The Effects of Deposit Insurance Coverage on Depositors' Behavior in the European Union:

Evidence from the 2007-08 Financial Crisis

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Abstract

The global financial crisis of 2007-08 caused tremendous global financial problems. It did not take long before the financial turmoil reached Europe. The European Council acknowledged that adjustments in the deposit insurance schemes were necessary to prevent financial instability: the minimum deposit coverage for European countries was raised. The impact of this policy measure on the size of bank deposits in European countries is assessed in this paper. A higher level of bank deposits is assumed to be associated with a higher level of depositors' confidence. A sample of eight European countries (four northern European countries and four southern European countries) are examined from 2004-2012 by means of fixed-effects least squares dummy variable estimations. The methodology accounts for yearly and intra-country variations. A positive significant relationship between the heights of minimum deposit coverage on the amount of bank deposits is found: a higher level of minimum coverage comes with higher depositors' confidence. This confirms that the policy measures taken by the European Council in late-2008 had the desired effect: increasing depositors' confidence and consequently maintaining financial stability. Increasing the minimum deposit coverage is an effective policy measure for increasing depositors' confidence in turbulent times.

Keywords: deposit insurance, depositors' confidence, financial crisis, European Union

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1. Introduction

The 2007-08 financial crisis hit the global financial system and caused a lot of bankruptcies in financial institutions around the world. When housing prices in the United States declined in the late half of 2007, many financial institutions got into trouble because of the subprime mortgages they had been given out. These mortgages were profitable because of the ongoing increase in housing prices, but when this trend reversed and housing prices started to decline, a global financial catastrophe was born. Well-known financial institutions among whom Merrill Lynch, Lehman Brothers, AIG, Citigroup, and others got into trouble and either failed or received government support by the US Fed. The interconnectedness of financial institutions globally caused a quick spread of the troubles worldwide. It was not long before Europe suffered as well.

It did not take long before the global financial turmoil contaminated the European financial system. It is therefore that on October 15, 2008, in the light of the instability of the banking system, the European Council proposed an amendment to *directive 94/19/EC* on deposit insurance schemes with respect to coverage level and payout delay[1], which was approved by the parliament and council on December 18, 2008[2]. *Directive 94/19/EC* stems from 1994 when the European Council (EC) set up rules that all member states should guarantee a minimum of €20,000 worth deposits in case banks fail. The guarantee was put in place to protect depositors from bank failures, so that they do not lose (all) of their money in case of a bank failure.

In October 2008 the council acknowledged that the minimum deposit coverage was not changed since 1994 and that the 2007-08 financial crisis could have tremendous effects on depositors' confidence in the financial system. The EC reasoned that the minimum coverage of €20,000 did not correspond to the savings distribution of that time, since some depositors would not be protected by this minimum level. This might decrease depositors' confidence for those depositors. They also argued that the current payout delay of three months did not fit the needs and expectations of depositors. Therefore the EC proposed three measures: (a) an increase in the minimum coverage level, (b) a reduction in the payout delay to a maximum of

[1] Proposal for a Directive of the European Parliament and of the Council amending Directive 94/19/EC on Deposit Guarantee Schemes as regards the coverage level and the payout delay [2008].
[2] European Parliament legislative resolution on 18 December 2008 on the proposal for a directive of the European Parliament and of the Council amending Directive 94/19/EC on Deposit Guarantee Schemes as regards the coverage level and the payout delay [2010] OJ C 45E.

three days, and (c) the termination of co-insurance. The proposal was approved by the council in December 2008.

These measures were proposed to improve the safety-net that protects depositors from losing their money when bank failures arise. The increase in minimum coverage takes care of the fact that depositors will get (part) of their deposits back in case of a failure, the reduction in payout delay makes sure that depositors can quickly assess their deposits after a bank failure has taken place and the termination of co-insurance implies that depositors are no longer just partly insured. All three measures are proposed to increase depositor protection and analogously to increase depositors' confidence in the European financial system.

The European Union experienced a new obstacle when Greece admitted that its debts were amounting up to €300 billion, which was about 113% of GDP. This being almost twice the permitted 60% countries in the European Monetary Union were allowed to have. Other countries followed suit, and when in 2010 Spain, Portugal and Ireland were also coping with excessive debts, the European Sovereign Debt Crisis was born[3]. A distinction between the southern European countries experiencing much difficulties and the northern European countries capable of confining their problems arose. Many policy initiatives followed from this point in time. When in June 2012 European leaders agreed that deeper economic and monetary integration was needed for the development of the European Union, this helped pave the way for the proposal of the European Banking Union in September 2012[4].

The main goal of the European Banking Union is to have one single banking supervision mechanism, which is important because of the interconnectedness among Europe's financial systems. The proposed measures include a new supervisory framework, bank recapitalization, a single European recovery and resolution framework, a single rule book for the banking sector, and more protection for bank depositors. The proposal specifies that bank deposits are still guaranteed up to €100,000, but that there should be faster pay-outs and an improved financing infrastructure of deposit insurance schemes.

It would be interesting to see whether the 2008 EC policy initiative had the effect it aimed for. So whether the increase in minimum deposit coverage in the countries of the EU increased depositors' confidence. This is specifically interesting because the development of a European Banking Union is an ongoing process at moment of writing (mid-2014) and insights on past

[3] A more extensive timeline can be found at (BBC News, 2012).
[4] European Commission Memo/12/256 (10 September 2012). Towards a Banking Union.

deposit insurance measures can help shape better future policies. The EC only sets a minimum required deposit insurance, which implies that countries can choose to set a higher minimum coverage. Belgium, Greece and Spain practiced a minimum coverage of €20,000 pre-2008, while the Netherlands and France held on to a minimum coverage worth €40,000 and €70,000 respectively.[5] Therefore it would be interesting to determine whether differences in deposit insurance policies across Europe can account for the differences in depositors' behavior, and specifically between the northern and southern European countries. The main question to be answered is: *Does the increase in minimum deposit coverage cause an increase in bank deposits in Europe for the period 2004-2012?*

The expectation is that in the presence of a financial crisis, the higher the minimum deposit coverage, the higher depositors' confidence and simultaneously their deposits stored at financial intermediaries. At the same time a decrease in minimum deposit coverage would imply less depositors' confidence, leading to a decrease in the deposits stored at financial intermediaries. Supposedly bank stability is higher in northern European countries as compared to Europe's south. This implies that depositors' confidence, and at the same time, bank deposits stored at financial intermediaries in northern European countries must be higher.

The introduction is followed by an overview of the pros and cons of deposit insurance, thereafter past empirical evidence is discussed. The sample, data, and fixed effects/least squares dummy variable methodology are introduced in the next section. The paper proceeds with the empirical analysis and continues with a discussion and concluding remarks.

[5] An overview of the required minimum coverage and the minimum deposit coverage in European countries (pre-, mid-, and post-crisis) is provided in appendix A, graph 1, 2, 3 and 4.

2. Literature review: the pros and cons of deposit insurance

2.1 Protecting depositors and minimizing systemic risk

The free-banking era in the United States is studied by Rolnick and Weber (1986), which is a period in US history in which there was almost no banking regulation. This period of 'free banking'[6] is characterized by bank panics, bank failures, and depositors losing the full value of their deposits. In the period ranging from 1838 to 1863 there were 709 unregulated banks in New York, Indiana, Wisconsin and Minnesota. The authors find that of these unregulated banks, 339 were closed after a few years and 104 failed to repay all liabilities. Asymmetric information about bank assets in general led to contagion in the banking system, and thus to increased systemic risk.

Rolnick (1993) argues that the National Banking Act of 1863 was a first move to increase the stability of the banking system in the United States. The Great Depression of the 1930s led to the development of the Federal Deposit Insurance Corporation (FDIC) in 1934. After the establishment of the FDIC there was a shift in depositors from uninsured to insured banks. Eventually this resulted in 50 bank failures in the first five years after the FDIC was developed, and this number shrank to 17 banks per year in the five years thereafter. Deposit insurance brought stability to the banking system and ended the period of banking panics in the United States.

The idea that deposit insurance brings bank stability is supported by the following model. Diamond and Dybvig (1983) state that depositors hurry to withdraw their deposits during a bank run, because they expect the bank to fail. They set up a model which explains the dynamics of the relationship between deposit insurance and bank runs. The model contains many identical agents who live for three periods $T = \{0, 1, 2\}$. Each agent makes the decision to either store or invest one unit of endowment in period 0. Type 1 agents are forced to withdraw in period 1 and receive one unit of endowment. Type 2 agents withdraw in period 2 and receive R units of endowment, with $R > 1$. Each agent learns his type in period 1, so that no agent knows in advance whether funds are required or not in period 1. Two assumptions are that a demand-deposit contract is created for type 1 agents to insure them against being a type-1 agent and the bank is subject to a sequential service constraint. The model shows that for period 1, the withdrawals per agent are 1 up to the point that bank reserves are exhausted.

[6] The era of free-banking lasted from 1837 to 1863.

For period 2, depositors who did not withdraw in period 1 will receive R or 0, which depends on whether the reserves of the bank are exhausted or not. Diamond and Dybvig (1983) conclude that there are two equilibria, the first one in which type-1 agents withdraw in period 1 and type-2 agents withdraw in period 2. The other one being that all agents withdraw in period 1: the bank is subject to a bank run. The authors argue that suspension of convertibility[7] or installing deposit insurance are possible solutions for impeding bank runs. They show that in the presence of deposit insurance no type-2 agent will withdraw in period 1, which implies that no bank runs will occur.

This model shows that deposit insurance is a good way of preventing bank runs, and so does the historical evidence provided by Rolnick and Weber (1986) and Rolnick (1993), and the study of Bhattacharya, Boot and Thakor (1998). Bryant (1980) reasons that, in the absence of deposit insurance, asymmetric information and risky assets are deemed necessary for bank runs to occur. He argues that a general degree of uncertainty exists among depositors. Depositors have to be confident enough to trust the bank with their deposits. If this confidence is hampered (which can happen for many reasons), depositors will be alarmed and start withdraw their deposits which eventually can lead to a bank run. Deposit insurance deals with this kind of uncertainty.

An antagonist of the view that deposit insurance helps preventing bank runs is Dowd (1993). He argues that laissez-faire would provide banks with the proper incentives to solve the problem of bank runs themselves. Deposit insurance would provide the wrong incentives and weaken the banking system. The fact that deposit insurance might provide the wrong incentives is endorsed by Bhattacharya, Boot and Thakor (1998). They argue that the advantage of full deposit insurance is that bank runs are eliminated. However, a disadvantage is the moral hazard problem. Since depositors will no longer run the bank once uncertainty around the bank's operations arises, banks are inclined to get involved in excessive risk taking. The dynamics of the relationship between deposit insurance and the moral hazard of banks is developed in the next section.

2.2 Banking, deposit insurance, and moral hazard

Banks have a distinct role within an economy, as units can store their surpluses at a financial intermediary who can simultaneously use these surpluses to finance units in deficit. Credit risk and the risk of delayed payments are the most significant risks a financial intermediary is

[7] Suspension of convertibility being preventing the withdrawal of deposits (Matthews & Thompson, 2005).

exposed to. If the borrowers are not able to repay the loan, intermediaries might get into trouble in sufficing their own liabilities (i.e. the deposits). Banks can maintain a nearly riskless loan portfolio by diversifying a large number of loans, which minimizes their credit risks (Matthews & Thompson, 2005).

These bank dynamics are shown in the Diamond (1996) model of delegated monitoring. Consider a bank providing one loan for the funding of one project. The bank raises capital from depositors in order to fund the investment. Suppose that the borrower can only repay the borrowed amount plus interest if the project turns out to be successful. The probability of success equals 0.8. The bank must suffice its liabilities to the depositors and otherwise faces a default. The bank can only pay back the depositors if the borrower repays the loan. The probability of the bank being able to settle its liabilities equals 0.8 and the bank's probability of default equals 0.2. Now consider a model in which a bank provides two loans for the funding of two different projects. Again, the borrower can only repay if the project is successful and the probabilities of success equal 0.8 for both projects. The bank is able to suffice its liabilities if at least one of the projects turns out to be successful. The probability that the bank is able to repay the depositors now equals 0.96, which corresponds to the bank's probability of default of 0.04. This example shows that diversification clearly decreases credit risks, which is beneficial to banks.

When making decisions about the kind of projects to finance, the bank regards the probability of its own ability to pay back depositors. However, the stakes change when deposit insurance enters the story. Deposit insurance takes away some the losses associated with failing investments as "lost" deposits are refunded by the government. This may increase the tendency of banks to choose more risky projects to invest in, since banks do not bear all losses when projects fail. They do collect the gains when projects are fortunate. Therefore it is argued that deposit insurance increases the moral hazard of banks.

This idea is formalized in the following simple example. Assume that there are two types of projects: a high-risk high-return project which gives α with probability θ and 0 with probability $(1-\theta)$, and a low-risk low-return project that gives β with probability γ and 0 with probability $(1-\gamma)$. Note that $\alpha > \beta > 0$ and $\gamma > \theta$. The value of the interest rates plus deposits is equal to ρ. The bank has to choose in which project to invest. Now suppose that there is no deposit insurance installed, which implies that the bank has to repay deposits if the project in which it invests succeeds or fails. This implies that in order for the bank to choose the safer low-risk low-return project $\gamma > \theta\alpha / \beta$ is needed. If instead you suppose that deposit insurance is installed, in order for the bank to choose the safer project $\gamma > \theta (\alpha-\rho) / (\beta-\rho)$ is needed.[8] This confirms that if deposit insurance is installed, γ must be larger to let the banker choose the safe project. Analogously we can infer that the probability that the bank chooses the risky project increases, which assents the moral hazard problem.

This finding that deposit insurance creates moral hazard is confirmed by Dowd (1993), and Bhattacharya, Boot and Thakor (1998). The latter argue the moral hazard problem exists in two forms. On the one hand, banks are more inclined to take on risky investments, and on the other hand banks tend to hold on to fewer reserves when they are backed by deposit insurance. Both forms of moral hazard will eventually increase the taxpayers' burden.

Rolnick (1993) states that depositors do not worry about the riskiness of the bank's portfolio anymore once they are insured. Banks will now benefit from risk-taking as they do not have to compensate the depositors fully for the risks they are taking, which means that the interest rates on deposits will be lower. He shows that this induces risk-neutral bankers to take on excessive risks. Suppose that Mr. Smith opens a bank (Smith National Bank) with $100,000 worth savings. He attracts $900,000 worth deposits and with a total of $1,000,000 in reserves he heads to Las Vegas and plays roulette. He bets $900,000 on black and his own $100,000 on red. This might seem like a very risky investment from the banks' point of view, although it is considered to be safe for Mr. Smith. If he loses, Smith National Bank will go bust, and the deposits are refunded by the FDIC. He will however still have the $100,000 win from his bet and he ends up with $200,000. If the wheel turns to black gains are even bigger. This example clearly shows that it is perfectly rational for banks to take on excessive risks in case deposit insurance is installed.

Policy reforms with respect to deposit insurance have been examined as well. Risk-based deposit insurance premiums to limit moral hazard problems are proposed by Diamond and Dybvig (1986), Bhattacharya, Boot and Thakor (1998), and Hellmann, Murdock and Stiglitz (2000). Though the latter add that implementing this in practice would be a challenge for policy-makers. A model on risk-sensitive deposit insurance premiums is developed by Chan, Greenbaum and Thakor (1992).

Diamond and Dybvig (1986) discuss other policy reforms with respect to the moral hazard of banks. They state that limiting deposit insurance, as to impose more market discipline on banks, is a bad policy as it will not significantly affect bank behavior. A possible side-effect

[8] Extensive calculations of this example can be found in appendix B.

of limiting deposit insurance is decreasing bank stability. They propose that limiting the ability of banks to fund risky operations by insured deposits is an effective policy measure.

2.3 Empirics on deposit insurance

2.3.1 Deposit insurance, market discipline, and bank stability

The theoretical foundations of deposit insurance are backed by empirical research. Market discipline is a common indicator used for assessing the impact of deposit insurance policies. In case deposit insurance is installed, market discipline tends to decrease as depositors do no longer bear the losses in case banks fail. This implies that market discipline must be high in absence of deposit insurance.

The relationship between deposit insurance and market discipline is investigated in the paper by Demirgüç-Kunt and Huizinga (2004). Cross-country evidence for the fact that deposit insurance reduces required interest rates by depositors is provided. Thus, deposit insurance decreases market discipline imposed by depositors on the risk-taking of banks. This confirms the claim of Rolnick (1993) that if deposit insurance is installed, banks do not have to compensate depositors fully for the risks they are taking, which enhances the moral hazard.

Cubillas, Fonseca and González (2012) evaluate the effects of banking crises on market discipline. The period ranging from 1989 to 2007 is studied using data on an international sample of banks from the Bankscope database. They conclude that banking crises tend to decline market discipline, and that the installment of a deposit insurance system has a negative impact on market discipline. Martinez-Peria and Schmukler (2001) examine the relationships between market discipline and banking crises. They focus on Argentina, Chile, and Mexico during the 1980s and the 1990s. They investigate whether bank characteristics explain the behavior of deposits and interest rates. The authors find that market discipline is present in the three countries under investigation as deposit growth declines as risk taking increases. They also find that the interest rate must increase if risk-taking by banks increases.

The effect of deposit insurance schemes on bank stability in different countries has also been examined before. One main reason for implementing deposit insurance schemes is that bank stability is enhanced as depositors are less likely to run the bank in case of uncertainty (Diamond & Dybvig, 1983). Another effect of deposit insurance is that the banks' moral hazard increases if deposit insurance is installed. Demirgüç-Kunt and Detragiache (2002) find evidence for 61 countries (from 1980 to 1997) that deposit insurance increases the likelihood of a banking crisis, which is evidence for the fact that banks take on more excessive risks when deposit insurance is installed. The negative effect between deposit insurance and bank stability is stronger the more extensive the coverage of the deposit insurance system. Thus, the moral hazard problem gets more severe if the minimum deposit coverage increases.

Anginer, Demirgüç-Kunt and Zhu (2014) acknowledge the relationship in an economic boom found by the former article, but want to check the effects of deposit insurance on bank stability in crisis times. They study the relationship between deposit insurance and bank stability during the latest financial crisis and the years preceding the crisis. They find that countries with a deposit insurance scheme installed had a more stable banking system during the crisis. Although deposit insurance induces moral hazard in economic booms, it does have a stabilizing effect during an economic crisis. When looking at the overall picture, the negative effect during booms outweighs the positive effects in crisis periods. Though the authors argue that if regulators supervise the deposit insurance system well during economic booms, the negative effect can be diminished.

2.3.2 Changes in minimum deposit coverage

We have seen what happens to the behavior of banks and depositors in the presence of deposit insurance. It is interesting however, to assess the effects of a change in the minimum deposit coverage on depositors' and banks' behavior.

Tsuru (2003) studies market discipline by depositors in Japan, just before a change in the minimum deposit coverage occurred. In April 2002 government decided to abolish the full coverage of deposits. The new guarantee is on time deposits, foreign-currency deposits and certificates of deposits and covers up to ¥10 million in principal plus interest. Japan has known a banking environment in which bank failures became a more realistic issue ever since the mid-1990s. It is therefore that Tsuru expects that depositors start to behave more selectively with respect to their deposits before the implementation of the new minimum deposit coverage. Tsuru (2003) studies a sample of 120 Japanese banks during the period ranging from March 1999 to March 2002. He performs regression analysis on year-on-year growth in deposits with banks' asset risks, liquidity risks, bank profitability, and a proxy for bank size as independent variables. He finds that the asset risk factor and proxy for bank size are significant: the asset risk factor negatively affects deposit growth and the proxy for bank size positively affects deposit growth. Concluding, Japanese depositors tend to consider asset risks when deciding where to store their deposits, at the same time depositors prefer larger banks over the smaller ones in the light of the upcoming decrease in deposit insurance coverage.

A study on the increase of minimum deposit coverage in the recent crisis is done by Prean and Stix (2011). The effect of the increase in minimum deposit coverage in October 2008 on Croatian deposits is studied using household-level survey data. They employ a binary probit model to assess the impact of the change. The results indicate that after controlling for socio-demographic variables, trust in the safety of deposits increased after the implementation of the new minimum coverage. This shows that the change in Croatian minimum deposit coverage was successful at increasing depositors' confidence.

The regulatory changes implemented during the 1997/1998 Indonesian crisis are investigated by Hadad et al. (2011). The Indonesian government imposed a blanket guarantee scheme (BGS) for domestic banks to increase confidence in the financial system. This was the first time an explicit deposit insurance scheme was introduced in Indonesia. A sample of 104 banks in the period ranging from 1995 to 2009 are studied using the Generalized Methods of Moments (GMM) method. Evidence for more market discipline is found as higher liquidity risks and default risks come with higher interest rates. When assessing the impact of the BGS on market discipline, evidence is found that the implementation of BGS led to lower interest rates on deposits. This confirms the notion that deposit insurance leads to less market discipline if the guarantee is perceived as credible.

2.4 Discussion of the literature

The preceding literature overview distinguishes two main effects of deposit insurance. Firstly the moral hazard by banks: losses are minimized which makes risk-taking more rewarding (Rolnick, 1993; Dowd, 1993; Bhattacharya, Boot, & Thakor, 1998). Secondly it protects depositors from losing their money, and subsequently raises depositor' confidence and minimizes bank runs (Diamond & Dybvig, 1983; Bhattacharya, Boot, & Thakor, 1998; Rolnick & Weber, 1986).

The goal of this paper is to examine the effects of the increases in minimum deposit coverage on bank deposits in the European Union from 2004 to 2012. The policy measures were put in place to secure deposits stored at financial institutions, increase depositors' confidence, and decrease bank runs. Diamond and Dybvig (1983) confirm that deposit insurance increases depositors' confidence and leads to less bank runs. Prean and Stix (2011) find that depositors' confidence increased in Croatia as an effect of the increase in minimum deposit coverage during the latest financial crisis. The latter article suggests that after the increase in minimum deposit coverage took place, depositors' confidence increased in Croatia. This relationship is predicted to hold for all European countries, because Croatia is a European country.

A side-effect of deposit insurance is that it leads to increased risk-taking by banks. This effect is confirmed empirically by Demirgüç-Kunt and Detragiache (2002). They find that risk-taking by banks increases in economic booms. Also, higher levels of minimum deposit coverage are associated with increased risk-taking. Thus: deposit insurance leads to more bank instability in economic booms through the banks' moral hazard.

Anginer, Demirgüç-Kunt and Zhu (2014) study the effect of deposit insurance on bank stability during the latest financial crisis. They show a stabilizing effect of deposit insurance in times of crisis. Thus: the stabilizing effect of deposit insurance outweighs the destabilizing moral hazard in times of crisis. This paper studies the period ranging from 2004-2012. The global financial crisis hit the financial system in late-2007. It is therefore that the stabilizing effect of deposit insurance shown by Anginer, Demirgüç-Kunt, and Zhu (2014) is expected to outrule the effects discussed by Demirgüç-Kunt & Detragiache (2002).

This study tries to establish relationships between the level of minimum deposit coverage and bank deposits, and thus considers the time period before and after the changes in minimum coverage were implemented. A hypothesis can be developed based on the discussed literature. The studied period is subject to a financial crisis, leading to the conclusion that the stabilizing effect of deposit insurance outrules the destabilizing effect. The prediction is that the increase in minimum deposit coverage will increase depositors' confidence, and simultaneously bank deposits.

3. Methodology and data

3.1 Sample

Europe consists of 28 countries with different backgrounds. To study the impact of the changes in minimum deposit coverage on bank deposits eight countries will be included in the investigation. A selection of four "northern" European countries (Belgium, France, Germany, and the Netherlands) and four "southern" European countries (Greece, Italy, Portugal, and Spain) is made. These countries are selected because the countries in the European Union are diverse in demographics, cultures, and most importantly economic aspects. These differences have become more apparent during the 2007-08 financial crisis: a split between northern European countries carrying minor credit risks and southern European countries carrying much credit risks developed (Greenspan, 2011).

Among the eight countries under investigation five are the founding members that initiated the European Coal and Steel Community in 1952[9]. Greece joined the European Community in 1981 and Portugal and Spain were accessed in 1986. All eight countries were already part of the European Community when the Maastricht Treaty was signed in 1993 which led to the creation of the European Union. Besides that, all eight countries have the Euro as their currency (Baldwin & Wyplosz, 2012). The eight countries can be considered as the original founders of the European Union. Therefore the countries included in this examination are considered as a representative sample of the EU.

The legally required minimum deposit coverage changed in Europe during the 2007-08 financial crisis. The minimum required deposit coverage was €20,000 as specified in *directive 94/19/EC*. *Directive 2009/14/EC*[10] states that minimum coverage should be extended to €50,000 by March 2009 and €100,000 by the 31st of December 2011. The times at which the countries effectively adjusted their minimum deposit coverage differ across Europe. An overview of the respective changes from 2008 to 2012 can be found in appendix C table 1. Co-insurance will be disregarded from this analysis. The European Council only specifies the minimum deposit coverage, which means that countries can guarantee deposits up to a higher amount if they want to.

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[9] The six founding members of the European Coal and Steel Community (ECSC) are Belgium, France, Italy, the Netherlands, Luxembourg and West-Germany.

[10] Directive 2009/14/EC of the European Parliament and the Council amending directive 94/19/EC on deposit-guarantee schemes as regards the coverage level and the payout delay [2009].

3.2 Variables

Tsuru (2003), and Martinez-Peria and Schmukler (2001) study the effect of deposit insurance on the behavior of depositors by looking at the effects of bank characteristics on deposit growth. This study aims to find the impact of the changes in minimum coverage on bank deposits and considers depositors' behavior before, during, and after the changes. Explanatory variables explaining the state of the deposit insurance schemes in the different countries are included. The bank characteristic variables are included in this analysis to control for risk-taking and to see whether the results found for Europe correspond to earlier findings. The bank characteristic variables are based on the variables used in Tsuru (2003).

3.2.1 Dependent variable and explanatory variables

The dependent variable is deposits. The Bankscope variable *customer deposits – savings (CDS)* will be used as a proxy for depositors' behavior. This variable represents most closely what is to be measured in this paper: total deposits stored at financial intermediaries. An increase in deposits will proxy an increase in depositors' confidence in the banking sector, a decrease is equivalent to a decrease in depositors' confidence.

Three explanatory variables explaining the effect of the different deposit insurance schemes are added. A *dummy for required insurance (INS)* is included to assess the effects of the required minimum coverage on depositors in Europe. This is €20,000 for the time-period ranging from 2004 to 2008, €50,000 from 2009 to 2011 and €100,000 from 2012 onwards. The dummy takes on value 0 in the years 2004-2008, 1 from 2009-2011 and 2 in 2012. The required insurance dummy is expected to positively affect bank deposits: a higher required minimum coverage increases depositors' confidence in the banking sector.

The respective levels of minimum deposit coverage in the eight countries are added in the *minimum coverage (COV)* variable. This variable presents the minimum deposit coverage per country per year. The minimum deposit coverage variable differs from the required insurance dummy as the times at which the countries effectively adjusted their minimum coverage varies. It is predicted that an increase in minimum coverage will increase depositors' confidence: thus a positive effect on bank deposits.

Finally, the *normalized coverage (NCOV)* variable is included. The minimum coverage levels are normalized with respect to the required minimum deposit coverage.[11] This creates an

[11] This implies that if the required minimum coverage is €20,000 and the country has a minimum deposit coverage equal to €70,000, the normalized coverage is €50,000.

opportunity to see whether deviations from the required minimum coverage level affect the behavior of the depositor. Supposedly the higher the (positive) deviation from the minimum coverage, the greater depositors' confidence and similarly deposits.

The hypothesized effects of the explanatory variables on the dependent variable can be assessed in table 1.

Explanatory variables	**Hypothesized effect on dependent variable: deposits**
Required insurance dummy (INS)	+
Minimum coverage (COV)	+
Normalized coverage (NCOV)	+

Table 1. Hypothesized effects of the explanatory variables on the dependent variable.

3.2.2 Control variables

The effect of minimum deposit coverage on bank deposits is filtered by the use of different control variables. The bank characteristic variables used in Tsuru's study (2003) are included to assess the effects of bank characteristics on deposits. These variables originate from the Bankscope database. The Standard and Poor's (S&P) sovereign rating is another included control variable.

The asset risk factor is a proxy for the health of the banks' balance sheets. Three measures are used to quantify the asset risk factor. The first measure is the capital-asset ratio, which shows the percentage of the assets backed up by the banks' capital. The second measure is the ratio of loans to total assets. Loans might carry more risk than assets do, since borrowers can default. The third measure for quantifying the asset risk factor is the ratio of non-performing loans to total loans. Non-performing loans are in default or close to default so this measure quantifies the effective loan default risk a bank is exposed to.

The banks' asset risk factor is expected to have a negative effect on deposit growth. As bank risk exposure increases, depositors' confidence will decline leading to a decrease in bank deposits. The Bankscope database presents limited information on the non-performing loan ratio and capital-asset ratio, it is therefore that these proxies are disregarded for the determination of the asset risk factor. The *ratio of loans to total assets (LTA)* is used to represent the asset risk factor. This can be done without losing much of the study's validity, since the sample used in this paper (5,971 banks) is large in comparison to the smaller sample

(120 banks) used by Tsuru (2003). The asset risk factor is expected to negatively affect deposits: the more risky the banks' assets, the less depositors' confidence and the lower bank deposits.

Another included control variable is the liquidity risk factor which measures the liquidity of the specific bank. This variable is measured by the *ratio of cash and deposits (due to other banks) to total assets (CASHTA)*. This is not the best indicator as it partly represents the liquidity of banks (short term loans to other banks). It is used in this analysis because it is the best indicator of liquidity found in the Bankscope database. The liquidity risk factor is expected to have a positive effect on deposits, because if banks have access to more liquid assets depositors' confidence will rise. Thus an increase in the liquidity risk factor leads to an increase in bank deposits.

The next control variable is bank profitability, measured by the *return on average assets* (*ROAA*). The return on assets is supposed to affect deposit growth positively, as depositors might prefer storing their deposits at a bank that has proven to be profitable. An increase in the profitability of the bank would lead to an increase in bank deposits.

A control variable correcting for bank size is added. The expectation is that depositors prefer storing their deposits at a larger bank, such that there is a positive relationship between the size of the bank and bank deposits. The *logarithm of total assets (LNTA)* is taken as a proxy for bank size.

Since it might be the case that the bank indicators are not known to depositors another control variable, that might be more familiar to depositors, is added. The (long term outlook) *Standard and Poor's (S&P) sovereign rating (SPR)* is used to express the risk a country is exposed to (Standard & Poor's Rating Services, 2014). Changes in the S&P sovereign rating are announced on the news, which is why it is considered as a good indicator of the economy's state known to the depositor. As obviously the S&P sovereign rating is not a perfect indicator of the depositors' confidence, it does provide us with more insights on the state of the economy in a country known to the depositor.

The S&P sovereign rating ranges from D to AAA: from countries facing the threat of default to countries perfectly able to suffice their liabilities (Standard & Poor's Global Credit Portal, 2012). It contains ten categories. Those categories are made more precise with the notion of minuses and plusses, to more reliably assess the riskiness of a country. The ratings are quantified by means of the ten categories, with a score of 1 given to countries in state D and score 10 given to countries in state AAA. The minuses and plusses are integrated in a subtraction or addition of 0.25, so that the true riskiness of the country is cherished. A higher score on the S&P rating scale corresponds to a less risky banking environment. The prediction is that the higher the S&P sovereign rating, the higher depositors' confidence and simultaneously bank deposits.

The hypothesized effects of the control variables on the dependent variable are summarized in table 2.

Control variables	Hypothesized effect on dependent variable: deposits
Asset risk factor (LTA)	-
Liquidity risk factor (CASHTA)	+
Bank profitability (ROAA)	+
Proxy for bank size (LNTA)	+
S&P sovereign rating (SPR)	+

Table 2. Hypothesized effects of the control variables on the dependent variable.

3.3 Data and methodology

Bank-level panel data on 5,971 banks in Belgium, France, Germany, Greece, Italy, Netherlands, Spain and Portugal is retrieved from Bankscope, which is a dataset containing annual report data on banks worldwide (in $). Yearly data is gathered for the period 2004 to 2012 to assess the real impact of the changes in minimum deposit coverage and different deposit insurance schemes on depositors across Europe. The information on the development of the required coverage in Europe and the countries' deposit insurance guarantees are retrieved from different sources including Schich (2009), the European Commission (2010), and the websites of the eight countries' national deposit insurance agencies.

There were a lot of missing observations present for several variables in the Bankscope dataset, especially with regard to the dependent variable: bank deposits. Therefore all banks with missing observations or value zero for deposits are deleted from the sample. Banks that do not have deposits on their balance sheet are not affected by changes in minimum deposit coverage and probably serve another part of the market (i.e. investment banks). This is confirmed by a quick scan of the data. Since this paper solely investigates the effects of deposit insurance on depositor behavior it makes sense to leave out banks serving other purposes. The sample decreases from 34,439 observations to 19,291 observations and the bank sample of 5,971 banks shrinks to 3,791 banks. The missing data percentages decreased for every variable.[12] The sample adjustment is not likely to affect the validity of the study much, because the sample is still large. The number of observations and number of banks differ per country (i.e. Germany has more observations than Greece).[13] Overall, the sample is assumed to be a representative sample of the European Union.

The descriptive statistics are provided in appendix D, table 4. The descriptives for deposits show that the mean is relatively low compared to the maximum value. This indicates that there are outliers in this variable. These outliers should not be deleted as the values might be unusual but not impossible. The asset risk factor descriptives (loans to total assets ratio) show that the banks in the sample approximately have a ratio of loans to total assets equal to 0.6. The liquidity risk factor shows a rather low mean value. This is not surprising, because the proxy for measuring the liquidity risk factor is not perfect and only represents part of liquidity. The indicator for bank profitability has a large standard deviation as compared to the mean, which follows from relatively large differences in the minimum and maximum value of return on average assets. The bank size proxy seems close to normally distributed, which makes sense since the log of total assets was taken to measure bank size (logarithmic transformed variables tend to approach the normal distribution).

The S&P rating descriptives show that relatively a lot of observations are associated with high country ratings (the mean is 9.8, which is high as compared to a maximum of 10). This is probably due to a relatively high number of observations stemming from Germany (Germany has an AAA rating for all sampled years). The minimum coverage variable shows that the mean coverage across all observations is equal to approximately €50,000. The mean of the normalized coverage variable across all observations is equal to approximately €15,000. The numbers of the required insurance dummy indicate that the mean is slightly larger than 0.5. This seems logical as the dummy only takes on value 2 in 2012 and the data ranges from 2004 to 2012. Relatively a lot of observations have a dummy with value 0 and 1, which explains why the mean is close to 0.5.

[12] Appendix D contains a table with the missing observations per variable both before (table 1) and after (table 2) the sample adjustment.

[13] An overview of the number of observations and banks per country available in the dataset is given in appendix D, table 3.

The impact of the different deposit insurance schemes on depositors' behavior during the 2007-08 financial crisis is studied by fixed effects models. Fixed effects models control for individual heterogeneity, by capturing are all individual-specific and time-invariant characteristics between units in the intercept (Carter Hill, Griffiths, & Lim, 2012). Year-fixed effects models are used in this study, to control for yearly variations. This is important due to the financial turmoil during the studied time period. The OECD based indicators for the Euro Area for the period following the peak and the trough show that Europe was in a recession[14] from April 2008 to June 2009 and from July 2011 to February 2013 (FRED Economic Data , n.d.). The financial turmoil is assumed to negatively affect deposit growth, since depositors' confidence is likely to decrease during a financial crisis. A year-fixed effects model corrects for these yearly variations, and allows for drawing more reliable conclusions on the studied time period.

Since year-fixed effects are used there is no control for cross-country heterogeneity. The European countries are diverse in many ways which makes it important to distinguish country-specific effects. Country-fixed effects were considered as well, but these models only control for inter-country variations and not for yearly variations. To control for both yearly and country variations a fixed effects least squares dummy variable (LSDV) method is used. This method estimates coefficients for every country so that all individual heterogeneity is captured in a country-specific intercept (Carter Hill, Griffiths, & Lim, 2012). This implies that both yearly and cross-country variations are taken into account when applying LSDV. Additionally, the intra-country differences become visible, which provide us with more information than the inter-country differences would. The data is processed using Stata 13.

The prediction is that the country-specific intercepts of southern European countries are lower than those of the northern European countries: lower financial stability in EU's south leads to less depositors' confidence and at the same time a lower amount of bank deposits.

First the impact of the control variables on deposits is estimated by both using year-fixed effects models (equation 1) and year-fixed effects LSDV models (equation 2).[15] The bank characteristic variables are based upon a study by Tsuru (2003), equation 1 and 2 are established to check whether the results are similar to Tsuru's results. The S&P sovereign rating was not used by Tsuru and is added to check its effect on deposits. Subscript t

[14] With a recession defined as a significant decline in economic activity spread across the economy which can last from a few months to more than one year (The National Bureau of Economic Research, 2010).
[15] The studied concepts, their related variables, abbreviations, and sources can be found in appendix E, table 1.

distinguishes between different time periods, subscript i shows bank-specific variables and subscript c represents country-specific variables. So, the deposits (CDS) for bank i, from country c, at time t rely upon bank-specific and country-specific variables.

$$(1)\ CDS_{ict} = \alpha_i + \beta LTA_{it} + \beta CASHTA_{it} + \beta ROAA_{it} + \beta LNTA_{it} + \beta SPR_{ct} + e_{ict}$$

$$(2)\ CDS_{ict} = \alpha_c + \beta LTA_{it} + \beta CASHTA_{it} + \beta ROAA_{it} + \beta LNTA_{it} + \beta SPR_{ct} + e_{ict}$$

Subsequently the LSDV model will be extended with the explanatory variables (coverage, normalized coverage and the required insurance dummy) to assess the impact of the different deposit insurance schemes on depositors across Europe. Due to multicollinearity issues (extensive discussion in section 4.4) coverage (COV) will not be regressed at once with normalized coverage (NCOV) and the required insurance dummy (INS). A year-fixed effects LSDV model with coverage as the explanatory variable (equation 3), and a year-fixed effects LSDV model with the required insurance dummy and normalized coverage as explanatory variables (equation 4) are estimated.

$$(3)\ CDS_{ict} = \alpha_c + \beta LTA_{it} + \beta CASHTA_{it} + \beta ROAA_{it} + \beta LNTA_{it} + \beta SPR_{ct} + \beta COV_{ct} + e_{ict}$$

$$(4)\ CDS_{ict} = \alpha_c + \beta LTA_{it} + \beta CASHTA_{it} + \beta ROAA_{it} + \beta LNTA_{it} + \beta SPR_{ct} + \beta INS_{ct} + \beta NCOV_{ct} + e_{ict}$$

4. Empirical analysis and robustness tests

Different models are estimated to assess the effects of deposit insurance policy measures on depositors across Europe (appendix E, table 5). First the results of regressing bank characteristics and the S&P sovereign rating on deposits using fixed effects are discussed. Thereafter, the LSDV estimations of the bank characteristics and S&P sovereign rating are presented. Finally, the results of the LSDV model for the effects of deposit insurance schemes on bank deposits are reviewed.

4.1 The effects of the control variables on deposits

First the effects of bank characteristics and the S&P sovereign rating on deposits are assessed using year-fixed effects models (appendix E, table 6). The bank characteristic variables are control variables used in an earlier study by Tsuru (2003). The control variables are regressed first to establish a baseline of the bank characteristic variables, and to see what the effect is when the S&P rating is included.

Model 2 shows that the asset risk factor and the proxy for bank size significantly affect deposits. The asset risk factor (ratio of loans to total assets) negatively affects deposits and the logarithm of total assets positively affects deposits. The return on average assets and the liquidity risk factor (ratio of cash and deposits (due to other banks) to total assets) are not significant. Model 3 finds that the S&P rating does not significantly affect deposits. The adjusted R-squared of model 3 is equal to 0, which implies that the explanatory power of the S&P rating ranges from very small to non-existing. The bank characteristics and S&P sovereign rating are combined in model 4. The asset risk factor, proxy for bank size, and S&P sovereign rating significantly affect deposits. It must be acknowledged that the adjusted R-squared of models 2, 3, and 4 are fairly small (0.0172, 0.0000, and 0.0174 respectively).

Since apparently the explanatory power of the bank characteristics and S&P rating is not very high (adjusted R-squared is at most 0.0174) the decision to include the lagged terms of bank characteristics is made. When solely investigating the effects of bank characteristics on deposits (model 5) the same significance arises. The asset risk factor and the proxy for bank size still significantly affect deposits. The size of the negative coefficient for the asset risk factor and the size of the positive proxy for bank size increase when the lagged terms are included. The adjusted R-squared increases to 0.1266. This implies that the explanatory power of the variables increases when the lagged terms are added. When the S&P rating is included (model 6), the asset risk factor, the proxy for bank size, and the S&P rating significantly affect deposits. The adjusted R-squared increases to 0.1281. The liquidity risk factor and bank profitability indicator are not significant.

The explanatory power of the model with the lagged terms is much higher than for the models without the lagged terms (R-squared of 0.1266 and 0.1281 versus 0.0172 and 0.0174). It is therefore that models with lagged terms are preferred in subsequent year fixed-effects estimations.

The liquidity risk factor and bank profitability indicator do not have a significant effect on bank deposits. This relationship can arise for a couple of reasons. It might be that the liquidity risk factor and return on assets are not known to the depositors and that it is therefore that deposits are not significantly affected. It could also be that depositors do not care about these factors much in reality. On the other hand it must be acknowledged that the variable used for measuring the liquidity risk factor (cash and deposits due to other banks) is not a perfect indicator of liquidity. As it only represents liquidity partially, it might fall short at showing the real effect of the liquid healthiness of financial institutions on deposits.

Tsuru (2003) studies the effects of bank characteristics on deposit growth in Japan. His study shows approximately the same results. The bank profitability indicator and liquidity risk factor do not significantly affect deposit growth in his study, which is similar to the results found in the first models. Furthermore, Tsuru (2003) found significant effects of the same sign for the asset risk factor (ratio of loans to total assets) and the proxy for bank size.

As hypothesized, it seems logical that an increase in the asset risk factor leads to a decrease in deposits: as banks behave more risky, depositors' confidence and bank deposits decrease. The proxy for bank size positively affects deposits, as depositors might prefer storing their deposits at a larger banks which they might perceive as being safer. Apparently, the effects of bank characteristics on deposits are similar in Japan and Europe. The S&P sovereign rating is significant and adds some explanatory power to the models. The next section develops whether these results still hold when country-specific effects are filtered out in LSDV models.

4.2 The country-specific effects of the control variables on deposits

Now that the effects of the control variables on deposits in Europe are investigated, it is interesting to assess the intra-country differences by applying LSDV (appendix E, table 7). The models of the previous section are estimated with country-specific intercepts so that the intra-country differences become apparent.

Model 7 assesses the effects of bank characteristics on deposits and finds that the asset risk factor and proxy for bank size significantly affect bank deposits. Model 8 investigates the relationship between the S&P sovereign rating and deposits and shows that there is no significant effect of S&P rating on deposits. The parameter changes considerably, as the sign and size change from -155 to +1310 with respect to the fixed effects model (model 3). When the bank characteristic variables and S&P rating are combined in model 9, only the asset risk factor and the proxy for bank size significantly affect deposits. This is surprising as compared to the fixed effects model (model 4), when the S&P rating was significant.

When investigating the R-squared of models 7, 8 and 9 something strange appears: the adjusted R-squared decreases slightly when the S&P rating is added to the model (0.0179 of model 7 versus 0.0178 of model 9). This implies that the explanatory power of the model decreases if the S&P sovereign rating is added. Evidently, the country-specific intercepts decrease the explanatory power of the S&P rating. The intra-country variations take away the need for controlling for the country's sovereign rating: it seems like the country-specific intercepts and S&P sovereign rating are substitutes.

The country-specific intercepts show the position of each country with respect to Belgium. Belgium is the reference category, because the countries are arranged on alphabetical order.[16] The intercepts, and thus deposits, of France, Germany, Italy, and the Netherlands lie above Belgium. The ones for Portugal, Spain and Greece lie beneath Belgium. Although there is some kind of North-South division visible, it is far from definite.

Again, the R-squared of models 7, 8, and 9 are fairly small. Therefore the decision to include the lagged terms of the bank characteristics is made. The significance of the variables when regressing bank characteristics on deposits does not change (model 10). The asset risk factor and proxy for bank size are still significant, as opposed to the coefficients of bank profitability and the liquidity risk factor. The S&P rating is not significant when added (model 11). Both models show the similar changes in the sizes of the coefficients. The asset risk factor parameter increases and the proxy for bank size parameter decreases with respect to the LSDV models without lagged terms. The R-squared of the models increases to 0.1350 in both cases, which implies that the explanatory power of the models increased. It is surprising to see that there are slight changes in the country-specific intercepts when using the lagged terms in model estimations. The intercepts of Germany, Italy, and the Netherlands still lie above

[16] The tables in the appendices comprise the official EU country codes, which are BE, FR, DE, EL, IT, NL, PT, and SP. The arrangement on alphabetical order is done using the full country names.

Belgium. France's intercept decreases and is lower than the one of Belgium. Other countries having a smaller intercept than Belgium are Greece, Portugal, and Spain. One would expect that the northern European countries would have larger intercepts than the southern European countries. As this was not the case in model 7 and 9 it is even less definite in model 10 and 11.

A comparison of the adjusted R-squared of model 10 and 11 shows that the information of the S&P rating does not add any explanatory power to the model (as these are 0.1350 in both cases). This result, and the decrease in R-squared when moving from model 7 to 9, indicate that the S&P sovereign rating does not add much to the model. As the coefficient is not significant in the LSDV model, and as including the variable leads to lower values of the adjusted R-squared it will be left out in subsequent LSDV estimations.

The adjusted R-squared increases when the lagged terms are included, it is therefore that also in LSDV estimations the use of the lagged terms is preferred. LSDV estimations provide more information on the relative stances of country and captures intra-country variations which is important in a diverse sample. Model 10 is considered as the model best capable of estimating the effects of the control variables on deposits. The next section adds the explanatory variables to the LSDV models to assess the impact of minimum deposit coverage on deposits.

4.3 The country-specific effects of deposit insurance on deposits

The effects of deposit insurance on deposits are assessed (appendix E, table 8). The next step is to include the explanatory variables: coverage, normalized coverage and the required insurance dummy. Coverage is not regressed simultaneously with the required insurance dummy and normalized coverage to avoid multicollinearity problems. The lagged terms of the bank characteristic variables are used and the S&P rating is excluded from the analysis. The explanatory variables are added to the LSDV models. An explanation for these decisions can be found in section 4.1 and 4.2.

The effects of coverage on depositors are examined first (model 12). The asset risk factor and proxy for bank size significantly affect deposits. Explanatory variable coverage has a significant effect on deposits, although it is small (0.033). The R-squared of model 12 as compared to model 10 (bank characteristics on deposits) increased from 0.1350 to 0.1362. The country-specific intercepts changed in comparison to model 10. Once more the intercepts of Germany, Italy, and the Netherlands lie above Belgium. The intercepts of France, Greece, Portugal, and Spain are below Belgium. The size of the intercepts in model 12 are comparable to those in model 10, except for the intercepts of France and Italy. The country-specific coefficient for France decreased from -895 to -1977 and the intercept for Italy decreased from 3041 to 1325. Thus coverage significantly affects deposits and by adding coverage the intercepts of Italy and France change.

Model 13 adds normalized coverage to the model of bank characteristics. The asset risk factor and the proxy for bank size have a significant effect on deposits. Normalized coverage is significantly affecting deposits, but the coefficient is small (0.026). The R-squared is lower than for the previous model (0.1352). The country-specific intercepts are comparable to those of model 12.

The required insurance dummy is added to the bank characteristics in model 14. The asset risk factor and proxy for bank size still significantly affect bank deposits. The insurance dummy relates to several specified minimum coverage levels specified by the EC. It is equal to 0 when the minimum required coverage was equal to €20,000, 1 when it is equal to €50,000 and 2 for the years that it is equal to €100,000. The required insurance category of 0 (thus €20,000) is set as the reference group, so that the effects of increases in the minimum required coverage can easily be assessed. The coefficients for the asset risk factor and proxy for bank size are still significant. The coefficients for the insurance dummy are significant as well. The number indicate that when the required insurance increased to €50,000, deposits would increase by approximately $956, and when the required insurance increased to €100,000, deposits would increase by $2,786 (with regards to the reference category of a coverage worth €20,000). The R-squared is slightly higher than the one of model 13, namely 0.1359. The country-specific intercepts for model 14 are similar to those of baseline model 10.

Explanatory variables normalized coverage and the required insurance dummy are combined in model 15. This model incorporates both the required level of insurance set by the EC as the deviations from this required level per country. The asset risk factor and proxy for bank size are still significant. The coefficients for the required insurance dummy for €50,000 and €100,000 are 294 and 3,170 respectively. The dummy for €100,000 is significant, as opposed to the one of €50,000. It seems quite logical that the first dummy is insignificant, as the parameter size is not very different from zero when compared to the size of the second dummy. Normalized coverage is significant, but the coefficient has a relatively small value (0.040). Model 15 has the highest adjusted R-squared of all previously discussed models: 0.1363.

The models best able to predict the deposits in the presence of different deposit insurance schemes are model 12 and model 15. The significance and coefficients of the models are similar and the adjusted R-squared (0.1362 and 0.1363 respectively) are highest compared to all other previously estimated models. Apart from the technical advantages of model 12 and 15, they seem like the best models intuitively. Model 12 incorporates the absolute levels of the minimum deposit coverage systems across Europe, while model 15 incorporates both the required guarantees set by the European Council and the country-specific deviations from this required level. Thus, the explanatory variables in both models are considered to be good and complete indicators for the changes in deposit insurance schemes.

4.4 Robustness tests

In order for the estimate to be the best linear unbiased estimator (BLUE), the ordinary least squares (OLS) assumptions must be satisfied. This implies that (a) the error term should have mean zero, (b) there must be no heteroskedasticity and (c) serial correlation, (d) the error terms must be uncorrelated with the regressors, and there must be (e) no multicollinearity (Carter Hill, Griffiths, & Lim, 2012). Assumption (a) and (d) can be satisfied by the specification of a good model. Tests can be done to check assumption (b), (c), and (e).

To check the OLS assumption of multicollinearity a table of correlations is made, which can be found in appendix E, table 3. As can be seen, minimum coverage (COV) highly correlates with normalized coverage (NCOV), and the required insurance dummy (INS) (i.e. correlations of 0.67 and 0.71 respectively). This implies that minimum coverage cannot be used in the same regressions as the required insurance dummy and normalized coverage to evade multicollinearity.

Huber/White/sandwich robust standard errors are used to avoid problems with heteroskedasticity and serial correlation in the error term. The Bankscope variables were tested on containing a unit root. There is significant evidence for stationarity for all Bankscope variables[17].

[17] The outcomes of the Fisher unit root tests (based on augmented Dickey-Fuller tests) can be found in appendix E, table 4.

5. Discussion

The results in the previous section show the effects of minimum coverage on deposits. Model 12 and 15 are considered best at explaining the effects of minimum coverage on deposits. The explanatory variable in model 12 is minimum coverage and the explanatory variables in model 15 are the required insurance dummy and normalized coverage. Each model is discussed separately.

5.1 The effects of minimum coverage on deposits

The variable minimum coverage comprises the minimum coverage levels in each country per year. The results (model 12) show a positive significant effect of this minimum coverage on deposits. This implies that if the minimum coverage in a country increases, deposits stored at banks will increase as well. The measures taken by the European Council during the 2007-08 financial crisis to maintain confidence in the financial institutions did have the impact it aimed for: higher levels of minimum deposit coverage increased depositors' confidence.

The size of the parameter (0.033) is not very large. The significant effects of minimum deposit coverage are present but do not affect deposits to a large extent. The increase in deposits caused by minimum coverage shows that depositors' confidence increases as minimum coverage increases: depositors are less worried about what happens to their deposits. This relationship was confirmed earlier by Diamond and Dybvig (1983).

Some reasons can be thought of as an explanation of this finding. First of all it is important to acknowledge that an increase in the minimum coverage is likely to affect all depositors, no matter the level of wealth. If a government decides to increase the minimum coverage, it tells citizens that their money is safe no matter what. It will probably increase depositor confidence for every depositor, which is likely to affect the total number of deposits.

This effect is alleviated by some other factors. Before the changes in minimum deposit guarantees were implemented, all countries already had a deposit insurance scheme in place. It seems logical that wealthy persons might spread the risk that comes with storing deposits at financial intermediaries, by means of having multiple bank accounts to avoid exceeding the minimum deposit coverage. As these persons already diversified the risk with respect to deposit insurance, it is unlikely that an increase in minimum coverage affects their decisions regarding deposit storage much. A similar rationale applies to the less wealthy. If a person's deposit are well below the minimum insured threshold, it is unlikely that an increase in deposit coverage will increase their deposits stored at financial institutions much. The persons that are likely to be affected most by the policy changes are those right on the threshold.

5.2 The effects of required insurance and normalized coverage on deposits

The required insurance dummy and normalized coverage are combined in model 15. The required insurance dummy takes on value 0 when the required minimum coverage set by the EC equaled €20,000. It takes on value 1 when the required minimum coverage was increased to €50,000 and 2 when it reached the present required value: €100,000. Normalized coverage captures the deviations from this norm.[18] If a country decided to set a minimum coverage equal to €70,000 instead of €20,000 it is captured by the normalized coverage.

The results show that the increased levels of the required deposit insurance have a positive effect on deposits. With €20,000 as the reference category the following results are observed: when the required level changed to €50,000, deposits increased with $294, and when the level increased to €100,000, deposits increased with $3,170. The second dummy is significant, but the first dummy is not. This tells us that the effects for the increase from €20,000 to €50,000 are not significantly different from zero: thus negligible. The second dummy is significant which implies that an increase from €20,000 to €100,000 does have a significant impact on deposits stored at financial institutions. Normalized coverage has a positive significant effect on deposits. The economic significance of normalized coverage is small, as it equals 0.04. Summarizing it can be seen that the required deposit insurance level set by the EC has a positive effect on deposits and that deviating from this norm affects deposits positively.

An increase in the required level of minimum deposit coverage comes with an increase in deposits. The required level of minimum deposit coverage corresponds to what governments are obliged to guarantee in case of bank failures and is equal for all European countries. The increase in minimum coverage from €20,000 to €50,000 did not significantly affect deposits, while the change from €20,000 to €100,000 did. This implies that the jump from €20,000 to €50,000 is too small to attain significant differences in deposits. The second jump did have the desired effect.

Deviating positively from the required level rewards: if governments decide to guarantee deposits up to a higher level bank deposits increase. The small economic value of the

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[18] There are only positive deviations from the norm. As the required minimum coverage is set by the EC only positive deviations from the required minimum coverage are allowed.

parameter estimate of normalized coverage can be explained similarly as the size of the coverage variable (section 5.1).

The effects of the explanatory variables on the dependent variable are summarized in table 3, the hypothesized outcomes are compared with the actual outcomes.

Explanatory variables	**Hypothesized effect on dependent variable: deposits**	**Actual effect on dependent variable: deposits**
Required insurance dummy (INS)	+	+
Minimum coverage (COV)	+	+
Normalized coverage (NCOV)	+	+

Table 3. Hypothesized effects and actual effects of the explanatory variables on deposits.

5.3 The effects of bank characteristics on deposits

The explanatory variables are important to determine the impact of the changes in deposit insurance schemes on depositors. It is also useful to assess the interpretation of the control variables: the bank characteristic variables. The parameter estimates for the bank characteristics variables are identical in size, sign and significance in model 12 and 15. The interpretation of these variables can be generalized by this means. The numbers of model 15 are discussed here.

As has been discussed before, the asset risk factor (ratio of loans to total assets) and the proxy for bank size (logarithm of total assets) have a significant effect on deposits. The asset risk factor has a negative effect on bank deposits, as deposits decrease by $8,504 when the asset risk factor increases by one unit. The asset risk factor has a negative effect on deposits as was hypothesized: increased risk taking by banks is followed by less depositors' confidence: a decrease in bank deposits. The proxy for bank size has a positive effect on bank deposits: the larger the bank the greater the amount of deposits stored. If the natural log of total assets increases with one unit, deposits increase by $4,370. This again is the same result as hypothesized: depositors prefer storing their money at large institutions.

The liquidity risk factor and bank profitability variable are not significant. The liquidity risk factor is measured by the ratio of cash and deposits (due to other banks) to total assets. The parameter estimate is positive which again is as expected. It seems that the higher the liquidity, the safer the bank and thus the higher the amount of the deposits. The measure used for presenting the liquidity risk factor is not perfect as it represents only part of liquidity. This could be an explanation of the fact that this variable is insignificant.

It seems like a negative relationship between bank profitability and bank deposits exists. Thus the higher the profitability, the lower the amount of deposits. This result contradicts what was expected beforehand. The expectation was that the higher the profitability of the bank, the higher the bank deposits. However, another relationship could be that the higher the bank profitability, the higher the risk-taking of a bank. Dowd (1993), Rolnick (1993), and Bhattacharya, Boot and Thakor (1998) have argued before that deposit insurance systems lead to increased moral hazard behavior of banks, which could be an explanation for the observed negative sign of the relationship between the bank profitability indicator and bank deposits.

The hypothesized effects and actual effects of the control variables on deposits are presented in table 4.

Control variables	**Hypothesized effect on dependent variable: deposits**	**Actual effect on dependent variable: deposits**
Asset risk factor (LTA)	-	-
Liquidity risk factor (CASHTA)	+	+
Bank profitability (ROAA)	+	-
Proxy for bank size (LNTA)	+	+

Table 4. Hypothesized effects and actual effects of the control variables on deposits.

5.4 Intra-country differences

The least squares dummy variable method was used to assess the intra-country differences in the sample. The reference category of the country-specific intercepts is Belgium, so all parameters in the estimated LSDV models should be interpreted with respect to Belgium. Appendix E, table 9 shows the intercepts when assessed with respect to Belgium for model 12 and 15. The intercepts do not change considerably when changing from model 12 to model 15. This can be inferred from the fact that the ranking of the intercepts is not subject to changes. The intercepts of model 15 are studied for further interpretation. Model 15 is chosen as it comprises both an indicator for the required level of insurance as an indicator for the deviations from the required level.

The Netherlands has the highest intercept, as can be seen visually from graph 1 in appendix E. It is surprising to see that Italy, as southern European country, ends up at the third place. Germany and Belgium are ranked second and fourth and are followed by Spain, France, Greece, and Portugal.

The country-specific intercepts reveal the intra-country variations not captured by the model parameters. The expectation was that northern European countries perform better than southern European countries in terms of bank deposits. This based on the higher level of credit risk in the southern countries, and a lower level of bank stability that comes with it. Intuitively, bank instability leads to less depositors' confidence in the financial system and consequently to lower levels of deposits stored at financial institutions. This belief corresponds to higher expected intercepts for the north as opposed to the south.

What can be seen is that there is no such definite division between the northern and southern European countries. The Netherlands, Germany and Belgium are on the anticipated side of the distribution and as are Spain, Greece, and Portugal. France and Italy are not on their anticipated sides of graph 1. The hypothesized findings and actual findings are presented in table 5. The expected ranks (1-4 for the northern European countries and 5-8 for southern European countries) are compared with the actual rating.

Country	**Hypothesized ranking**	**Actual ranking**
Belgium (BE)	1 to 4	4
France (FR)	1 to 4	6
Germany (DE)	1 to 4	2
Greece (EL)	5 to 8	5
Italy (IT)	5 to 8	3
Netherlands (NL)	1 to 4	1
Portugal (PT)	5 to 8	8
Spain (ES)	5 to 8	7

Table 5. Hypothesized ranking versus the actual ranking of the countries in the sample.

There can be several reasons for this phenomena. Italy already had a high level of minimum coverage compared to other countries in the sample (i.e. €103,291). Although Italy is considered to be a less stable southern country, depositor confidence in the banking system might still be high since the minimum deposit coverage was initially high. This would confirm that a higher level of minimum coverage increases depositors' confidence.

The reason for France's presence among the southern countries is less straightforward. France had the second-highest initial minimum coverage: €70,000. The same rationale as for Italy would suggest that France should be among the countries on the left-hand-side of graph 1. The descriptive statistics for France[19] show minor differences to those of the other countries. The only outstanding deviation occurs in the bank profitability indicator (ROAA), the mean of this variable is higher for France as compared to all other countries in the sample. As been assessed before, a high bank profitability indicator could be an indicator of moral hazard behavior by banks. So although the minimum guaranteed coverage is quite high, the moral hazard by banks may explain why French depositors are still reluctant to store their money at financial institutions even though minimum coverage increased. This might be an explanation for France's presence among the southern European countries, however more extensive analysis is needed to draw any concrete conclusions on France's position.

An overall split between northern and southern countries is tangible. The Netherlands, Germany, and Belgium are clearly among the countries with a relatively higher level of deposits. Spain, Portugal, and Greece are clearly among the countries with a relatively lower level of deposits. This suggests a north/south split in Europe. The split is not definite as the results indicate that Italy and France are standing out.

5.5 Limitations

There are a few limitations to my research. This paper analyzes bank deposits stored at financial institutions, which hinders analyzing deposits at the level of the individual depositor. It could be useful to study deposits at the individual level as it enables drawing more reliable conclusions on what really drives depositors, since depositors might diversify deposits if their wealth exceeds the minimum deposit coverage. More insights on these diversification strategies can give more information on the effects of changes in minimum deposit coverage on depositors' behavior.

The models in this analysis are estimated for the total European sample. This implies that the parameters are generalized for all included European countries. It might be helpful to estimate the models per country, so that also country-specific differences in the parameters of the variables become visible.

Another limitation is that causation might be violated. In order to estimate causal effects, certain conditions must hold: (a) there must be association between two variables, (b) the

[19] The descriptives for all countries in the sample can be found in appendix E, table 10.

dependent variable must follow the explanatory variable in time, and (c) there must be no third variable causing both the explanatory and dependent variable. The empirical analysis has proven that association between minimum coverage and bank deposits exists. The time-order is satisfied too, as it is unlikely that higher levels of bank deposits lead to increased levels of minimum deposit coverage. Condition (c) might be violated as it is not clear whether other confounders exist that could explain the relationship between coverage and bank deposits. The adjusted R-squared for all models are fairly low, so it could be useful to add other control variables explaining the dependent variable to the analysis.

Recommendations for future research are based upon the limitations described above. First of all it would be recommended to find a dependent variable representing deposits at the level of the individual depositor. A second recommendation would be to estimate the models per country, as to assess the parameter differences in significance, signs and sizes. A third recommendation is to extend the country sample to a less narrowed down definition of Europe. Besides that it could be useful to evaluate whether the effects found apply to more areas globally (e.g. Americas, Asia, etc.).

The empirical analysis established a positive relationship of minimum deposit coverage on bank deposits. It would be interesting to see whether this relationship holds infinitely. A possibility is that the effect on deposits flats out if the increases in minimum coverage are high enough: the size of the effect might decrease if the minimum deposit coverage reaches a certain point. Future research is needed to investigate whether the effect of minimum coverage on deposits is proportional.

6. Concluding remarks

This paper evaluates the effects of the different deposit insurance schemes on depositors in Europe. The global financial crisis caused a lot of financial turmoil around the world and it did not take long before Europe suffered as well. The European Council acknowledged that the financial crisis could harm Europe's financial system and decided to increase the required minimum deposit coverage to increase depositors' confidence and thereby preventing bank runs and increasing financial stability.

A split between northern and southern European countries has become apparent during 2007-08 financial crisis. Southern Europe developed major credit risks as compared to northern Europe. The question is whether these differences are also distinct when assessing the effects of deposit insurance on the height of bank deposits.

The predictions are than an increase in the minimum deposit coverage leads to an increase in depositors' confidence, and thus implying an increase in deposits stored at financial institutions. Southern Europe is expected to perform worse as compared to northern Europe in terms of bank deposits: higher bank instability is associated with less depositors' confidence and analogously with a lower level of bank deposits.

The related literature shows that deposit insurance has two main effects. Firstly, deposit insurance induces moral hazard by banks as the losses associated with misconduct are minimized. As the losses associated with risky behavior are minimized, banks decide to engage in riskier behavior: the stability of the banking system decreases. Secondly, deposit insurance protects depositors and similarly enhances financial stability. Depositors are less prone to bank runs if their deposits are fully insured. This leads to increased depositors' confidence, less banking crises, and enhances the stability of the banking system. The stabilizing effect dominates the destabilizing effect during economic recessions.

The empirical analysis suggests that deposit insurance has a positive effect on depositors' confidence: an increase in the minimum coverage level leads to an increase in bank deposits, and thus in depositors' confidence. The intra-country variations show that a north-south division is present, as the intercepts for the northern countries are roughly higher than those of the southern countries. There is no clear division as France and Italy stand out.

The research question can be answered with this information. So, *does the increase in minimum deposit coverage cause an increase in bank deposits in Europe for the period 2004-2012?* The empirics suggest that the changes in deposit insurance schemes during the 2007-08 financial crisis had a positive effect on depositors. The deposits stored at financial institutions increase with the height of the minimum coverage. So, depositors' confidence rose as an effect of the increases in minimum coverage. The policy measures had the aimed effect: they increased bank deposits and thereby depositors' confidence.

The European Council decided in 2008 that improvements in the deposit insurance schemes were necessary for maintaining depositors' confidence in the financial sector. This analysis suggests that the measures had the desired effect: bank deposits and consequently depositors' confidence increased. Which decreases the likelihood of banking runs and lowers the instability of the banking system. Raising the minimum deposit coverage is a good method for maintaining depositors' confidence in turbulent times.

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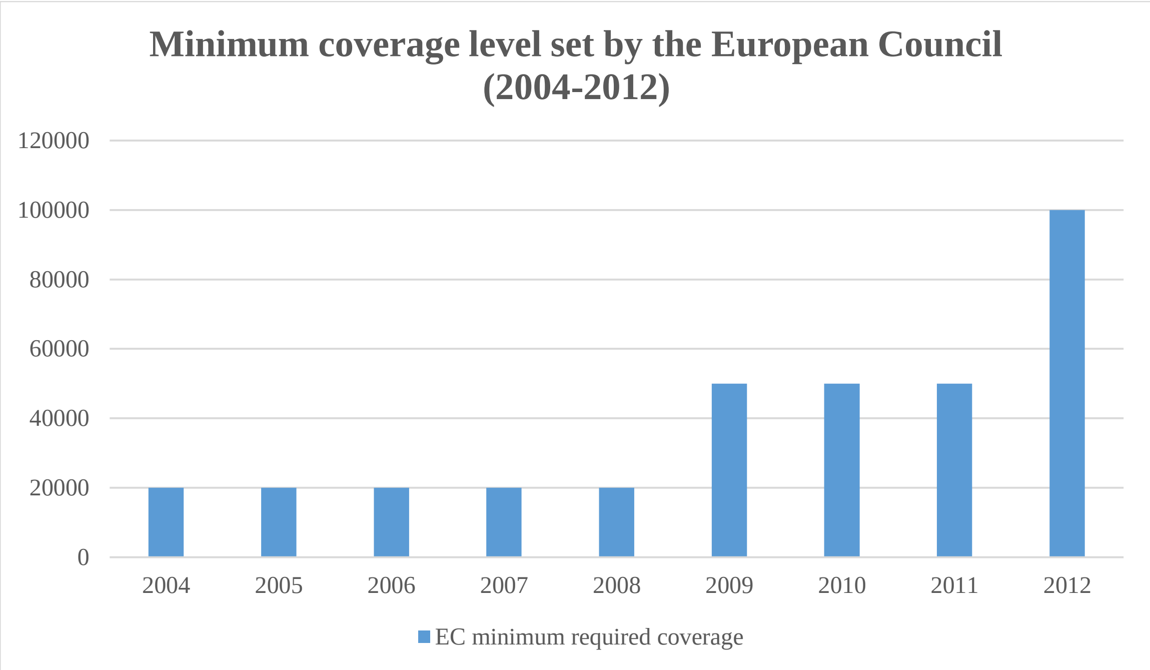
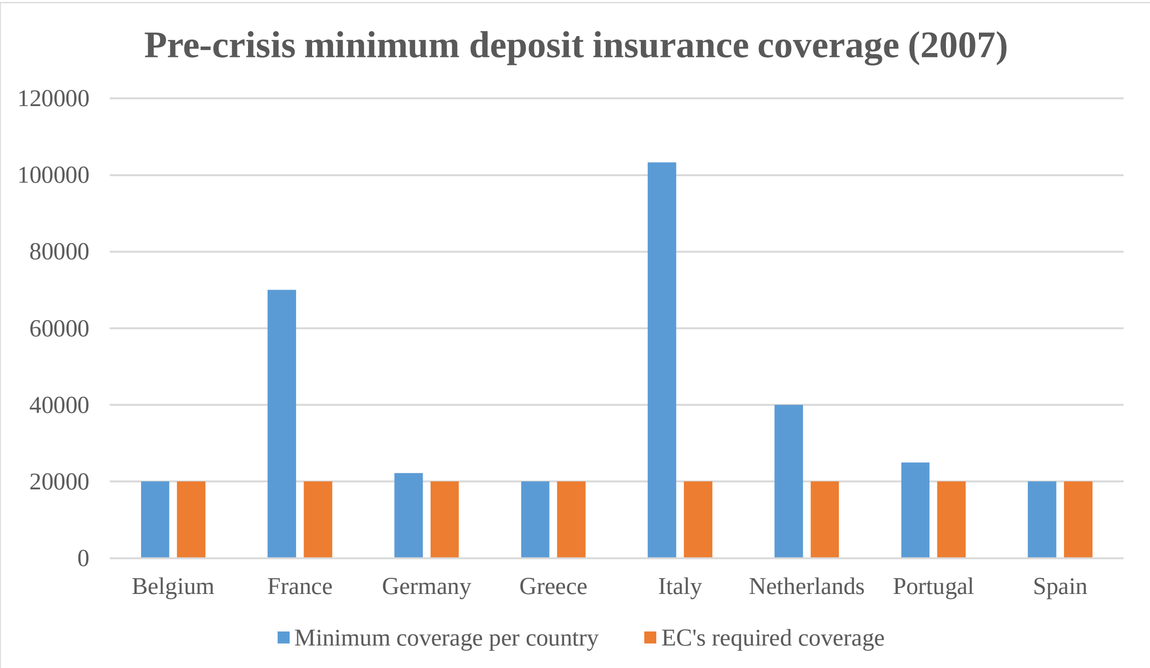
Appendices

Appendix A: Required coverage and minimum coverage development (2004-2012)

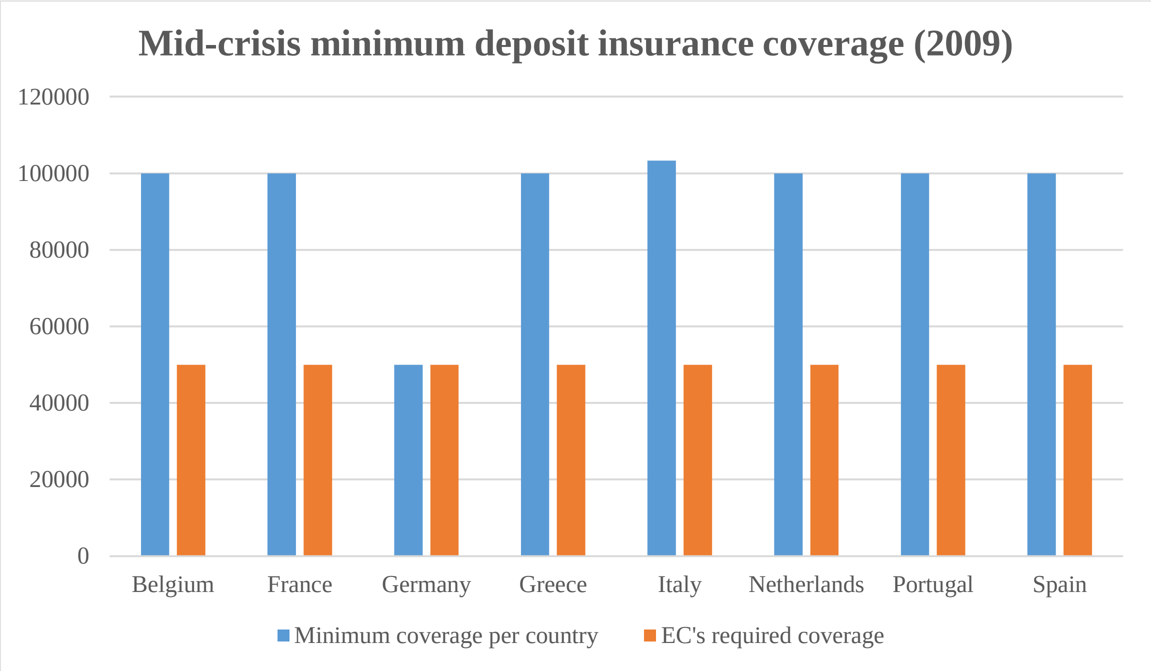
Graph 1: Development of the required minimum deposit insurance set by the European Council (EC).



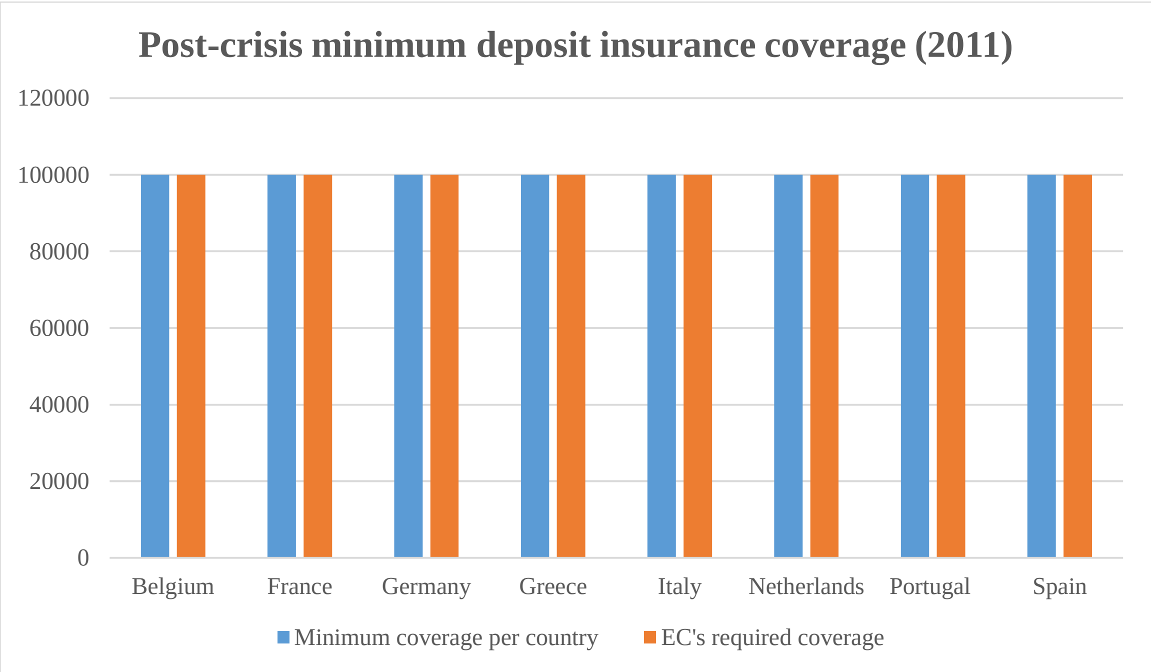
Graph 2: Pre-crisis (2007) deposit insurance coverage compared to the required level set by the European Council (EC).



Graph 3: Mid-crisis (2009) deposit insurance coverage compared to the required level set by the European Council (EC).



Graph 4: Post-crisis (2011) deposit insurance coverage compared to the required level set by the European Council (EC).



Source: data in graph 1, 2, 3, and 4 is retrieved from Schich (2009), the European Commission (2010), and the websites of the respective countries' national deposit insurance agencies.

Appendix B: Simple example on moral hazard in banking

Assume that a banker can choose two different investments. One is a safe investment with a low risk and a (relatively) low return, the other is a risky investment with a high risk and a (relatively) high return. The low risk/low return projects has a return equal to β with a probability of γ, and 0 at probability (1-γ). The high risk/high return has a return equal to α at probability θ, and 0 at probability (1-θ). Note that $\alpha > \beta > 0$ and $\gamma > \theta$.

If the chosen project fails, the bank goes bankrupt and is not able to repay the deposits plus interest rates to the depositors. The value of the deposits plus interest rates is equal to ρ. If no deposit insurance is installed, the bank has a liability equal to ρ to its depositors in either case (so if the project succeeds or fails). If deposit insurance is installed, the bank only has a liability of ρ to its depositors if the project succeeds.

If case no deposit insurance system is installed, the following equation holds.

$$\gamma(\beta-\rho) \ -(1-\gamma)\rho > \theta(\alpha-\rho)-(1-\theta)\rho$$

$$\gamma > \frac{\theta\alpha}{\beta}$$

If deposit insurance is installed, the following equation holds.

$$\gamma(\beta-\rho)+(1-\gamma)0 > \theta(\alpha-\rho)+(1-\theta)0$$

$$\gamma > \frac{\theta(\alpha-\rho)}{(\beta-\rho)}$$

This implies that if deposit insurance is installed, in order to choose the safer project, the probability of success of the safe project (γ) must be larger. Besides that, an inverse relationship between the size of ρ and γ exists. If ρ increases, γ must also be higher in order for the bank to choose the safe investment.

(Based on an example of Freixas and Rochet (2008))

Appendix C: Deposit insurance guarantees per country

Table 1: Overview of the changes in deposit insurance coverage since the proposed EC changes in 2008 for Belgium, France, Germany, Greece, Italy, the Netherlands, Portugal, and Spain.

Country	**Coverage September 2008 (3rd quarter)**	**Coverage December 2008 (4th quarter)**	**Minimum Coverage Developments**
Belgium	€20,000	€100,000	Raised to €100,000 on the 17th of November 2008.
France	€70,000	€70,000	Coverage increased to €100,000 on 11th of March 2009.
Germany	€22,222 (10% co-insurance)	€22,222 (10% co-insurance)	Raised to €50,000 on the 30th of June 2009, raised to €100,000 on the 31st of December 2010.
Greece	€20,000	€100,000	Raised to €100,000 on the 7th of November 2008.
Italy	€103,291.38	€103.291.38	Changed to €100,000 on the 24th of March 2011.
Netherlands	€40,000 (10% co-insurance)	€100,000	Raised to €100,000 on the 7th of October 2008.
Portugal	€25,000	€100,000	Raised to €100,000 on the 8rd of November 2008.
Spain	€20,000	€100,000	Raised to €100,000 on the 10th of October 2008.

Source: data in table retrieved from Schich (2009), the European Commission (2010), and the websites of the respective countries' national deposit insurance agencies.

Appendix D: Data descriptives

Table 1: Overview of the Bankscope data and the missing observations per variable.

Total observations	**34,439**	**(5,971 Banks)**	
Variable	**Observations**	**Missing observations**	**Percentage**
Customer deposits –savings *(deposits)*	19,291	15,148	43.98%
Loans/total assets ratio *(asset risk factor)*	14,369	1,436	4.17%
Cash and deposits due to other banks/assets *(liquidity risk factor)*	32,918	1,521	4.62%
Return on average investment *(bank profitability)*	34,336	103	0.29%
ln_assets *(bank size)*	34,434	5	0.01%

Table 2: Overview of the Bankscope data and the missing observations per variable when missing data on consumer deposits – savings is left out.

Total observations	**19,291**	**(3,791 Banks)**	
Variable	**Observations**	**Missing observations**	**Percentage**
Customer deposits – savings *(deposits)*	19,291	0	0.00%
Loans/total assets ratio *(asset risk factor)*	12,980	608	3.15%
Cash and deposits due to other banks/assets *(liquidity risk factor)*	19,177	114	0.75%
Return on average investment *(bank profitability)*	19,261	35	0.18%
ln_assets *(bank size)*	19,291	0	0.00%

Table 3: Overview of the observations and banks per country.

Country	**Number of Observations**	**Number of Banks**
Belgium (BE)	384	107
France (FR)	2,230	567
Germany (DE)	14,582	2,163
Greece (EL)	186	58
Italy (IT)	824	523
Netherlands (NL)	348	109
Portugal (PT)	193	67
Spain (ES)	544	197
Total	*19,291*	*3,791*

Table 4: Descriptive statistics for the total sample

Variable	**Observations**	**Mean**	**Standard Deviation**	**Minimum**	**Maximum**
Customer deposits – savings *(deposits)*	19,291	4775.83	104661.6	1	1.41E+07
Loans/total assets ratio *(asset risk factor)*	19,250	0.580786	0.162122	0.000106	0.993631
Cash and deposits due to other banks/assets *(liquidity risk factor)*	19,173	0.02035	0.019311	0	0.873518
Return on average investment *(bank profitability)*	19,256	0.368403	1.156042	-37.78	26.67
ln_assets *(bank size)*	19,291	7.060757	2.135868	2.302585	17.29923
S&P sovereign rating	19,291	9.842854	0.526242	3	10
Required insurance dummy	19,291	0.536209	0.677088	0	2
Minimum coverage	19,291	53772.52	33674.87	20000	103291
Normalizd coverage	19,291	15588.92	24531.51	0	83291

Appendix E: Results

Table 1: Overview of the studied concepts, their operationalization, and the related variables from the Bankscope database.

Concept	**Variable**	**Abbreviation**	**Source**
Deposits	Customer deposits – savings.	CDS	Bankscope
Minimum coverage	Level of the minimum deposit insurance coverage per country per year.	COV	Schich (2009)
Normalized coverage	Minimum deposit insurance coverage levels normalized with respect to the required coverage levels set by the European Council.	NCOV	Schich (2009)
Required insurance dummy	Takes on 0 if the required coverage equals €20,000, 1 if the required coverage equals €50,000, and 2 if the required coverage equals €100,000.	INS	The European Commission (2010)
Asset risk factor	Ratio of loans to total assets.	LTA	Bankscope
Liquidity risk factor	Ratio of cash and deposits (due to other banks) to total assets.	CASHTA	Bankscope
Bank profitability	Return on average assets.	ROAA	Bankscope
Bank size	Natural logarithm of total assets.	LNTA	Bankscope
S&P Sovereign Rating	Country rating from Standard and Poor’s formalized on a scale from 1 to 10.	SPR	Standard & Poor's Rating Services (2014)

Table 2: Country-name abbreviations used in the tables to represent the country-specific coefficients.

Country	Abbreviation
Belgium	BE
France	FR
Germany	DE
Greece	EL
Italy	IT
Netherlands	NL
Portugal	PT
Spain	ES

Table 3: Correlations.

	CDS	LTA	CASHTA	ROAA	LNTA	SPR	INS	COV	NCOV
CDS	1								
LTA	-0.0200	1							
CASHTA	-0.0052	-0.1375	1						
ROAA	-0.0041	-0.0508	-0.0296	1					
LNTA	0.1309	-0.0350	-0.0742	-0.0451	1				
SPR	-0.0013	-0.1056	0.0474	0.0433	-0.1639	1			
INS	0.0119	-0.0279	0.0287	-0.0752	0.1056	0.0342	1		
COV	0.0249	0.0186	-0.0710	0.0369	0.1999	-0.2412	0.7114	1	
NCOV	0.0223	0.0497	-0.1224	0.1258	0.1724	-0.3652	-0.0360	0.6669	1

Table 4: Outcomes of the Fisher unit tests (based on augmented Dickey-Fuller tests) for all Bankscope variables.

Fisher test outcomes (based on augmented Dickey-Fuller tests)	CDS	LTA	CASHTA	ROAA	LNTA
Number of panels	3,338	3,335	3,321	3,334	3,338
Average number of periods	5.78	5.77	5.77	5.78	5.78
Fisher type unit root test based on augmented Dickey-Fuller tests (no trend)	0.000	0.000	0.000	0.000	0.000
Fisher type unit root test based on augmented Dickey-Fuller tests (trend)	0.000	0.000	0.000	0.000	0.000

Table 5: The estimated models.

Model	**Specification**[a]
(1)	$CDS_t = \alpha + \beta LTA_t + \beta CASHTA_t + \beta ROAA_t + \beta_t LNTA_t + e_t$
(2)	$CDS_{it} = \alpha_i + \beta LTA_{it} + \beta CASHTA_{it} + \beta ROAA_{it} + \beta LNTA_{it} + e_{it}$
(3)	$CDS_{ict} = \alpha_i + \beta SPR_{ct} + e_{ict}$
(4)	$CDS_{ict} = \alpha_i + \beta LTA_{it} + \beta CASHTA_{it} + \beta ROAA_{it} + \beta LNTA_{it} + \beta SPR_{ct} + e_{it}$
(5)	$CDS_{it} = \alpha_i + \beta LTA(-1)_{it} + \beta CASHTA(-1)_{it} + \beta ROAA(-1)_{it} + \beta LNTA(-1)_{it} + e_{it}$
(6)	$CDS_{ict} = \alpha_i + \beta LTA(-1)_{it} + \beta CASHTA(-1)_{it} + \beta ROAA(-1)_{it} + \beta LNTA(-1)_{it} + \beta SPR_{ct} + e_{ict}$
(7)	$CDS_{ict} = \alpha_c + \beta LTA_{it} + \beta CASHTA_{it} + \beta ROAA_{it} + \beta LNTA_{it} + e_{ict}$
(8)	$CDS_{ict} = \alpha_c + \beta SPR_{ct} + e_{ict}$
(9)	$CDS_{ict} = \alpha_c + \beta LTA_{it} + \beta CASHTA_{it} + \beta ROAA_{it} + \beta LNTA_{it} + \beta SPR_{ct} + e_{ict}$
(10)	$CDS_{ict} = \alpha_c + \beta LTA(-1)_{it} + \beta CASHTA(-1)_{it} + \beta ROAA(-1)_{it} + \beta LNTA(-1)_{it} + e_{ict}$
(11)	$CDS_{ict} = \alpha_c + \beta LTA(-1)_{it} + \beta CASHTA(-1)_{it} + \beta ROAA(-1)_{it} + \beta LNTA(-1)_{it} + \beta SPR_{ct} + e_{ict}$
(12)	$CDS_{ict} = \alpha_c + \beta LTA(-1)_{it} + \beta CASHTA(-1)_{it} + \beta ROAA(-1)_{it} + \beta LNTA(-1)_{it} + \beta COV_{ct} + e_{ict}$
(13)	$CDS_{ict} = \alpha_c + \beta LTA(-1)_{it} + \beta CASHTA(-1)_{it} + \beta ROAA(-1)_{it} + \beta LNTA(-1)_{it} + \beta NCOV_{ct} + e_{ict}$
(14)	$CDS_{ict} = \alpha_c + \beta LTA(-1)_{it} + \beta CASHTA(-1)_{it} + \beta ROAA(-1)_{it} + \beta LNTA(-1)_{it} + \beta INS_{ct} + e_{ict}$
(15)	$CDS_{ict} = \alpha_c + \beta LTA(-1)_{it} + \beta CASHTA(-1)_{it} + \beta ROAA(-1)_{it} + \beta LNTA(-1)_{it} + \beta INS_{ct} + \beta NCOV_{ct} + e_{ict}$

[a] subscript i distinguishes bank-specific variables, subscript c distinguishes country-specific variables, and subscript t distinguishes between time periods (years).

Table 6: Year-fixed effects estimations for the effects of bank characteristics and S&P sovereign rating on deposits.

Dependent Variable: CDS						
Model:	**(1)**	**(2)**	**(3)**	**(4)**	**(5)[a]**	**(6)[a]**
LTA	-9804.325** (4739.181)	-9822.028*** (2092.202)		-8504.819*** (2461.118)	-10354.9*** (1448.149)	-9738.17*** (1406.532)
CASHTA	13410.98 (39552.92)	10282.5 (8432.942)		8191.764 (8819.519)	13527.5 (9559.05)	12239.01 (9539.183)
ROAA	106.8781 (723.4159)	149.3567 (302.1198)		89.64055 (285.5219)	-300.0546 (360.3949)	-280.3353 (359.4586)
LNTA	6432.036*** (355.1111)	6426.474*** (1703.633)		6575.772*** (1757.177)	4172.296*** (232.3418)	4247.021*** (235.3313)
SPR			-154.689 (566.0774)	3785.266*** (1469.718)		1993.361*** (538.6735)
Constant	-35296.35*** (4118.062)	-35198.13*** (12195.44)	6298.415 (5418.594)	-74213.22*** (26803.27)	-19555.76*** (1551.15)	-40044.84*** (5670.09)
Number of observations	19,103	19,103	19,291	19,103	19,102	19,102
Adjusted R-squared	0.0172	0.0172	0.0000	0.0174	0.1266	0.1281
Year fixed effects	No	Yes	Yes	Yes	Yes	Yes
LSDV estimations	No	No	No	No	No	No

[a] (5) and (6) comprise the lagged variables of LTA, CASHTA, ROAA, and LNTA.
All fixed effects panel estimations include robust standard errors.
***,**,* denote statistically significant effects at a 1%, 5% and 10% level.

Table 7: Year fixed-effects LSDV estimations for the effects on bank characteristics and S&P sovereign rating on deposits.

Dependent Variable: CDS					
Model:	**(7)**	**(8)**	**(9)**	**(10)[a]**	**(11)[a]**
LTA	-7240.421*** (2426.951)		-7204.995*** (2453.832)	-8613.415*** (1474.495)	-8602.02*** (1469.831)
CASHTA	15991.24 (10079.15)		16072.05 (10102.21)	5516.342 (10200.82)	5550.912 (10179.95)
ROAA	168.1015 (234.7222)		143.7011 (234.3799)	-217.6211 (386.8264)	-217.6051 (386.8219)
LNTA	7118.051*** (1843.05)		7118.62*** (1843.569)	4410.073*** (265.8677)	4410.591*** (265.7687)
SPR		1309.584 (2162.141)	1527.356 (2183.695)		293.6648 (1704.486)
Country specific intercepts with Belgium as reference group (intercept)					
FR	5373.462 (6429.207)	3831.458 (5725.307)	4397.75 (5651.281)	-894.9556 (990.0103)	-1084.509 (1453.013)
DE	9493.296** (4187.659)	-8789.112*** (1943.05)	8249.223** (3408.552)	2520.235*** (934.0925)	2282.525 (1643.537)
EL	-6430.43*** (1116.637)	-3420.816 (5008.055)	-2920.808 (4667.884)	-5703.82*** (836.957)	-5022.943 (4088.267)
IT	11474.25** (5277.65)	-7528.243*** (1874.98)	12361.53** (6119.446)	3040.651*** (1048.679)	3210.508** (1389.615)
NL	9273.71*** (3548.691)	14333.3*** (4088.223)	8038.624* (4290.587)	13664.89*** (3667.336)	13427.32*** (3884.598)
PT	-12610.22*** (1779.906)	-7768.225*** (2373.49)	-11019.13*** (2026.379)	-11267*** (815.8741)	-10959.65*** (1995.273)
ES	-3336.19 (3185.579)	-217.4887 (3076.907)	-3624.095 (3467.096)	-1351.35 (2835.86)	-1406.314 (2994.199)
Constant	-49892.81*** (17532.29)	-1733.627 (19885.42)	-63947.67* (33821.24)	-24088.2*** (2375.165)	-26799.1* (15750.24)
Number of observations	19,103	19,291	19,103	19,102	19,102
Adjusted R-squared	0.0179	0.002	0.0178	0.1350	0.1350
Year fixed effects	Yes	Yes	Yes	Yes	Yes
LSDV estimations	Yes	Yes	Yes	Yes	Yes
[a] (5) and (6) comprise the lagged variables of LTA, CASHTA, ROAA, and LNTA. All fixed effects panel estimations include robust standard errors. ***,**,* denote statistically significant effects at a 1%, 5% and 10% level.					

Table 8: Year fixed-effects LSDV estimations for the effects of bank characteristics and the explanatory deposit guarantee variables on deposits.

Dependent Variable: CDS					
Model:	**(10)**	**(12)**	**(13)**	**(14)**	**(15)**
LTA(-1)	-8613.415*** (1474.495)	-8451.143*** (1479.265)	-8575.294*** (1474.645)	-8499.321*** (1484.542)	-8503.614*** (1484.416)
CASHTA(-1)	5516.342 (10200.82)	4988.082 (10205.11)	5643.967 (10212.12)	4799.739 (10188.99)	5024.619 (10195.24)
ROAA(-1)	-217.6211 (386.8264)	-185.3509 (389.3051)	-220.0173 (386.6924)	-181.3338 (391.2904)	-191.2976 (391.3925)
LNTA(-1)	4410.073*** (265.8677)	4371.347*** (264.0815)	4405.451*** (266.034)	4375.514*** (263.5431)	4369.529*** (263.4742)
COV		0.0326625*** (0.0069758)			
NCOV			0.0264796* (0.0145965)		0.0403488** (0.0166465)
INS = 0				0[a]	0[a]
INS = 1				955.5406** (409.1103)	294.3679 (473.2955)
INS = 2				2786.23*** (840.3686)	3169.888*** (846.1366)
Country specific intercepts with Belgium as reference group (constant)					
FR	-894.9556 (990.0103)	-1976.956* (1058.558)	-1674.781 (1072.533)	-1019.538 (1000.882)	-2194.182** (1086.289)
DE	2520.235*** (934.0925)	2568.746*** (938.0785)	2715.558*** (934.3445)	2320.381** (929.6089)	2637.734*** (939.7622)
EL	-5703.82*** (836.957)	-5821.859*** (854.5981)	-5773.351*** (846.1767)	-5734.115*** (844.4937)	-5807.686*** (857.8539)
IT	3040.651*** (1048.679)	1324.741 (1082.01)	1176.741 (1482.234)	3643.906*** (1073.78)	721.4425 (1598.053)
NL	13664.89*** (3667.336)	13160.5*** (3674.787)	13310.39*** (3678.629)	13596.4*** (3669.134)	13073.92*** (3680.608)
PT	-11267*** (815.8741)	-11514.24*** (830.9467)	-11435.09*** (821.5148)	-11303.42*** (824.7762)	-11510.16*** (833.7329)
ES	-1351.35 (2835.86)	-1544.139 (2815.979)	-1458.442 (2822.333)	-1408.441 (2829.979)	-1511.813 (2816.657)
Constant	-24088.2*** (2375.165)	-25486.2*** (2461.85)	-24458.33*** (2365.876)	-24369.72*** (2389.094)	-24743.64*** (2388.291)
Number of observations	19,102	19,102	19,102	19,102	19,102
Adjusted R-squared	0.1350	0.1362	0.1352	0.1359	0.1363
Year fixed effects	Yes	Yes	Yes	Yes	Yes
LSDV estimations	Yes	Yes	Yes	Yes	Yes
All fixed effects panel estimations include robust standard errors. ***,**,* denote statistically significant effects at a 1%, 5% and 10% level.					

Table 9: Country-specific intercepts

Country	**Model 12**	**Rank (Model 12)**	**Model 15**	**Rank (Model 15)**
Belgium (BE)	-25,486	4	-24,744	4
France (FR)	-27,463	6	-26,938	6
Germany (DE)	-22,917	2	-22,106	2
Greece (EL)	-31,308	7	-30,551	7
Italy (IT)	-24,161	3	-24,022	3
Netherlands (NL)	-12,326	1	-11,670	1
Portugal (PT)	-37,000	8	-36,254	8
Spain (ES)	-27,030	5	-26,255	5

The intercepts are rounded to whole numbers.
The country-specific intercepts are ranked in descending order.

Graph 1: Visual representation of the country specific intercepts (model 15). The orange bars represent the southern European countries and the northern European countries are presented in blue.

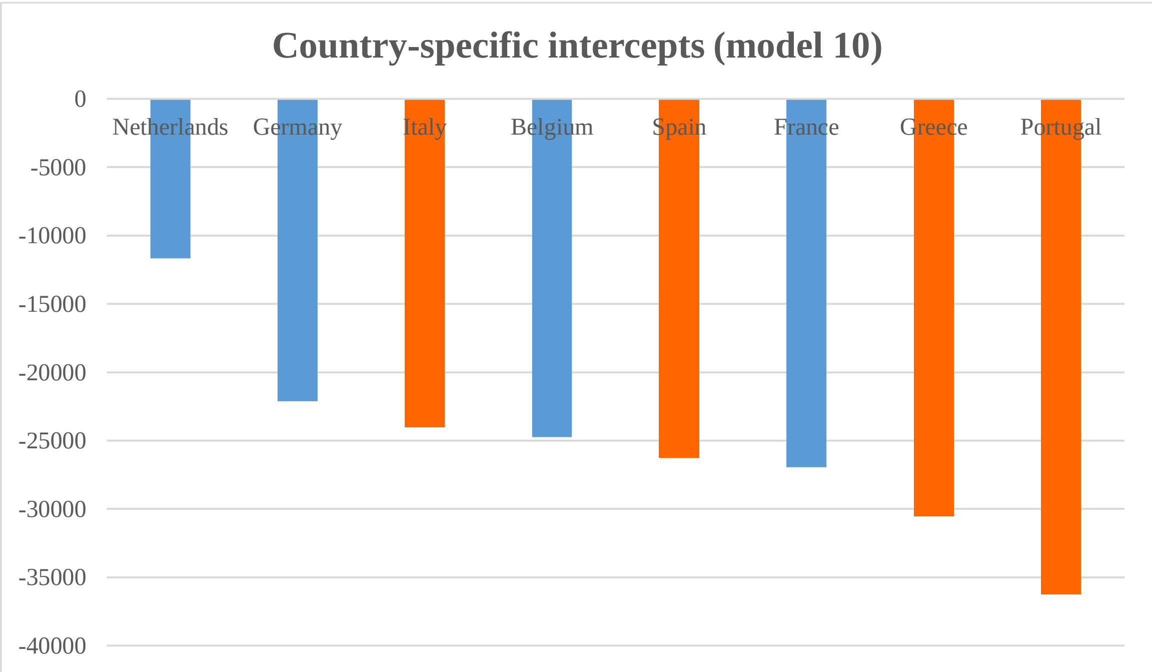


Table 10: Country-specific descriptive statistics

Sample: Belgium					
Variable	**Observations**	**Mean**	**Standard deviation**	**Minimum**	**Maximum**
CDS	384	10140.52	15206.49	1	61489
LTA	378	0.468469	0.216385	0.003289	0.9681698
CASHTA	373	0.010472	0.021244	0	0.1636883
ROAA	381	0.463307	1.31983	-9.71	11.21
LNTA	384	8.86656	2.454557	4.70048	13.6776
SPR	384	9.203125	0.097705	9	9.25
INS	384	0.473958	0.653849	0	2
COV	384	50833.33	38986.28	20000	100000
Sample: France					
Variable	**Observations**	**Mean**	**Standard deviation**	**Minimum**	**Maximum**
CDS	2,230	14954.09	299958.2	1	14100000
LTA	2,210	0.586235	0.248103	0.003245	0.9799477
CASHTA	2,177	0.015911	0.039347	0	0.8735178
ROAA	2,225	0.922162	2.627585	-37.78	26.67
LNTA	2,230	8.851453	2.085542	2.302585	17.29923
SPR	2,230	9.835874	0.310161	9.25	10
INS	2,230	0.561883	0.690563	0	2
COV	2,230	83399.1	14917.67	70000	100000
Sample: Germany					
Variable	**Observations**	**Mean**	**Standard deviation**	**Minimum**	**Maximum**
CDS	14,582	2677.954	20678.48	1	691060
LTA	14,575	0.575212	0.137231	0.000566	0.9936306
CASHTA	14,548	0.021333	0.011541	0	0.5
ROAA	14,559	0.278472	0.426026	-12.02	8.38
LNTA	14,582	6.572703	1.825637	2.564949	15.57882
SPR	14,582	10	0	10	10
INS	14,582	0.562954	0.683393	0	2
COV	14,582	46065.04	31157.19	22222	100000
Sample: Greece					
Variable	**Observations**	**Mean**	**Standard deviation**	**Minimum**	**Maximum**
CDS	186	3899.269	4960.864	1	25147
LTA	186	0.671959	0.126953	0.1873	0.8797643
CASHTA	184	0.031354	0.020731	0	0.1415689
ROAA	185	-0.84459	3.991641	-34.03	11.45
LNTA	186	9.080151	1.406984	5.680173	11.70144
SPR	186	6.889785	1.650947	3	8
INS	186	0.5	0.651402	0	2
COV	186	53118.28	39509.93	20000	100000

Sample: Italy					
Variable	**Observations**	**Mean**	**Standard deviation**	**Minimum**	**Maximum**
CDS	824	417.3459	3422.748	1	81234
LTA	824	0.64099	0.140451	0.083082	0.988751
CASHTA	824	0.008625	0.007431	0	0.1
ROAA	823	0.813609	0.521996	-2.11	4.16
LNTA	824	6.248715	1.943035	2.484907	13.86011
SPR	824	8.683859	0.198017	7.25	8.75
INS	824	0.019418	0.154673	0	2
COV	824	103271	255.7357	100000	103291

Sample: Netherlands					
Variable	**Observations**	**Mean**	**Standard deviation**	**Minimum**	**Maximum**
CDS	348	25668.91	68012.73	1	408830
LTA	340	0.461397	0.233425	0.000106	0.93624
CASHTA	330	0.042604	0.054139	0	0.33283
ROAA	346	0.432746	0.995733	-8.09	6.32
LNTA	348	9.516325	2.118034	5.765191	14.10194
SPR	348	10	0	10	10
INS	348	0.554598	0.683192	0	2
COV	348	66724.14	29863.55	40000	100000

Sample: Portugal					
Variable	**Observations**	**Mean**	**Standard deviation**	**Minimum**	**Maximum**
CDS	193	1213.513	2686.278	1	29417
LTA	193	0.642653	0.1762	0.031385	0.909962
CASHTA	193	0.024649	0.019693	0	0.157319
ROAA	193	0.230518	1.197097	-8.47	1.28
LNTA	193	9.545873	1.630385	4.174387	11.74211
SPR	193	8.147668	0.974055	6	9
INS	193	0.544042	0.660948	0	2
COV	193	58808.29	37414.9	25000	100000

Sample: Spain					
Variable	**Observations**	**Mean**	**Standard deviation**	**Minimum**	**Maximum**
CDS	544	10299.43	65255	1	875948
LTA	544	0.716351	0.127238	0.042569	0.966914
CASHTA	544	0.017624	0.014374	0	0.11463
ROAA	544	0.19079	1.938239	-16.79	5.11
LNTA	544	9.614938	1.841603	3.583519	15.35577
SPR	544	9.376838	0.93787	6.75	10
INS	544	0.538603	0.649677	0	2
COV	544	56176.47	39853.49	20000	100000