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Research Report

Regulatory complexity and the quest for robust regulation

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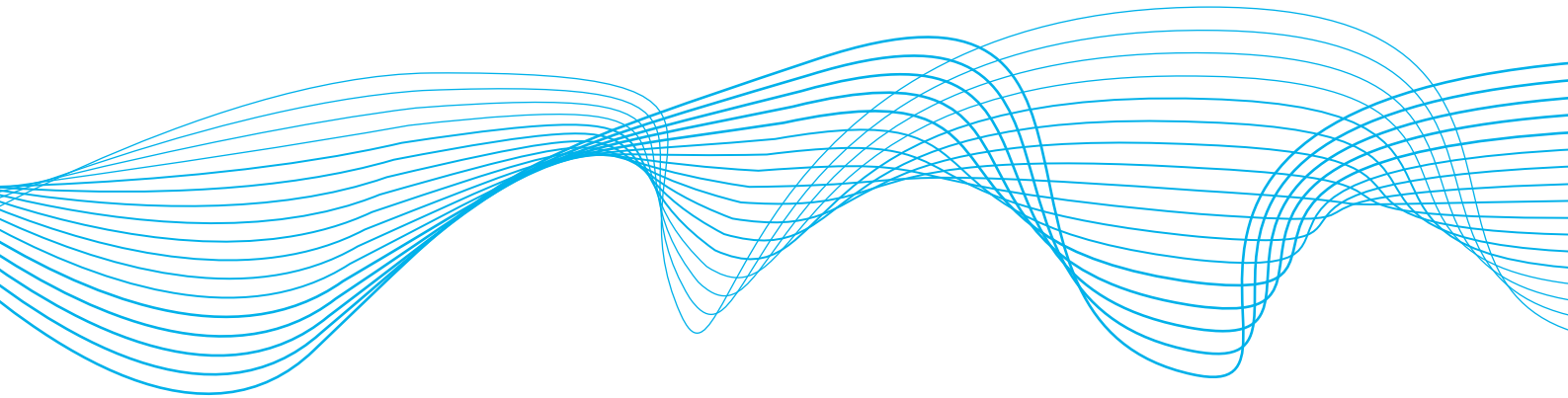
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Reports of the Advisory Scientific Committee

No 8 / June 2019

Regulatory complexity and the
quest for robust regulation

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European Systemic Risk Board
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Executive summary

Regulatory action in response to the global financial crisis, together with broader developments in finance and society, have materially expanded regulation in the financial sector. While there is a general consensus on the need for regulation, there is much less agreement on whether recent increases in the complexity of regulation are necessary and appropriate. As a result, we are seeing a strong pushback from the financial industry, which is arguing that overly complex regulation has led to financial institutions becoming overburdened, hampering their ability to provide financial services efficiently.

However, neither excessive complexity nor excessive simplicity are likely to be features of a regulatory framework that successfully deals with the challenge of maintaining cost-efficiency and adequate risk-sensitivity in an increasing complex world. Ideally, regulation should be robust enough to accommodate the hard-to-predict evolution of the financial system (including the emergence of new business models and financial innovations) while preserving financial stability at a reasonable cost.

Regulation sets limits on the behaviour of actors in the financial arena in order to prevent socially undesirable outcomes. This inherently entails a certain degree of standardisation and a compliance burden with a large fixed-cost component. As a result, it can limit the diversity of business approaches and hence constrain competition and innovation.

Regulatory complexity stems from supply-side and demand-side factors. Supply-side factors include developments in the financial system and crisis-generated policymaking, which may increase regulatory complexity, including through the institutional architecture underpinning it. Demand-side factors include the self-interest of regulated entities. Financial firms may favour complex frameworks where these are better tailored to their idiosyncrasies or even enable them to maintain a strategic informational advantage over regulators. A financial sector that is subject to excessively complex regulation may entail overburdened regulatory authorities. Regulators and regulated entities may be induced to recruit large numbers of highly specialised staff focused on detailed aspects of compliance, with complex rules and a lack of overall perspective.

Excessively complex regulations contribute to increased systemic risk in several ways. First, complex regulatory frameworks create the illusion of a well-controlled system, while at the same time creating incentives for regulated entities to game the system. Second, such a framework risks missing contingencies that are not well understood, e.g. because of a lack of historical experience. An “over-fitted” regulatory system may not be well equipped to address “unknown unknowns”. Third, when risks materialise, the combination of hard-to-understand interactions between different regulations and a wide array of regulatory tools can make policy responses convoluted and difficult to judge. It can also hamper the accountability of regulators and supervisors. Finally, excessive regulatory complexity can encourage the transfer of risks to institutions outside the regulatory perimeter, creating an environment where systemic risk is amplified more than it would have been if risks had remained within the perimeter.

Conversely, overly simple financial regulations are unlikely to properly address the misaligned incentives, informational asymmetries and externalities underlying the need for regulation. They are also likely to be too blunt to deal appropriately with system-wide risks. A simpler framework for



capital requirements might, for example, treat exposures with very different risk characteristics similarly, discouraging firms from entering into the safer ones among them.

While public disclosure of information by regulated firms is not by itself sufficient to address regulatory complexity, a transparent cost-benefit analysis, greater evidence-based design of financial regulation, and evaluations of the effectiveness of regulations are desirable actions by regulators to improve financial regulation and to avoid an increase in systemic risk due to excessive regulatory complexity.

This report argues that, in addition, financial regulation should be robust in the sense of being able to preserve its effectiveness when confronted with hard-to-predict developments and innovations. System robustness refers to the capacity of a system to maintain its core functions in the face of unexpected perturbations or disturbances. Regulatory robustness entails being able to cope with a variety of failure-inducing circumstances and behaviours, while not trying to offer the best-tailored response to each specific phenomenon. It therefore accounts for the interaction between Knightian uncertainty (the situation in which future contingencies or their probabilities are difficult or impossible to determine) and systemic risk. Arguably, the quest for robustness could improve the cost-effectiveness of the regulatory outcome while reducing its complexity.

More broadly, the quest for robustness in financial regulation could be facilitated by adopting the following seven principles in the design and reform of financial regulation:

1. **Adaptability:** financial regulation (including the calibration of its key tools) must be able to evolve with the financial system and not become an obstacle to innovation. This includes not creating material barriers to entry or discouraging the emergence of new business models. Regulatory sandboxes and sunset clauses could be effective tools to deal with innovation in a controlled environment and ensure that obsolete rules are removed or revised.
2. **Diversity:** the diversity of financial institutions and business practices should be preserved, as this represents a powerful safeguard against systemic instability. By introducing some redundancy, diversity also ensures substitutability, i.e. the ability to find ongoing elements of the system that can replace failed elements and ensure the continuity of core functions. Excessive homogenisation of regulated entities and activities is to be avoided.
3. **Proportionality:** the burden of regulation (in terms of compliance and enforcement costs, as well as wider costs such as the induced distortions to competition and innovation and the diversion of activity to less regulated sectors) should be commensurate with the importance of the market imperfection at stake.
4. **Resolvability:** regulation should allow unviable entities to exit the system, without endangering systemic stability. Efforts must be intensified in the areas of recovery and resolution of all financial institutions (not just banks), and policies tackling internal structure and complexity must be adopted so as to ease the resolution process.
5. **Systemic perspective:** financial regulation should aim to ensure the continuous provision of critical financial services to society. A regulatory system that favours the concentration of activities in a limited number of financial institutions can become more vulnerable owing to its dependence on the survival of these few institutions. A systemic perspective requires a



comprehensive understanding of correlations and interlinkages, as well as an understanding of macroeconomic feedback mechanisms.

6. Information availability: regulatory information should allow for prompt identification of contagion channels and pockets of vulnerability. Timely information enables policies to be implemented that react effectively to new developments, either by recalibrating or activating existing regulatory tools or by activating crisis management tools.
7. Non-regulatory discipline: the presence of regulatory discipline should not entail the removal of non-regulatory discipline. On the contrary, the discipline that derives from market players, effective governance structures and the prevalence of high ethical and personal responsibility standards in the management of financial institutions is complementary to financial regulation and may reduce its need to rely on complex rules.



1 Introduction

Financial crises are often followed by far-reaching regulatory reforms, as the urgent demands of the situation compel politicians and regulators to respond quickly and decisively.¹ In the aftermath of the global financial crisis, G20 leaders set in train an ambitious agenda of reform with the objective of making sure “...our regulatory system for banks and other financial firms reins in the excesses that led to the crisis.” (G20, 2009). Since then, the G20 agenda has been implemented by national authorities and international standard-setters to address financial stability risks and other weaknesses brought to prominence by the global financial crisis (Financial Stability Board, 2017).

The reform agenda has involved a substantial increase in the scope and scale of financial regulation, which, in general, has also become more complex. Within the EU banking sector, recent additional regulatory requirements include (i) an increase in the sophistication of regulatory capital computations, like those being introduced by the Fundamental Review of the Trading Book (FRTB); (ii) new policy instruments, such as those relating to liquidity regulation (the liquidity coverage ratio (LCR) and the net stable funding ratio (NSFR)), macroprudential tools (e.g. countercyclical capital buffers) and bail-in debt; and (iii) new institutions, such as the Single Supervisory Mechanism, the Single Resolution Board and the European supervisory authorities.² The increase in regulation is directly evident in the Basel Accords on banking regulation and in the granular detail of domestic financial legislation. For instance, the 848 pages of the Dodd-Frank Act of 2010 stand in marked contrast to the 24 and 37 pages, respectively, of the Federal Reserve Act and the Glass-Steagall Act, the two seminal pieces of US financial legislation of the 20th century.

The trend towards higher complexity is visible in all areas of financial regulation and partly reflects a longer-term trend common to non-financial regulation as well. New regulation has also been introduced outside the banking sector. For example, major changes to how derivatives are traded and cleared have been brought in, and the adoption of Solvency II by the EU in 2016 represents a culmination of a 20-year effort to harmonise insurance regulation across EU countries (the previous common regulatory framework, “Solvency I”, was introduced in 1973). The introduction of the General Data Protection Regulation in 2018 reflects technological and societal developments that are not directly linked to financial stability, but the legislation still has important regulatory consequences for financial institutions. Many other parts of society have also seen substantial growth in regulation. The size of the Codex Alimentarius³ (relating to food standards) far exceeds that of the latest Basel Accord or the Dodd-Frank Act. Similarly, civil aviation is another field confronted with a significant volume of regulation (e.g. the Aeronautical Information Manual Official Guide to Basic Flight Information and ATC Procedures spans over 732 pages). Increasing regulatory complexity is probably common to any sector where a failure in product quality or a

¹ According to Blinder (2014), regulatory reforms are made “[...] generally in the aftermath of a serious financial crisis [...]”.

² Arguably, these institutions contribute to harmonising regulatory and supervisory policies and practices in the EU, thus reducing the complexity associated with the heterogeneity in country legislations and practices. In practice, however, some of the new institutions have not wholly replaced the old ones, creating a more complex institutional landscape.

³ See [Codex Alimentarius](#).



disruption in the provision of a product or service can have important costs for users and society at large.⁴

The increase in regulatory complexity in the financial sector is reflected in changes to the institutional architecture of financial policy. The institutional architecture of financial policy often comprises multiple institutions or agencies, distinguished by the geographical, sectoral or functional scope of their responsibilities, each with their own mandate. In these cases, a financial entity will need to interact with a number of authorities (the microprudential supervisor, the macroprudential authority, the resolution authority, etc.), which, at the same time, will need to interact with each other (Blinder, 2010), adding to institutional complexity.

Developments in information technology (IT) may play an important role in managing regulatory complexity. IT expands human capacity to manage complexity (Deitel and Deitel, 1985; Becker, 1995; Harari, 2015) and can also contribute to dealing with regulatory complexity at a low cost. Indeed, IT makes it possible to manage complex data and complex rules in ways and at speeds that would have been impossible a few decades ago (for example, calculating the capital requirements of a large bank would take many workers many days without the help of computers). In this sense, any discussion of the increase in regulatory complexity in recent years must also take into consideration that the costs of some aspects of regulatory complexity (such as the execution of massive routine calculations on a regular basis) have been significantly reduced. Further developments in areas such as big data, artificial intelligence and machine learning are opening up scope to accommodate apparently complex data and tasks into user-friendly, low-cost management and regulatory systems.

Financial regulation should be designed so that the societal benefits derived from its implementation exceed the costs, even when benefits and costs relate to different institutions. Benefits typically affect the financial system and society, as they relate to the correction of market failures and the avoidance of systemic crisis. Regulated institutions typically enjoy only part of these benefits as, for example, a better-functioning market and lower incidence of crises are a general public good. In contrast, the costs of implementation of regulation are typically borne in the first instance by the regulated entities, regulators and supervisors, and ultimately by customers, investors and taxpayers. In addition to the funding costs of prudential capital requirements, firms incur significant operational costs in creating and implementing the processes needed to adhere to regulation. Compliance costs are likely to be materially higher than they were decades ago, even if their exact level is difficult to estimate. Some reforms raise unanticipated operational issues that entail new costs or pose new risks.⁵ Regulators and supervisors are also subject to non-negligible costs related to checking compliance with regulation and correcting shortcomings. Often, regulatory and supervisory authorities are funded by contributions from the institutions they supervise.⁶ Ultimately, part of these costs end up being borne by the customers of

⁴ In the United States, Davis (2017) shows a significant increase in regulation since the end of the Second World War, including in its tax system, and in the proportion of licensed work within the total workforce.

⁵ For example, to decrease the risk of trading in customised off-exchange derivative securities, the Dodd-Frank Act requires derivative transactions, wherever possible, to be cleared on exchanges. But this requirement increases risk for pension funds and asset managers due to the way exchanges handle margin collateral. In this case, changing exchange brokerage arrangements to reduce the risk significantly increases costs (Grant, 2011).

⁶ For example, the Single Supervisory Mechanism allocates its estimated costs (€475 million for 2018) across the banks it supervises.



financial institutions, as institutions pass them through to the interest rates or fees associated with their products.

There is an ongoing debate as to whether the increase in regulatory volume and complexity in the financial sector is a necessary and appropriate response to previous weaknesses in the international financial architecture. Many commentators consider that this is indeed the case. Carney (2017) suggests that recent reforms have made the financial system simpler and safer because banks are more focused, fragile forms of market-based intermediation have been eliminated and a more durable financial infrastructure has disentangled complex webs of exposures. Others are more critical, however. Romano (2012) argues that, in the absence of a proper understanding of the causes of crises, regulatory fixes are bound to be well off the mark. Requiring financial institutions to implement a multitude of rules without an understanding of how the rules interact to influence both individual and system-wide behaviour may be counterproductive (Haldane, 2015). Probably as an outcome of this debate, some of the latest pieces of regulation, such as the limitation of portfolios subject to internal ratings-based (IRB) approaches for banks (Basel Committee of Banking Supervisors, 2016a), can be understood as an attempt to limit regulatory complexity (or its negative implications).

Moreover, regulations that are appropriate when launched can become inappropriate as the financial system's business, legal and technological conditions evolve. Institutions and individuals adapt their behaviour in response to regulation, and their reactions change over time, interacting with the regulatory environment, most likely in nonlinear ways. As a result, it is difficult to know in advance what the optimal regulatory policies to reduce systemic risk will be. Systemic risks are hard to predict in advance with much accuracy. The granular nature of financial regulation has hitherto tended to focus on the “knowns” – i.e. on risks amenable to statistical measurement – at the expense of an emphasis on internal controls and systems that may be more responsive to uncertainties that are hard to predict (Diebold et al., 2010; King, 2016).

In what follows, regulatory complexity refers to regulatory requirements that vary across contingencies at a very detailed, or granular, level, potentially leading to substantial non-linearities and unpredictability in their effects. Regulatory complexity is invariably associated with considerable administrative burdens for market participants, including reporting and conduct requirements, and for regulators and supervisors, in checking compliance. Regulatory complexity is exacerbated by heterogeneity across jurisdictions, market segments and business lines. A complex regulatory framework may feature hidden non-linearities and give rise to hard-to-anticipate arbitrage opportunities.

This report argues that complex regulation is not necessarily the best response to the complexity of the financial system; rather the aim should be to introduce robustness into financial regulation.⁷ The report therefore proposes seven principles to make financial regulation more robust (see Section 4.3). The proposed approach would be consistent with the objective of regulation at minimum cost (European Commission, 2017) and with the principle of maximum simplicity subject to effectiveness. This implies accepting that financial regulation should be complex (state-contingent, risk-sensitive, case-dependent) enough to appropriately capture the

⁷ The Oxford English Dictionary defines robustness as “the ability to withstand or overcome adverse conditions or rigorous testing.”



heterogeneity of institutions, risks and circumstances, but not so convoluted and onerous to comply with and enforce that it results in unnecessary cost burdens, discourages competition and innovation, leaves room for regulatory arbitrage or induces hard-to-anticipate behaviours that can increase systemic risk.

Complementing financial regulation by making it robust would enhance its capacity to perform well in the face of Knightian uncertainty. Building on the terminology developed by Knight (1921)⁸, future states of the financial system are not only risky, but also uncertain in that they or their probabilities are not known at present (Pollock, 2012). Even though the concepts of “risk” and “uncertainty” are often used interchangeably, differentiating the latter from the former is necessary to the development of concepts such as ambiguity and ambiguity aversion (Hansen, 2013). Under the definition by Honohan and Stiglitz (2001), robustness in regulation is the quality of being able to cope with a variety of failure-inducing circumstances and behaviours. It does not require regulation to be excessively “subtle” or granular in nature. Designing robust regulation means being aware of the informational limitations faced by regulators and supervisors and acknowledging the impossibility of addressing all possible phenomena as accurately as would theoretically be possible under a perfect understanding of the system being regulated. Sticking to a number of principles rather than extremely detailed rules might enable the financial system to better deal with uncertainty when it crystallises.⁹

This report calls for cost-effective and robust financial regulation rather than deregulation or overly simple regulation. While not questioning the need for adequate financial regulation, the report posits the conjecture that some aspects of the current regulatory architecture might be excessively complex in a way that either implies an unnecessarily large burden on the regulated agents, their activities and their supervisors or, perhaps more importantly, limits its effectiveness in dealing with systemic risk. Addressing regulatory complexity by promoting overly simple regulation would not generate an optimal outcome in terms of systemic risk: the regulatory framework would not be able to capture the inherent complexity of the financial system and would place excessive focus on reducing the regulatory burden, possibly at the expense of improving the incentive structure of regulated entities. In the long term, this could increase the societal costs of systemic crises. Our report thus contributes to the debate on the optimal design of financial regulation, taking an approach focused on addressing systemic risk throughout the whole financial system in an ever-changing environment.

The report is structured as follows: In Section 2, we describe the factors that can explain the evolution of regulatory complexity in the financial system. Section 3 develops the relationship between regulatory complexity and systemic risk, and also considers recent efforts to simplify the regulatory framework. Section 4 defends the argument that the challenge is not to aim for simpler regulation per se, but rather to enhance it by making it robust against unpredictable developments, and establishes seven principles for the design of better regulation.

⁸ See also Cowan (2016).

⁹ It is possible to make an analogy between the concept of robust regulation and robust statistical methods, as the latter are a response to the limitations of methods where a minor violation of one of the underlying assumptions leads to a large bias or inconsistency of the implied inference. Robust methods are designed not to be strongly affected by violations of some assumptions (e.g. the lack of serial correlation in the error terms in a linear regression model); in other words, to generate valid outcomes in a larger set of circumstances. Robust regulation should ideally be able to generate sound outcomes even in situations where the understanding or information about the regulated phenomenon is incomplete.



2 What lies behind the increase in regulatory complexity?

Societies have evolved considerably in the last two centuries, making the world much more interconnected than before. Science, demographics, technology and economic growth have contributed to shaping our societies as they are today, in a process of evolution without historical parallel. The financial system has followed pace, and traditional financial markets have been transformed into a global and highly interconnected network of institutions and markets, with long intermediation chains, substantial specialisation of activities, new entrants and high-speed financial transactions.

There is little dispute that regulation is needed in the financial sector. The financial system plays a crucial role in channelling savings to investment opportunities, making a decisive contribution to growth. However, its functioning is affected by market failures (e.g. externalities, asymmetric information and moral hazard), and it exhibits the hallmarks of a complex system that can be subject to unexpected fragilities (Gai et al., 2011).¹⁰ Indeed, when financial markets malfunction, the real economy is often impacted as well. Regulation serves to address these market failures.

In addition to prudential regulation, conduct regulation is needed to level the informational asymmetries between less sophisticated customers and well-informed financial institutions. Financial contracts are often complicated, and it can be difficult for customers, who usually lack the necessary skills, to identify the quality and nature of the product in advance (Wolak, 2015). Conduct regulation in financial services is designed to tackle this flaw. Regulatory requirements on how firms behave seek to limit the scope for financial institutions to take unfair advantage of consumers. The development of the financial system has also expanded the scope of conduct regulation beyond mere consumer protection, and nowadays it covers areas such as corporate governance, competition and antitrust, as well as remuneration (Norton Rose Fulbright, 2014).

Regulation may limit agents' scope for action in order to prevent undesirable future states of the system (systemic crises). A system without rules could lead to future states that cause harm for society as a whole. The goal of regulation (and the broader legal framework within which it is set) is to limit, as far as practical, future possible states of the system to desirable ones. In this sense, regulation sets the “rules of the game”. For example, financial regulation helps to ensure that banks return deposits of their customers when they are asked to do so and that insurers compensate policyholders when insured risks materialise. Within this framework, our society generally allows agents to interact as they like according to their own interests. Modern financial systems also typically include safety nets, accepting that the “rules of the game” may not always work as planned. These safety nets create a further need for regulation, in order to limit moral hazard.

The standardising effect of regulation needs to be balanced against the benefits of the diversity frequently associated with competition. Competition typically relies on some differentiation in the product or service to be delivered to the final customer. There is a degree of

¹⁰ See Dewatripont and Tirole (1994) for a broader discussion of the economic rationale for banking regulation.



tension between the standardising effect of regulation and the importance of innovation and differentiation. In this regard, a regulatory system that is too constraining creates its own risks (e.g. herd behaviour, monopolistic behaviour) and inhibits innovation and evolution, sending the system into stagnation. However, a regulatory system that is too soft is inefficient in the sense that it provides too much discretion to its actors to deliver according to their individual preferences and not as most benefits society.

The target of prudential regulation is largely to limit exposure to the risk of failure by financial institutions (microprudential regulation) or by the system as a whole (macroprudential regulation).

In pursuing its objectives, it relies on tools such as capital requirements with a direct impact on loss absorption capacity. Identifying, understanding and adequately measuring the relevant sources of risk are key to calibrating these tools. From this perspective, it would be hard to argue that prudential regulation should not be risk-sensitive. Yet the debate over the optimum degree of risk-sensitiveness in regulation is unresolved. Imperfect information, enforcement costs and the possibility of creating unintended regulatory arbitrage opportunities limit the degree to which regulation can be risk-sensitive at a reasonable cost. Other targets of financial regulations may refer to achieve sociopolitical goals (for example, to ensure income in old age via pension regulation), to foster environmental investments via favourable capital treatment of related exposures or to ensure a level playing field among institutions.

The costs of complex financial regulation go beyond direct compliance-related costs. These costs consist of the resources allocated to maintain and manage regulation and its enforcement (information acquisition costs), and the costs of checking compliance with regulation (for example costs incurred by auditors in checking the accuracy of regulatory data). They also include resources devoted by others in both the public sector (e.g. regulators and supervisors) and the private sector (e.g. consultancy and law firms) for these purposes. Other costs relate to:

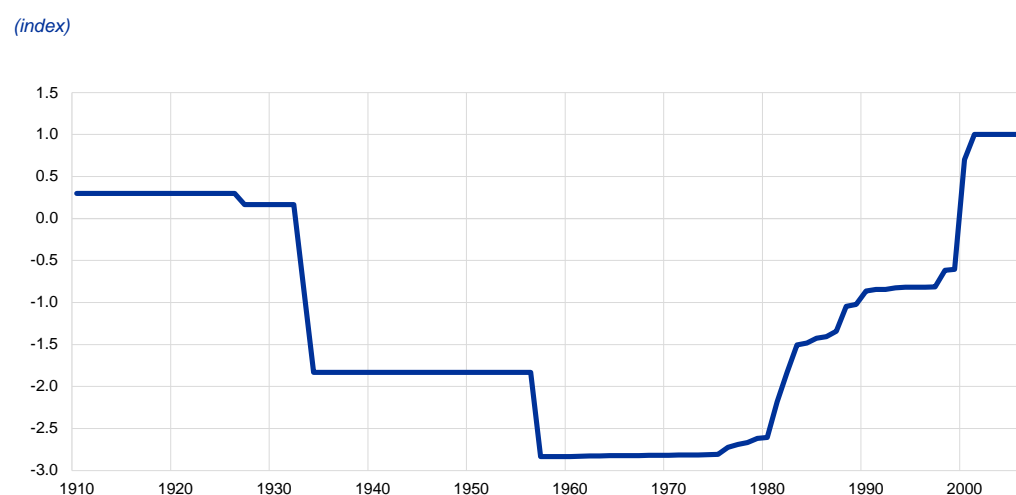
- reduced effectiveness, due to a potential misalignment of reality and regulation (model uncertainty, measurement uncertainty) and increased uncertainty about the functioning of regulation (e.g. interaction among instruments), which could potentially produce unintended consequences;
- misaligned incentives, as regulation could create incentives for regulatory arbitrage, e.g. gaming the complex system or shifting activities to less intensively regulated sectors;
- changes to market structure, as regulation may impact the current market structure in terms of the number of participants, concentration, size and nature of the institutions in the market;
- lower resolvability, because complexity can make financial institutions more costly to be resolved or even “too complex to fail”;
- political economy, since complexity may increase the opacity of the regulatory and supervisory processes, hampering accountability and increasing the potential for regulatory capture by the regulated entities.



2.1 Characterising complexity in financial regulation

Many commentators, particularly from the financial industry, have expressed concerns about the recent growth in regulatory volume and complexity, complaining about the costs and dangers of overregulation. Growth in regulation typically creates additional costs for regulated firms, some of which, at least, can be expected to be ultimately borne by their customers. Conversely, the increased complexity of regulation can be viewed as a response to previous under-regulation, or to the weak design and/or implementation of previously prevailing regulatory frameworks. With the benefit of hindsight, regulatory frameworks before the global financial crisis proved less fit for purpose in maintaining financial stability than had been expected at the time. Prevailing regulatory incentives and new risk management paradigms that were intended to spread risk more broadly across the financial system to everyone's benefit proved unreliable, at considerable cost to the public purse and to economic prospects. Authors such as Philippon and Reshef (2012) document a prolonged period of deregulation between the late 1970s and the early 2000s (Chart 1). However, general deregulatory or re-regulatory trends do not necessarily coincide with the trend towards lower or higher complexity of individual regulatory tools. Specifically, capital requirements (the tool which dominated the focus of prudential regulation during such deregulatory phase) became increasingly complex throughout the various reforms of the Basel Accord, as illustrated below.

Chart 1
Financial deregulation index



Source: Philippon and Reshef (2012).

Notes: The deregulation index incorporates bank branching restrictions (mostly phased out during the 1980s); the Glass-Steagall Act (enacted in 1933 and repealed in 1999), interest rate ceilings (introduced in 1933 and removed by 1984); and legislation to separate banks from insurance companies (introduced in 1956 and repealed in 1999). The deregulation index is adjusted to reflect how each piece of legislation affects each subsector, as defined in Philippon and Reshef (2012).

Quantifying complexity in financial regulation is difficult; it commonly relies on indirect measurements, such as the length of regulatory texts or the size of compliance costs. A rough first indicator of regulatory complexity can be the number of pages or articles in the relevant pieces of regulation. According to Haldane (2012), the capital regulation of banks has seen the number of pages increase from 30 in the initial Basel Accord to 347 in Basel II and 616 in Basel III



(as of the 2012 text).¹¹ This approach assumes that regulatory complexity increases with the number of pages. However, regulatory requirements may require long descriptions spanning dozens of pages but be simple to interpret and implement (especially using modern information technologies). Similarly, regulatory requirements that are expressed in concise terms may prove highly complex in practice, e.g. because of their ambiguity or the way they interact with other pieces of regulation. In such a situation, complexity stems from excessive room for discretion and might make the supervisory process more complex, as there would be different possible approaches to implementing and enforcing the same regulation.¹² Colliard and Georg (2018) have developed a methodology that quantifies regulatory complexity based on algorithms, and their initial results signal that shorter regulations are not necessarily less complex, as they can use more principles and “high-level” language, which may substitute for detailed rules. Another measure of regulatory complexity is the size of financial institutions’ compliance departments. Härle et al. (2010) estimate a need for an additional 135 to 210 full-time equivalent workers for a medium-sized bank due to the entry into force of Basel III. Similarly, Dahl et al. (2016) estimate the cost of compliance at 8% of non-interest expenses for small banks (total assets of below USD 1 billion) and 3% for medium-sized banks (total assets of between USD 1 billion and USD 10 billion). A common difficulty in these studies is in distinguishing the costs attributable to compliance from those related to other activities, such as risk management.

The literature on system complexity suggests drawing a conceptual distinction between essential and accidental regulatory complexity. Computer science distinguishes between essential and accidental complexity. According to Brooks (1987), essential complexity is inherent to the problem to be solved and cannot be eliminated when developing a computer program, while accidental complexity is the result of choices made when developing the program and can be avoided or minimised. In the context of financial regulation, essential complexity can be viewed as deriving from complexity in the financial system and the need to address this, and as such cannot be fully avoided (although unlike in computer programming, financial regulation has the power to influence the structure and hence the essential complexity of the financial system). However, accidental complexity, i.e. complexity unnecessarily induced by regulation itself (for example through excessively granular regulatory treatment of a given activity), is easier to avoid.

Complexity can also be seen as the outcome of the interaction between many different components of a system, where linkages are not fully understood, and the urgency of responding to the risk of system collapse. Complexity, in this sense, can be understood to stem from the nature of the system and the many risks arising from the interactions between the entities that are part of it. When the number of entities increases, the number of interactions between them can increase exponentially, making it hard to track them all. At the same time, complex processes are prone to unexpected failure, and the likelihood and severity of the damage caused by such failure determine the “urgency” (also called “coupling” in such literature) of intervening in the system to prevent its collapse. Applying the taxonomy used by Dvorak (2009), the financial system could be placed in the top-right quadrant in Figure 1, indicating the complexity of interactions between

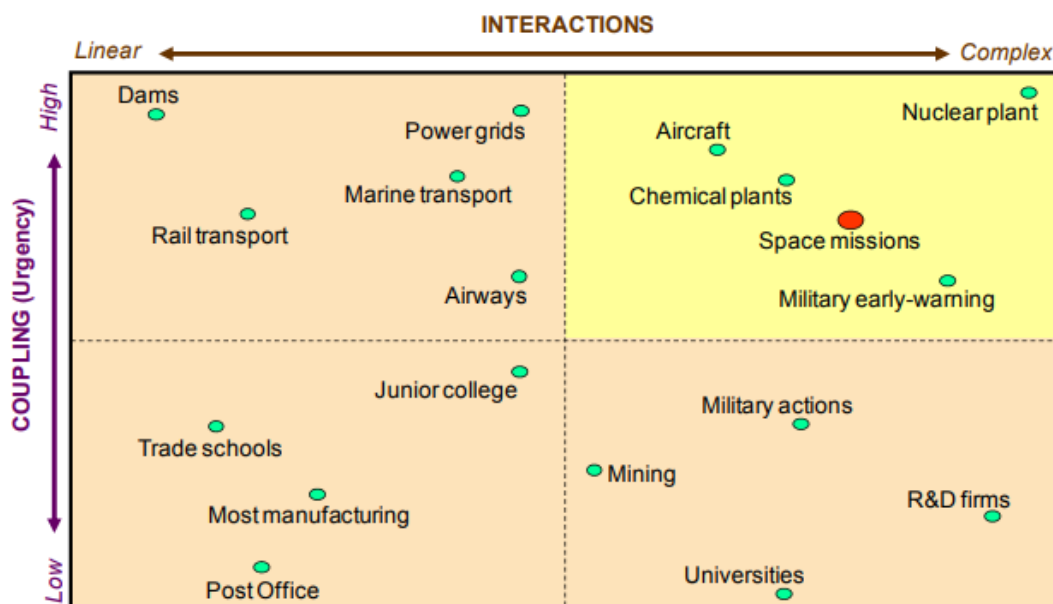
¹¹ The latest elements of the Basel III Accord (operational risk, amendment to credit risk) were published in 2017, so the final number of pages is certainly higher. Indeed, the Basel Committee on Banking Supervision has recently launched a public consultation on the consolidated version of the Basel III Accord, which has 1,868 pages (Basel Committee on Banking Supervision, 2019).

¹² Ensuring high quality in legal drafting plays a pivotal role in limiting ambiguity in regulation and should reduce legal uncertainty in the implementation phase.



participants in the system and the severe consequences that an “accident” leading to a financial system meltdown could have on the real economy.

Figure 1
Accidents in systems with different degrees of complexity



Source: Dvorak (2009).

Notes: In the horizontal axis, complex interactions are those of unfamiliar, unplanned or unexpected sequences and that are either not visible or not immediately comprehensible. Information about the state of components or processes is more indirect and inferential, and complex systems have multiple feedback loops that can baffle operators. In the vertical axis, tightly coupled systems have more time-dependent processes; they cannot wait or stand by until attended to.

Another way of defining complexity focuses on the extent to which the behaviour of the system under consideration can be characterised reasonably accurately by a relatively simple model. The Algorithmic Information Content (AIC) approach relates complexity to the minimum amount of information needed to describe a system (Dodder and Dare, 2000). In physics, for example, the dynamics of a flowing fluid can be relatively simple to characterise provided the flow is laminar (i.e. smooth) in nature. It is more complicated to model and understand how a flow operates next to fixed surfaces, where it is typically more turbulent. This insight has important implications for the design of items such as boat hulls, aircraft wings, golf balls and other objects that need to travel through liquids or gases. Their design must be robust to hard-to-predict turbulences. Likewise, if there are many possible ways in which participants in the financial system can behave under existing regulatory rules, then capturing the dynamics of the system will necessarily require a more complex model than if all agents behaved more similarly. Moreover, the system is likely to be more “complex” if the rules do not have single unambiguous interpretations that everyone can adopt. This has implications for assessing the complexity implications of, for example, the extent of discretion to be given to firms when determining risk weights, internal model structures and other features of regulatory capital requirements. The more scope there is for



regulated institutions to interpret regulation differently, the more complicated it is to understand the likely end-behaviour of the system.¹³

2.2 Regulatory complexity in financial regulation: demand and supply factors

For supply-driven factors, regulatory complexity may arise from the very nature of policymaking. Financial reforms often occur in the aftermath of financial crises, as pressure from public opinion to fix failures revealed by the crisis opens a window of opportunity to adopt changes that might be politically too costly to adopt in normal times, when the consequences of the imperfections are less visible or have been forgotten. A crisis typically reveals weaknesses affecting multiple dimensions of the system, where joint analysis may be conceptually and practically difficult in a limited amount of time. Regulators have many options to choose from and lack a fully precise understanding of how these measures map onto outcomes. A common approach to financial reform is to divide the task into multiple subtasks, each tackling a class of imperfections or a class of potential tools to address such imperfections. This friction-by-friction approach has the shortcoming of potentially duplicating the treatment of some imperfections (e.g. establishing living wills to tackle resolvability problems at banks might not be so important given reinforced loss absorption capacity and clearer bank resolution regimes), and a risk that relevant interactions between imperfections and tools will be overlooked. This approach is likely to result in greater regulatory complexity than a more integrated approach would achieve.

Regulatory complexity may also stem from complexity in the latent institutional architecture that makes the resulting procedures very complex. The institutional architecture of financial policy typically comprises multiple institutions, with different objectives, compositions, processes and scopes. Financial reforms, especially those following a financial crisis, commonly involve creating new institutions, which must be embedded into the existing institutional architecture. Fitting the new institutions into the pre-existing architecture can lead to complex and at times convoluted procedures for deciding on crucial aspects. For example, after the global financial crisis, the EU introduced a Single Resolution Mechanism, designed to provide an adequate toolkit to allow the orderly resolution of banks without compromising financial stability or resorting to public funds. While this is a welcome development for the EU financial system, determining the resolution conditions involves a wide array of institutions that must act in coordination under tight timelines: the European Central Bank, national resolution authorities (NRAs), the European Commission and the Single Resolution Board (SRB) (Micossi et al., 2013).

The evolution of the financial system has also played an important role in the observed increase in regulatory complexity. Many regulatory changes can be related to developments in the regulated industry. In the financial sector, intermediation chains have become longer, creating greater interconnections and making financial systems more complex. For example, over the past 20 years derivative markets have expanded vastly in volume and type, with a broader range of

¹³ However, if complexity derives from heterogeneity in agents' behaviour, the result is not necessarily less financial stability than with more uniform behaviour among the relevant players. This is because heterogeneity may protect the system against failure due to common exposures or adherence to a failing business model (see Wagner, 2010 for a formalisation of this argument in a portfolio choice setup).



instruments being traded on them (see Box 1). Over time, policymakers become more conscious of the risks associated with these markets and respond with changes to regulation once these markets have already grown large. In some circumstances, early regulatory intervention could have prevented the system from evolving in a complex manner. However, early intervention is tricky to achieve in practice, partly because of a genuine lack of understanding of (or evidence on) the phenomenon to be regulated and partly because of political relevance. A similar lack of political or analytical attention may create a tendency for regulations to persist long after their original purpose has ceased to exist.

On the demand side, regulated institutions may have an interest in promoting excessively complex regulation to maintain informational advantages over supervisors and regulators.

In several instances, regulated institutions may legitimately promote regulations tailored to the idiosyncrasies of their business models, inducing complexity in regulation that mirrors the complexity and diversity of the financial system. However, complex regulation can make it harder for regulators and supervisors to ascertain the impact of regulation on institutions' behaviour and the resulting risk. Supervisors' assessments may become overly reliant on the expertise of industry participants and consultants (Hakenes and Schnabel, 2014; Quigley and Walther, 2017). This can lead to overly cosy relationships, resulting in regulators placing excessive credence on what they are told by financial institutions. These institutions thus have incentives to engage in ever more complex activities to maintain informational advantages and to extract economic rents in the process.¹⁴ Therefore, the increased volume and complexity of regulation also reflects a feedback loop or "Red Queen's race" in which regulatory complexity begets complexity in regulated entities, which in turn induces further regulatory complexity (Kane, 1977; Rogoff, 2012). In the race to complexity, as in other arms races, the common good is generally jeopardised.

Furthermore, it has often been argued that regulatory complexity is a consequence of lobbying. Financial regulation can be shaped by pressure from lobbying groups. If, for example, there is a wish to protect a specific type of investment, lobbyists may be able to persuade policymakers or politicians to ascribe a different (typically, more favourable) regulatory treatment to that investment type. Sometimes, this extra complexity merely reflects more accurately the characteristics of the investment opportunity. Nevertheless, there is the suspicion that some of this lobbying involves manufacturing artificial arguments to support the selected investment and generate competitive advantages for its suppliers. In the EU, this phenomenon shows up in banking lobbies often pushing to obtain national options and discretion "reflecting the specific characteristics of national banking systems" (Posch et al., 2018). The results are additional complexity and fragmentation across countries, market segments and business models.

¹⁴ Job market considerations also provide motives for regulatory and firm-level complexity. A large industry made up of risk managers, financial consultants, lawyers and regulators has a vested interest in ensuring that both financial activities and the regulations that police them remain elaborate.



Box 1

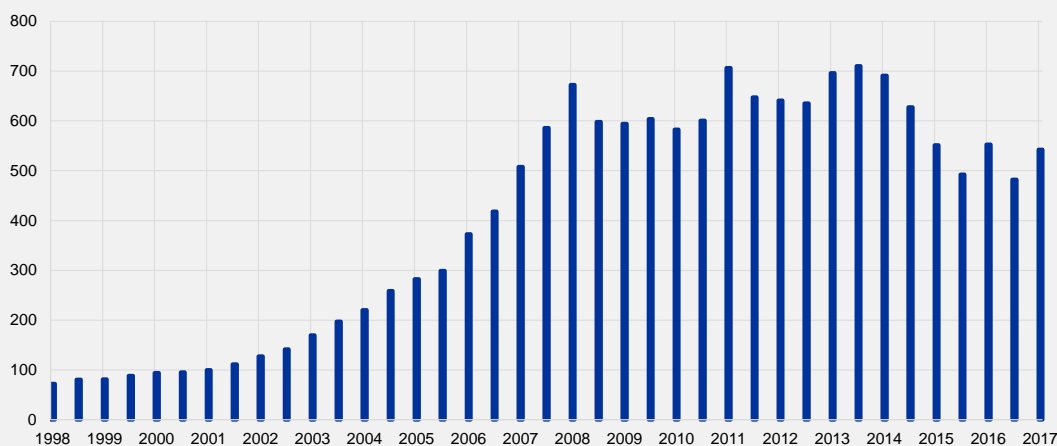
Regulatory complexity stemming from developments in the financial system: the over-the-counter (OTC) derivative markets

The global financial crisis exposed major vulnerabilities in OTC derivative markets.¹⁵ OTC derivative markets grew significantly in the years before the global financial crisis (Chart A). The global financial crisis revealed the existence of unaddressed weaknesses in these markets, including large counterparty risks that were not appropriately managed, and a lack of transparency at transaction and market level (Acharya and Engle, 2009).

Chart A

Outstanding notional amount of OTC derivatives

(USD trillions)



Source: Bank for International Settlements.

Notes: Notional amounts of exchange rate, interest rate and equity-linked derivative contracts are included. The time series are much shorter for other contracts, and these have therefore not been included.

Consequently, the G20 leaders decided at the Pittsburgh summit to address these vulnerabilities with a regulatory reform of OTC derivative markets. This reform included the requirement to centrally clear standardised OTC derivatives in central counterparties (CCPs) by 2012 and to report all transaction data on OTC derivatives to trade repositories (G20, 2009). In the United States, these measures were implemented through the Dodd-Frank Act, with further technical work by the Commodity Futures Trading Commission, the Securities and Exchange Commission and prudential regulators. In the EU, the European Market Infrastructure Regulation (EMIR)¹⁶ incorporated the reform of OTC derivative markets into the EU regulatory framework, with

¹⁵ A derivative can be defined as a financial security with a structure of payments that depends on an underlying financial variable (for example, a commodity price, a stock price, an interest rate or an exchange rate) or on another derivative (see e.g. Sundaram, 2012 for an introduction to derivatives). Derivatives can be traded on an exchange or directly between the counterparties (over the counter, OTC).

¹⁶ Regulation (EU) No 648/2012 of the European Parliament and of the Council of 4 July 2012 on OTC derivatives, central counterparties and trade repositories.



additional technical work being undertaken primarily by the European Securities and Markets Authority (ESMA) and the European Banking Authority (EBA).

A consequence of the regulatory reform of OTC derivative markets has been the creation of a new type of systemically important institution in the financial system: CCPs.¹⁷ Before the reform of OTC derivative markets, a handful of major investment banks transacted the majority of OTC derivatives, a role that increased their systemic importance – as the collapse of Lehman Brothers demonstrated. Now counterparty risk coming from these or similar players may affect counterparties only through CCPs. Consequently, following the regulatory reform, it has been necessary to develop a new regulatory framework for CCPs, with particular importance placed on solvency requirements and resolution and recovery regimes, in order to avoid the impact of the disorderly failure of a CCP on financial stability.¹⁸ In this regard, there has therefore been a degree of shift in systemic importance from major investment banks to CCPs. The regulation of margining and haircut practices at CCPs protects the CCPs against default risk but, depending on their design, also protects the system against potential sources of procyclicality. These practices ideally need to ensure the adoption of an adequate risk management approach while simultaneously avoiding unintended consequences in terms of financial stability. Finally, CCPs are subject to annual stress test exercises, which require considerable technical work in the regulatory and supervisory domains.

The reform of the OTC derivative markets has also affected banks. Banks are typically highly interconnected with CCPs in their role as clearing members, which involves contributing to the CCPs' default funds, and they clear positions with CCPs on their own behalf and that of their customers (Figure A). The introduction of the mandatory clearing obligation for OTC derivative contracts led to parallel revision of the banking regulatory framework for operations with CCPs. The Basel Committee on Banking Supervision (2014) revised the regulatory treatment of bank exposures to central counterparties. It defines a qualifying CCP as “an entity that is licensed to operate as a CCP (including a licence granted by way of confirming an exemption), and is permitted by the appropriate regulator/overseer to operate as such with respect to the products offered.” The regulatory treatment of clearing member exposures to CCPs and to clients, client exposure, collateral posted and default fund exposures is subsequently further clarified.

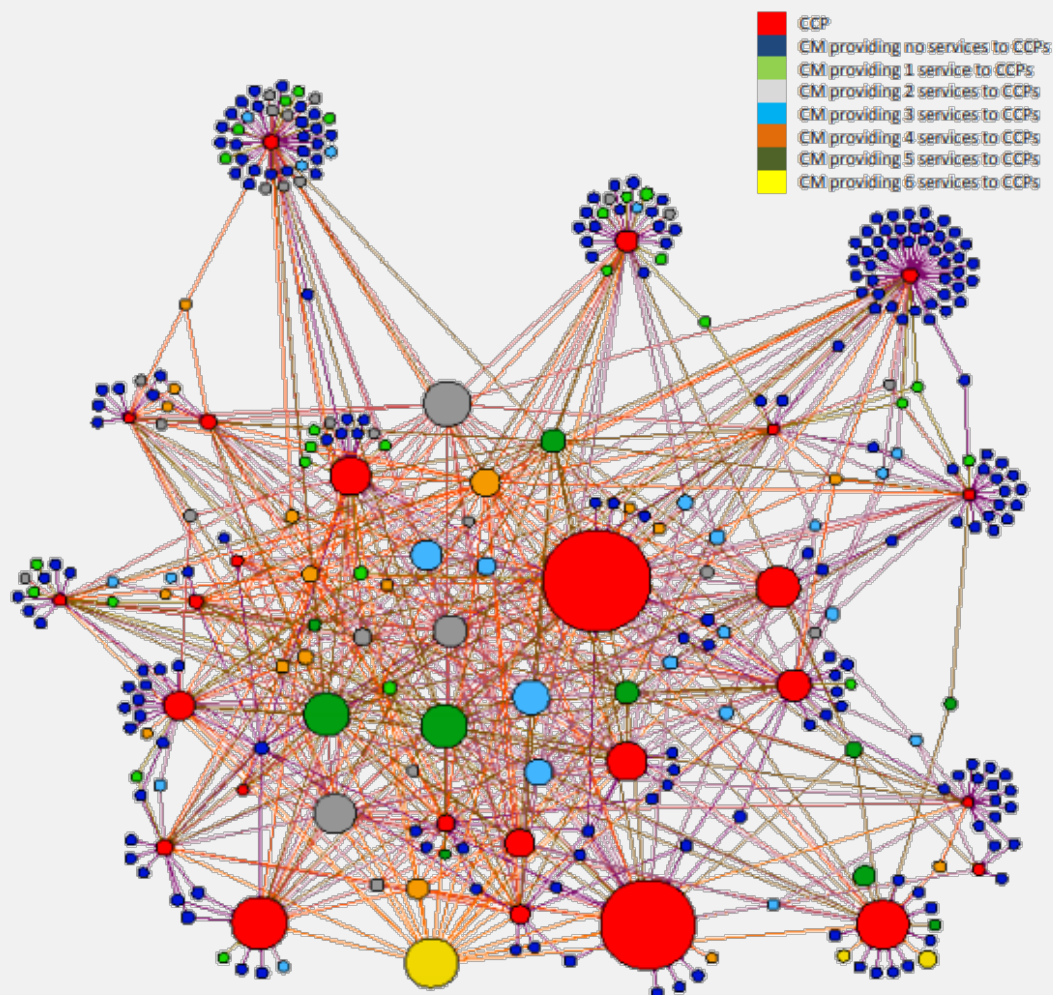
¹⁷ See Domanski et al. (2015) for an accessible introduction to how CCPs function.

¹⁸ Cox and Steigerwald (2017) discuss in further detail the challenges of defining a regulatory approach to CCPs, considering the fundamental differences between banks and CCPs, which calls for a different approach to regulating them.



Figure A

Network of CCPs and clearing members providing multiple services



Source: BCBS, CPMI, FSB and IOSCO (2018).

Notes: Red circles represent CCPs. Circles in other colours show clearing members providing additional services to the CCPs, attributed according to the number of services provided. Services provided by clearing members to the CCP may include acting as a custodian, settlement bank, investment counterparty, intraday liquidity and settlement provider, or credit or liquidity provider. The size of the circles represents the pre-funded financial resources of the underlying institution.

Another important component of the regulatory reform of the OTC derivatives markets is the obligation to report transactions to trade repositories, as a way to increase transparency.

Regulatory complexity does not arise in this case as a response to developments in “front-office” activities (i.e. positions in OTC derivatives taken by banks), but rather in relation to “back-office” activities on reporting transactions to trade repositories. Even if sometimes not fully acknowledged, complexity stemming from the latter activities is also important and can lead to significant inefficiencies and costs. This new reporting requirement has driven further regulatory efforts in order to define the information that must be sent to a trade repository at transaction level and to facilitate its usefulness. The introduction of the legal entity identifier (LEI) in 2012 responded in part to the need to report transaction-level information to trade repositories and was complemented by the introduction of a unique trade identifier (UTI). The UTI attempts to overcome the limits to cross-



checking the accuracy of information deriving from the fact that the various parties to a transaction might report it to different trade repositories – as frequently occurs. In the EU, the European Systemic Risk Board (ESRB) has access to the whole dataset of OTC derivative transactions, with millions of data points being reported on a daily basis. Storing and dealing with these data in a way that will ultimately be useful for macroprudential surveillance (e.g. with proper treatment of inconsistently reported information) will involve major investment in IT infrastructure and specialist human capital (see Abad et al, 2016 for an initial exploration of the data).

To sum up, the reform of the OTC derivative markets represents a case where financial regulators have responded to a development in financial markets by significantly increasing regulation. Despite increasing regulatory complexity, the reform aims to contribute to financial stability by reducing the implications for systemic risk transmission and amplification of the complex network of interconnections associated with OTC derivative transactions and by reducing their opacity. The regulatory response has led to the creation of a new regulatory regime for CCPs, the amendment of the regulatory regime for banks' dealings with CCPs and the introduction of a mandatory reporting obligation.¹⁹

¹⁹ The added standardisation brought about by the reform has also increased the opportunities for the compression of gross positions throughout the system, with potential positive effects for financial stability (D'Errico and Roukny, 2017).



3 Regulatory complexity and systemic risk

Excessive complexity in financial regulation may contribute to the scale of systemic risk in the financial system. After discussing the diverse factors which could explain the significant degree of complexity in the current financial regulation, this section describes the impact of excessive regulatory complexity on systemic risk. Later, we will consider the downsides of simple regulation, which could be seen as the immediate response to regulatory complexity but is itself not optimal in terms of systemic risk either.

3.1 The contribution of complex regulation to systemic risk

Regulatory frameworks that are excessively complex can create the illusion of a well-controlled system, while creating incentives for players to game the system, possibly leading to additional risks. Complex regulatory frameworks may provide regulators with a false sense of safety (analogous to the “illusion of control” defined by Langer, 1975). This is related to what Hayek (1974) calls the “pretence of knowledge” in economics, according to which “unlike the position that exists in the physical sciences, in economics and other disciplines that deal with essentially complex phenomena, the aspects of the events to be accounted for about which we can get quantitative data are necessarily limited and may not include the important ones”. Therefore, regulators may overestimate the degree of control they have over the financial system (see Box 2 for a discussion centred on risk-based capital requirements). Haldane (2011) states that “policy predicated on over-precision risks catastrophic error”. What is more, complex frameworks may provide regulated entities with multiple opportunities to game the system and stronger incentives for regulatory arbitrage and for the transfer of activities beyond the regulated perimeter, potentially creating further systemic risks.²⁰

A complex regulatory framework risks missing contingencies and provoking unintended reactions to regulation not fully foreseen at the time of designing the framework. Financial regulation shares with most popular risk management techniques a significant emphasis on addressing risks that are measurable and doing so in proportion to their quantified importance, which in turn rests on available historical evidence. This approach may be insufficient to deal with new forms of risk, structural change and, in general, phenomena which cannot easily be anticipated or measured in advance (“unknown unknowns”). A complex regulatory framework may be less robust to Knightian uncertainty than simpler, and possibly blunter, alternatives built under more modest assumptions on the knowledge of reality. In addition, complex systems may be harder to adapt to a changing environment, given the many interactions between different rules and different actors.

Complex regulation could exacerbate the impact of Knightian uncertainty on systemic risk. Recent academic contributions analyse the implications of Knightian uncertainty for systemic risk and its management. For example, Caballero and Simsek (2013), Dicks and Fulghieri (2018) and Roukny et al. (2018) show the detrimental effects of uncertainty about the interconnections

²⁰ The pitfalls of excessively complex regulation can also be related to the mechanisms behind Goodhart’s Law (see Manheim and Garrabrant, 2018).



between financial agents in a financial networks setup.²¹ On a related note, ambiguity aversion among agents dealing with uncertainty may amplify its negative effect on asset prices and increase the risk of bank runs (Epstein and Wang, 1994; Uhlig, 2010; Epstein and Schneider, 2010).²² Insofar as adding regulatory complexity may increase Knightian uncertainty (for example, by reducing the predictability of how financial institutions might react when constrained by the complex regulatory mix); complex regulation can increase the level of systemic risk (relative to similarly effective but simpler regulation).

There is significant uncertainty about how recently introduced regulation will ultimately impact the overall behaviour of financial institutions and the evolution of their business models. The interplay between the various regulatory measures and institutions' strategic responses to them are still poorly understood (Duffie, 2013). There may be conflicting impacts on institutions' portfolio choices, and the system-wide impact of multiple regulations – including indirect impacts and behavioural responses – is far from clear-cut.²³ Moreover, to the extent that problems are latent rather than manifested, there is a tendency not to remove measures already in place. Regulation thus comes in the form of a “rising tide of red tape” (Haldane, 2012) or “kludges” (Ely, 2011), whose exact nature is quite path-dependent and based upon the order in which problems come to light.²⁴

The combination of hard-to-understand interactions and a wide array of regulatory tools may make the overall effect of regulation convoluted and hard to judge. In a scenario where regulation (or policymaking) uses many tools to address risks in the financial system and where the interactions between the different tools are not fully understood, there are opportunities to err in multiple dimensions. Failure to recognise the complementary or offsetting effects of the various tools may lead to excessively tough or excessively soft cumulative impacts. Furthermore, delegating the calibration or management of the tools to multiple agencies (or even divisions within an agency) may produce inefficiencies owing to a lack of coordination in the use of the tools. Even when each tool targets a different goal (as under Tinbergen's rule), interactions may lead to unintended consequences. For example, levying heavy fines for conduct failings may incentivise desirable behaviour in the future but may also deplete the current capital bases of the firms involved.

A system of financial regulation that is excessively complex hampers accountability. Having many tools and many agencies in charge of them can dilute responsibilities in relation to financial stability. In these circumstances, accountability towards the public plays an important role. When the regulatory framework is unnecessarily complex, the public can perceive the regulatory framework as hard to understand and may think that it is being used to avoid public scrutiny. There can be a perception that regulators and supervisors are using financial regulation and the “technical

²¹ Caballero and Simsek (2013) also identify a negative externality associated with the complexity of the network.

²² Ambiguity is a concept introduced by Ellsberg (1961), who proposes a theory of choice in the presence of uncertainty that does not rely on the attribution of subjective probabilities to events that cannot be measured using objective probabilities. Ambiguity aversion refers, broadly speaking, to the preference for “unambiguous risks” over “ambiguous risks”. Unlike for the concept of risk aversion, the literature has not yet converged on a unanimous formal definition of ambiguity aversion (see Machina and Siniscalchi, 2014 for an overview).

²³ Engel (2016) also suggests that the greater the layers of regulation, the less productive those regulations are and the less favourable outcomes they are likely to generate.

²⁴ A kludge is a marginal adaptation that compensates for, but does not eliminate, fundamental design inefficiencies. The accumulation of kludges can result in permanently sub-optimal outcomes.



jargon” it contains to blur their accountability for their past actions. Moreover, the false sense of security provided by complexity in the near term may make society less prepared to accept the instances of financial instability that will still occur, producing a greater decline in public trust in the institutions that control the financial system if and when such cases materialise.

The need for highly specialised technical expertise at the various regulatory niches may conceal the view of the financial system as a whole. One of the direct consequences of increased regulatory complexity (and of financial complexity overall) is that coping with it requires significant technical expertise at the level of both the regulated entities and their supervisors. The greater importance of technical staff who are highly specialised in relatively narrow parts of the financial system potentially comes at the expense of losing perspective on the evolution of the system as a whole. Different specialised professional groups (including risk managers, accountants, lawyers and auditors) involved in defining, applying and enforcing complex regulation have a vested interest in keeping the system complex and as such keeping their scarce skills and qualifications in high demand.

Regulatory complexity entails the risk that supervision becomes a tick box exercise instead of a truly comprehensive assessment of the contribution that the supervised entities and activities make to systemic risk. The costs of complex financial regulation affect not only the regulated entities, but also those who are in charge of supervision and of detecting developments that might constitute new sources of systemic risk. On paper, the richness of the data currently available to supervisors should allow for a more comprehensive and accurate assessment of each regulated institution and the financial system than ever before. However, the lack of established methodologies to make use of such data and the scarcity of supervisory resources may leave the data not used to their full potential. In fact, overburdened supervisors may end up focused on mere compliance (in a sort of tick box exercise), at the expense of performing deeper independent assessments of risks and the capacity of the supervised entities to withstand them, and at the expense of better understanding the evolution of systemic risk (Warwick Commission, 2009; Hellwig, 2014).²⁵ Finally, with current wage structures in supervisory agencies and the regulated entities, it is quite likely that the former will on average be at a disadvantage in recruiting and retaining the talent needed to play the regulatory and supervisory game.

Excessive regulatory complexity may create barriers to entry for new participants, thus hampering competition and innovation in the financial system. Incumbent financial institutions may find that regulatory complexity is a barrier to the entry of new competitors, for which the compliance burden represent a large fixed cost. This allows incumbents to offer their services at higher prices than would prevail in a more competitive environment. Institutions operating under a complex regulatory framework might, therefore, enjoy more market power and be less pressed to reach cost-efficiency than under a lighter regulatory framework (Berger and Hannan, 1998; Delis and Tsionas, 2010). What is more, the cleansing effect of recessions has been found to be smaller when competition is impaired (Gropp et al., 2017), which allows some less efficient incumbents to operate for longer. In the case of capital regulation, for example, qualifying for the use of internal models under the IRB approach may require having data covering sufficiently long periods, forcing newly created banks to apply the standardised approach. For some classes of loans, the risk

²⁵ Along these lines, Kay (2016) argues that “regulation based on detailed prescriptive rules has undermined rather than enhanced ethical standards, by substituting compliance for values”.



weights under the standardised approach are higher than those under the IRB approach, putting new entrants at a disadvantage relative to incumbent banks that use the IRB approach.²⁶ Limited competition stemming from complex regulation may also have detrimental effects on innovation: innovation by entrants is discouraged, while incumbents may focus their innovative efforts on formally complying with existing regulations to their maximum advantage.

Through its opacity and granularity, regulatory complexity may favour the capture of regulators and supervisors by incumbent financial institutions.

Regulatory capture can be defined as the process by which regulated entities influence regulators in favour of their interests (Stigler, 1971; Laffont and Tirole, 1991). In the absence of entry threats, one might expect incumbent financial institutions to seek lighter regulation and supervision (Heinemann and Schüller, 2004). Paradoxically, such lighter regulation may be achieved in practice by promoting an excessively complex regulatory framework, because its reliance on technical concepts and a very granular approach can make it easier to gain support for regulatory reforms or interpretations of existing rules that favour incumbents.²⁷

Finally, a complex regulatory framework can encourage the transfer of risks to institutions outside the regulatory perimeter, where they might also contribute to transmitting or amplifying systemic risk.

Imposing a complex and onerous regulatory burden on some risky activities inside the perimeter of regulated entities may shift such activities to entities outside the regulatory perimeter. In some instances, the transfer of risk to less regulated entities may be enough to reduce the relevant contribution to systemic risk, but in other cases the risk shifted to other parts of the system may be equally, if not more, harmful as when contained within the regulated perimeter (Group of Thirty, 2018). The recurrent use of special-purpose vehicles in securitisations before the global financial crisis is one such example, to the extent that this practice may have been aimed at saving on regulatory capital relative to the old originate-to-hold business model in banking.

Box 2

Complexity in regulation: the IRB approach for the computation of banks' capital requirements

Internal models for the computation of capital requirements for market and credit risk were introduced in banking capital regulation in 1996 and 2006 respectively. The first Basel Accord on capital requirements for banks (Basel I) considered only five categories of assets, to which different risk weights were applied, reflecting their risk profile. In 1996, an internal model-based approach for capital requirements for market risk was introduced (Basel Committee on Banking Supervision, 1995), responding to the need that “regulatory requirements do not impede the development of sound risk management by creating perverse incentives.” For credit risk, a more elaborate system of risk weights was introduced in 2006 (Basel Committee on Banking

²⁶ There are also views pointing to the existence of a genuine trade-off between competition and financial stability. There is an ongoing debate – along similar lines to a previous discussion in the field of banking – over the optimum number of CCPs. Some authors claim that limiting the number of CCPs might be good for financial stability but bad for competition (Duffie and Zhu, 2011; Fontaine et al., 2012). See Committee on Payment and Settlement Systems (2010) for a comprehensive discussion of this topic.

²⁷ At a second level, supervisory capture also operates through the application of global rules at the national level, where captured financial regulators defend their domestic financial institutions against competition from foreign institutions (Hardy, 2006).



Supervision, 2006a), allowing banks to follow a standardised approach (SA) with predefined risk weights or to develop IRB models. These models, to be approved by the microprudential supervisors, yield estimates of the probability of default (PD), loss given default (LGD) and exposure at default (EAD) for each exposure. These parameters are then introduced into a non-linear formula prescribed in the regulation. The outcome of the formula with some transformations can be translated into a risk weight. The introduction of this more complex system of risk weights was a response to the consensus view at the time that simple capital ratios would be ineffective at capturing the cross-sectional distribution of risk across assets and banks.²⁸ It was argued that, if the same risk weights were applied to exposures with different risk, risk-taking could be incentivised, since the cost, in terms of bank capital, of a riskier asset would be the same as for a safer one.

The IRB approach to capital requirements entails greater complexity in the computation of capital requirements than the standardised approach or the approach under Basel I. As described by Aikman et al. (2014), the capital requirements for a corporate loan under the IRB approach in Basel II require a mathematical formula to be fed with a number of internally estimated parameters (see Table A). By contrast, the SA applies the risk weight that corresponds to the external rating attributed to the exposure or a 100% risk weight (as in Basel I) if the exposure has no external rating. The main aspect of complexity of the IRB approach (beyond a formula that is trivial to implement using IT) lies in its reliance on statistically based internal estimates that must be fed into it (and that supervisors must check and validate). For its part, the SA is also complex in that it involves the judgement of a rating agency (and possibly the need to validate such external ratings).

Table A

Capital requirements for a corporate loan under Basel I and Basel II

	Basel I	Basel II – standardised approach	Basel II – IRB approach
Risk weight	100%	AAA to AA-: 20% A+ to A-: 50% BBB+ to BB-: 100% Below BB-: 150% Unrated: 100%	$K = LGD \left[N \left[(1-R)^{-0.5} \cdot G(PD) + \left(\frac{R}{1-R} \right)^{0.5} \cdot G(0.999) \right] - PD \right]$ $\left(\frac{1 + (M - 2.5)b}{1 - 1.5b} \right)$ $R = 0.12 \left(\frac{1 - e^{-50PD}}{1 - e^{-50}} \right) + 0.24 \left(1 - \frac{1 - e^{-50PD}}{1 - e^{-50}} \right)$ $b = (0.11852 - 0.05478 \ln(PD))^2$
Capital requirements for a loan of €100	€8	€1.60 to €12	

Sources: Aikman et al. (2014). The IRB formula is reproduced from the text of the Basel II Accord.

Notes: The implied risk weight (in %) would be $K \cdot 12.5 \cdot 100$. The capital requirement for a loan of €100 would be $€100 \cdot K$.

The relative complexity of the IRB approach can also be proxied by comparing the length of the text devoted to its description in EU legislation with that devoted to the SA. The Capital

²⁸ Among others, Kim and Santomero (1988) and Rochet (1992) have derived theoretical models advocating a system of optimal risk weights.



Requirements Directive and Regulation (CRR)²⁹ introduced into EU legislation the capital requirements designed by the Basel Committee on Banking Supervision after the global financial crisis (Basel Committee on Banking Supervision, 2011). The SA is described in 31 articles (Articles 111 to 141), which span 15 pages, while it takes 50 articles (from Articles 142 to 191) and 33 pages to describe the IRB approach. The provisions in the CRR are complemented by additional rules laid down by the EBA, which was asked to prepare four implementing or regulatory technical standards or guidelines for the SA, and 15 for the IRB approach. Similar patterns emerge when considering the articles and other rules devoted to incorporating the SA and IRB approaches for market risk into the European regulatory framework.

This complexity could be justified if it provided a more accurate measurement of credit and market risks in banks' balance sheets and thus contributed to the ultimate objective of capital requirements (namely, that banks hold sufficient capital to withstand unexpected losses). However, the performance of IRB models seems to have been relatively poor, as highlighted by the global financial crisis. The introduction of the IRB models appears to have led to a significant decrease in risk weights for bank exposures (Basel Committee on Banking Supervision, 2006b; Kupiec, 2004 and 2006). A second consequence of the introduction of IRB models has been that similar exposures generate different risk weights, depending on the model used by each individual bank. Indeed, the Basel Committee on Banking Supervision performed an assessment of the variability of risk weights in the banking book of banks in 2016 and found that a hypothetical portfolio of loans produced significantly different risk weights in the IRB models (Basel Committee on Banking Supervision, 2016b). The global financial crisis has also revealed the poor forecasting power of capital ratios in comparison with other metrics, such as the leverage ratio (Haldane, 2012 and 2013; Aikman et al., 2014).

In the academic domain, the degree of discretion exercised by banks when applying risk weights has been repeatedly analysed. Le Leslé and Avramova (2012) have undertaken a comprehensive review of risk weights, pointing to possible explanatory factors for the differences across jurisdictions. Similarly, Mariathasan and Merrouche (2014) found evidence of strategic use of internal models by banks to generate desired risk weights. Ledo (2011) found that instead of the risk-weighted assets (derived from the calculation of the relevant parameters for the IRB models) behaving procyclically as expected, they remained overly stable in terms of total assets during the global financial crisis or even decreased. Finally, Behn et al. (2016) show that German banks systematically underestimated default probabilities under an IRB approach and that those loans under the IRB approach had not only lower risk weights but also higher default probabilities. The overall message is that the effectiveness of internal models is in practice strongly linked to how well supervisors can truly check them. Without a suitable level of supervisory challenge, institutions may be overly incentivised to adopt internal models that paint them in an artificially favourable light. Hellwig (2014) summarises this point by stating that “[...] this approach encourages financial institutions to invest in the management of risk weights, in modelling risks and in hedging them so that they can economise on equity and maximise the business they do with the equity they have.”

²⁹ Directive 2013/36/EU of the European Parliament and of the Council of 26 June 2013 on access to the activity of credit institutions and the prudential supervision of credit institutions and investment firms, amending Directive 2002/87/EC and repealing Directives 2006/48/EC and 2006/49/EC, and Regulation (EU) No 575/2013 of the European Parliament and of the Council of 26 June 2013 on prudential requirements for credit institutions and investment firms and amending Regulation (EU) No 648/2012.



From the above, it is commonly stated that the use of internal models for the computation of capital requirements produced an underestimation of risks in banks' balance sheets, which then unravelled during the global financial crisis (Hellwig, 2008; Trichet, 2009; Gerding, 2009; Crotty, 2009). Key contributors to this underestimation of risks were the insufficient consideration given to modelling risk (in other words, the risk that the models would produce inaccurate outputs in certain circumstances) and the complexity embedded in these models. An important caveat is that we should ideally be comparing the performance of IRB models with the alternative that would have been used instead (SA), which arguably did not perform ideally during the crisis either. When the financial system in particular and the world in general become more complex and riskier, and particularly when differentials between risks increase, static risk weights largely independent of exposure type are unlikely to be the most robust way of measuring risk. Moreover, the use of internal models assumes that banks' objective function mirrors that of society. However, as long as banks do not take into account externalities generated by their actions (which are included in the objective function of societies), this is not true. Unless supervisors are able to thoroughly check internal models and ensure that they include the externalities generated by each bank, these models are going to be suboptimal from a societal point of view.

The recent reforms to Basel III (Basel Committee on Banking Supervision, 2016a) contain several amendments addressing complexity in financial regulation. Capital requirements for credit exposures to banks, large firms and equity portfolios will no longer be determined by risk weights derived from banks' internal risk models, but instead will use the revised SA. There are also constraints on the use of internal models for specialised lending and loans to medium-sized firms. Two further changes to the Basel arrangements also involve simplifications (Basel Committee on Banking Supervision, 2017): (i) the introduction of a non-risk-weighted CET1 leverage ratio as a "backstop" (rather than as a substitute) to the risk-weighted assets approach,³⁰ and (ii) the application of "output floors" for banks using internal models that are to be set at 72.5% of the capital requirement that the bank would face under the revised standardised approach.³¹ Importantly, simpler (and possibly less risk-sensitive) rules under Pillar 1 imply a much greater reliance on Pillar 2 supervisory approaches that involve more subjective risk assessment – more akin to principles-based regulation – with its own complexities.

3.2 The downsides of simple regulation

We have recently observed some attempts to reduce the complexity of financial regulation.

The increasing recognition that fundamental uncertainty, rather than just measurable risk, is relevant for financial stability and the fact that regulators will invariably operate at a lag compared with private institutions have prompted calls for greater simplicity in regulation. The driving idea, building on Hansen and Sargent (2007), is that simpler rules might be more robust to Knightian uncertainty. Aikman et al. (2014) propose simple heuristics and decision trees as a basis for

³⁰ However, the indicative minimum requirement of 3% to 3.5% means that it is unlikely to be binding for many banks.

³¹ See Huizinga (2016) for a concise summary of the rationale behind the consideration of output floors. While the introduction of output floors on IRB models seems an logical response to the issue in isolation, it will arguably add further complexity to the overall regulatory framework.



regulatory intervention when there is considerable uncertainty about the true signal. In the area of banking regulation, Haldane (2012) states that “for a set of the world’s most complex banks, simple-weighted measures appear to have greater pre-crisis predictive power than risk-weighted alternatives.” In the same vein, Hoenig (2013) suggests that “the tangible leverage ratio is a superior alternative to risk-weighting schemes that have proven to be an illusion of precision and insufficient in defining adequate capital.” Ingves (2016) also notes that “simple rules can sometimes be more risk-sensitive and robust than complex ones, and can better meet supervisory objectives.”

Nonetheless, in general, simple rules are far from being a panacea, as they may exacerbate the problem, compounding complexity in the process. Even if simple rules are attractive for their simplicity, they are not a silver bullet. To be effective against riskier cases or in more adverse scenarios, a simpler rule might have to be blunt on safer or less adverse ones, inducing a possible decline in valuable financial activities or an unintended shift from safer to riskier strategies. For instance, Duffie (2017) cautions that applying a simple leverage ratio for banks will affect relatively safe segments of bank activity, such as trade in US Treasury repos. Broker-dealers are likely to respond to increased capital requirements by seeking higher bid-ask spreads for positions that will require more regulatory capital relative to risk. They may also be encouraged to develop new financial engineering techniques to economise on the use of balance sheet space, potentially making the financial system more complex. These observations mirror the critiques of the simplicity (in the form of limited risk-sensitivity) of Basel I.

The merit of simple bright-line regulations must be judged against the often underestimated costs of their enforcement. If regulators attempt to balance potentially conflicting goals (e.g. market-making vs proprietary trading) where attainment is not easily measured, then seemingly simple concepts often evolve into regulations that are complex to define or to enforce. Box 3 considers how attempts to ringfence retail banking activities and to require financial firms to implement resolution plans (also called living wills) have spawned additional complexity, contrary to the original intention. Critically, the ambiguous nature of the Volcker Rule, which ringfences retail banking in the United States, provides incentives for banks to disguise proprietary trading or evade the regulatory net. Indeed, banks have created trading strategies that satisfy the quantitative metrics required by the regulation, while violating the spirit of the rule. Proprietary trading has also moved into the hedge fund industry, possibly leaving banks exposed to the same risks but via an industry subject to less regulation (e.g. through direct investments in such funds or indirectly through prime brokerage arrangements with such funds).

Simplicity by itself is not a goal of financial regulation. To paraphrase Calabresi’s (1970) famous articulation of the law of accidents, the aim of macroprudential policy should be to minimise the sum of the costs of crises and the costs of their prevention, i.e. the compliance costs and any other costs or distortions imposed by the regulatory measures. An excessive focus on simplicity will tend to overemphasise the latter and understate the greater effectiveness (e.g. desirable incentive effects across risk categories) that, in some cases, can be achieved with more complex rules. As put by Epstein (1995), the right approach to regulatory design would be to consider compliance costs and other relevant costs associated with complexity at the time of assessing the net advantages of any regulatory measure (Table 1). Simplicity of financial regulation would focus on decreasing compliance and other costs (in orange in Table 1) and could also come at the expense of an adequate incentive structure.



Table 1

Taxonomy of trade-offs between benefits and costs in financial regulation

	Incentives structure	
	Superior	Inferior
Compliance and inefficiency costs	Increase	(1)
	Decrease	(2)
		(3)
		(4)

Source: Own elaboration.

Box 3**Bank structural reform and resolution plans: can simple rules beget complexity?**

In the aftermath of the global financial crisis, there has been a policy discussion about how to address the complexity of banks³², with the ultimate objectives of curtailing it or alternatively being better prepared to cope with it in a resolution context. This box will discuss in further detail two important pieces of banking regulation related to this debate: (i) the ringfencing of retail banking activities (bank structural reform) and (ii) the preparation of detailed resolution plans for large and complex banking groups (living wills). Both stem from simple ideas, which on paper were widely considered effective at addressing perceived weaknesses in the regulation of banks. However, as argued below, their actual implementation may have created additional complexity, against their original goal.

Bank structural reform

As a response to the global financial crisis, policymakers saw the need to particularly protect (“ringfence”) retail activities of banks in case of a systemic event. A series of regulatory initiatives were therefore adopted to ensure that banks’ retail activities (i.e. operations with households and smaller non-financial corporates) would be protected in the event of a crisis. On paper, ringfencing would protect the provision of credit to the real economy without providing blanket protection to the rest of banks’ activities, thus mitigating distortions such as the too-big-to-fail subsidy enjoyed by large banks. It should allow the investment banking activities of, say, a large bank to be closed down without causing harm to the real economy. With this aim, the Dodd-Frank Act in the United States included the “Volcker Rule”, under which customers’ deposits are not allowed to be used in “speculative activities”. In the United Kingdom, a similar rule was adopted following the advice in the Vickers report (Independent Commission on Banking, 2011). In the EU the Liikanen report also proposed a separation of banks’ trading and retail activities (High-Level Expert Group on reforming the structure of the EU banking sector, 2012). In all three cases, the intention was to promote the use of deposits from households and non-financial corporations in providing credit to them, rather than in undertaking riskier or more “speculative” financial trading activities. An implicit underlying premise was that traditional banking activities are safer or more socially valuable than non-traditional ones, which may not always be true. The proposals were also

³² See Flood et al. (2017) for an approach to the complexity of bank holding companies based on the complexity of their corporate structures, and Cetorelli and Goldberg (2016) for a discussion of the impact of complexity on the management of banks.



based on the view that the benefits of diversification offered by large universal banks are largely illusory, or at least insufficient to counteract other risks implied by mixing commercial and investment banking activities.

However, translating this seemingly simple idea into rules and current banking reality has created several layers of complexity. Such complexity stems from the fact that it is not that straightforward to distinguish which activities of a bank are truly related to the provision of credit to the real economy and which are not. In the United States, the final rule passed in 2013 takes up 272 pages (or over 900 including commentaries), mostly devoted to detailing numerous exceptions to the overall principle (e.g. allowing trading in certain government and municipal obligations, certain investments in covered funds and trading for the general account of insurance companies to qualify as traditional banking). The regulation has imposed substantial compliance costs. Piasio (2013) estimates that the 10,000 US banks would spend about 1.74 million hours each year complying with the rule. Similarly, in the United Kingdom, the entry into force of the bank structural reform led to intensive preparatory work on the regulatory and supervisory side, with the publication of several pieces of legislation, concerning, among other matters, the reporting of information, the conditions for the establishment of ringfencing transfer schemes and the impact of ringfencing on the computation of Pillar 2 capital requirements. These efforts were necessary to ensure that all the individual pieces of regulation reinforce each other and contribute to the intended objective of bank structural reform. In the EU, the legislative initiative by the European Commission (European Commission, 2014), based on the recommendations in the Liikanen report, was dropped in 2017 due to the lack of progress since 2014.

A simple idea has evolved into a very complex piece of regulation. Bank structural reform received initial support from numerous experts in academia and policymaking institutions (Demirgüç-Kunt and Huizinga, 2011; Boot and Ratnovski, 2012; Gambacorta and van Rixtel, 2013; Viñals et al., 2013). However, the practical implementation of bank structural reform in the form of a specific piece of regulation turned out to be very complicated, involving multiple definitions, thresholds and exceptions. In the United States, a call for public responses on how the final Volcker Rule accomplished its purposes and asking for feedback on its implementation drew significant attention from diverse stakeholders (over 8,400 responses). The need to remove complexity in the regulation was frequently mentioned in the responses (Office of the Comptroller of the Currency, 2017).³³ Following this call, a request for comments on a proposal to simplify the Volcker Rule was issued in 2018. Interestingly, in its response to the Independent Commission on Banking, Finance Watch (2013) stated that “the simpler the rules, the stronger the ringfence.”

Resolution plans (living wills)

One of the most striking facts unveiled by the global financial crisis was the lack of knowledge of the structure and internal organisation and governance of large financial institutions. The top management of large and complex banking groups usually lacked a clear view of the structure of their own group and of the activities carried out by different parts of the institutions. The knowledge of supervisors was even more limited and narrow. In this context, Claessens et al. (2010) coined the term “too complex to fail”, as it was sometimes the complexity of

³³ For example, various respondents noted that “[...] Volcker should focus on permitted activities, rather than prohibitions with a complex system of exemptions”.



the organisations, rather than the size of their balance sheets, that made them almost impossible to resolve. As a response, an idea gained traction in the subsequent regulatory reform of making banks write out in detail how they would be resolved in a situation of stress, so that the supervisory authorities could make use of this information if needed.

Resolution plans, known colloquially as “living wills”, are already part of regulation in the United States and are in the course of full implementation in the EU. In the United States, the Dodd-Frank Act requires that bank holding companies with total consolidated assets above USD 50 billion and non-bank financial companies designated by the Financial Stability Oversight Council (FSOC) for supervision by the Federal Reserve (Fed) submit resolution plans to the Federal Reserve and the Federal Deposit Insurance Corporation (FDIC) on a regular basis. The public sections of these resolution plans and the assessments by the Fed are published on the Fed website.³⁴ The feedback submitted by the Fed and the FDIC over recent years reveals an improvement in the quality of resolution plans, although some amendments are still required. Interestingly, many of the resolution plans explicitly refer to a reduction in the complexity of their corporate structures as one of the main actions undertaken by banks in this context. However, at the same time, the documents themselves are complex and long, with varying structures and different degrees of detail. In the EU, resolution plans are governed by Articles 8 and 9 of the Bank Recovery and Resolution Regulation.³⁵ It is worth noting that, unlike in the United States, the drafting of resolution plans in the EU does not lie with the banks themselves, but is one of the main tasks of the Single Resolution Board (SRB).³⁶ In the EU banks are in charge of drafting their “recovery plans”. The recovery and resolution plans of individual banks and the exchanges between banks and the resolution authorities on them are not yet public. The EBA is also mandated to undertake technical work in some areas of resolution planning. An interesting finding of the EBA in this respect is that resolution authorities have so far made only limited use of simplified obligations and waivers, as allowed by European regulation (European Banking Authority, 2017).

One widely recognised benefit of the introduction of resolution plans is that they will improve all participants’ knowledge of the affected banks, which might contribute to easier and quicker resolution in the event of trouble, even if the drafted plans cannot be followed precisely due to unforeseen circumstances. These benefits must be compared with the costs associated with drafting and checking the resolution plans at banks and at supervisory and resolution authorities (including the opportunity cost of supervisory staff). A balance should be found when determining the frequency of updates of resolution plans. The extensive feedback provided by US authorities on existing resolution plans and the severe consequences in the event of non-compliance (in terms of limitations on the distribution of dividends, additional capital requirements and divestments of assets) provide evidence of both the high costs of resolution plans and of the commitment of US authorities to making them useful. In the EU, resolution plans are not

³⁴ For a detailed explanation of how this process works in practice, see Board of Governors of the Federal Reserve System and Federal Deposit Insurance Corporation (2016).

³⁵ Regulation (EU) No 806/2014 of the European Parliament and of the Council of 15 July 2014 establishing uniform rules and a uniform procedure for the resolution of credit institutions and certain investment firms in the framework of a Single Resolution Mechanism and a Single Resolution Fund and amending Regulation (EU) No 1093/2010.

³⁶ According to Single Resolution Board (2016), a resolution plan details the characteristics of a bank and describes the preferred resolution strategy for that bank, including which resolution tools to apply. It concludes with a resolvability assessment of the bank aimed at identifying and addressing any impediments to the resolution of the bank.



yet fully operational, and a report of the European Court of Auditors (2017) serves as a reminder of the work to be done to make them an effective piece of the supervisory system.

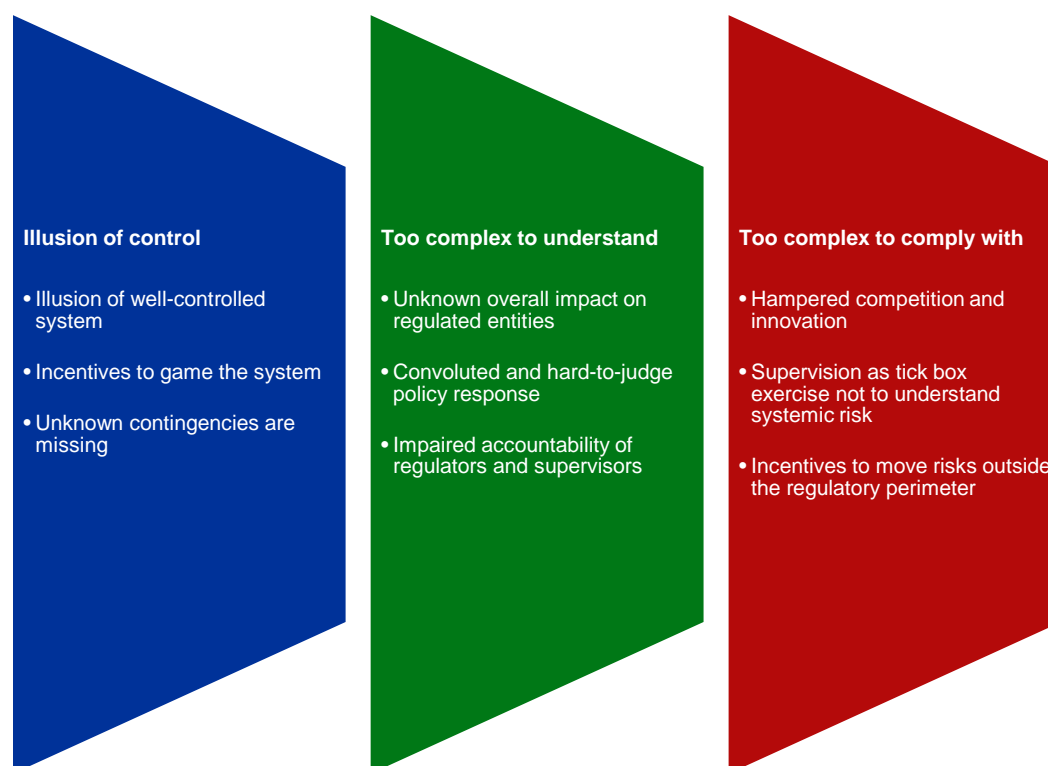


4 Towards a better regulatory framework

4.1 Addressing excessive regulatory complexity

One conclusion from the foregoing sections is that regulatory complexity can contribute in various ways to systemic risk. Figure 2 summarises the channels through which, as discussed earlier, regulatory complexity can be detrimental to financial stability. Excessively complex regulation creates potential vulnerabilities, distortions and costs because it provides authorities with an illusion of control, makes the regulatory apparatus and the reactions of the agents confronting it too complex to understand, and is too complex to comply with.³⁷

Figure 2
Contribution of regulatory complexity to systemic risk



Source: Own elaboration.

Disclosing more information is not sufficient to address complexity. It could be argued that regulatory complexity is what a complex financial system calls for and that it should be

³⁷ These channels can alternatively be grouped by reference to the main economic sector involved in each of them: society at large (unknown contingencies are missing, convoluted and hard-to-judge policy response, and impaired accountability of regulators and supervisors); regulatory and supervisory authorities (illusion of well-controlled system, supervision as tick box exercise not to understand systemic risk, and unknown overall impact on regulated entities); and financial institutions themselves (incentives to game the system, hampered competition and innovation, and incentives to move risks outside the regulatory perimeter).

accompanied by a reporting system that better allows regulators and market participants to understand such fundamental complexity (e.g. through the reporting of more granular information or even the live monitoring of institutions via direct access to their IT systems). However, the financial system today is very interconnected, and it is doubtful that access to even the richest data on individual institutions could meaningfully allow full control of the risk in the system. As Brunnermeier and Oehmke (2009) point out, always seeking to increase the information disclosed to supervisors or the market is not a valid response to complexity as it can lead to information overload. In summary, the availability of more granular information can create an illusion of control, while in reality the wood is not seen for the trees.

Overall, transparent cost-benefit analysis and greater evidence-based design of financial regulation are desirable. The “better regulation” framework, developed by the European Commission (2017), is a useful tool in developing cost-benefit analysis and evidence-based regulation. However, its practical implementation involves major challenges, including the collection of necessary information and the fact that estimating the benefits of new regulation will typically require structural models that rely on strong assumptions.³⁸ Some academics perceive intractable challenges. Gordon (2014) argues forcefully that a quantitative cost-benefit analysis of financial rules is impossible. He notes that the scale, complexity, speed and anonymity of the modern financial system are possible only because of a system of rules and the adaptations to those rules, including regulatory arbitrage. He also expresses concerns that efforts to quantify costs and benefits of associated rules reflect pretence of knowledge that regulators simply lack. Sunstein (2014) argues otherwise. He suggests that having cost-benefit analysis of regulations as an aspiration serves to reduce ignorance over time. A natural course of action in the face of ignorance is to pursue a maximin principle, i.e. to choose actions that eliminate the worst-case scenario. Since there is a risk that such guidance might lead to regulations that are overly complex or expensive, Sunstein suggests as a way forward requiring regulators to take steps to acquire information that makes use of the maximin principle unnecessary.

There should also be greater efforts regarding the evaluation of the effectiveness of regulations. Such evaluations are important ways of determining whether a given regulatory component is fit for purpose and justified in terms of benefits exceeding costs. Evaluations undertaken after a regulation enters into force can thus serve to identify unintended consequences and potential regulatory failures, contributing to a richer quantification of benefits and costs derived from its implementation. They can also ensure that a given piece of regulation follows developments in the activities of regulated entities, calling for amendments if necessary. To avoid conflicts of interest, these evaluations could be undertaken by independent bodies and could cover a broad set of policies in order to assess their interactions and their possible contributions to systemic risk.³⁹

³⁸ See the special issue of the Journal of Legal Studies (2014) for a range of papers exploring the challenges for cost-benefit analysis of financial regulation in greater detail.

³⁹ See also Organisation for Economic Co-operation and Development (2012) and European Commission (2017).



4.2 Regulation in the presence of Knightian uncertainty

In a complex financial system subject to significant Knightian uncertainty, the optimal regulatory response to deal with systemic risk is unlikely to be along the simplicity-complexity domain. Based on the previous discussion, it can be inferred that, especially in the presence of Knightian uncertainty, financial regulation that is excessively complex may not only be unsuited to address systemic risk but may even contribute to it. Therefore, an effort must be made to avoid unnecessary complexity in financial regulation while increasing robustness towards uncertainty. However, the quest for robustness is not solved by just adopting simpler regulation. In many instances, simpler regulation will not lead to optimal outcomes for the prevention of systemic risk.

Designing robust regulation requires acknowledging that capacity to address in detail every possible manifestation or source of systemic risk is limited. If regulators try to detect every new source of systemic risk and develop a tool specifically tailored to such risk, regulation will end up being too complex while not necessarily arriving on time to be prepared for the next source of systemic risk. By contrast, a system of regulation that acknowledges its limitations in perfectly accommodating each vulnerability but is flexible and far-reaching enough to be effective when confronting a wide range of them and to adjust to the changing environment by possibly recalibrating a few basic tools should be able to generate a better outcome overall.⁴⁰ As shown in Table 2, the decisive feature of robust regulation is its capacity to deal with a wide range of risks and with uncertainties and endogenous responses by agents in an evolving framework.

Table 2

Main features of different approaches to financial regulation

	Simple	Robust	Complex
Focus on reaching the desired outcomes	√	√	√
Consideration of complexity of the underlying phenomenon			√
Avoidance of unnecessary costs and burdens	√	√	
Able to cope with a broad range of risks and be adapted, if necessary		√	

Source: Own elaboration.

While robust financial regulation still entails a certain degree of complexity, it can contribute to reducing unnecessary complexity and generate a better outcome in terms of systemic risk. In the light of the significant complexity in the financial system, it is clear that robust financial regulation will not be able to remove fully complexity from financial regulation. However, such complexity can pay off if it makes financial regulation better suited to dealing with systemic risk and protecting the real economy from the negative consequences where it materialises.⁴¹ The role of

⁴⁰ See also Carney (2018).

⁴¹ Ben-Haim and Demertzis (2016) argue, from a microprudential perspective, that a regulatory framework adjusted to enhance robustness against Knightian uncertainty will increase the costs for banks and thus hamper their profitability and, indirectly, the quality of their services. However, such analysis does not consider the broader benefits entailed by a regulatory framework that is robust to uncertainty, which would decrease the cost of crisis to society.



financial regulation is then to address this complexity by setting limits to behaviours and outcomes (e.g. through bank structural reforms) and by providing adequate incentives to regulated entities (e.g. through higher capital requirements). A proper combination of limits and incentives should be capable of minimising accidental complexity and be an adequate response to the significant essential complexity already existing in the financial system.

4.3 The principles of robust financial regulation

This report calls for the avoidance of excessively complex regulation and proposes a greater reliance on robust regulation, which is better equipped to deal with systemic risk, particularly when confronted with Knightian uncertainty. Neither complex nor simple financial regulations are able to optimally address systemic risk in a financial system that is increasingly complex and subject to Knightian uncertainty. Therefore, current financial regulation should be complemented by a set of robustness principles. This section establishes seven broad principles that would contribute to making financial regulation more robust.⁴²

The seven principles summarised in Figure 3 are established with the aim of promoting a more cost-effective and robust regulatory framework.⁴³ Robust regulation should be proportionate and cost-effective and allow for flexible adjustment of the financial system without stifling competition and innovation.⁴⁴ It should rely on providing the right incentives to agents while allowing for a diversity of business models. It should ensure the resilience of the system, not of its individual components. The remainder of this section discusses each of these features in further detail.⁴⁵

⁴² The financial system is not the only system that needs to cope with complexity and it should therefore be possible to gain important insights by considering other disciplines, such as the natural world or physics (Kambhu et al., 2007; Taylor, 2011; Levin and Lo, 2016). That would include the concept of entropy and insights gained by considering the importance of a system's boundaries. As we have noted earlier, a call for robust financial regulation can also be viewed as consistent with the European Commission's objective (extending beyond the financial sector) of regulation at minimum cost.

⁴³ Ben-Haim and Demertzis (2016) identify five proxies for robustness: resilience, redundancy, flexibility, adaptiveness and comprehensiveness. They are broadly aligned to our seven principles outlined in this section.

⁴⁴ In the case of a complex evolving system, robustness can be achieved either by rigid and solid structures, which are able to withstand disturbances, or by a flexible system, based on diversity and heterogeneity (Kambhu et al., 2007). Rigidity can be the most appropriate approach when the system is confronted with a limited number of disturbances. Over the long term, when there is a continuous flow of disturbances, a rigid system may collapse, like the Tacoma Narrows Bridge.

⁴⁵ In the following paragraphs, we have not attempted to provide concrete proposals of actions that would effectively contribute to raising robustness in financial regulation; rather, we provide general principles that such actions should exhibit. The practical implementation of these principles depends upon regulators and policymakers, and we encourage them to reflect on these principles when developing financial regulation.



Figure 3
Principles for robust financial regulation



Source: Own elaboration.

The first principle (“adaptability”) establishes that financial regulation should be able to evolve with the financial system and not become an obstacle to innovation. Evolution itself entails preparing for future unknowns through the development of new ideas and approaches. Unlike an excessively complex regulatory framework, regulatory intervention should not create material barriers to entry by new participants or discourage new business models (Blinder, 2010). Therefore, a robust regulatory framework must also be able to keep pace with the evolution of the financial system and regulations must be continuously adapted to new developments in the financial system. In that sense, calls for periods of regulatory pause should be rejected, as regulation has to be a continuous process.

Regulatory sandboxes and sunset clauses are effective means to cope with innovation and new business models and ensure that obsolete rules or rules that emerged as a transitory solution are properly removed or revised. When new entrants come into a market with new business models or ideas, regulators often do not have full knowledge of how best to regulate them. Time pressure may lead to early implementation of the regulation, at the expense of a complete knowledge of the phenomenon. In these cases, the use of regulatory sandboxes can be promoted. Regulatory sandboxes are a set of rules that allow innovators to test their products or business models in a live (but limited) environment without following some or all legal requirements, subject to predefined restrictions (e.g. number of customers, risk exposures, time limitations, individual monitoring by supervisors).⁴⁶ Sunset clauses should also accompany any new and untested regulation. They imply that a piece of regulation would cease to be in force after a number of years unless its benefits can be empirically assessed (Spatt, 2012). Sunset clauses then force regulators to review the functioning of a given piece of regulation and to revise or even drop it, in view of its performance and the evolution of the system. Sunset clauses can also be useful for

⁴⁶ Regulatory sandboxes can be seen as a metaphor of sandboxes in parks, where children play and experiment in a controlled environment. See Russian Electronic Money Association (2016) for further details on existing regulatory sandboxes in the world.



retiring outdated pieces of regulation that are no longer necessary but contribute to increasing complexity in the regulatory framework.

The second principle (“diversity”) preserves the diversity and heterogeneity of financial institutions because guaranteeing the existence of some functional redundancy can raise the resilience of the system. Typically, regulation tends to disfavour diversity, as it limits or guides the behaviours and reactions of regulated entities in directions that might unintendedly favour specific business models and discourage others. While a harmonised treatment of the same risk across institutions is desirable, it would be important, all else being equal, to avoid this leading to excessive homogenisation of business models. One advantage of diversity from the point of view of systemic risk is that it provides an element of redundancy, understood as the capacity to have an alternative that survives should another fail in a systematic manner (Kambhu at al., 2007; De Nederlandsche Bank, 2018).⁴⁷ This can ensure that financial institutions are more substitutable and hence resolvable.

Entity-based regulation could be complemented by activity-based regulation in some areas that require a homogenous treatment of risks across the financial system. As outlined above, there is a trade-off between the desire for a common regulatory framework and its tendency to reduce diversity. On the one hand, one-size-fits-all approaches to financial regulation may not always be appropriate because similar activities may imply different risks in different types of institutions. However, regulatory frameworks excessively tailored to the specific characteristics of each group of institutions may amplify complexity, as is the case in some areas of the current European financial regulation. Given the recent evolution of the financial system, in which financial institutions have in some cases expanded their range of activities, it may be advisable to ensure a consistent treatment of certain risks across the financial system, as a complement to the existing entity-based regulation (Chong Tee, 2018). This should contribute to the avoidance of regulatory arbitrage and the transfer of risks to less regulated parts of the system (European Systemic Risk Board, 2016).

The third principle (“proportionality”) ensures that the burden of regulation should be proportionate to the importance of the market imperfection at stake. It addresses the fact that complex regulation involves a particular burden for smaller or less sophisticated regulated entities. Larger players are expected to be better able to cope with detailed and granular regulations and also to be a larger source of externalities than smaller players. Adopting the principle of proportionality in regulatory design allows smaller players to enjoy exemptions or simplified approaches to some rules. From a macroprudential perspective, this stance can be justified if smaller institutions generate less systemic risk, and especially so if they abstain from certain types of risky activities. From a broader economic perspective, there may also be a desire to avoid creating anticompetitive incentives that favour larger incumbents over smaller new entrants. Another motivation for the principle of proportionality is to restrict the cost of adhering to regulation to only what is clearly justifiable in terms of achievable benefits. Finally, proportionate regulation may also help regulators and supervisors target their efforts to where they will be most productive. Having said that, financial regulation should not ignore the potential for a simultaneous

⁴⁷ Similarly, redundancy is also present in civil aviation, for example, as planes have more engines than are strictly required to take off, fly and land, and in electricity grids, where transmission networks ensure the supply of power to all users even if a line failure occurs (power is simply rerouted while the failed line is repaired).



accumulation of vulnerabilities in many smaller institutions to trigger systemic problems (e.g. as was the case with some Spanish savings banks before the global financial crisis). The challenging task of regulators is thus to apply the proportionality principle in a way that provides the optimal output in view of the described trade-off.

The fourth principle is “resolvability”. Rather than ensuring that financial institutions do not fail at any cost, prudential regulation should ensure that they can fail without causing excessive disruption to the system. Robust financial regulation should allow inefficient and unviable entities to exit the system without endangering systemic stability. That may require a certain change in the focus of regulatory efforts: instead of considering all possible scenarios and trying to ensure that they do not lead any regulated entity to fail, financial regulation should ensure that the failure of an entity would not create a major disruption in the financial system. This becomes particularly relevant in a financial system that is growing in complexity and is therefore likely to be confronted with increasing Knightian uncertainty over time.

Policies related to recovery and resolution as well as to simplifying the internal structure should be promoted, including beyond the banking sector. Individual financial institutions, of any size and nature, should be able to fail non-disruptively (Blinder, 2010; Carney, 2018). That implies that others should be able to take their place and ensure a smooth provision of financial services to end-customers. Credible resolution procedures ensure that institutions must better internalise the consequences of their risk-taking, which reduces the need for resolution in the first place (Posch et al., 2018). Therefore, efforts must be intensified in the areas of recovery and resolution of all kinds of financial institutions (Group of Thirty, 2018), and on those policies that tackle the internal structure and complexity of financial institutions to ease the process should difficulties lead to resolution (Posch et al., 2018).

The fifth principle prescribes a “systemic perspective”. Financial regulation should aim to ensure the continuous provision of critical financial services to society (“survival of the system”). A regulatory framework that discourages diversity and favours the concentration of activities in a limited number of institutions can lead to the undesired situation where the ultimate objective of ensuring continuous provision of critical financial services is undermined, as it is transformed into the survival of the individual components of the system. A systemic perspective implies a different regulatory perspective. Instead of focusing on individual vulnerabilities (“microprudential”), it requires a comprehensive understanding of correlations and interlinkages, as well as an understanding of macroeconomic feedback mechanisms (“macroprudential”). Since most macroprudential instruments are implemented through microprudential supervisors, there is a need for close collaboration, exchange of information and mutual understanding of the different supervisory authorities.

The sixth principle (“information availability”) establishes that supervisors should have access to information and the capability to process it smartly and sensibly so as to detect contagion channels and pockets of vulnerability in good time. Massive data collection is not a panacea, and relying on information that is too granular, too imprecise and reported in too untimely a manner would not help maintain the required monitoring of the evolution of systemic risk. Reporting requirements should be designed with a realistic view of what is achievable and can be more useful in monitoring the overall status of the financial system and its components in a timely manner (Squam Lake Group, 2009). Simultaneously enhancing the capabilities of supervisors to work with large datasets and maintain a sound monitoring framework of the financial system would



also contribute to a better understanding and management of systemic risk. The collection of regulatory information should allow the main pockets of vulnerability and relevant contagion channels to be identified. The reporting obligation set for derivative transactions (see Box 1) is an example in this direction, but further efforts are necessary.

Timely access to relevant information and its effective processing should allow the regulatory and supervisory authorities to react to new developments through the activation (or deactivation) of existing tools (including crisis management tools), the recalibration of elements of regulation or other adaptations. Once vulnerabilities in the system and possible contagion channels have been identified, robust financial regulation should enable regulatory and supervisory authorities to address them. Drawing on insights from other disciplines dealing with complex systems, such as the electricity grid, forest fires and virus epidemics, these policy responses may entail the creation of (temporary or even permanent) fire breaks to avoid the spread of the vulnerabilities across the system, the isolation of certain parts of the financial system to avoid contagion or an increase in safety requirements for regulated entities that play a key role in the system and whose failure could create major disruptions (Kambhu et al., 2007; Blinder, 2010). In practical terms, this might mean setting limits to exposures to certain entities or activities, increased capital requirements for systemically important institutions (not only banks) and contingency plans to isolate the core activities of institutions (similar to bank structural reforms). These are actions which were, at least partially, implemented after the global financial crisis and whose scope could be extended to additional institutions and activities.

The seventh principle is “non-regulatory discipline”. Discipline coming from market forces, corporate governance and managerial ethics should be seen as a complement to regulation, not as a substitute for it. Fully relying on market discipline or self-regulation is problematic if the objective functions of regulated entities and society diverge, as is always the case in the presence of externalities. The various instances of non-regulatory discipline should therefore be seen as a complement to regulation and not as a substitute for it. Nevertheless, in conformity with several of the principles stated before, robust regulation should not aspire to regulate every aspect of financial activity in full detail, leaving ample room for the operation of non-regulatory discipline (Omarova, 2010; Marcinkowska, 2013; Lautenschläger, 2015; Wolak, 2015).

While not being able to remove complexity from financial regulation, a shift to robustness could address some of the contributions of excessive regulatory complexity to systemic risk. A robust financial regulatory framework, constructed under the principles outlined in previous paragraphs, could address some of the contributions of excessive regulatory complexity to systemic risk. Some of these would work directly: for example, regulatory sandboxes would be able to at least partially correct issues relating to barriers to entry, and a complementary role for activity-based regulation can help avoid the shift of risks outside the regulatory perimeter. In other cases, the impact would be seen indirectly: the focus on enabling orderly resolution of financial institutions can indirectly make regulators and supervisors reconsider their illusion of control of the financial system, and enhanced data capabilities of supervisors may move them away from tick box exercises towards a better understanding of systemic risk. In any case, implementing robust regulation is likely to require a greater need for discretion in financial supervision, guided by the above principles.

In combination, adopting these seven principles would help to raise systemic stability by reducing the need for excessive regulatory complexity (or simplicity), while making



regulation more cost-effective and robust. The existing complexity in the financial system implies that a certain degree of complexity in financial regulation remains necessary. But the consideration of cost-effectiveness and robustness to uncertainty will shift the overall degree of regulatory complexity downwards. Current and future regulation should be checked as to whether they are in line with the robustness principles, and any violation of the principles should lead to an adjustment of regulation. This will help avoid the harmful consequences of excessive regulatory complexity for systemic risk, by reducing the illusion of control and making it easier to understand and comply with regulation. Other than a rollback of regulation, which would be likely to reduce the resilience of the financial system, robust regulation holds the promise of preserving systemic stability in an effective and cost-efficient way.



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