

Deposit Insurance and Risk Taking

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Abstract

We review the theory of deposit insurance highlighting the underlying assumptions that were not fulfilled during the recent financial crisis and that may have led to serious policy mistakes. In theoretical models deposit insurance is mostly seen as an equilibrium selection device to avoid panic-based runs. In such a context, it is not drawn on and is thus costless and fully credible. However, if bank runs are linked to a fall in asset values, providing deposit insurance can be very costly and, as the case of Ireland has shown, can even threaten sovereign solvency. This perspective indicates a need for new research on the relation between bank failures, deposit insurance schemes, sovereign default and currency depreciation and for reforms of deposit insurance schemes.

I. INTRODUCTION

The financial crisis that started in 2007 is certainly one of the most significant economic events of the last fifty years. Its consequences both for the financial system and the real economy are enormous. Among other things, the crisis has highlighted the inadequacy of the existing regulatory framework and the financial safety net (i.e., deposit insurance and lender of last resort) in preventing the crisis as well as in mitigating its effects. Governments all over the world had to implement extraordinary emergency measures during the crisis and reforms of the regulatory framework are very much at the top of the agenda for both practitioners and academics.

One crisis management tool that has been modified significantly during the crisis is deposit insurance. In a narrow sense, this refers to the insurance that depositors, typically retail, receive in case of a bank's failure. More broadly, deposit insurance can also include other forms of interventions in terms of ex post bailouts, general guarantee schemes and other forms of support of banks in distress. Examples of these broader forms of interventions abounded in the recent crisis, when public authorities intervened massively in an attempt to preserve the stability of the financial system. The interventions ranged from extensions of existing deposit insurance schemes in terms of scope and coverage to the introduction of new schemes and generalized guarantees.

In this paper we use both concepts of deposit insurance. The scope is to highlight how the recent events have questioned the rationale for deposit insurance and, in particular, its desirability. The main assumption in the existing theory of deposit insurance is that bank runs, and more generally crises, are panic-based events that can be prevented by the sole announcement of a complete and credible deposit insurance scheme. This ensures that depositors will always obtain their full repayments and will thus not precipitate a run. As it prevents the crisis, deposit insurance does not entail any disbursement. The only drawback is that, as with any other form of insurance, it can entail moral hazard problems if not adequately risk-adjusted and fairly priced.

The assumptions that crises are purely panic phenomena and that the insurance scheme is credible are crucial as they imply that deposit insurance is not disbursed and is thus costless. If either of the two assumptions does not hold, then providing insurance can be very costly. A recent literature has focused on the issue of limited commitment. The idea resembles that of time inconsistency. If providing insurance is not ex post optimal, it cannot be ex ante credible either. Anticipating this, depositors fear they will not obtain their promised repayment and this may precipitate a crisis. In this framework, deposit insurance becomes ineffective in preventing even purely panic-based runs.

While this lack of credibility is certainly an important issue, it does not seem to have played an important role during the recent crisis for two main reasons. The theory on limited commitment in deposit insurance (now intended more broadly as public intervention) considers that governments may not do *enough* ex post in the sense of not completely fulfilling the initial commitments of insuring depositors. Moreover, it is still based on the idea that crises are exclusively panic phenomena.

Both of these assumptions have not found valid support in practice during the recent crisis. First, in practice governments tend to do *more* ex post than was originally announced rather than less. Second, crises are not solely panic events, but tend to be also related to deterioration in economic conditions and asset prices (see Allen, Babus and Carletti, 2009, for a survey on the different sources of crises).

These non-panic types of crises mean that deposit insurance and other types of guarantee to prevent runs can be extremely costly. The case of Ireland, where the generalized guarantees given to the banking sector threatened the solvency of the country, is a striking example. The two-way feedback between financial sector bailouts and sovereign credit risk calls for additional research in this area and underlines the need for a reform of deposit insurance schemes.

The paper proceeds as follow. Section II presents a brief history of deposit insurance. Section III discusses its main rationale in terms of prevention of panic-related crises. In Section IV we discuss the two main drawbacks of deposit insurance as addressed in the literature, namely the moral hazard problem and the problem of limited commitment. Section V describes briefly the main events of the recent crisis with regard to deposit insurance. Finally Section VI draws some policy conclusions and discusses some recent proposals for reforms of deposit insurance schemes.

II. A BRIEF HISTORY OF DEPOSIT INSURANCE

Deposit insurance was formally introduced in the 1900s in the U.S. but the first insurance schemes date back to the early 1800s¹. The first scheme, called New York's Safety Fund, was introduced in the state of New York in 1829 with the objective of guaranteeing deposits and circulating notes in case of a bank failure. The scheme was of private nature in that it was funded by limited annual contributions of the member banks. However, the state government was in charge of regulating and supervising the Fund. The scheme failed in 1842 when, after the failure of numerous banks, it became insolvent.

¹ See Calomiris (1990) and FDIC (1998) for a detailed survey on the history of deposit insurance in the US before and in 1920s.

In the period between 1831 and 1845, deposit insurance schemes were introduced in the states of Michigan, Vermont, Indiana, Ohio and Iowa. The schemes were again unsuccessful in the first two states, while they performed better in the other three states. As argued by Calomiris (1990), the reason for the different success of these scheme hinges upon their different funding mechanisms. As in New York, the insurance scheme in Michigan and Vermont was funded exclusively by the annual contributions of the member banks. By contrast, in the other states the insurance scheme was structured as unlimited mutual liabilities by member banks. In case of a bank's failure the other banks were required to cover any remaining losses and creditors' claims. This implied that all banks were effectively responsible and liable for the failure of one member bank and thus had the right incentives to monitor the peer banks and prevent excessive risk-taking behaviours.

In the early 1920s, eight new insurance schemes were introduced but they were again unsuccessful. Calomiris (1990) argues that the main problem with these schemes was that as in the case of the New York fund, they were funded by limited contributions of the member banks and peer monitoring was insufficient.

The first deposit insurance scheme sponsored by the Federal Government was introduced in 1933 as a response to the Great Depression. The severity of the crisis and the widespread belief that the financial instability was panic-based (e.g., Friedman and Schwartz, 1963) highlighted the need to restore confidence in the banking system. With the Banking Act of 1933, the Federal Government created the Federal Deposit Insurance Corporation (FDIC), which had as its primary objective the provision of insurance to depositors in the case of bank failure. Differently from the previous schemes, the FDIC insurance program was funded through capital provided by the Treasury and the Federal Reserve Banks. The scheme was successful in restoring depositors' confidence in the financial system and thus helped restore stability.

With the proliferation of crises in the 1980s and 1990s a large number of countries – both developed and developing – introduced explicit deposit insurance schemes. In 1994, deposit insurance schemes were introduced in most European countries in compliance with the European Union's Directive on Deposit Insurance. In 1997 the IMF endorsed a limited form of deposit insurance in its best practice².

III. THE RATIONALE FOR DEPOSIT INSURANCE

The justification for deposit insurance in the academic literature dates back to the seminal paper by Diamond and Dybvig (1983) and is directly related to the main role of financial institutions as

² See Garcia (1999) and Kyei (1995) for surveys of deposit insurance around the world.

liquidity providers. Banks perform an important role in terms of maturity transformation. They collect demandable deposits and raise funds in the short-term capital markets and invest them in long-term assets. This maturity mismatch allows them to offer risk-sharing to depositors but also exposes them to the possibility that all depositors withdraw their money early. These runs can originate in two ways. They can either occur spontaneously as a panic resulting from sunspots (e.g., Diamond and Dybvig, 1983) or they may arise from a deterioration in economic conditions and particularly falls in asset prices (e.g., Gorton, 1988; Jacklin and Bhattacharya, 1988; Allen and Gale, 2000; Reinhart and Rogoff, 2009). The different nature of bank runs is crucial for the discussion on the effectiveness and implementation of deposit insurance as we will discuss in detail in Section V.

The ‘panics’ view shows that bank runs are self-fulfilling prophecies and emerge as multiple equilibria. In Diamond and Dybvig (1983) runs occur because depositors find it optimal to withdraw their funds prematurely if they expected the others to do the same. This is due to the assumptions of first-come first-served and of costly liquidation of the long-term assets. If everybody believes no panic will occur only those with genuine liquidity needs will withdraw their funds and these demands can be met without costly liquidation of assets. However, if everybody believes a crisis will occur then it becomes a self-fulfilling prophecy as people rush to avoid being last in line. The bank has then to liquidate the long-term asset to meet the unexpected large liquidity demand and fails.

Deposit insurance arises in this context as an equilibrium selection device. If late depositors believe that they will obtain their promised repayments no matter what the others do, then they no longer have an incentive to withdraw prematurely. The bank does not need to liquidate the long term assets and it remains solvent. Thus, in the multiple equilibria framework, deposit insurance eliminates the bank run equilibrium and allows the financial system to perform its correct risk sharing role.³

The effectiveness of deposit insurance in Diamond and Dybvig relies crucially on the fact that it is fully credible. The scheme is funded through general taxation and as such it is believed to be able to fully repay depositors. Anticipating this, the depositors without immediate consumption needs wait and a run never occurs. This implies that no taxes are actually imposed and deposit insurance is

³ Another rationale for deposit insurance is that it corrects the market failure resulting from too few deposits and extends the markets in frameworks characterized by asymmetric information (e.g., Morrison and White, 2008; Allen, Carletti and Marquez, 2011).

costless.⁴ Relaxing any of these assumptions may have important effects on the effectiveness and desirability of having deposit insurance.

IV. DRAWBACKS OF DEPOSIT INSURANCE

As highlighted in the previous section, deposit insurance is effective in preventing crises in a multiple equilibria framework where runs emerge as simple self fulfilling phenomena. In such a context deposit insurance is always optimal. It prevents crises and allows the economy to reach the optimal allocation without entailing any cost. However, this view of deposit insurance is quite narrow and relies on numerous restrictive assumptions. This has spurred a vast literature on the effects of deposit insurance in contexts that differ from the Diamond and Dybvig framework in various respects.

In what follows we focus on two particular features of the Diamond and Dybvig model. The first refers to the fact that the provision of deposit insurance does not have any ex ante effect in terms of altering the behaviour of either banks or depositors. The second concerns the fact that deposit insurance is costless in that neither the banks nor the insurer bear any cost of providing it. We analyze these two points in detail below.

(i) Moral hazard problems

A crucial assumption in the Diamond and Dybvig analysis is that banks invest only in a riskless technology and thus the presence of deposit insurance does not affect either banks' or depositors' incentives to behave prudently. Extending the framework by introducing risky investment possibilities introduces potential distortions, which crucially depend on the specific characteristics of the insurance scheme and of the regulatory and institutional environment.

A large theoretical literature has analyzed the drawbacks of deposit insurance in terms of moral hazard. All these contributions start from the assumption that deposit insurance eliminates panic bank runs as in Diamond and Dybvig and focus on its costs in terms of greater risk. The main insight is that, as with any other form of insurance, risk-insensitive and complete deposit insurance worsens banks' incentives to behave prudently and limits market discipline as depositors no longer have an incentive to monitor their banks (see, e.g., Boot and Greenbaum, 1993). This means that risk is shifted onto the deposit insurer and that there exists a trade off in the provision of deposit insurance. On the one hand, this is effective in preventing bank runs as depositors are sure to

⁴ By restoring depositors' confidence, deposit insurance also improves investors' incentives to deposit their funds thus extending banks' size (see, e.g., Matutes and Vives, 1996, and Chernykh and Cole, 2011).

receive the promised repayments. On the other hand, deposit insurance increases risk in the financial system and this may entail costs in terms of effective disbursements for the insurer.

The distortions of deposit insurance on risk-taking and market discipline find empirical support in a number of studies. Using cross-country data sets over the period 1980-1997, Demirgüç-Kunt and Detragiache (2001) and Demirgüç-Kunt and Huizinga (2003) find that deposit insurance has a negative impact on the monitoring incentives of all investors having claims on the banks, thus increasing the likelihood of banking crises. Similar results are obtained by Ioannidou and Penas (2010) on a Bolivian dataset. The study finds that after the introduction of deposit insurance in 2001, Bolivian banks were more likely to initiate riskier loans.

There are several ways in which the distortions introduced by risk insensitive deposit insurance can be corrected, or at least ameliorated. The first is to implement a risk sensitive pricing structure. If premia were risk sensitive, then deposit insurance would not entail incentive problems as premia would perfectly reflect the risk of banks' portfolios thus eliminating any incentive to take greater risk. However, implementing risk sensitive premia can be problematic as it requires that the regulator observes the risk of banks' portfolio or is able to induce banks to reveal it without entailing too high costs. Chan, Greenbaum and Thakor (1992) show that a deposit insurance pricing scheme linked to banks' observable reported capital can induce banks to reveal their true risk and behave prudently. However, such a scheme may be costly or not desirable. The question is whether a risk-sensitive scheme is also fairly priced, that is if it allows the insurer to break even on each individual institution. Chan, Greenbaum and Thakor (1992) show that fairly priced and completely risk-sensitive deposit insurance requires that banks have access to rents and thus it is not implementable in a perfectly competitive banking system. By contrast, Freixas and Rochet (1998) argue that, under more general assumptions on banks' costs, a fairly priced deposit insurance becomes possible even in a competitive banking system but it may not be desirable as it entails cross-subsidization between more and less efficient banks.⁵

The importance of risk-sensitive pricing raises the issue of whether a private insurance market could provide a solution to the problem. While private insurance markets work well for some kinds of risks, the crisis has illustrated that they do not work very well in crisis situations. For example, the bailout of AIG in September 2008 as a result of problems with the credit default swaps it had underwritten and the bankruptcy of the monoline insurer Ambac in November 2010 show that there are strict limits to the amount of insurance they can provide. It is difficult to imagine that private

⁵ Another reason why risk-sensitive deposit insurance may not be desirable is if the scheme is financed through distortionary taxes.

insurers could provide credible insurance for the potentially severe losses that can occur in a systemic crisis in the context of deposit insurance.

A second way to correct the incentive distortions entailed by deposit insurance is to complement it with a proper regulatory framework. Cooper and Ross (2002) analyze the relationship between deposit insurance and capital regulation in a model similar to Diamond and Dybvig's where banks also have the possibility to invest in risky assets. Deposit insurance has the benefit of preventing bank runs, but it also entails the cost of reducing depositors' monitoring and thus inducing banks to take greater risk. A solution that restores banks' prudent behaviour is to require them to raise capital. Given that shareholders have to use their capital to repay depositors in case the bank fails, they no longer have an incentive to gamble with depositors' funds. Thus, a combination of deposit insurance and capital regulation allows the achievement of the first best allocation. The former is necessary to prevent inefficient runs, while the latter is necessary to solve the moral hazard problem.

Another way to ameliorate the incentive problem resulting from deposit insurance is through taxation of banks' liabilities. In a framework similar to Diamond and Dybvig's where banks can anticipate the probability of self-fulfilling runs, Keister (2010) shows that without bailouts banks invest excessively in short term assets as a form of private insurance against runs. When bailouts in the form of protection of investors in case of a bank's failure are possible, the opposite happens. Banks undertake an excessive maturity transformation as they invest excessively in the long-term asset. This increases the probability of self-fulfilling runs and makes banks more fragile. Banks' incentives can be corrected through a Pigouvian tax on banks' short-term liability. The effect of the tax is to equalize the private value of the bank's investment choice to that of the social planner so that the efficient allocation can be achieved. This allocation entails a positive probability of self-fulfilling runs so that bailouts will be necessary.

A number of empirical papers confirm the importance of the regulatory and institutional framework for the extent to which deposit insurance affects bank risk taking and thus bank stability. The main findings are that the quality of the institutional and regulatory environment, the differences in management and membership rules and the presence of co-insurance mechanisms are relevant in shaping the impact of deposit insurance on bank risk taking. In insurance systems managed by banks rather than by the government there is less room for abuse as banks have better information and capability to monitor each other. Similarly, the weaker the institutional and regulatory environment, the stronger is the negative impact of deposit insurance on financial stability. Finally, co-insurance mitigates the negative effect of the safety net on bank stability as well as on market

discipline. Hovakimian, Kane and Laeven (2003) find further direct empirical support for these results. They find that risk-sensitive premia, coverage limits and co-insurance mitigate the negative effects of deposit insurance. Moreover, they obtain that a weak institutional and political environment also exacerbates the risk taking problem induced by deposit insurance.

(ii) *Costs of providing deposit insurance: limited commitment and non-panic crises*

One of the crucial assumptions in what we have discussed so far is that there is full commitment on the side of the insurer so that deposit insurance is fully credible. This means that any type of insurance scheme can be honoured and, anticipating this, depositors do not run. In a Diamond and Dybvig context where runs are only panic-based, this also implies that deposit insurance is costless. It is a simple method of ensuring that the bad equilibrium is eliminated. The details of the scheme besides the fact that the coverage is complete do not play any role. It does not matter whether the scheme is announced at the initial or the intermediate period as long as it is known before the liquidation of the long-term asset takes place and is credible that each depositor is fully repaid irrespective of the bank's liquidation policy. Although a public scheme may be preferable as long as the government can raise non-distortionary taxes, the exact structure of the insurance fund does not matter as long as full repayments are credible. In fact, deposit insurance has a pure "announcement" effect. As runs do not occur, banks remain solvent and there is no effective disbursement. In other words, the insurance is costless.

The nature and the effects of the deposit insurance are very different if the assumption of full commitment is removed and if runs are not pure coordination failures but rather are linked to a deterioration in economic conditions. In both cases, guaranteeing deposits entails effective disbursements and can therefore be very costly. The reason is different in the two cases. If the insurer cannot fully commit to an insurance scheme, self-fulfilling runs are not necessarily prevented so that even solvent banks may fail because of the illiquidity of their assets. If banks invest in risky assets, a complete and credible deposit insurance may still prevent bank runs. However, it requires an intervention by the insurer when banks become insolvent and are unable to fully repay their depositors. In all these cases, the funding structure of the deposit insurance scheme becomes crucial in determining the optimality of the scheme itself. This in turn affects the credibility of the scheme as the cost of providing insurance can offset its benefit.

The literature on limited commitment considers a broader definition of deposit insurance, which includes policies such as ex post bailouts and suspension of convertibility. The focus is on whether the policy is effective in preventing bank runs. The lack of commitment introduces a problem of

time inconsistency. Government policies are credible only to the extent they are ex post optimal. Thus, only ex post optimal policies can prevent bank runs, as in the case of full commitment on the side of the insurer (e.g., Ennis and Keister, 2009 and 2010).

In this scenario, it becomes crucial how the scheme is financed and what its actual costs are. Since in the absence of commitment there is a non-negligible probability of runs, the government has to evaluate benefits and costs related to the implementation of the scheme. Cooper and Kempf (2011) analyze the trade-off between insurance gains and redistribution issues related to the financing of deposit insurance in a Diamond and Dybvig framework with heterogeneous agents. As deposit insurance entails a cost in terms of redistribution of resources from poor to rich households, it may not be optimal ex post. When this is the case, deposit insurance is not fully credible and self-fulfilling runs can still occur.

To sum up, the literature has focused on either the distortions of deposit insurance in terms of incentives and excessive risk taking or its effectiveness in preventing self-fulfilling bank runs in the case of limited commitment. The recent crisis has, however, highlighted new issues related to deposit insurance and more broadly government guarantees. First, in contrast to the literature of limited commitment, governments may end up doing *more* than what they have promised in order to avoid crises and restore the stability of the banking system. Second, when crises are not self-fulfilling phenomena but they are rather linked to a deterioration of economic conditions, introducing widespread guarantees can be very costly and even threaten the solvency of the countries providing them, as the case of Ireland illustrates.

In the next section, we review the measures introduced during the recent crisis and discuss their effectiveness as well as the problems that they might have contributed too. We focus in particular on the case of Ireland as this illustrates how extensive government intervention aimed at rescuing the banking system may affect the solvency of the country itself.

V. THE RECENT FINANCIAL CRISIS

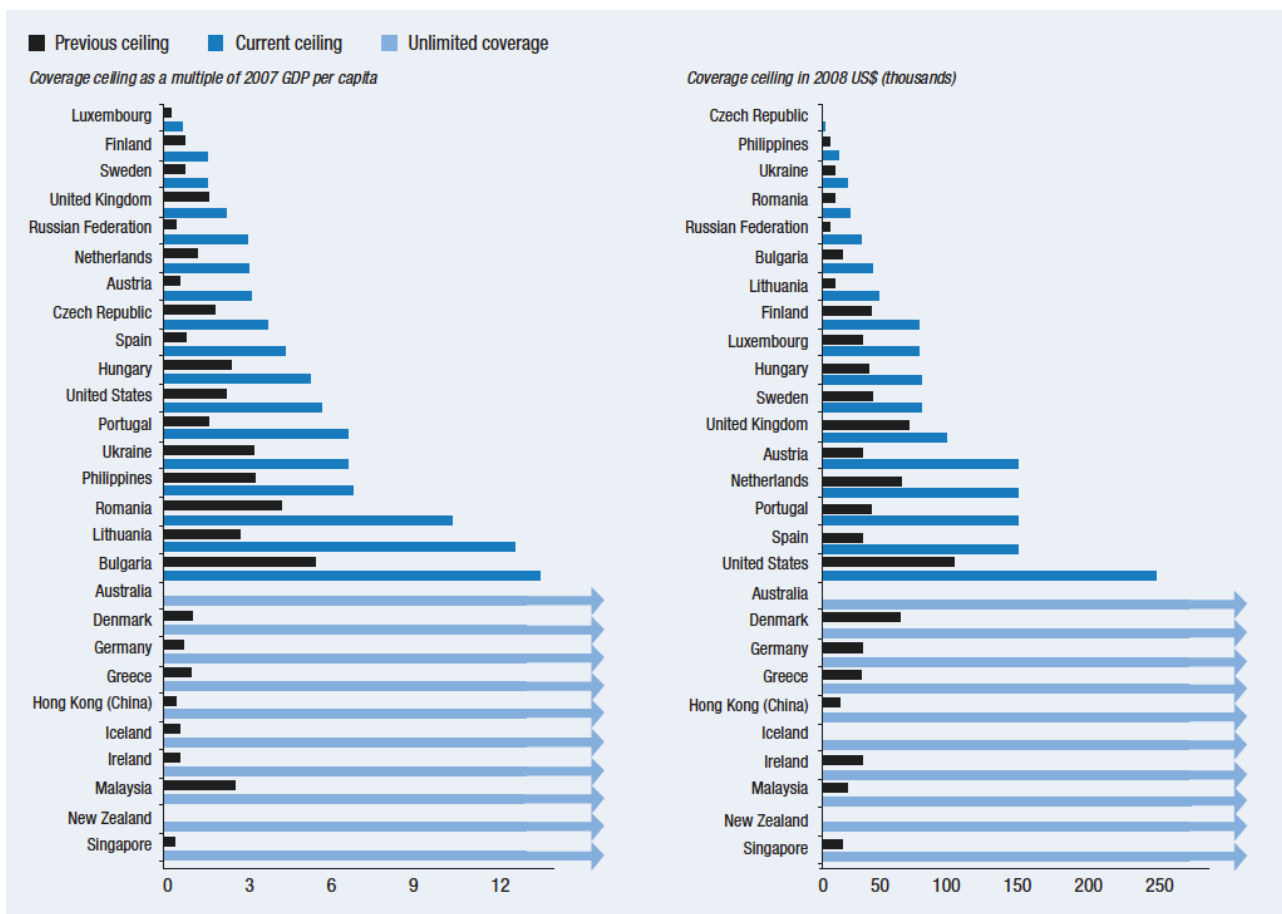
The severity of the recent financial crisis has required governments and central banks to introduce extraordinary emergency measures to rescue the banking system. Existing deposit insurance schemes turned out to be highly inadequate to prevent crises in a modern financial system where banks' funding and asset structure had significantly changed.

As argued by Brunnermeier (2009), one of the major causes of the crisis was the bursting of the housing bubble in the U.S. in 2007. This was followed by a deterioration of the credit quality of

subprime mortgages and an increase in delinquency rates. The turmoil spread from the subprime mortgage market to other securitized products. Rating agencies started downgrading many mortgage-related products as well as other structured finance products. The confidence in the reliability of ratings dropped. Market participants started to become reluctant to lend to each other: interest rates on asset-backed commercial paper and LIBOR spreads rose significantly as a consequence of the dry up of liquidity.

To stop the downward spiral in asset prices and restore confidence in the solvency of the financial system, in the fall of 2008 just after the collapse of Lehman Brothers numerous governments started introducing emergency measures and extended existing safety net arrangements in terms of coverage and scope. As shown in Figure 1, several countries (Australia, Denmark, Germany, Greece, Hong Kong, Ireland, Iceland, Malaysia, New Zealand and Singapore) introduced unlimited coverage on retail deposits. In others (e.g., Austria, Netherlands, Portugal, Spain and United States) the coverage was substantially increased.

Figure 1: Deposit Insurance Coverage Limits



Source: International Association of Deposit Insurers; IMF

The increasing reliance of banks on sources of funding other than retail deposits required also governments to extend the insurance also to banks' liabilities other than retail deposits. Various countries including Australia, Canada, France, Germany, Italy, New Zealand, Spain, the United Kingdom and the United States guaranteed wholesale liabilities (Schich, 2008). The scope of the extension of the guarantees differed significantly across countries. In some cases (e.g., in Australia, Spain and New Zealand) only new senior unsecured debt issues were guaranteed. In others, the coverage was much broader including interbank market claims.

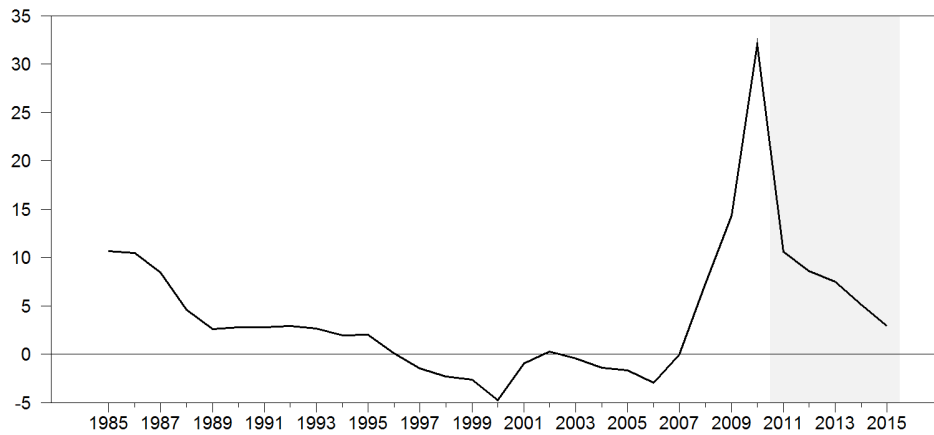
All the described measures were implemented by the various countries without any coordination on either the amount or the scope of the coverage. In an attempt to introduce some form of harmonization and coordination among European countries, the European Commission required that all countries would raise the coverage on retail deposits up to €100,000 by the end of 2010 (EC, 2009). The responses by the countries were very heterogeneous in that most of them introduced much greater coverage amounts. The lack of international coordination may raise important issues in terms of guaranteeing a level playing field and a fair burden sharing among countries, as we will discuss more in the next section.

The most extreme example in terms of emergency actions taken to rescue the banking system was Ireland, where the government intervention included blanket guarantees for all the liabilities of the six major banks as well as additional measures in the form of recapitalization and purchase of toxic assets. The guarantees of covered bonds, subordinated debt and interbank deposits amounted to a total coverage of about €400 billion (about 200% of Irish GDP). The recapitalization of the three largest banks (Bank of Ireland, Allied Irish Bank and Anglo Irish Bank) entailed a cost for the government of about €11 billion. Subsequently, other rescue interventions were implemented in favour of the Anglo Irish Bank for an estimated total cost for the state of €30 billion. As a part of the total rescue plan, in November 2009 the government established the National Asset Management Agency (NAMA). This entity had the task to buy troubled assets from the Irish banks. These acquisitions have been estimated to entail additional costs of €54 billion (OECD, 2010, p. 141). An estimate of the total costs of the Irish rescue plan till September 2010 amounts to €50 billion (FT, 2010).

All these measures contributed significantly to a deterioration of Irish public finances. They implied a transfer a risk from the banking sector to the Irish government and also limited the possibilities of restructuring the insolvent banks to share the losses with the private sector (Whelan, 2011). At the end of the 2010, about two years after the introduction of the guarantees, the Irish deficit accounted for 32 percent of the GDP (Figure 2). The deterioration of the state finances, the continued losses of

the banks and little evidence about the recovery of the economy induced international capital markets to be concerned about a potential sovereign default.

Figure 2: Budget deficit as a percentage of GDP



Source: Whelan (2011)

This fear was reflected in a sharp increase in the bond yields in sovereign debt that rose to 6.55% in November 2010 (Figure 3).

Figure 3: Irish government 10 year bond yield



As noted by Whelan (2011), the concerns of international financial market about the sovereign solvency undermined the credibility and the effectiveness of the guarantees. Banks were not able to roll over their bonds and this, in turn, worsened Ireland's creditworthiness in a vicious circle. The severity of the crisis induced the Irish government, the EU and the IMF to agree a bailout plan in late November 2010. The plan included financial support of €85 billion to Ireland from the EU and

the IMF and included bilateral loans from the U.K., Sweden and Denmark. Together with the financial support, the EU-IMF programme contained a fiscal package to reduce the public deficit and debt as well as a set of measures to stabilize the banking sector.

VI. POLICY IMPLICATIONS AND CURRENT REGULATORY REFORMS

The recent financial crisis and the emergency measures introduced to restore investors' confidence have clearly shown that the pre-crisis deposit insurance schemes were highly inadequate to maintain the stability of the financial system. This has spurred numerous initiatives to reform the deposit insurance schemes at the national and international level.⁶ The main principles behind the proposed reforms is that deposit insurance has to be clearly defined *ex ante* both in terms of coverage and scope, and has to be homogenous among countries. A clearly specified *ex-ante* coverage is intended to guarantee consumer protection and limit the *ex post* over-intervention by the governments. This latter problem has emerged clearly during the crisis. Because of the central role played by financial institutions in the economy and because of the characteristics of the financial system in terms of systemic risk and contagion, governments and central banks tend to intervene much beyond what specified in the formal schemes of deposit insurance.

If anticipated by the financial institutions, this over-intervention by the public authorities exacerbates the moral hazard problems and undermines the credibility of the deposit insurance schemes, thus leading to greater risk of instability. These arguments are empirically supported by the findings in Gropp and Vesala (2004) that the introduction of explicit deposit insurance schemes in the EU over the period 1991-98 led to better market discipline and lower risk taking. The reason is that such schemes implied a *de facto* reduction in the safety net as it allowed regulators and public authorities to credibly limit the extent of the insurance scheme. This underlines a different aspect of the credibility problem of the deposit insurance schemes. On the one hand, as discussed in the literature on limited commitment described in Section IV, the insurer has to be able to commit to the preannounced schemes so to preserve investors' confidence. On the other hand, as emerged clearly in the recent crisis, the insurer must also be able to commit not to extend the previously announced insurance scheme.

This last point requires that banks are monitored and, mostly importantly, that they are allowed to fail. Only if failure is a concrete possibility can it be credible for the insurer not to extend the guarantees *ex post*. From here the importance to reform financial supervision and create special resolution procedures, in particular for systemically important institutions (see also Bernet and

⁶ See, for example, EC (2010).

Walter, 2009). As supported by the findings in Beck and Laeven (2008), the insurer should be actively involved in the prudential supervision as well as in the resolution procedures of financial institutions as this improves the credibility of the insurance scheme and thus the resilience of the financial system. While this is the case already in the United States, it is not in the EU, where even the current reforms appear insufficient in addressing this issue (Gerhardt and Lannoo, 2011).

Given the internationalization of the financial system and the emergence of cross-border institutions in particular in Europe, the coverage of the deposit insurance schemes does not only have to be credibly specified, but it must also be internationally harmonized to guarantee fair consumer protection across countries and avoid regulatory arbitrage. The 2009 Directive of the European Commission (EC, 2009) that raised the maximum coverage to €100,000 e for retail deposits in all countries goes in this direction. However, the effectiveness of such harmonization crucially relies again on the credibility of the public authorities not to intervene *ex-post*. This is the case either when bank failures are prevented or when they are allowed to occur. This relates partly to the discussion on the desirability of a pan-European structure for deposit insurance as this would minimize the problems of national regulators protecting national champions and would guarantee full harmonization of the schemes (Gerhardt and Lannoo, 2011).

The urgency of designing credible *ex-ante* deposit insurance schemes that limit excessive *ex-post* government intervention is also motivated by the need to limit the costs that can arise in providing the insurance. As the Irish case has shown, blanket guarantees to the financial system can entail large fiscal costs to the point of threatening the solvency of the country. In the context of Diamond and Dybvig (1983), bank runs are exclusively related to investors' confidence in the future solvency of their banks. The mere existence of a credible deposit insurance scheme fully protecting all investors prevents the runs from occurring. Thus, as long as crises are purely panic phenomena arising from the illiquidity of banks' assets, the insurance scheme has just to be enough to restore confidence and avoid runs. How extensive such a scheme must be to achieve that does not have any implications for the solvency of the insurer, as the insurance is not *de facto* provided. By contrast, if crises are related to the deterioration of banks' assets, then providing deposit insurance can entail a substantial disbursement. At the extreme, this can threaten the solvency of the country and thus undermines the credibility of the guarantees themselves. This two-way feedback between financial sector bailouts and sovereign credit risk is supported by the empirical findings in Acharya, Drechsler and Schnabl (2011) and Attinasi, Checherita and Nickel (2009) of an immediate increase in the sovereign CDS spreads to the announcement of financial sector bailouts and of a co-movement between bank and sovereign CDS in the post-bailout phase.

The threat of bankruptcy of the government introduces new types of risk associated with the guarantees designed to prevent financial crises. The available alternatives depend on the political, fiscal and institutional position of the country with distressed finances.

Countries with independent monetary policies have the possibility to avoid bankruptcy by monetizing the guarantees. This entails higher inflation and possibly exchange rate depreciation, but it can succeed in avoiding default both on the guarantees and on the sovereign debt. The desirability of this alternative is difficult to evaluate. With moderate inflation it may be preferable to avoid a banking crisis. With hyperinflation a default on the guarantees and a financial crisis may be better.

Countries belonging to a monetary union have fewer options to deal with the threat of sovereign bankruptcy. In the absence of the possibility to use inflation and depreciation as a way to reduce the real value of the commitments, a default may be the only way out. Either the banking guarantees or the sovereign debt claims or both may not be fully honoured. The implications of the different types of default would presumably depend on the interconnections between the financial and the public systems and the maturity of their debt structures.

In countries where sovereign debt forms a significant part of bank assets, a default on the sovereign debt or on the bank guarantees would have very similar effects. It would be difficult to preserve the stability of the financial institutions even if only a sovereign default occurred because the losses that this would entail for the financial systems. By contrast, in cases where sovereign debt is not a large part of banks' assets, a sovereign default may be desirable over a default on the bank guarantees as the losses entailed from the former would be shared among a larger group of debtholders and would not threaten financial stability.

The maturity structure of the sovereign and bank debt can also influence the desirability of the different types of default. If the maturity structure of the sovereign debt involves mostly long term debt, the consequences of a sovereign default may be more limited because of the lack of an immediate need to refinance in large quantities. In contrast, an anticipation of default on the bank guarantees would quickly generate a crisis and distort incentives. Anticipating not to be repaid, long-term debtholders would start behaving like shareholders and would want their bank to gamble for resurrection. Short-term debtholders would certainly run. An important issue is also whether haircuts and limits would be imposed on the repayments to withdrawing depositors. What would happen in the case of default or simply in the case where guarantees are no longer credible is difficult to predict.

Another alternative for a country in a monetary union at risk of sovereign bankruptcy is to leave the union and regain control of its monetary policy. This reintroduces the possibility for the country to use inflation and currency depreciation as ways to reduce the debt commitments and start growing faster. Whether this is preferable remains very much debatable, as the current situation in Greece is demonstrating. A lot depends on the degree of austerity measures that a troubled country has to undertake to be able to obtain help from the union. It appears that political economy considerations may play an even bigger role than pure economic considerations in the decision making process.

An important issue in the relation between bank failures, deposit insurance and sovereign default in a monetary union concerns the risk of contagion. Presumably, sovereign default by one country would very likely lead to pressures on other countries belonging to the monetary union, in particular if linked to the defaulting country or exhibiting weak fundamentals. At the extreme, such pressures could even lead to a disintegration of the monetary union. With such risk, it is crucial to prevent vicious circles and systemic crises in the financial system by limiting the safety net schemes and allowing for bank bankruptcy through proper resolution regimes.

Clearly, important areas for future research both at the micro- and macro-level emerge from these considerations.

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