The Impact of Deposit Insurance on Bank Risk and Competition: Bank Level Analysis*

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Abstract

This paper aims at studying the causal effects of deposit insurance on bank risk and competition. The study uses difference-in-difference approach from period 2010 - 2018 and is separated into two parts: (1) cross country analysis and (2) within country analysis. Cross country analysis explores the effect of deposit insurance implementation. Different countries implemented deposit insurance in different point in time, we use matching on banks' country and banking sector's credit rating, bank size, and bank specialization of the year before implementation. We also conduct the difference-in-differences with multiple time periods by Callaway and Sant'Anna (2021). The results show that treated banks take more risk after implementation due to a decrease in Z-Score. Also, treated banks increase their deposit market share when looking at the ratio between individual bank's customer deposit to total customer deposit of all deposit insurance's member banks in its country. We add to this study by analyzing also the variations of deposit insurance schemes, such as premium method, covered product, and coverage limit. We discover that more relaxing premium method, larger product scope, and higher coverage limit lead to higher risk taking due to an increase in Z-Score and to more potential to attract customer deposit due to an increase in bank's deposit share. Within country analysis investigate the effect of deposit insurance maximum coverage limit changes.We analyze this question by conducting within-country analysis under two exercises: 1)the study of the latest year of limit changes and 2) the study of multiple periods of limit changes. Regarding the first exercise, we implement difference-in-difference to explore behavior of 2 groups of banks, investment and non-investment credit rating, after the limit changes by matching on individual bank's credit rating, size, and specialization of the year before limit changes. Towards the second exercise, we also implement difference-in-difference, but by including all periods of limit changes and controlling for bank's lagged credit rating. The results of two exercises are consistent showing that the increase in maximum coverage limit lead to higher risk taking and attraction of customer deposit of bank with non-investment grade before the year of limit changes.

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1 Introduction

Deposit insurance is firstly established in United States of America in 1933 followed the Great Despression. Figures 1 and 2 show that there was an increase in numbers of countries implemented deposit insurance later, in 1980s to 1990s. In 1994, European Union adopted deposit insurance as the standard for the newly established single banking market. Moreover, IMF has commended deposit insurance in a code of best practices together with a set of typical practices for its successful scheme (Lindgren and Folkerts-Landau, 1998). However, deposit insurance has been discussed among economists and policy makers due to both of its advantages and disadvantages (Garcia, 1996).

The existing literature provides mixed evidence on the relationship between deposit insurance and banks risk and competition. For instance, Diamond and Dybvig (1983) discover deposit insurance could prevent bank runs. Egan et al. (2017) finds that estimated demand from a structural empirical model of the US banking sector for uninsured deposits declines with banks' financial distress. However, this does not happen for the case of insured deposits. On the contrary, other studies find a negative effect of deposit insurance on banks risk and performance. For instance, Calomiris and Jaremski (2019) exploit a setting of deposit insurance laws in US at state level to show that deposit insurance worsen a market discipline and contributed to a great loss after the system collapsed.Demirgüç-Kunt and Detragiache (2002) show that explicit deposit insurance tends to increase the probability of banking crises. Demirgüç-Kunt and Huizinga (2004) investigate the effect of variation in deposit insurance schemes on interest expense of the banks. They found that deposit insurance leads to a lower required interest rate by depositor but adversely affect market discipline of the banks. Shy et al. (2016) finds that deposit insurance weakens bank competition and reduce total welfare. Karas et al. (2013) study the effect of deposit insurance on market discipline and found that sensitivity of households to bank capitalization reduce after the implementation.

A possible reason why the existing studies provide non-conclusive evidence on the effect of deposit insurance on banks behavior is because the adoption of regulation is an endogenous variable in those works. Also some of them provides only country level analysis.

The closest work to ours is Anginer et al. (2014) who estimate the relation between deposit insurance and bank risk and systemic fragility in the years leading up to and during the 2007 - 2009 financial crisis. They find that generous financial safety nets

increase bank risk and systemic fragility in the years leading up to the global financial crisis. However, during the crisis, bank risk is lower and systemic stability is greater in countries with deposit insurance. Overall, the adverse effect dominates the positive effects for the whole period of their study. The study is bank level analysis and the main outcome variable is risk measure, Z-Score. On the contrary, we study the effects of the implementation of deposit insurance and the variation of deposit insurance schemes. Besides, we add to the literature by studying those effects on banks' deposit market share.

Our paper contributes to this literature on financial regulation and bank behavior by providing causal estimates of the effect of deposit insurance on banks' risk and competition in bank level analysis. To obtain unbiased estimates of the impact of deposit insurance on banks, we use difference-in-difference approach to investigate the effect of deposit insurance and its schemes by separating the study into 2 parts.

In part 1, we study cross country variation in order to investigate the effect of deposit insurance implementation and the variation of its schemes. Since countries implemented deposit insurance in different years, we match banks in countries with deposit insurance with banks in countries without deposit insurance with respect to their country and banking sector's credit rating, bank size, and bank specialization of the year before the implementation. As a result, we have treated banks and untreated banks that have the similar level of risk before the year of implementation. The interaction between country and banking sector's credit rating results in non-investment grade (high risk group) and investment grade (low risk group). Beside studying the effect of deposit insurance implementation, we also explore the variation of deposit insurance schemes: (1) premium method,(2) covered products, and (3) maximum coverage limit (per person per institution). The objective of this exercise is to compare bank risk and competition when the country adopted more or less relaxing deposit insurance schemes.

Considering our identification strategy in this part, we are the first study exploiting the matching on banks' country and banking sector credit rating to control for the level of their risk before the period of regulation is implemented. Therefore, our paper provides more reliable causal estimates of the effects of deposit insurance.

Relying on a difference-in-difference estimation, we empirically identify the causal effects of deposit insurance implementation, by comparing the risk behavior of treated banks with the same outcomes of untreated banks, and of the variation of its scheme on banks, by comparing the risk and deposit competition between banks adopted dif-

ferent deposit insurance schemes. In our empirical estimations, our outcome variables, regressors, and control variables come from banks' balance sheet, income statement, and historical credit rating for the period 2010 to 2018, which are the years after financial crisis. This has advantage to our analysis since the result would not be contaminated by external risk factor such as in the crisis period. Our results suggest that treated banks have higher risk taking but attract more customer deposit after deposit insurance implementation or when countries have more relaxing deposit insurance schemes.

In part 2, we investigate further, not only the effect of the introduction of deposit insurance, but also the effect of changes in deposit insurance schemes. As a result, we study within country variation when the countries change their deposit insurance maximum coverage limit per depositor per institution. The study of De Roux and Limodio (2021) presents the interesting findings that an in crease in deposit level and growth after the surprised increase in deposit insurance threshold. However, we aim at investigating the effect of both increasing and lowering the coverage limits on bank's risk and deposit market share, or ability to compete for deposit. We conduct the exercise differently by looking at heterogeneous response to changing in coverage limit by low and high risk banks.

To achieve this goal, we utilize the different levels of risk of banks operating in the same country to investigate the impact of changes in coverage limit on their behaviors. This has an advantage in alleviating the differences in environment or market structures when comparing the impact across different countries. We use individual bank's credit rating before the year of limit changes in order to compare behavior of banks that approximately have same level of risk. Consequently, we are the first to explore behavior of banks, having different individual credit rating, before and after the coverage limit changes, by controlling for banks' countries, sizes, leverage, fee income, and specialization.

During the sample period of 2010 - 2018, there is a set of countries that change their maximum coverage limit of deposit insurance. Among these countries, the changes occur more than one time during the sample period. Consequently, this second part of the paper is divided into 2 studies. Firstly, the latest year of limit changes of each country is used to flag as treatment period. Since different countries changes coverage limit in different years, we use 4-nearest matching on one-lagged bank's credit rating to match banks, in each year of limit changes, in treated countries to banks in untreated countries. Then, we use difference-in-difference to explore behavior of those two groups of banks, investment

and non-investment credit rating, after the limit changes. One-lagged of bank's credit rating before the year of limit changes is used in order to be able to compare the effect of limit changes on bank's behavior when banks have the same level of risk before the year of changes. Besides lagged credit rating, we also match banks on sizes and specialization as well in order to be able to have a set of comparable banks as much as possible. As a result, we have non investment grade banks and investment grade banks in the year before the limit changes, in each year of limit changes. Secondly, we mark all the years that have limit changes as treatment period. One might concern that the result of this strategy could be contaminated by the previous or later changes in the case that there are more than one time of limit change during sample period. In order to tackle this challenge, we use lagged credit rating of the year before the limit changes to control for the risk level before the next period's changes.

As a result, we empirically identify the causal effects of changes in deposit insurance coverage limit by comparing risk and deposit competition of non-investment grade banks with the same outcomes of investment grade banks. In our empirical estimations, our outcome variables, regressors, and control variables come from banks' balance sheet, income statement, and historical credit rating for the period 2010 to 2018, which are the same period as the cross country analysis. Our results suggest that non-investment grade banks have higher risk taking but attract more customer deposit after the countries increase the maximum coverage limit of deposit insurance.

The remainder of this research is organized as follows. Section 2 describes the institution background of deposit insurance regulation. Section 3 explains data used in the empirical estimations and the summary statistics. Section 4 presents identification strategy and checks the validity of control group. The results are shown in Section 5. Section 6 concludes.

2 Institution Background

This section explains briefly the history of deposit insurance and the variation of its schemes.

Deposit insurance was firstly implemented in United States in 1933. Table 1 explains the list of countries that have deposit insurance established along with the year of implementation. Figures 1 and 2 present the incremental and accumulated amounts of

countries that have deposit insurance from 1933 - 2017, respectively. We can see that, from total 194 countries of the world, it takes about 67 years (1933 - 2000) to have 23% (53 countries) of all countries implemented deposit insurance. Then, the proportion of countries implemented deposit insurance increased doubly to 46% (35 countries) in 10 years and to 61% (30 countries) in 7 years later. The study in this research on effect of deposit insurance implementation and its scheme deployment will help to understand the consequence of this rapid growth of deposit insurance adoption.

The variation of deposit insurance schemes can be classified according to multiple categories such as management, system mandate, covered products, premium method, and maximum coverage limit.

The management of deposit insurance is separated into 5 types:

1) government legislated and administered

2) government legislated and privately administered

3) privately established and administered

4) central bank administered

5) other

Based on International Association of Deposit Insurers (IADI) Annual Survey (2018) that has information as of the end of 2017, 82 out of 117 countries (70%) have government legislated and administered. Table 2 presents the detail of each type of management.

The system mandate of deposit insurance has 5 categorizations:

1) Pay-box: Deposit Insurer is only responsible for the reimbursement of Insured Deposits.

2) Pay-box Plus: Deposit Insurer has additional responsibilities, such as certain Resolution functions (e.g. financial support).

3) Loss Minimizer: Deposit Insurer actively engages in a selection from a range of least-cost Resolution strategies.

4) Risk Minimizer: Deposit Insurer has comprehensive risk minimization functions, including risk assessment or management, a full suite of Early Intervention and Resolution Powers, and in some cases, prudential oversight responsibilities.

5) Other

Based on IADI Survey (2018), 55 out of 117 countries (45%) have Pay-box Plus system mandate. Table 3 presents the detail of each type of system mandate.

Types of deposit products eligible for coverage by deposit insurance agency include 12

products, such as saving account, checking account, foreign-currency deposit, etc. The detail is shown in Table 4.

Types of deposit insurance premium method are separated into 4 types:

1) Flat rate

2) Differential rate

3) Combination of both flat rate and differential rate

4) Other

Flat rate premium is given as percentage of deposits or liabilities. On the contrary, differential rate premium is adjusted based on criteria of each country. Those include, but not limited to, individual bank's risk rating, liquidity, asset quality, capital adequacy, regulatory solvency ratio, and the effectiveness of internal control systems. We can see that, among all types of premium method, flat rate is the least stringent while differential rate is tailored to bank's risk level.

Based on IADI Survey (2018), 58 out of 117 countries (50%) have flat rate premium method. Table 5 presents the detail of each type of system mandate.

The coverage limit as of 2017, based on IADI Survery (2018) is shown in Table 6 and Figure 3 with Thailand has the maximum coverage limit USD 456,660, and Republic of Moldova has the minimum coverage limit USD 356. The average of coverage limit is USD 54,653.83 and the median is USD 26,947.5.

According to the above information (as of end of 2017), Brazil, for example, introduced deposit insurance in 1995, has government legislated and privately administered type of management, Pay-box Plus type of system mandate, covers saving, checking, certificates of deposit, guaranteed investment certificate, and deposits in accounts not drawable by means of checks; bills of exchange; real estate bills; mortgage bills. The premium method that Brazil uses is flat rate method and the maximum coverage limit is USD 75,588 per depositor per institution.

3 Data

Outcome variables, regressors, and control variables that we use in this paper come from banks' balance sheet, income statement, and credit rating for the period 2010-2018, which are the years after financial crisis. In part 1, we use country's and banking sector's credit rating to match the banks' risk level before the treatment period and individual

bank's credit rating to match the banks' risk level before the time of limit changes in part 2. These annual bank-level data are obtained from Orbis Bank Focus and Bloomberg database.

3.1 Data: Part 1 - Cross Country Analysis

Regarding the detail of deposit insurance implementation and its scheme for each country, we use the International Association of Deposit Insurers (IADI) Annual Survey from 2011 - 2019. The 2011 survey reports the information of the end of year 2010 and so on. The information that we use from the survey includes year of deposit insurance implementation, the information whether the membership to deposit insurance system is mandatory or not, types of deposit insurance agency (DIA) member banks or institutions, types of deposit products eligible for coverage by DIA, premium method, and maximum coverage limit (per depositor per institution). To guarantee that deposit insurance implementation is binding to the banks when it was introduced, we find that the bank membership to deposit insurance agency of all the countries that introduced deposit insurance under the period of our study are mandatory.

As for the analysis on effect of differences in maximum coverage limit at the time of the first implementation of deposit insurance, we use average deposit per person to normalize the amount of maximum coverage limit so that we could be able to compare the effect across different countries. The average deposit per person is computed from outstanding deposits with commercial banks divided by number of depositors with commercial bank (from IMF: Financial Access Survey) [1] or number of adult population aged between 15 - 64 years (when number of depositors with commercial bank are not available), then adjusted by GDP Deflator (World bank data)[2]. Thus, maximum coverage limit of each country is computed as follows:

[1] 71% of all the countries

[2] Maximum coverage limits of Bahrain, Burmuda, and Palestinian Territories are normalized by GDP per capita and adjusted by GDP deflator since IMF does not provide outstanding deposits with commercial banks of these three countries

$$\text{Limit} = \frac{\text{Maximum Coverage Limit}}{\text{Deposit per person}} \quad ; \text{where :}$$

$$\text{Deposit per person} = \frac{\text{Total outstanding deposits with commercial bank} \times \text{GDP Deflator}}{\text{No. of depositors with commercial bank}} \quad \text{or}$$

$$= \frac{\text{Total outstanding deposits with commercial bank} \times \text{GDP Deflator}}{\text{No. of adult population (age 15-64 years)}} \tag{1}$$

We gather data of banks from all the countries that have implemented deposit insurance during 2011 - 2017 and that have not yet implemented deposit insurance during 2010 - 2018. The initial sample includes 19,539 bank-year observations (2,171 banks, 101 countries).

However, as shown in Table 1, different countries adopted deposit insurance in different point in time. This sequential adoption could lead to some issue concerning peer effect in choice of implementation. Moreover, there might be subjected to endogenous decision to implement deposit insurance based on tendency of risk (reverse causality). In order to avoid those problems, we create matched pair between treatment and control group. Treatment group is defined as banks from countries that already implemented deposit insurance and control group is defined as banks from countries that have not implemented deposit insurance. For each treatment and control group, we match them according to the condition of having the investment grade or non-investment grade together with bank size and bank specialization. The (non) investment grade is derived from the interaction between country and banking sector's credit rating. The non-investment grade (high risk group) has the interaction of the two credit ratings from BB+ downward, whereas the investment grade (low risk group) has the interaction of the two credit ratings from BBB- upward. These matched pairs are created for each implementation year from 2011 - 2017. Since during the matching process, some banks might be repeatedly matched as control group for treated banks in different year, we thus remove duplicate control groups presented in latter matching group-year. After this process, we end up with 8,586 bank-year observations (954 banks, 94 countries).

The next step is to consider only banks that are members of deposit insurance agency in the treated countries. Based on the IADI survey, of those implemented countries, Table 9 shows the detail of types of banks that are covered under deposit insurance and highlights the ones that are excluded from the analysis. Thus, we have 274 banks in total to be included in the treated group. This accounts for 2,466 bank-year observations as

shown in Table 10.

Additionally, since this exercise involves multiple treatment periods of each country, we also drop banks which their rating group had changed during the sample period to alleviate the problem when matched pair between treated and control group changed their risk level. This accounts for 234 bank-year observation exclusion.

Table 11 explains the implementation year of each country along with the total number of banks. Lastly, Table 12 shows the list of all countries and their number of banks that are included in our analysis. As a result, we have 8,244 bank-year observations (916 banks, 90 countries) as our final sample.

Overview of mean differences of main outcome variables are presented in Table 13

3.2 Data: Part 2 - Within Country Analysis

Regarding the detail of maximum coverage limit for each country, we use the International Association of Deposit Insurers (IADI) Annual Survey from 2011 - 2019. The 2011 survey reports the information of the end of year 2010 and so on. The information that we use from the survey includes information of whether the membership to deposit insurance system is mandatory or not, types of deposit insurance agency (DIA) member banks or institutions, maximum coverage limit, and year of maximum coverage limit changes. To guarantee that deposit insurance implementation is binding to the banks when it was introduced, we find that the bank membership to DIA of all the countries that introduced deposit insurance under the period of our study are, actually, mandatory [3]. We have initial sample includes 22,581 bank-year observations (2,509 banks, 15 countries).

Additionally, this section explains the detail of countries and the year when they change maximum coverage limit per depositor per institution. Table 7 shows the list of countries that have maximum coverage limit of deposit insurance changed during 2011 - 2017 together with the amount of limit changes in each year. For the year that it is left blank, this means that the maximum coverage limit in that year is still the same as the one from previous year. For example, Argentina has maximum coverage limit equal 120,000 Argentine peso from year 2011 - 2013, or Australia has maximum coverage limit

[3] In Australia, membership is not a relevant concept in Australia - entities do not have to be a 'member' to receive the guarantee is a consequence of authorization. In Ukraine, membership is mandatory for all banks except for The State Savings Bank of Ukraine (Oshchadbank), thus we remove this bank from the sample.

at 995,465.85 Australian dollor in 2010 - 2011. We identify "no dis" for the year that there was still no deposit insurance implemented. Thus, we set the value of the maximum coverage limit in that year to zero.

To proceed the analysis on effect of changes in maximum coverage limit, we use average deposit per person to normalize the amount of maximum coverage limit so that we could compare the effect more meaningfully across different countries. The average deposit per person is computed from outstanding deposits with commercial banks (from IMF: Financial Access Survey) divided by number of adult population aged between 15 - 64 years, then adjusted by GDP Deflator (World bank data)[4]. Finally, we compute maximum coverage limit according to this formula:

$$\begin{aligned} \text{Limit} &= \frac{\text{Maximum Coverage Limit}}{\text{Deposit per person}} \quad ; \text{where :} \\ \text{Deposit per person} &= \frac{\text{Total outstanding deposits with commercial bank} \times \text{GDP Deflator}}{\text{No. of adult population (age 15-64 years)}} \end{aligned} \tag{2}$$

We propose to set the number of maximum coverage limit when it is defined as"no limit" as 1000 to infer that, in that year, the country does not have the limit to provide the insurance to the banks. Then, we use the difference between these normalized maximum coverage limit before and after the change to investigate its effect on bank behavior. Table 8 shows the amount of limit changes in each year in each country after the normalization.

Firstly, we consider only banks that are covered under deposit insurance agency of each country. Based on the IADI survey, Tables 14 and 15 show detail of types of banks that are covered under deposit insurance of each country and highlights the ones that are not covered, thus be excluded from the analysis.

The first part of the study in part 2 where the latest year of limit changes of each country is used to flag as treatment period, we create matched pair between non-investment grade and investment grade banks, using banks both from the same country and different countries, based on one-lagged of bank's credit rating, for each year of limit changes and . This is due to the same reason to prevent interpreting the results concerning the issue of endogenous decision to change maximum coverage limit based on tendency of risk

[4]Maximum coverage limits of Bahrain and Taiwan are normalized by GDP per capita and adjusted by GDP deflator since IMF does not provide outstanding deposits with commercial banks of these two countries. We did not use the number of depositors with commercial bank as in part 1 since there is only 40% of the countries that have this data provided by IMF.

(reverse causality). The non-investment grade (high risk group) bank has credit rating from BB+ downward, whereas the investment grade (low risk group) bank has credit rating from BBB- upward. Orbis Bank Focus database gives very few information on individual bank's credit rating. Therefore, we need to match banks from two databases, Orbis Bank Focus and Bloomberg, to combine bank's credit rating. For each matched pair, we match them according to bank one-lagged credit rating, size, and specialization. These matched pairs are created for each limit changes year from 2011 - 2017. Since some countries have multiple periods of limit changes, this first study treats the latest limit changes year as the treatment period. Thus, the matching process occurs in the earlier year before the latest limit changes year. Section 5.2.3 provides robustness test when include only countries that did not have more than 2 consecutive periods of limit changes (at least one period ahead or after the change) to be able to extract the effect of changes without being exposed to effect of another connected years. After this process, we end up with 11,457 bank-year observations (1273 banks, 15 countries).

Additionally, Table 16 shows the latest year of limit changes of each country together with number of banks included in each country.

The second part of the study in part 2 aims at analyzing the effect of changing in maximum coverage limit, including multiple treatment periods. This exercise exploits the strategy using lagged credit rating as control variable, thus we propose to use the whole sample of data. The initial sample includes 22,581 bank-year observations (2,509 banks, 15 countries). Therefore, we have final sample of 21,501 bank-year observations (2,389 banks, 15 countries). Table 17 demonstrates all multiple years of limit changes and number of banks in each country.

Overview of mean differences of main outcome variables is shown in Table 18. Since there are some countries having multiple period of maximum coverage limit changes, we remove those countries out to be able to identify pre- and post-treatment period more clearly to compute those mean differences. We can see that the mean differences of Z-Score (log) both for first and second parts are negative while that of deposit share is positive. This results in insight that there is higher risk taking but higher potential to attract deposit too. Next section presents identification strategy to our difference-in-difference exercise to help clarify this mean difference better.

4 Identification Strategy

4.1 Part 1 - Cross Country Analysis

4.1.1 Effect of Deposit Insurance Implementation

We implement our empirical strategy by estimating the following regression:

$$Y_{ict} = \alpha_i + \alpha_c + \alpha_t + \beta_1 Post_{ct} + \beta_2 Treated_c + \beta_3 Post_{ct} Treated_c + \gamma X_{ict} + \epsilon_{ict} \quad (3)$$

where Y_{ict} is an outcome variable, including risk measure of bank i in country c in year t, such that i is bank from country with or without deposit insurance implemented. $Post_{ct}$ is a dummy variable equal 1 if country c with time t being from the year that deposit insurance was introduced onwards and equal 0 when t is before deposit insurance was introduced. $Treated$ is a dummy variable equal 1 if bank i is from country with deposit insurance and equal 0 if bank i is from country without deposit insurance. X_{ict} is a vector of variables that control for banks' characteristics. The variable $Post_{ct}Treated_c$ is the treatment-status dummy variable which is equal to 1 for banks residing in countries with deposit insurance implemented from the year of implementation onwards. Otherwise, it is equal to zero. The parameter β_3 captures the causal effect of deposit insurance implementation on the outcome variable Y_{ict}.

Bank i in country that already implemented deposit insurance is matched with bank j in countries that have not yet implemented deposit insurance with respect to credit rating before the year of implementation. The credit rating is the result of the interaction between bank's country credit rating and banking sector credit rating of its country. It is then categorized into non-investment grade (high risk group) for credit rating BB+ downward and investment-grade (low risk group) for credit rating BBB- upward. The objective to match banks subjecting to their credit ratings is to compare the effect of deposit insurance implementation on banks' outcome when they have similar risk level before the time of implementation. This is to avoid endogeneity problem when the decision to implement deposit insurance might be led by tendency towards risk before implementation. In the matching process, we also use bank size (log of total asset) and banks' specialization as the additional matching variables.

The outcome variable is a risk measurement called Z-score. It is calculated by the

formula

$$\text{Z-Score} = \frac{\text{Return on Asset (ROA)} + \text{Capital Asset Ratio (CAR)}}{\text{Standard Deviation of ROA}}, \tag{4}$$

where standard deviation of ROA is computed over the past 4 years. We use log of Z-score as in Anginer et al. (2014) since it is highly skewed.

In our regressions we control for bank's specialization (Saving, Commercial, Corporate, Islamic, Investment, Private, Real estate & Mortgage), log of asset to control for bank size, equity to asset ratio to control for leverage, and fee income (net-non-interest income to pre-taxed income ratio) to control for non-main-activity income.

4.1.2 Effects of Differences in Deposit Insurance Premium Method

In this section, we compare among all the countries that implement deposit insurance in the same year but with different premium methods. We check for the credit rating of those countries of the year before deposit insurance implementation and they all are from high-risk group. Thus, we implement our empirical strategy by estimating the following 3 regressions:

$$\begin{aligned} Y_{ict} =& \alpha_i + \alpha_t + \beta_1 \text{Post}_{ct} + \beta_2 (\text{Premium Method})_c \\ &+ \beta_3 (\text{Post}_{ct})(\text{Premium Method})_c \\ &+ \gamma X_{ict} + \epsilon_{ict} \end{aligned} \tag{5}$$

where Y_{ict} is an outcome variable, including risk and deposit measures of bank i in country c in year t, such that i is bank from country with deposit insurance implemented. Post_{ct} is a dummy variable equal 1 if country c with time t being from the year that deposit insurance was introduced onwards and equal 0 when t is before deposit insurance was introduced. Premium Method is categorical variable equal 0 if the country has flat rate premium method, equal 1 if it has differential premium method, and equal 2 if it has combination of both differential and flat rate premium method. The differential premium method is considered more stringent than flat rate since the premium will be calculated based on risk level of the banks. The regression output will present coefficients for interaction between Post_{ct} and each Premium Method by having flat rate as a base case. X_{ict} is a vector of variables that control for banks' characteristics. The parameter β_2 captures the causal effect of differences in deposit insurance premium method on the

outcome variable Y_{ict}.

$$\begin{aligned} Y_{ict} =& \alpha_i + \alpha_t + \beta_1 \text{Post}_{ct} + \beta_2 (\text{Premium Method = All Method except Flat Rate})_c \\ &+ \beta_3 (\text{Post}_{ct})(\text{Premium Method = All Method except Flat Rate})_c \\ &+ \gamma X_{ict} + \epsilon_{ict} \end{aligned} \tag{6}$$

where all variables are the same as in equation (5) except dummy variable Premium Method = All Method except Flat Rate. This equation estimates different effects between countries having two premium methods of differential and combination rate against flat rate as base case. It takes value 0 when country uses flat rate premium method and 1 for the rest of other premium method.

$$\begin{aligned} Y_{ict} =& \alpha_i + \alpha_t + \beta_1 \text{Post}_{ct} + \beta_2 (\text{Premium Method = Combination Rate})_c \\ &+ \beta_3 (\text{Post}_{ct})(\text{Premium Method = Combination Rate})_c \\ &+ \gamma X_{ict} + \epsilon_{ict} \end{aligned} \tag{7}$$

where all variables are the same as in equation (5) except dummy variable Premium Method = Combination Rate. This equation estimates different effects between countries having differential rate against flat rate premium method. It takes value 1 when country uses differential rate and 0 when country uses flat rate as premium method.

The outcome variable is a risk measurement called Z-score calculated the same as part 4.1.1 and deposit share measurement. Deposit share of each bank is calculated by the formula

$$\text{Deposit Share} = \frac{\text{Customer Deposit}}{\text{Country Total Customer Deposit}} \tag{8}$$

In our regressions we use same control variables as in equation (5).

4.1.3 Effects of Differences in Covered Products

We implement our empirical strategy by estimating the following regression:

$$\begin{aligned} Y_{ict} =& \alpha_i + \alpha_t + \beta_1 \text{Post}_{ct} + \beta_2 (\text{Total Covered Products})_c \\ &+ \beta_3 (\text{Post})_{ct} (\text{Total Covered Products})_c + \gamma X_{ict} + \epsilon_{ict} \end{aligned} \tag{9}$$

where Y_{ict} is an outcome variable, including risk and deposit measures of bank i in country c in year t, such that i is bank from country with deposit insurance implemented. $Post_{ct}$

is a dummy variable equal 1 if country c with time t being from the year that deposit insurance was introduced onwards and equal 0 when t is before deposit insurance was introduced. Total Covered Products is a continuous variable representing total amount of products that are covered by deposit insurance. The more products covered by deposit insurance reflects the less stringent of deposit insurance scheme of that country. X_{ict} is a vector of variables that control for banks' characteristics. The parameter β_2 captures the causal effect of differences in deposit insurance covered products on the outcome variable Y_{ict}.

The outcome variable is a risk measurement called Z-score and deposit share measurement calculated the same as part 4.1.2.

In our regressions we use same control variables as in equation (5).

4.1.4 Effects of Differences in Maximum Coverage Limit (per depositor per institution)

We implement our empirical strategy by estimating the following regression:

$$Y_{ict} = \alpha_i + \alpha_t + \beta_1 Post_{ct} + \beta_2 Limit_c + \beta_3 Post_{ct} Limit_c + \gamma X_{ict} + \epsilon_{ict} \tag{10}$$

where Y_{ict} is an outcome variable, including risk and deposit measures of bank i in country c in year t, such that i is bank from country with deposit insurance implemented. $Post_{ct}$ is a dummy variable equal 1 if country c with time t being from the year that deposit insurance was introduced onwards and equal 0 when t is before deposit insurance was introduced. Limit is a continuous variable of maximum coverage limit per depositor per institution of each country, normalized by deposit per person as described in section 3, equation (1). X_{ict} is a vector of variables that control for banks' characteristics. The parameter β_3 captures the causal effect of differences in maximum coverage limit on the outcome variable Y_{ict}.

The outcome variable is a risk measurement called Z-score and deposit share measurement calculated the same as part 4.1.2.

In our regressions we use same control variables as in equation (5).

4.1.5 Validity of Control Group: Parallel Trend

This section provides detail of how we disentangle the challenge in searching for a meaningful counterfactual group for the treated banks. In this part, we have the control

group by construction which is the bank from country that has not yet implemented deposit insurance.

We show parallel trend to analyzes the pre-trend of average of outcome variables separated between treated banks and untreated banks. The objective is to investigate whether risk and deposit measure of the two bank groups before deposit insurance implementation period exhibit parallel trends. Figure 4 shows the trends of outcome variables in each period with respect to the implementation period at 0 for Treated banks and Untreated banks. This parallel trend analysis uses the matched sample. We can see that there are parallel trends for each outcome variable between Treated banks and Untreated banks before time 0.

The key point to take away from this section is that Untreated banks are reasonable control group to investigate the effect of deposit insurance implementation on risks of Treated banks. Consequently, we could use Untreated banks as a control group in the identification strategy to investigate further the effect of deposit insurance implementation of Treated banks on their risks and competition.

4.2 Part 2 - Within Country Analysis

4.2.1 Effect of Changes in Deposit Insurance Limits (Latest Year)

We implement our empirical strategy in this section by estimating the following regressions, one with country and year fixed effect separately and another one with their interaction.

$$\begin{aligned} Y_{ict} =& \alpha_i + \alpha_c + \alpha_t + \beta_1 \text{Limit Changes}_c + \beta_2 \text{Non-Investment Grade}_i \\ &+ \beta_3 \text{Non-Investment Grade}_i \times \text{Limit Changes}_c + \gamma X_{ict} + \epsilon_{ict} \end{aligned} \tag{11}$$

$$\begin{aligned} Y_{ict} =& \alpha_i + \alpha_{ct} + \beta_1 \text{Limit Changes}_c + \beta_2 \text{Non-Investment Grade}_i \\ &+ \beta_3 \text{Non-Investment Grade}_i \times \text{Limit Changes}_c + \gamma X_{ict} + \epsilon_{ict} \end{aligned} \tag{12}$$

where Y_{ict} is an outcome variable, including risk and deposit measures of bank i in country c in year t, such that i is bank from country with maximum coverage limit changes. Limit Changes is a continuous variable measuring the difference of coverage limit between before and after changes. Non-Investment Grade is a dummy variable equal 1 if bank has credit rating from BB+ downward and equal 0 if bank has credit rating from BBB- upward. X_{ict} is a vector of variables that control for banks' characteristics. The variable

Non-Investment Grade$_i$ $\times$ Limit Changes$_c$ is the treatment-status dummy variable for non-investment grade banks in countries with deposit insurance coverage limit changed onward interacting with amount of limit changes. Otherwise, it is equal to zero. The parameter β_3 captures the causal effect of deposit insurance coverage limit changes on the outcome variable Y_{ict} for non-investment grade compared with investment-grade bank.

This part is to study the effect of coverage limit changes. However, some countries present multiple periods of changing (as shown in Table 17. We thus propose in this section to study only the latest change of each country. However, one might concern that the result on outcome variables might be contaminated by previous changes. In order to alleviate that problem, we create matched pair between non-investment grade and investment grade bank, both from the same country and different countries. The non-investment grade (high risk group) bank has credit rating from BB+ downward, whereas the investment grade (low risk group) bank has credit rating from BBB- upward. For each matched pair, we match them according to bank size and specialization. The objective to compare banks' behavior between non-investment and investment grade bank by matching banks subjecting to their size and specialization is to investigate whether and how mostly similar banks subjecting to their risk level, before the change, will behave differently as a result of changes in coverage limit, or not. This is to alleviate as much as possible the endogeneity problem when the decision to change coverage limit might be led by specific types or behavior of banks.

Since the levels of coverage limits in each country are different, we then normalize those value by the average deposit amount per person, as explained in section 3.2.

The outcome variable is a risk measurement called Z-score. It is calculated by the formula

$$\text{Z-Score} = \frac{\text{Return on Asset (ROA)} + \text{Capital Asset Ratio (CAR)}}{\text{Standard Deviation of ROA}}, \tag{13}$$

where ROA and CAR are of average over the past 2 years and standard deviation of ROA is calculated from the past 2 years as well. We use log of Z-score as in Anginer et al. (2014) since it is highly skewed.

Another outcome variable in interest to investigate ability to have access to deposit is a deposit measurement that is calculated by the formula

$$\text{Deposit Share} = \frac{\text{Customer Deposit}}{\text{Country Total Customer Deposit}}, \tag{14}$$

In our regressions we control for bank's specialization (Saving, Commercial, Corporate, Islamic, Investment, Private, Real estate & Mortgage), log of asset to control for bank size, equity to asset ratio to control for leverage, and fee income (net-non-interest income to pre-taxed income ratio) to control for non-main-activity income.

4.2.2 Effect of Changes in Deposit Insurance Limits including Multiple Treatment Periods)

We implement our empirical strategy in this section by estimating the following regressions, the difference is the separation and the interaction between country and year fixed effect:

$$\begin{aligned} Y_{ict} =& \alpha_i + \alpha_c + \delta_t Year_t + \beta_1 \text{Lagged Non-Investment Grade}_{it} + \beta_2 Change_{ct} \\ &+ \beta_3 \Big(\text{Lagged Non-Investment Grade}_{it} * Change_{ct} \Big) + \gamma X_{ict} + \epsilon_{ict} \end{aligned} \tag{15}$$

$$\begin{aligned} Y_{ict} =& \alpha_i + \alpha_{ct} + \beta_1 \text{Lagged Non-Investment Grade}_{it} \\ &+ \beta_2 \Big(\text{Lagged Non-Investment Grade}_{it} * Change_{ct} \Big) + \gamma X_{ict} + \epsilon_{ict} \end{aligned} \tag{16}$$

where Y_{ict} is an outcome variable, including risk and deposit measures of bank i in country c in year t, such that i is bank from country with maximum coverage limit changes. Limit Changes is a continuous variable measuring the difference of coverage limit between before and after changes. Lagged Non-Investment Grade is a dummy variable equal 1 if bank has credit rating from BB+ downward and equal 0 if bank has credit rating from BBB- upward, before the year of limit changes. X_{ict} is a vector of variables that control for banks' characteristics. The variable Lagged Non-Investment Grade$_{it}$ $\times$ Limit Changes$_{ct}$ is the treatment-status dummy variable for lagged non-investment grade banks residing in countries with deposit insurance coverage limit changed onward interacting with amount of limit changes. Otherwise, it is equal to zero. The parameter β_3 (equation 15) and β_2 (equation 10 16) capture the causal effect of deposit insurance coverage limit changes on the outcome variable Y_{ict} for non-investment grade compared with investment-grade bank.

This part is to study the effect of coverage limit changes. However, some countries present multiple periods of changing (as shown in Table 17). We thus propose in this section to include all periods of limit changes of each country. However, one might concern

that the result on outcome variables might be contaminated by previous changes. In order to alleviate that problem, we propose to control for lagged credit rating of the banks before the year of limit changes. The credit rating is categorized the same as section 4.2.1. The objective to control for lagged credit rating is to compare the effect of changes in coverage limit on banks' outcome when they have similar risk level before the time of changes. Moreover, even when we include multiple period of changes, the impact of previous changes that might remain until the next change could then be minimized by at least maintaining the same risk level of banks before the latter changes.

The outcome variable is a risk measurement called Z-score and deposit share. Z-Score is calculated by the formula

$$\text{Z-Score} = \frac{\text{Return on Asset (ROA)} + \text{Capital Asset Ratio (CAR)}}{\text{Standard Deviation of ROA}}, \tag{17}$$

where ROA and CAR are of average to the past 2 years and standard deviation of ROA is calculated to the past 2 years as well. Deposit share is calculated as the same as ones in section 4.2.1

In our regressions we control for bank's specialization (Saving, Commercial, Corporate, Islamic, Investment, Private, Real estate & Mortgage), log of asset to control for bank size, equity to asset ratio to control for leverage, and fee income (net-non-interest income to pre-taxed income ratio) to control for non-main-activity income.

4.2.3 Validity of Control Group: Parallel Trend

This section provides detail of how we disentangle the challenge in searching for a meaningful counterfactual group for the treated banks. In this part, we propose to refer investment grade bank as the control group since the changing in coverage limit should not have any effect on a healthier bank. We show parallel trend analysis as follows.

We analyzes the trend of average of outcome variables separated between non-investment grade and investment grade banks. The objective is to investigate whether risk and deposit measure of the two bank groups before deposit insurance coverage limit changes exhibit parallel trends. Figure 5 shows the trends of outcome variables in each period with respect to the implementation period at 0 for Investment grade and Non-Investment grade. This parallel trend analysis uses the matched sample of section 4.2.1. We can see that there are parallel trends for each outcome variable between non-investment grade

and investment grade banks before time 0.

Therefore, investment grade banks are reasonable control group to investigate the effect of deposit insurance coverage limit changes on risks and deposit measure of non-investment grade banks. Consequently, we could use investment grade banks as a control group in the identification strategy to investigate further the effect of deposit insurance coverage limit changes of non-investment grade banks on their risks and deposit.

5 Results

5.1 Result: Part 1 - Cross Country Analysis

This section shows the results of identification strategy defined in equation (3), (5), (6), (7), (9), and (10).

To begin with effect of deposit insurance implementation, Table 19 shows a significant negative effect of deposit insurance implementation of Treated banks on Z-score of 35.9%. This means that banks take more risk after their countries adopted deposit insurance (the lower Z-Score implied higher risk).

Secondly, to investigate the effect of different premium methods, Table 20 shows a significant positive effect of differential rate against flat rate on Z-Score of 35.8%. Next, Table 21 shows positive significant effect of all other premium methods against flat rate on Z-Score of 33.9%. Lastly, Table 22 shows a significant negative effect of combination rate against differential rate on Z-Score of 117.5%. In other word, we can see that; 1) when comparing between countries designated differential rate and flat rate premium method, banks tend to take less risk than when countries use flat rate, 2)banks tend to take less risk when countries deploys any other premium method then when countries choose to implement only flat rate method, and 3)banks tend to take less risk when countries use differential rate than when countries choose combination rate method. In summary, this could be due to differential rate premium method deploys deposit insurance premium based on bank's risk level. As a result, banks in countries that implement premium method that involves differential rate try to manage their risk to appropriate level concerning the possible deposit insurance premium they are subjected to be charged.

When looking at effect of premium method on deposit share, Table 23 shows significant positive effect of differential and combination rate, against flat rate, of 3.881 pp and 8.972 pp, respectively. We have that the magnitude of an increase in bank's deposit share

measured by bank customer deposit to country total customer deposit increase more with combination method than purely differential rate. This implies that when banks are with combination method, they could seek for customer deposit more than when they are with purely differential method.

Table 24 shows significant negative effect on Z-Score of 12.2% when there is higher amount of covered products. This means that when the scope of products is expanded, banks could take more variety of sources of fund, resulting in more risk reflecting from a reduction in Z-Score.

Table 25 and Table 26 show significant negative effect on Z-score of 15.2% and positive impact on bank deposit share of 0.6 pp when the maximum coverage limit is higher. This result is consistent with the other deposit insurance schemes, premium method, in the sense that the more generous deposit insurance schemes tend to lead the bank to take more risk, while on the other hand to be able to attract more deposit.

5.1.1 Robustness Test

This section provides robustness test of the impact of deposit insurance implementation when there are multiple treatment periods. We use doubly robust DiD estimator based on stabilized inverse probability weighting and ordinary least squares of *csdid* Stata package proposed by Callaway and Sant'Anna (2021) that deals with variation in treatment timing in the staggered DiD setups. Table 27 shows the consistent result, both in terms of sign and magnitude of coefficient, as the identification in section 4.1.1. The results show the significant negative effect of deposit insurance implementation on Z-Score [5]. of 34.2%.

5.2 Result: Part 2 - Within Country Analysis

5.2.1 Changes in Deposit Insurance Limits (Latest Year)

This section shows the results of identification strategy defined in equation (11) and (12).

Table 28 shows the significant negative effect of an increase in coverage limit changes

[5] Z-Score in this section is calculated from formula $\text{Z-Score} = \frac{\text{Return on Asset (ROA)+Capital Asset Ratio (CAR)}}{\text{Standard Deviation of ROA}}$ where standard deviation of ROA is computed over the whole sample period. The reason we use this formula is because csdid uses balanced panel data in computing the average treatment on treated (ATT) and to use the rolling standard deviation over the past 4 years led to losing a lot of observations

on Z-Score (3.7%) and Table 29 shows a significant positive effect of maximum coverage limit changes on bank's deposit share (0.003 bp) when the limit is increased by 1 unit for non-investment grade banks, compared with investment-grade banks. This implies that the higher risk banks take more risk and have more potential to attract customer deposit when the deposit insurance coverage limit is increased.

5.2.2 Changes in Deposit Insurance Limits, including Multiple Treatment Periods

This section shows the results of identification strategy defined in equation (15) and (16).

Table 30 shows the significant negative effect of an increase in maximum coverage limit on Z-Score (0.17%) and Table 31 shows a significant positive effect of an in crease in maximum coverage limit on banks' deposit share defined by bank's customer deposit to country's total customer deposit, (0.0027%) when the limit is increased by 1 unit for non-investment grade banks, compared with investment-grade banks. This implies that the higher risk banks take more risk and have more potential to attract customer deposit when the deposit insurance coverage limit is increased.

5.2.3 Robustness Test

This section provides robustness test of the results in section 4.2.1. One might concern that, even considering the latest year of limit changes when countries in the sample actually have multiple period of limit changes, this could contaminate the result since the pre-treatment of some year could mix with the post-treatment of the previous change.

To manage this, we provide additional investigation, considering only country that have single time change of maximum coverage limit in the sample period. Table 32 and 33 show consistent result that higher risk banks tend to take more risk and attract more customer deposit, representing by the significant negative impact of Z-Score (12.8%) and the significant positive effect of deposit share (0.003 pp).

6 Conclusion

This research aims at studying the effect of deposit insurance on bank risk and competition.

The cross country analysis in part 1 shows that Treated banks take more risk after having deposit insurance implemented. Moreover, banks in countries with more relaxing deposit insurance premium method, such as a combination of both flat and differential rate method instead of purely differential rate method, also take more risk. On the other hand, they could also be more relaxed so that they could increase potential to attract more customer deposit. To add to that, when analyzing the scope of products that are covered under deposit insurance, banks in countries that deposit insurance covers more types of products also take more risk and could attract more customer deposit. Lastly, when considering the maximum coverage limit (per depositor per institution) at the time of deposit insurance implementation, banks have tendency to take more risk while gain more deposit share when the countries have higher maximum coverage limit.

The within country analysis in part 2 aims at studying the effect of changes in maximum coverage limit (per depositor per institution) of deposit insurance system. The result shows that higher risk banks (non-investment grade banks) take more risk and could attract more customer deposit than lower risk banks (investment grade banks) when their countries increase the deposit insurance maximum coverage limit. These results are consistent when consider only latest year and multiple years of limit changes. The result is robust to when analyzing only countries that have one limit change during period of study. This is also consistent with the analysis in the generosity of deposit insurance schemes in part 1.

In conclusion, we can see that deposit insurance or more loosen deposit insurance schemes, even they contribute a higher risk taking, they also increase competition for adopted banks reflecting from an increase in their customer deposit. Additionally, the higher risk banks tend to take more risk while attract more customer deposit when countries increase maximum coverage limit of deposit insurance system, comparing with lower risk banks.

7 Figures and Tables

Table 1: List of Countries with Deposit Insurance Implementation year

Country	Implementation Year	Country	Implementation Year	Country	Implementation Year
UNITED STATES OF AMERICA	1933	BAHAMAS	1999	AFGHANISTAN	2009
GERMANY	1976	BULGARIA	1999	ECUADOR	2009
INDIA	1962	EL SALVADOR	1999	LIBYA	2010
PHILIPPINES	1963	ICELAND	1999	NEPAL	2010
CANADA	1967	KAZAKHSTAN	1999	SRI LANKA	2010
LEBANON	1967	LAO PEOPLE'S DEMOCRATIC REPUBLIC	1999	BAHRAIN	2011
FINLAND	1970	MEXICO	1999	BERMUDA	2011
JAPAN	1971	VIETNAM	1999	BRUNEI DARUSSALAM	2011
BELGIUM	1974	FRANCE	1999	CENTRAL AFRICAN REPUBLIC	2011
TURKEY	1983	JORDAN	2000	CHAD	2011
BANGLADESH	1984	UNITED KINGDOM	2000	DEMOCRATIC REPUBLIC OF CONGO	2011
COLOMBIA	1985	HONDURAS	2001	GABON	2011
KENYA	1985	LIECHTENSTEIN	2001	GUINEA	2011
CHILE	1986	NICARAGUA	2001	KOSOVO	2011
TRINIDAD AND TOBAGO	1986	SLOVENIA	2001	SAN MARINO	2011
DENMARK	1987	ALBANIA	2002	MACAO	2012
ITALY	1987	BOSNIA AND HERZEGOVINA	2002	ISLAMIC REPUBLIC OF IRAN	2013
PORTUGAL	1987	GUATEMALA	2002	MONGOLIA	2013
NIGERIA	1989	UZBEKISTAN	2002	PALESTINIAN TERRITORIES	2013
SERBIA	1989	ALGERIA	2003	BENIN	2014
PERU	1991	MALTA	2003	BURKINA FASO	2014
UNITED REPUBLIC OF TANZANIA	1991	PARAGUAY	2003	COTE D'IVOIRE	2014
HUNGARY	1993	ZIMBABWE	2003	GUINEA BISSAU	2014
CZECH REPUBLIC	1994	HONG KONG	2004	MALI	2014
UGANDA	1994	INDONESIA	2004	NIGER	2014
ARGENTINA	1995	MONTENEGRO	2004	SENEGAL	2014
BRAZIL	1995	REPUBLIC OF MOLDOVA	2004	TOGO	2014
CROATIA	1995	RUSSIAN FEDERATION	2004	NETHERLANDS	2015
GREECE	1995	TAJIKISTAN	2004	LUXEMBOURG	2015
IRELAND	1995	NORWAY	2004	MOROCCO	2015
OMAN	1995	ARMENIA	2005	GHANA	2016
POLAND	1995	MALAYSIA	2005	RWANDA	2016
REPUBLIC OF KOREA	1996	SWITZERLAND	2005	GEORGIA	2017
ROMANIA	1996	URUGUAY	2005	**Total 117 Countries**	
SUDAN	1996	SINGAPORE	2006		
SWEDEN	1996	AZERBAIJAN	2007		
LITHUANIA	1997	BARBADOS	2007		
MACEDONIA (FYROM)	1997	AUSTRALIA	2008		
ESTONIA	1998	BELARUS	2008		
GIBRALTAR	1998	KYRGYZSTAN	2008		
JAMAICA	1998	THAILAND	2008		
UKRAINE	1998	YEMEN	2008		

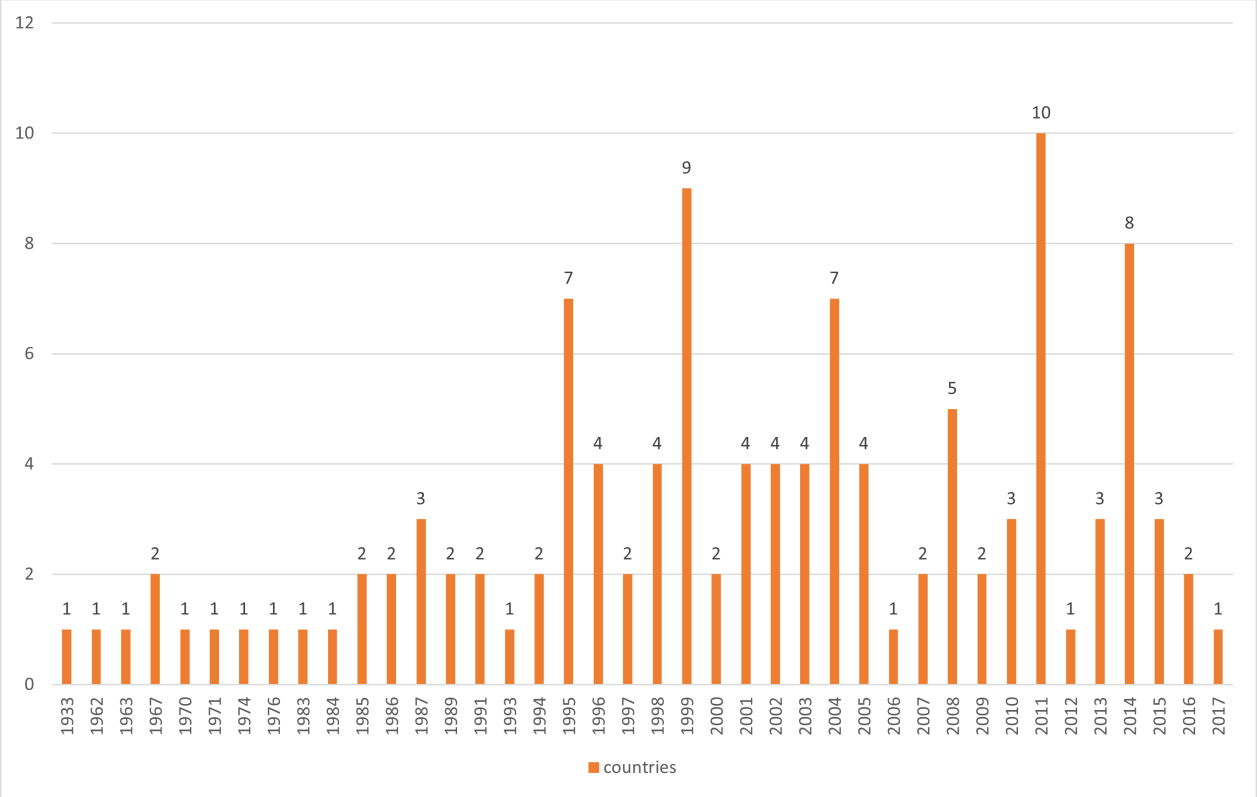

Figure 1: Number of Countries with Deposit Insurance Establishment, 1933 - 2017 (Incremental)

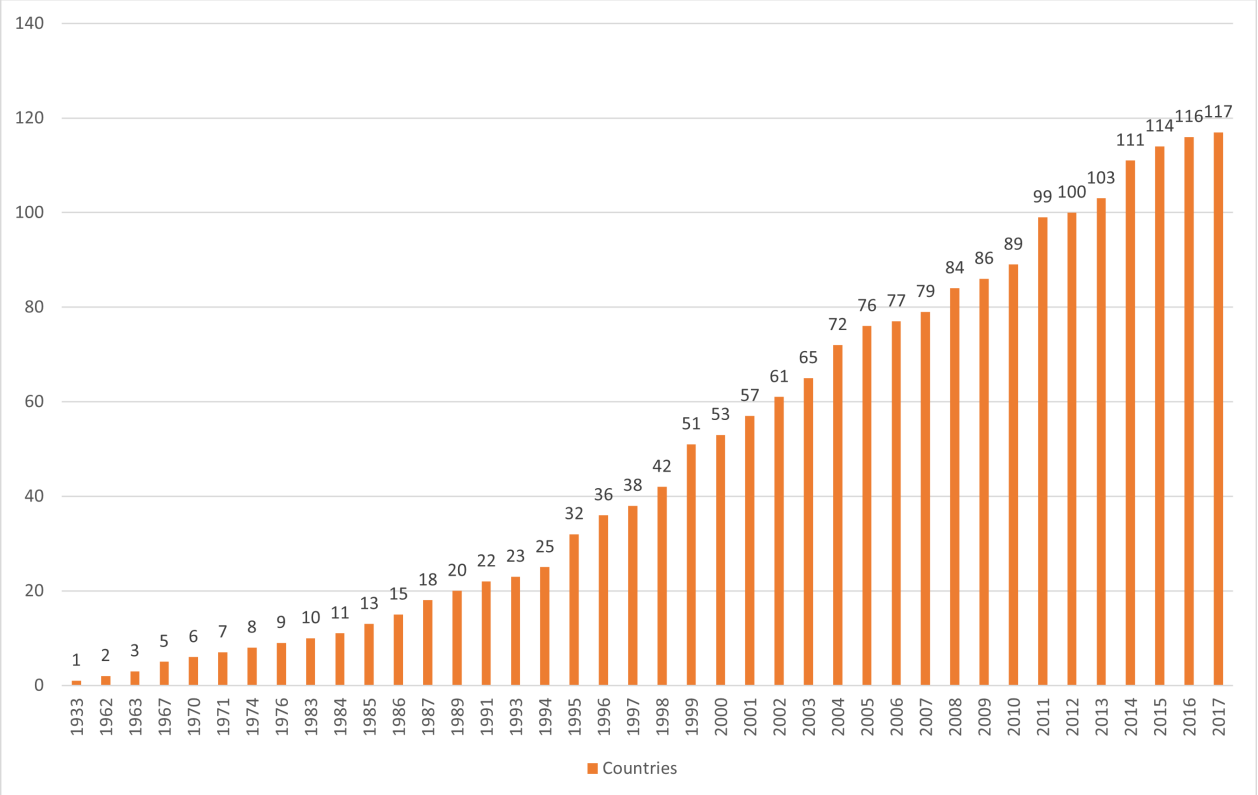

Figure 2: Number of Countries with Deposit Insurance Establishment, 1933 - 2017 (Accumulation)

Table 2: Types of Deposit Insurance Management

Management	No. of Countries	Percent
Government legislated and administered	82	70%
Government legislated and privately administered	19	16%
Privately established and administered	2	2%
Central bank administered	11	9%
Other	3	3%
Total	117	

Table 3: Types of Deposit Insurance System Mandate

System Mandate	No. of Countries	Percent
Pay-box	39	33%
Pay-box Plus	55	47%
Loss Minimizer	15	13%
Risk Minimizer	7	6%
Other	1	1%
Total	117	

Table 4: Types of Products Covered by Deposit Insurance

Product	Number of Countries
Savings Account	117
Checking Account	101
Foreign Currency Deposits	79
Certificates of Deposit	77
Other	32
Money Orders	19
Government Deposits	19
Travelers Checks	17
Certified Drafts of Checks	16
Inter-bank Deposits	9
Guaranteed Investment Certificate	8
Annuity Contracts	7

Table 5: Types of Deposit Insurance Premium Method

Premium Method	No. of Countries	Percent
Flat rate	58	50%
Differential rate	34	29%
A combination of both	21	18%
Other	4	3%
Total	**117**	

Table 6: Coverage Limit of Deposit Insurance (per depositor per instituion)

Country	Coverage Limit (USD)	Country	Coverage Limit (USD)	Country	Coverage Limit (USD)
THAILAND	456,660	MALAYSIA	61,782	GUINEA	9,158
UNITED STATES OF AMERICA	250,000	SERBIA	59,765	LIBYA	8,378
NORWAY	243,754	MONTENEGRO	58,248	MONGOLIA	8,240
AUSTRALIA	195,000	TRINIDAD AND TOBAGO	55,444	MOROCCO	8,000
INDONESIA	149,740	BAHRAIN	53,022	YEMEN	7,984
BELGIUM	120,482	OMAN	52,016	UKRAINE	7,126
SLOVENIA	120,482	BAHAMAS	50,000	KOSOVO	6,001
MEXICO	120,254	REPUBLIC OF KOREA	46,816	LAO PEOPLE'S DEMOCRATIC REPUBLIC	5,634
BULGARIA	120,186	URUGUAY	42,397	JAMAICA	4,800
MALTA	120,062	SINGAPORE	37,408	CHILE	4,738
CZECH REPUBLIC	120,020	BRUNEI DARUSSALAM	37,383	LEBANON	3,500
DENMARK	120,019	MACEDONIA (FYROM)	35,979	VIETNAM	3,309
ESTONIA	120,019	ECUADOR	32,000	KYRGYZSTAN	2,905
SAN MARINO	120,019	BOSNIA AND HERZEGOVINA	30,660	NEPAL	2,727
NETHERLANDS	120,019	PERU	30,092	GUATEMALA	2,723
GIBRALTAR	120,000	KAZAKHSTAN	30,091	BENIN	2,557
ITALY	119,990	ISLAMIC REPUBLIC OF IRAN	27,721	BURKINA FASO	2,557
PORTUGAL	119,933	PARAGUAY	27,383	COTE D'IVOIRE	2,557
GREECE	119,933	TURKEY	26,512	GUINEA BISSAU	2,557
LITHUANIA	119,933	BERMUDA	25,000	MALI	2,557
FINLAND	119,930	RUSSIAN FEDERATION	24,306	NIGER	2,557
HUNGARY	119,828	ARGENTINA	24,260	SENEGAL	2,557
POLAND	119,809	ALBANIA	22,502	TOGO	2,557
ROMANIA	119,740	ARMENIA	20,657	TAJIKISTAN	1,984
CROATIA	119,623	PALESTINIAN TERRITORIES	20,000	SRI LANKA	1,963
IRELAND	119,048	AZERBAIJAN	17,647	GEORGIA	1,928
FRANCE	119,048	ALGERIA	17,181	NIGERIA	1,637
LUXEMBOURG	116,158	COLOMBIA	16,756	INDIA	1,564
SWEDEN	115,401	BARBADOS	12,500	AFGHANISTAN	1,436
UNITED KINGDOM	114,865	EL SALVADOR	10,227	GHANA	1,389
LIECHTENSTEIN	100,000	PHILIPPINES	10,014	BANGLADESH	1,210
SWITZERLAND	100,000	NICARAGUA	10,000	ZIMBABWE	1,000
JAPAN	94,127	HONDURAS	9,633	KENYA	969
CANADA	79,713	CENTRAL AFRICAN REPUBLIC	9,158	UGANDA	822
BRAZIL	75,588	CHAD	9,158	UNITED REPUBLIC OF TANZANIA	669
JORDAN	70,522	DEMOCRATIC REPUBLIC OF CONGO	9,158	RWANDA	598
HONG KONG	63,988	GABON	9,158	REPUBLIC OF MOLDOVA	356
MACAO	62,098			Max	456,660
				Mean	54,653.83
				Median	26,947.50
				Min	356

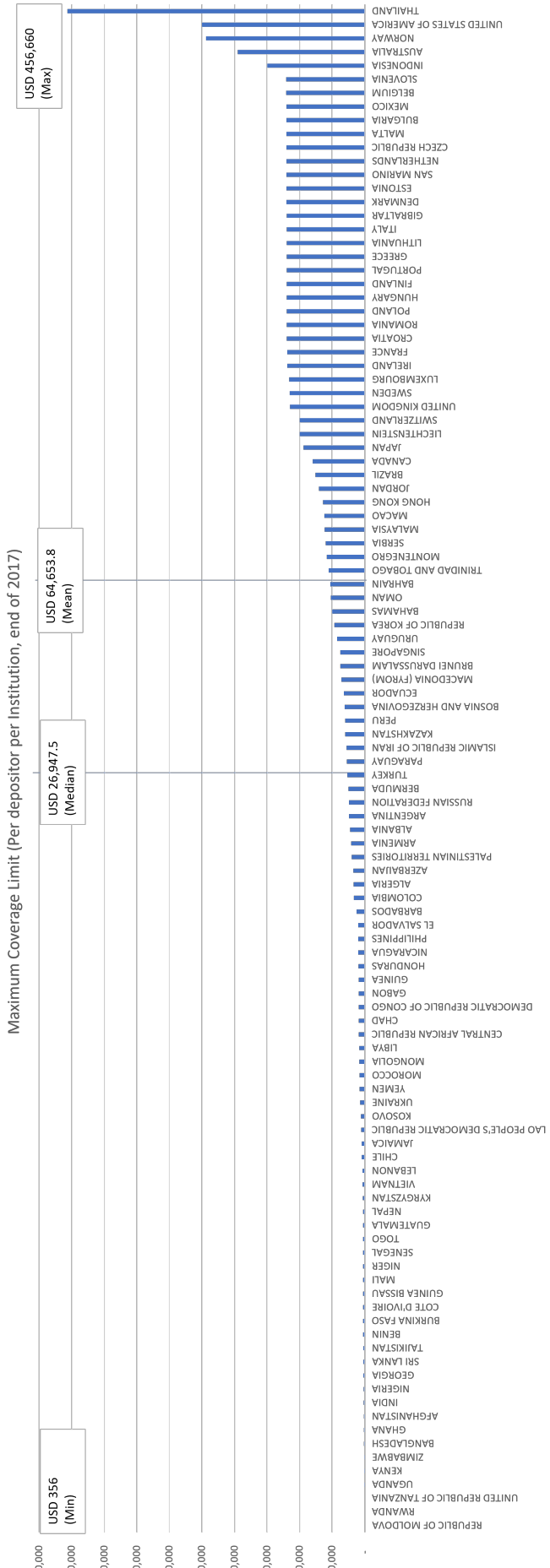

Figure 3: Coverage Limit of Deposit Insurance (per depositor per institution, 1933 - 2017)

Table 7: List of Countries with Maximum Coverage Limit Changes during 2011 -2017 and the Amount of Coverage Limit in each Year*

Country Name	Maximum Coverage Limit (per depositor per institution, local currency)								
	2010	**2011**	**2012**	**2013**	**2014**	**2015**	**2016**	**2017**	**2018**
ARGENTINA	30,000	120,000			350,000		450,000		
AUSTRALIA		995,465.85	249,735.2						
BAHRAIN	no dis**	20,000							
BRAZIL			70,000	250,000					
COLOMBIA		22,098,882	18,700,426	38,568,644	19,867,540	20,000,000			50,000,000
IRELAND	100,000	130,000		100,000					
KAZAKHSTAN					5,000,000	10,000,000			1,5000,000
LUXEMBOURG					no dis**	100,000			
MACAO		no dis**	500,000						
RUSSIAN FEDERATION				700,000	1,400,000				
TAIWAN	no limit***	2,999,999.7							
THAILAND	no limit***	50,000,000				25,000,000	15,000,000		10,000,000
TURKEY			50,000	100,000					
UKRAINE			150,000	200,000					
UNITED KINGDOM					85,000	75,000	85,000		

*The empty cell represents the same amount of maximum coverage limit as the previous year.
*no dis: There is no deposit insurance system established yet in that period.
***no limit: There is no maximum coverage limit of deposit insurance.

Table 8: List of Countries with Maximum Coverage Limit Changes during 2011 -2017 and the Normalized Amount of Changes in each Year

CountryName	Amount of Limit Changes in each Year (after normalization)								
	2010	**2011**	**2012**	**2013**	**2014**	**2015**	**2016**	**2017**	**2018**
ARGENTINA	0	1.116	0	0	-0.641	0	-0.772	0	0
AUSTRALIA	0	0	-24.093	0	0	0	0	0	0
BRAZIL	0	0	0	9.364	0	0	0	0	0
COLOMBIA	0	0	-1.168	2.140	-2.623	-0.235	0	0	0
GERMANY	0	0	0	0	0	-0.100	0	0	0
IRELAND	0	0.090	0	-0.217	0	0	0	0	0
LUXEMBOURG	0	0	0	0	0	0.851	0	0	0
MACAO	0	0	0.777	0	0	0	0	0	0
KAZAKHSTAN	0	0	0	0	0	0.769	0	0	0
RUSSIAN FEDERATION	0	0	0	0	1.641	0	0	0	0
THAILAND	0	-745.802	0	0	0	-173.012	-35.458	0	0
UNITED KINGDOM	0	0	0	0	0	-0.191	0.033	0	0
TURKEY	0	0	0	1.703	0	0	0	0	0
UKRAINE	0	0	0	1.423	0	0	0	0	0
TAIWAN	0	-994.558	0	0	0	0	0	0	0
BAHRAIN	0	2.153	0	0	0	0	0	0	0

Table 9: Excluded Banks not Covered by DIS of Each Country (No. of Banks)

Country Name	Specialisation							Total	Exclusion	Final Total
	Commercial banks	Cooperative banks	Investment banks	Islamic banks	Private banking/ Asset management companies	Real Estate & Mortgage banks	Savings banks			
BAHRAIN	8	0	5	5	0	1	0	19	6	13
BENIN	7	0	1	0	0	0	0	8	1	7
BERMUDA	2	0	0	0	0	0	0	2	0	2
BRUNEI DARUSSALAM	0	0	0	1	0	0	0	1		1
BURKINA FASO	8	0	0	0	0	0	0	8		8
COTE D'IVOIRE	15	0	0	0	0	0	0	15		15
GABON	1	0	0	0	0	0	0	1		1
GEORGIA	15	0	0	0	0	0	0	15		15
GHANA	20	0	4	0	0	1	4	29		29
GUINEA	2	0	0	0	0	0	0	2	0	2
GUINEA BISSAU	1	0	0	0	0	0	0	1		1
ISLAMIC REPUBLIC OF IRAN	0	0	0	23	0	0	0	23		23
KOSOVO	3	1	0	0	0	0	0	4		4
LUXEMBOURG	49	13	4	0	14	2	3	85	2	83
MACAO	1	0	0	0	0	0	0	1		1
MALI	10	0	0	0	0	0	0	10		10
MONGOLIA	5	0	0	0	0	0	0	5		5
MOROCCO	10	0	2	0	0	1	0	13	3	10
NIGER	7	0	0	0	0	0	0	7		7
PALESTINIAN TERRITORIES	3	0	1	2	0	0	0	6		6
RWANDA	8	0	0	0	0	0	0	8		8
SENEGAL	16	0	0	1	0	0	0	17		17
TOGO	6	0	0	0	0	0	0	6		6
Total	**197**	**14**	**17**	**32**	**14**	**5**	**7**	**286**	**12**	**274**

Table 10: Excluded Banks not Covered by DIS of Each Country (No. of Observations)

Country Name	Specialisation							Total	Exclusion	Final Total
	Commercial banks	Cooperative banks	Investment banks	Islamic banks	Private banking/ Asset management companies	Real Estate & Mortgage banks	Savings banks			
BAHRAIN	72	0	45	45	0	9	0	171	54	117
BENIN	63	0	9	0	0	0	0	72	9	63
BERMUDA	18	0	0	0	0	0	0	18	0	18
BRUNEI DARUSSALAM	0	0	0	9	0	0	0	9		9
BURKINA FASO	72	0	0	0	0	0	0	72		72
COTE D'IVOIRE	135	0	0	0	0	0	0	135		135
GABON	9	0	0	0	0	0	0	9		9
GEORGIA	135	0	0	0	0	0	0	135		135
GHANA	180	0	36	0	0	9	36	261		261
GUINEA	18	0	0	0	0	0	0	18	0	18
GUINEA BISSAU	9	0	0	0	0	0	0	9		9
ISLAMIC REPUBLIC OF IRAN	0	0	0	207	0	0	0	207		207
KOSOVO	27	9	0	0	0	0	0	36		36
LUXEMBOURG	441	117	36	0	126	18	27	765	18	747
MACAO	9	0	0	0	0	0	0	9		9
MALI	90	0	0	0	0	0	0	90		90
MONGOLIA	45	0	0	0	0	0	0	45		45
MOROCCO	90	0	18	0	0	9	0	117	27	90
NIGER	63	0	0	0	0	0	0	63		63
PALESTINIAN TERRITORIES	27	0	9	18	0	0	0	54		54
RWANDA	72	0	0	0	0	0	0	72		72
SENEGAL	144	0	0	9	0	0	0	153		153
TOGO	54	0	0	0	0	0	0	54		54
Total	**1,773**	**126**	**153**	**288**	**126**	**45**	**63**	**2,574**	**108**	**2,466**

Table 11: List of Countries with Deposit Insurance Implementation from 2011 -2017 and Number of Banks

Country Name	Implementation Year	No. of Banks
BAHRAIN	2011	13
BERMUDA	2011	2
BRUNEI DARUSSALAM	2011	1
GABON	2011	1
GUINEA	2011	2
KOSOVO	2011	4
MACAO	2012	1
ISLAMIC REPUBLIC OF IRAN	2013	23
MONGOLIA	2013	5
PALESTINIAN TERRITORIES	2013	6
BENIN	2014	7
BURKINA FASO	2014	8
COTE D'IVOIRE	2014	15
GUINEA BISSAU	2014	1
MALI	2014	10
NIGER	2014	7
SENEGAL	2014	17
TOGO	2014	6
LUXEMBOURG	2015	83
MOROCCO	2015	10
GHANA	2016	29
RWANDA	2016	8
GEORGIA	2017	15
Total		**274**

Table 12: Countries included in Cross-Country Analysis and Number of Banks

Country Name	Number of Banks	Country Name	Number of Banks
ANDORRA	3	LUXEMBOURG	83
ANGOLA	11	MACAO	1
AUSTRIA	51	MADAGASCAR	5
BAHRAIN	13	MALAWI	3
BELIZE	3	MALDIVES	1
BENIN	7	MALI	10
BERMUDA	2	MAURITANIA	6
BHUTAN	4	MAURITIUS	12
BOLIVIA	10	MONACO	9
BRUNEI DARUSSALAM	1	MONGOLIA	5
BURKINA FASO	8	MOROCCO	10
BURUNDI	3	MOZAMBIQUE	10
CAMBODIA	27	MYANMAR	5
CAMEROON	4	NAMIBIA	3
CAPE VERDE	4	NIGER	7
CAYMAN ISLANDS	2	PAKISTAN	19
CHINA	72	PALESTINIAN TERRITO..	6
COSTA RICA	16	PANAMA	43
COTE D'IVOIRE	15	PAPUA NEW GUINEA	1
CUBA	3	RWANDA	8
CURACAO	2	SAINT KITTS AND NEVIS	3
CYPRUS	18	SAINT LUCIA	3
DJIBOUTI	1	SAINT VINCENT AND T..	1
DOMINICA	1	SAO TOME AND PRINCIPE	1
DOMINICAN REPUBLIC	18	SAUDI ARABIA	9
EGYPT	18	SENEGAL	17
ETHIOPIA	9	SEYCHELLES	3
FEDERATED STATES OF..	1	SIERRA LEONE	2
FIJI	2	SINT MAARTEN	1
GABON	1	SLOVAKIA	5
GAMBIA	2	SOUTH AFRICA	14
GEORGIA	15	SPAIN	52
GHANA	29	SUPRANATIONAL	3
GRENADA	1	SURINAME	4
GUINEA	2	SWAZILAND	4
GUINEA BISSAU	1	SYRIAN ARAB REPUBLIC	12
GUYANA	5	TOGO	6
HAITI	7	TUNISIA	13
IRAQ	19	TURKMENISTAN	1
ISLAMIC REPUBLIC OF..	23	UNITED ARAB EMIRATES	19
KOSOVO	4	VANUATU	1
KUWAIT	17	VATICAN CITY STATE/..	1
LATVIA	13	VENEZUELA	13
LESOTHO	1	VIRGIN ISLANDS (BRI..	1
LIBERIA	1	ZAMBIA	10
		Total	916

Table 13: Mean Differences Overview: Cross Country Analysis

Variable	Pre-Treatment				Post-Treatment				DID	
	Untreated	Treated	Diff	P-value	Untreated	Treated	Diff	P-value	DID	P-value
Z-Score	1.484	1.621	0.138	0.312	0.920	0.674	-0.246	0.000	-0.383	0.000
Deposit Share	10.442	8.852	-1.590	0.095	7.386	9.240	1.854	0.001	3.444	0.118

Table 14: Excluded Banks not Covered by DIS of Each Country (No. of Banks)

Country Name	Specialisation							Total	Exclusion	Final Total
	Commercial banks	Cooperative banks	Investment banks	Islamic banks	Private banking/ Asset management companies	Real Estate & Mortgage banks	Savings banks			
ARGENTINA	52	4	2	0	0	0	1	59	2	57
AUSTRALIA	21	50	8	0	0	8	1	88		88
BAHRAIN	9	0	5	20	0	2	0	36	7	29
BRAZIL	121	1,008	44	0	0	6	1	1,180		1180
COLOMBIA	21	4	6	0	0	2	1	34		34
IRELAND	12	17	3	0	0	3	0	35	6	29
KAZAKHSTAN	27	0	2	0	0	2	2	33		33
LUXEMBOURG	50	13	7	0	14	2	3	89	2	87
MACAO	13	0	0	0	0	0	0	13		13
RUSSIAN FEDERATION	430	0	15	0	1	1	3	450	20	430
TAIWAN	38	1	17	0	0	0	1	57	17	40
THAILAND	24	0	8	1	2	0	1	36	10	26
TURKEY	41	2	6	5	1	1	0	56	8	48
UKRAINE	78	0	1	0	0	0	0	79	1	78
UNITED KINGDOM	117	2	63	6	26	47	3	264	47	217
Total	**1,054**	**1,101**	**187**	**32**	**44**	**74**	**17**	**2,509**	**120**	**2389**

Table 15: Excluded Banks not Covered by DIS of Each Country (No. of Observations)

Country Name	Specialisation							Total	Exclusion	Final Total
	Commercial banks	Cooperative banks	Investment banks	Islamic banks	Private banking/ Asset management companies	Real Estate & Mortgage banks	Savings banks			
ARGENTINA	468	36	18	0	0	0	9	531	18	513
AUSTRALIA	189	450	72	0	0	72	9	792		792
BAHRAIN	81	0	45	180	0	18	0	324	63	261
BRAZIL	1,089	9,072	396	0	0	54	9	10,620		10620
COLOMBIA	189	36	54	0	0	18	9	306		306
IRELAND	108	153	27	0	0	27	0	315	54	261
KAZAKHSTAN	243	0	18	0	0	18	18	297		297
LUXEMBOURG	450	117	63	0	126	18	27	801	18	783
MACAO	117	0	0	0	0	0	0	117		117
RUSSIAN FEDERATION	3,870	0	135	0	9	9	27	4,050	180	3870
TAIWAN	342	9	153	0	0	0	9	513	153	360
THAILAND	216	0	72	9	18	0	9	324	90	234
TURKEY	369	18	54	45	9	9	0	504	72	432
UKRAINE	702	0	9	0	0	0	0	711	9	702
UNITED KINGDOM	1,053	18	567	54	234	423	27	2,376	423	1953
Total	**9,486**	**9,909**	**1683**	**288**	**396**	**666**	**153**	**22,581**	**1080**	**21501**

Table 16: List of Countries with Maximum Coverage Limit Changes from 2011 -2017 (latest year) and Number of Banks

Country Name	Year of Limit Changes (Lastest)	Number of Banks
BAHRAIN	2011	25
TAIWAN	2011	37
AUSTRALIA	2012	55
MACAO	2012	12
BRAZIL	2013	178
IRELAND	2013	8
TURKEY	2013	45
UKRAINE	2013	71
RUSSIAN FEDERATION	2014	410
COLOMBIA	2015	30
KAZAKHSTAN	2015	31
LUXEMBOURG	2015	84
ARGENTINA	2016	53
THAILAND	2016	26
UNITED KINGDOM	2016	208
Total		1273

Table 17: List of Countries with Maximum Coverage Limit Changes from 2011 -2017 and Number of Banks

Country Name	Year of Limit Changes	Number of Banks
ARGENTINA	2011, 2014, 2016	57
AUSTRALIA	2012	88
BAHRAIN	2011	29
BRAZIL	2013	1,180
COLOMBIA	2012, 2013, 2014, 2015	34
IRELAND	2011, 2013	29
KAZAKHSTAN	2015	33
LUXEMBOURG	2014	87
MACAO	2012	13
RUSSIAN FEDERATION	2014	430
TAIWAN	2011	40
THAILAND	2011, 2015, 2016	26
TURKEY	2013	48
UKRAINE	2013	78
UNITED KINGDOM	2015, 2016	217
Total		**2,389**

Table 18: Mean Differences Overview: Within Country Analysis

Variable	Pre-Treatment				Post-Treatment				DID	
	Inv Grade	Non-Inv Grade	Diff	P-value	Inv Grade	Non-Inv Grade	Diff	P-value	DID	P-value
Z-Score (Part 1)	1.947	1.893	-0.053	0.837	1.742	1.409	-0.334	0.000	-0.280	0.000
Z-Score (Part 2)	1.742	1.554	-0.187	0.169	1.330	1.010	-0.321	0.000	-0.133	0.000
Deposit Share	4.234	1.263	-2.970	0.000	2.885	0.573	-2.312	0.000	0.659	0.000

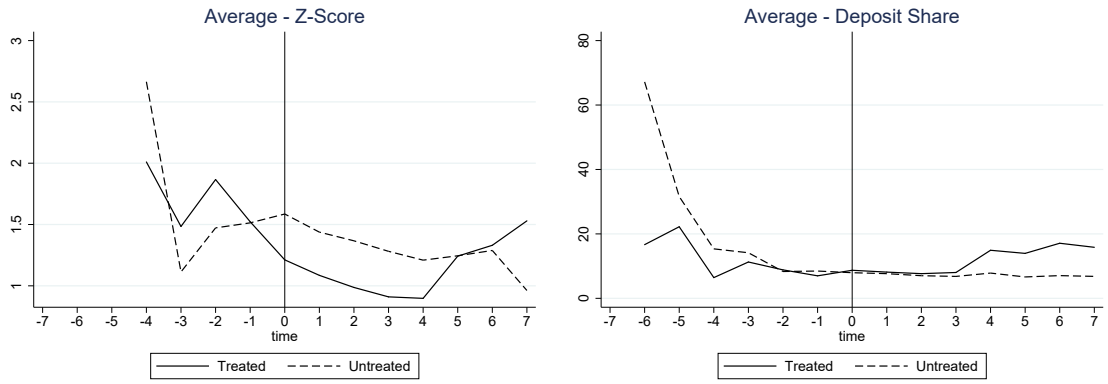

Figure 4: Validity of Control Group: Parallel Trend - Cross Country Analysis

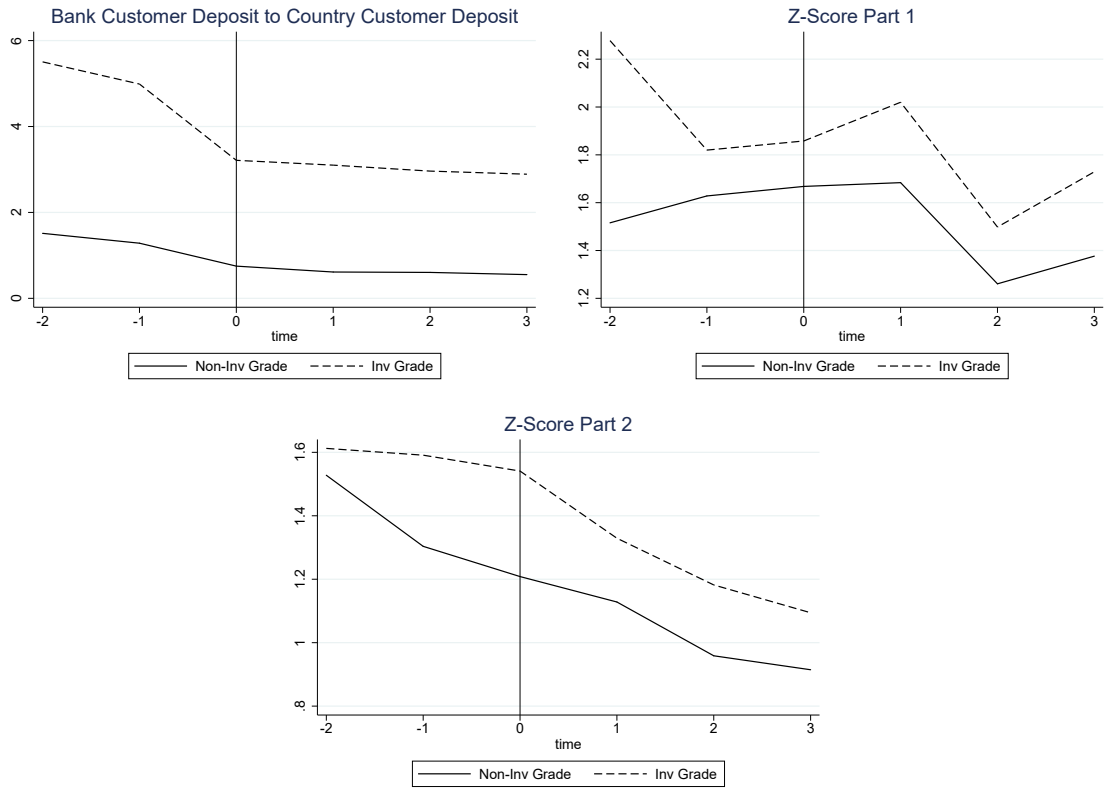

Figure 5: Validity of Control Group: Parallel Trend - Within Country Analysis

Table 19: Result: Effects of Deposit Insurance Implementation, Treated vs Untreated - Z-Score
This table presents difference-in-difference estimates of banks' Z-Score and a dummy variable (Treated x Post) that takes value 1 if it is post-treatment period and the bank resides in country that already implemented deposit insurance. The result in column one includes only bank fixed effect and column two includes bank and time fixed effect. Z-Score is calculated as $(ROA + CAR)/sd(ROA)$, where CAR is defined as (Total equity)/(Total asset), and sd(ROA) is standard deviation of ROA of each bank of the last 4 years. Robust standard errors clustered at the country level are reported in parentheses. ***, **, and * indicate statistical significance at the 1%, 5%,and 10% levels, respectively.

	(1)	(2)
	Z-Score	Z-Score
Treated x Post	-0.342**	-0.359*
	(0.171)	(0.183)
Total Asset	-0.001	0.182
	(0.160)	(0.125)
Equity/Asset	0.005	0.013
	(0.010)	(0.010)
Fee/Commission Income	0.118**	0.141***
	(0.049)	(0.044)
Bank FE	Yes	Yes
Time FE	No	Yes
Y-Mean	1.353	1.353
Adj. R^2	0.565	0.585
N	3334	3334

Table 20: Result: Effects of Differences in Deposit Insurance Premium Method - Z-Score
This table presents difference-in-difference estimates of banks' Z-Score and an interaction between, Post (that takes value 1 if it is post-treatment period) and Premium Method (that takes value 0 if country adopts flat rate, 1 when country adopts differential premium method, and 2 when premium method is combination between differential and flat rate). The based value for variable premium method is flat rate. Z-Score is calculated as $(ROA + CAR)/sd(ROA)$, where CAR is defined as totalequity/totalasset, and sd(ROA) is standard deviation of ROA of each bank for the last 4 years. The result in column one includes only bank fixed effect and column two includes bank and time fixed effect. Robust standard errors clustered at the country level are reported in parentheses. ***, **, and * indicate statistical significance at the 1%, 5%,and 10% levels, respectively.

	(1)	(2)
	Z-Score	Z-Score
Post x Differential Rate	0.222	0.358*
	(0.164)	(0.186)
Post x Combination of		
Flat and Differential Rate	-0.670***	-0.406
	(0.189)	(0.611)
Total Asset	0.362**	0.916**
	(0.160)	(0.363)
Equity/Asset	0.023	0.040*
	(0.019)	(0.021)
Fee/Commission Income	0.151	0.223*
	(0.108)	(0.109)
Bank FE	Yes	Yes
Time FE	No	Yes
Y-Mean	1.203	1.203
Adj. R^2	0.554	0.581
N	1045	1045

Table 21: Result: Effects of Differences in Deposit Insurance Premium Method (Not Flat Rate vs Flat Rate)- Z-Score
This table presents difference-in-difference estimates of banks' Z-Score and a dummy variable (Post x Premium Method) that takes value 1 if it is post-treatment period and the country has premium method that is not flat rate. The based value for variable premium method is flat rate. Z-Score is calculated as $(ROA + CAR)/sd(ROA)$, where CAR is defined as totalequity/totalasset, and sd(ROA) is standard deviation of ROA of each bank for the last 4 years. The result in column one includes only bank fixed effect and column two includes bank and time fixed effect. Robust standard errors clustered at the country level are reported in parentheses. ***, **, and * indicate statistical significance at the 1%, 5%,and 10% levels, respectively.

	(1)	(2)
	Z-Score	Z-Score
Post x Premium Method		
(Not Flat Rate vs Flat Rate)	0.206	0.339*
	(0.170)	(0.182)
Total Asset	0.391**	0.945**
	(0.152)	(0.359)
Equity/Asset	0.020	0.041*
	(0.017)	(0.021)
Fee/Commission Income	0.162	0.227**
	(0.098)	(0.107)
Bank FE	Yes	Yes
Time FE	No	Yes
Y-Mean	1.204	1.203
Adj. R^2	0.568	0.581
N	1104	1045

Table 22: Result: Effects of Differences in Deposit Insurance Premium Method (Combination Rate vs Differential Rate)- Z-Score
This table presents difference-in-difference estimates of banks' Z-Score and a dummy variable (Post x Premium Method) that takes value 1 if it is post-treatment period and the country has premium method that is combination rate. The sample includes only countries that have combination rate and differential rate as premium method. The based value for variable premium method is flat rate. Z-Score is calculated as $(ROA + CAR)/sd(ROA)$, where CAR is defined as totalequity/totalasset, and sd(ROA) is standard deviation of ROA of each bank for the last 4 years. The result in column one includes only bank fixed effect and column two includes bank and time fixed effect. Robust standard errors clustered at the country level are reported in parentheses. ***, **, and * indicate statistical significance at the 1%, 5%,and 10% levels, respectively.

	(1) Z-Score	(2) Z-Score
Post x Premium Method		
(Combination Rate vs Differential Rate)	-1.020***	-1.751**
	(0.090)	(0.347)
Total Asset	0.235*	0.723
	(0.087)	(0.554)
Equity/Asset	0.018	0.029
	(0.030)	(0.033)
Fee/Commission Income	0.057	0.123**
	(0.066)	(0.035)
Bank FE	Yes	Yes
Time FE	No	Yes
Y-Mean	1.125	1.125
Adj. R^2	0.464	0.502
N	469	469

Table 23: Result: Effects of Differences in Deposit Insurance Premium Method - Deposit Share
This table presents difference-in-difference estimates of banks' deposit share, defined as banks' customer deposit to its country's total customer deposit and an interaction between, Post (that takes value 1 if it is post-treatment period) and Premium Method (that takes value 0 if country adopts flat rate, 1 when country adopts differential premium method, and 2 when premium method is combination between differential and flat rate). The based value for variable premium method is flat rate. The result in column one includes only bank fixed effect, column two includes bank and country fixed effect, column three includes bank and time fixed effect, and the last column includes bank, country, and time fixed effect. Robust standard errors clustered at the country level are reported in parentheses. ***, **, and * indicate statistical significance at the 1%, 5%,and 10% levels, respectively.

	(1) Bank Customer Deposit to Country Customer Deposit	(2) Bank Customer Deposit to Country Customer Deposit
Post x Differential Rate	3.817***	3.881***
	(1.214)	(1.062)
Post x Combination of Flat & Differential Rate	0.620	8.972***
	(1.282)	(2.517)
Total Asset	0.947	2.441**
	(0.715)	(0.916)
Equity/Asset	0.006	0.055
	(0.030)	(0.041)
Fee/Commission Income	-0.073	0.004
	(0.520)	(0.458)
Bank FE	Yes	Yes
Time FE	No	Yes
Y-Mean	8.954	8.954
Adj. R^2	0.807	0.855
N	1623	1623

Table 24: Result: Effects of Differences in Amount of Covered Products- Z-Score
This table presents difference-in-difference estimates of banks' Z-Score and an interaction between dummy variable, Post (that takes value 1 if it is post-treatment period) and amount of covered products. Z-Score is calculated as $(ROA + CAR)/sd(ROA)$, where CAR is defined as totalequity/totalasset, and sd(ROA) is standard deviation of ROA of each bank for the last 4 years. The result in column one includes only bank fixed effect and column two includes bank and time fixed effect. Robust standard errors clustered at the country level are reported in parentheses. ***, **, and * indicate statistical significance at the 1%, 5%,and 10% levels, respectively.

	(1)	(2)
	Z-Score	Z-Score
Post x No. of Covered Products	-0.118***	-0.122***
	(0.042)	(0.046)
Total Asset	-0.004	0.179
	(0.161)	(0.124)
Equity/Asset	0.004	0.013
	(0.010)	(0.010)
Fee/Commission Income	0.118**	0.140***
	(0.049)	(0.045)
Bank FE	Yes	Yes
Time FE	No	Yes
Y-Mean	1.353	1.353
Adj. R^2	0.566	0.586
N	3334	3334

Table 25: Result: Effects of Differences in Maximum Coverage Limit (per depositor per institution) - Z-Score
This table presents difference-in-difference estimates of banks' Z-Score and an interaction between a dummy variable, Post (that takes value 1 if it is post-treatment period), and a continuous variable, Limit. Z-Score is calculated as $(ROA + CAR)/sd(ROA)$, where CAR is defined as totalequity/totalasset, and sd(ROA) is standard deviation of ROA of each bank throuout the whole sample period. The result in column one includes only bank fixed effect and column two includes bank and time fixed effect. Robust standard errors clustered at the country level are reported in parentheses. ***, **, and * indicate statistical significance at the 1%, 5%,and 10% levels, respectively.

	(1)	(2)
	Z-Score	Z-Score
Post x Limit	-0.147***	-0.152**
	(0.040)	(0.068)
Total Asset	0.282*	0.749**
	(0.145)	(0.317)
Equity/Asset	0.015	0.027
	(0.014)	(0.017)
Fee/Commission Income	0.189	0.258**
	(0.111)	(0.112)
Bank FE	Yes	Yes
Time FE	No	Yes
Y-Mean	1.216	1.216
Adj. R^2	0.568	0.592
N	1054	1054

Table 26: Result: Effects of Differences in Maximum Coverage Limit (per depositor per instituion) - Deposit Share
This table presents difference-in-difference estimates of banks' deposit share, defined as banks' customer deposit to its country's total customer deposit and an interaction between a dummy variable, Post (that takes value 1 if it is post-treatment period), and a continuous variable, Limit. The result in column one includes only bank fixed effect amd column two includes bank and time fixed effect. Robust standard errors clustered at the country level are reported in parentheses. ***, **, and * indicate statistical significance at the 1%, 5%,and 10% levels, respectively.

	(1) Bank Customer Deposit to Country Customer Deposit	(2) Bank Customer Deposit to Country Customer Deposit
Post x Limit	-0.490	0.624*
	(0.298)	(0.308)
Total Asset	0.597	1.919**
	(0.600)	(0.889)
Equity/Asset	-0.001	0.038
	(0.024)	(0.031)
Fee/Commission Income	0.031	0.074
	(0.562)	(0.488)
Bank FE	Yes	Yes
Time FE	No	Yes
Y-Mean	8.505	8.505
Adj. R^2	0.813	0.856
N	1627	1627

Table 27: Robustness Test - Doubly robust DiD estimator based on stabilized inverse probability weighting and ordinary least squares: Effects of Deposit Insurance Implementation, Treated vs Untreated - Z-Score

Difference-in-difference with Multiple Time Periods

Number of obs = 10,776
Outcome model : least squares
Treatment model: inverse probability
(Std. Err. adjusted for 89 clusters in country)

	Coef.	**Std. Err.**	**z**	**P>—z—**	**[95% Conf.**	**Interval]**
ATT	-0.342	0.181	-1.890	0.059	0.698	0.013

Control: Never Treated
See Callaway and Sant'Anna (2020) for details

Table 28: Result: Changes in Deposit Insurance Limits, Non-Investment Grade vs Investment Grade - Z-Score
This table presents difference-in-difference-in-difference estimates of banks' Z-Score and an interact between dummy variable, Non-Inv Grade (that takes value 1 if the bank has Non-Investment Grade before the year of limit changes) and Limit Changes. Z-Score is calculated as $(ROA + CAR)/sd(ROA)$, where ROA and CAR (Total Equity/Total Asset) are average over the past 2 year and sd(ROA) is standard deviation of ROA of each bank to the past 2 year. The sample includes only banks that are members of deposit insurance of each country. The result in column one includes only bank fixed effect and time dummies, column two includes bank fixed effect, time dummies and country fixed effect, and column three includes bank fixed effect and country-year fixed effect. Robust standard errors clustered at the country level are reported in parentheses. ***, **, and * indicate statistical significance at the 1%, 5%,and 10% levels, respectively.

	(1) Z-Score	(2) Z-Score	(3) Z-Score
Non-Inv Grade x Limit Changes	-0.032***	-0.032***	-0.037***
	(0.003)	(0.003)	(0.007)
Total Asset	0.386***	0.386***	0.404***
	(0.091)	(0.091)	(0.084)
Equity/Asset	0.011**	0.011**	0.012**
	(0.004)	(0.004)	(0.004)
Fee/Commission Income	0.113*	0.113*	0.115*
	(0.059)	(0.059)	(0.063)
Bank FE	Yes	Yes	Yes
Time Dummy	Yes	Yes	No
Country FE	No	Yes	No
Country-Year FE	No	No	Yes
Y-Mean	1.628	1.628	1.628
Adj. R^2	0.332	0.329	0.338
N	3735	3735	3732

Table 29: Result: Changes in Deposit Insurance Limits, Non-Investment Grade vs Investment Grade - Deposit Share
This table presents difference-in-difference estimates of banks' customer deposit to country customer deposit and an interact between dummy variable, Non-Inv Grade (that takes value 1 if the bank has Non-Investment Grade before the year of limit changes) and Limit Changes. The sample includes only banks that are members of deposit insurance of each country. The result in column one includes only bank fixed effect and time dummies, column two includes bank fixed effect, time dummies and country fixed effect, and column three includes bank fixed effect and country-year fixed effect. Robust standard errors clustered at the country level are reported in parentheses. ***, **, and * indicate statistical significance at the 1%, 5%,and 10% levels, respectively.

	(1) Bank Customer Deposit to Country Customer Deposit	(2) Bank Customer Deposit to Country Customer Deposit	(3) Bank Customer Deposit to Country Customer Deposit
Non-Inv Grade x Limit Changes	0.003***	0.003***	0.003***
	(0.000)	(0.000)	(0.000)
Total Asset	0.653**	0.653**	0.511**
	(0.301)	(0.301)	(0.207)
Equity/Asset	0.010	0.010	0.005
	(0.006)	(0.006)	(0.004)
Fee/Commission Income	-0.004	-0.004	-0.019
	(0.045)	(0.045)	(0.039)
Bank FE	Yes	Yes	Yes
Time Dummy	Yes	Yes	No
Country FE	No	Yes	No
Country-Year FE	No	No	Yes
Y-Mean	1.763	1.763	1.718
Adj. R^2	0.896	0.896	0.944
N	6513	6513	6510

Table 30: Result: Changes in Deposit Insurance Limits, including Multiple Treatment Periods, Non-Investment Grade vs Investment Grade - Z-Score

This table presents difference-in-difference estimates of Z-score and the interaction between a dummy variable, Lagged Non-Inv Grade (that takes value 1 if bank has Lagged Non-Investment Grade before the year of limit changes) and the level of limit changes. Z-Score is calculated as $(ROA + CAR)/sd(ROA)$, where ROA is average of ROA back to the past 2 years, CAR (Total Equity/Total Asset) is average of CAR back to the past 2 years, and sd(ROA) is standard deviation of ROA of each bank to the past 2 years. The sample includes only banks that are members of deposit insurance of each country. The result in column one includes only bank fixed effect and time dummies, column two includes bank fixed effect, time dummies and country fixed effect, and column three includes bank fixed effect and country-year fixed effect. Robust standard errors clustered at the country level are reported in parentheses. ***, **, and * indicate statistical significance at the 1%, 5%,and 10% levels, respectively.

	(1)	(2)	(3)
	Z-Score	Z-Score	Z-Score
Lagged Non-Inv Grade	-0.2037	-0.2037	-0.1975
	(0.1199)	(0.1199)	(0.1378)
Limit Changes	0.0016	0.0016	0.0000
	(0.0011)	(0.0011)	(.)
Lagged Non-Inv Grade x Limit Changes	-0.0020*	-0.0020*	-0.0017*
	(0.0011)	(0.0011)	(0.0009)
Total Asset	0.2708*	0.2708*	0.3793***
	(0.1445)	(0.1445)	(0.1234)
Equity/Asset	0.0166***	0.0166***	0.0193***
	(0.0045)	(0.0045)	(0.0047)
Fee/Commission Income	0.0643	0.0643	0.0831
	(0.0506)	(0.0506)	(0.0480)
Bank FE	Yes	Yes	Yes
Time Dummy	Yes	Yes	No
Country FE	No	Yes	No
Country-Year FE	No	No	Yes
Y-Mean	1.259	1.259	1.259
Adj. R^2	0.485	0.483	0.496
N	6563	6563	6560

Table 31: Result: Changes in Deposit Insurance Limits, including Multiple Treatment Periods, Non-Investment Grade vs Investment Grade - Deposit Share

This table presents difference-in-difference estimates of bank's deposit share, defined as banks' customer deposit to its country's total customer deposit, and the interaction between a dummy variable, Lagged Non-Inv Grade (that takes value 1 if bank has Lagged Non-Investment Grade before the year of limit changes) and the level of limit changes. The sample includes only banks that are members of deposit insurance of each country. The result in column one includes only bank fixed effect and time dummies, column two includes bank fixed effect, time dummies and country fixed effect, and column three includes bank fixed effect and country-year fixed effect. Robust standard errors clustered at the country level are reported in parentheses. ***, **, and * indicate statistical significance at the 1%, 5%,and 10% levels, respectively.

	(1) Bank Customer Deposit to Country Customer Deposit	(2) Bank Customer Deposit to Country Customer Deposit	(3) Bank Customer Deposit to Country Customer Deposit
Lagged Non-Inv Grade	-0.1898	-0.1898	0.0449
	(0.2134)	(0.2134)	(0.0981)
Limit Changes	-0.0022***	-0.0022***	0.0000
	(0.0006)	(0.0006)	(.)
Lagged Non-Inv Grade x Limit Changes	0.0027***	0.0027***	0.0026***
	(0.0001)	(0.0001)	(0.0002)
Total Asset	0.5167*	0.5167*	0.4025**
	(0.2447)	(0.2447)	(0.1531)
Equity/Asset	0.0040	0.0040	0.0015
	(0.0030)	(0.0030)	(0.0015)
Fee/Commission Income	-0.0206	-0.0206	-0.0048
	(0.0254)	(0.0254)	(0.0237)
Bank FE	Yes	Yes	Yes
Time Dummy	Yes	Yes	No
Country FE	No	Yes	No
Country-Year FE	No	No	Yes
Y-Mean	1.211	1.211	1.211
Adj. R^2	0.950	0.950	0.971
N	9339	9339	9339

Table 32: Robustness Test: Changes in Deposit Insurance Limits, Non-Investment Grade vs Investment Grade - Z-Score
This table presents difference-in-difference-in-difference estimates of banks' Z-Score and an interact between dummy variable, Non-Inv Grade (that takes value 1 if the bank has Non-Investment Grade before the year of limit changes) and Limit Changes. Z-Score is calculated as $(ROA + CAR)/sd(ROA)$, where ROA and CAR (Total Equity/Total Asset) are average over the past 2 year and sd(ROA) is standard deviation of ROA of over the past 2 year. The sample includes only countries that have only one time of maximum coverage limit change in the sample period. The sample also includes only banks that are members of deposit insurance of each country. The result in column one includes only bank fixed effect and time dummies, column two includes bank fixed effect, time dummies and country fixed effect, and column three includes bank fixed effect and country-year fixed effect. Robust standard errors clustered at the country level are reported in parentheses. ***, **, and * indicate statistical significance at the 1%, 5%,and 10% levels, respectively.

	(1) Z-Score	(2) Z-Score	(3) Z-Score
Non-Inv Grade x Limit Changes	-0.072**	-0.072**	-0.128**
	(0.025)	(0.025)	(0.041)
Total Asset	0.421**	0.421**	0.398**
	(0.138)	(0.138)	(0.124)
Equity/Asset	0.016***	0.016***	0.016***
	(0.005)	(0.005)	(0.005)
Fee/Commission Income	0.125***	0.125***	0.119**
	(0.038)	(0.038)	(0.043)
Bank FE	Yes	Yes	Yes
Time Dummy	Yes	Yes	No
Country FE	No	Yes	No
Country-Year FE	No	No	Yes
Y-Mean	1.592	1.592	1.592
Adj. R^2	0.349	0.346	0.356
N	2788	2788	2786

Table 33: Robustness Test: Changes in Deposit Insurance Limits, Non-Investment Grade vs Investment Grade - Deposit Share
This table presents difference-in-difference estimates of banks' customer deposit to country customer deposit and an interact between dummy variable, Non-Inv Grade (that takes value 1 if the bank has Non-Investment Grade before the year of limit changes) and Limit Changes. TThe sample includes only countries that have only one time of maximum coverage limit change in the sample period. The sample also includes only banks that are members of deposit insurance of each country. The result in column one includes only bank fixed effect and time dummies, column two includes bank fixed effect, time dummies and country fixed effect, and column three includes bank fixed effect and country-year fixed effect. Robust standard errors clustered at the country level are reported in parentheses. ***, **, and * indicate statistical significance at the 1%, 5%,and 10% levels, respectively.

	(1) Bank Customer Deposit to Country Customer Deposit	(2) Bank Customer Deposit to Country Customer Deposit	(3) Bank Customer Deposit to Country Customer Deposit
Non-Inv Grade x Limit Changes	0.003***	0.003***	0.003***
	(0.000)	(0.000)	(0.000)
Total Asset	0.607	0.607	0.486*
	(0.363)	(0.363)	(0.253)
Equity/Asset	0.006	0.006	0.002
	(0.004)	(0.004)	(0.002)
Fee/Commission Income	-0.047	-0.047	-0.047
	(0.043)	(0.043)	(0.046)
Bank FE	Yes	Yes	Yes
Time Dummy	Yes	Yes	No
Country FE	No	Yes	No
Country-Year FE	No	No	Yes
Y-Mean	1.480	1.480	1.441
Adj. R^2	0.922	0.922	0.955
N	5070	5070	5068

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