit insurance limit may, in fact, have increased banks' operating costs, which - if not compensated for by higher risk-taking and profitability - would have reduced their demand for deposits.

#### **4.5 Heterogeneous Policy Effects**

The bank-level comparison of similar groups of treatment and control banks showed that an increase in the deposit insurance limit negatively affects the average interest rate on bank deposits, since depositors, who are now more protected against bank default, require a lower return for a given amount of deposits. If this is indeed the case, then we should observe a larger reduction in the average interest rate on deposits among riskier banks. In fact, risk-averse depositors allocate their money according to the risk-adjusted return offered by banks (Sharpe,

1994) and require higher returns for riskier investments. As a result, riskier banks must offer higher rates to attract depositors and reward them for the greater risk they take on (Acharya and Mora, 2015). An increase in the deposit insurance limit decreases the risk associated with deposits and makes them more homogenous across different levels of risk. Consequently, the decrease in average deposit rates after an increase in the deposit insurance limit should be larger among riskier banks until the risk-adjusted returns equalise.

In this section, we examine the heterogeneity between banks in order to understand whether the baseline effect on average deposit rates and deposit amounts is stronger for riskier banks. In particular, we consider a heterogeneity dimension which is likely to be viewed by depositors as a proxy for risk, namely the ratio of Non-Performing Loans to Total Assets.<sup>16</sup>

We test this intuition by ranking the banks according to percentage of NPLs within Total Assets and, in particular, we split the sample into four quartiles according to this measure of risk. We first estimate Equation 3 while excluding the banks in the first quartile (i.e. the safest banks). We then exclude banks whose NPLs ratio is below the median value and finally we keep only the banks in the fourth quartile. The results when the dependent variable is the average deposit interest rate are reported in Table 9. Column (1) reports the baseline results contained in Table 7; Columns (2) to (4) report the estimates for subsamples that feature progressively riskier banks.

According to the results, banks with a higher share of Non-Performing Loans within Total Assets show a larger decrease in average deposit rates. By comparing the magnitude of the coefficients across the different samples, it can be seen that, while the decline in average deposit interest rates in the baseline case is about 78 basis points, among the riskiest banks the decline is about 147 basis points, thus confirming that the drop in average deposit rates is larger for riskier banks.

*Insert Table 9 here*

We repeat the analysis with Total Deposit as the outcome variable. The results in Table 10 show that the total amount of deposits does not significantly differ between the quartiles.

---

<sup>16</sup>In Appendix B, we consider two alternative measures of perceived risk - the the ratio of Tier One Capital to Total Assets and the log of the Z-score.

In contrast to the baseline analysis, we observe a decline in total deposits among the riskiest banks, although the estimate is not statistically significant.

*Insert Table 10 here*

Taken together, the heterogeneity results confirm that the reduction in average deposit rates was stronger for banks that are perceived to be riskier by depositors, absent the deposit insurance coverage. Since lower average deposit rates are not associated with a higher amount of deposits, the results provide evidence of a larger reduction in demand for deposits among riskier banks.

## **5 Conclusions**

This paper studies the effect of an increase in deposit insurance limits on average deposit rates by examining the effect of the 2009/14/EC Directive, which increased deposit insurance limits in the European Union from €20.000 to €100.000. We exploit the fact that the limit had already been increased in Italy in 1994. According to the findings, the average deposit rates decreased substantially among banks in the EU relative to banks in Italy. The drop in average rates was larger among riskier banks, thus confirming the theoretical prediction that deposit insurance negatively affects banks' deposit interest rates by reducing the return required by depositors. Employing a combination of diff-in-diff and propensity score matching in order to provide a consistent estimate of the policy's impact, we conclude that the introduction of a higher limit on deposit insurance in the EU led to a significant reduction in the per unit cost of deposit funding for Eurozone banks. The findings contribute to the policy debate over the impact of a common regulatory framework for the Eurozone banking sector.

## REFERENCES

- ACHARYA, V. V. and MORA, N. (2015). A crisis of banks as liquidity providers. *Journal of Finance*, **70** (1), 1–43.
- ANGINER, D. and BERTAY, A. C. (2019). Deposit insurance. *ifo DICE Report*, **17** (01), 03–08.
- , DEMIRGUC-KUNT, A. and ZHU, M. (2014). How does deposit insurance affect bank risk? evidence from the recent crisis. *Journal of Banking & Finance*, **48**, 312–321.
- AZEVEDO, J. V. and BONFIM, D. (2019). Deposit insurance and cross-border banks. *ifo DICE Report*, **17** (01), 14–20.
- BARTHOLDY, J., BOYLE, G. W. and STOVER, R. D. (2003). Deposit insurance and the risk premium in bank deposit rates. *Journal of Banking & Finance*, **27** (4), 699–717.
- BONFIM, D. and SANTOS, J. A. C. (2018). The importance of deposit insurance credibility, working paper.
- CANNAS, G., CARIBONI, J., VEISARI, L. K. and PAGANO, A. (2014). Updated estimates of eu eligible and covered deposits. *Joint Research Centre Technical Report - JRC87531*.
- CARIBONI, J. and UBOLDI, A. (2008). Investigating the efficiency of eu deposit guarantee schemes. *Joint Research Centre Technical Report - JRC48944*.
- CELERIER, C., KICK, T. K. and ONGENA, S. (2018). Taxing bank leverage: The effects on bank capital structure, credit supply and risk-taking, working paper.
- CHERNYKH, L. and COLE, R. A. (2011). Does deposit insurance improve financial intermediation? evidence from the russian experiment. *Journal of Banking & Finance*, **35** (2), 388–402.
- COOPER, R. and ROSS, T. (2002). Bank runs: Deposit insurance and capital requirements. *International Economic Review*, **43** (1), 55–72.
- DAVILA, E. and GOLDSTEIN, I. (2015). Optimal deposit insurance, working paper.

- DEMIRGUC-KUNT, A. and DETRAGIACHE, E. (2002). Does deposit insurance increase banking system stability? An empirical investigation. *Journal of Monetary Economics*, **49** (7), 1373–1406.
- DEMIRGÜÇ-KUNT, A. and HUIZINGA, H. (2004). Market discipline and deposit insurance. *Journal of Monetary Economics*, **51** (2), 375–399.
- DEMIRGUC-KUNT, A., KANE, E. and LAEVEN, L. (2015). Deposit insurance around the world : A comprehensive analysis and database. *Journal of Financial Stability*, **20**, 155–183.
- DEWENTER, K. L., HESS, A. C. and BROGAARD, J. (2018). Institutions and deposit insurance: empirical evidence. *Journal of Financial Services Research*, **54** (3), 269–292.
- DIAMOND, D. W. (1984). Financial intermediation and delegated monitoring. *Review of Economic Studies*, **51** (3), 393–414.
- and DYBVIK, P. H. (1983). Bank runs, deposit insurance, and liquidity. *Journal of Political Economy*, **91** (3), 401–19.
- GAMBACORTA, L. and SHIN, H. S. (2018). Why bank capital matters for monetary policy. *Journal of Financial Intermediation*, **35**, 17–29.
- IYER, R., JENSEN, T., JOHANNESSEN, N. and SHERIDAN, A. (2017). The run for safety: Financial fragility and deposit insurance, working paper.
- LAEVEN, L. and LEVINE, R. (2009). Bank governance, regulation and risk taking. *Journal of Financial Economics*, **93** (2), 259–275.
- and VALENCIA, F. (2010). Resolution of banking crises: The good, the bad, and the ugly. *IMF Working Papers*, **10** (146), 10–146.
- LAMBERT, C., NOTH, F. and SCHÜWER, U. (2017). How do insured deposits affect bank risk? evidence from the 2008 emergency economic stabilization act. *Journal of Financial Intermediation*, **29**, 81–102.



MATUTES, C. and VIVES, X. (1996). Competition for deposits, fragility, and insurance. *Journal of Financial Intermediation*, **5** (2), 184–216.

— and — (2000). Imperfect competition, risk taking, and regulation in banking. *European Economic Review*, **44** (1), 1–34.

PEIA, O. and VRANCEANU, R. (2017). Experimental evidence on bank runs under partial deposit insurance, essec working paper no.1705.

SHARPE, W. (1994). The sharpe ratio. *The Journal of Portfolio Management*, **21**, 49 – 58.

## A Propensity Score Matching

In Section 4.1 we carried out a propensity score matching that restricts the sample and allows us to compare banks with similar characteristics in the diff-in-diff estimation. The benefit of reducing the sample size to a group of more similar banks is to eliminate any potential bias that could be picked up by heterogeneous bank characteristics. On the other hand, it reduces the amount of information available and the precision of the estimates.

In this appendix, we carry out an alternative and more conservative selection of the banks. This involves narrowing the caliper, i.e. the maximum distance in the score between a treated bank and a control bank, to 0.001. This should lead to a more homogeneous group of banks, although it reduces the size of the sample. Table 11 provides the summary statistics for treated and control banks after the implementation of the propensity score matching with a caliper of 0.001. There does not appear to be a significant improvement in terms of the balance between the treatment and control groups with a smaller caliper, while there is a significant reduction in number of banks selected (from 96 to 54). Using this smaller sample, we then estimate the baseline diff-in-diff in Equation 3 at the bank level.

Table 12 presents similar estimates to the baseline regression although the standard errors are higher, possibly due to the smaller number of observations. This robustness shows that the choice of a caliper of 0.005 does not impose any costs in terms of balancing observable characteristics between treated and control banks and, at the same time, has the advantage of a larger sample size. In contrast, we also tried larger calipers when implementing the propensity score matching (for example 0.01 and 0.1), which enlarged the matched sample of banks, but worsened ex-post matching between control and treatment banks in terms of observable characteristics (results are not presented here for brevity but are available upon request).

*Insert Table 11 and Table 12 here*

## B Heterogenous impact: alternative risk measures

In this section, we repeat the heterogeneity analysis in Section 4.5 using two alternative measures of risk: the ratio of Tier One Capital to Total Assets and the log(Z-score). We proceed

in a similar manner by splitting the sample into four quartiles based on the distribution of the risk variables and then run the regressions on subsamples which progressively exclude the less risky banks. Column (1) in each table shows the results of the baseline regression while the estimation results for the various subsamples appear in the subsequent columns. We sequentially exclude an additional quartile of the safer bank. Table 13 shows the results when using average deposit interest rates as the dependant variable, while Table 14 shows the result for total deposits. The results confirm that deposit insurance has a larger negative impact among banks in the fourth quartile, while there is no significant difference in the case of total deposits.

*Insert Table 13 and Table 14 here*

Similarly, Tables 15 and 16 show results when a bank' riskiness is measured by the log(Z-score). With respect to average deposit rates, we find a larger negative effect when excluding the first quartile of the distribution (Column 2), but not for banks above the median of the log(Z-score). In particular, the non-significant effect on average interest rates among the banks in the fourth quartile can be explained by the significant increase in total deposits observed in Column (4) of Table 16. This result is theoretically compatible with an increase in the supply of deposits that is not matched by a sizeable decrease in the demand for deposits by banks that are closer to default.

*Insert Table 15 and Table 16 here*

## **C Cross-border banks**

We check how many banks in our matched sample operate cross-border. As highlighted by Azevedo and Bonfim (2019), for cross-border banks that operate as subsidiaries in the European Union, the host deposit insurance fund is responsible for reimbursing insured depositors. We identify 9 banks (6 in the treated group and 3 in the control group) in our matched sample that are mother banks of cross-border subsidiaries. As a robustness check we repeat the bank-level analysis after excluding those banks from the matched sample. For these banks, indeed, the consolidated balance sheet items that measure the cost of deposit funding could be potentially

affected by changes in deposit insurance schemes in both the origin and the host jurisdictions. Results, reported in Table 18, are robust to this check. In particular, the effect of the increase in deposit insurance limit on average deposit rates is strongly significant, while no significant effect is detected on the total amount of customer deposits.

*Insert Table 18*

## Tables

Table 1  
Deposit Insurance Limit by Country in September 2008

Country	DI Limit (€)	Country	DI Limit (€)
Austria	20,000	Ireland	20,000
Belgium	20,000	Italy	103,291
France	70,000	Netherlands	20,000
Germany	20,000	Portugal	25,000
Greece	20,000	Spain	20,000

*Note:* The source of data is Demirguc-Kunt *et al.* (2015) and data available online from various national deposit insurers.

Table 2  
Summary Statistics - Country level 2006-2008

	(1) Treatment	(2) Control	(3) Difference
Weighted Average Deposit Interest Rates	3.9456	2.7555	-1.1901**
Growth rate of Total Deposits	0.0882	0.0927	0.0045
Growth rate of real GDP	0.0214	0.0225	0.0011
Unemployment rate	7.2540	6.5250	-0.7290
Public Debt to GDP ratio	63.4481	102.6700	39.2219**
Covered to eligible ratio	0.5554	0.7337	0.1783***
Ratio of deposits for top 25 institutions	0.9261	0.8396	-0.0865
Observations	27	3	

*Note:* Column (1) shows average values for the EU countries listed in Table 1 except for Italy whose average values are shown in Column (2). Column (3) shows the mean difference between Columns (2) and (1). \*, \*\*, and \*\*\* denote significance at 10%, 5%, 1% respectively. Weighted average deposit rate is the interest expenses per unit of deposit of each bank weighted by the bank's total assets for each year-country; the Growth rate of Total Deposits is the yearly log change in the sum of each bank's total deposits in each year-country; the Growth rate of real GDP (source: OECD) is the yearly log change of each country's real GDP; the unemployment rate and the Public Debt to GDP ratio are from OECD sources; Covered to Eligible ratio is taken from Cariboni and Uboldi (2008); the ratio of deposits for top 25 institutions is the ratio of Total Deposits of the 25 largest banks - defined using total assets - in each country-year to the sum of Total Deposits of all the banks in each country-year.

Table 3  
Cross-Country Regressions

	(1)	(2)	(3)	(4)
	Average Deposit Rates		Log of Deposits	
T·post	-0.3651*	-0.7388***	0.1250**	-0.0145
	(0.1764)	(0.1852)	(0.0496)	(0.0137)
Year Dummies	✓	✓	✓	✓
Country Fixed Effects	✓	✓	✓	✓
Weighted Regression	✓		✓	
Observations	3123	3123	8390	8390

*Note:* T is a dummy variable that equals 0 if the bank operates in Italy and 1 otherwise; *post* is a time dummy that equals 1 in the post-reform years (2009-2010) and 0 in the pre-reform years (2006-2008). Standard errors appear in parentheses and are clustered at country level. \*, \*\*, and \*\*\* denote significance at 10%, 5%, 1% respectively.

Table 4  
Bank-Level Analysis

	(1)	(2)
	Average Deposit Rates	Log of Deposits
T·post	-0.6404***	-0.0479***
	(0.1132)	(0.0161)
Year Dummies	✓	✓
Bank Fixed Effects	✓	✓
Observations	3080	8312

*Note:* T is a dummy variable that equals 0 if the bank operates in Italy and 1 otherwise; *post* is a time dummy that equals 1 in the post-reform years (2009-2010) and 0 in the pre-reform years (2006-2008). Standard errors appear in parentheses and are clustered at bank level. \*, \*\*, and \*\*\* denote significance at 10%, 5%, 1% respectively.

Table 5  
Summary Statistics - All banks 2006-2008

	(1)	(2)	(3)
	Treatment	Control	Difference
Total Assets (EUR billions)	21.62	6.47	-15.15***
Average Deposit Interest Rates	3.47	1.74	-1.73***
Total Deposit to Total Assets ratio	0.63	0.52	-0.11***
Tier One capital to Total Assets ratio	0.06	0.11	0.05***
Non-Performing Loans to Total Assets ratio	0.02	0.04	0.02***
ROA	0.47	0.86	0.39***
Log(Z-score)	1.19	1.62	0.43***
Observations	3651	1370	

*Note:* Average values for banks operating in the EU countries listed in Table 1 except for Italy (Column 1) and banks operating in Italy (Column 2); Column (3) shows the mean-difference between Columns (2) and (1). Bank-level variables refer to key items from Bankscope. \*, \*\*, and \*\*\* denote significance at 10%, 5%, 1% respectively.

Table 6  
Summary Statistics - Matched Sample 2006-2008

	(1)	(2)	(3)
	Treatment	Control	Difference
Total Assets (EUR billions)	35.49	44.59	9.11
Average Deposit Interest Rates	4.31	1.95	-2.36***
Total Deposit to Total Assets ratio	0.50	0.48	-0.02
Tier One Capital to Total Assets ratio	0.08	0.09	0.01
Non-Performing Loans to Total Assets ratio	0.02	0.02	-0.00
ROA	0.81	0.80	-0.01
Log(Z-score)	1.23	1.38	0.16
Observations	137	133	

*Note:* Average values for banks operating in the EU countries listed in Table 1 except for Italy (Column 1) and banks operating in Italy (Column 2); Column (3) shows the mean difference between Columns (2) and (1). The number of banks in the treatment and control group after implementing the propensity score matching procedure is 48. Bank-level variables refer to key items from Bankscope. \*, \*\*, and \*\*\* denote significance at 10%, 5%, 1% respectively.

Table 7  
Bank-Level Analysis - Matched Sample

	(1) Average Deposit Rates	(2) Log of Deposits
T·post	-0.7814** (0.3420)	0.0406 (0.0993)
Year Dummies	✓	✓
Bank Fixed Effects	✓	✓
Observations	334	448

*Note:* The sample is obtained after implementing the propensity score matching procedure. T is a dummy variable that equals 0 if the bank operates in Italy and 1 otherwise; *post* is a time dummy that equals 1 in the post-reform years (2009-2010) and 0 in the pre-reform years (2006-2008). Standard errors appear in parentheses and are clustered at the bank level. \*, \*\*, and \*\*\* denote significance at 10%, 5%, 1% respectively.

Table 8  
Bank-Level Analysis: The Impact on Risk

	(1) log(Z-score)	(2) $\frac{NPLs}{TA}$	(3) $\frac{TierOne}{TA}$
T·post	-0.3146 (0.3400)	0.0181* (0.0093)	0.0093 (0.0079)
Year Dummies	✓	✓	✓
Bank Fixed Effects	✓	✓	✓
Observations	349	388	403

*Note:* The regressions repeat the baseline analysis using the log Z-score (Column 1), the Non-Performing loans to Total Assets ratio (Column 2) and the Tier One to Total Assets ratio (Column 3) as the dependant variable. The sample is obtained after implementing the propensity score matching procedure. T is a dummy variable that equals 0 if the bank operates in Italy and 1 otherwise; *post* is a time dummy that equals 1 in the post-reform years (2009-2010) and 0 in the pre-reform years (2006-2008). Standard errors appear in parentheses and are clustered at bank level. \*, \*\*, and \*\*\* denote significance at 10%, 5%, 1% respectively.



Table 9  
Heterogeneity in Risk: Average Deposit Rates

	(1) Matched Sample	(2) >25	(3) >50	(4) >75
T·post	-0.7814** (0.3420)	-0.7534** (0.3554)	-0.9462*** (0.3457)	-1.4734** (0.5247)
Year Dummies	✓	✓	✓	✓
Bank Fixed Effects	✓	✓	✓	✓
Observations	334	249	165	81

*Note:* Column (1) presents estimates from the regression analysis reported in Table 7; Column (2) reports the estimates of a regression analysis using a subsample that excludes the banks whose  $\frac{NPLs}{TA}$  is below the 25th percentile of the distribution; Column (3) reports the estimates when excluding the banks whose  $\frac{NPLs}{TA}$  is below the median; Column (4) reports the estimates when excluding the banks whose  $\frac{NPLs}{TA}$  is below the 75th percentile of the distribution. T is a dummy variable that equals 0 if the bank operates in Italy and 1 otherwise; *post* is a time dummy that equals 1 in the post-reform years (2009-2010) and 0 in the pre-reform years (2006-2008). Standard errors appear in parentheses and are clustered at country level. \*, \*\*, and \*\*\* denote significance at 10%, 5%, 1% respectively.

Table 10  
Heterogeneity in Risk: Total Deposits

	(1) Matched Sample	(2) >25	(3) >50	(4) >75
T·post	0.0406 (0.0993)	0.0278 (0.0528)	0.0328 (0.0742)	-0.0675 (0.1185)
Year Dummies	✓	✓	✓	✓
Bank Fixed Effects	✓	✓	✓	✓
Observations	448	332	220	110

*Note:* Column (1) presents estimates from the regression analysis reported in Table 7; Column (2) reports the estimates of a regression analysis using a subsample that excludes the banks whose  $\frac{NPLs}{TA}$  is below the 25th percentile of the distribution; Column (3) reports the estimates when excluding the banks whose  $\frac{NPLs}{TA}$  is below the median; Column (4) reports the estimates when excluding the banks whose  $\frac{NPLs}{TA}$  is below the 75th percentile of the distribution. T is a dummy variable that equals 0 if the bank operates in Italy and 1 otherwise; *post* is a time dummy that equals 1 in the post-reform years (2009-2010) and 0 in the pre-reform years (2006-2008). Standard errors appear in parentheses and are clustered at country level. \*, \*\*, and \*\*\* denote significance at 10%, 5%, 1% respectively.

Table 11  
Summary Statistics: Matched Sample 2006-2008 - Robustness

	(1)	(2)	(3)
	Treatment	Control	Difference
Total Assets (EUR billions)	32.68	44.16	11.48
Average Deposit Rates	4.30	1.83	-2.47***
Total Deposit to Total Assets ratio	0.49	0.50	0.01
Tier 1 Capital to Total Assets ratio	0.09	0.09	-0.00
Non-Performing Loans to Total Assets ratio	0.03	0.03	0.00
ROA	0.80	0.83	0.03
Log(Z-score)	1.12	1.50	0.38**
Observations	76	76	

*Note:* The table shows average values for banks operating in the EU countries listed in Table 1 except for Italy (Column 1) and banks operating in Italy (Column 2); Column (3) shows the mean difference between Columns (2) and (1). The matched sample is obtained using a propensity score matching procedure with a caliper of 0.001. The number of banks in the treatment and control group is 27. Bank-level variables are taken from Bankscope. \*, \*\*, and \*\*\* denote significance at 10%, 5%, 1% respectively.

Table 12  
Bank-Level Analysis: Matched Sample - Robustness

	(1)	(2)
	Average Deposit Rates	Log of Deposits
T·post	-0.9107*	-0.1274
	(0.4766)	(0.1862)
Year Dummies	✓	✓
Bank Fixed Effects	✓	✓
Observations	334	448

*Note:* The matched sample in the robustness check is obtained after implementing a propensity score matching procedure using a caliper equal to 0.001. T is a dummy variable that equals 0 if the bank operates in Italy and 1 otherwise; *post* is a time dummy that equals 1 in the post-reform years (2009-2010) and 0 in the pre-reform years (2006-2008). Standard errors appear in parentheses and are clustered at bank level. \*, \*\*, and \*\*\* denote significance at 10%, 5%, 1% respectively.

Table 13  
Heterogeneity in Risk: Average Deposit Rates - Robustness

	(1) Matched Sample	(2) >25	(3) >50	(4) >75
T·post	-0.7814** (0.3420)	-0.8611** (0.3655)	-0.3076 (0.3220)	-1.2302* (0.6681)
Year Dummies	✓	✓	✓	✓
Bank Fixed Effects	✓	✓	✓	✓
Observations	334	249	165	81

*Note:* Column (1) reports estimates from the regression analysis presented in Table 7; Column (2) reports the estimates of a regression analysis using a subsample that excludes the banks whose  $\frac{NPLs}{TA}$  is below the 25th percentile of the distribution; Column (3) reports the estimates when excluding the banks whose  $\frac{NPLs}{TA}$  is below the median; Column (4) reports the estimates when excluding the banks whose  $\frac{NPLs}{TA}$  is below the 75th percentile of the distribution. T is a dummy variable that equals 0 if the bank operates in Italy and 1 otherwise; *post* is a time dummy that equals 1 in the post-reform years (2009-2010) and 0 in the pre-reform years (2006-2008). Standard errors appear in parentheses and are clustered at country level. \*, \*\*, and \*\*\* denote significance at 10%, 5%, 1% respectively.

Table 14  
Heterogeneity in Risk: Total Deposits - Robustness

	(1) Matched Sample	(2) >25	(3) >50	(4) >75
T·post	0.0406 (0.0993)	0.0247 (0.1230)	-0.0044 (0.1997)	0.2811 (0.4738)
Year Dummies	✓	✓	✓	✓
Bank Fixed Effects	✓	✓	✓	✓
Observations	448	336	220	112

*Note:* Column (1) reports estimates from the regression analysis presented in Table 7; Column (2) reports the estimates of a regression analysis using a subsample that excludes the banks whose  $\frac{NPLs}{TA}$  is below the 25th percentile of the distribution; Column (3) reports the estimates when excluding the banks whose  $\frac{NPLs}{TA}$  is below the median; Column (4) reports the estimates when excluding the banks whose  $\frac{NPLs}{TA}$  is below the 75th percentile of the distribution. T is a dummy variable that equals 0 if the bank operates in Italy and 1 otherwise; *post* is a time dummy that equals 1 in the post-reform years (2009-2010) and 0 in the pre-reform years (2006-2008). Standard errors appear in parentheses and are clustered at country level. \*, \*\*, and \*\*\* denote significance at 10%, 5%, 1% respectively.

Table 15  
Heterogeneity in Risk: Average Deposit Rates - Robustness II

	(1) Matched Sample	(2) >25	(3) >50	(4) >75
T-post	-0.7814** (0.3420)	-0.9153** (0.4441)	-0.4744 (0.4384)	-0.8431 (0.6861)
Year Dummies	✓	✓	✓	✓
Bank Fixed Effects	✓	✓	✓	✓
Observations	334	250	168	83

*Note:* Column (1) reports estimates presented in Table 7; Column (2) reports estimates of a regression analysis on a subsample which excludes the banks whose  $\text{Log}(Z - \text{score})$  is below the 25th percentile of the distribution; Column (3) reports estimates of a regression analysis on a subsample which excludes the banks whose  $\text{Log}(Z - \text{score})$  is below the median; Column (4) reports estimates of a regression analysis on a subsample which excludes the banks whose  $\text{Log}(Z - \text{score})$  is below the 75th percentile of the distribution. T is a dummy variable that equals 0 if the bank operates in Italy and 1 otherwise; *post* is a time dummy that equals 1 in the post-reform years (2009-2010) and 0 in the pre-reform years (2006-2008). Standard errors appear in parentheses and are clustered at country level. \*, \*\*, and \*\*\* denote significance at 10%, 5%, 1% respectively.

Table 16  
Heterogeneity in Risk: Total Deposits - Robustness II

	(1) Matched Sample	(2) >25	(3) >50	(4) >75
T-post	0.0406 (0.0993)	0.0858 (0.1022)	0.1906 (0.1255)	0.1413** (0.0604)
Year Dummies	✓	✓	✓	✓
Bank Fixed Effects	✓	✓	✓	✓
Observations	448	334	221	110

*Note:* Column (1) reports estimates from the regression analysis presented in Table 7; Column (2) reports the estimates of a regression analysis using a subsample that excludes the banks whose  $\frac{NPLs}{TA}$  is below the 25th percentile of the distribution; Column (3) reports the estimates when excluding the banks whose  $\frac{NPLs}{TA}$  is below the median; Column (4) reports the estimates when excluding the banks whose  $\frac{NPLs}{TA}$  is below the 75th percentile of the distribution. T is a dummy variable that equals 0 if the bank operates in Italy and 1 otherwise; *post* is a time dummy that equals 1 in the post-reform years (2009-2010) and 0 in the pre-reform years (2006-2008). Standard errors appear in parentheses and are clustered at country level. \*, \*\*, and \*\*\* denote significance at 10%, 5%, 1% respectively.

Table 17  
Bank-Level Analysis - Matched Sample - Robustness

	(1)	(2)	(3)	(4)
	Average Deposit Rates		Log of Deposits	
T·post	-0.6796** (0.3014)	-0.6587** (0.3031)	0.0864 (0.0627)	0.0178 (0.0516)
Lagged Average Deposit Rates	0.2411*** (0.0445)	0.0878 (0.0651)		
T · Lagged Average Deposit Rates		0.1886*** (0.0667)		
Lagged Log of Deposits			0.3966*** (0.0946)	0.1232 (0.1228)
T · Lagged Log of Deposits				0.3722*** (0.1281)
Year Dummies	✓	✓	✓	✓
Bank Fixed Effects	✓	✓	✓	✓
Observations	246	246	349	349

*Note:* The estimates are based on a sample obtained using propensity score matching. T is a dummy variable that equals 0 if the bank operates in Italy and 1 otherwise; *post* is a time dummy that equals 1 in the post-reform years (2009-2010) and 0 in the pre-reform years (2006-2008). Standard errors appear in parentheses and are clustered at bank level. \*, \*\*, and \*\*\* denote significance at 10%, 5%, 1% respectively.

Table 18  
Bank-Level Analysis - Matched Sample - Robustness II

	(1)	(2)
	Average Deposit Rates	Log of Deposits
T·post	-1.0621*** (0.3989)	0.0710 (0.1031)
Year Dummies	✓	✓
Bank Fixed Effects	✓	✓
Observations	295	403

*Note:* The sample is obtained after implementing the propensity score matching procedure and after excluding banks that operate cross-border. T is a dummy variable that equals 0 if the bank operates in Italy and 1 otherwise; *post* is a time dummy that equals 1 in the post-reform years (2009-2010) and 0 in the pre-reform years (2006-2008). Standard errors appear in parentheses and are clustered at the bank level. \*, \*\*, and \*\*\* denote significance at 10%, 5%, 1% respectively.

# Figures

Figure 1



Figure 2

