



**UNIVERSITA' DEGLI STUDI DI PADOVA**  
**DIPARTIMENTO DI SCIENZE ECONOMICHE ED AZIENDALI**  
**"M.FANNO"**

**CORSO DI LAUREA MAGISTRALE IN**  
**ECONOMIA E FINANZA**

**TESI DI LAUREA**

**"DEPOSIT INSURANCE AND MORAL HAZARD"**

**RELATORE:**

**CH.MO PROF. FRANCESCO ZEN**

**LAUREANDO: RICCARDO GATTOLIN**

**MATRICOLA N. 1034573**

**ANNO ACCADEMICO 2019 – 2020**



Il candidato dichiara che il presente lavoro è originale e non è già stato sottoposto, in tutto o in parte, per il conseguimento di un titolo accademico in altre Università italiane o straniere.

Il candidato dichiara altresì che tutti i materiali utilizzati durante la preparazione dell'elaborato sono stati indicati nel testo e nella sezione "Riferimenti bibliografici" e che le eventuali citazioni testuali sono individuabili attraverso l'esplicito richiamo alla pubblicazione originale.

*The candidate declares that the present work is original and has not already been submitted, totally or in part, for the purposes of attaining an academic degree in other Italian or foreign universities. The candidate also declares that all the materials used during the preparation of the thesis have been explicitly indicated in the text and in the section "Bibliographical references" and that any textual citations can be identified through an explicit reference to the original publication.*

Firma dello studente

Riccardo Gattolin



# CONTENTS

ABSTRACT .....	7
INTRODUCTION .....	9
CHAPTER 1: BANKING.....	10
1.1 Banking economics and financial crises.....	10
1.2 Banking regulation and supervision .....	11
CHAPTER 2: MORAL HAZARD .....	13
2.1 Asymmetric information .....	13
CHAPTER 3: HISTORY OF BANKING, FINANCIAL CRISES, AND DEPOSIT INSURANCE .....	14
3.1 Ancient Greece .....	14
3.2 Ancient Rome .....	15
3.3 Imperial bank run (to Lehman Brothers from Pittius Brothers).....	19
3.4 Contemporary history – United States of America .....	24
3.5 Contemporary history – Other countries .....	27
CHAPTER 4: EXPLICIT DEPOSIT INSURANCE SCHEME.....	28
4.1 ‘What’ it is.....	28
4.2 Legal framework.....	28
4.3 ‘Who’ is affected .....	29
4.4 ‘Why’ it exists .....	29
CHAPTER 5: DEPOSIT INSURANCE AND MORAL HAZARD .....	30
5.1 Bank moral hazard.....	30
5.2 Too-big-to-fail bank moral hazard .....	40
5.3 Systemic risk bank moral hazard.....	42
CHAPTER 6: HOW TO REDUCE MORAL HAZARD .....	46
6.1 Regulatory environment – EDIS design.....	46
6.2 Regulatory environment – EDIS credibility.....	51
6.3 Market environment – Household depositors behavior.....	52
6.3.1 Financial information and communication .....	52
6.3.2 Financial education-knowledge .....	53
6.3.3 Financial psychology.....	55
6.3.4 Financial sociology.....	56
6.3.5 Financial anthropology.....	58
6.4 Market environment – Market discipline .....	59
6.4.1 Bank market discipline .....	59
6.4.2 Too-big-to-fail market discipline .....	67

6.4.3 Systemic risk market discipline .....	67
6.5 Bank management – Self-discipline .....	69
6.6.1 Charter value .....	69
6.6 Regulatory environment – Public discipline .....	70
6.6.1 Bank activities regulation .....	70
6.6.2 Bank capital regulation.....	70
6.6.3 Bank supervision .....	70
6.6.4 Bank resolution .....	71
6.6.5 Regulatory environment (and interaction effects) .....	72
6.7 Institutional environment.....	74
6.7.1 Institutions .....	74
6.7.2 Bank corporate governance structure .....	75
6.7.3 Bank market structure .....	78
6.7.4 Sound accounting, disclosure regime, and independent audits.....	78
CHAPTER 7: DEPOSIT INSURANCE BENEFITS.....	79
7.1 Avoiding bank runs (and their induced banking crises) .....	79
7.2 Crisis management and recovery effects .....	83
7.3 Liquidity .....	84
7.4 Financial development.....	86
7.5 Bank competition.....	91
7.6 Wealth effects and risk effects.....	92
CONCLUSIONS .....	95
BIBLIOGRAPHY.....	96

## **ABSTRACT**

The 2008 global financial crisis tested deposit insurance schemes around the world, and they showed their effectiveness by avoiding panics amongst insured depositors.

However, financial crises involving depositors' panics, bank runs and bank failures, with depositors losing their deposited money, stretch far back in time. On the contrary, deposit insurance is a fairly recent topic of significant research for the academia.

This thesis has the objective of analyzing the evidence on deposit insurance and moral hazard. A fair share of the available literature on deposit insurance schemes focuses on the possible costs created by it, specifically on the moral hazard behavior by banks and the related possible weakening of market discipline, the latter being the behavior of bank stakeholders in curbing the banks' excessive risk-taking before the introduction of explicit deposit insurance.

But besides market discipline, other factors can stem moral hazard, including the design and credibility of the deposit insurance scheme, the self-discipline by bank managers, the public discipline exercised by public regulators and the country-level institutional characteristics.

Notwithstanding the mixed evidence on the broad theme of moral hazard risk (the strongest argument against explicit deposit insurance), and considering that the explicit deposit insurance schemes in the different countries are a continuous work-in-progress to improve them by the national and/or supranational authorities throughout time, with the correct measures to alleviate the possible negative side-effects of explicit deposit insurance, the scheme is beneficial.

## SINTESI

La crisi finanziaria globale del 2008 ha messo alla prova i sistemi di assicurazione dei depositi in tutto il mondo ed essi hanno dimostrato la loro efficacia evitando il panico tra i depositanti assicurati.

Tuttavia, le crisi finanziarie che coinvolgono il panico dei depositanti, le corse agli sportelli delle banche e i fallimenti bancari, con i depositanti che perdono il loro denaro depositato, hanno una storia molto lunga. Al contrario, l'assicurazione dei depositi è un argomento abbastanza recente di ricerca significativa per il mondo accademico.

Questa tesi ha l'obiettivo di analizzare le prove riguardanti l'assicurazione sui depositi e l'azzardo morale.

Una buona parte della letteratura disponibile sui sistemi di assicurazione dei depositi si concentra sui possibili costi da essa creati, in particolare sul comportamento di azzardo morale delle banche e il relativo possibile indebolimento della disciplina di mercato, quest'ultimo inteso come il comportamento delle parti aventi interesse nel destino della banca nel limitare le banche all'assunzione di rischi eccessivi ma prima dell'introduzione di un'assicurazione sui depositi.

Ma oltre alla disciplina di mercato, altri fattori possono arginare l'azzardo morale, tra cui la progettazione e la credibilità dell'assicurazione dei depositi, l'autodisciplina da parte dei gestori delle banche, la disciplina pubblica esercitata dai regolatori pubblici e le caratteristiche istituzionali a livello nazionale.

Nonostante le prove contrastanti sull'ampio tema del rischio di azzardo morale (la più forte argomentazione contro l'assicurazione dei depositi) e considerando che i sistemi di assicurazione dei depositi espliciti nei diversi paesi sono un continuo lavoro in corso per migliorarli da parte delle autorità nazionali e/o sovranazionali nel tempo, con adeguate misure per alleviare i possibili effetti collaterali negativi dell'assicurazione sui depositi espliciti, il regime è vantaggioso.



# INTRODUCTION

The thesis has the main aim of analyzing deposit insurance and its possible negative impact in the form of moral hazard by banks and by weakening market discipline.

Moreover, a historical perspective is given on banking, financial crises and deposit insurance, because the government intervention on banking matters stretches far back in time, but only recently has created a permanent explicit deposit insurance scheme for the protection of depositors and, with other parts of the financial safety net, the stability of the financial system.

The thesis is structured in various parts, with the fifth and sixth parts being the main ones.

In Chapter 1, there is a brief discussion of banking economics and financial crises, and then the banking regulation and supervision.

In Chapter 2, a presentation of asymmetric information in an insurance setting, with its two main distinctions, being the adverse selection and the moral hazard.

In Chapter 3, a description of the long history of deposit banking and financial crises, the latter showing *implicit* deposit insurance by the government, and then the only recent creation of *explicit* deposit insurance schemes.

In Chapter 4, there is a description of what deposit insurance is, the legal framework, who is affected by it, and why it exists.

In Chapter 5, the presentation of the evidence regarding moral hazard following the creation or presence of explicit deposit insurance.

In Chapter 6, the presentation of various factors that can stem banks' moral hazard.

In Chapter 7, the description of the possible benefits associated with deposit insurance.

In the Conclusions, there is a sum up of the entire discussion on deposit insurance and moral hazard.

# CHAPTER 1: BANKING

This chapter gives a brief description of banking economics and related financial crises, and then of the banking sector regulation and supervision.

## *1.1 Banking economics and financial crises*

The banking sector is important in the economy given its economic functions (monetary, credit, and payment), but especially so for the big size of its lending activity when compared to the whole economy (% credit/GDP).

When the financial sector has serious problems, they could cause financial crises, oftentimes creating GDP losses of big dimensions, compared to the size of the economy, and lasting for various years (Reinhart, Rogoff, 2009).

However, financial crises always happened, and financial history shows it clearly (Reinhart, Rogoff, 2008).

Also, financial crises affect the finances of governments (i.e. tax revenue collapses, countercyclical fiscal policies, and bailout costs), increasing their debt/GDP ratios (Reinhart, Rogoff, 2008).

Moreover, for the economy to reach the pre-crisis income from an analysis of systemic financial crises the average recovery time is 8 years, while the median is 6,5 years (Reinhart, Rogoff, 2014).

The governments created laws to regulate banking activities to avoid financial crises happening again, or at least to lessen their magnitude and duration.

## ***1.2 Banking regulation and supervision***

The banking sector, given its *economic* and *financial* importance, is regulated and supervised. Here the point of view is from the country perspective of Italy, but most countries in the world have adopted the same, or similar, frameworks to create a *financial safety net*.

*Bank (activities) regulation* relates to the “Second Council Directive 89/646/EEC”, agreed at an European level, then implemented in Italy being the core of the “Testo Unico Bancario” (TUB) (Decreto legislativo 1° settembre 1993, n. 385), that regulates the activities of the banking sector (European Union, 1989) (Banca d’Italia, 1993).

*Bank (capital) regulation* relates to the “Basel III” regulatory framework, agreed at an international level, with several objectives (Bank for International Settlements, 2017):

- Increase the level and quality of capital
- Enhance risk capture
- Constrain bank leverage
- Improve bank liquidity
- Limit procyclicality

And it has been implemented in the European Union with the “Capital Requirements Regulation and Directive” (CRD) (Regulation (EU) No 575/2013), agreed at an European level (European Union, 2013).

*Bank bankruptcy and resolution regulation* relates to the “Bank Recovery and Resolution Directive” (BRRD) (Directive 2014/59/EU) regulatory framework, agreed at an European level, with several objectives (European Union, 2014):

- Banks in difficulties – prevention
- Banks in a difficult financial situation – early intervention
- Failing banks – restructuring (resolution) (i.e. “bail-in”)
- National resolution funds to provide financial support for banks’ restructuring plans

Also, there is the “Single Resolution Mechanism” (SRM) (Regulation (EU) No 806/2014) regulatory framework, agreed at an European level, made up by the Single Resolution Board (SRB) and the Single Resolution Fund (SRF), with the objective (European Union, 2014):

- Uniform rules and a uniform procedure for the resolution of credit institutions and certain investment firms

*Bank supervision* relates to the “Single Supervisory Mechanism” (SSM) (Council Regulation (EU) No 1024/2013) regulatory framework, agreed at an European level, with several objectives (European Union, 2013):

- Directly supervises (by the ECB) significant banks
- Indirectly supervises banks considered less significant that are directly supervised by their national supervisory authorities

*Bank deposit insurance regulation* relates to the “Deposit Guarantee Schemes Directive” (DGSD) (Directive 2014/49/EU), agreed at an European level, with several objectives (European Union, 2014):

- Harmonized national deposit guarantee schemes
- Coverage level
- Beneficiaries of the guarantee
- Repayment
- Financing of deposit guarantee schemes
- Use of funds
- Depositor information

*Lender of last resort (LOLR)* relates to the European Central Bank (ECB), at an European level, with several objectives (European Central Bank, 2019):

- Offer the last safety net for banks that cannot get the funding they need elsewhere (illiquid) through the “Emergency liquidity assistance” (ELA) loans: it is provided by the national central bank of the country in which the struggling bank is based, it is for solvent banks, it is temporary, and it has a price

## CHAPTER 2: MORAL HAZARD

The main element of discussion will be the moral hazard effect created by deposit insurance, therefore an illustration of what the moral hazard effect is would be useful.

### *2.1 Asymmetric information*

In microeconomics (Katz, Rosen, 2007), *asymmetric information* is a situation where one of the parties involved in an economic transaction has more information than the other about the object of the transaction.

*Insurance* is a contract (insurance policy) that protects the buyer from a certain damage that causes him a financial loss, and in exchange the buyer pays a regular amount to the insurer (insurance premium).

In the context of an insurance contract, the asymmetric information can be divided into two types (Greenlaw et al., 2017):

- *Adverse selection*: when the insurance buyer has more information about whether he is high risk or low risk than the insurance company does
- *Moral hazard*: when the insurance buyer behavior becomes riskier because he knows he is insured, and that the insurer does not know about it

In short:

- Adverse selection: about the buyer's information *before* the contract is signed (hidden information)
- Moral hazard: about the buyer's behavior *after* the contract is signed (hidden action)

However, the insurer has several ways to *reduce* the moral hazard problem:

1) The *insurer* does investigations and monitoring

2) Making the *buyer* shoulder part of the cost of the insurance, inducing a less risky behavior:

- Deductibles: the amount that the buyer must pay out of pocket before the insurance coverage starts paying
- Co-payments: the buyer must pay a small amount also
- Co-insurance: the insurer covers only a percentage of the cost of the damage

## CHAPTER 3: HISTORY OF BANKING, FINANCIAL CRISES, AND DEPOSIT INSURANCE

*History* can give a perspective through time of various objects of interest (banking, financial crises and the shift from implicit to explicit deposit insurance).

Taking a step back through time, there is the question of “*when*” the activities of “*modern-like*” banking started, meaning the long history of banking since Ancient Greece and Ancient Rome, with an example of a financial crisis of that time (showing an *implicit deposit insurance*), and then the very *recent* efforts by U.S. state governments to create a deposit insurance scheme (*explicit deposit insurance*), the U.S. federal deposit insurance scheme in 1933, and in time other countries in the world following suit.

### 3.1 Ancient Greece

In Ancient Greece, there was a monetized economy that first saw the presence of the modern elements of banking and related activities.

The first factor is the presence of *money* and a *monetary economy* (Engen, 2014):

*“With few exceptions (Sparta being the most famous), the Greeks of the Classical period had a thoroughly monetized economy employing coinage whose value was based on precious metals, principally silver. The value of the coinage was commensurate to the value of the precious metal it contained with a small mark-up, since the value of the metal was guaranteed by its issuing state. The tie of the Greek monetary system to the supply of precious metals limited the ability of governments to influence their economies through the manipulation of their money supplies. However, we do know of cases when states debased their coinages for such purposes.”*

In particular, there were *banking activities* as lending, deposits, and money-exchange (Engen, 2014):

*“Given that the ancient Greeks did have a monetized economy, it is not surprising that they also developed banking and credit institutions. It is generally agreed that at the very least, bankers, who were metics as a rule (note Pasion and Phormion above), performed various functions from money-changing to securing deposits in cash and other assets. The question whether bankers lent out money deposited by others at interest, however, is the subject of*

*some debate. [...] Although Millett may be right that much of the lending and borrowing in Athens was for consumptive purposes, particularly those secured by landed property, it is hard to deny that the evidence of productive lending and borrowing from banking practices, numerous maritime loans, and even temple loans in the Classical period constitute something more than just exceptions to the rule.”*

Regarding the development of *deposit banking* in Ancient Greece (Munro, 2003):

*“As Raymond Bogaert contends, deposit banking with lending developed in Greece during the early fourth century BC from the activities of professional money-changers, known as trapezites and goldsmiths, known as argyropatês (L. argentarius), who exchanged ‘foreign’ for domestic coins. The transition from money-changer and coin dealer to banker is well known. Because money-changers and goldsmiths had to be able to safeguard their valuable inventories, many also offered the additional service of safeguarding the moneys, precious metals, and valuables of their mercantile clients. They soon learned that, by maintaining a sufficiently high reserve ratio (usually a third), they could safely lend out the remainder, in short-term interest-bearing loans. They could also allow clients who maintained deposit accounts to make transfer payments, on verbal or by written instructions. By the third century BC, Athenian bankers routinely provided giro transfers, written orders of payment, and, in effect, cheques (documented by 254 BC).”*

### **3.2 Ancient Rome**

In Ancient Rome, there was also a functioning market economy, a monetary economy with a private banking sector that showed financial interconnections throughout the territory of Rome.

On the Roman *monetary economy* (Scheidel, 2008):

*“Recent estimates of the Roman imperial budget in the middle of the second century CE converge on approximately 1 billion sesterces. It is certain that not all of these funds were collected in cash. However, if we employ the simplifying assumption of an annual revenue stream of 1 billion sesterces in coin, this amount would not have exceeded 10 percent of the coined money stock. Allowing for assessments in kind and/or a coinage volume in excess of 10 billion sesterces (see above) –, its actual share was probably smaller still.*

*[...] At the same time, unless my above estimates of total metal stocks are very wide of the mark, the Roman empire was significantly more monetized than the Han state and more coin was therefore available for commercial exchange or hoarding.”*

Another view on the Roman *monetary economy* (Kessler, Temin, 2005):

*“We have argued here that the early Roman Empire was thoroughly monetized. We do not argue that people everywhere had adequate supplies of Roman coins, but rather that people throughout the empire used a single monetary standard to value their activities. This single monetary standard was based on sestertii in the western empire and on drachmae in the eastern empire, with a fixed exchange rate between them. The result was to create a single currency area like the euro zone today. Whether or not all regions had adequate supplies of coin, the survival of prices from all corners of the empire indicate that the Roman economy was thoroughly monetized.”*

About the Roman highly *monetized economy* (Temin, 2001):

*“The abundant evidence of Roman coinage testifies to the common use of coins as a means of payment. The issue here is not the size of the money supply—a contentious issue—but rather whether it makes sense to speak of a money supply at all. Howgego argued that coin was used for transactions throughout the Roman Empire. Egypt was fully monetized, and he asserted that records of transactions in other distant areas showed them to involve money rather than barter. Even in the countryside, people carried coin while traveling. It seems obvious that they carried coin in anticipation of spending their money buying goods and services in market exchanges.”*

The Roman economy was also a *market economy* (Temin, 2001):

*“There was not a single empire-wide market for all goods, but local markets were connected together around the Mediterranean. Transportation and communication took time, and the discipline of the market was loose. But there were many economic connections between even far-flung parts of the early Roman Empire. Finley was exactly wrong; ancient Rome had an economic system that was an enormous conglomeration of interdependent markets.”*

Similarly, on the Roman *market economy* (Temin, 2006):

*“Given the widespread use of markets in goods, labor and financial capital in the early Roman Empire, there is reason to believe that resources were used relatively efficiently.”*



Another point on the *market economy* (Arruñada, 2016):

*“The Roman economy was preindustrial but, at least for our period of interest, it offers many indicators of impersonal exchange, such as high rates of urbanization, remarkable productive specialization, substantial market integration for at least some products, and extensive and sophisticated financial markets.”*

On the *Roman bankers* (Temin, 2006):

*“Argentarii in Rome received deposits and made loans; they clearly were commercial banks. Some deposits were “sealed,” that is, preserved physically intact, and did not pay interest, while others were not sealed and paid interest.”*

The *banking functions* of Roman banks resembled today’s commercial banks: making loans, accepting deposits and providing cashier services (Temin, 2002):

*“Raymond Bogaert defined banks, typically individual bankers identified as trapezitai or argentarii, as accepting deposits and making loans. Jean Andreau expanded this definition slightly by adding a third function: “Banking is a commercial business involving receiving deposits from clients to whom the banker provides cashier services and lends available funds to third parties with whom the bank acts as a creditor.” By adding cashier services, Andreau appears to be saying that ancient banks must have dealt with the day-to-day needs of their clients for cash even if most deposits were not available on demand, that there were financial arrangements like demand deposits in addition to other, less available, deposits.”*

On the detail of banking operations, *bookkeeping* sheds some light (Arruñada, 2017):

*“Moreover, Romans kept records of transactions in both the private and public spheres. Private recordkeeping was effective. E.g., some banks preserved contracts of third parties for which they had facilitated payment, for them or for the benefit of their clients (Temin 2013:184), and, more importantly, lenders’ books were used as evidence in courts. The books of bankers were seen as “unimpeachable legal evidence [... and] the praetor required bankers to disclose their entries as evidence on behalf of anyone to whose case they were relevant” (Crook 1967:233). This made their records a sort of partial register, acting as notaries or specialized witnesses.”*

The financial intermediation was *sophisticated* and for the *private sector* (Arruñada, 2016):

*“Similarly, financial intermediaries and transactions were also sophisticated, and bankers*

*provided such an array of services (Andreau 1999) that it has even been suggested that “financial institutions in the early Roman Empire were better than those of eighteenth century France and Holland” (Temin 2013:189). Moreover, much, or even most borrowing, according to some authors (e.g., Johnston 1999:84), was for commercial purposes, and financial markets in different regions of the Empire were linked, most likely through financial intermediaries (Temin 2013:178–79). Credit was also so abundant that indebtedness was often considered a problem (Crook 1967:171–72). Lastly, if interest rates, “perhaps the most evident quantitative dimension of the efficiency of the institutional framework” (North 1990:69), were indeed not much higher than those of today (Crook 1967:211), this would suggest low default risk and therefore effective guarantees. And, despite usury regulations, market participants were able to adjust the interest rate to the risk of the loan.”*

Again, on the *banking sector dimension* and its economic importance (Scheidel, 2009):

*“Above all, however, financing costs depend on the nature of financial institutions. In a recent study of the financing of maritime commerce in the Roman empire of the early monarchy, Dominic Rathbone has drawn attention to the increasing sophistication of credit arrangements and long-distance payments that can be glimpsed from a variety of documentary sources. He stresses the importance of enforceable contracts and the existence of banks with trans-regional contacts for the expansion of commerce. The institution of the *societas*, which permitted the pooling of resources and the spread of risk, appears to have flourished in the late Republican and early imperial periods. Banks were instrumental in transferring large amounts of money without moving commensurate quantities of coin. According to Peter Temin practices of financial intermediation appear to have been more developed in this period than those even of eighteenth-century France. Whatever the details, we may safely conclude that Roman-era institutions kept financing costs low relative to rates that had prevailed, and would do so again, under less favorable conditions.”*

Furthermore, Roman bankers also offered *insurance* (Temin, 2001):

*“In addition, ancillary records are consistent with market exchange, not reciprocity. For example, there were maritime loans to finance shipping with insurance provisions. The loans had an interest rate at which they were to be repaid, but there was no obligation to repay if the ship was lost. In other words, the lender shared the risk of shipping with the ship owner and the owner of the ship’s contents. The interest rate was high in order to compensate the lender for bearing this risk. This is a sophisticated economic transaction.”*

Similarly, on *insurance* purchasing by merchants (Temin, 2006):

*“Roman merchants and shippers could purchase insurance; they were able to borrow with repayment conditional on a safe return. The interest rate charged was higher than usual and not subject to the normal limitation of 1 percent per month in an explicit acknowledgement that the payment included both interest and insurance. A legal principle stated: “Money lent on maritime loans can bear interest at any rate because it is at the risk of the lender as long as the voyage lasts” (Paulus, Sent. II, xiv, 3, quoted in de Ste. Croix, 1974).”*

Importantly, Roman banks showed strong *financial interconnections* (Temin, 2006):

*“Cicero noted the interconnection of financial markets around the Roman world, describing conditions in 66 BCE by reference to events 20 years earlier:*

*“Coinciding with the loss by many people of large fortunes in Asia, we know that there was a collapse of credit at Rome owing to suspension of payment. . . . This system of credit and finance which operates at Rome, in the Forum, is bound up in, and depends on capital invested in Asia; the loss of the one inevitably undermines the other and causes its collapse (Pro lege Manilia, 7, 19).”*

*It is possible that these linked financial markets were connected by loans from one individual to another, but it is far more likely that Roman loans to Asia were done by making use of banks such as the Egyptian one that reported in 155 CE”*

### ***3.3 Imperial bank run (to Lehman Brothers from Pittius Brothers)***

In the Roman Empire, a situation of crisis in the land market and then in the banking sector with financial effects that were spiraling downwards, forced the emperor (the state) to intervene to inject liquidity into the system (as a lender of last resort) and other measures to restore confidence, and therefore avoid the financial crisis to continue or getting worse.

On the *liquidity crisis* of 33 CE in the Roman Empire (Temin, 2001):

*“The financial system in the early Roman Empire also had some of the attributes of a modern monetary system. There even was a liquidity crisis in 33 CE in which interest rates rose, loans were called in, and land prices collapsed. Tiberius made available a substantial sum of money to be loaned to landowners without interest for three years to restore liquidity. This crisis exposed several aspects of the Roman economy. Members of the aristocracy were*

*borrowing freely. Loans were not restricted to specific activities, but pervaded all ranks of Roman life. The price of land was not fixed. It was a market price that could fall when putative sellers outnumbered buyers. People with land could sell as they wished, and people could buy if they had the money. This well-documented financial crisis demonstrates clearly that prices were used to equilibrate both the financial and land markets."*

Another source on the 33 CE crisis broadens the picture, describing the worsening banking conditions prior to the financial crisis, involving already some bank runs (Lightner, 1922):

*"A description of the panic reads like one of our own times: The important firm of Seuthes & Son, of Alexandria, was facing difficulties because of the loss of three richly laden spice ships in a Red Sea storm, followed by a fall in the value of ostrich feathers and ivory. About the same time the great house of Malchus & Co., of Tyre, with branches at Antioch and Ephesus, suddenly became bankrupt as a result of a strike among their Phoenician workmen and the embezzlements of a freedman manager. These failures affected the Roman banking house, Quintus Maximus and Lucius Vibo. A run commenced on their bank and spread to other banking houses that were said to be involved, particularly the Brothers Pittius. The Via Sacra was the Wall Street of Rome, and this thoroughfare was teeming with excited merchants. These two firms looked to other bankers for aid, the same as is done in modern days, but unfortunately at this time an outbreak had occurred among the semi-civilized people of North Gaul, where a great deal of Roman capital had been invested, and a moratorium had been declared by the government on account of the disturbed conditions. Other bankers, fearing the suspended conditions, refused to aid the first two houses and this augmented the crisis."*

The linchpin factor was from a law (Lightner, 1922):

*"Money was tight for another reason: agriculture had been on a decline for some years and Tiberius had proclaimed that one-third of every senator's fortune must be invested in lands within the province of Italy in order to recoup their agricultural production."*

Another point of view on the effect of the land law (Bartlett, 2018):

*"In setting the scene for his description of the crisis, Cornelius Tacitus (a senator who wrote approximately eighty years after the crisis and provides the best ancient account of the events) tells us that usury had long plagued Rome, resulting in high interest rates and harsh enforcement of contractual terms. In the early 40s BCE, Julius Caesar had attempted to remedy this problem by passing a law stating that creditors had to invest a certain portion of*

*their capital in Italian land in order to lend at interest; we do not know the exact date or provisions of this legislation. The law fell into disuse over the following decades, but it remained on the books and was revived in 33 CE when a flood of cases brought against prominent individuals alleged widespread violation of the land-owning requirement.”*

*“The number of cases quickly overwhelmed the court tasked with these matters, which referred the issue to the senate, and the senate in turn referred the issue to Tiberius. Amazingly—and hyperbolically, in all likelihood—Tacitus tells us that every one of the 600 senators was in personal violation of this law, and they sought Tiberius’s indulgence. He instituted a grace period of eighteen months in which all personal finances were to be brought into accordance with the law.”*

The land law was the trigger for a *credit crisis* and fire-sale prices (Bartlett, 2018):

*“What followed was a credit crisis. Creditors called in all their loans in order to buy land, and in addition, according to Tacitus, the sale at auction of the assets of those who had already been convicted of violating this law—and whose property had therefore been seized—concentrated substantial amounts of coin in the imperial treasury and out of circulation. The senate then passed a resolution that creditors invest two-thirds of their capital in Italian land, and that debtors pay back the same amount of their loans. But what happened in fact was that creditors demanded that loans be paid back in their entirety, and debtors were morally obligated to pay the full amount.”*

*“This touched off the worst of the crisis. Debtors tried to sell their lands to raise funds for repayment, but the flood of property onto the market depressed prices. Those who could not make enough from the sale of their lands to repay their loans, as well as those who could not sell at all, turned to money-lenders who charged exorbitant rates. This recourse failed in many cases, and a great number of debtors were brought into court. When judgments came against them, many were ejected from their lands.”*

*“The senatorial decree had made matters worse. It was intended to prop up land values, but because it forced many to sell their properties, prices dropped. The creditors who were required to invest in land held onto the funds from the loans they had managed to call in, figuring that they would allow land prices to continue to fall before they made the purchases that would bring them into conformity with the law. The result was a collapse in land values and a shortage of credit that drove up interest rates.”*

Another point of view on the unexpected side-effects of the land law and the subsequent panic, bank runs and a full-blown *financial crisis* throughout the empire (Lightner, 1922):

*“Publius Spinther, a wealthy nobleman, was at that time obliged to raise money to comply with the order and had called upon his bank, Balbus Ollius, for 30,000,000 sesterces, which he had deposited with them. This firm immediately closed their doors and entered bankruptcy before the praetor. The panic was fast spreading throughout all the province of Rome and the civilized world. News came of the failure of the great Corinthian bank, Leucippus' Sons, followed within a few days by a strong banking house in Carthage. By this time all the surviving banks on the Via Sacra had suspended payment to the depositors. Two banks in Lyons next were obliged to suspend; likewise, another in Byzantium. From all provincial towns creditors ran to bankers and debtors with cries of keen distress only to be met with an answer of failure or bankruptcy.”*

*“The legal rate of interest in Rome was then 12 per cent and this rose beyond bounds. The praetor's court was filled with creditors demanding the auctioning of the debtors' property and slaves; valuable villas were sold for trifles, and many men who were reputed to be rich and of large fortune were reduced to pauperism. This condition existed not only in Rome, but throughout the empire.”*

With a severe financial crisis threatening the entire economy, guidance and help was asked to the *state* (Lightner, 1922):

*“Gracchus, the praetor, who saw the calamity threatening the very foundation of all the commerce and industry of the empire, dispatched a message to the emperor, Tiberius, in his villa at Capri. The merchants waited breathlessly for four days until the courier returned. The Senate assembled quickly while a vast throng, slaves and millionaires, elbow to elbow, waited in the forum outside for tidings of the emperor's action. The letter was read to the Senate, then to the forum as a breath of relief swept over the waiting multitude.”*

The Roman state stepped in with a *public policy response* (Lightner, 1922):

*“Tiberius was a wise ruler and solved the problem with his usual good sense. He suspended temporarily the processes of debt and distributed 100,000,000 sesterces from the imperial treasury to the solvent bankers to be loaned to needy debtors without interest for three years. Following this action the panic in Alexandria, Carthage and Corinth quieted.”*

The *policy response* of the Roman state was the suspension of the crisis-originating law, a temporary grace period for debtors, and the provisioning of liquidity to solvent banks for land-collateralized loans at a zero-interest rate, ending the financial crisis (Bartlett, 2018):

*“At this point, Tiberius stepped in. He distributed 100 million sestertii to specially chartered banks in order to make available three-year, interest-free loans. Each loan was secured against land of twice its value. Tacitus tells us that this restored credit and encouraged the eventual reemergence of private lenders as well. His description of the events ends with the statement that the provisions of the senatorial decree concerning the amount of capital to be invested in land was not followed, for, “as quite often in such things,” observance of the law was strict at first, but lax in short order.”*

*“When we look to Tiberius on the other hand, we see that once the matter was referred to him, he first created a grace period rather than continuing with the prosecutions that had caused the situation. This relaxed the pressure, albeit only temporarily. It was his decision, as the person setting monetary policy, to make available vast sums for interest-free loans that finally put an end to the crisis. Within this context of negotiations across government entities, his provisions of time and liquidity proved far more effective than was the conduct of the senators.”*

A comparison of the *policy responses* between the 33 CE crisis (land law-induced financial crisis) and the 2008 financial crisis (real estate bubble-induced financial crisis) (Bartlett, 2018):

*“While the institutional differences between Rome and the United States do not permit us to say simply that Tiberius used quantitative easing to end the crisis, we must note the effectiveness of his provision of interest-free loans in stopping the crisis. We are reminded here of the liquidity provided by the Troubled Asset Relief Program (TARP), and indeed both cases illustrate the inherent difficulty of pricing assets—whether mortgage securities or Italian land—for the purposes of collateralization when the market for such assets is collapsing. We might remember as well Mario Draghi’s famous promise to do “whatever it takes” to stabilize the euro [during the 2012 European debt crisis] as another instance where the clear declaration of governmental intent curbed the panic. In both 33 and 2008, governmental commitment to stabilization and provisions of liquidity were what halted the financial crisis.”*

On a comparison of the *underlying causes* (political efforts for Roman landownership vs American homeownership) between 33 CE crisis and 2008 financial crisis (Bartlett, 2018):

*“At Rome, Italian land used for farming was prized for the social prestige it conferred, whereas in the United States home-ownership has long been extolled by politicians and social commentators. And in each situation the importance was by no means only rhetorical. We have touched upon the centrality of agriculture to the ancient economy, and of course it was the special characteristics of the mortgage market—often the result of legislation stemming from political initiatives—that gave the 2008 crisis its particular form.”*

*“The juxtaposition of these crises suggests that widespread acceptance of certain political projects can lead to legislation that distorts particular investments, that the resulting situation may be unstable, and that if a crisis does emerge, politicians and bureaucrats, rather than jurists or lawyers, are often the ones who make first-order decisions aimed at stopping the crisis. These first-order decisions in turn determine the contexts of subsequent studies and proposals by scholars and other experts. And while they can be rather unpopular, monetary backstops are at times necessary to halt crises. In such instances, who receives government support will likely emerge as a political issue in subsequent years.”*

Summing up the evidence presented, and contrary to today’s time, back then there was *no deposit insurance*, so when a bank failed, the depositors took losses too.

In turn, that could very well create panics and the following bank runs, making banks fail and creating disruptions in the economy.

The approach by the ancient government was only *temporary* in dealing with the problem of bank runs by creditors (depositors), thereby an *implicit* deposit insurance system (IDIS).

### ***3.4 Contemporary history – United States of America***

In the many centuries that followed the ancient times, there was never an *explicit* deposit insurance system (EDIS) to avoid widespread depositors’ panic in case of bank/s having problems or due to a financial crisis.

The *permanent* solution of a “deposit guarantee fund” was only a recent doing of the governments, starting out in the early 1900s by the U.S. states and then in 1933 by the U.S. government with the foundation of the Federal Deposit Insurance Corporation (FDIC).

As described below, it was not an obvious nor a simple nor an easy task.



After the formation of the U.S. federal government in 1789, bank failures soon started to happen and calls for banking reforms followed.

The first state to adopt a *bank-obligation insurance program* (for bank notes) was the state of New York in 1829.

Between 1831 and 1858, another five states adopted such insurance system: Vermont, Indiana, Michigan, Ohio, and Iowa.

These state insurance systems collapsed due to the “free banking” movement of 1830s and the creation of the national banking system in 1863, both leading to a decrease in the participation in the state insurance programs.

By 1870, bank deposits were twice the amount of bank notes, and towards the 1900 were seven times, creating new efforts for *deposit insurance*.

Between 1908 and 1917, eight states adopted deposit insurance, funded by the banks and with no state explicitly guaranteeing the deposits, also supervision of banks was enacted but in the end it was lax.

However, the depression of 1921 and the years-long severe agricultural problems led to many bank failures (more than 600 banks failed each year between 1921 and 1929, mostly in agricultural areas), with the state deposit insurance systems unable to cope, and by early 1930 all state programs had closed.

Since 1866 and until 1933, the Congress had 150 proposals for the creation of a deposit insurance, seeing the growth of bank deposits and drawing from the experiences of the failed state deposit insurance programs, but no proposal ever passed.

A wave of bank failures in the last few month of 1930 caused depositors to convert deposits into cash, squeezing the liquidity of banks, which in turn reduced credit and in some cases sold assets.

Some banks were unable to meet the demand of withdrawals, rumors started, and banks runs followed.

Meanwhile, the Federal Reserve (Fed) did not do much to help the banks' liquidity situation. In 1930, 1350 banks suspended operations (banks not in agricultural areas) and had a greater increase in depositors' losses than before.

In 1931, 2300 banks suspended operations.

In 1932, another wave of bank failures happened, with also the emergence of bank moratoria. The winter of 1932-1933 saw the banking sector conditions decline quickly, due to a general uncertainty on banking and monetary conditions and specific events.

In certain parts of the country the suddenness of withdrawals set off a massive banking panic, with state after state declaring a bank holiday.

It was not until the situation in the country *completely* went out of control and the whole economy was threatened that the U.S. federal government acted.

On March 6, President Roosevelt declared a nation-wide bank holiday lasting four days.

On March 9, the "Emergency Banking Act" legalized the national bank holiday and set the bank reopenings.

The Act authorized the Reconstruction Finance Corporation (RFC), created in 1932, to invest in banks' preferred stocks and capital notes, and to make secured loans to single banks.

Lastly, the Act empowered Federal Reserve Banks to advance new supply of currency (issuance of Federal Reserve Notes, backed by U.S. government securities) to member banks, without requiring much collateral.

With the reopenings, public confidence was restored.

However, 4000 banks never reopened.

Congress discussed the deposit insurance legislation, though there were arguments against it.

On June 16, 1933, the Banking Act was signed by President Roosevelt, creating the Federal Deposit Insurance Corporation (FDIC).

On January 1, 1934, the federal deposit insurance became effective, with \$2,500 in coverage, and a success in restoring public confidence in the banking system.

Only 9 banks failed in 1934, while more than 9,000 did in the preceding four years.

### ***3.5 Contemporary history – Other countries***

The U.S. explicit deposit insurance approach expanded to other countries worldwide.

The evolution over time of EDIS *adoption* by countries had generally *phases* (Pruski, Kerlin, 2015) (Anginer, Demirgüç-Kunt, 2018).

- 1934: 1 country (U.S.)
- 1930-1970: 9 new countries
- 1971-1982: 9 new countries
- 1982-1993: 22 new countries
- 1994-2007: 57 new countries (especially Europe and emerging markets)
- 2008-2015: 22 new countries

Adoption of EDIS seems to increase with the *income level* (GDP) (Demirgüç-Kunt, Karacaovali, Laeven, 2005).

The *2008 global financial crisis* increased EDIS adoption, with 5 countries adopting it in that single year, and countries already with deposit insurance increased its coverage (both in its amount and scope) (Demirgüç-Kunt, Kane, Laeven, 2014).

*Geographically*, as of today the explicit deposit insurance scheme (EDIS) is currently present in most countries around the world, although the schemes vary in their designs.

The increasing number of countries adopting EDIS had also the effect of creating a growing interest from *researchers*, both individuals and international organizations (e.g. World Bank, IMF, EU, FSB, IADI), with theoretical and empirical studies on the matter of deposit insurance (Pruski, Kerlin, 2015).

- 1934: start of research on deposit insurance
- 1930-1970: fringe economic research
- 1971-1982: broadened research scope
- 1982-1993: research on side effects (like moral hazard)
- 1994-2007: dynamic period of research
- Post-2008: new research

## CHAPTER 4: EXPLICIT DEPOSIT INSURANCE SCHEME

This chapter is dedicated to explaining the explicit deposit insurance scheme (EDIS): what it is, its legal context, who is affected by it, and the reasons for its existence.

### 4.1 *‘What’ it is*

The explicit deposit insurance is part of the financial “*safety net*” (together with banking regulation, banking supervision, banking resolution, central bank as lender of last resort).

The International Monetary Fund (2004) gives a definition of a ‘deposit insurance scheme’:  
“A formal scheme normally established by law that is designed to limit the losses of depositors in the event of bank failure(s). Typically, the scheme is intended to support the confidence in the financial system of small-scale depositors and thus reduce the risk of systemic crises being caused by panic withdrawals of deposits. The scheme can be privately or government operated and funded.”

In case of a bank failure, if the losses on the bank’s assets are greater than the amount of the uninsured liabilities, the latter are “wiped out” and the remaining loss is shouldered by the depositors. However, with an explicit deposit insurance scheme in place, the deposit insurer covers such part of the losses on the guaranteed deposits, leaving the insured deposits intact.

### 4.2 *Legal framework*

There is a distinction between *implicit* and *explicit* deposit insurance (IDIS vs EDIS).

- *Implicit* deposit insurance (IDIS): relies on the backup support of the government in case of a banking crisis, therefore there are no laws in place (discretion-based).
- *Explicit* deposit insurance (EDIS): there are laws created to provide a legal framework for the deposit insurance scheme and its workings (rule-based).

For example, in the European Union, there is the “Deposit Guarantee Schemes Directive” (Directive 2014/49/EU), agreed at an European level and then implemented at the national level by each country.

### 4.3 'Who' is affected

The explicit deposit insurance seemingly affects directly only *insured depositors*, but instead has far reaching effects regarding many *economic agents*, directly or indirectly involved:

- Commercial banks: managers and owners (shareholders)
- Bank stakeholders: insured depositors, uninsured depositors, bank debtholders, and borrowers
- Regulators: EDIS, bank (activities, capital) regulator, bank supervisor, bank resolution authority, and lender of last resort
- Government: politicians and taxpayers

### 4.4 'Why' it exists

There are some explanations on the reason ('why') deposit insurance was, or is, adopted by countries:

- *Economic-financial reason (public interest reason)*: a bank/s crisis can create bank runs from depositors, leading to other bank failures even amongst healthy banks, and to a systemic financial crisis, in turn leading to an aggregate loss of current GDP and/or future GDP growth.

This scenario could be avoided through the implementation of a deposit insurance scheme (DIS), a better solution than the suspension of convertibility or the lender of last resort, that would guarantee the depositors in getting their money back even if the bank incurred in liquidity/solvency problems, thereby avoiding bank runs from depositors (Diamond, Dybvig, 1983).

- *Political reason*: domestic private and public interests and external influence play important roles in the adoption decisions (Demirgüç-Kunt, Kane, Laeven, 2006).

For example, the U.S. saw continuous disagreements between the various kinds of interests at play in politics (the public, banks, politicians), delaying the creation of EDIS for many years (1866-1933), and in fact the FDIC was created only in 1933 (Federal Deposit Insurance Corporation, 1998).

## CHAPTER 5: DEPOSIT INSURANCE AND MORAL HAZARD

*Moral hazard from the banking sector* comes from the banks (bank moral hazard), their dimensional level (too-big-to-fail bank moral hazard), and their aggregate behavior (systemic risk bank moral hazard).

Such increase in risk-taking by banks is a *cost* of the presence of EDIS.

### 5.1 Bank moral hazard

A *cost* of having EDIS is the possible creation of *moral hazard* behavior in banks, a distortion of incentives, leading to an increase in *bank risk-taking*.

Explicit deposit insurance is different from the example of a private insurance (Ch. 2).

In fact, EDIS in the banking context shields depositors against losses from bank failure *regardless* of the *reason* for the failure, *increasing* the distorting effects of deposit insurance (Anginer, Demirgüç-Kunt, 2018).

A definition of bank moral hazard (European Union, 2016): “*Moral hazard in the context of deposit insurance typically concerns the risk of opportunistic behaviour among banks and depositors in exploiting the implicit state protection of deposits. Among banks, such opportunistic behaviour can take the form of riskier activities, so as to boost profits, leaving governments (taxpayers) at greater risk of having to step in to protect depositors in the event a bank fails. Moral hazard also affects depositors, who can 'free-ride' on the state guarantee to deposit money where they receive a higher interest rate, regardless of a bank's riskiness. The risk of such opportunistic behaviour is associated with deposit insurance protection whether it is a national or a supranational one.*”

Another definition of bank moral hazard (International Association of Deposit Insurers, 2014): “*Moral hazard arises when parties have incentives to accept more risk because the costs are borne, in whole or in part, by others. In the context of deposit insurance, protecting depositors from the threat of loss (e.g. through explicit limited deposit insurance or the belief that banks will not be allowed to fail) insulates them from the consequences of unsafe and unsound bank practices, and can lead to greater risk-taking by banks than might otherwise be the case.*”

In the *literature* (most of it is empirical) regarding deposit insurance and moral hazard there are *mixed findings*, and this could be due to various *factors*, some of them for example:

- EDIS design: flat-rate deposit premium vs risk-based deposit premium
- EDIS credibility
- Regulatory environment
- Institutions: differences between developed vs emerging economies
- Time-varying effects: crisis times and normal times
- Country-specific differences
- Data time window
- Omitted variables (example: a possible endogeneity problem)

### *Cross-country evidence*

*PAPER – Anginer and Demirgüç-Kunt (2018)*

The authors review the literature on *country* and *cross-countries studies* on EDIS.

EDIS helps ensure depositors' confidence in the banking system and prevents contagious bank runs (*financial stability*), as banking crises could create severe social and fiscal costs.

Moreover, there are other *indirect economic benefits of EDIS*: limit regulatory discretion (bank resolution mechanism), can provide the right set of incentives for regulators and politicians for supervision, expand financial intermediation in developing countries, and can foster greater bank industry competition.

However, EDIS has also the unintended consequence of encouraging banks to take on excessive risk (*moral hazard*), although there is mixed evidence on the matter.

The study indicates several *factors that impact how well, or not, EDIS works in practice*:

- EDIS design (coverage, scope, and risk-adjusted premiums)
- Stringent bank capital regulations
- Bank supervisors empowered to take prompt corrective action (public monitoring)
- Cultivate market discipline (uninsured creditors monitoring of banks – private monitoring)
- Strong institutions and rule of law

Summing up, the authors point out the *unpredictability of EDIS results*, because deposit insurance can cause harm or good depending on how well it is designed and administered.

*PAPER – Prabha and Wihlborg (2008)*

The study covers 146 countries, industrial and emerging countries, for the period 1985-2003.

The authors argue that the ambiguity in empirical literature with respect to the effects of deposit insurance schemes on banks' risk-taking and on the probability of banking crises can be resolved if it is recognized that the *absence of deposit insurance* is rarely credible and that the *credibility of non-insurance* can be increased by *EDIS* and by *institutional developments*.

*EDIS coverage* affects risk-taking directly, as well as indirectly through its impact on implicit insurance (caused by a lack of credibility of non-insurance) of depositors and other creditors.

There is a *U-shaped relationship between EDIS coverage increase and risk taking in a country's banking system (occurrence of banking crises and non-performing loans)*, given macroeconomic and institutional conditions:

- No coverage: high risk-taking
- Low partial coverage: lowest risk-taking
- High coverage: largest risk-taking

There exists for most countries a *partial (intermediate) level of coverage that maximizes market discipline and minimizes moral hazard incentives for risk-taking in banking*.

At this level, the lack of complete explicit insurance and credibility of non-insurance combine to minimize the incentives of banks to shift risk to a deposit insurance fund or taxpayers.

*Partiality of coverage* can be achieved *either by setting a maximum amount for insured deposits or by excluding foreign and/or interbank deposits*.

More curvature and higher U-shape (for banking crises than risk-taking) for *emerging countries than for industrial countries* imply that the credibility of non-insurance is lower in the former countries (implicit protection seems to be stronger).



Moreover, the extensive explicit protection seems to be associated with stronger risk-taking incentives as well in emerging markets.

Importantly, the *country-specific institutional factors* affect not only the credibility of non-insurance, but also the banks' risk-taking at both high and low levels.

- More curvature and lower U-shape caused by institutional variables like strong rule of law, lack of corruption, and GDP per capita (proxy for general institutional quality)
- High corruption is associated with higher likelihood of banking crisis when moral hazard incentives are strong (coverage is high)

*Supervisory powers* seem to reduce risk-taking the most on high and low levels of explicit coverage, where risk-taking incentives are expected to be strong.

*Supervision* has the strongest effect only when moral hazard incentives are relatively strong (coverage is high).

*Institutional conditions* that enhance the credibility of non-insurance make it possible to increase the explicit coverage without increasing risk-taking.

Though the risk-minimizing coverage level does not depend on the institutional characteristics reflecting institutional quality.

Also, the *risk-adjusted deposit insurance premium* affects moral hazard incentives.

Moreover, bank risk-taking incentives increase as *equity capital* declines.

Notably, most of the *risk adjustment* takes place on asset side risk (than liabilities side risk).

*PAPER – Qian, Zhang, and Zheng (2017)*

The article analyzes 190 countries, both developed and emerging economies, for the period 1996-2011.

It is found that *regulatory ability* is the determinant of *EDIS adoption*.

The more *competitive banking market structures* increase the probability of banking crisis. Also, *regulatory ability* has a negative effect on (reduction of) bank risk. Lastly, an *improvement of regulatory ability* could decrease the positive effect of *banking market concentration* on banking risk reduction (interactive effect). Thus, *government regulators* should modify the market access policy based on their level of regulatory ability, using the banking market structure to regulate the banking risk reasonably.

#### *Developed economies evidence*

##### *PAPER – Chang and Ho (2011)*

The authors study the United States of America, a developed economy, for the period 1962-2008.

*Risk-shifting behaviors* (moral hazard) at commercial banks have *reduced significantly* but have not disappeared after the *adoption of risk-based deposit premium EDIS* (from a previous *flat-rate deposit premium EDIS*), where banks pay more premium as they take on more risk.

The risk-based EDIS restrains the incentives of risk shifting for *regular commercial banks* (highly capitalized) but is ineffective for *banks in financial distress* (undercapitalized).

*Large banks* (“too-big-to-fail”) take more risk than smaller banks, but this effect can be reduced or completely eliminated after the introduction of a risk-based assessment system, suggesting that the differences of risk-shifting between large and small banks diminished after the regulatory change (from flat-based to risk-based EDIS).

##### *PAPER – Lopez-Quiles and Petricek (2018)*

The article studies the United States of America, a developed economy, for the period 2007-2010.

*EDIS (partial and risk-based) coverage increase* (from \$100.000 to \$250.000) did not increase *bank risk-taking*, nor did it affect *market discipline*, evident through a lack of a decrease on deposit rates (thus no deposit supply rise).

In particular, the null effect above is not caused by EDIS effects having opposite signs during the *crisis* and *non-crisis* periods.

Such result is important for *policy making*, because when faced with the trade-off between the risk of *bank runs* or the higher systemic risk induced by *moral hazard*, the regulator should take into consideration that the moral hazard channel may not be an issue (for a limited increase in EDIS coverage).

*PAPER – Gropp and Vesala (2004)*

They study 15 EU countries, developed economies, for the period 1992-1998.

If the *absence* of any safety net is *credible* (no public intervention in case of distress in the banking system), the *introduction of EDIS* explicitly (credibly) limits the safety net to those explicitly covered by deposit insurance, and consistent with this the authors found an increased *market monitoring* and reduced *moral hazard* (increase in asset risk, leverage risk, overall risk) as well as the likelihood of banking crisis.

Moreover, *higher charter values* and *subordinated debt* may mitigate moral hazard.

Results also showed some adjustments in the *balance sheet structure* of banks towards more insured deposits after the introduction of explicit deposit insurance.

However, the introduction of EDIS does *not mitigate too-big-to-fail problems* (risk taking of large systemically important banks), thus market monitoring may not be enough.

*PAPER – Chesini (2014)*

The author studies Australia, a developed economy, for the period 2003-2012.

The *introduction of partial coverage EDIS* produced a *decrease in bank risk* (no increase in moral hazard) and an *increase in bank stability*, but also an *increase in the stability of the Australian banking system* as well.

*PAPER – Penas and Ioannidou (2008)*

The analysis regards Bolivia, an emerging economy, for the period 1999-2003.

*Banks' decisions on credit quality:*

- *After EDIS introduction* (with flat premiums and partial coverage for all depositors), banks are more likely to initiate riskier (subprime) loans (contemporaneous and ex-ante risk-taking), but also non-performing loans (ex-post risk-taking measure).
- Banks do not adjust other contract terms, such as collateral (less) and maturity (no change), to compensate for the extra risk.

*How bank characteristics affect those decisions:*

- *Large depositors* discipline banks prior to, but not after, EDIS introduction.
- Before EDIS, *very large banks* (more likely to enjoy 'too-big-to-fail' guarantees) take more risk than small banks do, but this effect disappears when all banks are subject to EDIS.
- Before EDIS, *banks with higher capital ratios* (stockholders have more to lose in the event of a bank run) take less risk, but this effect is eliminated in EDIS period.
- Banks that experienced the largest drop in their cost of funds (i.e., the *riskiest banks* that benefited the most from EDIS introduction) are those that take more risk in the second period.

*The reduction in depositors discipline* spurs the increase in risk-taking after EDIS introduction, as suggested by the different behavior of large depositors and riskiest banks.

*PAPER – Muslumov (2005)*

The author studies Turkey, an emerging economy, for the period 1988-2000.

*After the introduction of full coverage EDIS* (cover to 100% of insured deposits amount), commercial banks subject to *moral hazard* behavior show significant increases in foreign exchange position risk and a deterioration in capital adequacy.

Therefore, full coverage EDIS distorts the incentive structure of commercial banks and thus prevents the proper functioning of the *market discipline* mechanism and leads to excessive risk-taking.

*PAPER – DeLong and Saunders (2006)*

The analysis is on the United States of America, during 1933-1935, an emerging economy.

Results shows that *the fixed premium (flat rate) deposit insurance was mispriced.*

Although EDIS brought *stability* to the financial system in that depositors returned to weak banks, but (on average) banks in general became *riskier*. More in particular, banks that performed well before EDIS became less risky, and *subsidized* riskier banks.

Also, the market believed deposit insurance would allow smaller banks to *compete* better with larger institutions.

However, the market did not perceive deposit insurance to be a net subsidy to the banking industry compared with other financial firms (in fact insurance companies received indirect financial stability benefits), thus overall the deposit insurance scheme brought *stability* to the financial services industry.

*PAPER – Karas, Pyle and Schoors (2019)*

The authors study Russia, an emerging economy, for the period 1999-2010.

The analysis finds a *causal chain between EDIS, market discipline, and bank moral hazard.* (*Partial coverage*) EDIS introduction, first off reduces household-imposed (insured group) *market discipline* (sensitivity of households to bank capitalization) relative to that of firms (uninsured group), and this causes a relaxation of the constraint on a *bank's risk-taking* in direct proportion to the bank's relative reliance on insured households deposits.

Therefore, *regulators* should exercise particular vigilance over banks that have come to rely excessively on the savings of insured depositors.

*PAPER – LÉ (2013)*

The article studies 117 countries, mostly developing economies, for the period 1986-2011.

On average, EDIS adoption fosters risk-taking, by *reducing the capital buffer* of banks (existing banks, not new ones) by 15% (thus increasing their leverage).

*Banks initially highly leveraged* appear to be insensitive to EDIS adoption, and this could be related to capital requirements, because banks with a high initial leverage have much less room to increase it before capital constraint binds.

*Large systemic banks (“too-big-to-fail banks”)* are unresponsive to EDIS adoption, consistent with the view that they were already not subjected to market discipline because they benefit from *implicit* state guarantees.

There is a *convergence process*, because to avoid subsidizing highly leveraged banks, well-capitalized banks reduce significantly more their capital buffer (due to the absence of risk-based deposit insurance premiums).

EDIS promotes *competition on the banking market*, as small and non-systemic banks reduce their capital buffer (increase leverage), thus reducing the comparative advantage of large and systemic financial institutions.

EDIS adoption does *not* generate a build-up of fragility among only a small set of banks (whether initially highly leveraged, relatively large or too-systemic-to-fail), instead *the whole domestic banking industry* tends to be less adequately capitalized.

After these results, the authors view the *raw leverage ratio* in Basel III *regulatory standards* as important step to control the side-effect of EDIS on banks leverage, as would be the introduction of *risk-based premiums* for EDIS.

*PAPER – Dao (2014)*

The author studies Vietnam, an emerging economy, for the period 2010-2012.

*EDIS (with a flat-rate deposit insurance premium) impacts banks' risk-taking incentives, but it has different effects on each type of risk (the higher the deposit insurance premium, the higher the asset risk, while the less credit, default and leverage risk).*

*PAPER – Aldunate (2017)*

The article analyzes the United States of America, in 8 U.S. states that each adopted a state-level EDIS, for the period 1900-1930, an emerging economy.

A necessary premise is to note the differences between the past and the current EDIS:

- Mutual insurance (fees paid by banks) than government insurance system
- Bank shareholders in most states did not have limited liability (as it is today)
- Strict limitations on bank branching (banking system was mostly populated by smaller unit banks)

EDIS effects on insured banks (compared to the uninsured banks of adjacent states):

- *Higher growth rate in deposits*
- No changes on *leverage, on the ratio of loans to total assets, or on failure rates, thus meaning no moral hazard*
- *Substitution of demand for time (riskier) deposits*, suggesting there was an increase in depositors' confidence in insured bank as they became willing to lend their money at longer maturities
- Lowered the *rate paid on deposits*
- Substitution in *financing from equity to deposits*

EDIS effects on type of insured banks (compared to the uninsured banks of adjacent states):

- *Smaller banks* became safer in terms of capital structure and reserves
- *Larger banks* became riskier relative to smaller banks in terms of liquid assets and capital structure
- *Troubled (riskier) banks* (banks facing funding problems) benefited from EDIS introduction by growing faster than troubled banks in the control states

*In the agricultural boom years, EDIS might have incentivized banks to increase lending to farm owners beyond what uninsured banks were willing to do.*

## 5.2 *Too-big-to-fail bank moral hazard*

Some banks gamble on the fact that they would be saved by the government given their big dimension compared to the size of the banking sector and their importance in the economy.

*Empirical evidence* on the presence of the “too-big-to-fail” effect has been shown in the previous papers on bank moral hazard.

*PAPER – Iyer et al. (2018)*

The authors study Denmark, a developed economy, for the period 2003-2011.

In the context of a shift from *unlimited EDIS* to *partial EDIS*, it evidenced a possible *implicit government too-big-to-fail (TBTF) guarantee* to systemically important banks (SIFIs), that causes *distortions* in the market for retail depositors (*competitive distortions* created by *asymmetric* guarantees) and add to the fragility of non-systemic banks (*destabilize* the financial sector).

*Deposit insurance limit* induced significant depositor responses: individuals with deposits above the limit *split* their deposits across multiple accounts to remain fully insured, but did *not withdraw* deposits from the banking system.

Also, there was a significant overall *growth in deposits during the 2007-2009 financial crisis*: (annual growth rates around 10% both above and below the limit in the years 2007-2009), consistent with a *flight to the relative safety* of the banking system as other asset types became more risky.

The *TBTF guarantees* distort the *bank market competition* for retail deposits by reducing the perceived risk of holding uninsured deposits in *systemic banks*: the six largest and systemically important banks were much more successful at retaining and attracting deposits above the insurance limit (-20% vs -50% in non-systemic banks), even as they differentially reduced interest rates on uninsured deposits (-0,4% w.r.t non-systemic banks).



The new deposit insurance limit was announced in spring 2009 but only introduced in October 2010, thus leaving time for affected depositors to show anticipation effects.

In fact, there were *anticipation responses* by uninsured depositors a few months (they started in June 2010) before the introduction of the deposit insurance limit in October 2010.

The reallocation of uninsured deposits towards TBTF banks (funding shock to non-systemic banks) *reduced only non-systemic banks' lending*: a 1% decrease in deposits in non-systemic banks (induced by deposits reallocation), reduced their lending by 0.35%.

*Implications for policy design: interplay between deposit insurance and TBTF guarantees.*

Depositors reallocate uninsured balances from non-systemic banks to systemic banks when they perceive a high risk of bank failures. If the insurance limit is high, only a fraction of deposits are uninsured and the scope for reallocation is limited. Conversely, if the insurance limit is low, large reallocations are possible and these movements could cause a severe funding shock to non-systemic banks.

*In a crisis*, too-big-to-fail banks have a major competitive advantage on the market for retail deposits.

However, *policymakers* can mitigate this adverse effect by *raising the deposit insurance limit in times of crisis*.

### 5.3 Systemic risk bank moral hazard

The interactive and correlated risk-taking behavior of banks creates a *systemic risk moral hazard* (banking system aggregate risk taking).

*PAPER – Anginer, Demirgüç-Kunt, and Zhu (2012)*

The authors study 96 countries for the period 2004-2009, and they focus on bank systemic risk: “*From a regulatory perspective, there is a growing consensus that the correlation in the risk-taking behavior of banks is much more relevant than the absolute level of risk taking in any individual institution. We thus examine the relationship between deposit insurance and bank systemic risk. Acharya (2009) suggests that if there is an implicit guarantee provided by the State to cover losses stemming from a systemic crisis, banks will have incentives to take on correlated risks. Guaranteed banks will not have incentives to diversify their operations, since the guarantee takes effect only if other banks fail as well.*”

The results found a difference of EDIS effects between normal and crisis times:

- *In normal times, EDIS increase bank risk (standalone risk of an individual bank) and systemic fragility (bank contribution to systemic risk, measured by CoVaR)*
- *In crisis times, EDIS decrease bank risk and systemic fragility*

Thus the “*moral hazard effect*” of deposit insurance *dominates in good times* while the “*stabilization effect*” of deposit insurance *dominates in turbulent times*.

However, the *overall effect of EDIS* over the entire sample period is *negative* on bank risk and systemic risk (moral hazard effect greater than the stabilization effect).

Banks with *higher leverage ratios, higher loan loss provisions, lower reliance on deposits or lower profitability* have *higher bank risk*.

Banks with *larger size, lower leverage, higher reliance on deposits as funding, or lower loan loss provisions* are associated with *higher systemic risk*.

Both *bank risk and systemic risk* are found to be higher in *crisis years*.

*Full coverage EDIS* worsen the moral hazard problem on *bank risk*, but instead full coverage EDIS does not change the overall results on *systemic risk*.

Including *bank supervision* is *very important* in changing EDIS effects on systemic stability.

- With *good bank supervision*, the full coverage EDIS is associated with lower *bank systemic risk* during global crisis years and has no adverse impact on bank systemic risk in non-crisis years
- With *bad bank supervision*, the full coverage EDIS increases *bank systemic risk* in all years

*PAPER – Bostandzic, Pelster and Weiss (2014)*

The authors analyze 40 countries, mostly developed economies, for the period 1999-2012.

In synthesis, for international systemically important banks (SIFIs) that are part of a global banking network, the article identifies *factors (bank and regulatory) that influence the build-up (exposure/contribution) of global (instead of country-level) systemic risk* across different regulatory and supervisory schemes.

*Financial fragility* in the global banking network affects markets on a country level, but also markets of overseas countries. An example is the 2007-2009 global financial crisis that originated in the U.S. but affected financial institutions as well as the real economies globally.

*Regulation* (bank activities, bank capital, bank supervision) increased over time.

Bank *exposure* to systemic risk (as measured by the Marginal Expected Shortfall - MES):

- Higher Tier 1 capital ratio decreases it
- Banks engaging more in nontraditional activities (non-interest income to interest income ratio) decrease it
- Less bank leverage decreases it
- More private monitoring reduces it
- EDIS design that requires banks to contribute more to it increases it
- Importance of a bank's respective home country's stock market in the world decreases it
- Banking sector concentration (less competition) increases it

Bank *contribution* to systemic risk (as measured by the SRISK):

- Bank total assets increases it
- More non-performing loans and loan loss provisions (lower loan quality) increases it
- More interconnectedness increases it
- Higher loans to assets ratio decreases it
- Banking sector concentration (less competition) increases it
- No effects for capital requirements or EDIS design

Bank *contribution* to systemic risk (as measured by the  $\Delta\text{CoVaR}$ ):

- Higher Tier 1 capital ratio decreases it
- Banks engaging more in nontraditional activities (non-interest income to interest income ratio) decrease it
- More interconnectedness increases it
- EDIS design that requires banks to contribute more to it increases it
- Regulatory system's restrictions on bank activities reduces it

Bank *exposure* to systemic risk *during crisis periods* (Marginal Expected Shortfall - MES):

- Higher Tier 1 capital ratio significantly decreased it
- High interconnectedness decreased it

Bank *contribution* to systemic risk *during crisis periods* (SRISK):

- Bank size significantly exacerbates the positive relation between bank interconnectedness and bank contribution to systemic risk
- More interconnections with banking sector increase a bank's systemic importance
- Banks highly interconnected with a more fragile funding structure contribute more to systemic risk

Bank *contribution* to systemic risk *during crisis periods* ( $\Delta\text{CoVaR}$ ):

- Tier 1 capital reduced it
- Adverse effect of EDIS requiring more financial resources from banks is less severe
- Adverse effect of EDIS requiring more financial resources from banks is attenuated if the bank holds more Tier 1 capital

- Adverse impact of interconnectedness is worsened by a higher value for cash and due from banks (higher interconnectedness through the interbank market can more easily facilitate shocks through the interbank market)
- Higher interconnectedness significantly decreases it

A higher *risk-adjusted deposit insurance premium* is an indicator of increased risk-taking by the banking firm, in turn as the EDIS contribution increases so does the bank contribution to global systemic risk.

There is no effect of *bank supervision* on global systemic risk.

The *distribution* of the three systemic risk measures showed an *increase, peak, and decrease* before, during and after the 2007-2009 global financial crisis.

Although of high importance during the 2007-2009 global financial crisis, the *debt maturity of banks* did not play such a significant role during the full sample period.

*PAPER – Acharya, Yorulmazer, and Santos (2009)*

The article involves a *theoretical analysis*.

If there is an *implicit* government guarantee to cover losses from a *systemic crisis*, not priced in the EDIS risk-based premiums, then banks will have incentives to take on correlated risks.

*Factors that creates systemic risk:*

- Correlation among banks' returns
- Bank size
- Bank interconnectedness

All these factors should be factored in when *setting the EDIS risk-based premiums*, leading to an *incentive-efficient full-cost deposit insurance premium*.

## CHAPTER 6: HOW TO REDUCE MORAL HAZARD

There are various factors that can stem the moral hazard created by EDIS (and interact with each other), and that can affect the demand-side (depositors), the supply-side (banks), or both.

### *6.1 Regulatory environment – EDIS design*

Banks' moral hazard can be reduced by a better *design* of EDIS, introducing features to stem such additional risk-taking, similarly to the example of a private insurance contract in Ch. 2.

An explicit DIS has a lot of possible *features* that make up its *design* (Demirgüç-Kunt, Kane, Laeven, 2006) (Demirgüç-Kunt, Karacaovali, Laeven, 2005).

- Type (IDIS vs EDIS)
- Coverage amount: level of insurance granted to a bank liability
- Coverage scope: type of bank liabilities that insurance applies to
- Coinsurance: whether the deposit insurance covers deposits to a certain percentage
- Organization: legally separated or not
- Role: paybox only (receive premiums and reimburses depositors), paybox plus (loss or risk minimizer)
- Multiple systems: whether present or not
- Participation: whether only domestic banks are covered, or also foreign bank subsidiaries or branches
- Types of deposits: whether foreign currency or interbank deposits are covered or not
- Funding: funded (ex-ante) or unfunded (funded ex-post a bank failure) system
- Funding source: public (government), private (banks), or both
- Government support: whether there is government backstop in case EDIS has a shortfall of funds to cover deposits
- Administration: official, joint, or private
- Membership/Participation: compulsory or voluntary
- Premiums: flat-based or risk-based
- Assessment base of premiums: whether covered deposits, eligible deposits, total deposits, or total liabilities
- Payout to depositors: whether per depositor per institution, per depositor, or per depositor account

In what follows there is a review of the theoretical and empirical studies on EDIS design.

*PAPER – International Association of Deposit Insurers (2014)*

IADI (2014): “A well-designed financial safety-net contributes to the stability of the financial system. However, if poorly designed, it may increase risks, notably moral hazard.”

A “one-size-fits-all” design for all countries does not work, and it is recognized by the IADI “Core Principles for Effective Deposit Insurance Systems” (2014).

After the 2007-2009 global financial crisis, in a number of countries the *deposit insurers* had their *mandates expanded* to include resolution tools (in addition to depositor reimbursement), from about half in 2005 to almost 65 per cent in 2011.

*PAPER – Demirgüç-Kunt, Kane, and Laeven (2006)*

The article involves a review of the empirical evidence.

The *decision to install EDIS* must not be hasty.

Also, factors found to dispose a country for such decision are:

- Outside pressure (to emulate developed-country regulatory frameworks)
- Political arrangements (facilitate intersectoral deal-making)
- In response to a financial crisis (countries design their schemes especially poorly)

Literature indicates that *introducing EDIS* into *weak* private and public contracting environments tends to undermine *market discipline* in ways that reduce bank stability, destroy real economic capital, and sidetrack economic development.

*Six principles of good EDIS design:*

- Enforceable coverage limits: the insurers must assure that official supervision complements private monitoring
- Compulsory membership: this increases the size of the insurance pool and prevents strong institutions from selecting out of the pool

- Public-private partnership: this creates checks and balances that improve management performance
  - Access to taxpayer assistance: should be legally impeded by statutory provisions that can be relaxed only in *extraordinary* circumstances and by following extraordinary procedures
- Normally*, funds to cover bank losses will come from the pool of surviving banks.
- Price EDIS appropriately: typically, countries have underpriced deposit insurance
  - Deposit insurers actively involved in bank resolution decisions: deposit insurers are responsible for paying off insured depositors, so they have a strong interest in assuring the prompt and speedy resolution of insolvent banks

Before adopting EDIS, its public and private contracting environments have to be improved if deemed necessary, and also EDIS must be correctly designed.

*PAPER – Laeven (2002)*

The author studies 42 countries, both developed and developing economies, in 2001.

The *actuarially fair price of deposit insurance* is affected by several *EDIS design features* (that curb moral hazard), in particular: membership, administration, funding, coverage (amount and scope), and pricing.

*Risk-based premiums* are used for a *fair-priced EDIS* (and give banks better incentives) and they may eliminate inequitable wealth transfers, but not necessarily lead to an *incentive-compatible EDIS* (provides incentives to banks to reveal the necessary information and thus facilitate the efficient pricing of the risk shifted to the deposit insurer), because when banks have *private information on their assets quality*, a risk-sensitive (risk-based) pricing is likely to provide banks with similar risk-taking incentives as a risk-insensitive (flat-based) pricing.

When setting the adequate EDIS premium in a country, *risk diversification* (the potential of diversification of non-systemic risk of banks; the actuarial cost of insurance decreases with the pool of underlying assets if default probabilities are not perfectly correlated) and *risk differentiation* (the possibility of excluding risky banks from the scheme) of banks should also be considered as they could lower the adequate premium.



After controlling for the level of economic development, *EDIS coverage* is less generous in rich countries than in poor countries.

And that countries with high coverage tend to implement risk-adjusted premiums, suggesting that it is a way to curb the moral hazard arising from the generous level of coverage.

Using the option-pricing method and the expected loss pricing method, *EDIS is found to be underpriced in many countries, but especially so in several developing countries.*

Moreover, *countries with weak banks and weak institutions* should not adopt EDIS, because they would not be able to afford its actuarially fair deposit insurance premium.

*PAPER – Prescott (2002)*

The article involves a *theoretical analysis*.

*With private information* (critical factor), *risk-based deposit insurance premiums* alone cannot control bank moral hazard inherent in EDIS.

Including *state-contingent payments* help to incentivize the bank to implement the safe socially desirable investment strategy (incentive compatible).

For example, if some investment decisions are easy to *observe* (e.g. class of investments a bank specializes in), then real estate lending bank might face high premiums plus state-contingent payments, while the Treasury-holding bank might face low premiums and relatively nonstate-contingent payments.

Moreover, *supervisory exams* (e.g. safety and soundness exams, audits, and off-site surveillance) are needed as well, where the insurer can take some costly action that lets it observe some of the private information of the bank.

In aggregate, with the *deposit insurance risk-based state-contingent pricing and inspection system*, it is incentive compatible for the bank to screen its investment portfolio and then take the safe investment strategy.

In particular, the supervisory exam prevents the bank from not screening, once the bank screens the state-contingent payments convince the bank to take the safe investment strategy, then the deposit insurance risk-based price system is actuarially fair (including examination costs), so no resources are transferred in or out of the banking system in expectation.

There are *parallels to the EDIS analysis in markets without government insurance*, like private insurers and banks.

- *Private insurance* contracts (besides the insurance premium) include deductibles and copayments and maybe audits to control moral hazard.
- *Banks* (besides the loan interest rate) take several actions to mitigate the private information of their borrowers, like imposing covenants on borrowers' actions and listing conditions under which they can call a loan.

*PAPER – Kerlin (2015)*

The author makes a cross-country study for the period 1934-2014.

Over time, deposit insurance institutions were *created* in countries around the world, but also developed their *significance* in the financial security network, although *differently* for each country.

The evolution is from simple payment agencies (*paybox* or *paybox plus*) until becoming important members of the financial security network with a wide scope of authority, including restructuring and obligatory resolution of financial institutions (*loss minimizer*) or also including resolution tools and execute cautionary supervision (*risk minimizer – resolution authority*).

## 6.2 Regulatory environment – EDIS credibility

After DIS is designed and created, it has also to be *credible* (for both depositors and banks). *Credibility* relies on various branches of the social sciences to be explained: law, management, economics and finance, politics.

The *credibility* of EDIS *for depositors (insurance credibility)* depends on the correct *management* of the DIS and in the ability of the DIS fund and/or government *finances* to cover the losses incurred by failed banks (if the losses arrived to the level of insured deposits). That is why there are also the increased capital requirements for banks (Basel III), to avoid bank failures in the first place by strengthening the capital of banks, especially systemic ones.

However, a country with weak banks and a very indebted government, weakens the *credibility* to cover the guaranteed deposits, especially if there is a systemic crisis involving both banks and government (e.g. economic and/or financial crisis).

In fact, the EDIS credibility in some countries had been threatened during the 2008 global financial crisis (Anginer, Demirgüç-Kunt, 2018).

Even if it is written in the *law* that there is a certain level of deposit insurance, the *formal credibility*, it is the *economic* and *financial* power underlying the EDIS fund and national government backstop that gives an EDIS the *real credibility*.

Also, there is the important matter of the government *political will* to uphold his part (if called to do so) to honor the deposit insurance in case the DIS fund is not enough.

In particular, as noted in a previous study (Ioannidou, Dreu, 2006), *political instability* is problematic in developing countries.

Another *political* point is that the EDIS coverage limits are *credible for banks (non-insurance credibility)* meaning that them being *de jure* is at the same time a credible *de facto*, implying a reduction from the *implicit* safety net existing before the introduction of EDIS.

For example, in the run-up to the 2007-2009 financial crisis, banks took on excessive risks also due to the *de jure-de facto* misalignment, with the alleged reluctance of public regulators to let big and financially interconnected banks fail (“too-big-to-fail”) during a crisis, and thus public bail-outs (Thakor, 2013).

### **6.3 Market environment – Household depositors behavior**

The *behavior* of household depositors (as individual, as group and country-wide) in the context of EDIS relies upon various assumptions (communication-information, education-knowledge, psychology, sociology, anthropology), but the reality is not exactly like the “*homo economicus*” assumed in economic theory.

For example, what *confidence* can depositors have on the safety of their deposits (and do not let fear lead them to a bank run) if they do not *know* that deposit insurance exists?

Also, these factors could obviously *interact*: a depositor never made *aware* of EDIS, or he/she could have informed him/herself a little about it, but a single bank crisis or an economic crisis question his/her limited *knowledge* about the safety of his/her deposits that turns into *fear*, *others* do the same, and *people* talk to each other, possibly creating a bank run.

At the same time, improving *market discipline* can be achieved through better public *communication* to depositors and improving their *knowledge* about EDIS, and strengthening their *confidence* in the deposit insurance scheme (in case of a banking crisis or a systemic risk, for example).

#### **6.3.1 Financial information and communication**

*PAPER – Sandulescu (2012) and IADI (2013)*

The articles underline that informing the guaranteed depositors, through various channels and target audiences, about the *existence* of EDIS and its *benefits and limitations* (guaranteed coverage and amount, repayment period) is a critical part of an *effective* deposit insurance scheme.

*PAPER – Grigorian and Kryshko (2017)*

This article studies the EDIS awareness in a developing country (Tajikistan), and indicates various ways to *communicate* and *inform* the public about the existence of deposit insurance and its benefits: “*Specifically, our results call for public relations’ measures and programs to enhance awareness of DI and the benefits it offers. While bank and MFO branches should be*

*the main windows where DI-related publications would be disseminated, the DIF could seek to use public and social media outlets to spread the word more widely in a cost-effective fashion. More traditional outreach tools, such as dissemination of DIF's Annual Reports (and related press releases) and maintaining toll-free phone lines (where public can reach DIF staff for questions) could be productive depending on the specifics of the area/region. IADI (2009) provides useful guidance in this regard."*

### **6.3.2 Financial education-knowledge**

EDIS effectiveness relies upon the fact that the public is aware and knowledgeable about it (e.g. coverage, time to recover the insured deposits, etc.).

Also, more knowledge about EDIS is associated with more *market discipline*, through depositors punishing weak banks by switching to good banks (Inakura, Shimizutani and Paprzycki, 2005).

However, the *knowledge* about EDIS *existence* is not obvious, when an EDIS is created or is already implemented by many years, nor *how much is known* about it, both in developing countries (Grigorian, Kryshko, 2017) and developed countries (Bijlsma and van der Wiel, 2012; Inakura, Shimizutani and Paprzycki, 2005; Bartiloro, 2011).

Such low levels of knowledge about EDIS are realistically directly related to the low levels of *financial literacy* of the population in many countries around the world (Lusardi, 2006).

This because the insured deposits (if the deposit amount is below the EDIS coverage) are a *financial instrument* like any other instrument in the financial market (e.g. uninsured deposits, bank certificates, bonds, equities, etc.).

On the study of a developing country (Tajikistan), the knowledge of EDIS by the public and its improvement is important (Grigorian, Kryshko, 2017): *"The results offer a relatively inexpensive way – via improved awareness of existing DI services and capacity – for policymakers to help boost the profitability of the banking sector, improve effectiveness of monetary policy, and reduce financial sector vulnerabilities."*

According to Lusardi (2014), for the *policymakers* investing in *financial education* (for the young and adults) is better than for the taxpayers to bear the costs of having a financially illiterate population: “Given the low levels of financial literacy documented in the paper and the consequences of a lack of financial knowledge, it is useful to consider what the role of the government can be. As mentioned earlier, what if a large number of individuals engage in poor decisions when entering into a mortgage contract or fail to save for retirement? If taxpayers will be asked to pay for the mistakes of others, then the missteps of some individuals will impact the finances of others. In other words, there is an “externality” in having a financially illiterate population, and initiatives to increase the level of financial knowledge in the population might be more effective than incurring and paying for the societal costs of financial illiteracy. One such initiative is to add curricula designed to enhance financial literacy into schools so that people are financially literate before they engage in important personal finance decisions, including whether or not to invest in education. In the United States, the cost of college education has been increasing at a rate faster than inflation, requiring students and their families to start planning for college as soon as possible, to be savvy about financial aid, and to manage student loans effectively. In order to reach the adult population, financial education has to go beyond schools. The workplace is an important venue. Several workplace financial education initiatives have been tested and suggestions have been made on how to make those initiatives most effective (Lusardi and Mitchell, 2014).”

### 6.3.3 *Financial psychology*

Psychology is the scientific study of the mental process and *behavior* (Spielman, 2017).

The *rational behavior* is a generalization used in economics that not always works in practice, where the (cognitive) psychological factor should not be disregarded, and such approach is used in *behavioral economics* (Angner, Loewenstein, 2007).

A *bank run* happens because due to a liquidity mismatch of a bank, the *fear* of a bank run by depositors from other depositors becomes *self-fulfilling* (Diamond and Dybvig, 1983).

Psychologically, the fear comes from a perceived *loss of predictability and control* that in turn creates financial panics (Bracha and Weber, 2012).

During a financial crisis, the investors' previous narrative had been broken ((e.g. 'too-big-to-fail belief in some banks) then would give rise to panic and negative narratives, but here *policymakers* can play a crucial role, in giving a *message* about a new and positive narrative to give guidance, thereby minimizing panic reactions (Bracha and Weber, 2012).

Also, the *fears* (rational or not) of investors can cripple banks if the deposit insurance system coverage in the country is *asymmetric*, i.e. different from private and public banks (Fecht, Thum and Weber, 2019).

### 6.3.4 Financial sociology

“Man is by nature a social animal” (Aristotle).

*Sociology* is the scientific study of human social behavior in groups and group interactions, societies and social interactions; a *society* is a group of people who live in a defined geographic area, who interact with one another, and who share a common culture (Griffiths, 2017).

*Socioeconomics* regards the *social factor* as important in the economic analysis (likewise the behavioral economics does with the psychological factor) (Angner, Loewenstein, 2007).

One particular study focused on *deposits* and their *choice* by households (Guiso, Sapienza, Zingales, 2001): “*Since the willingness to delegate is affected by the level of trust, then individuals living in high social capital areas will be more prone to delegate the custody and management of their money to a third party. Thus, ceteris paribus, we expect that households living in high social capital areas invest a larger fraction of their financial wealth in deposits and stocks and retain a smaller fraction in cash. The sensitivity of deposits to social capital is particularly interesting. Deposits require delegation, and hence trust, but not so much information, because deposit insurance makes them insensitive to specific information about the bank issuing them. Therefore, any effect of social capital on deposits will point to trust and not information as the main channel through which social capital affects the investment behavior (see also Hong, Kubick and Stein, 2001). [...] Overall, the level of deposits increases with social capital.*”

On the relationship between social capital and education on deposits (Guiso, Sapienza, Zingales, 2001): “*For the uninformed, delegation is the only alternative to keeping their money under a mattress. But delegation requires trust. Thus, to invest money in assets other than cash, trust becomes more necessary, the less sophisticated the investor. [...] In fact, social capital has no significant impact on the proportion of wealth invested in deposits among educated people, as should be the case, since deposits are very well protected contractually. By contrast, social capital has an economically and statistically significant impact on the proportion of wealth invested in deposits among households with low levels of education. [...] Overall, the results suggest that social capital is a more important input among less educated people.*”



In fact, for evidence on social interactions and cooperation regarding EDIS and depositors, a study in the Netherlands of Caloia, Mastrogiacomo and Pasini (2019) where *peers affect deposit decisions in periods of high uncertainty* (global financial crisis):

*“This result shows that among those having uninsured balance accounts (treated depositors), respondents without sophisticated peers save more after the reform [that increased the EDIS coverage limit], while respondents with sophisticated peers tend to stay more cautious: they don’t increase their uninsured balances in a period of unusual uncertainty and they keep their deposit amounts closer to the insurance limit”.*

This influences consumption and stock market investments, because for people with an unsophisticated social circle, the increase in saving amounts above the insurance limit came at the cost of consumption, suggesting precautionary motives (in times of uncertainty, they cut consumption and increase savings). Instead, people with sophisticated peers, keep saving more cautiously, and consumption and stock investment paths do not change.

Meaning that *peer sophistication* in financial matters influences (probably through the information sharing within the *social circle*) a depositor’s financial decision even on a simple financial instrument such as a savings deposit.

And the cause is that: *“[...] gathering information on bank fundamentals is a difficult and expensive task, therefore people can take advice from sophisticated peers, who carry the most informational content.”*

For evidence on *trust*, during the 2008 global financial crisis, such *increase in EDIS coverage amount*, thus providing more guarantees, *boosted the confidence (trust) of depositors*, because people with deposits above the insurance limit increased their savings amount (and hence their uninsured balances) despite the high uncertainty characterizing the banking sector during the crisis.

Similarly to the article above, a study of Mistrulli and Vacca (2015), on the credit relationship between banks and small firms, shows that: *“the main benefits of social capital come from mitigating informational asymmetries”.*

Considering all the empirical evidence above, *policymakers* could try to find ways to increase *trust* in the banking system in case it is weakened by a financial crisis or a bank failure.

With sophisticated peers sharing the information of increased safety of the banking system with their social circle and less financially sophisticated peers.

### 6.3.5 *Financial anthropology*

*Culture* is an all-encompassing term that includes knowledge, beliefs, art, morals, law, custom, habits acquired by persons as members of society.

In turn, culture affects the *behavior* of people (Brown, McIlwraith, Tubelle de González, 2017).

And there are many research papers of the effect of *culture* in managerial aspects and in economic/financial aspects (Breuer, Quinten, 2009).

In particular, *cultural finance* is a research field that focuses on *cultural values* in explaining financial behavior (Nadler, Breuer, 2017).

In fact, cultural factors affect in the allocation of funds in different *financial assets* by households in different countries, and the study of Breuer and Salzmann (2009) brings various examples to the fore: “*Japan scores very high in Hierarchy and shows a strong preference for deposits in household portfolios, but neglects equities. Singapore emphasizes the cultural dimension of Embeddedness and reaches very high shares of debt securities, but shows only very little use of life insurance. Autonomy is important in France, which maintains a high level of life insurance consumption, but disacknowledges the use of debt securities. Australia stresses Autonomy as well and underlines pension funds, but disregards all other asset classes substantially.*”

*Policymakers* can help in various ways in creating awareness amongst the investors about their cultural biases, so that they can counter them (Breuer, Salzmann, 2009).

Considering the evidence above, in the context of *deposit insurance*, the cultural factor is different *between* countries, so if a country’s regulator take the approach of just copy-and-paste an EDIS of another country that has a different culture, that could create *by default* deposit insurance *design* problems in the adopting country because it is not adjusted to the local conditions. For example, if the amount of coverage granted (like for the country that EDIS is copied from) on average is way above what the country’s population is comfortable with, comprising the influence of cultural factors, then the EDIS design is not correct, including also big depositors in the scheme, possibly undermining *market discipline*.

## ***6.4 Market environment – Market discipline***

As described in many papers, even in the presence of explicit deposit insurance, there are many types of *bank stakeholders* (each having a stake in one of the bank's liabilities covered or not by EDIS) through which *market discipline* still happens.

### ***6.4.1 Bank market discipline***

As shown in the articles below, the bank stakeholders monitor bank risk-taking by looking at bank fundamentals.

#### *Insured (small) household deposits*

*PAPER – Calomiris and Jaremski (2018)*

The authors study the United States of America, in particular 8 U.S. states that each adopted a state-level EDIS, for the period 1900-1930, an emerging economy.

Much, but not all, of the influence of (flat-rate) EDIS (the differential effect with respect to uninsured banks on the same state or other states) on deposit growth and loan growth and *increased risk-taking* (moral hazard) reflected responses to the World War I price run up.

Depositors ignored warning signs of insured banks' rising default risk (*a removal of market discipline*, compared to the market discipline exercised on uninsured banks), when those banks were making very risky bets about the persistence of the *World War I price increases*, thus apparently depositors believed that EDIS was *credible*.

EDIS did not cushion insured banks during the *post-World War I downturn* (early 1920s) and may have led to significant negative consequences for economic growth.

Temporally, given the above results, the potential costs of EDIS may appear low in environments that are relatively lacking in risk-taking opportunities (pre-WWI agricultural price boom), but those costs can appear much higher when greater risk-taking opportunities present themselves (WWI agricultural price boom).

Thus, it can explain why EDIS can be active for long periods without resulting in large-scale banking crises.

An *important note* is that insured state banks were constrained only by a *lenient regulatory requirement* (about a minimum capital-to-deposits ratio, minimum reserves-to-deposit ratio, and in some cases a maximum interest rate paid on deposits) which often proved *inadequate* to prevent insolvency.

Another note is that the protection offered by state EDIS was weaker than under the current systems of government-guarantee insurance and bailouts.

*PAPER – Ioannidou and Dreu (2006)*

The article studies Bolivia, an emerging economy, for period 1998-2003.

*EDIS introduction* (with partial coverage and flat-rate deposit insurance premium) caused a significant reduction in *market discipline*, as the coefficients of market discipline (equity to total assets, nonperforming loans to total assets, loan loss reserves to total assets, overhead expenses to total assets) were 50 to 90 percent smaller.

However, EDIS effect depends on *coverage*, because when the coverage rate is increased beyond 60% then market discipline is significantly reduced, and then completely eliminated when the coverage rate is 100%.

Most market discipline comes from *large depositors* (for small depositors the threshold to respond to bank risk is accounts of \$5000-\$10000) and *EDIS introduction* affected mainly those who were already active in imposing discipline.

*Foreign banks* are subject to less market discipline than domestic banks, and also depositors “run” more from domestic banks than foreign banks whenever there are *episodes of political instability*.

This is consistent with the hypothesis that foreign banks are trusted more, because more efficient or because perceived to have implicit guarantees from their home country or parent company.

The aggregate results imply that EDIS in Bolivia was *credible* and that *indirect costs* (associated with the recovery of deposits from a failed bank) are not important enough for depositors to continue monitoring and disciplining their banks.

*PAPER – Quintero V (2019)*

The author analyzes Colombia, an emerging economy, for the period 2010-2018.

*Increase in (partial and risk-based) EDIS coverage* (sizeable increase, but still a high proportion of deposits remained uninsured) during good times (no crises) causes *no decrease in market discipline*, depositors still discipline banks by requiring higher rates and by reducing demand (funding costs for banks).

No change in market discipline for *large listed banks or small unlisted banks*, but the levels of market discipline are different because market discipline is present for small unlisted banks while no market discipline is present for *large listed banks*, caused by *local too-big-to-fail perceptions of depositors*.

No change in market discipline for *banks with a high proportion of insured deposits*, and they normally pay higher interest rates than other banks.

Market discipline did not decrease when differentiating *between the type of financial institutions* (banks vs other types of credit institutions), and normally banks pay lower interest rates than other credit establishments with similar risk characteristics.

*PAPER – Anderson, Richardson, and Yang (2017)*

This paper studies the United States of America, during 1912-1938, an emerging economy.

*EDIS introduction* (with partial coverage and flat-rate deposit insurance premium) *reduced the monitoring efforts* of the newly *insured depositors*, as they ceased to react to banks balance sheet information (achieving the objective of avoiding depositors bank runs), while depositors continued to partially react to information about aggregate economic risks (macroeconomic news) thus retaining part of market discipline.

The reduced monitoring is *not flat in time*, because there is an increase of monitoring (wake-up effect) in the aftermath of a banking crisis.

Thus, the EDIS promise of deposit insurance seemed *credible* to insured depositors. Moreover, the Banking Act of 1935 made the FDIC permanent and increased the fees of insured banks while giving government backstop in case of losses, moreover reformed the *governance* of commercial banks and improved the *resolution of failing banks* (reducing depositors' risk).

*PAPER – Yan et al. (2011)*

The article studies Australia, a developed economy, for the period 2002-2010.

*EDIS introduction* (with partial coverage) increased the safety of depositors (both total and household – the latter being less sophisticated depositors) as it reduced their previous *market discipline* (both in deposit withdrawals and in asking a higher interest rate on their deposits).

*Bigger banks* are able to pay lower interest rates on household deposits, consistent with the too-big-to-fail perception by depositors.

Market discipline is less pronounced in *foreign owned* than *domestic banks*.

#### *Uninsured (large) deposits*

*PAPER – McDill and Maechler (2003)*

The authors study the United States of America, a developed economy, during 1987-2000.

Uninsured depositors respond to changes in *bank fundamentals* (reflecting bank risk-taking) by adjusting their deposits *quantity* (for a given price), thus exercising *market discipline*.

Also, *banks are able to borrow additional uninsured deposits* by raising the premium paid on uninsured deposits relative to the *interest rate* on total deposits, but it comes with a high funding cost (1% interest rate margin increase leads to 0.89% increase in uninsured deposits).

However, the average hides the important difference between good and weak banks, again consistent with *market discipline* imposed by uninsured depositors.

*Good banks* can raise the interest rate by 1% and gain 1.29% more of uninsured deposits, while *weak banks* raising interest rates cannot attract uninsured deposits.

*If a bank raises the average interest rates, it attracts mostly insured deposits*, consistent with the hypothesis that deposit insurance mitigates insured depositors' discipline, while uninsured depositors are more cautious and exercise market discipline.

The high level of U.S. EDIS coverage (75% of total deposits is insured) indicates that the market discipline affects only 25% of all deposits.

Also, *public regulators* may exploit the information contained in the behavior of insured and uninsured deposits.

*PAPER – Inakura, Shimizutani and Paprzycki (2005)*

The article studies Japan, a developed economy, for the period 1996-2001.

In 2001, *full coverage EDIS* was reduced to *partial coverage EDIS*.

*After the financial crisis in the late 1990s, households became more sensitive* (2001 vs 1996 data) to *overall bank risk*, more so those households with financial assets in excess of the deposit insurance cap.

*Households' "new" banks*, where they switched deposits from "old" banks, had significantly *healthier* conditions (in liquidity and capital asset ratios, greater amounts of total assets, greater increase in total deposits and smaller contraction in time deposits), showing more *market discipline* of depositors on weak banks.

*After the financial crisis in the late 1990s, household depositors were more aware of EDIS.*

On the *determinants of households' knowledge of EDIS or EDIS cap reintroduction*: higher level of income, greater financial assets, owning a house (real assets), and higher educational attainment.

Interestingly, *households with better knowledge of EDIS* and/or larger financial assets were more inclined to switch banks.

*Households with large ordinary deposits (fully insured)* did not switch banks.

*PAPER – Martin, Puri and Ufier (2018)*

The authors study the United States of America, a developed economy, for the period 2006-2014, investigating *deposit stability and drivers of deposit outflows and inflows in a distressed bank/s*.

Results shows *gross funding outflows (run-off)* by uninsured depositors, and they typically withdraw a large share even of insured funds.

Although some accounts are more stable (checking accounts and older accounts).

Uninsured term deposits (despite their lack of demand ability) are more risk sensitive and unstable than demandable deposits.

Government deposit guarantees (both EDIS and temporary deposit insurance measures) reduce the outflow of deposits (improving funding stability of the bank).

Simultaneous with the run-off, there is a *gross funding inflows (run-in)* of large and first-order impact (result missed if one looked at aggregated net deposit data alone) by new *insured (term) deposits* as the bank approached failure, suggesting the *credibility of EDIS* and attracted also by *higher interest rates*.

However, such *increased amount of insured deposits of the failing bank* created a *risk transfer* to the FDIC (increased credit risk exposure).

Also, there were inflows of *institutional term deposits (from small banks)*, substituting the previous run-off of institutional (uninsured) term placed deposits, through the comparatively new channel of *internet listing services*, a warning that *technological innovation* can open new channels for moral hazard.

In aggregate, *EDIS weakens market discipline*, as depositor discipline was ineffective in restraining bank risk-taking, suggesting that *prudential supervision* is required also.



The *Basel III new liquidity requirements of banks*, the Liquidity Coverage Ratio (LCR), to reduce the liquidity risk of banks, *assumed run-off rates* that are higher than those found empirically here during banks' distress periods in the U.S.

### *Interbank deposits*

*PAPER – Kouassi, Distinguin and Tarazi (2013)*

The article studies 10 countries in Central and Eastern Europe, emerging economies, for the period 1995-2006.

*EDIS introduction* led to *higher bank risk-taking* (moral hazard incentives).

However, EDIS presence *strengthened market discipline* (in the implicit insurance period there was none), measured by interbank deposits (with EDIS they became *credibly* excluded from insurance), that reduced in part the moral hazard created initially by EDIS.

*Larger banks* are less risky and less vulnerable (lower default probability).

*Foreign banks* take more risk and exhibit higher insolvency risk than domestic banks.

*Higher quality of law enforcement, strong bank resolution strategy, and higher deposit insurance authority power* (capital requirements, insurance premiums, examinations, etc.) are associated with lower bank riskiness and lower default probability.

Market discipline is effective only for *domestic banks* (reducing their risk-taking), instead uninsured creditors do not exercise market discipline on *banks with foreign ownership* (have more confidence in them).

The *power (high or low) of the deposit insurer* does not influence market discipline.

*Strong bank resolution strategies undermine market discipline*, because when banks are supervised by a regulator that is more likely to liquidate failing banks (rather than rescuing them), the fear of punishment leads them to take less risk in the first place.

## *Subordinated debt*

*PAPER – Hancock, Kwast and Covitz (2004)*

The authors study the United States of America, a developed economy, for the period 1985-2002, showing that *market discipline* was exercised on banks in the *primary subordinated debt* market.

*Subordinated debt* spreads were sensitive to organization-specific risks, but effective *market discipline* (subordinated investors significantly more risk-sensitive) only appears in the periods *after conjectural government guarantees were reduced* (end of the de facto too-big-to-fail regime in 1987).

There was a *decrease* in risk sensitivity of subordinated debt spreads between the purchase and assumption (1988-1992) period and the post-FDICIA (1993-2002) period, consistent with the view of subordinated investors perceiving *prompt corrective actions (by bank supervisors)* to reduce their expected losses in case of bank failure, despite a lower liquidation standing due to FDICIA and depositor preference rules.

## *Borrowers*

*PAPER – Onder and Ozyildirim (2008)*

The article studies Turkey, an emerging economy, for the period 1988-2000.

Deposit insurance created *bank moral hazard* (increased risk-taking) in the *partial coverage EDIS period*, and it increased further during the *full coverage EDIS period*, with *market discipline* being not enough to reduce it.

*Risky banks* were punished (market discipline) by *borrowers* during the partial EDIS period but increased in the full EDIS period, suggesting that borrowers carefully chose their banks from the beginning and built a lending relationship with them, as they would have to incur in switching costs in the event the bank they have a lending relationship fails.

*Risky banks* were punished (market discipline) by *depositors* not during the partial EDIS period (they thought EDIS was credible), but instead during the *full coverage EDIS period* (coverage had increased substantially), through withdrawal of deposits and requiring a higher interest rate, and this suggests that depositors believed the government guarantee to be *not credible* (it was a period of economic and political uncertainties).

Both *savers* and *borrowers* did *not seem to believe* in “*too-big-to-fail*” protection.

In the full coverage EDIS period, *large banks* behaved more conservatively, increasing liquidity and reducing nonperforming loans and their spread, but decreased capital adequacy (consistent with them believing in the “*too-big-to-fail*” argument).

On the factors argued that *might* explain the failure of market discipline against bank moral hazard: ill-designed EDIS, lack of effective bank supervision and ill-conceived bank regulation.

#### ***6.4.2 Too-big-to-fail market discipline***

As shown in various papers mentioned in the thesis, the bank stakeholders can and do react to the presence of implicit “*too-big-to-fail*” guarantees made by the governments.

#### ***6.4.3 Systemic risk market discipline***

As shown in the papers below, depositors are interested in their deposits’ exposure also to systemic risks when they appear.

*PAPER – Martinez Peria and Schmukler (1998)*

The article studies Argentina, Chile, and Mexico, emerging countries, during 1980s-1990s.

*EDIS* introduction did *not weaken market discipline* of insured depositors, suggesting that they did believe *EDIS to be not credible*, in fact there is evidence of contagion.

Depositors responded to *bank fundamentals* but also to *systemic and macroeconomic factors*.

The authors study Argentina and Uruguay, emerging economies, for the period 2000-2002.

*In emerging economies*, where risk is *systemic* (sovereign and currency risks) to a larger degree (e.g. Argentina and Uruguay crises) and a few systemic shocks can rapidly destabilize banking systems that *ex-ante* appear to be robust (*bank runs*), past *bank fundamentals* (indicators of bank health in normal times) can fail to capture *systemic risk exposure of banks* (macroeconomic risk), and when *systemic risk increases to significant levels*, it becomes a significant *predictor* of future bank fundamentals (explaining why depositors focus more on systemic than idiosyncratic risk) and the main driver of market responses (*market discipline*).

*Implications for academic analysis* on market discipline (especially for emerging countries):

- *Market discipline is robust once both idiosyncratic and systemic factors* are taken into account

*Implications for policymakers* (especially for emerging countries):

- *Market discipline* (Basel's Pillar 3) as disciplining device is questionable in emerging economies, when market reaction is driven by systemic risk (macroeconomic conditions - mostly beyond the control of bank managers) and less by idiosyncratic risks (bank fundamentals - can discipline bank managers)
- Reduce bank exposure to systemic factors through *prudential regulation*
  - o Liquid asset and provisioning requirements could take into account the denomination of bank loans
  - o Risk assigned to government bonds to compute capital requirement could be based on market considerations
- *Transparent banking crisis resolution procedures*, for example, reducing the scope for government intervention that could reduce the value of bank deposits, might help to avoid bank runs (dual agency problem: the government becomes a second agent that affects the banks' capacity to pay)

## ***6.5 Bank management – Self-discipline***

The managers of the bank can also contribute to constrain excessive risk-taking as they exercise self-discipline.

### ***6.6.1 Charter value***

As shown in the paper below and evidence in a previous paper (Gropp and Vesala, 2004), the charter value of a bank may make bank managers exercise self-discipline in taking excessive bank risk-taking.

*PAPER – Gueyie and Lai (2002)*

The authors study Canada, a developed economy, for the period 1959-1982.

Insured banks could exploit a mispriced risk-independent flat-rate EDIS by increasing leverage (decreasing capital ratios) and/or asset risk, thereby showing moral hazard behavior.

One factor that can induce self-discipline by banks is the self-discipline of bank managers through *charter value* (closed banks lose their valuable charters, to retain this intangible asset then bank managers tend to take less risk), measured using a proxy as the ratio of market-to-book value of assets.

In fact, as empirically found, given that *Canadian chartered banks* did adjust their capital in the same direction as their asset risk, *before and after the introduction of EDIS*, there is no change in Canadian chartered banks' behavior toward exploiting the introduction of a flat-rate EDIS.

## ***6.6 Regulatory environment – Public discipline***

Besides the private efforts to monitor banks (“market discipline”), the public regulators and monitors exercise “public discipline” on banks.

### ***6.6.1 Bank activities regulation***

As shown in various papers presented, bank activities regulation can affect banks’ risk-taking.

### ***6.6.2 Bank capital regulation***

As illustrated in many papers, bank capital regulation has an effect on banks’ risk-taking.

### ***6.6.3 Bank supervision***

As shown in previous papers and those below, bank supervision can affect banks’ risk-taking.

*PAPER – Dekle and Kletzer (2004)*

The authors analyze Japan, a developed economy, for the period 1980-2002, and finds that *public deposit insurance (implicit and explicit) and weak prudential supervision* can lead to banking crises and permanent declines in economic growth.

Weak bank supervision (no enforcement of loan-loss reserves or loan write-downs) gives bank managers the ability to finance transfers (through dividends) to shareholders from the public sector (as public debt), because when the government finally intervenes (or is forced to by an endogenous banking crisis) it has to face the accumulated unrealized deposit insurance liabilities of the banks that accumulated on the asset side of their balance sheets in the form of non-performing loans (acknowledged or not).

The longer the government waits to stop the growth of such deposit insurance liabilities, the larger is the public debt created when it finally does intervene.

In turn, such waiting negatively affects investments and economic growth of the economy.

#### **6.6.4 Bank resolution**

The banking resolution authority creates “public discipline” and influences bank risk-taking, as shown by various papers in the thesis, including the one here below.

*PAPER – Milhaupt (1999)*

The article here studies Japan, a developed economy, for the period 1971-1998.

The *moral hazard effects* that contributed to the high-risk lending of banks in the bubble period (pre-1990) were created by *implicit* resolution norms of financial distress, leading to *regulatory forbearance*.

In the 1990s, the banks’ financial problems involved serious amounts of non-performing loans that had been accumulated.

In the banking crisis (1990s), most problems were from the implicit portions of the financial safety net through the discretion of regulators.

Only in late 1998 there was a move to a greater institutionalization (stronger EDIS; framework governing bank risk regulation, failed bank resolutions, and bank recapitalizations) of the financial safety net (complete shift from *implicit* to *explicit* financial safety net).

The *implicit safety net* suffers from moral hazard and forbearance problems as in an explicit DIS, but it also has other problems:

- No bank resolution authority
- No legal framework for dealing with bank distress and resolution, and for allocating the following financial burden (complex task and involves politics)
- Time-inconsistency problem (discretion creates more problems than rules)

Therefore, a *well-designed EDIS together with a bank closure policy that is credible* (by legal constraints on regulatory autonomy) are better than an implicit government deposit protection and discretionary bank resolution procedures.

### 6.6.5 Regulatory environment (and interaction effects)

*Regulatory environment* refers to the various parts that constitutes it (bank activities regulation, bank capital regulation, bank supervision, bank resolution, EDIS, lender of last resort), but more importantly their *interactions* in restraining banks' excessive risk-taking.

*PAPER – Bartholdy, Boyle and Stover (2001)*

The authors' analysis regards Denmark, a developed economy, for the period 1986-1988.

*EDIS introduction* (here with partial coverage and with a flat-rate premium) must be conditioned by the *market perception* of the *country's regulatory system*, in fact *high risk small banks* (but not mid- or low-risk small banks, nor mid-sized or big-sized banks) exhibited a negative stock market reaction to the announcement of the fixed-rate EDIS.

The above results contrast with studies on the U.S., where fixed-rate EDIS favors large riskier banks.

Such difference in country results is attributed to Denmark's use of *market value accounting* and a *rigid bank closure policy*.

Thus, these comparative results suggest that the discussion on flat-rate EDIS must be based also considering the *country's whole regulatory structure*.

*PAPER – Beck (2003)*

The paper makes a *theoretical analysis* and an *analysis of country studies*.

It is pointed out that *deposit insurance schemes and bank failure resolution systems* are asked to *fulfill conflicting public policy objectives*:

- To protect small depositors by preventing contagion risks from bank runs (enhancing financial stability)
- To avoid moral hazard and the following aggressive risk-taking by banks (avoid financial fragility)

However, to balance these two objectives, *all parts of the financial safety net* (EDIS, bank failure resolution system, bank supervision and lender-of-last resort) must be consistent with



each other, through incentive-compatible individual design features and interactions between the various parts.

After three country studies (Germany, Brazil, Russia) of financial safety net components, it is pointed out the importance of analyzing the *whole financial safety net*, but also taking into account the *structure of the banking system* and the *level of institutional development*.

## **6.7 Institutional environment**

The *institutional environment* where EDIS is introduced matters on affecting bank risk-taking, as shown in many papers throughout the thesis.

### **6.7.1 Institutions**

Institutional factors like rule of law, economic freedom, and corruption level are important.

*PAPER – Dewenter, Hess and Brogaard (2017)*

The article analyzes 15 countries, all developed economies (EU countries, US, UK, Australia), for the period 1999-2010, to find that even in *similar economically developed countries with relatively homogeneous banks, institutions* (i.e. rule of law, economic freedom, less corruption) make the difference.

*In the stable economic period, increases in EDIS coverage in turn increase bank risk-taking* (more non-performing loans, higher leverage, and less franchise value).

Such adverse effect of EDIS is significantly tempered by *stronger institutions*.

Overall, the stable period results are consistent with *moral hazard concerns*, as deposit insurance affects bank performance.

*In the crisis period* (global financial crisis), *increases in EDIS coverage* in turn significantly *increase bank risk-taking* (higher leverage) but also significantly *increase bank franchise value*, consistent with “too-big-to-fail” concerns.

Such adverse effect of EDIS is significantly tempered by *stronger institutions*.

Overall, the crisis period results are consistent with *endogeneity concerns*, that poor bank performance could drive changes in regulations.

*Capital, entry, and activities regulations* affect bank performance.

The adverse effect of more permissive/lenient regulations are tempered by *stronger institutions*.

Therefore, a one-size-fits-all regulation (one regulation for all countries) may impose unintended consequences on bank performance.

## 6.7.2 Bank corporate governance structure

The corporate governance of the banks in a country is also an important institutional factor.

*PAPER – Laeven and Levine (2008)*

The authors study 48 countries, developed and emerging countries, for the period 1996-2001.

*Bank risk-taking* is influenced by the comparative power of shareholders (concentrated vs dispersed ownership) in the *corporate governance structure* of the bank.

*Bank risk is higher* in banks that have *large owners* (concentrated ownership) (ability/power to influence bank risk) with substantial cash-flow rights (incentives of owners towards bank risk) than in banks with *dispersed ownership*.

This is consistent with the view that owners tend to advocate for more bank risk taking than managers and debt holders, and that large owners with substantial cash-flow rights have greater incentives and power to increase bank risk taking than small shareholders.

An *effective legal system that protects minority shareholder rights effectively* (shareholder protection laws) influences that effect of ownership structure on bank risk-taking.

*Shareholder protection laws* are unimportant for bank risk taking with *dispersed ownership*.

In countries with *stronger shareholder protection laws* the importance of a *large owner* is weaker.

While in countries with the *highest level of shareholder rights*, an increase in cash-flow rights of the *largest shareholder* is not associated with a significant increase bank risk.

This is consistent with theory predicting that investor protection reduces the expropriation by controlling shareholders.

The *impact of regulations* (bank capital, bank activities, deposit insurance) on *bank risk-taking* depends on the *bank's ownership structure* (concentrated vs dispersed):

- *Bank capital regulations* reduces bank risk (enhance bank stability) with dispersed ownership, instead with a large owner the capital regulations increase bank risk
- *Bank activity restrictions* do not affect bank risk with dispersed ownership, instead with a large owner the activity restrictions increase bank risk
- *EDIS* does not affect bank risk with dispersed ownership, instead with a large owner the EDIS significantly increases bank risk

*PAPER – Laeven (2000)*

The article analyzes 12 countries, Asian developed and emerging economies, Western developed economies, for the period 1991-1998.

*EDIS creates moral hazard for banks* (calculated as gross safety net subsidies: risk-adjusted deposit insurance premiums that banks should have been paying given their risk-taking levels), but the banks moral hazard is different in magnitude between *bank corporate governance structures* and *institutional environments*.

Regarding different bank corporate governance structures:

- The subsidy is largest for banks with *concentrated private ownership*, especially for banks that are predominantly owned by a single company or another financial institution, and to a lesser extent by a single family or individual.  
This might be explained because they have more access to the safety net, not only because they are riskier but also because they might have better connections.
- *Banks with dispersed ownership* have a relatively low degree of risk-taking
- *State-owned banks* are average performers
- Gross safety net subsidies are higher for *business group-affiliated banks*, suggesting they might have supported some member companies of their group

Gross safety net subsidies are higher for *small banks* and *banks with high credit growth*.

Gross safety net subsidies are higher for banks in countries with *low levels of GDP per capita, high inflation rates, poor quality and enforcement of laws, low bank concentration, and low foreign bank penetration*.

*PAPER – Prabha and Wihlborg (2010)*

The paper involves 52 countries, divided between 14 industrial, 32 emerging, and 6 developing countries, for the period 1997-2003.

*Market discipline* is determined by the *extent* of EDIS, by the *credibility* of non-insurance of groups of depositors and other creditors, by the ownership structure of banks, and by the responsiveness of bank managers to market incentives.

There is an *U-shaped relationship between EDIS coverage* (as EDIS coverage increase there is a decrease of IDIS, supposing a credibility of non-insurance, thus substituting each other but less so at intermediate levels of EDIS coverage) *and banks' risk-taking* (as EDIS coverage increases, market discipline declines and increases bank risk-taking).

Moreover, such relationship is influenced by *country-specific characteristics of bank corporate governance* (government ownership, foreign ownership, and shareholder rights).

*In all countries:*

- *Risk-taking is minimized at an intermediate level of partial insurance coverage (U-shape)*, where market discipline is likely at its strongest
- High explicit coverage as well as low explicit coverage induces risk-taking through relatively low *capital ratios*
- *Creditor rights* seem irrelevant for risk-taking (both all and emerging countries)
- Increasing *shareholder rights* reduce risk-taking
- Higher share of *state-ownership* is associated with higher risk-taking
- *Foreign ownership* increases risk-taking in countries with low explicit coverage

*In emerging countries:*

- Higher *shareholder rights* are associated with lower bank risk-taking and the curvature (EDIS coverage – bank risk-taking) is more pronounced
- Incentive effects of *EDIS* coverage are relatively strong with strong shareholder rights, while the incentive effects of *implicit* deposit protection are strong with weak shareholder rights
- Higher share of *state-ownership* is associated with higher risk-taking, and the curvature is more pronounced only at high levels of EDIS coverage
- Increased *foreign ownership* reduces risk-taking at high levels of explicit coverage

### **6.7.3 Bank market structure**

As shown in various paper in the thesis, the bank market structure (the level of competition) affect bank risk-taking.

### **6.7.4 Sound accounting, disclosure regime, and independent audits**

Accounting, financial disclosure and audits are also important institutional factors.

*PAPER – International Association of Deposit Insurers (2014)*

IADI (2014) indicates the point about accounting, disclosure, and audits:

*“Sound accounting and disclosure regimes are necessary for the effective evaluation of risks by deposit insurance systems. Accurate, reliable and timely information can be used by management, depositors, the market and authorities to make decisions regarding the risk profile of an institution, and thereby increase market, regulatory and supervisory discipline. A sound accounting and disclosure regime includes comprehensive and well-defined accounting principles and rules that command wide international acceptance.”*

*“A system of independent audits ensures that users of financial statements have independent assurance that the accounts provide a true and fair view of the financial position of the financial institution. They also ensure that reports are prepared according to established accounting principles, with auditors held accountable for their work. The lack of strong accounting and disclosure regimes makes risk identification difficult. All financial safety-net participants, including the deposit insurer, need to have timely access to reliable financial information.”*

## CHAPTER 7: DEPOSIT INSURANCE BENEFITS

For each possible benefit created by EDIS presence, the related literature is presented here, and moral hazard considerations are present as ever.

### *7.1 Avoiding bank runs (and their induced banking crises)*

The EDIS first and main objective is to avoid bank runs by depositors, and their induced banking crises.

*PAPER – Demirgüç-Kunt and Detragiache (1999)*

The article involves an analysis spanning 61 countries, both developed and emerging economies, for the period 1980-1997.

EDIS presence increases (on average) *banking system vulnerability* (systemic banking crisis probability), consistent with moral hazard effects.

EDIS tends to make *countries more sensitive to systemic risk factors*, meaning that economies are more vulnerable to increases in real interest rates, exchange rate depreciation, and to runs triggered by currency crises.

EDIS adverse effects can be *more severe in liberalized banking systems*, and the conjecture is that bank interest rates controls limit the ability of banks to benefit from investment in high-risk high-return projects, thus curbing the moral hazard created by EDIS.

Countries have different *EDIS design features*, and each of these features have different effects on bank stability.

Differentiating between *levels of coverage* is important:

- *Lower coverage levels* induce low levels of banking crisis probability, while *risk-taking increases as coverage increases*.

Therefore, EDIS adverse effects on moral hazard can be reduced by limiting the level of coverage.

- *No coinsurance, foreign deposits covered, or interbank deposits covered* increases bank fragility

Differentiating between *types of funding* (unfunded, funded) is essential:

- *Funded systems* create bank fragility, suggesting that the safety net credibility plays a significant role

Differentiating between *sources of funding* (private, public-private, public) is important:

- *Government funding* give rise to stronger moral hazard

Differentiating between *management* (private, public-private, public) is important:

- *Government management* creates bank fragility, the distinction is between systems run by the government and systems where the banking sector plays at least some role, suggesting that in a bank-managed system there may be less room for abuse if banks have better information to monitor each other

Differentiating between *membership* (compulsory, voluntary) is important:

- *Compulsory membership* reduces bank fragility, suggesting that by reducing adverse selection among banks it makes the banking systems less unstable than EDIS with voluntary membership

EDIS adverse effects are dampened by *good institutions* (degree of law and order, contract enforcement quality, bureaucracy quality, bureaucratic delay, degree of corruption), while nullified (in a number of cases) by the *highest index-level of institutions*.

EDIS negative impact on bank stability is greater in countries with *weak institutions*, suggesting that such countries should be wary of introducing EDIS.

Variables that increase *EDIS adoption probability*:

- *Richer economies* (GDP per capita), suggesting that countries are more likely to adopt EDIS if they can reduce its costs (as better institutions are correlated with higher GDP per capita and may be associated with better bank regulation and supervision)
- *Contagion* variable, suggesting some fad among policymakers on EDIS adoption



*PAPER – Calomiris and Chen (2019)*

The authors' analysis covers 69 countries in total, 32 developed economies and 37 emerging economies, for the period 1970-2013.

*Greater EDIS coverage produced greater overall lending relative to bank assets and a greater proportion of lending to households, and small increases in banking system leverage, thus there is an overall increase in “micro” bank risk (increase in asset risk and insolvency risk).*

However, estimates about “macro” bank risk, are *not conclusive* whether *greater EDIS coverage* resulted in greater total loans relative to GDP or in more frequent or severe (systemic) banking crises.

Regarding the *factors that predict EDIS adoption*: international influences, recession, and in the wake of a banking crisis.

*PAPER – Chung and Richardson (2006)*

The article focuses on some U.S. states that had adopted state-level EDIS, covering the period 1921-1929, thus an emerging economy.

*State-level EDIS did not change the overall level of bank suspensions, but its composition (number of suspensions due to runs fell, while number of suspensions due to moral-hazard mismanagement rose).*

Such results suggest the *credibility of EDIS*, because only if the regime is credible the incentives of depositors and managers change and alters their behavior, which reduces bank runs while inducing moral hazard.

Moreover, even if state EDIS had eliminated all bank runs and moral hazard was not created, the overall rate of suspensions would have fallen only by 10%, because the real problem in the banking system was a *lack of managerial capital* (the ability to manage a bank during good times, or protect it from unforeseen economic shocks during bad times).

PAPER – Demirgüç-Kunt, Kane, and Laeven (2014)

This paper involves a cross-country study.

The authors indicate that the benefit of EDIS (besides its possible negative effects, like moral hazard) is to largely avoid or reduce *bank runs* (liquidity risk), and their consequent negative effects in endangering the stability of *healthy banks* (solvency risk), and also of the financial system at large.

During the latest *global financial crisis of 2007*, that created large economic and financial shocks, there were *no widespread bank runs by insured depositors*, besides some exceptions (e.g. Northern Rock in the United Kingdom), but lots of withdrawals by *uninsured depositors*.

However, the *guarantees during the crisis had been expanded* also (both in EDIS coverage and in government guarantees to non-deposit liabilities), creating questions about EDIS future stresses can create on government finances and about moral hazard.

There is *underpricing* of EDIS but also it is *time-inconsistent*, because reducing EDIS coverage and government guarantees after the crisis passed is not easy.

Therefore, the authors argue that it is important for governments to monitor, assess and report fiscal risks related to EDIS, but this calls also for reforms in mitigating these contingent liability risks.

## ***7.2 Crisis management and recovery effects***

As discussed below, the presence of EDIS during a crisis may lessens the crisis effects and shortens the recovery.

*PAPER – Hasan et al. (2020)*

Such article involves an analysis of 39 countries, both developed and emerging economies, for the period 2000-2013.

Results show that *EDIS* had a lending *stabilization effects during the 2007-2009 global financial crisis*, with banks experiencing a smaller reduction in banks' *lending* and a smaller increase in *lending spreads* (less contagion risk from the financial sector to the corporate sector), and a smaller reduction in *foreign lending* (less contagion risk from financial systems of different countries).

These positive effects are strengthened for *banks that rely more on deposit funding* (less effects from external liquidity shocks).

*More generous EDIS* (no coinsurance, high coverage, interbank deposits coverage) have stronger stabilization effects on bank lending.

*More credible EDIS* (ex-ante funded, government-funded, government backstop funding) have stronger stabilization effects on bank lending.

*After the crisis, banks in countries with EDIS recovered faster* (in credit amount, in credit spreads, and in foreign lending).

### 7.3 Liquidity

The main object of EDIS is to avoid bank runs, and in turn the banks always have enough *liquidity* to maintain their normal operations with depositors, during normal and, especially, during distress times.

*PAPER – Martin, Puri, and Ufer (2018)*

The article (already seen) studies the United States of America, a developed economy.

EDIS generally increases the willingness of depositors, of various kinds, to fund the banks, therefore improving the banks' *funding stability*.

In the new banking regulation of *Basel III*, specifically the *liquidity requirements* of banks with the Liquidity Coverage Ratio (LCR), designed to reduce the liquidity risk of banks (Bank for International Settlements, 2013), the *run-off rates* assumed by the regulation are like those found empirically in the paper during banks' distress periods in the U.S.

*PAPER – Fecht, Thum, and Weber (2019)*

The authors analyze Germany, a developed economy, for the period 2005-2016.

*Asymmetries in EDIS coverage* can lead investors' fear for their bank deposits' safety to shift their funds to other banks reputed more secured (covered by public guarantees), but this means that different financial institutions have a different ability to be a *liquidity provider*.

*PAPER – Fungáčová, Weill, and Zhou (2012)*

The article studies Russia, an emerging economy, for the period 2003-2007.

*EDIS introduction* weakened the positive *impact of bank capital on bank liquidity creation* only for *banks with a higher share of household deposits* (for all banks, there is no impact), suggesting that the implementation of EDIS made liquidity creation less risky by reducing the potential liquidity demands of customers.

The implications are that *both fields of bank regulation*, EDIS and capital regulation, are related and cannot be considered separately.

For regulators, it increases the trade-off between the benefits of higher bank capital (more financial stability) and the costs of diminished liquidity creation.

## ***7.4 Financial development***

As showed by the empirical evidence below, EDIS can (or not) help bank intermediation and financial development.

*PAPER – Cull, Sorge, and Senbet (2004)*

The paper regards an analysis of 119 countries, both developed and emerging economies, for the period 1960-2001.

Two EDIS indexes are used in the analysis:

- *EDIS generosity index* (coverage per depositor, foreign currency deposits, interbank deposits, source of funding, management, co-insurance)
- *Entry hurdle index* (compulsory membership, ex-ante or ex-post funding, annual premium payment by member banks, risk-adjusted premium payments)

*Relatively generous EDIS* (a composition of its design features) increases (on average) the *volatility of bank intermediation (moral hazard)*, the latter measured as private credit or liquid liabilities.

*Rule of law* mitigates such negative effect.

Only countries with the highest scores on the legal index (five or six) nullify the negative effect of EDIS (developed countries), however developing countries score well below such threshold.

*Supervisory power* increases such negative effect.

*Supervisory discretion* has no effect.

*Supervisory independence* (from legal reprisal) mitigates such negative effect.

*Entry hurdles* on member banks have little effect on *volatility of bank intermediation*, regardless of the nature of supervision or the rule of law.

This might suggest that deposit insurance premia (even risk-adjusted) are so low that their effectiveness to constrain banks' risk-taking incentives is compromised.

*EDIS-induced risk-taking* (increased volatility) slower (on average) the *long-run growth of bank intermediation*, as it might distort savings and investment decisions away from the profit-maximizing choices.

*Rule of law* has no effect.

*Supervisory power* has no effect.

*Supervisory discretion* and *supervisory independence* (from legal reprisal) mitigate such negative effect.

*Entry hurdles* on member banks have little effect on *growth of bank intermediation*.

*Relatively generous EDIS* can boost the *long-run growth of bank intermediation* (compared to IDIS), by drawing more savers into the formal financial system, but *only in countries with a strong rule of law and a strong bank supervision* (discretion, independence) as in developed countries, while emerging countries would do better without EDIS (thus IDIS).

*PAPER – Bergbrant et al. (2014)*

The article studies 87 countries, both developed and emerging economies, during 1984-2002.

EDIS introduction effects on *financial activity*:

- Reduces significantly that of the *banking sector*, but the *highest level of law and order* (institutions) nullifies it
- Reduces significantly that of the *equity market*, but the *highest level of law and order* (institutions) dampens it
- Does not affect the *nonbank financial sector*

EDIS introduction effects on *financial size*:

- Reduces significantly that of the *banking sector*, but the *highest level of law and order* (institutions) almost nullifies it
- Does not affect the *equity market* or the *nonbank financial sector*

In synthesis, EDIS retards the development of the overall financial market.

For the *dynamics*, the financial market development declines both in the short and long term.

Accounting for possible endogeneity, EDIS *causes* the decline in financial market development.

Disaggregating for the *stage of economic development* (given that per capita income and institutional development are highly correlated):

- *Emerging economies*: EDIS causes a decline in both banking sector and equity market, while law and order dampens such negative effects
- *Developed economies*: EDIS causes a decline only in the banking sector

Disaggregating the effects of EDIS for its *credibility and generosity*:

- *EDIS credibility* reduces significantly the *financial activity* of the *banking sector*, with *law and order* (institutions) having no effect.

A possible reason is that publicly and permanently funded EDIS are more credibly designed but lead to higher moral hazard, hence banking sector instability that lowers banking sector development.

EDIS credibility has no effect on *equity market* or *nonbank financial sector*.

- *EDIS generosity* increases significantly the *financial activity* of the *banking sector* (likely to increase moral hazard), with the *highest level of law and order* (institutions) nullifying it.

EDIS generosity has no effect on *equity market*.

EDIS generosity decreases significantly the *financial activity* of the *nonbank financial sector*, with the *highest level of law and order* (institutions) nullifying it.

Disaggregating *EDIS for its various design features* (affecting the generosity or credibility of EDIS), showed that they influence not only the banking sector but also the equity market and the nonbank financial sector differently.

Design features that benefit depositors influence the negative effect on nonbank markets.

*Policymakers* should adopt *EDIS judicious in coverage*, as it provides much scope to arrest the decline in financial market development before it starts.

Another possible solution is the *regulatory environment*.

Moreover, the above results do not imply EDIS is not effective in preventing bank runs.



*PAPER – Ramirez (2010)*

The paper studies the United State of America, at the state and country level, during the 1900-1930 period (emerging economy) and the 1975-2008 period (developed economy).

The *effect of banking crises on state deposits* in the 1900–1930 period for all states and then states without deposit insurance was a *long-term decline of 0.82% and 0.92%*, respectively.

Such result is attributable to a *loss of confidence* in the banking system by depositors, as they move away from banks to more rudimentary forms of savings (like keeping their money “under the mattress”, both literally and metaphorically), bank deposits are reduced in the long-run (not temporary), damaging bank lending capacity, thus affecting economic growth.

Moreover, such negative but seemingly small effect is the cost in terms of the loss of deposit growth *per crisis*, therefore the *accumulated effects of repeated crises can be significant*.

The effect of banking crises on state deposits in the 1900–1930 period for states that had *state-level EDIS* was negative but not statistically significant.

The effect of banking crises on state deposits for the 1975–2008 period as the entire country had *national-level EDIS* was none.

Such results are consistent with the hypothesis that EDIS existence (a *credible and confidence-building* institution for depositors) lessens or eliminates any long-lasting effects of banking crises on *deposit growth*.

*PAPER – Davison and Ramirez (2016)*

This article analyzes the United States of America, in particular at the state level, for the period 1921-1929, thus an emerging economy.

*State-level EDIS* was able to arrest the outflow of deposits away from the banking system during periods of bank distress (*liquidity-enhancing effect*) by maintaining depositors’ confidence, and thus reducing the extent to which money went “under the mattress” (literally and metaphorically).

The first evidence regards the *U.S. Postal Savings System*, as it became a refuge during times of financial distress, and is used as a proxy for “mattress” money (because the currency-deposit ratio is correlated with the ratio of postal savings balances to bank deposits), although an underestimation of the actual effect because of a deposit limit (\$2.500) that severely limited the intake of deposits especially during times of distress.

*Deposits in adjacent non-EDIS-states postal savings cities grew 16% (9%, 0%) more than deposits in the EDIS postal savings cities following a bank suspension within 10 (20, 30) miles, and as the magnitude of the effect declined with distance suggests that such effects were localized.*

Moreover, such *effects were persistent*, the disintermediation that bank suspensions caused in terms of deposit runoffs was long-lasting.

The second piece of evidence regards some of the *U.S. states that had introduced EDIS*, a more precise estimate of the effects of deposit insurance.

*State-level EDIS promoted financial depth* through its (stability-enhancing) influence on depositor behavior, as it increased *local bank capacity* (county-level deposits for state-chartered banks) by 56%.

*PAPER – Chernykh and Cole (2010)*

The authors study Russia, an emerging economy, for the period 2004-2006.

One of the primary goals of EDIS introduction by the Russian government was to draw out the estimated USD 40 billion in cash savings held by Russian citizens “under their mattresses” (thus unproductive for the economy) that could be instead used by banks as the basis for new loans (thus be productive for the economy).

*EDIS introduction led to a more effective banking system*, evidenced by increased deposit-taking and decreased reliance upon state-owned banks as custodians of retail deposits.

- EDIS introduction increased the levels of retail deposits and ratios of retail deposits to total assets for covered banks (relative to banks that did not enter the new deposit insurance system)

- Such effect was greater the longer a bank entered into EDIS
- Such effect was stronger for regional banks (than Moscow-based banks) and for smaller banks (than larger banks)
- Also, EDIS introduction had the effect of “leveling the playing field” between privately-owned banks and state-owned banks, as the market share of deposits by state-owned banks decreased

*EDIS introduction had the negative effect of increasing bank-risk taking (moral hazard), because there was an increase of financial risk (equity to assets ratio) by banks, although limited evidence about an increase of operating risk (loans to assets ratio).*

### ***7.5 Bank competition***

As shown in previous papers, EDIS can contribute to create a ‘*level playing field*’ for small relative to big banks, and from private to public banks, increasing the competition in the banking sector.

## 7.6 *Wealth effects and risk effects*

Although limited to just one country study (shown below), EDIS may have also *wealth effects* (involving large and diversified investors in banks) and *risk effects* (bank non-systematic risk-shifting to the government and a reduction of systematic risk of the economy).

*PAPER – Wagster (2006)*

The article, although limited to a single country, Canada, a developed economy, for the period 1962-1972, points out interesting elements related to the introduction of (flat-based) EDIS.

In brief, there was an *incentive for* and an *increase in bank risk-taking* (moral hazard hypothesis), a shift of the *bank non-systematic risk* to the insurer (risk transfer hypothesis), and a *reduction in systematic risk of the whole economy*.

The “*moral hazard hypothesis*” is supported by empirical evidence:

- *Bank risk-shifting incentives*: Canadian banks had risk-shifting incentives before EDIS adoption, while both banks and trust companies had risk-shifting incentives after EDIS adoption.

This suggests that Canadian banks received implicit deposit guarantees in the period before EDIS, and that EDIS probably improved or expanded the conjectural guarantees and/or improved the credibility of projections of additional implicit support.

Moreover, because only the banks received implicit support before EDIS adoption, it appears regulators were pursuing a “too-big-to-fail” policy.

- *Increased bank risk-taking*: bank managers to increased financial leverage and asset volatility, in turn producing a significant increase in the banks’ actuarially fair deposit-insurance premium (greatly exceeding the actual premium charged). Trust-company managers increased financial leverage, in turn producing an increase in the trust-companies’ actuarially fair deposit-insurance premium (exceeding the actual premium charged).

While deposit insurance is underpriced for both banks and trust companies, the increase in the actuarially fair deposit-insurance premium for banks is 53 percent higher than the increase for trust companies.

This suggests that because banks had greater incentives to increase asset risk (non-systematic risk) than trust companies, because underpriced EDIS causes low-risk institutions to subsidize high risk institutions so banks solved the problem by increasing their risk to the level of trust companies.

- *Wealth increase*: managers increased firm-specific risk (non-systematic risk) to increase expected future cash flows (moral hazard) because EDIS premium is flat rate (insensitive to changes in risk), as EDIS virtually eliminated the pricing of non-systematic risk we find positive abnormal returns (wealth increase) for bank shareholders (3.67%) and positive but not significant for trust-company shareholders (1.33%).

Moreover, because the wealth increase of bank shareholders is greater than that of trust-company shareholders, large Canadian banks benefited more than small banks (trust-companies) from the imposition of deposit insurance.

This result is consistent with the previous finding that banks were more successful (than trust companies) in increasing non-systematic risk (moral hazard behavior).

The “*risk transfer hypothesis*” is supported by empirical evidence:

- *Shift from non-systematic to systematic risk by bank stocks*: Increase in systematic risk after EDIS introduction for bank portfolio (not for trust companies).

Substantial increase in positive covariance with the market for both banks (52%) and trust companies (61%), suggesting that EDIS provision helped aligning the size and direction of returns of each portfolio with market returns.

These results suggest that EDIS absorbed most of the firm-specific risk previously faced by bank and trust-company shareholders (most of the non-systematic risk is no longer being priced).

Therefore, the wealth increase (see above) is probably driven by a combination of an increase in expected future cash flows and the transference of the consequences of non-systematic risk to the deposit insurer.

- *Shareholder wealth changes*: Increase in the number of bank and trust-company shareholders and increase in trading volume of their stocks.

Large-block stockholders diversify away their bank or trust-company stock holdings, because they are no longer adequately compensated for bearing non-systematic risk (to monitor the bank management) as the expected returns exceeded the required returns.

Instead, diversified investors buy the bank and trust-company stock, because they only price systematic risk.

The *reduction in systematic risk* is supported by empirical evidence:

- *Standard deviation of market returns*: after EDIS introduction, they declined by almost 20%, suggesting that the systematic risk of the economy declined because EDIS reduced the threat of loss to depositors (no need for depositors to run a bank) and because EDIS expanded the role of monitors (non-systematic risk monitoring by private monitors replaced by public monitors that surveil both non-systematic and systematic risk).

The author argue that the *cost for the government* of assuming non-systematic risk of banks and trust companies without adequate compensation (due to the flat-rate premium of EDIS) may thus be (partly) offset by a *reduction in systematic risk of the economy* (given the more stable and reliable financial intermediation system for the economy) as EDIS may have allowed the government to reduce its exposure to systematic risk.

Although beyond the scope of the paper, all this may have allowed the government to decrease its overall risk profile.

## CONCLUSIONS

The great amount empirical evidence on deposit insurance effects and side-effects (moral hazard in particular), sometimes with contrasting results, or apparently so, allows to draw some conclusions.

A correctly *designed, managed and credible* explicit but limited (in its coverage amount) deposit insurance scheme (EDIS), letting the most of *market discipline* be present, together with a *good* banking regulatory environment, in a *good* institutional environment, is an *effective* (bank runs and crises are reduced in frequency and gravity) and *beneficial* (the benefits outweigh the costs) public policy for the banking sector and the economy.

History shows that EDIS is a continuous *work-in-progress* even today.

When it was first created, in some U.S. states in the early 1900s, it had the objective of reducing or eliminating bank runs (and the following banking crisis they induced), but there was no precise knowledge or experience on *how* do it.

Since then, *a lot* of progress has been made to understand it.

In short, it is not the *function* of EDIS that is wrong, but instead it is the *implementation*.

If done right, it works well; if done wrong, it works badly.

## BIBLIOGRAPHY

Acharya, V.V., Yorulmazer, T., Santos, J., 2009. *Systemic Risk and Deposit Insurance Premiums*. Economic Policy Review, Vol. 16, No. 1, p. 89, August 2010.

Aldunate, F., 2017. *Deposit Insurance, Bank Risk Taking, and Failures: Evidence from Early Twentieth-Century State Deposit Insurance Systems*. Available at: <https://ssrn.com/abstract=2692131>.

Anderson, H., Richardson, G., Yang, B., 2017. *Deposit Insurance and Depositor Monitoring: Quasi-Experimental Evidence from the Creation of the Federal Deposit Insurance Corporation*. NBER Working Paper No. w23828.

Anginer, D., Demirgüç-Kunt, A., 2018. *Bank Runs and Moral Hazard: A Review of Deposit Insurance*. World Bank Policy Research Working Paper No. 8589.

Anginer, D., Demirgüç-Kunt, A., Zhu, M., 2012. *How Does Deposit Insurance Affect Bank Risk? Evidence from the Recent Crisis*. World Bank Policy Research Working Paper No. 6289.

Angner, E., Loewenstein, G.F., 2007. *Behavioral Economics*. HANDBOOK OF THE PHILOSOPHY OF SCIENCE: PHILOSOPHY OF ECONOMIC, pp. 641-690, Uskali Mäki ed., Amsterdam: Elsevier, 2012.

Arruñada, B., 2016. *How Rome Enabled Impersonal Markets*. Explorations in Economic History, 2016, 61, 68-84.

Arruñada, B., 2017. *The Institutions of Roman Markets*. In Giuseppe Dari-Mattiacci and Dennis Kehoe (eds.), Roman Law and Economics, vol. 2, Oxford Studies in Roman Society and Law (Thomas A. J. McGinn and Paul du Plessis, eds.), chapter 17, Oxford University Press, Oxford, 2020.

Bank for International Settlements, 2013. *Basel III: The Liquidity Coverage Ratio and liquidity risk monitoring tools*. Basel.



- Bank for International Settlements, 2017. *Finalising Basel III - in brief*. Basel.
- Bartholdy, J., Boyle, G., Stover, R.D., 2001. *Deposit Insurance and Market Assessment of Banking System Stability: Evidence from Denmark*. EFMA 2001 Lugano Meetings.
- Bartiloro, L., 2011. *Is Your Money Safe? What Italians Know About Deposit Insurance*. Bank of Italy Occasional Paper No. 104.
- Bartlett, C., 2018. *The Financial Crisis, Then and Now: Ancient Rome and 2008 CE*. Epicenter - Weatherhead Center for International Affairs - Harvard. December 10, 2018. Available at: <https://epicenter.wcfia.harvard.edu/blog/financial-crisis-then-and-now>.
- Beck, T., 2003. *The Incentive-Compatible Design of Deposit Insurance and Bank Failure Resolution: Concepts and Country Studies*. World Bank Policy Research Working Paper No. 3043.
- Bergbrant, M.C., et al., 2014. *Does Deposit Insurance Retard the Development of Financial Markets?*. Available at: <https://ssrn.com/abstract=2024420>.
- Bijlsma, M.J., van der Wiel, K., 2012. *Consumer Perception of Deposit Insurance: Little Awareness, Limited Effectiveness?*. TILEC Discussion Paper No. 2012-013
- Bostandzic, D., Pelster, M., Weiss, G., 2014. *Systemic Risk, Bank Capital, and Deposit Insurance Around the World*. Available at: <https://ssrn.com/abstract=2438693>.
- Bracha, A., Weber, E.U., 2012. *A Psychological Perspective of Financial Panic*. Federal Reserve Bank of Boston, Research Department Public Policy Discussion Papers, 2012, No. 12-7.
- Breuer, W., Quinten, B., 2009. *Cultural Finance*. Available at: <https://ssrn.com/abstract=1282068>.
- Breuer, W., Salzmann, A.J., 2009. *National Culture and Household Finance*. Global Economy and Finance Journal 5, 37-52, 2012.

Brown, N., McIlwraith, T., Tubelle de González L., 2017. *Perspectives: An Open Invitation to Cultural Anthropology*. Arlington: American Anthropological Association.

Caloia, F., Mastrogiacomo, M., Pasini, G., 2019. *Being in Good Hands: Deposit Insurance and Peers Financial Sophistication*. De Nederlandsche Bank Working Paper No. 638, May 2019.

Calomiris, C.W., Chen, S., 2019. *The Spread of Deposit Insurance and the Global Rise in Bank Asset Risk Since the 1970s*. Available at: <https://ssrn.com/abstract=3297294>.

Calomiris, C.W. Jaremski, M., 2018. *Stealing Deposits: Deposit Insurance, Risk-Taking and the Removal of Market Discipline in Early 20th Century Banks*. Journal of Finance, Forthcoming.

Chang, C., Ho, R., 2011. *Risk-Shifting Behavior at Commercial Banks Under Different Deposit Insurance Systems: Further Evidence from U.S. Markets*. Available at: <https://ssrn.com/abstract=1907705>.

Chernykh, L., Cole, R.A., 2010. *Does Deposit Insurance Improve Financial Intermediation? Evidence from the Russian Experiment*. Journal of Banking and Finance, Vol. 35, No. 2, pp. 388-402, 2010.

Chesini, G., 2014. *Does Deposit Insurance Increase Moral Hazard in Banks? The Case of the Australian Financial Claims Scheme*. Available at: <https://ssrn.com/abstract=2485091>.

Chung, C., Richardson, G., 2006. *Deposit Insurance and the Composition of Bank Suspensions in Developing Economies: Lessons from the State Deposit Insurance Experiments of the 1920s*. NBER Working Paper No. w12594.

*Council Regulation (EU) No 1024/2013*.

Cull, R., Sorge, M., Senbet, L.W., 2004. *Deposit Insurance and Bank Intermediation in the Long Run*. BIS Working Paper No. 156.

Dao, B., 2014. *Deposit Insurance and Bank Risks in Vietnam*. Available at: <https://ssrn.com/abstract=2543048>.

Davison, L., Ramirez, C.D., 2016. *Does Deposit Insurance Promote Financial Depth? Evidence from the Postal Savings System during the 1920s*. FDIC Center for Financial Research Paper No. CFR WP 2017 - 02.

*Decreto legislativo 1° settembre 1993, n. 385.*

Dekle, R., Kletzer, K.M., 2004. *Deposit Insurance, Regulatory Forbearance and Economic Growth: Implications for the Japanese Banking Crisis*. CESifo Working Paper Series No. 1136; UC Santa Cruz International Economics Working Paper No. 554; UC Santa Cruz Economics Working Paper No. 04-01.

DeLong, G.L., Saunders, A., 2006. *Did the Introduction of Fixed-Rate Federal Deposit Insurance Increase Bank Risk?*. Available at: <https://ssrn.com/abstract=897319>.

Demirgüç-Kunt, A., Detragiache, E., 1999. *Does Deposit Insurance Increase Banking System Stability? An Empirical Investigation*. World Bank Policy Research Working Paper No. 2247.

Demirgüç-Kunt, A., Kane, E.J., Laeven, L.A., 2006. *Deposit Insurance Design and Implementation: Policy Lessons from Research and Practice*. World Bank Policy Research Working Paper Series, Vol., pp. -, 2006.

Demirgüç-Kunt, A., Kane, E.J., Laeven, L.A., 2006. *Determinants of Deposit-Insurance Adoption and Design*. World Bank Policy Research Working Paper No. 3849.

Demirgüç-Kunt, A., Kane, E.J., Laeven, L.A., 2014. *Deposit Insurance Database*. World Bank Policy Research Working Paper No. 6934.

Demirgüç-Kunt, A., Karacaovali, B., Laeven, L.A., 2005. *Deposit Insurance Around the World: A Comprehensive Database*. World Bank Policy Research Working Paper No. 3628.

Dewenter, K.L. Hess, A.C. Brogaard, J., 2017. *Institutions and Deposit Insurance: Empirical Evidence*. Available at: <https://ssrn.com/abstract=2472618>.

Diamond, D.W., Dybvig, P.H., 1983. *Bank runs, deposit insurance, and liquidity*. *Journal of Political Economy* 91(3): 401–19.

*Directive 2014/49/EU*.

*Directive 2014/59/EU*.

Engen, D., 2014. *The Economy of Ancient Greece*. EH.Net Encyclopedia, edited by Robert Whaples. July 31, 2004. Available at: <http://eh.net/encyclopedia/the-economy-of-ancient-greece/>.

European Central Bank, 2019. *What is a lender of last resort?*. Frankfurt. Available at: <https://www.ecb.europa.eu/explainers/tell-me-more/html/what-is-a-lender-of-last-resort.en.html>.

European Union, 2016. *Effects analysis on the European deposit insurance scheme (EDIS)*. Bruxelles.

Fecht, F., Thum, S., Weber, P., 2019. *Fear, Deposit Insurance Schemes, and Deposit Reallocation in the German Banking System*. Deutsche Bundesbank Discussion Paper No. 12/2019.

Federal Deposit Insurance Corporation, 1998. *A Brief History of Deposit Insurance*. Washington.

Fungáčová, Z., Weill, L., Zhou, M., 2012. *Bank Capital, Liquidity Creation and Deposit Insurance*. 29th International Conference of the French Finance Association (AFFI) 2012.

Greenlaw, S.A., et al., 2017. *Microeconomics*. 2ed. Houston: Rice University.

Griffiths, H., et al., 2017. *Sociology*. Houston: Rice University

Grigorian, D.A., Kryshko, M., 2017. *Deposit Insurance, Remittances, and Dollarization: Survey-Based Evidence from a Top Remittance-Receiving Country*. IMF Working Paper No. 17/132.

Gropp, R., Vesala, J., 2004. *Deposit Insurance, Moral Hazard and Market Monitoring*. ECB Working Paper No. 302.

Gueyie, J., Lai, V.S., 2002. *Bank Moral Hazard and the Introduction of Official Deposit Insurance in Canada*. Available at: <https://ssrn.com/abstract=304159>.

Guiso, L., Sapienza, P., Zingales, L., 2001. *The Role of Social Capital in Financial Development*. Eleventh Annual Utah Winter Conference; AFA 2001 New Orleans; CRSP Working Paper No. 511.

Hancock, D., Kwast, M.L., Covitz, D.M., 2004. *Market Discipline in Banking Reconsidered: The Roles of Funding Manager Decisions and Deposit Insurance Reform*. FEDS Working Paper No. 2004-53.

Hasan, I., et al., 2020. *Deposit Insurance and Design: Effects on Bank Lending During the Global Financial Crisis*. Available at: <https://ssrn.com/abstract=3567763>.

Inakura, N., Shimizutani, S., Paprzycki, R., 2005. *Deposit Insurance and Depositor Discipline: Direct Evidence on Bank Switching Behavior in Japan*. Hi-Stat Discussion Paper No. 125.

International Association of Deposit Insurers, 2013. *Enhanced Guidance for Effective Deposit Insurance Systems Public Awareness of Deposit Insurance Systems*. Basel.

International Association of Deposit Insurers, 2014. *Core Principles for Effective Deposit Insurance Systems*. Basel.

International Monetary Fund, 2004. *Compilation Guide on Financial Soundness Indicators*. Washington.

Ioannidou, V., Dreu, J., 2006. *The Impact of Explicit Deposit Insurance on Market Discipline*. CentER Discussion Paper No. 2006-05.

Iyer, R., et al., 2018. *The Distortive Effects of Too Big To Fail: Evidence from the Danish Market for Retail Deposits*. Forthcoming in *The Review of Financial Studies*.

Karas, A., Pyle, W., Schoors, K., 2019. *Deposit Insurance, Market Discipline and Bank Risk*. BOFIT Discussion Paper No. 10/2019.

Katz, M.L., Rosen, H.S., 2007. *Microeconomia*. 3ed. McGraw-Hill Education.

Kerlin, J., 2015. *Development of Deposit Insurance Systems in the World*. *Journal of Management and Financial Sciences* Volume VIII, Issue 22, p. 33-43.

Kessler, D., Temin, P., 2005. *Money and Prices in the Early Roman Empire*. MIT Department of Economics Working Paper No. 05-11.

Kouassi, T., Distinguin, I., Tarazi, A., 2013. *Bank Deposit Insurance, Moral Hazard and Market Discipline: Evidence from Central and Eastern Europe*. *Journal of Comparative Economics*, Elsevier, vol. 41(2), pages 544-560.

Laeven, L.A., 2000. *Banking Risks Around the World: The Implicit Safety Net Subsidy Approach*. World Bank Policy Research Working Paper No. 2473.

Laeven, L.A., 2002. *Pricing of Deposit Insurance*. World Bank Policy Research Working Paper No. 2871.

Laeven, L.A., Levine, R.E., 2008. *Bank Governance, Regulation, and Risk Taking*. NBER Working Paper No. w14113.

LÉ, M., 2013. *Deposit Insurance Adoption and Bank Risk-Taking: The Role of Leverage*. PSE Working Paper No. 2013 –41.

Levy-Yeyati, E.L., Martinez Peria, M.S., Schmukler, S., 2004. *Market Discipline Under Systemic Risk: Evidence from Bank Runs in Emerging Economies*. World Bank Policy Research Working Paper No. 3440.

Lightner, O.C., 1922. *History of business depressions*. New York: The Northeastern Press.

Lopez-Quiles, C., Petricek, M., 2018. *Deposit Insurance and Bank Risk Taking*. Available at: <https://ssrn.com/abstract=3158394>.

Lusardi, A., 2006. *Financial Literacy and Financial Education: Review and Policy Implications*. NFI Policy Brief No. 2006-PB-11.

Lusardi, A., 2014. *Financial Literacy: Do People Know the ABCs of Finance?*. Global Financial Literacy Excellence Center Working Paper No. 2014-9.

Martin, C., Puri, M., Ufieri, A., 2018. *Deposit Inflows and Outflows in Failing Banks: The Role of Deposit Insurance*. FDIC Center for Financial Research Paper No. 2018-02.

Martinez Peria, M.S., Schmukler, S., 1998. *Do Depositors Punish Banks for Bad Behavior? Market Discipline in Argentina, Chile, and Mexico*. World Bank Policy Research Working Paper No. 2058.

McDill, K., Maechler, A., 2003. *Dynamic Depositor Discipline in U.S. Banks*. FDIC Working Paper No. 03-7.

Milhaupt, C.J., 1999. *Japan's Experience with Deposit Insurance and Failing Banks: Implications for Financial Regulatory Design?*. Columbia Law School, Center for Law and Economic Studies, Working Paper No. 148.

Mistrulli, P.E., Vacca, V., 2015. *Social capital and the cost of credit: evidence from a crisis*. Banca d'Italia, Temi di discussion (Working papers) No. 1009.

Munro, J.H., 2003. *The medieval origins of the 'Financial Revolution': usury, rentes, and negotiability*. *The International History Review*, Vol. 25, No. 3: pp. 505-562.

Muslumov, A., 2005. *Full Deposit Insurance and the Moral Hazard Problem: The Case of the Turkish Banking System*. Bogazici Journal - Review of Social, Economic and Administrative Studies, Vol. 19, No. 1-2, 2005.

Nadler, C., Breuer, W., 2017. *Cultural Finance as a Research Field – An Evaluative Survey*. Available at: <https://ssrn.com/abstract=2658146>.

Onder, Z., Ozyildirim, S., 2008. *Market Reaction to Risky Banks: Did Generous Deposit Guarantee Change it?*. World Development, Forthcoming.

Penas, M.F., Ioannidou, V., 2008. *Deposit Insurance and Bank Risk-Taking: Evidence from Internal Loan Ratings*. EFA 2008 Athens Meetings Paper; TILEC Discussion Paper No. 2008-022.

Prabha, A.P., Wihlborg, C., 2008. *Deposit Insurance, Risk-Taking and Banking Crises: Is there a Risk-Minimizing Level of Deposit Insurance Coverage?*. Available at: <https://ssrn.com/abstract=1295452>.

Prabha, A.P., Wihlborg, C., 2010. *Deposit Insurance Coverage, Ownership, and Banks' Risk-Taking in Emerging Markets*. Journal of International Money and Finance, Vol. 29, No. 2, pp. 201-386, March 2010.

Prescott, E.S., 2002. *Can Risk-Based Deposit Insurance Premiums Control Moral Hazard?*. FRB Richmond Economic Quarterly, vol. 88, no. 2, Spring 2002, pp. 87-100.

Pruski, J., Kerlin, J., 2015. *Characteristics of Deposit Insurance Research and the Challenges Ahead*. Safe Bank (Bezpieczy Bank), No. 2(59) 2015.

Qian, N., Zhang, K., Zheng, C., 2017. *How Do Regulatory Ability and Banking Market Structure Affect Explicit Deposit Insurance Scheme Adoption and Banks' Risk Taking?*. Available at: <https://ssrn.com/abstract=3060943>.

Quintero V, J.C., 2019. *Deposit Insurance and Market Discipline*. Available at: <https://ssrn.com/abstract=3470428>.



Ramirez, C.D., 2010. *The Effect of Banking Crises on Deposit Growth: State-Level Evidence from 1900 to 1930*. FDIC Center for Financial Research Working Paper No. 2010-07.

*Regulation (EU) No 575/2013.*

*Regulation (EU) No 806/2014.*

Reinhart, C.M., Rogoff, K.S., 2008. *This Time is Different: A Panoramic View of Eight Centuries of Financial Crises*. NBER Working Paper No. w13882.

Reinhart, C.M., Rogoff, K.S., 2009. *The Aftermath of Financial Crises*. NBER Working Paper No. w14656.

Reinhart, C., Rogoff, K.S., 2014. *Recovery from Financial Crises: Evidence from 100 Episodes*. NBER Working Paper No. w19823.

Sandulescu, N.E., 2012. *Public Information - Requirement of Deposit Guarantee Schemes*. REVISTA DE MANAGEMENT COMPARAT INTERNATIONAL/REVIEW OF INTERNATIONAL COMPARATIVE MANAGEMENT, Faculty of Management, Academy of Economic Studies, Bucharest, Romania, vol. 13(3), pages 387-393, July.

Scheidel, W., 2008. *The Monetary Systems of the Han and Roman Empires*. Princeton/Stanford Working Papers in Classics Paper No. 110505.

Scheidel, W. 2009. *A Comparative Perspective on the Determinants of the Scale and Productivity of Maritime Trade in the Roman Mediterranean*. Princeton/Stanford Working Papers in Classics Paper No. 040902.

*Second Council Directive 89/646/EEC.*

Spielman, R.M., et al., 2017. *Psychology*. Houston: Rice University

Temin, P., 2001. *A Market Economy in the Early Roman Empire*. MIT Dept. of Economics Working Paper No. 01-08.

Temin, P., 2002. *Financial Intermediation in the Early Roman Empire*. MIT Department of Economics Working Paper No. 02-39.

Temin, P., 2006. *The Economy of the Early Roman Empire*. *Journal of Economic Perspectives*. 20 (1): 133–151.

Thakor, A.V., 2013. *Skill, Luck, and Financial Crises*. Available at: <https://ssrn.com/abstract=2265472>.

Wagster, J.D., 2006. *Wealth and Risk Effects of Adopting Deposit Insurance in Canada: Evidence of Risk Shifting by Banks and Trust Companies*. *Journal of Money, Credit and Banking*, Vol. 39, No. 7, pp. 1651-1681, October 2007.

Yan, X., et al., 2011. *Market Discipline and Deposit Guarantee: Evidence from Australian Banks*. 24th Australasian Finance and Banking Conference 2011 Paper.