

Central Banking and Prudential Regulation: How the Wheel Turns

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ABSTRACT

The financial deregulation which occurred in major Western economies in the 1970s and 1980s freed banks from many pre-existing constraints, facilitating competition and greater risk-taking, and eventually leading to the emergence of prudential regulation and supervision as a specific, well-defined, area of regulatory activity. It was codified in the Basel Accord, which allowed banks considerable discretion in how they met broadly specified regulatory requirements (in the form of an aggregate risk weighted capital ratio) and was focused primarily on individual bank safety. The financial crisis of 2007-8 highlighted numerous weaknesses in the design and application of this approach. The previous micro-orientation has been complemented by a macroprudential focus, suggesting a strengthened case for central bank involvement in prudential regulation. Microprudential regulation has been strengthened, with changes reflecting less confidence in the previous “market-oriented” approach and more reliance on what might be termed “direct controls”. In these, and other ways outlined in this chapter, the wheel has turned such that a number of pre-deregulation approaches and attitudes have been incorporated into the post-crisis design and approach of prudential regulation.

KEYWORDS: Prudential Regulation, Basel, Financial Crisis, Risk Weights, Bank Supervision.

Introduction

Any generic analysis of Central Banking activities is complicated by the international diversity of regulatory arrangements, institutional structures, mandates given to Central Banks, and the state of financial sector development and structure. This is certainly so in the case of prudential regulation and supervision where responsibilities may be shared across, or be the sole responsibility of other, regulatory agencies. And testing hypotheses about the effects of international difference in Central Bank involvement in, or management of, these activities is complicated because, as Barth, Caprio Jr, and Levine (2013) note “measuring bank regulation and supervision around the world is hard”. But there are enough common themes to suggest that a coherent story can be told of how Central Bank prudential regulation responsibilities and activities have developed internationally over recent decades.

Fundamental to that story is the significant impact of the global financial crisis of 2007-8 (and its aftermath) in changing attitudes towards, and practices of, prudential regulation. The wheel has turned, back towards the situation prevailing prior to the period of extensive global financial deregulation which began in the 1970s. It is far from a complete reversal, but there are many elements of recent developments which reflect older approaches to prudential regulation.

While bank supervision had long been an element of Central Bank activities in many countries, the wave of financial deregulation of the 1970s and 1980s initially led to a deemphasising of this role while simultaneously freeing banks from many pre-existing constraints, thereby facilitating competition and greater risk-taking. Together with a number of costly bank failures¹, and concerns of national authorities regarding competitive imbalances from international differences in regulatory standards, discussed by Goodhart (2011), this eventually led to the emergence of prudential regulation as a specific, globally led, well-defined, area of regulatory activity. It was codified in the standards developed under

the Basel Accord which initially focused primarily on individual bank safety and was based upon minimum capital requirements. This micro-orientation, well distant from (and arguably creating potential conflicts of interest with) the operation of monetary policy, led to an increase in international practice of prudential regulation being housed in a specialist regulator separate to the Central Bank.

Although the Basel agenda saw an increasing incorporation of different types of risk in the determination of minimum capital requirements (and increasing complexity of those requirements), the design of regulation reflected in Basel 2, was very much market oriented. The emphasis was on the role of market discipline and (for large banks) use of approved bank internal risk models for determination of capital requirements.ⁱⁱ

It would be difficult to overstate the impact of the financial crisis on attitudes towards prudential regulation and supervision.ⁱⁱⁱ Indeed, the US Federal Reserve Board Governor Tarullo (2014) argued that “the aims and scope of prudential regulation have been fundamentally redefined since the financial crisis”, referring in particular to the increased emphasis on macro prudential policy as well as the need (in his view) for prudential policy to also consider institutions and activities outside of the traditional banking sector.

One of the most significant influences has been the exposure by the crisis of a range of risks which were not adequately recognised in the pre-crisis Basel approach to prudential regulation. Recognition of the role of financial sector interlinkages, network effects and systemic risk has led to a new focus on macroprudential regulation and systemic (financial) stability, complementing the microprudential approach previously applied. This renewed focus on financial stability, argues Bernanke (2013), is a return to the rationale for the origins of central banking – at least in the case of the US Fed. The new emphasis on macroprudential regulation has also stalled, if not reversed, the pre-financial crisis trend towards allocation of prudential regulation and supervision responsibilities to agencies other than the Central Bank,

(Masciandaro 2012) with a notable reversal being the decision of the UK to transfer prudential supervision from the FSA back to the Bank of England in 2012.

Macroprudential concerns have also led to new regulatory changes which aim to influence the shape and structure of the financial sector, which Goodhart (2011) argues was once seen by Central Banks as among their roles. The view that microprudential regulation was sufficient to promote financial stability^{iv}, and that the evolution of financial market structure should be left primarily to market forces, no longer holds such sway.

Microprudential regulation has certainly not escaped unscathed, and views on its appropriate design are currently in something of a state of flux – as evidenced by the ongoing adjustments to the standards prescribed by the Basel Committee for Banking Supervision (BCBS).^v Faith in the risk-weighted assets approach to capital regulation has been shaken with (at least some) regulators looking to place more emphasis on simpler more traditional measures such as unweighted leverage ratios. Faith has also been shaken in reliance on bank internal risk models to (partially) determine required capital, and on allowing bank choice of their preferred response to meeting broad regulatory settings. There has been, arguably, a move back to more of a “command” or “direct controls” approach of earlier decades, reflected in an enhanced role for a (revised) “standardised approach” in the Basel standards.

This shift away from reliance on bank internal risk management practices is particularly apparent in the case of liquidity risk. The crisis highlighted an absence of liquidity regulation in the Basel standards, prompting introduction of new specific regulations involving liquid asset holdings and funding composition requirements. While different in design, this is another example of a reversion to prior approaches and views – including less faith in banks to adequately provide for such liquidity and funding risks.

One feature of the changes in the Basel standards, reversing pre-crisis trends, has been requirements for higher levels, and better quality, of capital, returning emphasis to common equity as core capital. Other forms of eligible regulatory capital have been strictly limited to instruments which can be “bailed-in” or written off if a bank is in distress, and giving the prudential regulator increased discretion and powers.^{vi}

The crisis also highlighted a number of other important issues for prudential regulation, discussion of which are precluded here by space limitations. One is the range of institutions or activities which should be subject to prudential regulation – particularly given increased focus on macro-prudential regulation and systemic stability. Shadow banking, for example, can contribute to financial instability but has not been subject to micro-prudential regulation, while systemic risks can arise from the interactions between capital markets and financial intermediaries. That issue of determining the appropriate boundaries (the “perimeter”) of prudential regulation (which undoubtedly differ for micro versus macro regulation) is further complicated by large banks undertaking activities outside of “traditional banking” and new business models emerging to mimic the functions of banks as a result of “fintech”.

Another important issue has been the ongoing search for design of suitable cross-border arrangements for dealing with prudential supervision and regulation of multinational banking. The crisis highlighted that allocation of supervisory responsibilities between home and host regulators and participation of national supervisors in a College of Supervisors for large multinational banks needs to be complemented by effective multi-lateral resolution arrangements for troubled banks to avoid aggravating a crisis. This is particularly evident in the case of the European Union, where new arrangements (the European Banking Union) have been introduced in recent years involving sharing of prudential supervision responsibilities between the European Central Bank and national authorities (European Commission 2015). Also relevant to these considerations have been the complications caused

by deposit insurance arrangements where, as well as cross agency issues of responsibilities at the national level, national authorities could, under some design structures, be burdened with providing recompense to depositors from other jurisdictions.

This Chapter elaborates on the issues introduced above. First, it considers the general nature of prudential regulation and supervision activities. This emphasises the importance of the distinction between regulation and supervision, and is followed by an overview of Central Bank involvement in prudential supervision. Then a brief recent history of the evolution of prudential regulation is provided, which focuses on how the wheel has turned since the 1970s with initially widespread removal of direct controls on banks, which are now being restored (albeit in different forms). This is followed by more specific analysis of micro-prudential regulation, and then an analysis of macro-prudential regulation. In these analyses, the questions of the need for such regulation, its particular forms, and interaction with other Central Bank activities are considered. The conclusion returns to the general theme of how the wheel has turned, making the approach and practices of prudential regulation somewhat more aligned to those prevailing before the phase of financial deregulation of the 1970s and 1980s.

The nature of prudential regulation and supervision

Polizatto (1992) argued that “prudential regulation is the codification of public policy toward banks, banking supervision is the government's means of ensuring compliance.” Underpinning such regulation and supervision is the desire to ensure safety and soundness of the banking system and to limit the adverse consequences of bad management. This involves placing limits and constraints on banks via legislation and regulation and using supervision as a complement to ensure compliance and prudent behaviour.

As components of prudential regulation policy Polizatto listed matters related to: entry criteria; capital adequacy; asset diversification; insider/connected party dealings; permitted/prohibited activities; asset classification/provisioning; audit arrangements; enforcement powers; resolution powers; and deposit insurance. That list is equally relevant today (although it does not explicitly include regulatory liquidity and funding requirements such as the liquidity coverage ratio (LCR) and Net Stable Funding Ratio (NSFR) requirements introduced as part of Basel 3). However the Basel agenda has tended to lead many towards a narrower perspective for prudential regulation as being about capital requirements (and more recently, liquidity requirements and activity restrictions). Dewatripont and Tirole (1994), for example, in attempting to build a theoretical framework for prudential regulation based on their “depositor representation hypothesis” tend to adopt a similar narrow focus.

Identifying what prudential regulation involves does not provide a rationale for why regulation is needed nor what form it should take. (Brunnermeier et al. 2009) indicate that:

“[t]raditional economic theory suggests that there are three main purposes [of regulation].

1. to constrain the use of monopoly power and the prevention of serious distortions to competition and the maintenance of market integrity;
2. to protect the essential needs of ordinary people in cases where information is hard or costly to obtain, and mistakes could devastate welfare; and
3. where there are sufficient externalities that the social, and overall, costs of market failure exceed both the private costs of failure and the extra costs of regulation.”

Prudential regulation is primarily premised on the latter two of these reasons. Information asymmetries abound in banking where opacity of bank balance sheets is prominent.^{vii}

Customer protection from mis-selling is one potential consequence – although this is typically regarded as being outside of the “prudential” domain. It is often the responsibility of a securities regulator or consumer protection agency, with a recent trend being the establishment of specialist Financial Consumer Protection agencies in a number of jurisdictions (including China and USA). Similarly, market manipulation (such as recent bank rate-rigging scandals) and (perhaps unwitting) facilitation of illegal transactions (such as money laundering or terrorist financing) typically fall outside the prudential domain^{viii} – although bank governance failings which enable (or induce or encourage) those activities are of (increasing) interest to prudential regulators.

Another consequence is the potential for information failures, in conjunction with bank balance sheet features, to lead to instability – such as the potential for bank runs (Diamond and Dybvig 1983). Information problems can also lead to significant agency problems between depositors and bank owners/managers. Potential incentives for increased risk taking by bank owners (particularly when depositors, or other creditors, are protected by implicit or explicit government insurance) are one common rationalisation for prudential regulation. Dewatripont and Tirole (1994) also note the problem of reduced market discipline arising from free-riding by depositors who are unable to assess relevant information, and emphasise their “representation hypothesis” (that small depositors need an agency to represent them in monitoring, intervening and dealing with cases of failure) as a rationale for prudential regulation.

An alternative view is found in Benston and Kaufman (1996) who argue that “banks should be regulated prudentially only to reduce the negative externalities resulting from government-imposed deposit insurance”. They argue that a requirement for prompt intervention and ultimately resolution if a bank’s capital ratio falls below some minimum requirement are sufficient to offset the moral hazard arising from deposit insurance. Their preference for

market based solutions and requirements for regulatory action based on pre-specified balance sheet developments is to some degree reflected in recent Basel requirements which introduce “bail-in” requirements for bank hybrid securities if they are to be eligible as regulatory capital. While the above quote from Benston and Kaufman refers only to explicit deposit insurance which has become common around the world (Demirgüç-Kunt, Kane, and Laeven 2013), a more pressing problem has been the role of “implicit insurance” in the form of perceptions that governments will “bail-out” failing banks, particularly those deemed too big to fail (TBTF). The actual bail-outs which occurred during the financial crisis have led to more stringent prudential regulation designed to limit the likelihood of bail-outs and also the consequent competitive benefits and moral hazard risks of TBTF banks.

Brunnermeier et al. (2009) suggest five relevant externalities from financial institution failure in potential support for regulation: (a) information contagion; (b) loss of access by customers to future funding; (c) financial institution and market interconnectedness, leading to; (d) pecuniary (asset fire-sale price effect) externalities, and; (e) deleveraging consequences for real economic activity. In regard to externalities leading to systemic risk and motives for macro-prudential regulation, De Nicoló, Favara, and Ratnovski (2012) expand upon interconnectedness effects. They identify strategic complementarities (where correlated risks arise in an upswing) and propagation of shocks, as well as fire sales with destabilising asset price and balance sheet consequences as important.

Increasing attention to the significance of these externalities and their consequences for financial sector (and economic) stability are characteristics of the post-financial-crisis literature on banking and motivation for macroprudential regulation (Brunnermeier, Eisenbach, and Sannikov 2012). Indeed, the World Bank (2013) suggests that “[f]inancial sector regulation and supervision are areas where the role of the state is not in dispute; the debate is about how to ensure that the role is carried out well.”

Prudential regulation is one component of a triumvirate of legislation, regulation and supervision which together constrain (or define permissible) activities of banks. Legislation (the “rule of law”) sets the overarching framework and provides regulators with powers to make (and enforce) regulations. It is one feature of the Basel agenda that despite significant international differences in legal systems, a largely common framework for prudential regulation has been widely accepted. But, at the other end of the triumvirate, international differences exist in the nature, responsibility for, and quality of prudential supervision.

Concern about the ability of supervisory agencies to effectively monitor compliance with prudential regulations is a common theme internationally. Even in relatively well-resourced supervisory agencies in advanced economies, the increasing complexity of the financial sector and regulatory requirements place strains on ability to attract sufficient expertise. These problems are even more marked in developing and emerging market economies where often the desirable characteristic of independence of the regulator from political interference is lacking, and strong legislative underpinnings for regulatory powers may be absent. In this regard, it is surprising that Barth, Caprio Jr, and Levine (2013) find that 45 per cent of 125 countries in the World Bank 2011 Global survey of Bank Regulation reduced supervisory powers after the financial crisis – although most increased the stringency of regulation.

The Role of the Central Bank in Prudential Supervision

One complication facing all nations is the appropriate structure of supervisory arrangements. Financial sectors involve a range of financial products and services created to provide particular economic functions and which are provided by a wide range of financial institutions and markets. In principle, “functional” regulation, ensuring consistent treatment of products and firms performing the same economic function, has appeal, but is difficult to implement in practice.^{ix} Consequently, financial regulation typically focuses on types of institutions or types of products – with prudential regulation generally more focused on

institutions, and securities markets regulation more product/activity focused. Ensuring consistency and avoiding regulatory “gaps” in a world of financial innovation is difficult, particularly given the substantial cast of actors in the regulatory family which can include central banks, prudential regulators, insurance regulators, securities market regulators, deposit insurers, and financial consumer protection agencies.

Different jurisdictions have adopted varying allocations of responsibilities among regulatory institutions, including integrated (prudential and securities) regulators and “twin-peaks” (separate prudential and securities regulators) approaches, with Central Banks either taking on one or more of these roles or being limited to monetary policy, payments systems oversight, and stability functions.^x Others have multiple specialized regulators, raising questions about coordination – an issue of increased importance given the emphasis being placed upon macro-prudential regulation, whose natural home appears to be the Central Bank but which can involve adjusting regulatory requirements which are under the responsibility of prudential or securities regulators.

While the GFC showed up deficiencies in some regulatory structures (and has led to changes in institutional arrangements and responsibilities in some cases) there is no clear answer to the optimal regulatory structure (BIS, FSB, and IMF 2016). But the need for ensuring regulatory cooperation has led to creation of institutions such as the Financial Stability Oversight Council (FSOC) in the US and the European Systemic Risk Board (ESRB) to ensure system-wide oversight arrangements.

International standard setters appear agnostic on whether prudential supervision should be assigned to the Central Bank. In the Basel Committee’s latest version of its Principles for Effective Banking Supervision (BCBS 2012), there is no reference to any particular set of institutional arrangements other than requirements for clear powers, responsibilities, independence, adequate resourcing etc. It notes that, as long as they do not create a conflict

with the primary objective (of promotion of bank safety and soundness) of bank supervision, the supervisor might “be tasked with responsibilities for: (i) depositor protection; (ii) financial stability; (iii) consumer protection; or (iv) financial inclusion.”

Čihák et al. (2012) provide an overview of international differences in the role of the Central Bank in prudential regulation (as at 2011-12), and highlight a significant difference in the allocation of responsibilities between emerging market and developing economies (EMDEs) and advanced economies. In the former, the Central Bank is most commonly the bank supervisor (around 75 per cent of cases), whereas it has that role in less than 40 per cent of cases in advanced economies – where other specialised supervisory agencies are found nearly 50 per cent of the time. There are a relatively limited number of situations, with the USA being the most notable, where bank supervision is spread across multiple agencies including the Central Bank.

The US case highlights the fact that allocation of supervisory/regulatory responsibilities is to a significant degree historically path dependent as discussed in the more general context of banking structure evolution by Calomiris and Haber (2014). While there have been numerous analyses of the merits of alternative allocations of supervisory responsibilities, ultimately national political factors (including vested interests of existing regulators) are crucial determinants of the allocation of roles and powers. That case also highlights the potential risk that US academic research into banking regulation and supervision which dominates the literature may be less relevant to non-US experience, a concern also reflecting the internationally atypical (both geographical and organisational) structure of the US banking sector.

Arguably, the same jurisdiction-specific situation applies in the case of the EU, where concerns over cross-border supervision and resolution (and deposit insurance) arrangements were brought to the fore by the financial crisis and its aftermath. This led to agreement in

2012 for a European Banking Union framework compulsory for the 19 Euro Area States and optional for other EU members. This has three components.^{xi} One is the Single Supervisory Mechanism (SSM) which in November 2014 formally recognised the ECB as the prudential supervisor of member state banks. In practice, the ECB has taken on responsibility for a designated group of large banks with national authorities (either a Central Bank or specialist supervisor) having responsibility for other institutions. (Schoenmaker et al. (2016) provides details and an appraisal of how the changes have worked in the initial years of implementation). The second feature is the Single Resolution Mechanism (SRM) which came into operation at the start of 2016. A Single Resolution Board (involving national, SSM, and EU representatives) is to oversee resolution activities, as required by the SSM, of the national resolution authorities. The SRM also involves the creation of a single resolution fund financed by *ex ante* contributions by banks to facilitate resolution arrangements. The third component is the development of a European Deposit Insurance Scheme to eventually replace national schemes in 2024, with transitional arrangements involving reinsurance and co-insurance between national schemes in the interim.

Goodhart and Schoenmaker (1995) provide an analysis of the arguments for and against separating responsibility for monetary policy and bank supervision. Among the arguments for allocating bank supervision to the Central Bank is the suggestion that aggregation of confidential bank-level information derived from supervision can be useful for the implementation of monetary policy. This could result from improved macro-economic forecasts or from anticipation of bank lending trends. Peek, Rosengren, and Tootell (1999) find that such supervisory information was relevant for the US FOMC policy decisions, but are unable to ascertain the relative importance of those two channels . They argue that the greater role of bank intermediation in most other countries might make integration of supervision with the central banking role even more important – given difficulties in sharing

confidential information among agencies. And while Yellen (2009) does not comment on the appropriate allocation of responsibilities, she notes that if macro-prudential regulation is to fulfil a role of anticipating and preventing systemic problems, it requires massive collection and interpretation of data from the broader financial sector.

Another argument is that the role of the Central Bank as Lender of Last Resort creates a natural synergy between bank supervision and central banking. In line with the view of Bagehot (1873) that the central bank should lend (at penalty rates on good security) to illiquid but otherwise solvent banks, the role of bank supervision provides the information needed to perform that role. More generally, it is the conventional wisdom that the insurance feature of the lender of last resort (LLR) role creates moral hazard and increases bank risk-taking. If so, allocating prudential supervision to the Central Bank may have some merit, although (Repullo 2005) demonstrates that while the LLR operations may reduce bank liquid asset holdings it does not necessarily lead to an increase in credit risk (arguably the primary concern for prudential supervisors).

A contrary view is that simultaneous responsibility for bank supervision and monetary policy may lead to conflicts of interest. In particular Central Banks may be inclined to adopt more accommodative monetary policy if concerned about risks of bank failures. There have been a number of studies which have attempted to test this conjecture through international comparisons. There is some slight evidence of a positive correlation between inflation levels and a central bank supervisory role (Di Noia and Di Giorgio 1999). Other studies have found relationships between a central bank supervisory role and bank safety and stability. One is a positive correlation between levels of banks' non-performing loans and central bank involvement in supervision (Barth et al. 2002) which appears at variance with the finding of Goodhart and Schoenmaker (1995) of combined supervision regimes tending to have less bank failures. Other studies emphasise a significant role for the level of regulatory

independence and other legal and institutional features in determining financial sector stability. Of particular note, Masciandaro, Pansini, and Quintyn (2013) find that indicators of supervisory unification and effective governance of regulatory institutions did not have a positive association with a country's economic resilience during the financial crisis, pointing to the need for ongoing research in this area.

Recent Pre-crisis Developments in Prudential Regulation: An Overview

Prior to the deregulatory trend which took hold in the 1970s through to the 1990s, banking and supervisory policy had for some time been largely based on the application of direct controls to bank activities which restricted the role of market forces. Banks may have occasionally got into financial difficulty, but (compared to more recent times) they had relatively little flexibility to engage in substantive risk-taking. Boot, Dezelan, and Milbourn (2001), for example, argue that the “traditional regulatory approach to Western banking implicitly guaranteed stability by reducing competitiveness” (p50), a view also expressed by Dean and Pringle (1994) and Goodhart (2011) . Techniques varied from country to country, but generally consisted of such restrictions as: credit (lending) controls; liquid asset (reserve) requirements; interest rate controls; activity and portfolio restrictions; minimum capital requirements. Banking markets were also often characterised by entry barriers (particularly for foreign entities, but also by constraints on branching) and in many countries state ownership was significant. The operation of market forces in foreign exchange markets and securities markets were also constrained. Ultimately, however, the forces of competition and regulatory avoidance combined with the dominance of free market ideology to make financial liberalisation both necessary and seemingly optimal – at least in Western countries. In much of Asia, following the Asian financial crisis of the late 1990s, more direct regulation and restrictions tended to prevail.

Prior to the “new era” of prudential regulation based around the Basel Accord, Central Banks took, to differing degrees, responsibility for banking supervision and implemented it in different ways.^{xii} Ultimately, since they would be responsible for clearing up the mess associated with banking failures, there was incentive to reduce the likelihood of such eventualities. In the UK, the Bank of England for many years operated a largely informal approach to supervision relying on “moral suasion”. This was gradually supplemented with increasing legal powers (particularly in the 1979 Banking Act) including requirements for bank auditors to provide information to the Bank. In many British Commonwealth countries, similar approaches prevailed. In the USA, in contrast, bank supervision was fragmented across a range of institutions including the FDIC, OCC, Federal Reserve banks and State regulators, and relied more on on-site inspection and use of metrics such as CAMEL ratios. Polizatto (1992) attributes the different approach to the UK model partly to the role of branch banking “internalising” some part of the supervision within the bank rather than requiring regulatory attention to a multitude of small banks. In Europe, more emphasis was placed on formal ratio requirements with auditor responsibility for informing regulators of the situation. Abiad, Detragiache, and Tressel (2008) provide an overview of the international deregulatory/financial liberalisation experience based on an IMF Survey covering 91 countries over the period 1973-2005. For the advanced economies, liberalisation occurred from the early seventies (or before) and was largely completed by the mid-1990s, whereas for developing and emerging market economies it was more a phenomenon of the late 1980s through till the 2000’s. Notably they “find that regulatory and supervisory reforms remain relatively less advanced even many years after the beginning of financial reforms.” And the experiences of some major bank failures were part of the motivation for a refocusing of banking regulation on what Boot, Dezelan, and Milbourn (2001) refer to as an indirect approach to regulation which “seeks to *induce* the desired behaviour”, rather than prohibiting

undesired behaviour. The Basel Accord risk based capital requirements were one element of this as, to lesser degree in practice, were risk based premiums for deposit insurance.

The history of the Basel Committee is well described in (BCBS 2015a). Formed in late 1974 and comprising the G10 Central Bank Governors, its membership has been expanded (in 2009 and 2014) to include 28 jurisdictions as at 2016. More than half of these have the head of a separate supervisory agency as well as a Central Bank governor as representatives, while the EU as well as a number of its constituent countries is also represented. The initial focus of the Committee was on cross-border supervisory cooperation, leading to the 1975 *Concordat*. This introduced the allocation of responsibility for foreign branches to the home supervisor and for foreign subsidiaries to the host supervisor. Despite many additions and alterations to the Basel standards over time, that allocation remains fundamental to the current structure of prudential supervision across national boundaries.

Possibly the most fundamental impact of the Basel Committee on prudential regulation and supervision was the introduction of the Basel Capital requirements (now generally referred to as Basel I) in 1988. This focused attention on the role of minimum capital requirements in prudential regulation, where risk weights were applied to credit exposures to, ideally, make required capital reflect risk-taking by the bank. Over time the range of risks reflected in the requirements has been expanded to include market (trading) risk, operational risk, and interest rate risk in the banking book (IRRB). Risk weights, the minimum risk weighted capital ratio, and definition of eligible capital have all undergone substantial changes over time. That process commenced in 1996 (with incorporation of trading book market risk), and subsequently led to Basel 2 (2006), Basel 2.5 (2009), and Basel 3 (2010). There have been a number of substantive changes introduced or proposed from late 2014 which are sometimes referred to (although not by the Basel Committee) as Basel 4.

As part of this journey, a two-tier approach emerged (initially in the 1996 market (trading book) risk capital requirements, but more generally in Basel 2 in 2006). Some larger banks were accredited to use “internal risk models” (in conjunction with some Basel assigned parameters) in determining minimum capital requirements, whereas capital requirements of other smaller banks were determined (at comparatively higher required capital levels) using a formulaic “standardised” approach.^{xiii} Many of these ongoing changes in regulatory standards reflected recognised shortcomings of earlier approaches (including inadequate risk sensitivity, inappropriate risk weights, concerns over use of bank internal models – which were initially viewed as providing better risk assessment, and eligibility of non-equity securities as regulatory capital). These issues came to the fore in the financial crisis of 2007-2009, prompting Basel 2.5 and Basel 3 and subsequent changes.

One important feature of the Basel approach was the emphasis upon risk-weighting in determination of required capital. This reflected concerns over the potential for regulatory capital arbitrage under a simple (unweighted) leverage requirement, by holding higher risk assets. While appropriately risk-weighted deposit insurance premiums could, in principle, penalise unwanted risk-taking, most schemes did not involve premium structures which contained the required level of risk sensitivity. Moreover several analyses, such as Flannery (1991) and Pennacchi (2006), pointed to the need for both risk-weighted capital requirements and risk based insurance premiums to induce the desired level of risk-taking.

Basel 2 also formalised the notion of prudential regulation involving three pillars of minimum capital requirements, effective supervision, and market discipline. Arguably, there were failings on all three pillars in the lead-up to the financial crisis, which also exposed other deficiencies in this focus of prudential regulation. In particular, deficiencies in bank liquidity risk management and system liquidity-relief techniques became apparent, as did inadequacies in crisis management and bank resolution powers (including problems of

TBTF), and lack of attention to systemic risk due to the micro (bank specific) focus of prudential regulation.^{xiv}

Consequently, the financial crisis has led to a significant shift in the approach to prudential regulation at both the micro-prudential and macro-prudential level – and with increased attention paid to the latter. The following section focuses on some recent changes at the micro level, and that is followed by an analysis of macro-prudential regulation developments. It should, however, be noted that a clear division of prudential regulation tools and techniques into micro and macro categories (which refer more to policy objectives) is not really possible. (The introduction of “bail-in” requirements for eligibility of hybrid instruments as allowable capital is one example – which is considered under the macro-prudential discussion).

Post-crisis developments in micro-prudential regulation

The changes introduced successively in Basel 2.5, Basel 3, and Basel 4 have been substantial and wide-ranging. The recalibration of risk weights and capital requirements, and introduction of liquidity regulation have involved a significant tightening of microprudential regulation. It has also involved some shift away from the Basel 2 approach of rewarding and partly relying on good, advanced, risk management practices in banks, and towards increased regulatory specification of required standards.

Space precludes providing details of all the regulatory changes involved, but they can be summarised as follows.^{xv} First, higher levels and better quality of regulatory capital have been mandated, with increased focus on common equity (Common Equity Tier 1 capital) and “bail-in” requirements imposed for eligibility of other instruments as Additional Tier 1 or Tier 2 capital. Several capital buffers have also been introduced. One (discussed later under the heading of macro-prudential regulation) is a counter-cyclical capital buffer. A second is a capital conservation buffer (of an additional 2 per cent). Limitations on distributions

(dividends and bonuses etc) apply if the capital conservation buffer is breached. This has the objective of ensuring that capital is not extracted from the bank at times of stress, reducing the buffer to absorb losses.

Risk weights have been adjusted and, generally increased, and reduced confidence in a reliance on a risk-weighted approach to capital requirements reflected in (forthcoming) implementation of a supplementary leverage ratio requirement. That reduced confidence, particularly with regard to bank internal risk models, also finds reflection in reduced scope for use of the internal models approach (rather than a (revised) standardised approach, where regulators determine all relevant parameters) and less benefits from its use. Those lower benefits stem from changes in relative risk weights in the two approaches and the Basel 4 proposed introduction of “capital floors” linked to the revised standardised approach.

Additional capital requirements for G-SIBS and D-SIBS which use the internal models approach, also reduces the benefits from that approach for those banks relative to the standardised approach. Finally (albeit ignoring other changes such as “living will” (resolution and recovery plan) requirements), the other major change has been the introduction of specific liquidity requirements.

Liquidity Regulation and Central Bank Operations

One of the most significant recent developments in the Basel standards has been the introduction of specific liquidity regulation requirements. This reflects two features of the crisis experience. First banks had come to rely largely on “liability management” rather than “reserve asset” management for liquidity purposes, reflecting the perception that funds could be obtained either from issuing new liabilities into wholesale markets or selling holdings of securities into the capital markets. The freezing up of capital markets in the financial crisis illustrated the risks associated with this strategy, both for individual banks and for financial

stability. (Brunnermeier and Pedersen (2009) analyse the way in which market and funding liquidity interact to generate liquidity spirals). Second, banks had undertaken excessive liquidity transformation (long term assets financed by short term liabilities) not consistent with prudent management.^{xvi}

Consequently, new Basel standards involved the introduction of a Liquidity Coverage Ratio (LCR) and a Net Stable Funding Ratio (NSFR). The former requires holding of high quality liquid assets (HQLA) which would be sufficient to meet “stress scenario” outflows of funds over a 30 day period – where different assets are given liquidity weights (to reflect ability to convert into cash) and scenario outflows reflect relevant features of balance sheet composition. The NSFR essentially requires that there is some correspondence between the durations of the asset and liability sides of the balance sheet, such that a greater proportion of longer term assets requires greater use of funding which is more stable (by virtue of being longer term or more reliable due to customer characteristics).

Keister and Bech (2012) model the consequences of the introduction of the LCR for the modus operandi and effectiveness of monetary policy. Among these they note that central bank dealings in HQLA may have greater effects on overnight interbank rates, and differential term structure effects, than dealings in non-HQLA. These effects depend, *inter alia*, upon institutional characteristics of banking system balance sheets and central bank liquidity facility arrangements (such as eligible collateral for repos) and indicate a need for more analysis of these issues – which may be relevant for improved understanding of consequences of non-conventional monetary policies and quantitative easing.

More generally, the question arises of the role of liquidity regulation in reducing the risk of bank runs and its interrelationship with the lender of last resort function of the Central Bank. Diamond and Kashyap (2016) consider this problem, adapting the model of Diamond and Dybvig (1983) to allow for bank liquid asset holdings to provide a return greater than that

from early liquidation of a long term loan. Within their framework they are able to examine different forms of liquidity regulation, and provide some rationale for LCR and NSFR type requirements as mechanisms contributing to less likelihood of bank runs. There is scope for much more analysis of these interrelationships, including the relationship between liquidity regulation, lender of last resort facilities and deposit insurance as contributors to reducing the likelihood of bank runs.

Bank Capital Requirements and Central Bank Operations

The Basel 2 framework was agreed by the Basel committee in 2006 (after a long gestation period) for introduction by 2008, and recognised “three pillars” of prudential regulation. The first was capital requirements and risks covered were extended beyond credit and market risk to include operational risk and (at regulator discretion) interest rate risk in the banking book. More risk-sensitive asset weights were introduced, together with a two tier approach whereby larger “more sophisticated” banks could use their internal risk models (once approved by the regulator) in determining risk weights, rather than following the “standardised” approach where the regulator determined the risk weights. This development also involved regulatory capital concessions for the internal models approach with the objective of providing incentives for banks to improve internal risk management processes. The second pillar was effective supervision, and the third pillar was disclosure and market discipline.

The financial crisis exposed serious deficiencies in the new Basel 2 capital requirements. Risk weights applied to credit exposures were still not appropriately calibrated, hybrid instruments allowed as regulatory capital did not provide the loss-absorption capacity expected, and capital levels were generally inadequate. The Basel 2.5 and Basel 3 changes attempted to address these issues, as well as concerns about inadequate risk disclosures and market discipline, and the internal models approach allowing banks to “game the system”.

That latter concern led to the proposal for use of a (non-risk weighted) leverage ratio requirement as a back-stop to the risk-weighted capital requirement. The latter, in turn, was increased substantially, with higher requirements for common equity tier 1 (CET1) capital, and introduction of a “bail-in” requirement for any hybrid securities to be included as additional tier 1 (AT1) or tier 2 (T2) capital.

More recently, the “Basel 4” proposals have suggested a partial shift away from a regulatory approach focused on use of bank internal models and granular risk weighting of capital requirements. As well as the non-risk-weighted leverage ratio requirement of Basel 3, the BCBS has proposed “capital floors”, set at some level below those applicable if the revised standardised approach were to be applied, for banks using advanced approaches. Similarly, limitations on the use of internal models for some credit portfolio exposures (and for operational risk), is also interpreted by many as a backing away from a risk-sensitive approach.

One consequence of substantially higher capital requirements is the potential implication for monetary policy which has traditionally been viewed as operating by affecting available bank reserves and short term policy interest rates and thus bank incentives and ability to extend credit. In that view, the capital position of banks did not act as a constraint on bank lending. Under Basel 1 and Basel 2 that situation also prevailed, with most banks operating with economic capital levels in excess of the regulatory minimums. Ultimately increased lending would require higher capital to maintain a desired economic capital position, but in the short run this was not a constraint. A number of studies summarised in Borio and Zhu (2012) have examined the potential role of a bank capital channel for the monetary transmission mechanism, with the primary factor being the effect of interest rate changes on bank profitability, cost of capital, and thus incentives to raise additional capital with greater effects when the capital constraint is binding.

With Basel 3 and 4 (and TLAC) higher capital requirements it is arguable that regulatory capital now exceeds economic capital and is more likely to be a binding constraint. While banks will operate with a precautionary buffer of capital above the regulatory minimum, unwillingness to allow that buffer to decline substantially may reduce the short term responsiveness of lending decisions to traditional monetary policy, and make those decisions conditional on ability to raise additional capital. In this regard the “capital threshold effect” on bank behaviour discussed by Borio and Zhu (2012) may have been increased by the higher capital ratio requirements of Basel 3 and 4. In addition the “capital framework effect” they identify, in which loan terms and conditions are affected by the relationship between risk and implied cost of funding, may have become more significant as regulatory capital replaces economic capital as the primary influence. Borio and Zhu also point to the effect of risk-sensitive capital requirements in creating a “risk-taking channel” for monetary policy through which changes in monetary policy influence the risk premia incorporated into bank loan pricing and loan terms and conditions.

One on-going concern regarding the Basel approach to prudential regulation has been the tendency for capital requirements to induce pro-cyclicality, resulting (*inter alia*) from risk weights derived from internal models varying inversely with the health of the economy or financial asset prices. Then, for example, reductions in capital buffers as an economic downturn occurs could aggravate that situation due to reduced bank willingness to lend. Yellen (2009) argues that while monetary policy could play a role in attempting to offset swings in financial asset prices, this would compromise the focus of monetary policy (away from real sector outcomes), and that a better approach is the design and implementation of suitable macro-prudential policy instruments for achieving financial stability.

Macro-prudential Regulation

An important feature of the evolution of the Basel agenda has been an increased emphasis on systemic stability or macro-prudential regulation rather than, as was the case with Basel I, virtually exclusive focus on individual bank solvency. Macroprudential regulation is a term which emerged in the late 1970s (Clement 2010), but which did not come into general prominence until the early 2000's and achieved particular prominence at the time of the financial crisis. While some of the macroprudential tools available are part of the Basel regulatory framework, there are others which are not, and which may reflect specific national concerns.^{xvii}

Macro-prudential regulation brings the issue of banking supervision arrangements more closely into alignment with the traditional responsibilities of Central Banks for financial system and economic stability. Basel 3 in particular adds a system stability focus to capital requirements in four ways. These are: introduction of countercyclical capital buffers; capital incentives for use of Central Clearing Counterparties (CCPs) for derivatives trades; higher capital requirements for financial sector counterparty exposures; identification of certain banks as globally systemically important banks (G-SIBs) to which higher capital requirements are applied. The last of those requirements is complemented by the introduction of Total Loss Absorbency Capacity (TLAC) requirements, implying much higher regulatory capital requirements. In November 2015, the Financial Stability Board (FSB) released final details imposing a minimum TLAC requirement for G-SIBs of 16 per cent of RWA to apply from January 2019.^{xviii} In some jurisdictions, similar TLAC requirements will be applied to domestically systemically important banks (D-SIBs).

Regulatory responses to implement macro-prudential regulation involve both a “time-series” and “cross-section” perspective. The time-series perspective involves regulations and actions which adjust to the state of the financial sector with the objective of reducing financial cycles.

This involves a fundamental change from the pre-crisis consensus view of Central Banks that the appropriate way of dealing with apparent bubbles was to manage a smooth adjustment when a bubble burst. Underpinning that view was the belief that central bankers were no better placed than market participants to reliably identify whether inflation of asset prices was due to fundamentals or constituted a bubble.

The new paradigm involves regulatory parameters which adapt to the state of the financial cycle, such as the countercyclical capital buffer, whereby the regulator can impose an additional capital requirement of up to two percent depending on the state of the financial sector. In a period of excessive growth in asset prices, the buffer would be increased to “lean against the wind”, and would be reduced if a decline in asset prices threatens stability. Thus asset price inflation has been implicitly added as an additional consideration to the usual target of (goods and services) price inflation of Central Banks, although the Basel Committee proposed a specific linkage between excessive credit growth (relative to trend) and the size of the capital buffer. How regulators will balance competing macro and micro prudential considerations when a financial downturn occurs (and micro, bank safety, considerations point to ensuring high capital ratios) remains to be seen.^{xix}

A resulting question is whether changing bank capital requirements will affect the supply of bank credit and, if so, whether this will be offset by changes in the supply of credit from unregulated sources. Aiyar, Calomiris, and Wieladek (2014) investigate this issue using UK data, where time-varying capital ratios have been applied since the introduction of Basel 1. They find that the supply of bank credit does respond to changes in capital requirements but that this effect is partially offset by changes in the supply of credit from other sources.

The countercyclical capital buffer measure raises important issues for international coordination, because it is inherently determined at a national level, yet applicable to

international banks operating in that jurisdiction. Such banks could find that there are varying (and variable) capital requirements applying to their operations in different countries.

Other practical issues arise regarding usage of the counter-cyclical capital buffer, including regulatory willingness to reduce capital requirements as the financial cycle moves into a downturn. Announcements that there is to be an increase in the capital buffer can also be expected to have effects on bank equity markets by changing expectations about potential new equity issues. There is also the risk that banks may respond to such a change by shifting asset portfolios toward lower risk weighted assets, such as housing, which may worsen asset price bubbles which the change is supposed to offset.

Potential changes to loan loss provisioning requirements are also relevant, with Basel requirements for a focus on expected losses, conflicting with, and inducing changes in, accounting standards which had previously been more backwards looking.^{xx} Also relevant are margin requirements and haircuts in securities lending arrangements and collateralized lending (such as repos) which the CGFS (2010) study and suggest could be adjusted to reduce procyclicality and systemic risk. This involves regulations which cover both banks and other participants such as broker-dealers, custodians, and hedge funds engaged in these markets.

Usage, and understanding of the efficacy, of macroprudential tools in the modern financial world is somewhat in its infancy. Cerutti et al. (2016) provides information on the global use of macroprudential tools over the period 2010-2014. Loan to valuation ratio and reserve ratio changes had the most instances of loosening and tightening (with mixed correlations with monetary policy changes), while changes to capital requirements have been more common, but reflect in large part the ongoing introduction of new Basel requirements.

The cross-sectional perspective to macro-prudential regulation reflects the increasing recognition that the financial sector may beneficially be viewed from a network perspective involving a complex set of interactions and feedback effects between participants. Shocks to the system may be amplified or ameliorated by the structure of interlinkages, while complexity of the system can reduce transparency and create uncertainty in times of stress. There is thus potential merit to policies which involve influencing the structure of the financial sector to reduce systemic spillovers. These include such things as introduction of CCPs, activity restrictions on banks (Volcker Rule), structural separation (Vickers approach), specific taxes or imposts (capital surcharges) on TBTF or systemically important institutions. Contingent capital and “bail-in” debt also are relevant in this regard.

The problem of understanding the cross-sectional linkages in the financial sector has prompted substantial research on “network” features of the financial system and identification of financial firms acting as important “nodes” in the transmission of disturbances. Biais et al. (2012) provide a recent survey of metrics which have been developed to identify systemic risk factors, but note that the relative infrequency of financial crises makes it difficult to empirically test the relevance of theories regarding systemic risk. They also note that systemic risk can arise in different parts of the financial sector (and affect all parts), creating complications when different regulatory agencies have responsibilities for different institutional groups or financial products. This may suggest the need for a lead regulatory agency to take responsibility for macro-prudential regulation and systemic stability, with Central Banks well placed to take on such a role, or ensuring good communication and coordination between regulatory agencies.

More generally Galati and Moessner (2011) note that there is little agreement on appropriate tools for macroprudential policy, but that many tools of fiscal and monetary policy are relevant, as may be various forms of capital controls as measures to limit the build up of

system-wide currency mismatches. Claessens (2015), also notes that “the set of policies currently being considered is mostly based on existing microprudential and regulatory tools [i.e., caps on loan to value (LTV) ratios, limits on credit growth (CG), additional capital adequacy requirements, reserve requirements (RRs), and other balance-sheet restrictions]” Another potential tool is the application of variable maximum loan-to-valuation ratios for some types of lending such as housing to financial institutions. Notably such measures suggest some willingness to move back towards “direct controls” and increased regulatory discretion rather than reliance on “incentives” such as risk weighted capital requirements.

Increased regulatory discretion is also involved in the major change implemented with Basel 3 that non-common-equity securities could only qualify for AT1 and T2 regulatory capital status if they contained “bail-in” provisions. Those provisions involve mandatory conversion (or write-off) of the instrument if a “trigger” event occurs, which could be either breach of a specified risk-weighted capital ratio or regulatory declaration of a point of non-viability (PONV) of the bank. The objective is to achieve recapitalisation of a troubled bank, enabling resolution without a government/tax-payer bail-out.^{xxi} Flannery (2014) also points to a potentially important role of “bail-inable” security prices in market discipline and provision of relevant information for prompt corrective action by supervisors.

There has been considerable analysis of “bail-inable” securities following Flannery’s original suggestion (Flannery 2002) for requirements for contingent convertible securities.^{xxii} Flannery (2014) provides a recent survey of this literature. Notably, however, that literature focuses primarily on the design of such securities, typically involving an equity price trigger point, rather than the reality of a vaguely specified PONV trigger. A number of authors (Squam Lake Working Group on Financial Regulation 2009) have argued for a “double trigger” involving both individual bank circumstances as well as regulatory declaration of a

systemic crisis to avoid moral hazard concerns and reflecting a view that the bail-in requirements are primarily for dealing with crises.

How the bail-in requirements will work in practice has yet to be tested. The likelihood that a declaration of PONV and bail-in would prompt a run of depositors or other creditors and counterparties, necessitating introduction of a blanket guarantee, cannot be discounted. However, the existence of bail-in provisions provides another weapon in the prudential supervision armoury of bank supervisors, including use of threat of a PONV declaration (“moral suasion”) to induce additional equity raisings or scaling back of bank activities. This also involves a significant degree of discretion for bank supervisors – and, given potential consequences, an increased need for accountability. At this stage there appears to have been little analysis of the accountability implications of this increased discretion which involves something of a reversion to earlier times when regulators relied on constructive ambiguity as part of their modus operandi.

Conclusion

Masciandaro (2012) writes about an increased post-crisis role of Central Banks as prudential supervisors as “back to the future?” This chapter argues that this is only one of the ways in which the wheel has turned to refashion prudential regulation in a manner incorporating more features of earlier approaches. One is the renewed focus on financial stability inherent in macroprudential regulation. Bernanke (2013) notes that “it is now clear that maintaining financial stability is just as important a responsibility as maintaining monetary and economic stability. And indeed, this is a return to where the Fed came from in the beginning....now we have come full circle”.

This chapter suggests that this reversionary trend also applies to some degree with regard to the *modus operandi* of prudential policy – regardless of whether it is conducted by the Central Bank or other agency.

Following the financial crisis, prudential regulation has involved greater constraints on banks in the form of liquidity requirements, higher and “better” capital requirements, differential capital requirements for exposures to financial versus non-financial counterparties, and acceptance of use of various direct controls as part of macro-prudential policy. These changes involve some reversion towards regulatory practices, albeit many of them components of monetary rather than prudential policy, which applied before the era of financial liberalisation of the 1970s and 1980s. This also suggests that prudential regulation and supervision may have an even greater (or at least different) impact upon the structural development of the financial sector than under the pre-crisis Basel regimes, where such impacts were by-products rather than objectives of the regulation. Goodhart (2011) notes that “[c]entral banks used to be concerned with such structural issues. They saw themselves as having a deliberate role to play in shaping the developing structure of the financial system. More recently, they have eschewed such a role” and Goodhart suggests that what is “needed is forward-thinking about what should be the desirable future structure of our financial systems, and how the various regulatory initiatives proposed might help to get us there”.

The final reversionary feature affecting prudential regulation is the increased scepticism about the merits of the Basel risk-weighting approach operating over the past three decades. Less flexibility for banks in ways of meeting aggregate regulatory capital requirements, and more reliance on direct control mechanisms are one result. Moreover, sceptical views on the merits of the risk weighting approach have been expressed by many, including some influential Central Bankers. Former Governor of the Bank of England, Mervyn King, has argued (King 2016) that “the pretence that it is possible to calibrate risk weights is an

illusion” and that a “simple leverage ratio is a more robust measure for regulatory purposes”. Governor Daniel Tarullo of the US Federal Reserve, has argued (Tarullo 2014) that “I believe we should consider discarding the IRB approach to risk-weighted capital requirements” and placing greater reliance on stress testing to determine regulatory capital requirements and use of a leverage ratio requirement.

While modifications to the Basel approach are ongoing it would appear that the wheel has turned such that post-crisis prudential regulation is encompassing a number of features of more direct controls reminiscent of earlier approaches, which were largely discarded when financial deregulation took hold. Whether that trend will continue, or abate due to a weakening of political and regulatory resolve as the financial crisis recedes into history, remains to be seen.

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ⁱ Dean and Pringle (1994) note the UK secondary banking crisis in 1973-5, the failures or near failures of Bank Herstatt (Germany, 1974), Franklin National (USA, 1974), Banco Ambrosiano (Italy, 1982), SMH (Germany, 1983), and Continental Illinois (USA, 1984) as relevant in this regard. Reinhart and Rogoff (2009) provide a more recent overview and analysis of banking and financial crises.

ⁱⁱ Incentives for banks, in the form of lower capital requirements for use of regulator-approved internal models, were also directed towards improving bank risk management practices.

ⁱⁱⁱ In Chapter 2 of its 2013 Global Financial Development Report, the World Bank (2013) identified five major failings of prudential regulation and supervision exposed by the crisis. These were: a micro focus not taking into account systemic stability risks; regulatory "silos" both on functional and national lines; poor design of some micro-prudential requirements; capacity constraints and incentives of regulators and supervisors; inadequate surveillance and crisis management.

^{iv} Masciandaro, Pansini, and Quintyn (2013) refer to this as the demise of the "Micro to Macro" (MtM) approach based on the assumption that "if micro incentives were correctly aligned, the macro outcomes would be automatically positive".

^v A series of proposals issued since late 2014 by the Basel Committee (see BCBS (2015b) for details), often referred to as "Basel 4", which are being finalised in early 2017, are particularly relevant in this regard.

^{vi} There has also been considerable emphasis on ensuring that regulators have increased legal powers with regard to resolution of troubled banks.

^{vii} Schwarcz (2014) also points to "rationality failures" leading to use of unsuitable heuristics in dealing with complex financial issues.

^{viii} The former activity comes under the purview of competition or securities regulators and the latter under specialist national transactions reporting agencies.

^{ix} Schwarcz (2014) provides a recent discussion of how prudential regulation deviates from functional regulation and also notes the distinction with a functional approach to supervision whereby an institution may come under the purview of a number of different supervisors, each focusing on a specific function or activity which it undertakes.

^x International surveys undertaken by the World Bank, such as reported by Barth, Caprio Jr, and Levine (2013) and Abiad, Detragiache, and Tressel (2008) provide information on the diversity of arrangements

^{xi} For more detail see: http://ec.europa.eu/finance/general-policy/banking-union/index_en.htm.

^{xii} Masciandaro and Quintyn (2013) argue that financial supervision “emerged as an autonomous policy area between the mid-to-late seventies and the early eighties of last century and grew to maturity during the eighties and nineties” (p 263).

^{xiii} The minimum risk weighted capital ratio requirements were the same, but the differential calculation of risk weights meant that standardised banks required a higher level of capital for a given asset portfolio.

^{xiv} One important consequence of the Basel regulatory agenda has been the implications for resourcing and expertise of regulatory agencies, which arguably have become more substantial anyway over recent decades due to financial innovation and financial sector complexity. Accreditation of internal models involves substantial expertise and resources for the regulator (as well as for banks, for whom costs of achieving accreditation ran into the hundreds of millions of dollars).

^{xv} For more detail see BCBS (2015b)

^{xvi} This was arguably even more pronounced in the case of investment banks which were subject to prudential regulation, where use of very short term “repo” financing to fund holdings of long term securities was pronounced leading in the financial crisis to what Gorton and Metrick (2011) termed “the run on the repo”.

^{xvii} The Vickers ring-fencing (UK) and Volcker rule (USA) are examples.

^{xviii} The minimum will increase to 18 per cent in 2022. There is also a requirement that TLAC exceeds 6 per cent of the Basel 3 leverage ratio denominator (with that requirement to subsequently increase to 6.75 per cent in 2022)

^{xix} Reducing the capital requirement may be necessary to leave banks with unchanged excess capital if a financial downturn leads to greater provisioning which reduces their eligible regulatory capital. Repullo (2013) develops a model which predicts that reducing regulatory capital requirements when there is such a negative shock to bank capital may improve social welfare because benefits from less contraction of lending outweigh the costs of reducing bank safety.

^{xx} The International Accounting Standards Board published the accounting standard IFRS 9 *Financial Instruments* in July 2014, for mandatory adoption in 2018, which incorporates forward looking expected credit losses more compatible with the Basel standards.

^{xxi} Another feature of the Basel 3 changes was the introduction of requirements for boards of large banks to develop “living wills” (recovery and resolution plans) to (hopefully) assist regulators in dealing with troubled banks.

^{xxii} Earlier proposals by a number of researchers for mandatory requirements for banks to have some minimum amount of subordinated debt on issue have some similarities, but generally do not involve the “bail-in” feature.