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Moral Hazard and Government Guarantees in the Banking Industry‡‡

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ABSTRACT

The massive use of public funds in the financial sector and the large costs for taxpayers are often used to justify the idea that public intervention should be limited. This conclusion is based on the idea that government guarantees always induce financial institutions to take excessive risk. In this article, we challenge this conventional view and argue that it relies on some specific assumptions made in the existing literature on government guarantees and on a number of modelling choices. We review the theory of government guarantees by highlighting and discussing the role that these underlying assumptions play in the assessment of the desirability and effectiveness of government guarantees and propose a new framework for thinking about them.

KEYWORDS: Government guarantees, bank moral hazard, panic and fundamental crises

1. INTRODUCTION

The 2007 financial crisis has led to renewed interest and debate about government intervention in the financial sector. The use of public funds in this sector in the years 2008–13 was massive. The interventions took various forms ranging from recapitalization, to loans and implicit as well as explicit guarantees. With the exception of Lehman Brothers, all large financial institutions which encountered difficulties (both banks and non-banks) were bailed out. This led to a substantial disbursement for many governments and threatened the solvency of various European countries such as Ireland and Spain.

†† The views expressed in the paper are the authors' and do not necessarily reflect those of the ECB or the Eurosystem.

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The public interventions were effective in restoring confidence and preserving financial stability, but generated significant negative consequences in terms of sovereigns' fiscal positions, banks' and firms' health, and cost of funding.

In response to the crisis, various regulatory measures were introduced both in the USA and Europe. In the latter, new regulations were imposed both on sovereigns and banks. This included the new Fiscal Compact,[1] the creation of a banking union in the Eurozone, and new directives on capital regulation and resolution mechanisms.[2]

The main goals of the new regulatory framework are to reduce the use of taxpayers' money in the future and limit excessive risk taking, or in other words, moral hazard, resulting from widespread support to the financial system. To achieve these goals, the new rules attempt to introduce more discipline both for sovereigns and banks, decrease the public support to banks, and strengthen the resiliency of financial institutions.

The moral hazard problem associated with public intervention is seen in the public and academic debate as its major drawback. It can undermine the effectiveness of intervention in reducing financial instability,[3] and thus magnify the costs for the government in providing it. This has been used as a key argument to support the view that large public intervention in the financial sector can be detrimental and, hence, should be limited or designed in a way that ensures that banks bear the costs of the intervention together with the taxpayers.[4]

In the article, we restrict our attention to government guarantees but some points raised in our analysis also apply to other fields of financial regulation, as we will discuss below. Throughout the article, we will refer to government guarantees in a broad sense as representing any form of implicit or explicit support that the government provides to banks. This includes deposit insurance, explicit and implicit guarantees of an *ex post* bailout, and general guarantee schemes.

The aim of this article is to challenge the widespread view that public support for the financial system is detrimental. In particular, we will address two main

1 The Fiscal Compact, formally the Treaty on Stability, Coordination and Governance in the Economic and Monetary Union, was signed on 2 March 2012 by the leaders of all the Euro area members and eight other European Union (EU) Member States, and entered into force on 1 January 2013. The Treaty establishes the implementation of a balanced budget rule in the signatories' national legislation. The full text of the Treaty is available at <http://european-council.europa.eu/media/639235/st00tscg26_en12.pdf> accessed 15 December 2014.

2 The key elements of the new supervisory and regulatory framework for financial institutions in the EU are set out in the Capital Requirements Regulation (CRR), EC 575/2013 on prudential requirements for credit institutions and investment firms (2013) and Capital Requirements Directive (CRD), EC 2013/36/EU on access to the activity of credit institutions and the prudential supervision of credit institutions and investment firms (2013); and in the Bank Recovery and Resolution Directive (BRRD), 2014/59/EU establishing a framework for the recovery and resolution of credit institutions and investment firms (2014).

3 See for empirical evidence A Demirgüç-Kunt and E Detragiache, 'The Determinants of Banking Crises in Developing and Developed Countries' (1998) 45 IMF Staff Papers 81–109.

4 In the opening speech at the Conference on 'Financing the Recovery After the Crisis - the Roles of Bank Profitability, Stability and Regulation' held at Bocconi University on 30 September 2013, Benoît Cœuré suggested that excessive risk-taking was the origin of the financial crisis and stressed the role of implicit guarantees and the lack of an effective resolution framework in determining banks' distorted incentives. The speech is available at <http://www.ecb.europa.eu/press/key/date/2013/html/sp130930.en.html> accessed 19 November 2014.

questions: (i) Is it true that government guarantees always lead to moral hazard? (ii) Are less generous guarantees always better than more generous ones in terms of overall welfare?

We will address these questions in steps. We will first briefly review the events that led to the massive public interventions in the public sector and the implications that these had for the stability and cost of funding of sovereigns, banks, and firms. In doing this, we will focus our attention on the Irish case as an example of massive public intervention with consequent negative effects on the stability and solvency of the sovereign.

Secondly, we will turn to the vast academic literature, both theoretical and empirical, on the role of public guarantees in preventing banking crises and their potential drawbacks. The prevailing view in the current academic and policy debate is that government guarantees can be an effective tool to prevent the occurrence of panic-based crises, but it may induce financial institutions to take excessive risk. This moral hazard problem associated with the introduction of guarantees may lead to the perverse outcome of increasing overall instability in the banking sector—when crises are not fully prevented—and entails large costs for the government providing them. Based on these arguments, common wisdom suggests that government support to banks should be limited. As we will argue in the article, this conclusion crucially relies on some assumptions made in the existing literature on government guarantees and on specific modelling choices. Our contribution consists in highlighting and discussing these assumptions and their implications for the assessment of the desirability and effectiveness of government guarantees to financial institutions. Starting from here, we discuss a new theoretical framework to think about government guarantees and draw some new insights on the desirability of government guarantees and their implications in terms of bank moral hazard.

The article proceeds as follows. Section 2 describes the implications of the massive support to the banking sector since 2007 in the Euro area for the solvency and cost of funding of sovereigns, banks, and firms. Section 3 reviews the academic literature on the need to have government guarantees, while Section 4 underlines their drawbacks. Section 5 discusses a new framework to address the desirability and consequences of government guarantees. Section 6 concludes.

2. PUBLIC INTERVENTIONS IN THE FINANCIAL SECTOR IN THE YEARS 2008–2011

The financial crisis starting in August 2007 in the subprime mortgage market in the USA propagated rapidly across the world. As argued by Brunnermeier,[5] one of the major causes of the crisis was the bursting of the housing bubble in the USA 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, leading to the downgrading of many mortgage-related products as well as other structured finance products. This in turn led to a

5 M K Brunnermeier, 'Deciphering the Liquidity and Credit Crunch 2007-2008' (2009) 23 J Econ Perspect 77–100.

general loss of confidence in financial markets. Market participants became reluctant to lend to each other: interest rates on asset-backed commercial paper and London Interbank Offered Rate (LIBOR) spreads rose as a consequence of liquidity drying up.[6]

The decline in asset prices and the break-down of the mortgage backed securities market led to numerous write-offs on the balance sheets of financial institutions, pressures on funding costs and instruments, and severe declines in the market equity values of many financial institutions. To stop the downward spiral in asset prices and restore confidence in the solvency of the financial system, governments and central banks were forced to undertake extraordinary emergency measures.

These measures took several forms ranging from recapitalization, loans, implicit and explicit guarantees by government and central banks, and mergers among private institutions (eg Lloyds–HBOS, Merrill Lynch–Bank of America).

Importantly for this article, just after the collapse of Lehman Brothers, numerous governments extended the scope and coverage of existing safety net arrangements. As shown in Figure 1[7], several countries (Australia, Denmark, Germany, Greece, Hong Kong, Ireland, Iceland, Malaysia, New Zealand, and Singapore) introduced unlimited coverage on retail deposits. In others (eg Austria, the Netherlands, Portugal, Spain, and USA) the coverage was substantially increased.

The increasing reliance of banks on sources of funding other than retail deposits required governments to extend the insurance to banks' liabilities other than retail deposits. Various countries including Australia, Canada, France, Germany, Italy, New Zealand, Spain, the UK and the USA guaranteed wholesale liabilities.[8] The scope of the extension of guarantees differed significantly across countries. In some cases (eg 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.

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 per cent of Irish GDP). The recapitalization of the three largest banks (Bank of Ireland, Allied Irish Bank, and Anglo Irish Bank) entailed a cost to the government of about €11 billion. Subsequently, other rescue interventions were implemented for Anglo Irish Bank with an estimated total cost to the state of €30 billion. By the end of 2011, the National Asset Management

6 See, among others, Brunnermeier (note 5 above); F Heider, M Hoerova, and C Holthausen, 'Liquidity Hoarding and Interbank Market Spreads: the Role of Counterparty Risk' (2009) European Central Bank Working Paper 1126/2009.

7 Source: S Schich, 'Financial Crisis: Deposit Insurance and Related Financial Safety Net Aspects' (2008) 2 OECD J: Financial Market Trends 73 <http://www.oecd.org/finance/financial-markets/41894959.pdf> accessed 12 December 2014.

8 ibid.

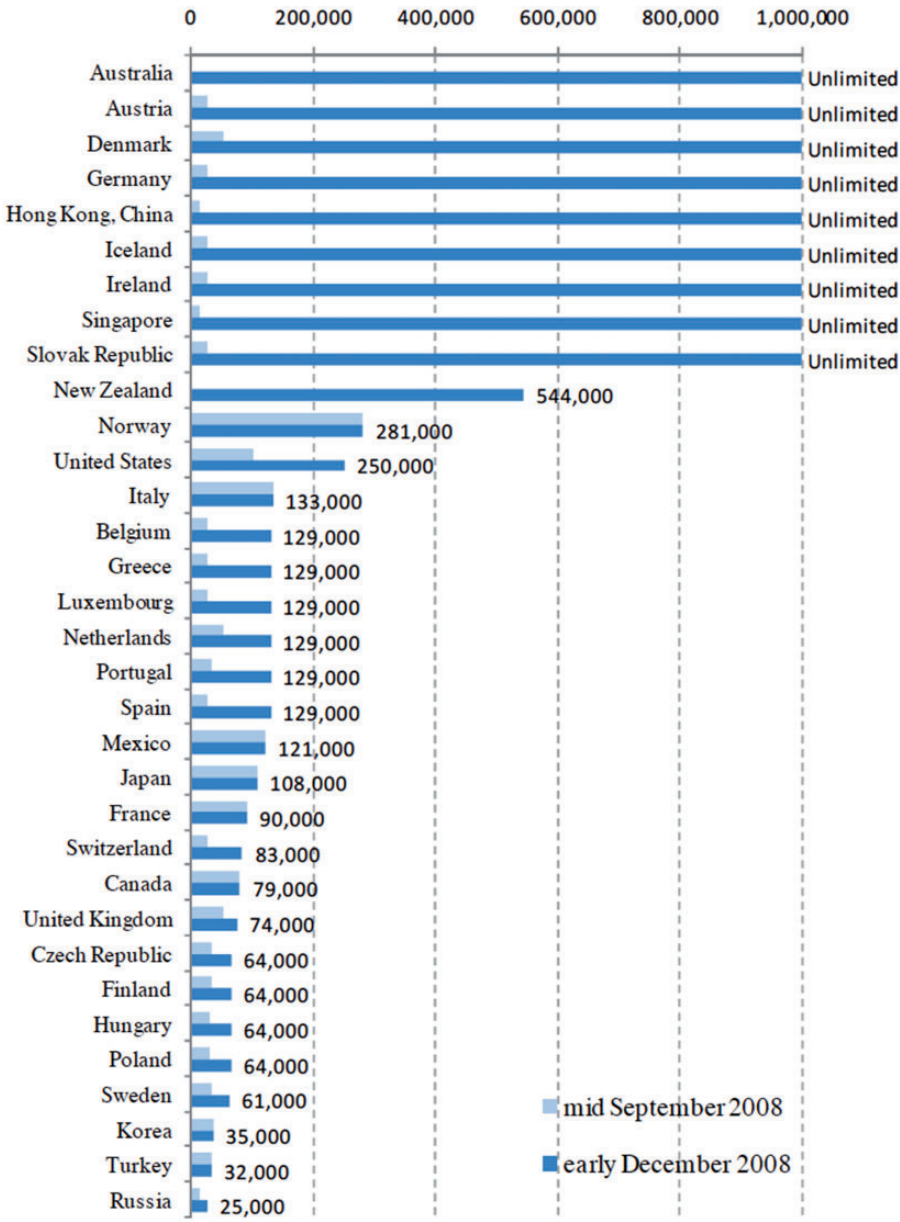

Figure 1. Deposit insurance coverage limits.

Agency (NAMA), created by the government in 2009 as part of the rescue plan, bought €74 billion in loan assets from banks at a 57 per cent discount. The exercise involved 850 creditors and a total number of 11,000 individual loans collateralized by 16,000 individual properties.

All these measures contributed significantly to a deterioration of Irish public finances. At the end of the 2010, about two years after the introduction of the

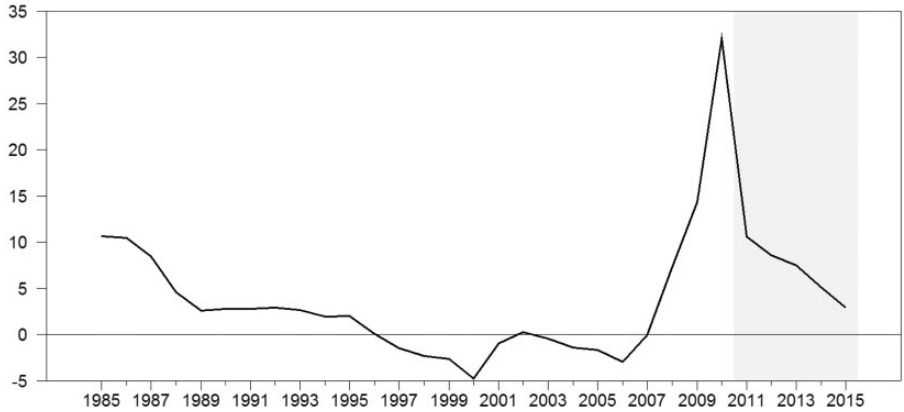

Figure 2. Irish budget deficit as a percentage of GDP.

Figure 3. Irish government 10-year bond yield.

guarantees, the Irish deficit accounted for 32 per cent of gross domestic product (GDP) (Figure 2[9]).

This initiated doubts about the solvency of the Irish sovereign, as reflected in the increase to 6.55 per cent for sovereign debt yields in November 2010 (Figure 3).

The severity of the crisis undermined the credibility and effectiveness of the guarantees and induced the Irish government, the EU and the International Monetary Fund (IMF) to agree on a bailout plan in late November 2010. The plan contained financial support for €85 billion from the EU and the IMF together with a fiscal package to reduce the public deficit and debt and a set of measures to stabilize the banking sector.[10]

9 Source: K Whelan, 'Ireland's Sovereign Debt Crisis' in F Allen, E Carletti, and G Corsetti (eds), *Life in the Eurozone with or without Sovereign Default?* (European University Institute and Wharton Financial Institutions Center 2011) <http://apps.eui.eu/Personal/Carletti/> accessed 12 December 2014.

10 For a detailed description of the EU/IMF bailout plan for Ireland, see National Treasury Management Agency programme summary available at <http://www.ntma.ie/business-areas/funding-and-debt-management/euimf-programme/> accessed 12 December 2014.

The Irish crisis showed clearly the limitations of the EU and, even more dramatically, of the Eurozone, in terms of the divergence between banks' activities and geographical scope and sovereigns' fiscal capacity. One of the main goals of the creation of the Single Market and the Economic Monetary Union (EMU) was to create a Single Market for goods and services across the Union, and in particular, an integrated banking market. Banks increasingly considered the EU as their domestic market, supported by regulators and policy makers. A wave of mergers in the early 2000s led to the formation of numerous pan-European banks with an organizational structure and a geographical scope in line with the idea of a Single Market.[11] The introduction of the single currency in the Euro area gave another boost in this direction by helping the integration of wholesale banking, bond markets, and the like.

However, when the crisis hit, it became clear that every Member State was responsible for cleaning up its own banking sector. In other words, countries had to rely exclusively on their own fiscal capacity when taking actions and intervening in their financial system. Any form of mutualization or integrated support mechanism was soon ruled out mostly because of political sensitivity. The problem of moral hazard that is often discussed in the context of bank bailouts was also applied to sovereign bailouts. Strong countries started fearing that the weak Member States would not undertake the necessary reforms should they receive financial support from outside. Using taxpayers' money to rescue banks in other jurisdictions was considered inappropriate. It then became clear that several banking systems had outgrown the fiscal capacity of their home country. This belief was reinforced when the Spanish crisis hit in 2012.

The financial crisis that had started in a small US mortgage market became at that point a deep sovereign crisis in the Eurozone. Although for different reasons, several countries experienced a steep increase in their sovereign bond yields as well as in their banks' cost of funding. This became known as the 'vicious circle' between sovereigns and banks, whereby banks' poor solvency conditions put pressure on their countries' fiscal positions, and pressure on highly indebted sovereigns led to increasing cost of funding for banks headquartered in these countries. This vicious circle soon became evident in the movement of credit default swap (CDS) spreads of banks and sovereigns. As shown in Figures 4 and 5,[12] such CDS spreads became highly positively correlated with each other. Interestingly, this was the case not only in the weaker countries such as Ireland and Portugal (Figure 4), but also in the stronger countries such as Germany and France (Figure 5).

This led to a dramatic re-fragmentation of the Single Market. The cost of funding for banks and sovereigns in the Eurozone again became something confined to 'national' borders. Banks' cost of funding diverged across countries in the same way as before the formation of the Single Market. As a consequence, banks started organizing their activities to take account of national borders, perhaps realizing that their destiny was inevitably tied up with that of their sovereign.

11 A Enria, 'Establishing the Banking Union and Repairing the Single Market' in F Allen, E Carletti, and J Gray (eds), *Political, Fiscal and Banking Union in the Eurozone?* (FIC Press 2013) 47–64.

12 ibid.

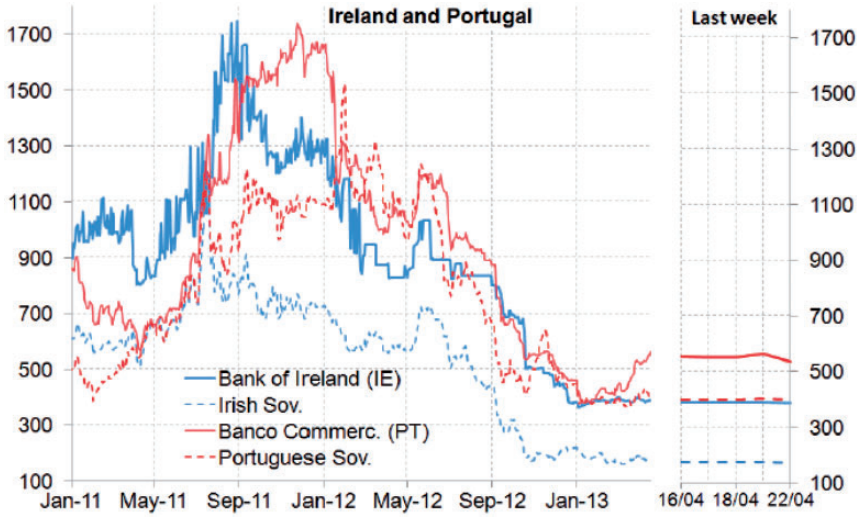

Figure 4. Sovereign and bank CDS spreads in Ireland and Portugal between January 2011 and January 2013.

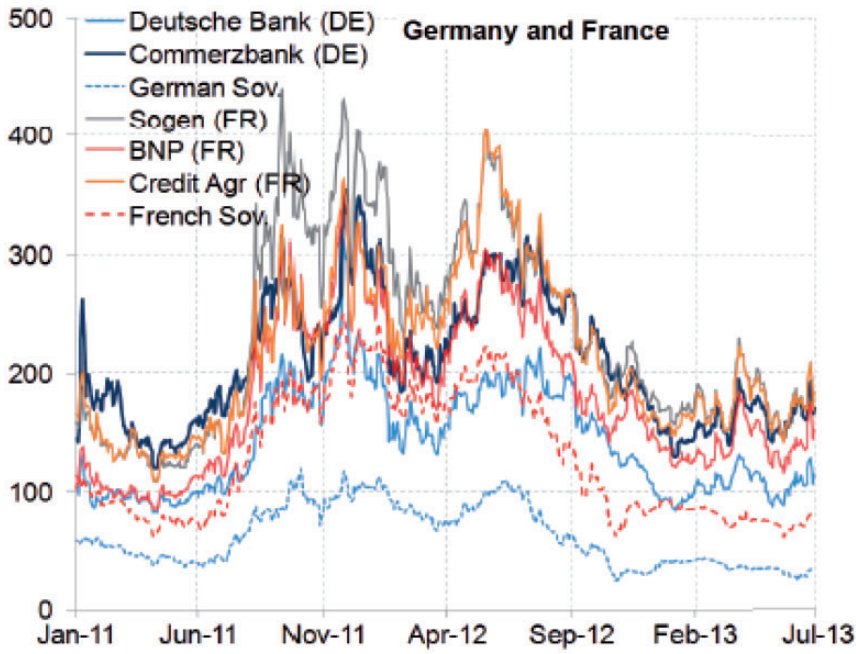

Figure 5 Sovereign and bank CDS spreads in France and Germany between January 2011 and January 2013.

The impairment of the Single Market soon spilled over into the real sector. Small and medium-sized enterprises (SMEs) started to pay increasingly divergent rates on bank loans depending on their physical location. Following the pattern described above for sovereigns and banks, SMEs located in weaker countries like Italy and Spain started to pay increasingly greater loan rates compared to firms located in stronger countries like Germany and France.[13] This again constituted strong evidence that the Single Market had stopped performing its role of redistributing savings from countries in surplus to countries in deficit.

To sum up, the crisis affected the Eurozone across several dimensions. Some Eurozone countries experienced a deep weakening of their financial systems with consequent pressure on their sovereigns. By contrast, some other highly indebted countries experienced significant pressure on their financial systems. This created a large divergence between the 'periphery' countries and the 'core' countries of the union and led to a deep fragmentation of the Single Market as reflected in the retrenchment of banks' activities within national borders and the deep divergence in SMEs' cost of funding across Eurozone countries.

The severity of the crisis led to the introduction of new regulations both for sovereigns and banks. The former includes the new Fiscal Compact imposing stricter limits on sovereign deficits and debt. The latter includes the creation of a banking union in the Eurozone and new directives on capital and liquidity requirements and on banks' resolution.

Most of these reforms emerged from the desire to impose more discipline on sovereigns and banks so as to minimize the use of taxpayers' money and curb their incentives to take excessive risks. This philosophy is based on the idea that the costs of government guarantees, and more generally, public intervention in the financial system, offset the benefits and thus should be minimized. In what follows, we analyse the academic literature studying government guarantees to shed some light on their benefits and drawbacks.

3. A RATIONALE FOR GOVERNMENT GUARANTEES[14]

The rigorous justification for the introduction of government guarantees in the academic literature dates back to the seminal paper by Diamond and Dybvig (1983)[15] and is related to the role that banks perform in the economy as liquidity providers. Banks issue liquid liabilities in the form of demandable deposits and invest mainly in illiquid assets. This maturity mismatch allows banks to improve depositors' welfare due to the sharing of liquidity risk that they provide, but also exposes them to the risk that depositors run and withdraw their funds before the maturity of the assets. These runs can originate in two ways. They can either occur because depositors panic and withdraw early out of the self-fulfilling belief that other depositors will do

13 ibid.

14 The next two sections are based on a more extensive survey of the literature in F Allen, E Carletti, and A Leonello, 'Deposit Insurance and Risk-taking' (2011) 27 Oxford Rev Econ Pol 464.

15 D W Diamond and P H Dybvig, 'Bank Runs, Deposit Insurance and Liquidity' (1983) 91 J Pol Econ 401.

the same and the bank will fail (eg Diamond and Dybvig (1983)) or they may arise from deterioration in economic conditions.[16] The different nature of bank runs is crucial for the discussion of the effectiveness and the design of the guarantee schemes as we will discuss in detail below.[17]

In the panic view, bank runs emerge as multiple equilibria. In Diamond and Dybvig (1983) banks offer demandable deposit contracts to investors that might face an early liquidity need, thus providing them with liquidity insurance, and invest those funds in long-term assets. In the model, two equilibria arise. In the good equilibrium, all depositors believe that no panic will occur. Then, only those facing early liquidity needs withdraw and these demands can be met without costly liquidation of portfolio assets. In the bad equilibrium, instead, all depositors withdraw because they believe that a crisis will occur. In this case, the bank is forced to liquidate long-term assets and the depositors who are last in line receive nothing. Then, it is optimal for a depositor to run when he believes that a crisis will occur so as to avoid being last in line.

In this context, deposit insurance works as an equilibrium selection device. By ensuring depositors to receive the promised repayment independently of the other depositors' withdrawal decision, the intervention rules out the bank-run equilibrium and the first best allocation is achieved. It is important to stress that in Diamond and Dybvig's framework deposit insurance has a mere announcement effect and does not entail any disbursement for the government. This also implies that the precise design of the guarantees does not matter for its effectiveness.

The result in Diamond and Dybvig (1983) that government guarantees are a costless and fully effective tool to prevent the occurrence of banking crises relies on outcomes that arise from their special set of assumptions. First, crises are only panic driven. Secondly, guarantees are costless in that neither the banks nor the government bear any cost in providing them. Thirdly, the scheme is fully credible because governments always have the ability to raise the resources they need to pay the guarantees. Fourthly, the introduction of the scheme does not affect banks' and depositors' behaviour and, thus, does not introduce any moral hazard problem.

The situation in the real world is, however, more complex. Even with deposit insurance in place, banking crises can still occur due to the deterioration in the fundamental value of the banks' assets or because the scheme is not fully credible and both banks' and depositors' decisions are affected by the government intervention. Moreover, as the recent Eurozone crisis has shown, governments may not have the ability to raise the resources they need to honour the guarantees. The analysis in Diamond and Dybvig has the merit of shedding light on the coordination failure associated with the intermediation function that banks perform in the economy and

16 See, among others, G Gorton, 'Banking Panics and Business Cycles' (1988) 40 Oxf Econ Pap 751; C Jacklin and S Bhattacharya, 'Distinguishing Panics and Information-based Bank Runs: Welfare and Policy Implications' (1988) 96 J Pol Econ 568; F Allen and D Gale, 'Optimal Financial Crises' (1998) 53 J Fin 1245; C Reinhart and K Rogoff, *This Time is Different: Eight Centuries of Financial Folly* (Princeton UP 2009).

17 For a broad review of the empirical literature on financial crises and the theoretical concepts of panic- and fundamental-based runs, see I Goldstein, 'Empirical Literature on Financial Crises: Fundamental vs. Panic' in G Caprio (ed), *Evidence and Impact of Financial Globalization* (Elsevier 2012).

describing how deposit insurance solves such a problem. However, their theoretical framework does not account for some key features of banks' activities—primarily the fact that banks are exposed not only to illiquidity risk but also to the risk of insolvency—and this significantly limits the implications for policy. Relaxing any of the assumptions in the Diamond and Dybvig's analysis has an important effect on the assessment of the effectiveness, costs, and desirability of government intervention. In more realistic frameworks, where guarantees are not necessarily credible or feasible and banks have access to risky investment opportunities, government guarantees may entail significant drawbacks. We analyse these in detail below.

4. DRAWBACKS OF GOVERNMENT GUARANTEES

As highlighted in the previous section, government guarantees are effective in preventing crises in a multiple equilibrium framework where runs emerge as a self-fulfilling phenomenon. In this context, government guarantees are always optimal. They prevent crises and allow the economy to reach the optimal allocation without entailing any costs. As mentioned above, this result relies on a number of assumptions. This has spurred a vast literature on the effects of deposit insurance in a context that differs from Diamond and Dybvig's framework in various respects. In these richer frameworks, government guarantees entail significant costs and may not be fully effective in preventing the occurrence of banking crises.

In what follows, we present the various drawbacks of government guarantees schemes that have been highlighted in the existing academic literature. We present them by referring to two particular features of the Diamond and Dybvig model. The first concerns the fact that government guarantees are costless in the sense that the government does not bear any cost in providing them. The second refers to the fact that the provision of the guarantees does not affect banks' incentives toward risk. We analyse these two points in detail below.

(a) The costs of government guarantees: fundamental-based crises, limited commitment and feasibility issues

One of the key assumptions in the Diamond and Dybvig analysis is that government guarantees are fully credible. This is the case because there is a full commitment on the side of the government and the scheme is funded via general taxation so that its provision is always feasible. This means that any type of guarantee scheme can and will be honoured and, anticipating this, depositors do not run. In the context where runs are only panic based, this also implies that deposit insurance is costless. It is a simple equilibrium selection device ensuring that the bad equilibrium is eliminated. The details of the scheme, besides the fact that depositors always receive the promised repayment, do not play any role. It does not matter when the scheme is announced as long as it is known before the liquidation of the long-term asset takes place and it is credible that each depositor is fully repaid irrespective of the bank's liquidation policy. Although a public scheme may be preferable 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, the government guarantee

scheme has a pure 'announcement' effect. As runs do not occur, banks remain solvent and there is no disbursement. In other words, the insurance is costless.

The nature and effects of deposit guarantees are very different if the assumption of full commitment and feasibility are removed, and if runs are not pure coordination failures but rather linked to the deterioration of economic fundamentals. In all these cases, guaranteeing deposits entails actual disbursements and can, therefore, be very costly. The reason is different if the assumptions of full commitment and feasibility do not hold or if there is full commitment but crises are fundamental-based. If the insurer (ie the government) cannot fully commit and/or the provision of the scheme is not always feasible, the credibility of the intervention is undermined and self-fulfilling runs are not necessarily prevented so that even solvent banks may fail. When banks invest in risky assets, instead, a complete and credible guarantee scheme can again prevent bank runs but it requires an intervention (and an actual disbursement) by the insurer when banks become insolvent and are unable to repay fully their depositors.

Accounting for the possibility that the guarantee scheme entails an actual disbursement for the government implies that the funding structure of the 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 more than offset its benefit. The funding structure of the scheme and its governance are key in determining the success or failure of the scheme.[18] Diamond and Dybvig argued that a public scheme funded by the government was better than a private one financed by banks' contributions and this view was widely supported. The conclusion was based on the idea that the government could always raise resources to finance the scheme at little or no cost, thus guaranteeing the full credibility of the scheme. However, the recent financial crisis has shown that this is not always the case. As we will discuss in detail below, the provision of the guarantees may not be optimal *ex post* or not feasible for the government.

The literature on limited commitment considers a broad range of interventions, which includes policies like deposit insurance, *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 if 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.[19]

In the absence of commitment, it becomes crucial how the scheme is financed and the level of costs involved. Since there is a non-negligible probability of runs, the government has to evaluate benefits and costs related to the implementation of the

18 For an interesting analysis of the importance of the funding model of the insurance scheme see C W Calomiris, 'Is Deposit Insurance Necessary? An Historical Perspective' (1990) 50 J Econ Hist 283 on the history of deposit insurance in the USA before and during the 1920s.

19 See H Ennis and T Keister, 'Bank Runs and Institutions: The Perils of Intervention' (2009) 99 Amer Econ Rev 1588; H Ennis and T Keister, 'Banking Panics and Policy Responses' (2010) 57 Journal of Monetary Economics 404.

scheme. Cooper and Kempf[20] analyse 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. Deposit insurance entails a cost in terms of redistribution of resources from poor to rich households and it may not be optimal *ex post*. The presence of these costs and the possibility that they offset the benefits of the intervention imply that deposit insurance is not fully credible and self-fulfilling runs can still occur.

A related issue to the one of limited commitment concerns the feasibility of the guarantees. In the above contributions, the key issue is that the intervention to rescue banks may not be optimal *ex post* and this undermines the credibility and, in turn, the *ex ante* effectiveness of the scheme. Still, a key assumption in those papers is that the introduction of government guarantees is always feasible. However, the recent Eurozone crisis has shown that this is not always the case. As the Irish crisis has shown, neither the credibility nor feasibility of the guarantee scheme can be taken for granted. Governments do not always have the possibility to raise the resources they need to finance the introduction or extension of new guarantee schemes. In the Eurozone, this limit arises from the fact that governments cannot monetize the guarantees as they cannot implement independent monetary policy and the European Central Bank is prohibited from direct monetary financing.[21] In countries, like the USA and UK, where new money could be printed to finance the provision of the guarantees, there may be costs such as inflation, which impose limits on the support that government can offer to the financial sector. The inability of governments to raise (unlimited) resources to finance their intervention has significant implications for its credibility. Credibility, effectiveness, and feasibility of the guarantees are strictly related to each other.

Some recent academic contributions have looked precisely at these issues.[22] They have shown that government guarantees represent an important channel linking the stability of banks and sovereigns. Differently from the existing literature, they have considered a framework in which not only banks but also governments are fragile and cannot raise unlimited resources by issuing default-free debt. In this context, these papers have highlighted the key role of guarantees in triggering a feedback loop between banking and sovereign debt crises in which any deterioration in the situation of banks spills over into the government and vice-versa. Specifically, this feedback loop works as follows. When the government has limited resources, the extension of the support that the government offers to banks tightens the government's budget. This, in turn, affects the effectiveness of the guarantees since, as the

20 R Cooper and T W Kempf, 'Deposit Insurance and Banks Liquidation Without Commitment. Can We Sleep Well?' NBER Working Paper 19132 (2013).

21 The prohibition of direct monetary financing for the ECB is defined in art 123 of the Treaty on the Functioning of the EU. European Union, *Consolidated version of the Treaty on the Functioning of the European Union*, 26 October 2012, 2012/C 326/50, available at: <http://eur-lex.europa.eu/legal-content/EN/TXT/PDF/?uri=CELEX:12012E/TXT&from=EN> accessed 12 December 2014.

22 See, among others, V Acharya, I Drechsler, and P Schnabl, 'A Pyrrhic Victory? - Bank Bailouts and Sovereign Credit Risk' (2014) 69 J Fin 2689; R Cooper and K Nikolov, 'Government Debt and Banking Fragility: The Spreading of Strategic Uncertainty' (2013) NBER Working Paper 19278; A Leonello, 'Government Guarantees and the Two-way Feedback Between Banking and Sovereign Debt Crises' (2014) mimeo.

situation of the government deteriorates, the beneficiaries of the guarantees start to wonder about the ability of the government to honour its promises. Thus, the credibility of the guarantees decreases and they are no longer effective in preventing crises. As a consequence, the instability in the financial sector further increases, thus magnifying the costs of the intervention.

This vicious circle between weak banks and weak sovereigns triggered by the introduction of government guarantees, and more generally by large public intervention in the financial sector, is an important drawback that was overlooked in the previous literature and that, instead, emerged as a major issue during the recent financial crisis. In Europe in particular, the negative feedback between banks and sovereigns is at the centre of the current policy debate. As an example, the creation of a common resolution mechanism and of a pan-European deposit insurance scheme, in the framework of the Banking Union, could represent an effective way to break this vicious circle since national governments would no longer be responsible to intervene in the case of banks in distress. While the establishment of the Single Resolution Mechanism (SRM) has been already decided and will be implemented fully in the next two years, the creation of a pan-European deposit insurance scheme is still under discussion. Currently, the EU Member States have only agreed about an increase in the harmonization and simplification of the rules concerning their deposit insurance schemes.

(b) Moral hazard problems

A crucial assumption in Diamond and Dybvig's analysis is that banks invest only in a riskless technology and thus the presence of government guarantees does not affect either banks' or depositors' incentives to behave prudently. Extending the framework by introducing risky investment possibilities introduces potential distortions in banks' and depositors' behaviour. The severity of this moral hazard problem crucially depends on the specific characteristics of the guarantee scheme and of the regulatory and institutional environment.

A large theoretical literature has analysed the moral hazard problem associated with the introduction of government guarantees in a framework in which banks have access to risky investment opportunities. This literature has focused specifically on deposit insurance. 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 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.[23] 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 receive the promised

23 See, among others, A Boot and SI Greenbaum, 'Bank Regulation, Reputation and Rents: Theory and Policy Implications' in C Mayer and X Vives (eds), *Capital Markets and Financial Intermediation* (CUP 1993) 262; R Cooper and T W Ross, 'Bank Runs: Deposit Insurance and Capital Requirements' (2002) 43 Intl Econ Rev 55.

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

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 within a bank's portfolio or is able to induce the bank to reveal it without entailing too high costs. Chan, Greenbaum, and Thakor (1992)[24] 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 and not desirable. The idea is that the cost of capital differs across banks based on their risk profile. The government anticipates that, for riskier banks, capital is more costly than for less risky ones and that they will choose a different combination of insurance premia-capital requirements. This implies that the government could design those combinations in such a way that each bank pays a premium that is enough to cover the cost of providing the insurance. In other words, the insurance could be fairly priced in that the government could break even on each individual institution. However, Chan, Greenbaum, and Thakor (1992) show that, despite the possibility for the government to set insurance premia and capital requirements together, a fairly priced and completely risk-sensitive deposit insurance requires that banks earn profits from issuing deposits and thus it is not implementable in a perfectly competitive banking system. In contrast, Freixas and Rochet (1998)[25] argue that, under more general assumptions on banks' costs, 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.[26]

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) analyse the relationship between deposit insurance and capital regulation in a Diamond–Dybvig-type model where banks also have the ability 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 the 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 first best allocation to be achieved. The former is necessary to prevent inefficient runs, while the latter is necessary to solve the moral hazard problem.

24 Y Chan, SI Greenbam, and A V Thakor, 'Is Fairly Priced Deposit Insurance Possible?' (1992) 47 J Fin 227.

25 X Freixas and JC Rochet, 'Fair Pricing of Deposit Insurance. Is it Possible? Yes. Is it Desirable? No' (1998) 52 Res Econ 217.

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

Another way to ameliorate the incentive problem deriving from deposit insurance is through taxation of banks' liabilities. In a framework like Diamond and Dybvig's, but where banks anticipate the probability of panic-based runs, Keister (2012)[27] 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 the case of a bank's failure are possible, the opposite happens. Banks undertake 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 proportional tax on their short term liabilities. The effect of the tax is to equalize the private value of the bank's investment choice to that of a social planner so that the efficient allocation can be achieved. This allocation entails a positive probability of self-fulfilling runs so that bailouts can be necessary.

The introduction of taxes to recover the cost of public intervention and to limit the scope of opportunistic behaviour by its beneficiaries (ie financial institutions) has been a highly debated topic in the aftermath of the recent financial crisis.[28] The idea behind corrective taxation is to induce financial institutions to internalize the costs that their failure has on the society and, at the same time, provide the government with extra resources to help the banks in distress. Despite the potential advantages, the introduction of a tax on financial transactions (FTT) is one of the most controversial reform proposals. Among public as well as academic opinion, there is no clear consensus about its introduction and the G-20 countries have not been able to agree on a joint position concerning a financial transaction tax. Such a divergence of opinion is also present in Europe, where the UK has strongly opposed the introduction of a transaction tax, while eleven other countries have decided to introduce a tax of 0.1 per cent on trading of shares and bonds and 0.01 per cent on derivatives.[29] However, currently the implementation of the European Commission's proposal about FTT, which was originally planned for January 2014, has been postponed to January 2016.[30]

A number of papers provide empirical support for the position that government guarantees distort risk-taking and market discipline. A number of them also confirm the importance of the regulatory and institutional framework for the extent to which deposit insurance affects bank risk-taking and thus bank stability.

Using cross-country datasets over the period 1980–97, Demirgüç-Kunt and Detragiache (2002)[31] and Demirgüç-Kunt and Huizinga (2004)[32] find that deposit

27 T Keister, 'Bailouts and Financial Fragility' Federal Reserve Bank of New York Staff Report 473 (2012).

28 In 2009, the IMF was asked by the G-20 leaders to prepare a report to analyse the design of such corrective taxes and the possible consequences of their introduction. See S Claessens, M Keen, and C Pazarbasioglu, 'Financial Sector Taxation: The IMF's Report to the G-20 and Background Material' (IMF 2010) <http://www.imf.org/external/np/seminars/eng/2010/paris/pdf/090110.pdf> accessed 12 December 2014.

29 The countries supporting the introduction of the FTT are: Germany, France, Italy, Spain, Portugal, Austria, Estonia, Greece, Slovakia, Slovenia, and Belgium.

30 The full text of the European Commission proposal is available at <http://ec.europa.eu/taxation_customs/resources/documents/taxation/com_2013_71_en.pdf> accessed 12 December 2014.

31 A Demirgüç-Kunt and E Detragiache, 'Does Deposit Insurance Increase Banking System Stability? An Empirical Investigation' (2002) 49 J Monetary Econ 1373.

32 A Demirgüç-Kunt and E Huizinga, 'Market Discipline and Deposit Insurance' (2004) 51 J Monetary Econ 375.

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[33] 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.

Regarding the importance of the regulatory and institutional framework, the main findings are that the quality of the institutional and regulatory environment, 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 the negative impact of deposit insurance on financial stability. Finally, co-insurance by depositors mitigates the negative effect of the safety net on bank stability as well as on market discipline. Hovakimian, Kane, and Laeven[34] 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 find that a weak institutional and political environment also exacerbates the risk-taking problem induced by deposit insurance.

To sum up, the existing literature has highlighted the existence of a trade-off associated with the introduction of government guarantees. On the one hand, government guarantees are an effective tool to prevent the panic of banks' creditors, if credible, and to improve their situation in the case of a crisis. On the other hand, they might create an incentive for banks to engage in excessive risk-taking. Based on this view, common wisdom suggests that less generous guarantees should be better than broader ones. By limiting the support they receive and introducing more discipline on banks, governments could reduce banks' incentive to take excessive risk and limit the use of taxpayers' money in the future. The key questions are, therefore, whether the introduction of government guarantees always leads the banks to take excessive risk and whether limiting the support to banks, as a way to curb the moral hazard problem, is beneficial.

5. A NEW SET-UP TO THINK ABOUT GOVERNMENT GUARANTEES

A recent paper by Allen, Carletti, Goldstein, and Leonello[35] attempts to answer those questions by developing a rich theoretical framework that endogenizes the probability of a banking crisis and how it is affected by banks' risk-taking choices and government guarantees. In this framework, the authors are able to characterize the overall trade-off induced by the guarantees and shed light on the optimal level and design of government guarantees.

33 V P Ioannidou and M F Penas, 'Deposit Insurance and Bank Risk-Taking: Evidence from Internal Loan Ratings' (2010) 19 J Fin Interdn 95.

34 A Hovakimian, E J Kane, and L Laeven, 'How Country and Safety Net Characteristics Affect Bank Risk-Shifting' (2003) 23 J Fin Serv Res 177.

35 F Allen, E Carletti, I Goldstein, and A Leonello, 'Government Guarantees and Financial Stability' (2014) mimeo.

Similar to the existing literature on the moral hazard problem associated with the introduction of government guarantees, this paper extends the theoretical framework from Diamond and Dybvig by allowing the banks to invest in risky assets, so that both panic- and fundamental-based crises are possible. The paper builds on the model developed in Goldstein and Pauzner,[36] in which depositors' withdrawal decisions and, in turn, the probabilities of panic-based and fundamental-based crises are uniquely determined using the global game methodology.[37] In this paper, Goldstein and Pauzner analyse the interaction between the demand deposit contract chosen by the bank and the probability of a run. They show that when banks take into account the effect that the deposit contract has on the probability of a run, they provide depositors with a level of risk-sharing lower than what depositors would have liked if there was no concern of a run and do this in the attempt of limiting the occurrence of runs. At the same time, since the benefits from risk-sharing are still large, banks still choose to offer a deposit contract that entails inefficient fundamental and panic runs. The limited risk-sharing provided to depositors and the occurrence of inefficient runs represents the rationale for introducing a public guarantee scheme.

Allen et al extend Goldstein and Pauzner's framework by adding a government and studying how the government's guarantee policy interacts with the deposit contract and the probability of a run. Like in Goldstein and Pauzner (2005), the likelihood of both panic and fundamental crises is affected by banks' risk choice, which is endogenous and given by banks' decision about the deposit contract offered to early withdrawing depositors. However, in Allen et al, both the deposit contract and the probability of a crisis are also affected by the government guarantees. As a consequence, unlike existing contributions (Keister (2012), Cooper and Ross (2002)), the effect of the guarantees on the probability of a banking crisis is two-fold. First, the provision of the guarantees has a *direct* effect on the probability of a run that captures the benefit of the support that the government offers to banks. The larger the guarantees are, the lower is the incentive for banks' creditors to run and, thus, the probability of a crisis. Secondly, the guarantees *indirectly* affect the probability of a crisis by inducing a change in the banks' risk-taking incentives. As the size of the guarantees increases, banks have an incentive to take more risk, with the consequence that the probability of a crisis also increases.

In this context, the exact design of the guarantee schemes plays a crucial role since different guarantee schemes have very different effects on the likelihood of a crisis. In the paper, two guarantee schemes are studied. First, the authors analyse a guarantee scheme that is only meant to prevent the occurrence of panic runs. In this scheme, depositors are guaranteed to receive the promised repayment if the bank's

36 I Goldstein and A Pauzner, 'Demand Deposit Contracts and the Probability of Bank Runs' (2005) 60 J Fin 1293.

37 Global games are games with incomplete information in which the players receive an imperfect signal about the underlying state of the economy, which in turn, gives them updated information about their payoffs. Incomplete information allows pinning down a unique equilibrium in games characterized by strategic complementarity between players' actions, in which, otherwise, there would be multiple equilibria. For an earlier review of the global games literature, see S Morris and HS Shin, 'Global Games: Theory and Applications' in M Dewatripont, L Hansen, and S Turnovsky (ed), *Advances in Economics and Econometrics* (CUP 2003) 56.

project is successful irrespective of the other depositors' withdrawal decisions. The scheme, thus, eliminates the negative externality that a run imposes and completely prevents the occurrence of panic crisis. Like in Diamond and Dybvig (1983), this scheme has only an announcement effect and there is no actual disbursement for the government. However, unlike Diamond and Dybvig, (fundamental) crises still occur in equilibrium since this guarantee scheme does not protect depositors against the risk that the bank's project fails (insolvency risk). This is a very relevant detail since, when this guarantee scheme is in place, banks have an incentive to take more risk in the form of a repayment offered to early withdrawing depositors, thus increasing, ceteris paribus, the likelihood of a fundamental crisis. Interestingly, even though panic crises are completely prevented, the fact that banks take more risk might increase the likelihood of fundamental-based runs. This is consistent with the empirical evidence presented in Demirgüç-Kunt and Detragiache (1998) that crises may become more likely in the presence of deposit insurance.

The increased instability resulting from the introduction of government guarantees that only protect depositors against illiquidity risk of the bank, introduces the need to look at a broader guarantee scheme also protecting depositors against the risk of a deterioration of banks' assets. This broader scheme is more effective in limiting the occurrence of banking crises—both panic- and fundamental-based ones—but introduces an actual disbursement for the government. As a consequence, in the context of this broader guarantee scheme, there is a non-trivial trade-off that the government faces in choosing the optimal size of the intervention. On the one hand, the government can reduce the likelihood of a banking crisis by increasing the size of the guarantees. On the other hand, larger guarantees induce a larger disbursement for the government. As a consequence, the government may decide to limit its support to the banking sector so as to contain the costs of the intervention. Despite this drawback, the paper shows that, by reducing the risk of inefficient fundamental runs, a broader guarantee scheme can achieve higher welfare than a more limited one.

The disbursement that the government faces in the context of a broad guarantee scheme protecting depositors against both illiquidity and insolvency risk introduces two distortions. The first one is a wedge in the optimal amount of risk (that the government would like to choose) and the one that is chosen by the banks. The second refers to the difference in the size of the guarantees chosen by government and the optimal one.

The first distortion arises because banks internalize the effect that their risk choice has on the probability of a run but not on the amount that the government needs to transfer to the banking sector to honour the guarantee scheme. This is due to the fact that overall government disbursement is determined by the decisions of all banks combined and an individual bank only slightly affects it. This is the intuition behind the moral hazard problem associated with the government intervention in the current policy debate. As discussed above, the prevalent view is that since banks do not internalize the cost of the intervention, they take too much risk.[38] The current debate relies on the important detail that the government faces a disbursement only

38 See Calomiris (supra note 16), V Acharya and N Mora, 'A Crisis of Banks as Liquidity Providers' (2015) J Fin (forthcoming).

when a run occurs. However, this might not always be the case. With the broad guarantee scheme described above, the government also faces a disbursement when there is no run since it ends up paying depositors in the case the project of the bank fails. If the disbursement is larger when there is no run than in the case where there is a run and the bank faces a shortage of liquidity, the cost of a run from the point of view of the bank is higher than from the point of view of the government with the consequence that banks choose a level of risk that is too low. In this case, then, the moral hazard problem associated with the introduction of the guarantees goes in the opposite direction than the one highlighted in the current policy debate. The opposite is true when the disbursement in the case of a run is larger than when there is no run and the bank ends up failing for fundamental reasons. In this case, consistent with the common wisdom, the banks choose excessive risk in response to the introduction of the guarantees. Interestingly, then, the paper by Allen et al shows not only that broader government guarantees can be better than less generous ones if they reduce significantly the probability of both panic and fundamental crises, but also that the guarantees do not always induce banks to take excessive risk.

The second distortion concerns the size of the guarantees relative to the optimal one—the one chosen by the government in the case it could also control the risk-choice of the bank—and it is strictly related to the first one. The government can influence banks' risk choices by changing the size of the guarantees. When the banks choose an inefficiently high level of risk, the government can 'correct' this by choosing an inefficiently low level of guarantees. The opposite is true when banks choose a level of risk that is too low. In this case, the government curbs this inefficiency by increasing the size of the guarantees above the optimal level.

To sum up, the analysis by Allen et al represents a step forward in understanding the trade-offs associated with the introduction of government guarantees. It also suggests the importance of analysing the desirability of government guarantees in a rich theoretical framework, where crises are due to both a coordination failure between depositors and to a deterioration of banks' assets, and where the probability of each type of crisis is endogenously determined and affected by the banks' risk choices and by government guarantees. Such a theoretical framework allows a disentangling of the various effects of guarantees and a full characterization of the associated trade-offs. This represents a difference from the previous literature that has focused either on the distortions of government guarantees in terms of incentives and excessive risk-taking, or their effectiveness in preventing self-fulfilling bank runs in the case of limited commitment but still relying on the assumption that government guarantees prevent the panic runs.

6. CONCLUDING REMARKS

In this article, we contribute to the current debate about the desirability of government guarantees to financial institutions by challenging the view that public intervention in the financial system should be limited so as to control for the associated moral hazard problem. We argue that this view crucially relies on some of the assumptions and specific modelling choices in the existing literature on government guarantees and we discuss their impact on the policy conclusions.

We highlight the importance of analysing the trade-off associated with the introduction of government guarantees in a richer theoretical framework that accounts for the existence of different types of crisis—fundamental- and panic-based ones—and allows their probabilities as well as the effect that banks' risk choice and government policy have on them to be determined endogenously. Relative to the existing contributions, the proposed theoretical framework allows capturing both the direct and indirect effects of government guarantees on the probability of banking crises and on banks' risk choice.

One key implication of the richer theoretical analysis concerns the importance of the design of the guarantee schemes. Different guarantee schemes can differ significantly in terms of their effectiveness in preventing instability in the banking sector, the distortions that they introduce in the banks' risk choices, and the costs for the government providing them. We show that the introduction of government guarantees does not always induce banks to take excessive risk, with the consequence that the public intervention increases instead of reducing the instability in the financial sector. This has important implications for policymakers since it suggests that limiting the size and the scope of the intervention, in the attempt to control the moral hazard problem on the side of banks, could be detrimental. This also has implications in the context of the debate about the introduction of taxes or other instruments to correct the distorted risk-taking incentives of banks.

The analysis in this article focuses on government guarantees, but some of the issues raised could also apply to other fields of financial regulation. This is true in particular of the need to analyse the public intervention in a context that allows disentangling all its effects on the likelihood of a crisis, the behaviour of banks, and their creditors, as well as the costs for the government. As an example, the concerns about banks' excessive risk-taking associated with public intervention and its negative consequences on the stability of the financial sector and the costs for sovereigns and taxpayers, are also extremely relevant for the discussion about the resolution regimes of distressed financial institutions. We believe that in light of the new regulatory reforms, new research is needed to evaluate the implications of such changes on banks and the financial system as a whole.