

The Micro, Macro and International Design of Financial Regulation

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Abstract

Regulation that is designed to enhance the stability of individual financial institutions, micro-prudential regulation, can create and exacerbate systemic instability. This is particularly true of detailed prescriptive rules about corporate governance which are prone to incorrect specification and the imposition of unwarranted homogeneity on the conduct of firms. They can create externalities where none previously existed. Harmonization of micro-prudential regulation across countries elevates this problem to a global level of financial instability and can be a source of rather than a cure for global financial crises.

Regulation required to protect the financial system as a whole, macro-prudential regulation, is fundamentally different in nature from micro-prudential regulation. It seeks to identify, immunize, isolate and intervene in financial failures and, in contrast to micro-prudential regulation, it requires international harmonization across countries. The focus of harmonization to date has therefore been precisely the opposite of that which is required to protect the financial system.

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“May I say I am particularly pleased to be participating in a discussion under the title "Are we heading towards over regulation?", since this is an issue I have been concerned about since becoming head of the UK FSA three years ago. My simple answer is yes. You may be surprised to hear that from someone who makes his living out of regulation and so let me explain. I believe strongly that markets are the lifeblood of successful economies and societies and that only carefully judged regulatory intervention can add to rather than detract from the positive impacts of market forces. It seems likely to be the case that the stock of rules and regulations across countries, across society and across the industrialised spectrum already contains much material in the latter category.” Speech by John Tiner, Chief Executive, UK Financial Services Authority (FSA), Monte Carlo, 12 September 2006.

1. Introduction

One of the most striking features of the global financial crisis is that it wasn't global. In fact, most countries in the world encountered little or no financial disturbance. The crisis was essentially restricted to Europe and the United States. But it was not simply a matter of geographical proximity, as illustrated by the fact that while the USA was seriously affected, Canada was not. Nor was it simply a matter of economic integration, as reflected in the losses sustained in France and Germany but not Italy.

Rather than geographical and economic proximity, the phenomenon had more to do with regulatory and corporate system proximity. Indeed, we would suggest that the one saving grace in the crisis was that most countries in the world had not adopted state of the art, “most advanced” regulatory and governance practices. Had they done so and followed the lead of the UK and USA in particular then there would have been a truly global crisis. As it was, many countries were able to avoid serious damage by retaining rudimentary and apparently unsophisticated regulatory and governance practices. The paradox of the supremacy of the worst is one of the subjects of this paper.

There are few now who need convincing about the risks of systemic failure. These arise from interconnections between the liabilities of different institutions and the holding of similar assets. The failure of one financial institution can have serious consequences for others. The failure of several financial institutions can undermine the operation of a country's financial system. The collapse of a financial system can impact the solvency of countries and sovereign crises can undermine international institutions and the global financial system. Avoiding financial failure is of global as well as individual investor concern.

The realization of the importance of systemic risks has led many to advocate that the attention of regulators should switch from the current pre-occupation with “micro-prudential” to “macro-prudential” regulation.¹ The distinction between the two is that the former is concerned with the protection and regulation of individual institutions, primarily to reduce the risk of calls having to be made on deposit insurance funds; the latter is focused on the risks of failure of financial systems as a whole. The former does not ensure the latter because there are interconnections, i.e. externalities between

¹ See, for example, Borio (2003), Borio, Furfine and Lowe (2001), Crockett (2000), and Hanson, Kashyap and Stein (2011) .

financial institutions which mean that financial institutions acting on their own do not take account of their effects on others. Regulation will not internalize these externalities any more than the institutions it controls unless it looks at the soundness of financial systems as a whole, as well as individual institutions. An example of the externality that can arise is the effect of one institution reducing its holdings in some assets on the prices of those assets and therefore the solvency of other institutions holding those assets. Another is the way in which reductions in credit extended by one financial institution can affect the financial condition of others which receive funding from it.

There is now a strong appreciation of the importance of, for example, holding capital to provide a cushion against systemic risks as well as individual institutional failure and of countercyclical requirements to avoid correlated constraints in the availability of credit and the holding of particular types of assets. This is reflected in the Basel III capital requirements. Nevertheless, there are concerns that the additional policy prescriptions of Basel III and others elsewhere retain too much of a micro- rather than macro-prudential flavour.² There are also concerns about the costs that the regulations, be they micro or macro in nature, impose on the financial system and the adverse consequences that they can therefore have on the functioning of the economy more generally.

This article will not rehearse those arguments but instead suggest that there is an impact of these developments that has not to date been considered that should be borne in mind when designing new regulatory rules. The essence of this argument is that regulation can be a source as well as a cure for systemic risks. This has already been described in the context of reputations of regulators infecting otherwise independent institutions and countries.³ There are two forms that this can take. The first is by imposing similar rules across institutions investors will legitimately conclude that the failure of one institution signals the potential vulnerability of others. The second is that the failure of one institution can cast doubt on the competency of the regulator and therefore of all of the institutions under its authority.

We suggest that even where there are no such reputational effects that inter-linkages can be created where regulators impose similar rules across institutions and countries. In particular, micro-prudential regulation that, as mentioned above, is concerned with the protection of individual institutions can have macro consequences where harmonization results in similar rules being imposed in different jurisdictions. There are three sources of these inter-linkages. First, harmonization suppresses useful cross-national experimentation in the selection of rules that govern the formation and operation of financial institutions. Second, harmonization discourages firm-level organizational experimentation and innovation and therefore diversity of forms of financial institutions and practices. Third, investors reduce the degree of care and monitoring that they undertake of financial institutions because of the lower variation across them in the way in which they conduct their business.

² See, for example, Shin (2010).

³ See Morrison and White (2010).

While harmonization is often associated with the work of such supranational organizations as the European Union and the Bank for International Settlements, it does not necessarily result from formal international collaboration. It can merely emerge when regulatory organizations engage in similar conduct and impose equivalent rules in different jurisdictions. One cause of this tendency is a generally misconceived belief that there are correct or dominant forms of governance and conduct of financial institutions and other corporations that justify the imposition of rules in one country similar to those adopted elsewhere. International competitive pressures may exacerbate this tendency and encourage different countries to introduce equivalent rules even in the absence of a formal requirement for them to do so. A general move towards harmonization of micro-prudential regulation is therefore more prevalent than might superficially appear to be the case.

This raises similar questions to those that have been addressed in the context of corporate governance competition, in particular whether there is a race to the top or bottom in regulatory standards.⁴ We argue that in the context of financial regulation the balance of that argument rests largely on whether the required regulation is of a micro- or macro-prudential form. Where it is micro in nature then harmonization can create systemic risks by discouraging experimentation and diversity in both regulatory form and financial institution conduct. Where it is macro in nature then harmonization is required to internalize the externalities that diversity otherwise creates.

This suggests that the starting point in designing regulatory systems should not, as at present, be to harmonize rules but to identify where systemic risks might naturally arise and then to seek ways in which those system wide risks can be most effectively diminished, including through the imposition of harmonized rules. The difference between harmonization as a product of underlying systemic risks and harmonization as a goal per se (albeit unintentional) is between harmonization as a solution and harmonization as a cause of systemic risks. It is therefore potentially of considerable significance.

We begin in Section 2 by describing how regulation can exacerbate systemic risks. In Section 3, we then illustrate how and where this has occurred in the past. Section 4 considers why nevertheless regulation and harmonization may be required to diminish systemic risks and Section 5 presents some specific policy proposals for harmonizing regulation at the global level. Section 6 summarizes the main conclusions of the paper.

⁴ See, for example, Easterbrook (2009) and Romano (1993).

2. Regulation as a Source of Systemic Infection

Morrison and White (2010) describe how regulation can be a source of systemic failure.⁵ When banks are regulated by a common regulator then the failure of one bank can be interpreted by depositors as informative about the ability of the regulator to evaluate the quality of others. The failure of one bank under the supervision of a particular regulator is therefore a signal of the vulnerability of all. Even where banks do not have financial inter-linkages with each other or assets that are correlated across the banks then a systemic failure can arise as a consequence of a loss of reputation of the regulator. Regulators try to preserve their reputation by keeping banks alive when otherwise they would be closed and to hide information about failing institutions for which they are responsible.

We extend Morrison and White's idea by arguing that regulators can have similar effects even where their reputation is not at stake. Regulators impose rules that restrict the activities in which firms can engage or require them to undertake activities which otherwise they would not do or only to a lesser extent than the regulator requires. Examples of the former are limitations on the assets in which financial institutions can invest, the markets in which they can operate and the way in which they can hold clients' monies. Examples of the latter are requirements to appoint certain individuals to control risks, to have a certain proportion of independent directors on their boards and to disclose particular types of information. The activities of financial institutions are therefore constrained by rules of both prohibition and obligation.

The justification for the imposition of such rules runs along the following lines. Commercial banks are financed by depositors who do not have the expertise or information with which to monitor banks. Their deposits are short-term in nature and can be withdrawn rapidly. Banks are therefore prone to bank runs. To avoid these, a credible deposit insurance scheme needs to be put in place but this creates a moral hazard problem of banks engaging in excessively risky lending with their depositors' money. To prevent this, regulators should control the degree of risk taking by banks, ensure that those who run banks are fit and proper and have the expertise to do so, that they control the level of risk taking of their institution and have proper systems in place for controlling risks, that they do not engage in excessively risky investments, that they make proper provisions for losses, and have sufficient capital and liquidity in place to provide protection against losses and withdrawals.⁶

The first issue this line of reasoning raises is one of *identification*. It presumes that there is an instruction manual that can be followed for assembling a safe bank. Good banks are like good meals – they can be created by a combination of the right ingredients (assets), a good chef (directors), and a well tried recipe (internal procedures). Regrettably the analogy is not a good one – if it were we would not have been subject to financial crises for more than the last 300 years.

⁵ See also Boot and Thakor (1993) and Dewatripont and Tirole (1994).

⁶ The case for regulation works even without deposit insurance. Good regulation can partially substitute for deposit insurance in assuring depositors that their funds are not at risk.

One of the most telling illustrations of this is the evidence that has been accumulated that the banks with the best corporate governance records by conventional standards were the ones that engaged in the greatest risk taking prior to the financial crisis and incurred the largest financial losses during the crisis. What was presumed to be good governance practice turned out to have the worst financial stability properties.

The natural response to such observations is to assert that while mistakes may have been made in the past, regulators have learnt from those mistakes and are now putting in place regulatory requirements that will avoid their recurrence. That is as compelling as the assertions that were made at the beginning of the 21st century that the business cycle and inflation had been conquered by modern macroeconomic policy. Not only do regulators make mistakes, they may well, as the corporate governance case illustrates, systematically make matters worse than they otherwise would be.⁷

The second concern is *unintended consequences*. As described above, regulatory rules encourage banks to engage in certain practices and investments and to avoid others. Any such rules systematically impact on demand and supply of different resources and assets. Those assets that banks are encouraged to hold rise and those that they are not decline in relative price. The general equilibrium consequences of this may in general be benign but there are circumstances in which they most certainly will not be. In particular if they depress the prices of assets held by other banks and financial institutions they may well undermine the financial stability of these organizations. For example, a rule that requires one institution to sell its holdings of risky mortgages will depress the price of similar mortgages held by other institutions and thereby expose those institutions to risks of insolvency that otherwise they would not have encountered.

This example is well understood. What is not generally appreciated is how pervasive this effect might be and how it might afflict more modest requirements. Take the example of the proportion of independent directors on banks. There is a potential trade-off between requirements for independence and competence – those who are competent are conflicted; those who are independent are incompetent. Those who are both competent and independent are rare and therefore as the demand on one institution to employ such

⁷ It is worth underscoring that differences in systemic risk concerns mean that the familiar debates about the corporate law “race” do not readily map onto questions about the governance of financial institutions. The failure of a non-financial firm will rarely create systemic risk; the costs of poor governance are internalized by the firm’s stakeholders, especially its shareholders and creditors. In the international setting, national economic competitiveness may be affected by the quality of the national governance regime, but that internalization gives countries appropriate incentives in law-making and standard setting. For financial firms, poor performance, especially failure, may have systemic effects far beyond the firm-level stakeholders. In setting the governance of US financial firms, for example, US regulators did not assess the way that particular incentives or board structures might lead US firms to produce financial products that could threaten European banks. Put otherwise, the jurisdictional competition argument in corporate governance has always assumed internalization of governance costs among the stakeholders; a particular governance regime, if replicated economy wide, might produce an economy of less (more) efficient firms. The comparable debate for financial firms has quite a different starting point: that governance costs will not be internalized within the firm and not necessarily within the boundaries of the authorizing country.

individuals increases, the pool of remaining independent, competent directors declines and others have to fish from a smaller murkier pool.

The third concern is *homogeneity*. One of the presumed benefits of competition is entry and innovation. Competition can create uniformity as in Hotelling type back-to-back competition or it can promote product diversity. Persuasive arguments can be made for both types of activities in financial markets. Attempts to distinguish financial products will encourage diversity as evidenced in, for example, hedge funds; however, risks of being subject to adverse selection problems as outliers might encourage homogeneity, “herding.” In any event, by requiring financial institutions to follow similar practices and rules, regulation discourages diversity. Leave aside the problems of convergence on inappropriate models and unintended macroeconomic consequences mentioned above, there is another reason why homogeneity is a cause of concern.

One of the interesting features of the financial crisis is that there were some institutions that did very well out of it. In particular those that were short in relevant asset classes profited significantly from declines in valuations.⁸ On balance, when asset values decline in aggregate investors are worse off but some more so than others and some not at all. Essentially the beta coefficients of institutions vary. Impose uniform rules and that diversity in betas diminishes, correlations increase, and essentially everyone is in the same boat together. Even in the absence of inter-linkages, regulation can create systemic risks that would otherwise not exist.

Together these properties of identification (convergence on the wrong model), unintended macroeconomic consequences, and homogeneity can seriously exacerbate the systemic risks of financial systems. But what we would suggest is a still more insidious tendency comes from another quarter and that is harmonization. What harmonization of rules by different regulators does is transfer these risks in individual jurisdictions to a global plane. Problems of identification, unintended consequences and homogeneity therefore make national systemic risks international. This is already a potential risk in the presence of global financial institutions that export failures across boundaries but in the absence of harmonized rules it is possible for regulators in one jurisdiction to mitigate the consequences of failure of financial institution in another.

The underlying source of the problem is the following. As described above, the justification for regulation of a bank is an individual institutional one. There is no systemic consideration that enters into the attempt to correct the inaccurate pricing of deposit insurance by limiting the risk taking of a particular bank. However, in the process of doing this for the reasons of identification, unintended consequences and homogeneity described above, these individual institutions remedies have systemic effects. In other words they create externalities that would otherwise not exist.

⁸ Some argue that under certain circumstances some classes of investors may have incentives to vote for value decreasing corporate policies in the presence of derivatives and “empty voting”. See for example Hu and Black (2007) and (2008) and Zachariadis and Olaru (2010).

Furthermore, as described in the introduction the nature of the harmonization that exacerbates the problem can be implied rather than formal. Regulators need not necessarily be constrained by common rules to adopt similar practices. There only has to be a perhaps mistaken belief in the efficacy of a particular remedy for its adoption by one regulator to be replicated by all. Furthermore, the pressure not to fall behind in the international sphere in being excessively lax or stringent in regulatory standards will encourage the adoption of similar rules. In other words, regulation creates a superstructure that encourages convergence in practices of financial institutions which in turn threatens global systemic risks where in its absence no such risks would exist. The next section describes three examples of where regulation has been a source of systemic infections.

3. Regulatory Infections – Three Examples

(i)The power of regulation to infect is best illustrated by the case of where it might be thought most likely to cure. The most extreme policy prescription for avoiding bank failures is what is termed “narrow banking”.⁹ This is premised on the observation that a primary function of banks is to provide payments and custodianship and that in performing this function they should not subject their clients to risks of failure. The best way of ensuring that is for banks to avoid engaging in risky lending and to hold all their deposits in riskless assets, such as government securities. How could such a policy do anything other than alleviate systemic risks?

The answer is that it is subject to all of the problems of identification, unintended consequences and homogeneity described above. On identification, one of the fundamental principles that finance students are taught is to avoid placing all ones eggs in one basket. Diversification is the best source of risk reduction. Even if banks are not required to hold all of their assets in government securities, by reducing the potential for diversification, narrow banking will tend in general to increase not diminish risks of failure. Second, requiring all banks to hold a limited class of assets will significantly distort the relative prices of assets, driving down the return on government securities, for example. Since all banks will hold similar assets, the holdings of one bank will impact negatively on the security of other banks’ assets. Third, the performance of banks will become highly correlated not on account of direct interconnections but simply on the basis of their exposure to the same asset classes. As we have observed recently, government securities are far less secure than was previously thought and in the process of seeking to rescue financial institutions, governments may undermine the security of the assets that they have required their banks to hold.

Money market mutual funds (MMFs) are illustrative of some of the problems that narrow banking can create. MMFs take deposits from investors who want safe, liquid investments and invest in assets designed to be, and deemed to be, safe and liquid. The demand for such investment outstrips the supply of assets that actually meet the criteria,

⁹ Proposals on this were originally put forward by Litan (1987) and Pierce (1991). A more recent manifestation of this in the form of a mutual fund proposal is Larry Kotlikoff’s “limited purpose banking”, (see Kotlikoff (2010)).

which stimulated the production of assets that appeared to do so.¹⁰ Moreover, if maturity and liquidity transformation are valued functions of a financial system then by restricting investments to Treasury bills, stability problems may exacerbated in other parts of credit intermediation.

(ii) If apparently as infallible a policy as narrow banking can be a source of systemic infection then what of others? Returning to the topic discussed above, board independence is a salutary case since there are few recommendations that have met with as clear universal support as increasing the degree of independence of directors. This is the Basel Committee on Banking Supervision statement on the subject: “Independence can be enhanced by including a large enough number of qualified non-executive members on the board who are capable of exercising sound objective judgment.”¹¹ Unfortunately as noted above, the evidence on the subject is almost uniformly contradictory in finding a negative relation of board independence to the performance of banks during the financial crisis. Adams (2009), Beltratti and Stulz (2011), Erkens, Hung and Matos (2010), and Minton, Taillard and Williamson (2010) all report negative relations and Ferreira, Kirchmaier and Metzger (2010) suggest an explanation. They record that variations in the proportion of independent directors on boards of banks are closely related to the regulatory requirements of different countries. They conclude that the poor performance of banks with large numbers of independent directors is a reflection of regulatory distortions: “banks adjust their boards to their particular conditions, but only when regulations allow them the freedom to do so.”¹²

Regulatory requirements on board independence may well therefore destroy value which in turn makes banks more vulnerable to failures. Now replicate this mistaken regulatory policy across several jurisdictions either through the recommendations of international organizations such as the Bank for International Settlements or through regulators adopting what is perceived to be best practice and the conditions for systemic failures of banks whose performance in other respects might be unrelated are sown.

(iii) A still more widely discussed issue is executive remuneration. Excessive pay and poor relation of pay to performance are thought to lie behind the financial crisis. Certainly the political ramifications have been extensive and there have been widespread calls to link executive compensation more closely to corporate performance. However, the evidence on the pay-performance linkage is far from clear cut. First, Fahlenbrach and Stulz (2009) find that performance was worse in those banks whose executive remuneration was closely tied to performance as reflected in a high proportion of CEO pay being in the form of shares. Second, Cheng, Hong and Sheinkman (2010) find a strong relationship between residual executive compensation (after controlling for firm size and industry) and risk taking in banks.

The problem that executive compensation in banks raises is that they are highly leveraged organizations. This creates two classes of distortions, firstly risk shifting - raising risk

¹⁰ Pozsar (2011).

¹¹ Para 38 of Basel Committee on Banking Supervision (2010).

¹² Ferreira et al (2010) page 9.

taking to the benefit of shareholders who enjoy the fruits of financial success at the expense of creditors who bear the costs of firm failure – and secondly underinvestment - a disincentive to undertake investments such as capital raising whose benefits accrue to existing creditors at the expense of shareholders. Bebchuk and Spamman (2009) propose to address these problems by linking executive compensation to measures of enterprise value, which picks up returns to creditors as well as returns to shareholders. Similarly, Bolton, Mehran and Shapiro (2010) propose to add creditor risk to compensation calculation, using the spread on banks' credit default swaps. The problem not directly addressed by either proposal is that firm-specific performance measures may be distorted by the way that financial risk is socialized. Concern about systemic distress costs may lead to government actions that buoy up creditors. This will undercut compensation measures tied to enterprise value and will produce contracts that are not socially incentive compatible.

In short, before the crisis, the problem with executive compensation in financial firms, as with non-financial firms, was thought to be a poor linkage between pay and performance. Remuneration best practice codes were developed that aimed to measure performance comparatively, so that, for example, stock option grants were to vest only in the event of “challenging and stretching financial performance.”¹³ After the crisis, we are still entangled in the problem of excessive pay and poor relation of pay to performance, except that now we think performance must be measured over a long horizon, and it is not clear whether performance should be tied solely to shareholder returns. Same problem, radically redefined.

The identification of appropriate remuneration arrangements is therefore more complex than earlier proposals on high powered incentives suggested,¹⁴ and more complex than the simple fix of long-term vesting or deferred compensation. Indeed there are some who believe that it is impossible to devise incentive arrangements that allow genuinely able and talented managers to be distinguished from those who merely mimic the activities of others.¹⁵ The problem is that it is easy to devise strategies, in particular in financial institutions, that apparently yield abnormally high returns over extended periods of time through disguising the small probabilities of large losses being incurred at some stage in the future and attempts to discourage this through, for example, deferred compensation arrangements risk deterring the truly talented as well as the charlatans.

The response of some regulatory bodies has been to seek a more intricate set of rules that capture the potential distortions of inappropriate remuneration policies. The Basel Committee on Banking Supervision (2011) for example raises complex questions about the appropriate benchmark against which to evaluate performance, the relevant adjustments that need to be made for risk taking, the degree to which remuneration should reflect future outcomes beyond the tenure of executives and the way in which remuneration should be governed. As Becht, Bolton and Roell (2011) note, there is a trade-off between simplicity and flexibility with worrying parallels between what is being

¹³ See Association of British Insurers (2008) and Gordon (2009).

¹⁴ See, for example, Jensen and Murphy (1990).

¹⁵ See Foster and Young (2011).

discussed now in relation to executive remuneration and the apparent greater sophistication but actual unintended consequences of Basel II versus Basel I recommendations on capital requirements.

The reality of policy on remuneration is that it is driven by politics not economics. While the economic case for intervention is weak, the politics require it. It is simply unacceptable to allow bankers pay to continue to rise while performance deteriorates, workers are laid off, and taxpayers bail out banks at substantial costs and threats to nations. It is simply unrealistic to fail to recognize the pressure on politicians and regulators to be seen to do something that appeases popular sentiment. We should nevertheless recognize the economic consequences of politically motivated decisions, namely that systemic risks may well be exacerbated not ameliorated as a result. The problems of identification, unintended consequences and homogeneity should not be underestimated.

4. Containment – The Case for Harmonization

Just as regulation and harmonization can create externalities and systemic risks where none in their absence would exist, so regulation may fail to correct the externalities and systemic risks that do exist. There are three that were particularly in evidence in the financial crisis. The first was interconnections between financial institutions that arose as a consequence of financial instruments, such as credit default swaps, that supposedly spread risks to a point that they were eliminated but were in fact concentrated in banks and other financial institutions. The second was the risks of runs in individual institutions, such as Northern Rock in the UK, spreading across the rest of a financial sector.¹⁶ The third was interbank wholesale markets ceasing to operate and providing sources of finance as a consequence of uncertainty about the credit worthiness of counterparties.

In each case, there are externalities that markets or institutions fail to price. The price at which investors are willing to trade credit default swaps reflects the risk of default by the referenced party, on the assumption that the swap contract adequately secures the obligations of the protection seller. Protection-buyers build their balance sheets based on that assumption. An event that threatens the creditworthiness of a protection seller may destabilize protection buyers. A decision to extend credit in the interbank markets prices the default risk that the lending institution perceives in its counterparty. It does not take account of the impact of the counterparty's potential default on the creditors and investors of the lender, or of how decisions *not* to lend affect the likelihood of default of denied borrowing institutions. Similarly depositors do not take account of the effect of their decision to withdraw money on the ability of others to do the same or the impact of their collective decisions on the survival of the bank and other investors and borrowers. The existence of these externalities means that securities are mispriced and the relevant actors do not internalize the systemic risks of failure of financial markets and sectors. Indeed the nature of the externalities, which include the effects of non-actions as well as actions, shows the limits of price-setting in the control of systemic risk.

¹⁶ For a description of the Northern Rock failure, see Shin (2008).

Macro- supervision and the protection of financial markets and systems are therefore the proper focus of regulators as against micro-prudential regulation and the risks of failure of individual institutions. If the macro were just the sum of the micro then the distinction between the two would be vacuous. However, that is clearly not the case. The failure of a particular number or value of financial institutions or securities is neither a necessary nor sufficient condition for the failure of a system. There are substantial non-linearities that convert local into global failures at difficult to determine triggers.

Since macro-prudential regulation is concerned with the protection of systems rather than institutions, by definition it implies a high degree of coordination and harmonization of regulation across institutions and countries. Harmonization does not imply uniformity but it does require a degree of consistency to ensure that externalities are appropriately addressed across all relevant institutions and securities.

The preoccupation of regulation and harmonization has therefore to date been precisely on the wrong set of issues. It has been largely directed at the protection and conduct of particular institutions at the micro level. Far from alleviating systemic risks, this potentially creates them. It has been much less at the macro level of the system where externalities exist. As a consequence we have to date neither provided the basis for ensuring the avoidance of failures nor prevented government intervention from exacerbating problems in the future.¹⁷

What does the distinction between protection of the system and institutions mean in practice? An analogy that helps to answer that question is the difference between medicine and public health care. The protection of the public is distinct from an aggregation of the protection of individuals and involves undertaking particular activities that are focused on, for example, interaction, transmission, isolation and inoculation. In seeking to protect the public, the authorities focus on the spread of disease and how to prevent it. They are therefore interested in interactions and avoidance of the resulting transmission of diseases. As an illustration of the implications, the most vulnerable members of society from, for example, pandemic flu might be the elderly but the most significant from the perspective of public health might be the young because the degree of social interaction of the latter far exceeds the former. While medics who are concerned about saving lives might therefore be particularly concerned about the elderly, the authorities who are responsible for the public at large will direct resources at the young.

By analogy, in the context of financial markets, macro-prudential regulation is a conceptually as well as practically distinct subject from micro-prudential regulation. Its focus is on interactions between institutions and organizations, on the transmission of losses and failures, and their isolation and containment. It therefore needs to identify the degree to which financial systems as a whole are vulnerable to failures and to determine

¹⁷ This is not to deny some of the ambitions of the Dodd-Frank Act in the United States or the EU, Capital Requirements Directive IV and the revised Markets in Financial Instruments Directive.

policies that are designed to address the systemic vulnerability as distinct from that of individual institutions.¹⁸

To illustrate this, proposals on capital requirements as, for example, enshrined in Basel III are related to measures of the riskiness of assets held by institutions. This is neither a necessary nor a sufficient condition for protection of the system. It is not necessary in so far as risky assets that could be the demise of systematically important financial institutions may have no systemic consequences if they are unrelated to the exposures of other institutions. Good examples are the frauds and misdealings that have afflicted major investment banks such as Barings, Société Générale and Union Bank of Switzerland (UBS) over the last few years which could have and in one case did cause the demise of the institutions but with no systemic consequences. Risk weighted capital requirements are not sufficient protection against systemic risks in so far as the weights do not identify the areas where interactions between financial institutions are most pronounced and systemic vulnerabilities are therefore greatest.

The incorrect design of macro-prudential regulation can be as serious in its consequence as inappropriate harmonization of micro-prudential regulation and it can similarly exacerbate rather than diminish systemic risks. The design of risk-weighting systems can distort asset creation, thereby changing relative asset risks and engendering correlations among financial institutions. By requiring institutions to provide for capital against a particular class of risks it leaves them all exposed to the same risks for which protection has not been provided. By discouraging financial institutions from engaging in particular activities because their capital requirement costs are high, it may have unintended side effects on risks in the system. For example, it may encourage them to lay off risks to other institutions through such instruments as credit default swaps that intensify the exposure of the system as a whole. Similarly proposals that debt as well as equity contribute to loss absorption in financial institutions through “bail-ins” may help to reduce exposure of individual institutions but intensify the vulnerability of the system as a whole as a consequence of the transmission of losses between institutions through loan write-downs.¹⁹ These design problems arise in significant part because the micro and the macro are easily blurred. Policies that reduce the failure risks of any particular institution may increase the risk of correlated failure. Policies that reduce the moral hazard associated with the failure of a particular institution may unwarrantedly assume other institutions will be largely unaffected.

What is the implication of the proposal that financial regulation should be repositioned to a focus on protection of the financial system rather than institutions? The analogy with public health care and medicine suggests that it is far-reaching. There are four

¹⁸ We therefore agree with similar sentiments recently expressed in Haldane & May (2011).

¹⁹ Indeed, the public is more exposed to these unanticipated side effects in financial markets than in public health. The reason for this is the well-known distinction between the social and medical sciences, namely the inability to undertake controlled experiments in the former but not the latter disciplines. As a consequence, it is harder to determine the side effects of financial as against health policy.

components to avoidance of pandemic or systemic failures: identification, immunization, isolation and intervention.

First, potential risks have to be identified and correctly measured at the system rather than the individual institution let alone individual asset level. This is exactly equivalent to the shift that occurred in the pricing of securities with the introduction of asset models that emphasized the significance of systematic risk of portfolios as against the total risks of individual securities. Likewise, here a redefinition of risk from institutional to systemic risk is required.

Second, immunization against risk of failure is required but again by analogy with asset pricing, the “value” of a regulatory or tax policy is not related to its contribution to reducing the risk of individual institutions but to systemic failure. Successful immunization policies need to consider their contribution to reducing risks of system rather than individual institutional failures.

Third, isolation of failures requires that the focus of financial regulation should be on diminishing transmission of risks. So for example, interbank lending, which may have beneficial effects on the allocation of financial resources, can also be a source of transmission of financial contagion. Instruments therefore need to be identified that can isolate risks and prevent their onward transmission.

Finally, intervention to resolve failing financial institutions, like the burying of bodies, needs to be undertaken with caution. Writing down liabilities might be beneficial for the survival of one institution but at the risk of failures of others. Some of the most successful bank rescues, for example, in the early 1990’s in Sweden, were managed from a system perspective and some of the most unsuccessful, for example in Japan in the later 1990’s, were not.

In summary, harmonization of financial regulation requires a very different approach from that which has been adopted to date. It needs a fundamental shift from individual institutional risks to the identification, immunization, isolation and intervention in global financial system failures. In the next section we turn to some specific policy recommendations.

5. Harmonization Proposals

At present the nature of financial systems can be characterized as follows:

- (i) There is little information about interconnectedness between banks and the way in which risks are propagated between institutions, markets and countries. Consequently when rescues are required they involve the bailout of all creditors at substantial costs to governments which in turn become liable to failure.
- (ii) Banks hold as little equity capital as possible. There are strong tax incentives for them to do so because interest payments on debt are deductible against

their corporate tax liabilities making debt cheap in relation to equity. In addition, the overhang of existing outstanding debt discourages shareholders from subscribing to new issues of equity

- (iii) Bondholders and providers of credit insurance in large financial institutions are protected from losses by domestic governments seeking to avoid major disruptions and systemic risks associated with their failure. Interest margins and spreads on bonds and credit default instruments therefore become less informative about anything other than the likelihood of receiving government bail-outs.
- (iv) The resolution of failing institutions can only occur once they are in violation of their legal liabilities. As a result, nothing gets resolved until it is complex and expensive to do so.

As a result, (a) information on risks of failure is poor, (b) there is no immunization against systemic failure, (c) there is no mechanism for isolating failures and (d) when they finally occur, interventions take the form of nationalization to prevent the paralysis created by trying to resolve un-resolvable contracts. The four requirements for avoidance of systemic failure - identification, immunization, isolation and intervention- are therefore largely absent thereby creating the conditions for a sizeable systemic failure.

There are numerous initiatives in process to address these issues.²⁰ New institutions have been created to manage macro-prudential regulation, for example the European Systemic Risk Board (ESRB), the Financial Stability Committee (FSC) in the UK, the Financial Stability Oversight Council (FSOC) in the US and the Financial Stability Board (FSB) of the G20 countries with such remits as “to develop and implement strong regulatory, supervisory and other policies in the interest of financial stability” (FSB).

Basel III has made significant efforts to add macro-prudential considerations to its traditional micro-prudential focus. The new accord requires that all banks and systemically important financial institutions (SIFIs) hold additional and higher quality capital and the measurement of risk has been extended to include risks associated with securitization and counterparty failure, in particular in credit default swaps. The procyclicality of capital requirements is addressed through, firstly, a capital conservation buffer that allows banks to decrease their risk weighed capital ratio from 10.5% to 8% when they face adverse conditions, and, secondly, a countercyclical capital buffer that a country should implement when it is confronted with excessive credit growth. There are two types of liquidity requirements under development -- the Liquidity Coverage Ratio, a measure of a bank’s ratio of high quality liquid assets to cash outflows over a 30 day period, and the Net Stable Funding Ratio, the ratio of available to required stable funding. A separate class of the most important financial institutions – Global Systemically Important Banks (G-SIBs) – are required to hold up to 3.5% of additional capital, depending on their “grade” on several tests of the potential contribution of the institution to systemic risk.

²⁰ See Galati and Moessner (2011).

On the analytic side there is a considerable amount of work in progress looking at the systemic consequences of failures of financial institutions and markets.²¹ This is based on the concept of CoVar which looks at the contribution of an individual institution's risk to systemic risk.²² There are attempts to introduce financial sectors into macroeconomic models including dynamic stochastic general equilibrium models (DSGE),²³ and there are empirical analyses of the effects of macro-prudential regulation on systemic stability.²⁴

Looking through a systemic lens of identification, immunization, isolation and intervention suggests that the focus of policy proposals should be on the following.

- (i) Augmenting regulatory surveillance of marketplace activity to avoid unanticipated threats to systemic stability.
- (ii) Recognizing that a “high capital” regime for global systemic important financial institutions is the systemic stability measure of exclusion and increasing the robustness of financial institutions by altering the tax-based incentives that favor debt over equity financing.
- (iii) Reducing the likelihood of correlated financial distress among financial institutions by augmenting regulatory capacity to force recapitalizations well before the onset of financial distress, preferably through mechanisms that minimize regulatory discretion to trigger them.
- (iv) Developing a credible resolution authority, the goal of which is not just to “resolve” a failing financial institution but to avoid the consequent effects on other financial institutions and to do so in the least cost way.

Effective implementation of these policies requires harmonization across countries if incentives to free ride on the protection provided by others are to be avoided.

(i) Identification. Regulators should be empowered to obtain information necessary for a panoptic view of financial markets. This is particularly significant in light of innovations in credit intermediation and risk allocation and trading. One striking feature of the recent financial crisis is that virtually no one seemed to appreciate the threat that the securitization (and re-securitization) of subprime mortgages created for the world financial system as reflected in Federal Reserve Bank Governor Ben Bernanke's reassurances in 2007 that the subprime problem was “containable”.

Detailed knowledge of these networks should be integral to the supervisors' scrutiny of SIFI's on-going business, in particular the provision of “living wills” that are now part of creating a credible resolution regime. “Living wills” should provide detail on the “family

²¹ See Duffie and Singleton (2003).

²² See, for example, Adrian and Brunnermeier (2009) and Segoviano and Goodhart (2009).

²³ See, for example, Borio and Zhu (2008) and Brunnermeier and Sannikov (2009).

²⁴ See, for example, Gauthier, Lehar and Souissi (2010).

tree,” meaning some accounting of the method and amount of inter-firm linkages, not just derivatives, so that regulators have more information on the residual counterparty exposure.

(ii) *Immunitization.* The financial system has been made unnecessarily fragile by an artificially created preference for debt on the right hand side of the balance sheet. Tax incentives are the driver, since in computing taxable corporate income, interest payments are deductible against earnings whereas dividends are not, making debt finance cheap in relation to equity. There is double jeopardy here: under the current arrangement the tax system skews funding away from equity. Then as financial institutions are threatened with failure, governments provide a further subsidy to bail out failing institutions and protect bondholders. The taxpayer therefore subsidizes bank risk-taking (through the tax deductibility of interest payments) that it then pays for (through bail-outs) as default looms. Apart from its manifest unfairness, this nonsensical arrangement undermines the stability of financial systems by giving banks special incentives to avoid equity.

Distortions between debt and equity can be removed by eliminating the tax deductibility of interest payments, or introducing equivalent provisions on equity. The former raises the cost of financial intermediation by making the interest income of financial institutions taxable while their interest payments are not tax deductible. The latter eliminates the tax cost of equity finance or subsidizes it to encourage equity based financial intermediation. The former has the advantage that it discourages the current layering of debt based financial intermediation and complex interactions between institutions.

High capital is required not just to reduce moral hazard but to augment the capacity of the financial system, including conditional government support, to absorb losses. On this view, whether capital is “costly” is almost beside the point. There is no effective substitute.²⁵

(iii) *Isolation.* Isolating failures requires problems in distressed institutions to be addressed well before there is a risk of insolvency. This allows institutions to be restructured while they are still viable organizations and before creditors seek to withdraw assets. In addition, a significantly positive market value – a deep in the money

²⁵ In effect there has been a role reversal of capital and deposit insurance. Depositors and other creditors of a failing bank had come to look to government insurance for protection. Capital was not the backstop for creditor repayment, but rather the government insurer’s tool to control moral hazard by the insured bank. The financial crisis, in revealing the constrained capacity of the government insurer, has changed this picture. Capital becomes the creditors’ tool to assure protection and repayment. Similarly, capital needs to play the role once assumed by deposit insurance in assuring systemic stability. That is, the main value of deposit insurance has not been in protecting depositors of a particular institution against loss, but rather in assuring depositors of other institutions that no matter what the second round consequences of the first bank’s failure, they were protected. This meant that bank failures could be successfully isolated. If deposit insurance is fiscally constrained, then capital needs to play that stability-providing role. A high capital regime is the only credible way that a large financial institution can protect itself against knock-on effects from the failure of another such institution. Although the capital/deposit insurance reversal may seem more evident from an American perspective because of the longer US experience with deposit insurance, the financial crisis has amply demonstrated the limits of governments in controlling systemic distress and thus the importance of capital to systemic stability.

shareholder option -- discourages financial institutions from gambling for resurrection. By contrast, postponement to a moment of near crisis is an invitation for a negative confidence cascade. As the firm's capital is written down if not by regulators then the market, capital issuance becomes increasingly costly because of the overhang of outstanding debt and because of the negative signalling implications of an equity issue. Among other things, the issuance signals that future earnings are at best uncertain (perhaps because of anticipated write-downs), since if this were not the case the firm could improve its capital position through the build-up of retained earnings from modest reductions in dividends and stock repurchases or through contraction in credit extensions. As parties begin to lose confidence in one large financial institution, speculation begins as to the impact of its potential failure on other institutions and the markets generally.

The counter-cyclical elements of Basel III, which address the permissible level of capital depletion, do not resolve this problem. Counter-cyclical provisioning is meant to smooth the credit cycle, requiring capital build-up in boom times when credit expands and write-offs are low and permitting capital decreases to cover write-downs as the credit cycle turns negative. The conservation buffer, which also covers write-downs, is replenished by limits on discretionary distributions. This may protect a bank against the pressure to make "confidence signalling" distributions from retained earnings when current earnings are feeble or negative, but it does not provide a warrant for regulatory intervention at a less critical point on the slope of financial instability.

Regulators should mandate that firms raise new capital well before a financial crisis is at hand. The US has developed a model of "prompt corrective action" (PCA) to address incipient undercapitalization that is valuable in concept but weak in implementation. After the costly Savings and Loans crisis in the 1980s, the Federal Deposit Insurance Corporation was charged with taking PCA to address bank-specific financial stress on the basis of deteriorating capital levels.²⁶ As a bank falls below the "adequately capitalized" threshold (< 8 percent), the FDIC can require the bank to produce a capital raising scheme, undertaken in the shadow of the FDIC's authority to impose progressively more stringent restrictions (limiting dividend payments and share repurchases, asset growth, and acquisitions). As the bank becomes critically undercapitalized (< 2 percent), the FDIC can exercise receivership powers.

This PCA power obviously did not help much in the recent financial crisis. In part this was because asset valuations on bank balance sheets were not written down to correspond to market values and in part because the then applicable accounting rules permitted dramatic increases in leverage through off-balance entities. For example, Duffie (2009) observes that Citibank's Tier 1 capital ratio never fell below 7% and at the moment of greatest peril, in December 2008, stood at 11.8% -- although the stock market capitalization of parent Citigroup (approximately \$20 billion) amounted to just 1% of its total assets.

This suggests that the mechanism needs to be at least in part automatic rather than discretionary, with triggers based on market measures rather than regulatory initiatives.

²⁶ See Federal Deposit Insurance Act §38, 12 U.S.C. § 1831o.

In this spirit, the convertible contingent capital suggestion of Calomiris and Herring (2011) is worth serious consideration. Their Co-Co proposal would require conversion of non-senior debt into equity designed to produce significant dilution of existing shareholders. The conversion feature is meant to act as a “bazooka” in the sense that management will be able to observe the decline in market measures of the firm’s capital adequacy – market measures like the ratio of equity to assets seem to have significant predictive value – and act preemptively to avoid dilution of their own as well as other existing shareholders’ holdings. The automatic nature of the trigger based on observable market measures reduces the risk of negative signaling. In addition, since the issue of capital occurs long before a solvency threat is on the horizon, it does not raise anxiety about the solvency of counterparty firms or catalyze a lost-confidence cascade.

(iv) *Intervention.* Regulators need resolution authority to address systemically important institutions that do in fact fail. In some cases, deterioration may occur in unpredictable ways and the failing institution may not have previously been denominated as “systemic”.

New powers have been conferred on regulatory authorities to undertake resolutions of failing or distressed institutions. For example, the Banking Act (2009) in the UK establishes a special resolution regime that allows the authorities to transfer all or part of a bank to a private sector purchaser or a subsidiary of the Bank of England pending a future sale, place a bank into temporary public ownership or apply to put a bank into a bank insolvency or administration procedure.²⁷ Dodd-Frank (2010) in the US establishes an “orderly liquidation authority” that gives the FDIC broad authority to resolve a failed SIFI. This is modelled on the FDIC’s authority to wind-up a failed bank. In cases where the SIFIs assets cannot be readily disposed of without great loss in going concern value, the FDIC can establish a bridge bank. Although it cannot inject capital into this bridge bank, the FDIC can use loan guarantees for a similar purpose.

The action of the Swedish government in organizing what has been probably the most successful bank restructuring of modern times suggests that the adverse moral hazard effects of interventions can be avoided by imposing losses on the shareholders and creditors of failing institutions while preventing failures spreading to second round institutions that are creditors of the first round failing institutions. When failures of Swedish banks occurred the government issued a guarantee to all depositors and creditors but not the shareholders of Swedish banks.²⁸ That immediately stemmed any possibility of a systemic failure. In essence by instigating systemic protection measures the government was indemnifying liabilities but not equity capital of the banking system. The advantage of this was that (i) assets could be written down and sold off rapidly (or at a later date if fire sales threaten to depress the value at which assets can be sold), (ii) shareholders bore losses not just in the failing institutions themselves but also in their corresponding creditor institutions, but (iii) creditors of these institutions were protected, thereby avoiding risks of systemic failures. So what this did was to isolate the consequences of failures so that they were not transmitted across the financial system but

²⁷ See Armour (2010).

²⁸ See Englund (1999).

at the same time it imposed losses on shareholders of failing institutions and their creditor counterparts. It therefore significantly diminished moral hazard problems by requiring shareholders not just of the directly affected institutions but also those that were creditors of the failing institutions to share the losses.

This is implicitly the procedure that was also used in the successful intervention to prevent a systemic crisis occurring as a result of the failure of Long-Term Capital Management (LTCM). Although the Federal Reserve Bank of New York did not guarantee creditors of LTCM, it did help organize a rescue of LTCM by which a consortium of fourteen institutions with outstanding claims against LTCM injected new equity capital and took over the management of its assets.²⁹ So in effect, creditors were persuaded that it was in their own interest not to let LTCM fail and to inject their equity capital to prevent this from happening.

The experience of the recent financial crisis was that, to avoid possible systemic repercussions from bank failures, the authorities felt compelled to bail out bondholders as well as depositors. This imposed massive costs on countries' fiscal resources to a point that some countries such as Iceland and Ireland were essentially rendered insolvent from doing so. Furthermore, when determining the nature of their interventions, national authorities failed to take account of the impact of their actions on financial institutions in other countries. So, for example, there was little consideration given by the US authorities to the international repercussions of their decision not to rescue Lehman Brothers on financial markets in Europe and elsewhere.

The current position is therefore in many respects the worst of all worlds. It imposes obligations on national authorities that are in many cases unsustainable and it encourages parochial decision taking that ignores wider international repercussions. Indeed the former problem exacerbates the latter because the only way of extracting themselves from the fiscal burdens is for national authorities to abrogate responsibility for the overseas repercussions of their actions.

The procedures that have been followed to date are therefore financially unsustainable and internationally divisive. Furthermore, in bailing out bondholders as well as depositors, moral hazard problems were made about as acute as they could have been. Anticipating that national authorities would bail them out, bondholders had little concern for the potential failure of the institutions in which they invested. Regulators were therefore caught between the prospects of systemic failures, sovereign insolvencies, international conflicts and moral hazard – not a happy place to be.

The alternative suggested by the Swedish experience is described in Appendix 1. Instead of protecting bondholders of a failing institution, its bonds should be written down; regulatory authorities should, however, stand ready to protect any institution that is subsequently at risk of failing as a consequence of the write-down of the failing institutions' liabilities. In other words, avoid systemic failures by protecting the second round institutions that are at risk as a consequence of their investments in the first round

²⁹ See Scholes (2000) and Haubrich (2007).

failures. That way the costs of failure are shared amongst the shareholders and bondholders of the first round failing institutions and the shareholders of the second round institutions that are creditors in the first round institutions, but not by the creditors of those second round institutions. Systemic effects therefore do not extend beyond the first round institutions.

In sum, this procedure has the property of minimizing fiscal burdens because (a) the assets of the failing institutions can be sold rapidly at maximum prices, (b) shareholders of all affected institutions will share in the costs of the failures, and (c) bondholders in the failing institutions will be written-down. Furthermore, it minimizes moral hazard risks because not only do the shareholders and bondholders of the failing institution lose out but so too do the shareholders in the institutions that purchased the bonds.

Nevertheless, even a minimum cost intervention procedure cannot guarantee that the fiscal capacity exists for governments to be capable of bailing out second round institutions threatened by first round failures. To avoid future failures becoming examples of Iceland rather than Sweden requires financial institutions to be immunized against the failures of others by holding sufficiently large amounts of capital themselves. Harmonization on significantly higher capital requirements therefore emerges as the primary form of absorption to prevent the contagious spread of financial crises from recurring in the future.

Harmonization is particularly important in the context of international banks and national banks with foreign creditors. In these cases, the risks of second round failures will not be restricted to the same national jurisdiction as the home countries of the first round failing institutions. Host countries will in general be better placed than home countries to identify potential contagious repercussions of the failure of foreign institutions for their own institutions, so that at least part of the costs of failure will be borne by host countries. In setting capital requirements, national authorities will not adequately incorporate these cross-border externalities and, as the case of global repercussions of the Lehman Brothers failure illustrates, will not take full account of the global consequences of their actions.³⁰

Harmonization in regard to macro-prudential regulations therefore raises precisely the opposite issues to those of micro-prudential: not only is it desirable, it is essential. It is required in relation to the identification of potential failures, the immunization of failures through setting appropriate capital requirements and avoiding tax distortions to holding debt, the isolation of failures when they occur through PCA and bail-ins, and in organizing interventions when they are needed. Without it, macro-prudential regulation is undermined by regulatory arbitrage and a failure of national authorities to internalize the international repercussions of their actions.

³⁰ Harmonization of capital requirements may facilitate risk sharing between home and host countries and therefore more efficient intervention arrangements.

6. Conclusion

Our argument can be stated thus: regulatory harmonization on the micro-prudential dimension is not desirable and potentially harmful for the cause of systemic stability for international finance. Nevertheless stability requires strong elements of regulatory harmonization on the macro-prudential dimension. This is not only because of the linkages, direct and indirect, among firms but because systemic stability is an expensive public good that invites free-riding.

Bank regulation in general and harmonization of regulation in particular have been misdirected towards micro-prudential issues of individual institutions and especially their corporate governance. Not only do these policies fail to address the underlying systemic problems, they exacerbate them. There are difficulties of identification, unintended consequences and homogeneity associated with micro-prudential rules that create interdependencies and externalities where none previously existed. Regulation, and in particular its harmonization, is therefore causing the very problem that it is seeking to address.

The case for regulatory harmonization is as strong for systemic risk management as it is weak for corporate governance. We need to contemplate the possibility that important financial firms will fail, and create mechanisms that will reduce their systemic costs. Reducing systemic distress costs is directly desirable, but it also has the indirect benefit of increasing the credibility of the threat not to rescue a troubled financial firm and thus of reducing moral hazard.

This paper suggests that refocusing attention to a systemic view of regulation from a micro, individual institution one has profound effects on its design. There remain fundamental deficiencies in information about systemic risks, immunisation of risks, isolation of failures, and interventions to resolve them once they occur. These highlight the need for a harmonized approach to more effective regulatory surveillance; higher capital requirements and elimination of tax incentives to employ debt; earlier recapitalizations of failing institutions; and lower cost resolution procedures.

In particular, neither bondholders nor shareholders in failing banks or the shareholders of their creditor institutions should be protected against risks of losses, while the bondholders and depositors of second round institutions should be protected to avoid failures spreading elsewhere. Automatic bail-ins of, for example, contingent contracts should be used to further isolate failures. While these arrangements will diminish costs of interventions they will not eliminate risks of nations having insufficient taxable capacity to ensure the solvency of second round institutions.

Capital requirements will therefore have to be raised significantly to immunize institutions from risks of contagious collapses spreading beyond first round failures. Harmonization of capital requirements will be particularly important in an international context in which the defence of second round institutions will fall to host as well as home countries and where the costs of failures will therefore not be restricted to the primary

home country regulators. Measures to enhance systemic stability will be costly, thus inviting regulatory arbitrage and, in the absence of international harmonization, the effort to free-ride on the systemic stability provided by others will undermine stability itself. Without the refocusing of regulation on system wide risks and the international harmonization of policies to address them, what was a relatively localized financial crisis three years ago will shortly become a truly global collapse.

Appendix

Minimum Cost Interventions to Prevent Systemic Failures

Let A_i be the non-bank net assets of bank i ; A_{ij} be the credit of bank i in bank j ; and D_{ij} be the liabilities of bank i to bank j . There are three classes of banks. First, there are $N-I$ banks that are insolvent as a result of the asset shock:

$$A_i + \sum_{j=1}^N A_{ij} - \sum_{j=1}^N D_{ij} < 0 \quad \forall i = I+1, \dots, N \quad (1)$$

Second, there are $I-K$ banks out of a total of N banks that are solvent after the asset shock even after the write-down of the liabilities of the first class of banks:

$$A_i + \sum_{j=1}^I A_{ij} - \sum_{j=1}^N D_{ij} \geq 0 \quad \forall i = 1, \dots, I-K \quad (2)$$

Third, there are K banks that would have been solvent were it not for the write-down of the liabilities of the first class of banks:

$$A_i + \sum_{j=1}^N A_{ij} - \sum_{j=1}^N D_{ij} \geq 0 \quad \forall i = I-K+1, \dots, I \quad (3)$$

but would be insolvent as a result of the write-downs of the liabilities of the first class:

$$A_i + \sum_{j=1}^I A_{ij} - \sum_{j=1}^N D_{ij} < 0 \quad \forall i = I-K+1, \dots, I \quad (4)$$

So the first class of banks is insolvent in any event and is closed down with their liabilities written off. The second class suffers a decline in share value of $\sum_{j=1}^N A_{ij} - \sum_{j=1}^I A_{ij}$ but remains solvent. The third class would be insolvent as a consequence of the write-downs and the loss in value of $\sum_{j=1}^N A_{ij} - \sum_{j=1}^I A_{ij}$ but otherwise would not be.

It is this third class that it is the potential cause of systemic risk beyond the immediate failures of the first class. To avoid this, the central authorities inject an amount

$$\sum_{j=1}^N D_{ij} - A_i - \sum_{j=1}^I A_{ij}$$

into each of the K banks. Note that this is less than or equal to $\sum_{j=1}^N A_{ij} - \sum_{j=1}^I A_{ij}$ because of (3), namely that the third class of banks participate in the funding costs through their own equity.

The total cost to the authorities is $\sum_{i=I-K+1}^I \{ \sum_{j=1}^N D_{ij} - A_i - \sum_{j=1}^I A_{ij} \}$ which is the minimum cost at which the restructuring could be undertaken because the liabilities of the first class of banks is written off entirely, the second class bear the full cost of their share and the third class bear as much as they can without themselves becoming insolvent.

Furthermore, the amounts realized from selling the first class of banks' assets $\sum_{j=I+1}^N \{ A_i + \sum_{j=1}^I A_{ij} \}$ are maximized since the assets can be sold unencumbered by any liabilities. Finally, moral hazard risks are minimized because the shareholders of all banks are bearing the costs of the asset shocks and the write-downs of the liabilities of failing banks.

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