CHAPTER 3

RISK TAKING BY BANKS: THE ROLE OF GOVERNANCE AND EXECUTIVE PAY

Summary

There is broad consensus that excessive risk taking by banks contributed to the global financial crisis. Equally important were lapses in the regulatory framework that failed to prevent such risk taking. Reforms are under way to further strengthen the regulatory framework, realign incentives, and foster prudent behavior by bankers. These reforms aim to enhance capital and liquidity buffers and influence the incentives that induce bankers to take excessive risk. Regarding the latter, measures are being introduced to enhance risk governance and to ensure that pay practices fully reflect the risks that bankers take.

To be effective and avoid unintended consequences, such reforms must be based on a thorough understanding of what drives risk taking in banks. This chapter aims to contribute to that understanding through an empirical investigation that relates various measures of bank performance and risks to bank characteristics of governance, risk management, pay practices, and ownership structures.

The results show that banks with board members who are independent of bank management tend to take less risk. The level of executive compensation in banks is not consistently related to their risk taking. More pay that is related to longer-term job performance is associated with less risk. Moreover, banks that have large institutional ownership tend to take less risk. As expected, periods of severe financial stress alter some of these effects because incentives change when a bank gets closer to default.

With these results in hand, the chapter recommends policy measures, some of which are part of the current policy debate but have so far not been empirically validated. Measures include more appropriate alignment of bank executives' compensation with risk (including the risk exposure of bank creditors), deferment of some compensation, and providing for clawbacks. Bank boards should be independent of management and should establish risk committees. Supervisors should ensure that board oversight of risk taking in banks is effective. Consideration should be given to including debt holders in addition to shareholders on bank boards. Finally, transparency is critical to accountability and the effectiveness of market discipline.

This chapter was prepared by Luis Brandão Marques and S. Erik Oppers (team leaders), Isabella Araújo Ribeiro, Kentaro Asai, Jonathan Beauchamp, Pragyan Deb, Nombulelo Duma, Johannes Ehrentraud, Oksana Khadarina, Ashraf Khan, Antonio Pancorbo, Ceyla Pazarbaşioğlu, Rohan Singh, and Oliver Wuensch, with contributions from Harrison Hong and Poonam Kulkarni.

Introduction

The run-up to the global financial crisis was marked by excessive risk taking in the financial sector, and once the crisis hit, the accumulated risks led to systemic problems and the failure of many individual financial institutions. The causes of such risk taking were many and complex, but there is general agreement in the financial industry, the public sector, and academia that incentive structures at some financial institutions played an important role. Moreover, some have called into question the integrity of banks and their executives, leading to reputational damage to the industry.

To tackle the issue of excessive risk taking, the postcrisis financial reform agenda has focused in part on improving the regulation of corporate governance in banks and regulating bank executives' pay. Thus, in addition to addressing the problem of banks being "too important to fail" and improving the financial capacity of banks to absorb losses, measures have been proposed to enhance board oversight of bank risk and to ensure that executive pay imparts the appropriate incentives to curb excessive risk taking.

The reform measures should be based on a thorough understanding of the underlying factors that led to excessive risk taking in banks, and this chapter aims to add to that understanding. By considering how incentives (such as compensation and ownership) and controls (such as board structure and the risk-management framework) shape bank risk taking (in theory and in practice), the analysis in this chapter can inform the design of regulation in these areas.

Specifically, the chapter investigates the following questions:

- To what extent does the design of corporate governance and compensation incentives in banks contribute to bank risk taking and to financial stability risks?
- How does the interaction of the interests of managers, shareholders, and creditors affect a bank's risk appetite, and how does it relate to public policy objectives, including the protection of depositors and taxpayers?
- How can regulation contribute to prudent risk taking in banks and thus foster financial stability?

To answer these questions, the chapter conducts a novel empirical investigation that links measures of corporate governance and managerial incentives (including compensation structures) to risk metrics of banks, including their contribution to systemic risk. It finds that some of these measures are consistently associated with risk taking in banks across countries. For example, more board members who are independent of bank management, a high share of equity awards in bank chief executive officer (CEO) compensation, and the presence of institutional investors are related to less risk taking. Although much of the public discussion has focused on the *level* of compensation, this analysis does not find a consistent relationship between the total amount of executive compensation (adjusted for firm size) and risk taking.

With these and other results in hand, the chapter makes the following policy recommendations: Reform measures should ensure that executive compensation of bankers is sufficiently risk sensitive through mandatory deferrals of compensation and a link to default risk and should require bank boards to be independent of management. Boards should establish board risk committees to improve board oversight and internal risk controls. In addition, policymakers should investigate the merits and pitfalls of having debt holders represented on bank boards.

Risk Taking in Banks: The Theory

This section (1) explains the traditional tension in objectives between managers and shareholders and argues that such tension is more severe for banks; (2) notes that especially for banks, maximizing shareholder value is not in the best interests of creditors; and (3) highlights the major conflicting interests vis-à-vis society that arise from the presence of externalities related to systemic risk.

Banks Are Different

It is worth remembering that modern compensation systems grew partly out of concern about insufficient risk taking by managers. The traditional corporate governance literature points to the well-known "agency" problems between the owners of a firm and the day-to-day managers (Jensen and Meckling 1976). That is, managers may not always act in the best interests of shareholders because of competing interests.[1] Manag-

[1]Managers may not put enough effort into supervising employees, seeking new clients, and selecting low-cost suppliers. Managers may also aim to make themselves indispensable in ways that do not necessarily add value to shareholders. Tirole (2006) provides a comprehensive survey of these matters.

ers' attitudes toward risk may also not be optimal from the shareholder's point of view: without additional incentives, managers may be too risk averse when the firm is doing well because they do not want to risk losing their personal financial wealth or the human capital they have invested in the firm. Pay incentives and corporate governance structures are intended to ensure that managers and workers act in the best interests of the firm's owners—that is, to maximize shareholder wealth by taking on appropriately risky projects.[2] Managers are monitored not only by the board of directors, but also by large shareholders, debt holders, market analysts, and credit rating agencies.[3] But monitoring is costly and may not be effective. Firms therefore aim to align managers' incentives with those of shareholders through schemes such as performance-based compensation packages (cash bonuses, stocks, or stock options), which generally make the manager more sensitive to changes in shareholder value (Box 3.1).

Agency problems are particularly relevant for banks, mainly because of the greater importance and difficulty of risk management. Risk management and the alignment of risk incentives between bank owners and managers are highly relevant for banks because risk taking is at the core of their business model. In addition, the relatively high complexity of banks' day-to-day business means that senior bank management must delegate much of the decision making about risk to less-senior workers.[4] That complexity also means that monitoring and control of the actions of risk-taking staff are difficult to implement and often less effective. Managers therefore base the pay of these employees on measured performance, which acts as a partial substitute for direct monitoring and control of their behavior.[5]

True performance is difficult to measure, however, and pay incentives may go too far and encourage the bank staff to engage in too much risk taking from the shareholders' point of view. For example, by taking on loans that appear to be profitable in the short term but come with hidden, long-term risks, bankers can increase their immediate performance-based pay and move on before the risks materialize. An additional complication is that bank staff often must choose the amount of risk to take on without knowing how it might affect the overall risk of the institution.

The Interests of a Bank's Creditors

Even if banks manage to align the incentives of their staff with the interests of shareholders, not all stakeholders will be satisfied, because maximizing shareholder value is not necessarily in the best interests of the bank's bondholders. Shareholders have limited liability, which means that they have a limited downside to their investment, but receive all the gains from an increase in the company's value. This position implies that they can sometimes transfer wealth from creditors to themselves by choosing risky projects that do not create value for the firm (see example in Table 3.1).[6] This so-called risk shifting increases as firms get closer to default because managers, often on behalf of shareholders, tend to "gamble for resurrection"—that is, hope to recover solvency by taking large risks that are in their own interests but not those of the bondholders. They are willing to take more risk when firms get closer to default (when their equity stake is nearly depleted) because shareholders and managers have less

[2]The view that the goal of corporate governance is to align managers' interests with the maximization of shareholder wealth is more common in English-speaking countries; corporate governance systems elsewhere (such as in continental Europe and Asia) often take into account the interests of other stakeholders as well (see Allen and Gale 2001; Clarke 2007; and Macey and O'Hara 2003). However, the shareholder focus is becoming more widespread because of increased cross-listings and international convergence of corporate governance codes.

[3]In most countries boards of directors have a one-tier structure that brings together management and nonexecutive directors in a single body responsible for protecting shareholders' interests. This system is common in Australia, Canada, France, India, Italy, the United Kingdom, and the United States. In Germany (as well as in Austria, the Netherlands, and Poland, and to a lesser extent in Denmark, Finland, Norway, and Switzerland; see Aluchna 2013), boards have a two-tier structure in which various stakeholders are represented on a supervisory board that is separate from the management board, which is composed only of executives. The management board is responsible for the day-to-day management of the company, while the supervisory board is responsible for appointing and monitoring the executives. In this chapter and for the purpose of measuring board independence, "board" refers to the supervisory board for firms with a two-tier structure.

[4]The relatively high complexity and business uncertainty in the banking sector have two additional implications for executive and employee compensation (Prendergast 2002). Because risk is high, overall compensation has to be high. Because delegation needs to be high, compensation must be indexed to some measure of performance or output to constrain employee discretion, and hence variable compensation needs to be a significant fraction of total compensation. Other factors may influence compensation (such as taxation), but those are not bank specific.

[5]See Prendergast (1999, 2000, 2002) on the trade-off between risk and incentives.

[6]There is evidence that the risk of creditor expropriation by shareholders may be significant: firms with stronger antitakeover protection provisions enjoy a lower cost of debt financing (Klock, Mansi, and Maxwell 2005).

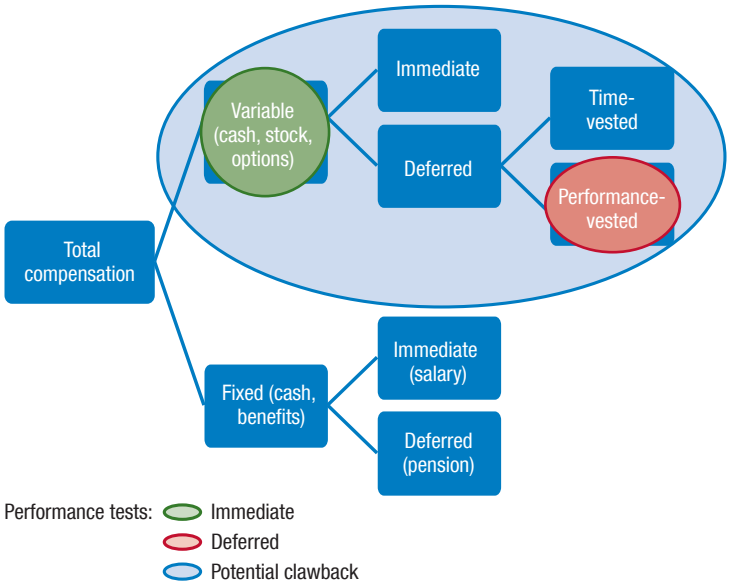
Box 3.1. Types of Executive Compensation

Total compensation of executives can consist of a number of components (Figure 3.1.1):

- *Fixed compensation,* the level of which does not depend on performance. Fixed compensation may be awarded immediately (for example, a salary) or may be deferred (for example, a pension).
- *Variable compensation* (bonus), the level of which depends on a variety of performance measures, which may include profits or stock performance. The bonus may be awarded immediately or promised for some future date. The future vesting of the deferred bonus may depend merely on the passing of time (in three years, for example) or may be dependent on future performance (future profits or stock price, for example).
- Variable compensation may be subject to *clawbacks*. A clawback occurs when previously awarded variable compensation (awarded immediately or after some time or after a performance test was met) is recouped in response to an adverse development (for example, a failed investment or a deterioration in the solvency position).

The performance tests that determine the amount of the variable compensation can be based on a variety of measures and should appropriately account for longer-term risk. Traditionally, compensation structures for bank executives have been based on operating profitability and stock price performance metrics such as return on equity and book value per share. These metrics are short term and do not account for operational, credit, and liquidity risks. More appropriate performance measures accounting for longer-term risk could include the sensitivity of a bank's stock to the wider stock market (beta), the credit default swap spread of a bank's debt, or risk-adjusted economic capital (measured by market capitalization plus total debt minus risk-weighted assets).

Figure 3.1.1. Types of Executive Compensation



Source: IMF staff.

The author of this box is S. Erik Oppers, with contributions from Poonam Kulkarni

Table 3.1. Equity Payoffs with Various Distances to Default
(U.S. dollars)

	Initial value	Final value if project fails (probability = 50 percent)	Final value if project succeeds (probability = 50 percent)	Expected final value (if project is undertaken)
Scenario 1				
Value of equity	100	0	150	75
Value of debt	200	200	200	200
Total assets	300	200	350	275
Scenario 2				
Value of equity	50	0	100	50
Value of debt	200	150	200	175
Total assets	250	150	300	225
Scenario 3				
Value of equity	0	0	50	25
Value of debt	200	100	200	150
Total assets	200	100	250	175

Source: IMF staff.

Note: The table shows scenarios for a bank with $200 of debt and various levels of equity. In Scenario 1, the bank's total assets are initially worth $300, so the initial value of the equity is $100 ($300 – $200 = $100); in Scenario 2, the bank's assets are initially worth $250 and the equity, $50; in Scenario 3, the bank's assets are initially worth $200 and the equity is worthless. The bank is considering an investment project that costs $100 and has a 50 percent chance of failing and a 50 percent chance of succeeding. The yield is independent of all other projects (so the project's risk is not diversifiable). If the project fails, it yields nothing; if it succeeds, it yields $150. The project therefore has a negative expected return of $25, so it should not be undertaken by the bank. The last column of the table shows the expected value of the debt, the equity, and the total assets under each scenario if the project is undertaken. In Scenario 1, the expected final value of the equity is less than the initial value; in Scenario 2, it is identical; and in Scenario 3, it is larger. Hence, if the board and the management represent only the interests of the shareholders, they will undertake the project in Scenario 3 even though it reduces the total value of the bank and therefore reduces the welfare of society as a whole. They like the project because in that scenario the equity holders capture all the gains if the project succeeds but the debt holders suffer the losses if the project fails. In all scenarios, the alignment of incentives between managers and shareholders is taken as given, as well as the compensation practices used to achieve said alignment.

to lose from failure (and more to gain from success) as their stake in the firm loses value. To the extent that compensation structures are designed to align incentives between managers and shareholders, they increase the risk-taking appetite of managers when the bank is close to default—against the interests of bondholders, who would prefer less risk.

Shareholder conflicts with debt holders are potentially more severe for banks than for other firms as a result of a failure of market discipline. Banks' many small depositors have little incentive to monitor the banks' actions because they are protected from default by deposit insurance. In addition, banks have much more leverage than other firms (heightening the shareholder–debt holder conflict) because the cost of debt is lowered by deposit insurance and explicit and implicit government guarantees (including from banks being considered too important to fail) and because of the premium banks earn when issuing liquid financial claims (that is, deposits and commercial paper).[7]

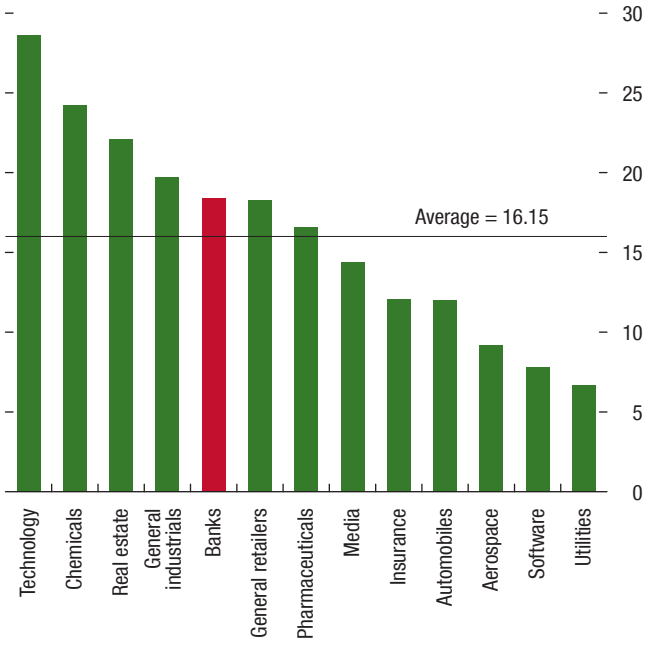
[7]The implicit subsidies coming from bailout guarantees can be appropriated to a larger extent by banks if they choose risky activities. In addition, mispriced debt and leverage reinforce each other. See Chapter 3 of the April 2014 *Global Financial Stability Report* for an assessment of too-important-to-fail subsidies.

Finally, creditors find it more difficult to discipline (and monitor) banks through bond covenants and by requiring collateral because banks are very complex and opaque (Figure 3.1).

Externalities and the Interests of Society

The main conflicting interests, however, are between shareholders, managers, and debt holders on one side, and society at large on the other side. They arise because of the presence of externalities related to systemic risk, and have long been a concern for regulators. For instance, shareholders, debt holders, and managers will fail to take into account the bank's contribution to systemic risk and hence its effect on other institutions and taxpayers. Banks' preferred levels of risk—and the compensation practices used to achieve them—may therefore be inconsistent with financial stability. In addition, banks are subject to runs because of high leverage and maturity mismatches in their balance sheets. These issues have been addressed in various ways by regulation—for example, through capital requirements that are contingent on the riskiness of bank assets.

Figure 3.1. Corporate Complexity and Opacity: Dispersion of Earnings-per-Share Forecasts by Sector
(Coefficient of variation)



Sources: Thomson Reuters Datastream; and IMF staff calculations.
Note: The figure shows the coefficient of variation of analysts' earnings-per-share forecasts (2012–13) for the largest firms in each economic sector. The measure underestimates the relative opacity of banks because it mixes opacity with hard-to-measure risk, which is probably more prevalent in innovation-driven sectors such as technology. Furthermore, because disclosure requirements are much higher for financial companies than for nonfinancial firms, information-based ambiguity is smaller for banks than for nonbanks, and bank opacity is mostly due to disagreement about firm fundamentals (that is, difficulty in understanding the business model) as a result of corporate opacity.

The global financial crisis showed that existing regulation to address this issue had been insufficient, and a regulatory reform agenda is paying attention to the issue of incentives for banks in a broad sense. Measures to address the too-important-to-fail problem, the development of standards on debt instruments that can be "bailed-in" (that is, those that can be made part of the loss-absorbing liabilities of a bank), and discussions of principles for compensation practices and principles for corporate governance are examples. In addition, measures were proposed (and in some cases adopted) with the goal of enhancing the effectiveness of price-based tools (such as capital requirements) and steering banks' business cultures away from excessive risk taking (see Viñals and others 2013). Such measures include living wills and structural measures that force the bail-in of unsecured liabilities, ring-fence riskier business segments, and bar banks from engaging in certain types of risky activities.

A number of international reform initiatives for corporate governance in banks are under way. The Organisation for Economic Co-operation and Development, the Financial Stability Board (FSB), and the Basel Committee on Banking Supervision (BCBS) are revising the standards for corporate governance based on lessons from the crisis in areas such as risk governance, board structure, compensation, internal audit, and the role of supervisors. Individual countries have also taken various initiatives (Table 3.2).

The most prominent incentive-based recommendations aimed directly at individual behavior are in the FSB's 2009 "Principles and Standards for Sound Compensation Standards" (P&S) (Box 3.2). The FSB guidance is intended to ensure (1) proper governance of compensation, (2) effective alignment of compensation with prudent risk taking, and (3) effective supervisory oversight and engagement by stakeholders. In its latest review in August 2013, the FSB reported that all but two of its member jurisdictions had completed the incorporation of the principles into their national regulations or supervisory guidance. The current focus is on the actual implementation of these rules and on effective supervision. Most supervisory authorities report that they now have a good sense of pay practices in their markets and exercise a good degree of oversight of the evolution of pay structures at supervised institutions.

It is important that regulatory reform initiatives aimed at reducing excessive risk taking in banks be based on a thorough understanding of the drivers of risk. Determining the *optimal* level of risk taking by banks is beyond the scope of this chapter. However, given the evidence that risk taking before the crisis had been excessive, the empirical exercise in the next section investigates a number of factors that are associated with risk taking in banks. Thus, although the results of the analysis do not distinguish between healthy and potentially hazardous risks, they may help policymakers design or refine regulatory reforms that will curb excessive risk taking in banks, while minimizing unintended side effects.[8]

[8]These measures of risk are tilted toward "bad risks" in that they cover negative tail risk, distance to default, and systemic risk. However, the analysis also uses more neutral measures of risk based on total or systematic risk, which can represent either healthy or hazardous risks.

Table 3.2. Reform Initiatives in Various Jurisdictions

Jurisdiction	Legislation/Initiative	Governance dimension	Measures
United States	Dodd-Frank Act (2010)	Compensation	"Say on pay": Listed companies are required to hold nonbinding vote on compensation of named executives at least once every three years; these companies must also hold a vote at least once every six years on the frequency of "vote on pay."
			"Say on golden parachutes": Listed companies must hold a nonbinding vote on "golden parachute" compensation when having to vote on a takeover bid.
			"Increased disclosures and transparency": Companies must disclose (1) the relationship between executive pay and the company's financial performance (including share value and dividend payout); (2) the median pay in firm (excluding CEO), the CEO's total pay, and its ratio; (3) any hedging against decreases in values of securities awarded to any employee or director.
			"Integrity and accuracy of executive compensation": (1) new standard for compensation committee independence, (2) clawback provisions allowing the recovery of any excess payment based on misreported financial data.
		Board of Directors	Risk management: (1) banks and some other financial companies with assets greater than $10 billion must have a separate board risk committee that includes at least one expert with experience in managing risks of large companies; (2) requirement may be extended to bank holding companies with assets less than $10 billion by the Federal Reserve.
	SEC proxy rules	Board of Directors	Banks must disclose in the annual report the extent of the board's role in risk oversight.
		Compensation	Companies must discuss: (1) the extent to which risks arising from compensation policies are likely to have a material adverse impact on the company; (2) how compensation policies and practices relate to risk management and risk-taking incentives.
European Union	CRD IV and CRR	Board of Directors	Requires separation between CEO and Chairman for banks with a one-tier board structure, unless authorized by competent authorities.
			Large banks must set up a nomination committee, making explicit its responsibilities (including self-evaluation).
			Requires the board to reflect "a broad range of experiences" and to possess sufficient collective knowledge to understand risks.
			Limits the number of directorships (subject to supervisor approval).
			Increases individual board members' responsibilities: Must have knowledge, integrity, and independence to assess and challenge management.
			Promotes diversity within boards.
		Compensation	Caps ratio of variable to fixed compensation at 1:1, which could be increased to 2:1 if approved by a super-majority of voting shareholders (65 percent if quorum exists and 75 percent otherwise).
			Up to 25 percent of variable pay may be exempt from the ratio requirement if paid in long-term deferred instruments (at least five years vesting period).
			Bonus-malus and clawback clauses must apply to 100 percent of variable compensation (that is, all compensation that is not required by law).
			At least 40 percent of each executive's bonus must be deferred and up to 60 percent for senior executives.
			Rules apply to MRTs (senior management, risk takers, control functions, and anyone receiving equal remuneration).
			Restrictions apply to worldwide employees of EEA firms, as well as to those of EEA-based subsidiaries of non-EEA firms, and to non-EEA-based employees with material responsibility for EEA operations.
			Bans hedging strategies or insurance contracts that would undermine the risk-alignment effects of the remuneration package.
			Requires complete and detailed disclosure of remuneration practices for large and complex firms: information on the link between pay and performance, shares award criteria, and aggregate figures of remuneration. Some qualitative disclosure required for smaller firms.

(continued)

Table 3.2. Reform Initiatives in Various Jurisdictions *(continued)*

Jurisdiction	Legislation/Initiative	Governance dimension	Measures
Canada	Ontario Securities Commission	Board Structure	Gender diversity: Requires disclosure of practices and policies — comply or explain. In consultation stage.
			Director term limits — comply or explain.
	Toronto Stock Exchange		Majority votes needed to confirm directors.
Bank for International Settlements	BCBS Principles for Enhancing Corporate Governance		Sets principles for sound corporate governance in six major areas:
			1. Board practices
			2. Senior management
			3. Risk management and internal controls
			4. Compensation
			5. Complex and opaque corporate structures
			6. Disclosure and transparency
Financial Stability Board	FSB Principles and Standards for Sound Compensation Standards	Compensation	Principles for effective governance of compensation:
			1. Board must oversee the design of compensation policies.
			2. Board must monitor and review compensation system.
			3. Financial and risk-control functions must be independent and have appropriate authority, and compensation must be independent of business functions.
			Principles for effective alignment of compensation with prudent risk taking:
			4. Compensation must be adjusted for all forms of risk.
			5. Compensation must be symmetric with risk outcomes.
			6. Compensation schedules must be sensitive to time horizon of risks.
			7. Mix of cash, equity, and other forms of pay must be consistent with risk alignment.
			Principles for effective supervisory oversight and engagement by stakeholders:
			8. Supervisory review of compensation practices must be rigorous and sustained; supervisors must include compensation practices in risk assessment of firms.
			9. There should be a comprehensive and timely disclosure of compensation practices, as well as risk-management control practices.
			Principles for sound compensation practices — implementation standards:
			1. Bonus-malus and clawback clauses must apply on cash bonuses.
			2. At least 40 percent of each executive's bonus must be deferred. The requirement increases to up to 60 percent for senior executives. At least 50 percent of variable compensation should be awarded in shares or share-linked instruments.
			3. Minimum deferral period is three years and at least half of bonuses are to be paid in restricted shares rather than cash.

Source: IMF staff.

Note: BCBS = Basel Committee on Banking Supervision; CEO = chief executive officer; CRD IV = Capital Requirements Directive (European Union Directive 2013/36/EU); CRR = Capital Requirements Regulation (European Union Regulation (EU) No. 575/2013); EEA = European Economic Area; FSB = Financial Stability Board; MRT = material risk taker; SEC = Securities and Exchange Commission.

Bank Governance and Pay: Empirical Evidence Regarding the Effects on Risk Taking

The Data

To examine the factors that affect risk taking in banks, the analysis in this chapter uses a large data set of relevant firm governance statistics for major banks in various advanced and emerging market economies.[9] The data cover more than 800 banks from 72 countries and include commercial banks, cooperative banks, savings banks, mortgage companies, and investment

[9] The data on compensation and other incentives are limited to CEOs. However, if CEO incentives are aligned with shareholders' interests, in principle the CEO will, in turn, accordingly condition the behavior of employees who are delegated to take financial risks. Furthermore, if excessive risk taking exists because of poor performance measurement, the problem should be common to senior and midlevel executives. Although agency problems between CEOs and those employees exist, they can be considered of second-order importance. Therefore, the findings based on CEO data provide a lower bound for the overall problem.

Box 3.2. Trends in the Regulation of Bankers' Pay

Several countries put caps on compensation at firms that received direct capital support during the global financial crisis to prevent public funds from being used to pay bonuses. Most of these countries (including Germany, the United Kingdom, and the United States) limited payouts to top executives, whereas others (such as Switzerland) aimed at limiting the bank-wide bonus pool. With crisis-related government support now withdrawn from most of these banks, the compensation caps have expired.

Separately, international standard setters have established compensation guidelines specifically for financial institutions. Under the mandate of the Group of 20, the Financial Stability Forum (which later became the Financial Stability Board, FSB) issued "Principles and Standards for Sound Compensation Practices" (P&S), which aims to align pay not only with performance, but also with risk. FSB members have agreed to implement these guidelines at least for "significant financial institutions," which in many countries means systemically important banks. The guidelines cover the following aspects:

- *Broad scope:* The rules should apply to senior management as well as to all other employees who have a "material" influence on the risk a financial firm is taking.
- *Ex ante risk adjustment:* Indicators that determine compensation amounts must recognize all types of risk, including the risk-adjusted cost of capital and funding, the correlation between total revenue and net income, and operational and compliance risks. Substantial portions of compensation packages should therefore be variable, although the FSB does not recommend a specific split between fixed and variable compensation.
- *Ex post risk adjustment:* Risks may take a long time to be realized, and outcomes can differ significantly from projections. Compensation that has already been awarded should therefore be adjusted according to risk outcomes. Between 40 and 60 percent of variable compensation should be deferred by awarding shares that remain blocked for a certain time, and variable pay should also be subject to clawbacks. The guidelines discourage options and other compensation instruments that lack a significant downside.
- *Enhanced disclosure:* The guidelines strengthen disclosure requirements to enhance market oversight and facilitate supervision. Going beyond general "say-on-pay" disclosure, financial firms are required to provide comprehensive information about pay at all hierarchy levels, in particular for material risk takers.

The FSB principles have since been supplemented by requirements of the Basel Committee on Banking Supervision.

Although FSB member countries have broadly implemented the P&S, they exercised considerable discretion in setting concrete national rules. In particular, there is substantial variation in how prescriptive countries are in implementing the P&S. Some jurisdictions, such as European Union member states, have been more prescriptive by placing absolute caps on variable compensation, with exemptions being subject to shareholder approval. Differences in the rules across countries may have hampered internationally active banks in the setting of consistent firm-wide compensation strategies.

The author of this box is Oliver Wuensch.

banks, among others. About 50 percent of the banks are from the United States; more than 20 percent are domiciled in Europe; and the remainder are located in Africa, the Asia and Pacific region, and the rest of the Americas (see Annex 3.1 for a detailed description of data sources).[10] The firm governance characteristics were divided into four groups of variables: board characteristics, risk management, compensation practices, and ownership (Table 3.3).

The data show the following main trends:

- *Bank executive compensation* (Figure 3.2): After dropping markedly at the outset of the global financial crisis, total CEO pay has now largely recovered. The share of fixed salary has risen markedly in Europe,

[10]Institutional coverage varies across the analyses because not all banks provide complete data. In particular, because many of the U.S. banks are smaller and often have incomplete data, they were excluded from the analysis in a number of cases, providing more institutional balance across geographical areas. Still, all regressions have some degree of oversampling of banks from regions where regulatory reforms have been more extensive (the United States and Europe in particular). To some extent, this issue is controlled for by using bank or country fixed effects.

Table 3.3. Governance Characteristics Used as Explanatory Variables in the Empirical Analysis

Risk drivers	Variables	Description
Board characteristics	Board independence	Share of independent board members (as reported by each bank)[1]
	CEO is chairman	Dummy = 1 if CEO is also a chairman of the board
	Financial experience	Average of independent board members' financial experience as a share of their total professional experiences[2]
Risk management	Risk committee	Dummy = 1 if there is a board risk committee
	CRO board member	Dummy = 1 if the CRO is a member of the board
	CEO background	Dummy = 1 if the CEO has retail banking or risk experience but no investment banking experience
Compensation practices	Share of salary	Share of salary in total calculated CEO compensation
	Equity-linked compensation	Share of equity-linked compensation in total calculated CEO compensation
	Compensation horizon	Maximum time horizon to reach full senior executive compensation
	Level of compensation	Total calculated CEO compensation adjusted for bank size
Ownership	Institutional investors	Share of firm that is owned by institutional investors
	Inside investors	Share of firm that is owned by inside investors
	Large shareholder	Dummy = 1 if there is a blockholder owning at least 10 percent of the firm

Source: IMF staff.

Note: CEO = chief executive officer; CRO = chief risk officer.

[1]Independent board members are defined as directors who are not employees of the bank (currently or in the past few years) and do not have a direct relationship with the bank. The exact definition varies by jurisdiction. For example, large shareholders may or may not be considered independent. In banks with a two-tier board structure, only the supervisory board is considered.

[2]Formally, it is the average (across all independent directors) of the share of individual directors' financial sector experience to their total experience.

possibly due to more direct regulation of executive pay. The role of long-term incentives is on the rise because the vesting periods for variable pay have been extended. This is in line with the implementation of the FSB P&S, which require compensation to be sensitive to the time horizon of risks. Finally, bank shareholders are more engaged on matters of executive compensation, as evidenced by the marked increase in votes on such practices ("say on pay").

- *Board structure* (Figure 3.3): The share of independent directors on boards has increased in Europe and the United States but has declined in Asia (see Table 3.3 for a definition of independent board members). On average, most independent board members have some degree of experience in finance, and this share has increased modestly.
- *Risk management:* The role of risk-related functions has gained importance since the crisis. More boards have established board risk committees, and the chief risk officer (CRO) is more often a member of the board.[11] This enhanced role for risk-related functions is partly also in response to regulations (for example, the Dodd-Frank Act in the United States and the Capital Requirements Directive—EU Directive 2013/36/EU, or CRD IV—in Europe) that require companies of a certain size to have board risk committees and CROs with direct access to board members. The BCBS Core Principles for Effective Banking Supervision also include a new principle stating that supervisors should require larger and more complex banks to have a dedicated risk-management unit overseen by a CRO.

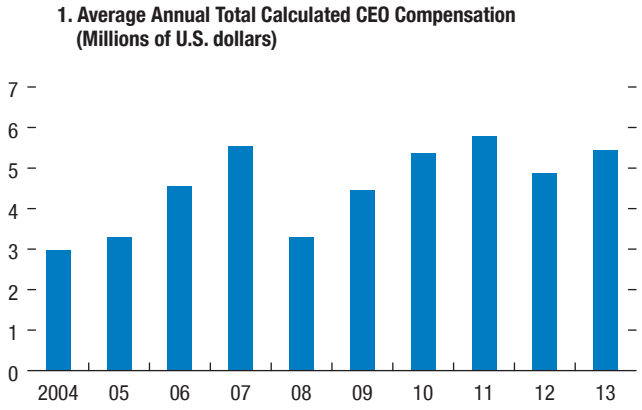
In addition to pay and governance, corporate culture has a significant effect on risk taking in banks. It is impossible to design an incentive structure that leads a bank manager to make the "right" decision every time (Stulz 2014). In cases in which incentive rules are insufficient, corporate culture will guide decisions and complement a bank's ability to manage risk. Corporate culture thus provides a set of unwritten, but widely accepted, rules that determine acceptable behavior—which in some corporate cultures may include disregarding written rules. A key characteristic of culture is that it is adopted over time.

Although measuring a bank's culture is seemingly impossible, some indicators of a sound risk culture can be identified (FSB 2014). First, boards and management must set the expectation for integrity in behavior

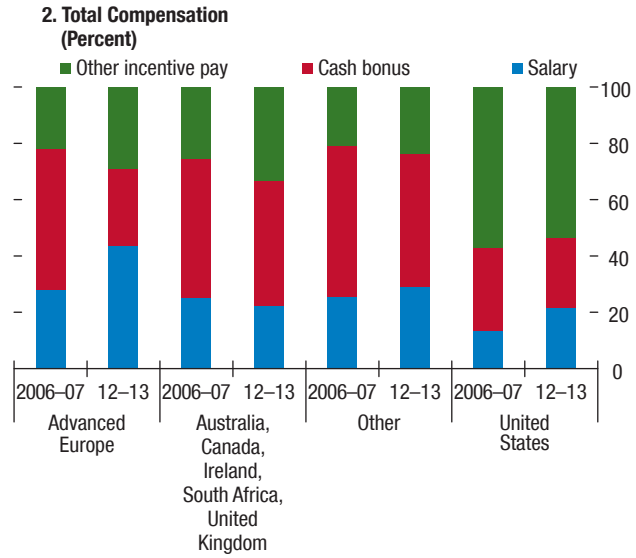
[11]The measure "CRO is a board member" is a proxy for the centrality of this officer but is not meant to capture a best practice. For two-tier boards, the measure indicates whether the CRO is a member of the executive board (he or she can, of course, not be a member of the supervisory board).

Figure 3.2. Trends in Compensation Practices in Banks

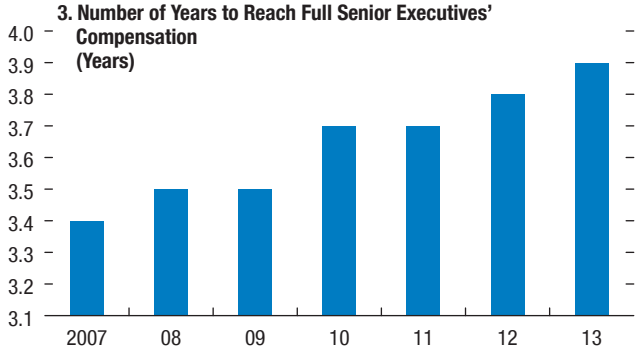
Total bankers' pay has recovered...



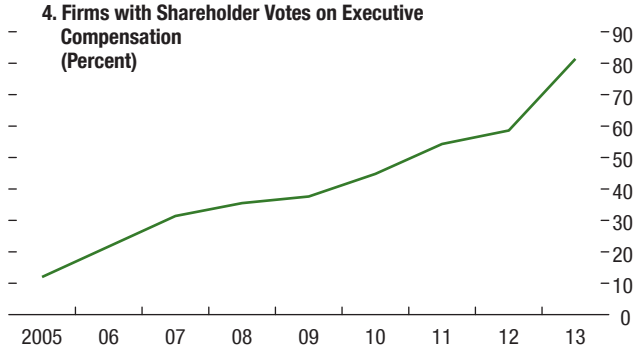
... and fixed pay has increased, mostly in Europe...



... but the vesting periods are becoming longer...



... and say-on-pay is becoming more widespread.



Sources: BoardEx; Standard and Poor's Capital IQ database; Thomson Reuters Datastream; and IMF staff estimates.
Note: CEO = chief executive officer; "Advanced Europe" comprises Austria, Belgium, Cyprus, Denmark, France, Germany, Greece, Iceland, Italy, Liechtenstein, Netherlands, Norway, Portugal, Spain, Sweden, and Switzerland; "Other" comprises China, Hong Kong SAR, India, Israel, Japan, Malaysia, Pakistan, Singapore, and South Africa. Only banks with assets of more than $10 billion are included. Panel 2 shows the share of the sum (across all banks in each region) of total compensation that was paid in salary, cash bonuses, and other incentive pay.

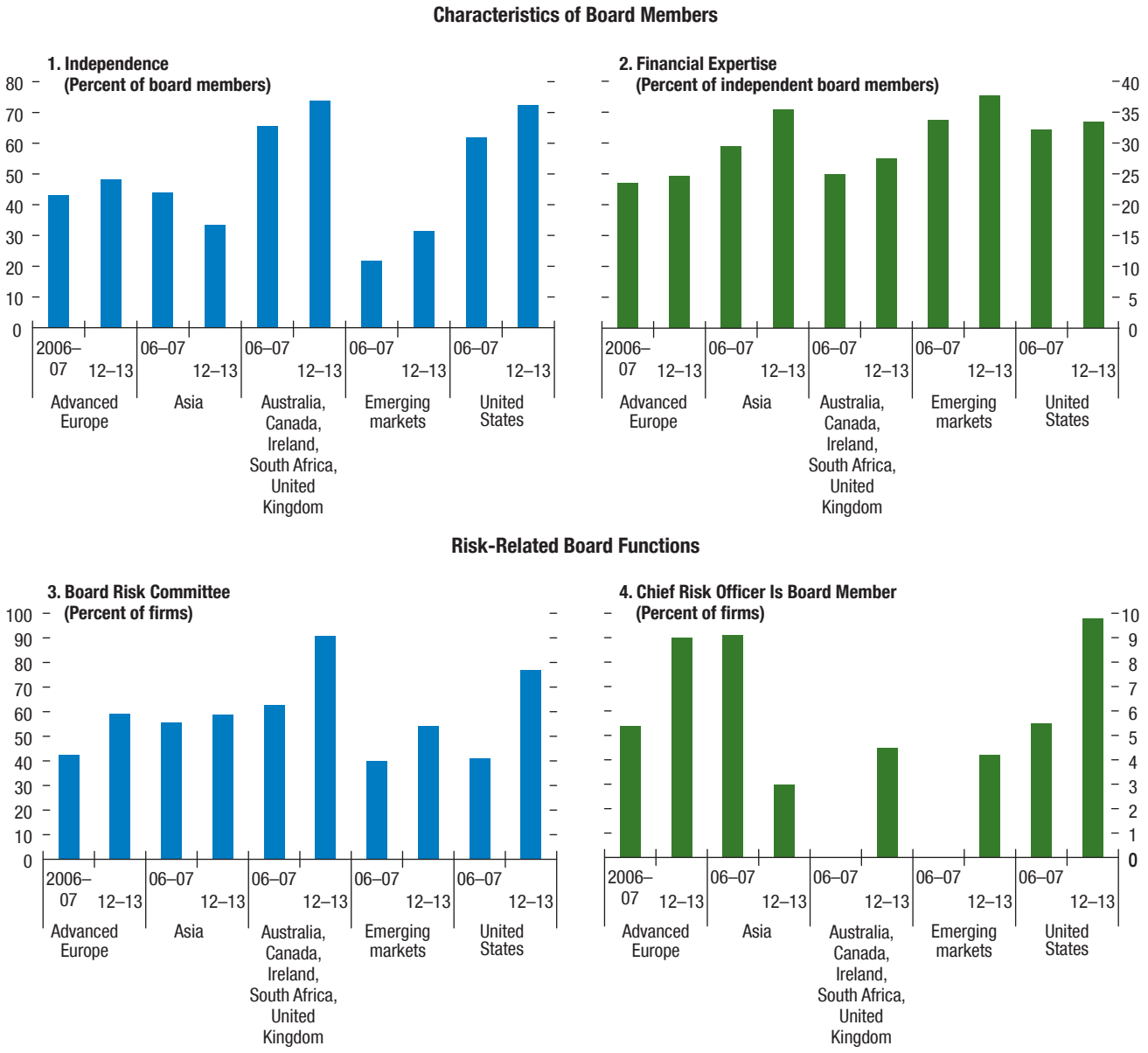
and make clear that noncompliance will not be tolerated (*tone from the top*). Second, a bank's staff must expect to be held accountable for their actions and their impact on risk taking (*accountability*). Third, a bank should have an environment that fosters communication and discussion of the decision-making process (*effective communication and challenge*). Fourth, financial and nonfinancial incentives must support and be consistent with the firm's core values (*incentives*). The empirical analysis in this chapter is only partially able to capture these elements.

The Existing Literature

The existing literature has partially investigated the links between governance, pay, and risk taking in various specific countries and cases (Table 3.4). Most studies look at a limited number of risk and governance dimensions and usually focus on the United States (despite a growing number of studies looking at specific variables using cross-country data). Although most issues remain unsettled, some of the main findings include the following:

Figure 3.3. Summary Statistics of Boards and Risk Management in Banks

Board independence is still lagging but the risk-management function is becoming more central.



Sources: BoardEx; and IMF staff estimates.
Note: Asia comprises China, Hong Kong SAR, India, Japan, Korea, Malaysia, Philippines, Singapore, Taiwan Province of China, and Thailand. "Emerging markets" comprise Chile, Colombia, Hungary, Lebanon, Mexico, Nigeria, Oman, Peru, Poland, Qatar, Russia, Saudi Arabia, and Turkey. "Advanced Europe" comprises Austria, Belgium, Cyprus, Denmark, Finland, France, Germany, Greece, Iceland, Italy, Liechtenstein, Luxembourg, Netherlands, Norway, Portugal, Spain, Sweden, and Switzerland. For Asia and emerging markets, the data are shown only for 2007. For Asia, the data for panel 4 for 2007 are based on a small sample. Only banks with assets of more than $10 billion are included.

- Larger and more diverse boards have sometimes been found to be associated with more risk.
- The share of independent board members does not affect risk taking, and the results on board financial experience are mixed.
- Stronger risk-management functions and cultures tend to be associated with less risk.
- Performance-linked compensation in the form of options tends to be associated with more risk. The evidence on other forms of compensation is mixed.
- Most studies find a positive relationship between institutional or insider ownership and risk taking during the height of the financial crisis, but obtain ambiguous findings for other periods.

Table 3.4. Summary of the Empirical Literature

Governance dimension	Authors (year)	Independent variable	Risk		Country coverage	Period
			Sign	Measure		
Board structure	Adams (2012)	Board independence, board size, and number of outside directorships	+	Bank bailouts	United States	2008–09
	Adams and Ragunathan (2013)	Gender diversity in the board	+	Idiosyncratic risk, tail risk, *z*-scores, percent of MBS or derivatives in total assets	United States	2006–09
	Battaglia, Curcio, and Gallo (2014)	Board size	+	Tail and systemic risks	European Union	2006–10
		Number of board meetings	–			
	Beltratti and Stulz (2012)	Shareholder-friendly board governance	–	Stock performance during the crisis	International	2007–08
	Berger, Kick, and Schaeck (forthcoming)	Executive director age	–	Risk-weighted assets over total assets and loan portfolio concentration	Germany	1994–2010
		Executive director education	–			
		Female representation in executive board	+			
	Erkens, Hung, and Matos (2012)	Board independence	None	Precrisis aggregate risk and expected default frequency	International	2008
	Fernandes and Fich (2013)	Financial experience of outside directors	–	Bank failure and bailouts	United States	2006–07
	Ferreira and others (2013)	Management insulation from shareholders	–	Bank bailouts	United States	2008–09
	Hau and Thum (2009)	Financial experience of directors	–	Write-downs and losses	Germany	2007–08
	Minton, Taillard, and Williamson (forthcoming)	Financial experience of outside directors	+	Aggregate risk and debt ratio	United States	2004–06
	Pathan (2009)	Shareholder-friendly governance	+	Aggregate, idiosyncratic, and systematic risks	United States	1997–2004
	Wang and Hsu (2013)	Board size	–	Operational risk	United States	1996–2010
		Board independence	–			
		Age heterogeneity	+			
		Tenure heterogeneity	None			
Risk management/ risk culture	Aebi, Sabato, and Schmid (2012)	CRO reports to board instead of CEO	+	Stock performance during the crisis	United States and Canada	2007–08
	Ellul and Yerramilli (2013)	Risk-management index	–	Tail risk	United States	2007–08
	Fahlenbrach, Prilmeier, and Stulz (2012)	Stock return in 1998	–	Bank failure	United States	2007–09
	Keys and others (2009)	CRO compensation	–	Delinquency of mortgage loans	United States	2001–06
	Lingel and Sheedy (2012)	Risk governance index	–	Aggregate and tail risks	International	2004–10
Compensation	Acrey, McCumber, and Nguyen (2011)	Compensation elements (salary, bonus, shares, and options)	Mostly none	Risk-rating variables and expected default frequency	United States	2008
	Bai and Elyasiani (2013)	Sensitivity to asset return volatility	+	Default risk and volatility of ROA	United States	1992–2008
	Balachandran, Kogut, and Harnal (2011)	More equity-based pay and less nonequity pay	+	Default risk	United States	1995–2008
	Chen, Steiner, and Whyte (2006)	More option-based pay	+	Aggregate risk and beta	United States	1992–2000
	Cheng, Hong, and Scheinkman (forthcoming)	Residual compensation (adjusted for firm size and specialization)	+	Various risks (aggregate and tail risks as well as various betas)	United States	1992–2008
	Chesney, Stromberg, and Wagner (2012)	Sensitivity to asset return volatility	+	Write-downs	United States	2007–08
	DeYoung, Peng, and Yan (2013)	Sensitivity to asset return volatility	+	Idiosyncratic risk as well as beta	United States	1994–2006
		Sensitivity to asset return	None			
	Fahlenbrach and Stulz (2011)	Cash bonus relative to salary	None	Buy-and-hold equity returns, ROE, and ROE during crisis	United States	2007–08
		Sensitivity to asset return	–			
	Hagendorff and Vallascas (2011)	Sensitivity to asset return volatility	+	Merger-related default risk	United States	1993–2007
		Sensitivity to asset return	–			

(continued)

Table 3.4. Summary of the Empirical Literature *(continued)*

Governance dimension	Authors (year)	Independent variable	Risk		Country coverage	Period
			Sign	Measure		
	Jokivuolle and Keppo (2014)	Sensitivity to asset return volatility	None or –	Buy-and-hold equity returns	United States	2008
		Cash bonus per net income	None			
	Keys and others (2009)	CEO compensation	None	Delinquency of mortgage loans	United States	2001–06
	Tung and Wang (2011)	Inside debt holding	–	Idiosyncratic risk and reduction in bond price	United States	2007–08
	Vallascas and Hagendorff (2013)	CEO cash bonus	None or –	Default risk	United States and Europe	2000–08
Ownership	Barry, Lepetit, and Tarazi (2011)	Individual or family ownership	–	Default risk and volatility of operating returns	Advanced Europe	1999–2005
		Bank ownership	None or –			
		Manager ownership	+			
	Beltratti and Stulz (2012)	Ownership by a large shareholder	None or +	Stock performance during the crisis	International	2007–08
	Berger, Imbierowicz, and Rauch (2014)	Ownership by lower management	+	Probability of default	United States	2007–10
		Ownership by chief officers and outside directors				
	Dolde and Knopf (2006)	Insider ownership	U-shape	Aggregate risk and volatility of operating returns	United States	1990–2003
		Institutional ownership	–			
	Erkens, Hung, and Matos (2012)	Institutional ownership	+	Precrisis aggregate risk and expected default frequency	International	2008
	Forssbaeck (2011)	Insider ownership	U-shape	Nonperforming loans/equity and default risk	International	1994–2005
	Gropp and Kohler (2010)	Ownership concentration	+	Deviation from the long-term average ROE	International	2008
	Laeven and Levine (2009)	Ownership concentration	+	Default risk, aggregate risk, and volatility of operating returns	International	1996–2001

Source: IMF staff.

Note: CEO = chief executive officer; CRO = chief risk officer; MBS = mortgage-backed securities; ROA = return on assets; ROE = return on equity.

- The few studies that examine the impact of concentrated ownership in banks typically find a positive relationship with risk taking.

The next section provides a comprehensive analysis of the contribution of many of these and other previously unexplored governance characteristics to risk taking. By covering a large number of banks from many different countries, and by using several measures of risk, the analysis tries to overcome the fragmentary nature of most published research and to contribute to a much-needed stock taking.

The Analysis

The analysis relates a variety of risk variables to a variety of corporate governance measures without necessarily implying causation. Risk is measured across eight dimensions, capturing both balance sheet and market measures of risk (Table 3.5). These measures can be grouped into four categories: (1) the distance to default captured by the market-implied and balance sheet *z*-scores; (2) the market assessment of risk captured by equity beta, equity return volatility, and asset return volatility; (3) tail risk captured by the Ellul and Yerramilli (2013) tail risk measure and the marginal expected shortfall developed by Brownlees and Engle (2011); and (4) the systemic risk measure developed by Acharya, Engle, and Richardson (2012), which captures the expected capital shortfall conditional on a systemic financial crisis.[12] The firm governance characteristics are also grouped into four categories: (1) board characteristics, (2) compensation, (3) risk management and culture, and (4) ownership structure (see Table 3.3).

These variables have complicated interactions and causality may run both ways. For example, banks that wish to take more risk may feel it is necessary to put in place more risk-management measures. This may make it seem as if more risk-control measures lead to higher risk, although the causality actually runs the other way. It is difficult to control fully for such endogeneity, and although the analysis tries to do this to some extent, most of the results should be read as reflecting correlations and not necessarily causation.[13]

Three different approaches are used to link corporate governance characteristics of banks to their risk profiles and performance.

- A *difference-in-means approach* that ranks banks based on their governance indicators in 2007: This approach asks whether there is a significant difference between the average risk profile and performance (as measured by the associated variables in Table 3.5) during 2009–13 of banks in the top and the bottom quartiles of each governance indicator in 2007.[14] Focusing on a longer performance period for measuring risk (instead of, say, only one year) reduces measurement error. The approach presupposes, however, that bank-level governance variables change slowly over time.
- A *panel regression approach* that uses data for all banks with sufficient coverage for all available time periods (2005–13): Lagged bank-level characteristics are used in an attempt to ameliorate potential endogeneity problems. In the case of risk controls, if the endogeneity problem is particularly severe, an instrumental variables approach is used. A set of bank-level and country-level control variables is included to account for effects that can be explained by these other factors.[15] The analysis also explores

[12]With the exception of the balance sheet *z*-score, the measures of risk used as dependent variables in the analysis are based on market data and thus cover only publicly listed firms. Given that the degree of market discipline and information disclosure for listed banks is likely to be higher than for unlisted banks, the results should be interpreted as applying first and foremost to listed banks. However, there is no evidence that sample selection in this dimension affected the results (see Annex 3.2).

[13]The endogeneity may arise because of reverse causation (as mentioned in the text) or because of omitted explanatory variables. The exercise ameliorates the problem by controlling for time-invariant firm characteristics (via fixed effects and first differences), using instrumental variables, or by including many control variables in the regressions.

[14]The difference-in-means approach compares risk outcomes in a postcrisis period (2009–13) to bank characteristics before the crisis. Although the postcrisis period excludes the most critical period of the crisis, it still includes a period of distress. Using a stronger definition of the postcrisis period (2010–13 or 2011–13) significantly weakens the results, as the 2007 rankings become less and less relevant, especially in light of the postcrisis regulatory reforms. To select a sample of relatively homogeneous banks, the sample is restricted to banks with balance sheet size of at least $10 billion in 2012. Because the domicile and other bank characteristics can affect bank performance independently of governance characteristics, those effects are removed from the analysis by first regressing the various indicators on a set of bank- and country-level variables (usually referred to in econometric analysis as controls). Country dummies are also included to capture country-level differences not captured by the country controls.

[15]The bank-level control variables are return on book assets, log book assets, the deposit-to-asset ratio, the Tier 1 capital ratio, and revenue growth. The country-level control variables are log GDP per capita (at purchasing power parity), current account balance as a fraction of GDP, the average of the six Worldwide Governance

Table 3.5. Measures of Risk Used in the Empirical Analysis

Measures of risk	Description	Risk dimension
Market-implied *z*-score[1]	Captures bank's market-implied distance to default, taking into account profitability, capital levels, and volatility of returns	Sign switched so that higher values mean higher risk
Balance sheet *z*-score[1]	Same as above, but calculated using only balance sheet data (suitable for unlisted banks)	Sign switched so that higher values mean higher risk
Equity beta	Captures systematic risk—risk arising from exposure to general market movements as opposed to idiosyncratic factors	Higher values mean higher risk
Equity return volatility	Volatility of return on equity	Higher values mean higher risk
Asset return volatility[2]	Volatility of return on assets, calculated using equity prices and the structure of the balance sheet	Higher values mean higher risk
Tail risk[3]	Average of the bank's worst five daily returns over the given year	Higher values mean higher risk
Marginal expected shortfall[4]	The bank's percentage of expected financial sector capital shortfall in a crisis	Higher values mean higher risk
Systemic risk[4]	Measures bank's share of total financial sector capital shortfall	Higher values mean larger contribution to systemic risk

Source: IMF staff.

[1]*Z*-scores are defined as the return on assets plus capital to asset ratio, divided by the standard deviation of return on assets. The balance sheet *z*-score uses balance sheet data to calculate this ratio. The market *z*-score uses the equity implied volatility and return on assets.

[2]Standard deviation of the annual change in the market value of assets. The market value of assets is derived from equity prices by treating the value of equity as an implicit call option on the assets with strike equal to the outstanding liabilities. See Merton (1974) for details.

[3]A bank's tail risk is defined for each year as the negative of the average return on the bank's stock during that stock's 5-percent-worst-return days that year. See Ellul and Yerramilli (2013) for details.

[4]Marginal expected shortfall captures the daily expected drop in equity value if the aggregate market falls more than 2 percent. It incorporates the volatility of the firm and its correlation with the market, as well as its performance in extremes. Systemic risk is the expected capital shortfall of this firm if there is another crisis. See Brownlees and Engle (2011) for details.

how bank-level governance measures interact with indicators of the regulatory environment at the country level.

- A *first-difference approach* that relates the difference between average risk taking in 2005–07 and 2011–13 to the change over the same periods in each governance dimension: This analysis includes country dummies. The approach mitigates endogeneity problems, which are less severe in comparisons of differences than when levels are used.

The analysis also examines the relationship between the governance indicators and risk taking in times of stress, using financial outcomes at the height of the global financial crisis in 2008. The expectation is that this relationship is different in times of extreme stress (during so-called tail events). In particular, given the complicated interactions between bank stress (measured by the distance to default) and compensation and ownership, the results along these two dimensions are expected to diverge in a banking crisis. This analysis uses dependent risk variables for all banks for 2008 and lagged explanatory variables for 2007 to investigate how bank risk, as it materialized during the crisis (a measure of exposure to extreme events), was related to banks' corporate governance characteristics in the previous year.

The analyses show a number of important correlations between governance, executive pay, and risk taking in banks. Many of these correlations are also economically significant when compared with the effect of Tier 1 capital ratios and size (see "Economic Significance and the Regulatory Environment" in Annex 3.2). As expected, different results are obtained for the crisis regression in a number of cases. All the dependent variables were normalized so that higher values signify more risk (see Table 3.6 and Figures 3.4 and 3.5).[16] Specific results follow.

Indicators variables, and a dummy that equals 1 if the country has deposit insurance (for each year). The panel regressions use firm and time fixed effects and the cross-section regressions use country fixed effects. The analysis controls for different bank business models using bank-level fixed effects. The results are robust to the inclusion of controls to capture the effect of overall risk appetite over the global interest rate cycle. See Annex 3.2.

[16]Figures 3.4 and 3.5 and the last rows in each section of Table 3.6 show Stouffer's *z*-statistic, a measure that summarizes the joint statistical significance of a number of *t*-tests having the same null hypothesis (and not to be confused with a *z*-score measuring risk). In this case, it gives a statistical indication of the joint significance of the effect of each explanatory variable on risk as measured by the different risk variables. The significance levels were adjusted using the Benjamini-Hochberg procedure to account for correlation among dependent variables.

Table 3.6. Summary Results of the Empirical Analysis

	Board characteristics			Risk management and culture			Compensation			Ownership structure		
	Board independence	CEO is chairman	Independents financial experience	Risk committee exists	CRO on board	CEO has retail banking or risk background	Share of salary	Equity-linked compensation	Compensation horizon	Share of institutional investors	Share of inside investors	10 percent blockholder exists
Difference-in-means approach												
Market-implied *z*-score	–0.56	1.66	1.65	–0.05	0.06	3.13	3.53	–2.12	0.45	–0.51	3.74	–0.56
Balance sheet *z*-score	–1.28	1.10	1.48	2.00	–0.16	0.34	3.94	–0.05	1.26	–2.57	–2.48	–4.49
Beta (local index)	–1.06	1.92	2.43	5.45	1.29	1.14	0.22	2.52	–0.05	–0.62	–3.49	–5.57
Equity return volatility	–0.47	0.81	1.16	1.80	1.26	0.56	1.65	0.22	0.30	0.34	–1.24	–4.54
Market-implied asset volatility	–0.67	0.25	–1.48	–1.36	1.73	–0.83	1.89	0.44	–1.49	–3.20	–2.08	0.63
Tail risk	–0.12	0.85	1.49	1.62	1.27	0.30	1.76	0.03	0.33	0.58	–1.64	–4.53
Marginal expected shortfall	–0.29	0.52	2.91	2.65	1.45	1.49	0.26	–1.24	1.56	0.37	–0.82	–4.88
Systemic risk	–3.92	1.10	1.77	–0.96	0.08	–0.87	–0.73	–0.30	1.22	–3.00	2.27	–3.66
Stouffer's *z*-statistic	**–2.96**	**2.91**	**4.03**	**3.94**	**2.47**	**1.86**	**4.43**	**–0.18**	**1.26**	**–3.04**	**–2.03**	**–9.76**
Panel regression analysis												
Market-implied *z*-score	0.58	2.37	1.72	–0.17	1.42	2.85	4.28	0.32	–1.80	–1.92	0.63	0.45
Balance sheet *z*-score	–3.91	1.08	0.97	–1.36	–3.17	–5.97	4.67	0.24	–2.33	0.53	–0.92	–0.43
Beta (local index)	0.91	–1.42	–0.89	0.73	0.77	1.62	3.22	–2.86	–2.25	1.18	–0.37	0.56
Equity return volatility	–3.77	4.66	2.08	–2.51	1.12	–2.35	4.17	–9.41	–1.31	–3.82	0.71	–1.59
Market-implied asset volatility	–1.92	3.11	5.28	1.95	2.08	2.94	1.07	0.63	–0.41	–0.22	–0.78	0.80
Tail risk	–5.04	3.22	1.11	–2.79	1.06	–2.59	4.94	–5.32	–1.32	–3.52	–1.40	–1.99
Marginal expected shortfall	0.38	–0.17	–0.30	–3.01	–0.30	–1.39	0.22	–0.16	–1.00	–0.36	1.30	–0.61
Systemic risk	–1.60	–2.83	–0.27	2.34	–0.18	–2.74	1.27	–2.33	1.36	–0.01	0.00	–0.62
Stouffer's *z*-statistic	**–5.08**	**3.54**	**3.43**	**–1.70**	**0.99**	**–2.70**	**8.43**	**–6.67**	**–3.20**	**–2.88**	**–0.29**	**–1.21**
First-difference approach												
Market-implied *z*-score	–0.83	–2.39	–1.48	2.02	1.51	–0.46	4.62	0.70	–0.11	–1.20	0.45	0.91
Balance sheet *z*-score	–2.67	8.02	3.22	–2.57	3.57	–5.97	5.49	–1.36	–4.80	1.75	–1.78	2.65
Beta (local index)	1.08	1.24	0.75	1.24	–0.90	3.02	2.77	0.26	–0.86	–1.33	–2.93	–0.02
Equity return volatility	–1.62	–0.25	4.85	–2.64	–0.00	–4.94	7.70	–6.72	–0.57	–2.47	–1.63	0.13
Market-implied asset volatility	–0.76	–0.44	3.02	1.11	1.02	–0.14	0.06	–0.36	0.32	0.95	0.20	1.15
Tail risk	–1.93	0.62	4.88	–1.88	0.37	–5.11	8.28	–5.07	–0.52	–2.20	–1.53	0.63
Marginal expected shortfall	1.00	–0.65	–0.27	0.04	0.28	0.33	2.44	–1.53	–2.82	–1.84	1.70	–0.95
Systemic risk	–0.74	–3.30	0.66	–1.70	–1.58	–1.67	1.31	0.35	2.90	–1.22	0.78	–0.12
Stouffer's *z*-statistic	**–2.29**	**1.01**	**5.53**	**–1.55**	**1.51**	**–5.28**	**11.55**	**–4.85**	**–2.29**	**–2.67**	**–1.68**	**1.55**
2008 regression analysis												
Market-implied *z*-score	–1.03	–0.19	–0.92	1.33	–0.63	–1.32	0.71	–2.65	1.13	–0.10	0.06	0.71
Balance sheet *z*-score	–1.98	2.32	3.55	3.65	7.04	–2.59	3.64	2.68	8.03	0.96	2.41	0.66
Beta (local index)	–0.89	3.60	–0.11	–0.56	–0.57	–0.98	–3.46	0.85	–0.45	1.44	1.80	–0.82
Equity return volatility	–1.91	1.92	–6.20	–0.82	–0.94	–2.36	3.31	2.09	–1.40	2.66	4.65	0.25
Market-implied asset volatility	–1.81	–2.03	–0.62	1.09	–0.40	–2.95	–0.99	4.20	2.00	0.94	2.00	–0.40
Tail risk	–1.45	–0.21	–4.24	–0.89	–0.95	–2.11	2.85	2.19	–2.33	2.51	5.08	0.49
Marginal expected shortfall	–1.12	–1.25	–0.22	–0.46	–0.24	0.08	–1.01	0.11	–1.57	–0.12	–0.99	–1.04
Systemic risk	–0.17	–0.28	0.74	0.38	0.74	–0.73	–1.44	–3.39	–3.51	–0.13	0.56	–1.85
Stouffer's *z*-statistic	**–3.66**	**1.37**	**–2.84**	**1.31**	**1.43**	**–4.58**	**1.28**	**2.15**	**0.68**	**2.89**	**5.51**	**–0.70**

Source: IMF staff estimates.

Note: The table shows *t*-statistics (in plain text) and Stouffer's *z*-statistics (in bold). The latter is a measure that summarizes the joint statistical significance of a number of *t*-tests having the same null hypothesis. In this case, it gives a statistical indication of the significance of the effect of each explanatory variable on risk as measured jointly by the regressions with the different risk variables on the left side of the equation. The significance levels were adjusted using the Benjamini-Hochberg procedure to account for correlation among dependent variables. CEO = chief executive officer; CRO = chief risk officer.

Figure 3.4. Bank Governance and Risk Taking
(z-statistics)

Various approaches to investigating the relationship between governance, pay practices, and risk taking in banks give generally consistent results.

Sources: Bankscope; BoardEx; Standard and Poor's Capital IQ database; Thomson Reuters Datastream; and IMF staff estimates.
Note: The figures show Stouffer's *z*-statistics—a measure that summarizes the joint statistical significance of a number of *t*-tests having the same null hypothesis. In this case, it gives a statistical indication of the significance of the effect of each explanatory variable on risk as measured jointly by the regressions with the different risk variables on the left side of the equation. The significance levels were adjusted using the Benjamini-Hochberg procedure to account for correlation among dependent variables. Solid and dashed lines indicate 5 and 10 percent levels of significance, respectively. CEO = chief executive officer; CRO = chief risk officer.

Board characteristics

- *Board independence* is associated with lower risk.[17] A board that is more independent of management may be better placed to supervise and control risk taking.[18] This is especially important when executive compensation (designed to counteract the managers' natural risk-aversion) gives managers incentives to take too much risk.
- The *CEO chairs the board* variable also appears to be associated with higher risk taking in banks, reinforcing the important role of board independence in curbing risk taking.[19]

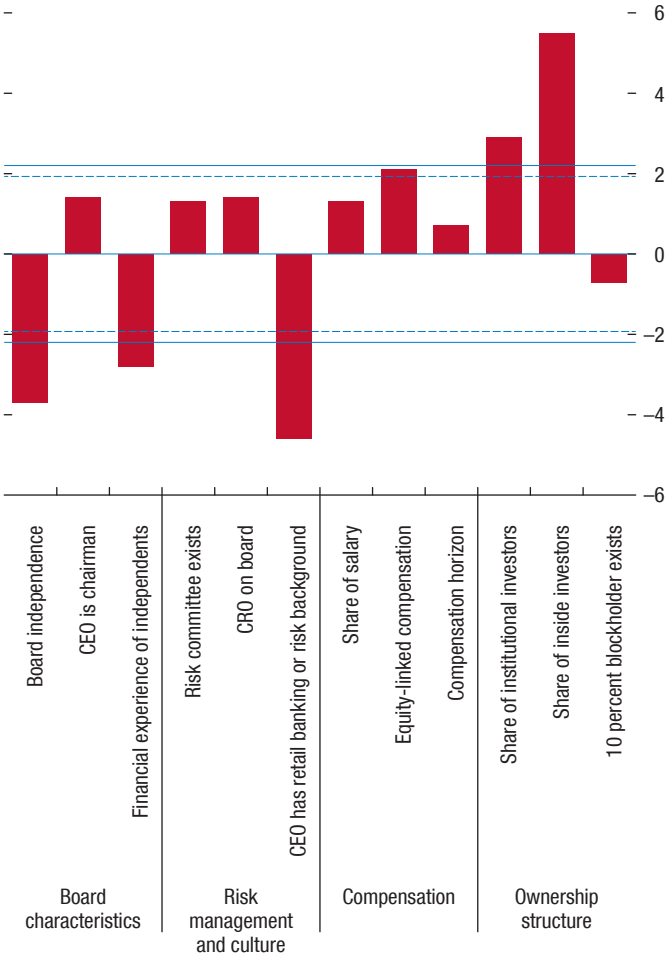
[17]Because the definition of an independent director may vary from country to country, the panel regression was repeated allowing the slope coefficients to vary by region, following Macey and O'Hara's (2003) definition of regional corporate governance models: Anglo-American, Franco-German or Advanced European, and Other. Board independence remains significantly associated with lower risk in the first two regions. These results are stronger for regions where board independence is more homogeneous and more data are available.

[18]A more independent board may also improve the measurement of performance and, in this way, curb risk taking. The two effects are probably observationally equivalent.

[19]Under CRD IV, the separation of the CEO and chairman roles is now required for European banks with a one-tier board structure.

Figure 3.5. Bank Governance and Risk Taking during the Global Financial Crisis
(z-statistics)

Vigilant and experienced boards mitigated measured risk, but institutional and insider ownership show evidence of "gambling for resurrection."



Sources: Bankscope; BoardEx; Standard and Poor's Capital IQ database; Thomson Reuters Datastream; and IMF staff estimates.
Note: The figure shows Stouffer's *z*-statistics using a cross-section regression of 2008 outcomes on 2007 characteristics. Stouffer's *z*-statistic is a measure that summarizes the joint statistical significance of a number of *t*-tests having the same null hypothesis. In this case, it gives a statistical indication of the significance of the effect of each explanatory variable on risk as measured jointly by the regressions with the different risk variables on the left side of the equation. The significance levels were adjusted using the Benjamini-Hochberg procedure to account for correlation among dependent variables. Solid and dashed lines indicate 5 and 10 percent levels of significance, respectively. CEO = chief executive officer; CRO = chief risk officer.

- *Board financial experience* is associated with increased risk in banks. This suggests that board members with financial experience are generally more comfortable with the bank taking more risk. However, the regression using 2008 data shows the opposite effect, suggesting that more financial experience on the board may guard banks against tail risks or enable boards to better manage the consequences if these risks materialize.[20]

Risk management and culture

- The evidence on the effect of *risk controls* is mixed. It suggests that although risk controls may help manage risks in general, they may not shelter the bank from tail risks. The panel regressions suggest that the existence of a *board risk committee* is associated with lower risk in banks (after addressing the possible endogeneity of the risk-management function using instruments), but the relationship is weak.[21] Only when simultaneously controlling for all governance variables does the analysis find that a risk committee is significantly related to less risk (see "Summary" section). Moreover, there is no such evidence in the 2008 cross-section regressions.
- The *professional background of the CEO* (an imperfect proxy for different risk cultures) is related to the bank's risk taking. When the CEO comes from retail banking or has previous experience in the risk function of a financial institution, banks tend to take on less risk, with the opposite being generally true for bankers with a background in investment banking.[22] These results are interpreted as indirect evidence that risk culture is an important determinant of bank risk taking.[23]

[20]This interpretation of the results is reinforced by the finding that financial experience is negatively (though not very strongly) associated with the measures of tail and systemic risks, at least in the regression approach, and is also in line with several studies of bank performance during the global financial crisis (see Table 3.4). The impact of other dimensions of board structure, such as board size and directors' workload, were also tested, but the results were either ambiguous or not significant. See Annex 3.2.

[21]Banks with higher risk may choose to have risk controls in place while less risky banks do not; see Annex 3.1 for details of how the regressions control for this potential endogeneity issue. Annex 3.2 provides extensive robustness checks of the findings, including for potential sample selection issues, which are rarely accounted for in the literature.

[22]The measure also gives a rough indication of who gets promoted within the institution. This new finding is in line with another study using a different approach to assess the impact of culture on risk taking in the financial sector (Fahlenbrach, Prilmeier, and Stulz 2012; see Table 3.4), which suggests that there are time-invariant firm characteristics that shape the willingness to take on risk.

[23]The "Culture and Business Model" section of Annex 3.2 shows that country and specialization characteristics (including investor protection and legal regimes) explain about half of the remaining firm-level heterogeneity in risk taking. The unexplained variation can be attributed to unobservable time-invariant characteristics—including firm culture—and omitted controls.

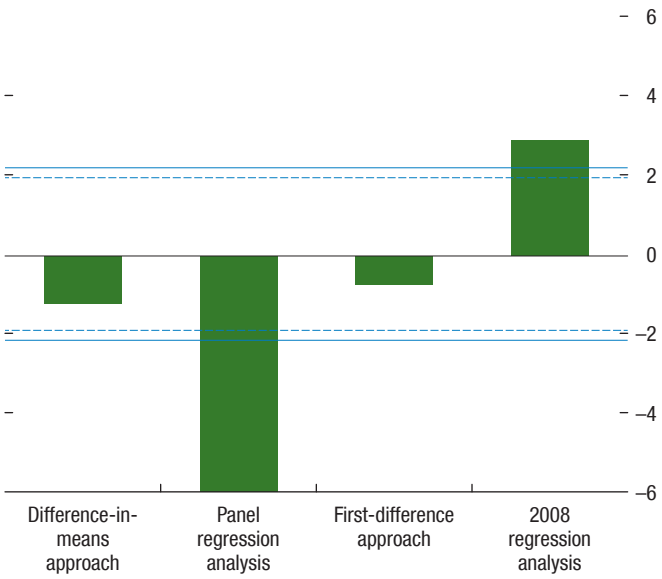
- As expected, the importance of board oversight and risk management is greater in countries with stronger legal frameworks and government effectiveness (see the "Economic Significance and the Regulatory Environment" section of Annex 3.2 for more details).[24] However, the association between board and risk governance indicators and risk taking is not consistently stronger in countries with strong supervisors.

Compensation

- *A higher share of salary (fixed pay)* is associated with higher risk, but only for small banks (with less than $10 billion in assets). This may reflect different compensation practices, reverse causality, or other omitted factors. For instance, smaller banks have a low charter value, which tends to lead them to take on more risk. Taking on more risk, in turn, means that their managers will require higher fixed pay. For larger banks, however, higher risk is usually associated with higher complexity, which demands delegation of responsibilities to managers, but also a higher share of variable compensation (see discussion in footnote 4). In line with the existing empirical literature, the relationship between *cash bonuses* and risk is ambiguous. There is generally no relationship using cash bonus as a percentage of total compensation, but an alternative measure (bonus as a share of salary) shows a positive association with risk during the crisis. See Annex 3.2 for a lengthier discussion.
- *Equity-linked* and *long-term incentive pay* are associated with less risk in general, except for the year of the crisis, when equity awards are positively related to risk. [25] The same holds for restricted stock awards.[26] Restricted equity awards can lead to increased risk taking if the bank is close to default (gambling for resurrection), but the opposite is true if the default probability is low because of managers' inability to diversify personal risk (related to their job tenure and personal wealth invested in the firm). Results reported in Annex 3.2 confirm this intuition: the impact of equity awards on risk taking during the global financial crisis was much higher and significant for banks closer to default, which suggests that extending the horizon of compensation reduces the incentive for managers to favor short-term risks.
- The *level of compensation* (fixed plus variable) is not consistently related to risk taking. The level of compensation (adjusted for bank size) was related to higher risk taking during the global financial crisis (as found by Cheng, Hong, and Scheinkman forthcoming), but the other approaches show that it is either negatively or not significantly related to bank risk (Figure 3.6). The findings reinforce the notion put forward by the Squam Lake Report

Figure 3.6. Size-Adjusted Compensation and Risk Taking
(z-statistics)

The level of compensation (conditional on bank size) does not relate consistently to measured bank risk.



Sources: Bankscope; Standard and Poor's Capital IQ database; and IMF staff estimates.
Note: The figure shows Stouffer's *z*-statistics—a measure that summarizes the joint statistical significance of a number of *t*-tests having the same null hypothesis. In this case, it gives a statistical indication of the significance of the effect of each explanatory variable on risk as measured jointly by the regressions with the different risk variables on the left side of the equation. The significance levels were adjusted using the Benjamini-Hochberg procedure to account for correlation among dependent variables. Solid and dashed lines indicate 5 and 10 percent levels of significance, respectively. The level of compensation is adjusted for bank size by regressing total compensation on the logarithm of book assets.

[24]As measured by the Worldwide Governance Indicators for Rule of Law and Government Effectiveness (World Bank 2013). See Annex 3.2.

[25]A high level of equity-linked pay is interpreted by some authors to indicate better alignment of the managers' incentives with the shareholders' interests. However, as discussed earlier, because of difficulties in performance measurement, a higher share of equity pay may lead to excessive risk taking even from the shareholders' perspective.

[26]Restricted stocks typically can only be sold after a minimum holding period.

(French and others 2010) that *how* you pay matters more than *how much* you pay.

Ownership structure

- In general, institutional ownership is associated with less risk taking, and insider ownership is not correlated with risk. However, the presence of *institutional investors* and of large *insider ownership* correlates with more measured risk in 2008. This result is in line with the idea that banks in which corporate insiders (managers) or institutional investors hold a higher fraction of the ownership of the company should show less risk taking if the bank is financially strong, because they have a lot to lose. When the firm is close to defaulting on its debt (as many did in 2008), managers have less to lose by taking more risk (see Table 3.1). In fact, the latter result can be seen as indicative of a significant gambling-for-resurrection problem, captured by the 2008 crisis regression.[27] These results are broadly consistent with previous empirical findings, which point to a different relationship between institutional or insider ownership and risk taking or performance during the crisis (see the "Ownership" section of Table 3.4).[28]

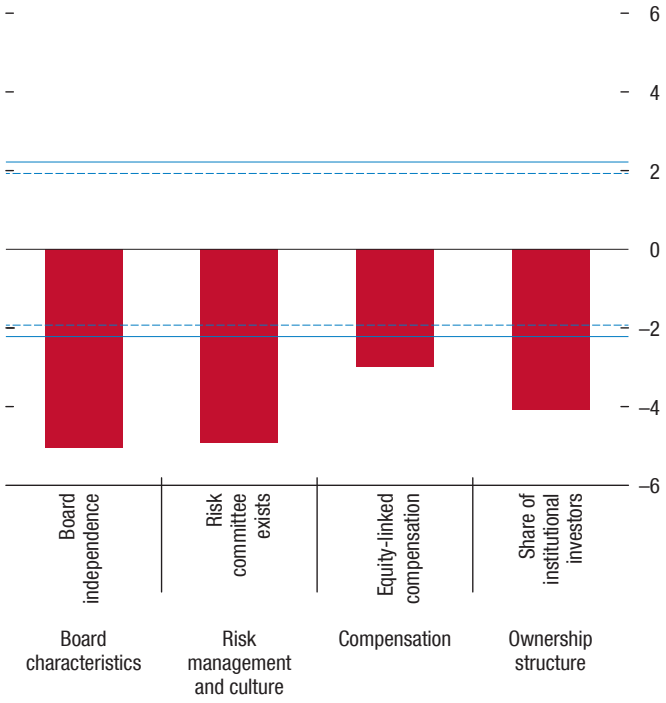
Summary

In sum, the empirical analysis suggests that board independence, risk committees, equity pay, and institutional investors (the four dimensions of governance that have received the most attention in the literature) are each related to less risk taking in banks.

The importance of board independence, risk committees, equity pay, and institutional investors can be confirmed in an overall regression that includes all four variables. The previous analysis has separately related each governance variable to risk taking. A more general regression would relate risk taking to all four variables simultaneously (at the expense of considerably smaller sample sizes). Figure 3.7 shows the results of panel regressions of each risk measure on all four measures of governance that were found to most robustly relate to risk taking: board independence, the existence of a risk committee, the share of equity-linked compensation in total compensation, and the share of ownership by institutional investors.[29] The results are largely consistent with the previous results—except that having a risk-management committee in the board is now found to be significantly associated with lower risk.

Figure 3.7. Summary of Main Findings: Impact on Risk Taking
(z-statistics)

Findings are even stronger when all governance dimensions are considered simultaneously.



Sources: BoardEx; Standard and Poor's Capital IQ database; and IMF staff estimates.
Note: The figure shows Stouffer's *z*-statistics—a measure that summarizes the joint statistical significance of a number of *t*-tests having the same null hypothesis. In this case, it gives a statistical indication of the significance of the effect of each explanatory variable on risk as measured jointly by the regressions with the different risk variables on the left side of the equation. The significance levels were adjusted using the Benjamini-Hochberg procedure to account for correlation among dependent variables. Solid and dashed lines indicate 5 and 10 percent levels of significance, respectively.

[27]This hypothesis is further confirmed by results of the panel regressions when insider ownership is interacted with a measure of distance to default (the expected default frequency). These results in the "Gambling for Resurrection" section of Annex 3.2 show that when a bank is close to default, larger insider ownership is correlated with more risk, with the opposite being true for safer banks. This result is driven by the fact that insiders tend to have more concentrated wealth (and therefore find it harder to fully diversify risk) than shareholders who typically disperse their holdings.

[28]The result on ownership concentration, however, is not consistent with Laeven and Levine's (2009) finding. This may be due to the use of a different measure of concentration or to the fact that the authors measure risk in 2001 only.

[29]The panel regressions with all four governance variables use significantly smaller samples and therefore were not the preferred specification. The regressions do not use instrumental variables (for the existence of a risk committee), but this does not significantly change the results.

Policy Discussion

These empirical results have implications for the policy debate. Some of the recommendations suggested by the analysis are already included in ongoing policy initiatives (although until now they had not been systematically corroborated empirically), and some are more novel.

On compensation

- Reforms of compensation practices should improve the link between compensation and the various sources of risk as well as extend the horizon over which compensation is awarded to better capture such risks.
- Compensation packages should be adequately sensitive to the risk exposure from the perspective of the bank as a whole, including debt holders. This recommendation is justified by the presence of significant incentives for risk shifting when banks are close to default (see the "Gambling for Resurrection" section in Annex 3.2 for econometric results) and of negative externalities in bank risk taking. A better mix of incentives could be achieved by making long-term illiquid bank debt a part of compensation (possibly with long vesting periods) or through inverse indexation of compensation to bank credit default swap spreads, if those markets are sufficiently liquid to reflect the riskiness of the bank. These suggestions are an important element that has largely been absent from reform initiatives.[30]
- The analysis in the previous section suggests that more pay tied to longer-term equity performance is related to less risk taking, provided banks are not distressed. Equity awards, especially with sufficiently long vesting periods, should therefore be encouraged. The imposition of overall caps, however, should not be expected to reduce risk taking given that no evidence was found that more fixed pay correlates with less risk in large banks. The analysis in Box 3.3 shows that, in theory, a cap on variable pay may actually increase the incentive for managers to take on risk at the expense of shareholders and debt holders.[31] Therefore, measures aimed at reducing the share of variable compensation should be subject to additional study.
- Deferred compensation should be mandatory with the creation of bonus accounts (to support bonus-malus clauses), restricted stock and bond awards, and clawbacks. These mechanisms are especially useful when longer-term performance is difficult to measure, because they allow for variable compensation to be adjusted later based on actual risk outcomes. Although more research is needed to determine the appropriate length of the deferral period, it should be long enough to take into account the fact that banking risks often take many years to materialize.[32]

On board oversight and risk management

- Authorities should give consideration to making board directors represent the interests not only of shareholders but also of creditors. In principle, board representation for creditors could improve monitoring and reduce the incentive for risk shifting.[33] Although the analysis suggests that this recommendation has potential merit, it is not currently part of reform proposals, and its practical aspects and consequences should be thoroughly analyzed before it is implemented.[34]
- Relying on simple metrics of financial sector experience or education to evaluate the suitability

[30]This recommendation is also supported by the theoretical analysis in Bolton, Mehran, and Shapiro (2011). Srivastav, Armitage, and Hagendorff (2014) provide additional empirical support that paying CEOs with bank debt reduces risk shifting.

[31]In addition, bonus caps can lead to distorted incentives. For example, a banker reaching a bonus cap has an incentive to "manage earnings" and to spread earnings across periods to maximize bonuses. This behavior is potentially costly to banks and may affect their financial performance and risk taking across periods. On the alignment of compensation with risk-adjusted performance, see IIF (2013) and on risk shifting see Murphy (2013) and Box 3.3.

[32]The FSB P&S stipulates that the deferral period "should not be less than three years, provided that the period is correctly aligned with the nature of the business, its risks and the activities of the employee in question" (FSB 2009, 3). See also IMF (2009) for tax implications of executive compensation reforms.

[33]Expanding board representation to creditors will probably lead to increased monitoring because of the reduced expectations of government bailouts of unsecured creditors under the new bank resolution frameworks. Board representation could be most useful for creditors that are most vulnerable to bank risk, for example, those holding contingent convertible bonds that convert to equity in case of financial distress.

[34]Extending control rights beyond shareholders, namely to bondholders, has been suggested by Macey and O'Hara (2003); Becht, Bolton, and Röell (2011); and Ellis, Haldane, and Moshirian (2014). A more ample policy discussion on this topic has also been requested in the United Kingdom (Parliamentary Commission on Banking Standards 2013).

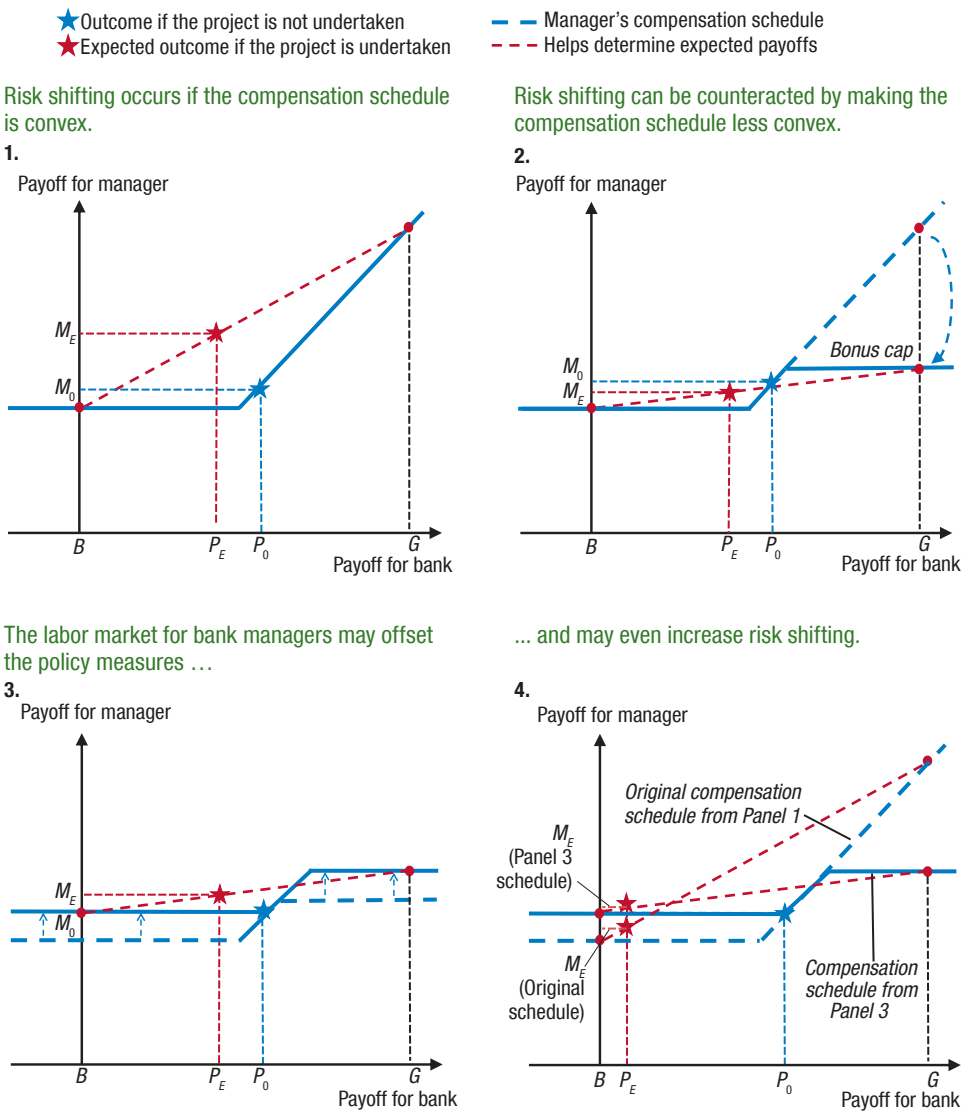
Box 3.3. Adjusting Compensation for Bank Managers: Advantages and Pitfalls

Suppose that a manager in a bank has an investment project that has a chance for a good outcome (G) and a chance for a bad outcome (B). The expected profit from the project for the bank is P_E, which depends on the relative likelihood of the good and the bad outcomes. The manager's expected pay depends on the bank's profit if profits exceed a certain base level, and the manager's expected payoff from the project is M_E. If the project is not undertaken, the bank and manager get a certain payoff of P_0 and M_0, respectively.

Panel 1 in Figure 3.3.1 shows that a convex pay schedule may make the manager prefer to under-

The author of this box is Kentaro Asai.

Figure 3.3.1. Risk Taking and Executive Compensation



Source: IMF staff.
Note: M_E, M_0 is the manager's expected pay if the project is/is not undertaken; P_E, P_0 is the bank's expected profit if the project is/is not undertaken.

Box 3.3 *(continued)*

take the risky project even though doing so does not benefit the bank. The manager's expected payoff if the project is undertaken (M_E) is higher than the payoff without the project (M_0). Therefore, the manager will prefer to undertake the project, even though P_E is less than P_0. The loss—the difference between P_E and P_0—is borne by the bank's owners (and its creditors in the case of default); the manager's undertaking of the project is an example of risk shifting.

Panel 2 shows how the pay schedule for the manager can be adjusted by regulation to eliminate the incentive for risk shifting by imposing a bonus cap. A cap on variable compensation (making the manager's pay not depend on the bank's profits above a certain profit threshold) can make the pay schedule less convex and reduce the project's expected payoff for the manager. In panel 2, the bonus cap reduces M_E to a value that is less than M_0, thereby ensuring that the risky project is not undertaken. Similarly, a clawback—which penalizes the manager if the project yields a bad outcome—can also eliminate the incentive for risk shifting.

Panel 3 shows how this solution can be undermined if developments in the labor market for managers lead to an increase in managers' pay. If restrictions on variable pay—such as a cap on the ratio of variable to fixed compensation—make bank managers move to jurisdictions where pay has not been capped or to other industries to avoid the regulation, banks may respond to the ensuing shortage of qualified managers by increasing their base pay. This action may undo the effect of the cap if it raises the manager's expected payoff from the risky project above the amount of pay if the project is not undertaken. The same reasoning applies to the case of a clawback clause.

Panel 4 shows that if the probability of a bad outcome is sufficiently large, imposing a cap could actually induce risk shifting by the manager even if this incentive did not exist before implementation of the policy action. If the probability of a bad outcome is high enough, M_E on the original convex compensation schedule from panel 1 may be less than M_0 on that schedule, and the manager may not have an incentive to undertake the project. But the imposition of the pay cap and the ensuing labor market developments can raise the manager's base pay (and with it the variable pay cap itself) such that M_E is larger than M_0 on the compensation schedule from panel 3. This unintended consequence stems from the fact that the increase in fixed pay caused by labor market developments in response to the cap decreases the manager's penalty associated with bad performance (this point is also made by Murphy [2013]).

of board members may not be sufficient. It may be equally important to assess board members on their ability to effectively challenge management. Further regulatory guidance for fit-and-proper processes for board members also has a useful role to play.

- A sufficient number of bank board members should be independent, and boards should be required to establish an independent risk committee. In addition, independent directors must have the necessary expertise and ability to monitor management. This recommendation is in line with guidelines put forward by the European Banking Authority (EBA 2011) and is already being implemented in the European Economic Area. In the United States, a separate risk committee is required for certain financial companies under the Dodd-Frank Act (see Table 3.2). However, the Federal Reserve has discretion regarding the number of independent board members it requires.
- Risk culture matters. The indirect evidence on the importance of the CEO's professional background suggests that the "tone from the top" is important in shaping risk taking (see also Group of Thirty 2013). Hence, supervisors should evaluate bank risk culture and governance regularly. A good example of such evaluation is the qualitative assessment of bank conduct and culture undertaken by the Central Bank of the Netherlands as a complement to the more traditional prudential supervision (see Box 3.4 and Nuijts and de Haan 2013).

The measures proposed here are potentially economically significant. For instance, the analysis shows that increasing the ratio of independent members on the board by 10 percentage points is typically associated with a decline in risk taking as large as that induced by a 2.3 percentage point increase in the Tier 1 capital ratio. Similarly, the reduction in risk achieved by the creation of a board risk committee is equivalent to

Box 3.4. Integrity in Financial Institutions

In recent years, the financial industry has been rocked by corporate scandals in which alleged misconduct and unethical behavior by top- and middle-tier employees has been common. According to the Edelman Trust Barometer, since 2006, in several economies around the world, banking has gone from being one of the public's most trusted sectors to the least trusted (Edelman 2007, 2014). At the same time, the number of customer complaints against banks has greatly increased, especially when compared with other sectors (Figure 3.4.1).

A number of factors may play a role in why the financial industry in general and the banking sector in particular have been so afflicted by accusations of unethical behavior. Financial services and banking activities are often complex and opaque, and it is often difficult for customers to assess the value of financial products, which presents an opportunity for deception. Moreover, the fast pace of financial transactions makes it difficult for internal and external auditors to monitor misconduct thoroughly. At the same time, the financial industry is subject to stricter rules of disclosure and tighter regulation and supervision, which may increase the number of reported cases of misconduct compared with other industries. Finally, the sensitive nature of some activities—such as price fixing—creates powerful incentives for misbehavior.

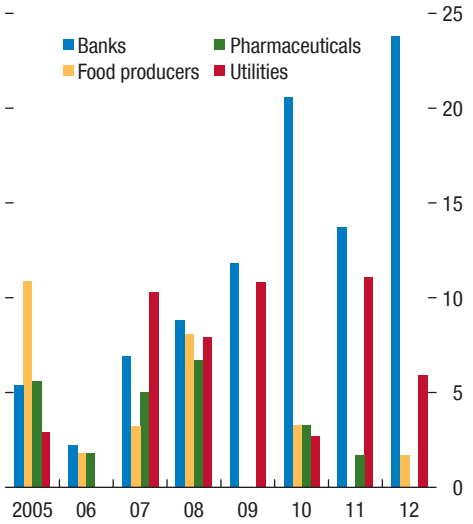
Incentives and controls can go some way toward addressing these issues, but the role of corporate culture is key. Improved transparency and disclosure, addressing perverse incentives, and internal and external controls are important, but none of these measures can always prevent such behavior. In instances in which incentives are poorly designed or rules insufficient, corporate culture—the set of unwritten rules and shared beliefs that govern how to act in the absence of rules—will be a powerful tool for improving risk management, discouraging misconduct, and even improving performance and creating value (Sørensen 2002).[1] Corporate culture plays an important role in banks because to a much larger extent than in other sectors, bank employees often face decisions in situations for which rules are ambiguous or allow for discretion, which may lead to an expectation that bad behavior will go unpunished and good behavior unrewarded.

Emphasizing the right tone at the top is an important step toward improving the business culture in banks, but attention should also be given to improving the tone in the middle. The tone at the top may not necessarily trickle down to middle management (Zinkin 2013). Indeed, strengthening integrity in financial institutions requires a culture in which ethical behavior is consistently rewarded throughout the ranks.

Supervisors are paying attention to risks arising from corporate culture and conduct. The Financial Stability Board has issued recommendations on how to assess the soundness and efficacy of the risk culture in a financial institution (FSB 2014). Similarly, at the country level, authorities are supplementing more traditional prudential supervision with supervision of conduct and culture (see Nuijts and de Haan [2013] for the example of the Netherlands). Supervision in this area focuses on leadership styles and the example

Figure 3.4.1. Customer Complaints
(Percentage of companies with customer complaints)

Banks are increasingly under the spotlight because of consumer complaints or dissatisfaction.



Sources: Thomson Reuters Datastream; and IMF staff calculations.

The authors of this box are Luis Brandão Marques and Ceyla Pazarbaşioğlu.

[1]Although corporate culture complements and may reinforce corporate governance, culture is different from governance and does not seem to be much affected by it. For instance, Guiso, Sapienza, and Zingales (forthcoming) do not find a significant relationship between measures of executive compensation or firm ownership and managerial integrity and ethics.

Box 3.4 *(continued)*

that leaders set and on accountability, shared values, openness to discussion, and the effects of groupthink.

Integrity and ethical behavior must also be a requirement for financial supervisors. In particular, closing the revolving door between financial institutions and supervisory agencies will help minimize regulatory capture.

To support these supervisory efforts, a thorough analysis of the link between the different flavors of corporate culture and sound risk taking is needed, as is a taxonomy of socially unacceptable behavior in finance. Such research would fill a gap in the literature; few studies have explored the role of culture in risk taking and fewer still have done so for the financial industry (see Table 3.4). Accordingly, the IMF is conducting work on the enhancement of integrity in the financial sector.

that achieved by increasing the Tier 1 capital ratio by 0.9 percentage points (see the "Economic Significance and the Regulatory Environment" section of Annex 3.2).[35]

When implementing new measures for banks, policymakers need to consider the possibility that activities may shift from banks to the shadow banking sector. New measures could increase the incentive for regulated institutions to shift activities outside the regulatory perimeter. Executives may also choose to leave bank employment and take jobs in less-regulated financial institutions if doing so would allow them to escape executive pay regulation. These incentives could fuel the growth of the shadow banking sector. Although shadow banking has benefits, including expanding access to credit and supporting market liquidity, maturity transformation, and risk sharing (see Chapter 2), by taking on bank-like risks, the shadow banking sector may contribute to overall systemic risk in the financial system. Policymakers should therefore take a broad view of the potential effects on the entire financial system of new regulatory measures on executive pay and governance in banks.

Furthermore, the policy measures should be considered to be complementary to capital and liquidity regulations designed to foster safe and sound financial structures. Specifically, liquidity and capital buffers help induce managers to adopt more prudent behavior by reducing the risk of bank failure and hence lowering bankers' incentives to gamble for resurrection in an environment of limited liability.

Transparency is important in promoting accountability. Regulation can play a forceful role by requiring timely and accurate disclosure not only of the financial situation of banks but also of risk management and corporate governance matters. The Comprehensive Capital Analysis and Review implemented in the United States, where the Federal Reserve discloses its qualitative assessment of a bank's corporate governance and risk-management framework, is an example of how to enhance transparency in practice (Board of Governors of the Federal Reserve System 2014). In addition, transparency of the work and decision making of regulators and supervisors can add to "supervisory discipline," which is strongly linked to effective supervisory outcomes (Viñals and others 2010).

Finally, supervisory effectiveness has a strong bearing on incentives and risk outcomes. This is why the BCBS has steadily enhanced the framework for risk supervision in banks, starting with the 1988 Basel I Accord, and especially with Basel II in 2005 (Box 3.5). In addition, attention is being paid to "softer" issues that rules alone cannot address, such as enhancing supervisor-board relations to improve supervisor and board effectiveness, and to the risk culture in financial institutions.

Conclusion

The agency problems typical of corporations—shareholders versus managers—are magnified in banks through the additional competing interests of shareholders and managers with those of bondholders, depositors, and society at large. Although taking risks is part of a bank's mission (for example, by funding uncertain but productive investment), banks may take more risks than is socially desirable with regard to systemic financial stability, as evidenced by the recent global financial

[35]The uncertainty associated with the estimates and the understanding that the measures should be considered to be a package of reforms of bank governance and compensation preclude a formal ranking of the measures.

Box 3.5. Regulation and Risk-Taking Incentives: Basel I to III

Although capital adequacy requirements have a long history in some countries—the United States had capital adequacy rules starting in the early 1900s, for example—Basel I (1988) introduced uniform, risk-sensitive minimum capital standards at the international level. Under Basel I, credit risk was divided into five buckets, ranging from zero percent to 100 percent depending on the riskiness of the underlying asset. Although Basel I was hailed for incorporating risk into the calculation of capital requirements and was regarded as a big step forward, it was also criticized for not taking into account hedging, diversification, and differences in risk-management techniques. It also did not take into account other types of risk, particularly market risk.

Advances in technology and risk-management techniques allowed banks to develop their own internal capital allocation models in the 1990s, which enabled them to align the amount of risk they undertook on a loan with the overall goals of the bank (internal risk tolerance). For example, Basel I placed all commercial loans into the 8 percent capital category. In contrast, internal model calculations led to capital allocations on commercial loans that varied from 1 to 30 percent, depending on the loan's estimated risk. It was hence argued that although Basel I was a step in the right direction, it was not sufficiently risk sensitive and could result in arbitrage: if capital regulation was binding, a lack of risk sensitivity encouraged banks to shift toward the riskiest activity within each category (see Koehn and Santomero 1980; Kim and Santomero 1988; Keeley and Furlong 1989, 1990; and Rochet 1991).

The Market Risk Amendment (1996) and Basel II (2005) were introduced to address these shortcomings, allowing internal models for market and credit risk, respectively. These measures allowed banks to use internal models to more finely differentiate risks of individual loans. Risk could now be differentiated not only between but also within loan categories. The regulations were designed to induce banks to invest more in risk-management and modeling technology by providing capital relief—the standardized approaches were calibrated to be more conservative than risk-sensitive internal models.

Before these changes were introduced, banks' internal risk models (and other risk-management functions) were designed to measure risk accurately. However, after the Market Risk Amendment and Basel II, subject to regulatory approval, models became a key input in determining capital requirements, generating a competing objective of using models to *minimize measured risk* to minimize capital requirements. These incentives may have contributed to the global financial crisis, during which banks, particularly large banks, were found to hold insufficient capital. Since the crisis, Basel III has raised the capital requirements for banks, and work is ongoing to better capture risk.

The author of this box is Pragyan Deb.

crisis. Excessive risk taking may occur even when managers' incentives are aligned with those of shareholders, particularly when performance is improperly measured (as was often the case in banks). Risks are heightened when leverage is high and when a bank is close to defaulting, with managers gambling for resurrection through high-risk bets because their losses are limited and the potential gains are substantial.

The empirical analysis in this chapter has provided a link between several aspects of corporate ownership, governance practices, and risk taking in banks. The strongest link is between board independence and lower risk taking. Although the *level* of compensation is not consistently associated with the degree of risk taking, its composition is: a larger share of equity pay and long-term pay for CEOs is related to lower risk in banks, especially when the banks are not in distress. Ownership matters: the presence of institutional ownership is associated with less risk taking, provided the bank's default risk is low.

The analysis in this chapter provides the first systematic empirical support for many of the ongoing reform efforts, and two areas warrant particular emphasis in the policy process. The analysis lends support to the ongoing push for more bank board members that are independent of management, for long vesting periods, and for clawback clauses. It also validates the concept that a company's culture has a large influence on a bank's risk taking. This chapter provides two recommendations that have not figured prominently in the reform effort but should be considered: (1) that creditors' interests could be represented on boards of directors in addition to those of shareholders; and (2) that the sensitivity of executive compensation to default risk should be enhanced through long-term debt awards or inverse indexation to bank default risk.

Annex 3.1. Data and Methods

Data Set

To analyze the factors that affect risk taking in financial firms, this chapter examined a large data set of risk-taking measures and governance statistics for banks in various advanced and emerging market economies.

- *Dependent variables:* Risk was measured across eight dimensions, capturing both balance sheet and market measures of risk. Measures of distance to default, volatility, tail risk, and systemic risk were included (see Table 3.5 for details). The balance sheet measures were derived from the data on bank financials available at Bankscope, and the market measures of risk were calculated using market data from Thomson Reuters Datastream and Moody's CreditEdge. The data for systemic risk were obtained from the New York University Stern School of Business Volatility Institute.
- *Explanatory variables:* A large set of potentially relevant explanatory variables was considered, which could be classified across four main dimensions of corporate governance—board characteristics, risk management, compensation practices, and ownership (see Table 3.3). The data on board characteristics and risk management were calculated using BoardEx data, and the Standard and Poor's Capital IQ database was the main source for the compensation and ownership data. The data on horizon of compensation were obtained from ASSET4-ESG, available via Thomson Reuters Datastream.
- *Country-level control variables:* A set of country-level control variables was included: log GDP per capita (adjusted for purchasing power parity); current account balance as a fraction of GDP (from the IMF World Economic Outlook database); the average of the six Worldwide Governance Indicators variables (from World Bank 2013); and a deposit insurance dummy (from Demirgüç-Kunt, Kane, and Laeven 2007).
- *Bank-level control variables:* A set of bank-level control variables from Bankscope was also included: return on book assets, log book assets, the deposit-to-asset ratio, the Tier 1 capital ratio, and revenue growth.

The resulting data set included more than 800 banks (although data are incomplete for a number of banks). The banks are from 72 countries, with slightly more than half from the United States, more than 20 percent from Europe, and the rest from Asia, the Americas, and Africa. Table 3.7 shows the breakdown of banks by country for the panel regressions of tail risk on each of the four dimensions of governance.

Methods

Four main methods were used to explore the determinants of bank risk taking during the past decade: (1) a nonparametric difference-in-means approach, (2) panel regressions, (3) a first-difference approach, and (4) cross-section regressions.

Difference-in-means approach

For each governance measure, banks were ranked according to their value in 2007 and were grouped in quartiles. The average difference was compared between the performance of banks belonging to the top and bottom quartiles for the period 2009–13. To select a sample of relatively homogeneous banks, the sample was restricted to banks with total assets of at least $10 billion in 2012. Furthermore, the effect of bank- and country-level differences that can influence bank incentive structures was stripped out by regressing the various indicators on the bank- and country-level controls. Country dummies were included to capture country-level differences not captured by the country controls.

Panel regressions

The explanatory variables (lagged to account for possible endogeneity) were regressed one by one, along with the lagged bank control variables, the lagged country control variables, year dummies, and bank fixed effects. Standard errors were clustered by country. Dependent variables were used from 2005 to 2013 (because the explanatory variables were lagged, they are from 2004 to 2012). For this and the remaining approaches the full sample of banks was used because the regressions explicitly control for bank size.

Although lagged explanatory variables were used to control for endogeneity, for some of the more structural explanatory variables that are related to the banks' business models, doing so may be insufficient. To illustrate, if a bank has a high risk appetite, it may naturally take on more risk while intentionally increasing the involvement of its board in risk management by creating a board risk committee and having its chief risk officer (CRO) sit on the board. In that case, a positive association between bank risk taking and the variables "risk committee exists" and "CRO on

Table 3.7. Number of Banks by Country in Samples for Various Regressions

	Board characteristics	Risk management	Compensation	Ownership structure
Australia	10	10	7	10
Austria	4	4	1	6
Belgium	2	2	2	2
Brazil	0	0	0	3
China	4	4	2	8
Denmark	4	4	6	11
Egypt	1	1	0	1
Finland	1	1	1	3
France	3	3	2	4
Germany	4	4	4	7
Greece	1	1	0	2
Hong Kong SAR	1	1	2	2
India	8	8	1	8
Indonesia	0	0	0	5
Ireland	1	1	1	1
Israel	5	5	5	5
Italy	12	12	8	13
Japan	17	17	3	86
Luxembourg	1	1	0	1
Mexico	1	1	0	2
Netherlands	3	3	0	3
Norway	4	4	7	15
Philippines	5	5	0	7
Poland	1	1	0	2
Portugal	3	3	2	3
Russia	1	1	0	4
Saudi Arabia	2	2	0	7
Singapore	3	3	2	3
South Africa	3	3	4	5
Spain	5	5	4	5
Sweden	4	4	3	4
Switzerland	6	6	6	8
Thailand	3	3	0	8
Turkey	4	4	0	5
United Kingdom	8	8	8	8
United States	373	373	273	498
Other	25	25	15	69
Total	533	533	369	834

Source: IMF staff.

Note: The table shows the sample used for the regressions of the tail risk measure on variables from each of the four dimensions of governance.

board" is observed, but it is not possible to conclude that these two governance variables are responsible for greater risk taking. To address this concern, an instrumental variable approach was used for the two risk-management measures: the "risk committee exists" and "CRO on board" measures were instrumented by net loans over deposits and short-term funding and a country-specific time trend. The rationale is that net loans over deposits and short-term funding can be considered a proxy for a bank's business model (and thus may cause variation in the two risk-management measures) but are not directly related to risk taking. The instruments passed the standard under-identification, weak-identification, and over-identification tests and were statistically valid. A robustness check was run by using the change in impaired loans over gross loans as an instrument, which yielded similar results.

First-difference approach

A first-difference approach was used to relate the change in risk taking between 2005–07 and 2011–13 to the change between the same periods in each

governance measure. Using first differences bypasses some of the endogeneity problems associated with the regressions in levels. Country dummies were included to incorporate country-level differences.

Cross-section regressions

Dependent variables from 2008 were regressed on independent variables from 2007 to capture the effects of the crisis. Bank control variables from 2007 and country fixed effects were included in the regressions. Standard errors were clustered by country. As in the panel regressions, an instrumental variable approach was used to account for endogeneity in the regressions involving the risk-management measures.

Summary statistics: Stouffer's z-statistic

The individual impact of each governance measure was calculated for each dimension of risk using *t*-statistics. Stouffer's *z*-statistic was used to summarize the result,

$$z = \frac{\Sigma_{i=1}^{k} Z_i}{\sqrt{k}} \sim N(0,1), \tag{3.1}$$

in which $Z_i = \varphi^{-1}(p_i)$ is the *t*-statistic for test *i*. Stouffer's *z*-statistic assumes that each regression is independent. Because the ($k = 8$) regressions run for each governance measure in these analyses (one regression for each risk variable) were not independent, the Benjamini-Hochberg procedure was used and the critical values were adjusted using the approximate false discovery rate $\alpha(k+1)/2k$.

Annex 3.2. Additional Results

Robustness

To test the robustness of the positive association between the share of fixed compensation and bank risk, a series of additional analyses were performed. First, to investigate whether the results were affected by bank size, the sample was restricted to banks with total assets of more than $10 billion; the correlation vanished both in the panel regression (Table 3.8) and in the crisis cross-section regression. When the exercise was repeated with different size thresholds the conclusion was the same each time. Then, using the entire sample, an interaction of fixed pay with bank size was included; the interaction term came in significantly negative, which reinforces the previous finding. Second, a differences-in-differences panel regression was performed in which fixed pay was interacted with a regulatory dummy for the European Union Capital Requirements Directive (CRD IV). The assumption was that those regulatory changes affected the ratio of fixed to total compensation and were exogenous. The effect of fixed pay on risk, measured by the coefficient of its interaction with CRD IV, was not significant.

The global macroeconomic environment could play a significant role in explaining bank risk taking. For instance, access to abundant liquidity combined with volume-based compensation for loan officers could lead to more risk taking and the formation of asset price bubbles (Acharya and Naqvi 2012; Adrian and Shin 2014). To test the robustness of the results when controlling for the macroeconomic environment, the panel regressions were run with interest rates on the three-month and 10-year securities of each bank's national government as additional controls. Separately, the above panel regressions were also run with country average equity returns as an additional control. The results were robust and similar to those shown in Figure 3.7.

An additional robustness check was performed on the results by extending the specification to include several measures of regulatory and supervisory quality as additional controls. Specifically, measures of the powers of the official supervisory entities, permissible bank activities, capital requirements, and private monitoring were added (Barth, Caprio, and Levine 2013). The results were qualitatively similar. Of the new variables only the official supervisory power index turned out to be significant, usually associated with more risk.

The previous analyses were also performed on a sample restricted to bank holding companies and commercial banks (that is, excluding cooperative banks, savings banks, mortgage companies, and investment banks, among others). The results were unchanged. The results also held for subsamples of banks from the United States and Europe (Table 3.8). Because splitting the sample greatly reduces the number of available observations and reduces the statistical power of the tests, the panel regression was repeated allowing the slope coefficients to vary by region, following Macey and O'Hara's (2003) definition of regional corporate

Table 3.8. Robustness in Subsamples

Variable	All sample	Commercial banks and bank holding companies	United States	Non-United States	Europe	Large banks (assets greater than $10 billion)
Board independence	↓	↓	↓	–	–	–
CEO is chairman	↑	–	–	–	–	↑
Financial experience	↑	↑	↑	↓	–	–
Risk committee	–	–	↑	–	–	↓
CRO board member	–	↑	–	–	↓	–
CEO background	↓	↓	–	–	–	↓
Share of salary	↑	↑	↑	↑	–	–
Equity-linked compensation	↓	–	–	–	–	–
Compensation horizon	↓	↓	–	↓	–	↓
Level of compensation	↓	↓	–	–	↓	↓
Institutional investors	↓	↓	–	–	–	–
Inside investors	–	–	–	–	↓	↓
Large shareholder	–	–	–	–	–	–

Source: IMF staff.
Note: ↑ = significant, higher risk; ↓ = significant, lower risk; – = not significant; CEO = chief executive officer; CRO = chief risk officer.

governance models: Anglo-American, Franco-German or Advanced European, and Other. Again, the results were similar but more significant than in the previous case.[36]

A check was performed to determine whether there was selection bias in the samples. Specifically, BoardEx and the Standard and Poor's Capital IQ database may sample only some types of banks. For instance, their coverage may be better for large banks or for U.S. or British banks. To check whether the results were robust to this potentially serious problem, the panel data analyses were performed using the Heckit method (Heckman 1976). The procedure involved running a first-stage pooled probit regression to estimate the probability that BoardEx or Standard and Poor's Capital IQ covers a bank based on its size, specialization, or country and whether it is listed on a major stock exchange. The panel regressions were then run with the inverse Mills ratio (estimated separately in the first stage for each regression) as an additional control. In several instances the hypothesis that the samples were nonrandom could not be rejected, but the estimated relationships of the governance variables with measured risk were qualitatively similar.

Finally, the dynamic panel generalized method of moments estimator developed by Arellano and Bond (1991) was used to control for lagged values of the dependent variables in the panel regressions. The results for board independence, the existence of a risk committee, compensation horizon, and large shareholders were robust, but the results for the CEO as chairman, share of salary, financial experience, equity-linked compensation, and institutional investor variables were not robust. This should not be surprising because including a lagged value of the dependent variable in the panel regression is a stringent control that strongly mitigates the effect of the lagged governance variable whenever the governance variable has a contemporaneous effect on the dependent variable.

Economic Significance and the Regulatory Environment

The economic impact of each variable in the subset of governance variables (board independence, existence of a risk committee, share of equity-linked compensation in total compensation, and share of ownership by institutional investors) on the eight measures of bank risk was compared to the impact of increasing (1) the Tier 1 capital ratio and (2) the size of the bank. To illustrate the effect, the results from the tail risk regression were selected for the comparison with an increase in the capital ratio while the regression with the systemic risk contribution was used for the comparison with bank size (Figure 3.8). The capital ratio is closely linked to microprudential policy.

Some of the governance variables had impacts comparable to that of changing the Tier 1 capital ratio or the size of the bank. For instance, an increase in board independence of 10 percentage points had roughly the same impact on tail risk as increasing the Tier 1 capital ratio by 2.3 percentage points. Similarly, creating a board risk committee or decreasing the share of salary by 10 percentage points would be equivalent to increasing the Tier 1 capital ratio by 0.9 and 1.8 percentage points, respectively.

Further analysis showed that the importance of board oversight and risk management was greater in countries with stronger legal frameworks and government effectiveness. Additional panel regressions with interaction terms of board independence, CEO as chairman, existence of a risk committee, and presence of the CRO on the board of directors with measures of government effectiveness and the strength of the rule of law (from World Bank 2013) were used to test this hypothesis. The results generally indicated that oversight by the board and the risk function were better in countries with stronger institutional environments. The importance of board oversight and of the risk function was also greater when banks faced few activity restrictions (measure from Barth, Caprio, and Levine 2013). However, the association between board and risk governance indicators and risk taking was not consistently stronger in countries with strong supervisors (measured by the index of official supervisory power, also from Barth, Caprio, and Levine 2013).

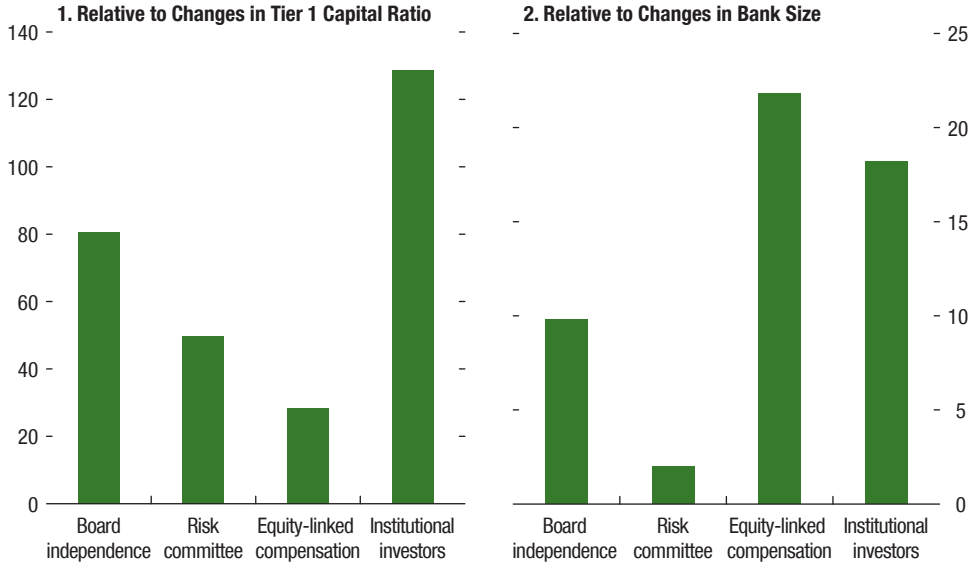
Gambling for Resurrection

CEOs who own a lot of equity in the bank they head may have an incentive to "gamble for resurrection" when the bank is in financial distress. As Table 3.1 shows, when the bank's equity has almost been wiped out (that is, when the bank has a high probability of default), the equity holders have an incentive to

[36]It would have been desirable to perform the same exercise for government-owned banks, but sufficient data were not available for a meaningful analysis.

Figure 3.8. Economic Significance of Bank Governance Variables
(Percent)

Bank governance variables have an impact on risk comparable to that of the Tier 1 ratio and size.



Source: IMF staff estimates.
Note: The bars show the impact on risk of a standard deviation change in the governance measure relative to the impact of a standard deviation change in the Tier 1 capital ratio and bank size. Risk is measured by tail risk for the comparison with the Tier 1 capital ratio and systemic risk for the comparison with bank size.

take high risks, because they will capture any possible upside, whereas the possible downsides will be mostly borne by debt holders. This effect may drive the somewhat different results in Figure 3.5 (relative to Figure 3.4), which focus on the crisis period when banks' distances to default were smaller than usual.

To formally test this supposition, the 2008 cross-section regressions were repeated for each dependent variable using equity-linked compensation in 2007 as the explanatory variable (as well as the customary control variables), with the addition of an interaction term between 2007 equity-linked compensation and a measure of the bank's distance to default in 2007. The distance to default was measured by the expected default frequency (EDF).[37] The exercise was then repeated with the share of inside investors instead of equity-linked compensation. If CEOs who own more equity do gamble for resurrection when their banks have a higher probability of default, the coefficients on the interaction terms should be positive.

The results suggest that there is indeed a practice of gambling for resurrection. As Table 3.9 shows, for both equity-linked compensation and the share of inside owners, the interaction terms with the probability of default were positive and significant at the 5 percent level in most of the eight regressions. The results also held when the exercise was repeated with the share of restricted stock instead of equity-linked compensation.

Culture and Business Model

One limitation of the empirical analysis in the main text of this chapter (and common to most of the empirical literature) is that some governance measures and dependent variables may be affected by the bank's business model or culture. To assess how much of the time-invariant bank-level heterogeneity is captured by variation across countries and business segments, the following exercise was conducted.

For each dependent variable, a panel regression was first run of the dependent variable on a subset of governance measures (board independence, existence of

[37] The baseline specification used the EDF measured at the five-year horizon available from Moody's (EDF5). The analysis was repeated with the EDF measured at the one-year horizon (EDF1) and, given that the distributions of EDF1 and EDF5 were highly skewed, with their logs. The results are robust to these alternative specifications.

Table 3.9. Gambling for Resurrection

A higher level of equity-linked compensation (current or cumulative) is associated with increased incentives to gamble for resurrection.

	Market-implied *z*-score	Balance sheet *z*-score	Beta (local index)	Equity return volatility	Market-implied asset volatility	Tail risk	Marginal expected shortfall	Systemic risk	Stouffer's *z*-statistic
Equity-linked compensation and probability of default									
Equity-linked compensation	–0.23	2.15***	–0.05	–0.57	–0.01**	–1.63	–0.52	–2.24**	–4.25
	(0.17)	(0.00)	(0.74)	(0.32)	(0.03)	(0.15)	(0.64)	(0.02)	
Equity-linked compensation X Probability of default	–1.35**	–9.22***	0.31*	6.01***	0.14***	11.18***	8.04	–0.67	14.54
	(0.02)	(0.00)	(0.10)	(0.00)	(0.00)	(0.00)	(0.12)	(0.85)	
Share of inside investors and probability of default									
Share of inside investors	–0.01***	–0.05***	–0.002*	–0.01**	–0.0002***	–0.01	–0.04	0.02	–4.93
	(0.01)	(0.00)	(0.05)	(0.03)	(0.00)	(0.14)	(0.10)	(0.27)	
Share of inside investors X Probability of default	0.03**	0.17***	0.01**	0.08***	0.001***	0.17***	0.14***	–0.11**	11.11
	(0.05)	(0.00)	(0.01)	(0.00)	(0.00)	(0.00)	(0.01)	(0.03)	

Source: IMF staff estimates.

Note: The table shows the estimated coefficients and *p*-values in parentheses. Stouffer's *z*-statistic is a measure that summarizes the joint statistical significance of a number of *t*-tests with the same null hypothesis. In this case, it gives a statistical indication of the significance of the effect of each explanatory variable on risk as measured jointly by the regressions with the different risk variables on the left side of the equation. ***, **, * indicate significance at the 1 percent, 5 percent, and 10 percent levels, respectively.

a risk committee, share of salary, share of institutional investors) and controls together in the regressions. Second, the resulting fixed effects were regressed on country and specialization dummies. Third, the weighted average of the *R* squared measures of these second regressions was computed, with the weights equal to the regression sample sizes. The result was a (weighted) average *R* squared of 52 percent, indicating that about half of the bank-level heterogeneity can be captured by the country and specialization dummies. The other half was attributable to other time-invariant bank characteristics that vary within countries and with bank specialization (such as culture and the business model) that were not controlled for in the cross-section regressions and difference-in-means analyses.

The analysis also sought to identify the share of the bank-level heterogeneity that can be captured by variables that aim to measure the legal and regulatory environment in various countries. To address this question, the above analysis was repeated with the second step replaced by a regression of the fixed effects on (1) the dummy variables measuring legal origin, from Spamann (2010); (2) the four variables measuring country-level bank regulation from the World Bank surveys on bank regulation (namely, overall restrictions on banking activities, official supervisory power, private monitoring index, and overall capital stringency); (3) the deposit insurance dummy from Demirgüç-Kunt, Kane, and Laeven (2007); and (4) the legal rights measure from the World Bank Doing Business project. The weighted average *R* squared obtained was 24 percent, indicating that slightly less than half (24/52, or 46 percent) of the country-level variation in bank fixed effects identified in the first analysis was attributable to the measured variation in the legal and regulatory environment.

Other Governance Variables

The analysis of the association of CEO compensation with bank risk was extended by including, in both panel and cross-section regressions, a dummy variable for options awards and the fraction of cash bonuses in total compensation. Stock option grants were positively and robustly associated with risk, but few banks outside the United States use this type of compensation. Cash bonuses, in contrast, were not associated with risk in this sample. This result prevailed even when the sample was restricted to larger banks.

In addition to the board governance variables described in the baseline analysis, the association between director workload (measured by the average number of outside directorships), the fraction of directors who are female, and the nationality mix of the directors and bank risk taking was examined. The results were either not robust or not significant for any of these variables.

A look at the relationship between risk taking and (1) the number of directors, (2) a dummy indicating small boards (with five or fewer directors), and (3)

a dummy indicating large boards (with 16 or more directors) followed. The number of directors was found to be significantly associated with less risk taking, and the small board dummy was significantly associated with more risk taking. The results were not significant and robust for the large-board dummy. This suggests that the negative effect of the number of directors on risk taking is driven by the effect of small boards, which is consistent with the hypothesis that small boards do not have sufficient resources to monitor management. No support was found for the hypothesis that large boards are inefficient at monitoring because they encourage free riding by directors.

Finally, restricted stock as a percentage of total CEO compensation was examined. More pay in restricted stock was found to be significantly associated with less risk taking in the difference-in-means and first-difference regressions but not in the panel regressions. This result is consistent with the results that more equity-linked compensation and longer compensation horizon are associated with less risk taking. The association becomes significantly positive in the crisis regression, which is consistent with the hypothesis that managers tend to gamble for resurrection when the risk of default is high.

References

Acharya, Viral V., Robert Engle, and Matthew Richardson. 2012. "Capital Shortfall: A New Approach to Ranking and Regulating Systemic Risks." *American Economic Review* 102 (3): 59–64.

Acharya, Viral V., and Hassan Naqvi. 2012. "The Seeds of a Crisis: A Theory of Bank Liquidity and Risk-Taking over the Business Cycle." *Journal of Financial Economics* 106 (2): 349–66.

Acrey, James Cash, William R. McCumber, and Thu Hien T. Nguyen. 2011. "CEO Incentives and Bank Risk." *Journal of Economics and Business* 63 (5): 456–71.

Adams, Renée B. 2012. "Governance and the Financial Crisis." *International Review of Finance* 12 (1): 7–38.

———, and Vanitha Ragunathan. 2013. "Lehman Sisters." Unpublished, FIRN Research Paper, Financial Research Network, Brisbane.

Adrian, Tobias, and Hyun Song Shin. 2014. "Procyclical Leverage and Value-at-Risk." *Review of Financial Studies* 27 (2): 373–403.

Aebi, Vincent, Gabriele Sabato, and Markus Schmid. 2012. "Risk Management, Corporate Governance, and Bank Performance in the Financial Crisis," *Journal of Banking and Finance* 36 (12): 3213–26.

Allen, Franklin, and Douglas Gale. 2001. *Comparing Financial Systems.* Cambridge, Massachusetts: MIT Press.

Aluchna, Maria. 2013. "Two-Tier Board." In *Encyclopedia of Corporate Social Responsibility*, edited by S.O. Idowu, N. Capaldi, L. Zu, and A. Das Gupta, pp. 2575–87. Berlin: Springer.

Arellano, Manuel, and Stephen Bond. 1991. "Panel Data: Monte Carlo Evidence and an Application to Employment Equations." *Review of Economic Studies* 58 (2): 277–97.

Bai, Gang, and Elyas Elyasiani. 2013. "Bank Stability and Managerial Compensation." *Journal of Banking and Finance* 37 (3): 799–813.

Balachandran, Sudhakar, Bruce Kogut, and Hitesh Harnal. 2011. "Did Executive Compensation Encourage Extreme Risk-taking in Financial Institutions?" Unpublished, Columbia University.

Barry, Thierno, Laetitia Lepetit, and Amine Tarazi. 2011. "Ownership Structure and Risk in Publicly Held and Privately Owned Banks." *Journal of Banking and Finance* 35 (5): 1327–40.

Barth, James R., Gerard Caprio Jr., and Ross Levine. 2013. "Bank Regulation and Supervision in 180 Countries from 1999 to 2011." *Journal of Financial Economic Policy* 5 (2): 111–219.

Battaglia, Francesca, Domenico Curcio, and Angela Gallo. 2014. "Board Structure and Tail and Systemic Risk Taking: Evidence from European Banks." Unpublished.

Becht, Marco, Patrick Bolton, and Ailsa Röell. 2011. "Why Bank Governance Is Different." *Oxford Review of Economic Policy* 27 (3): 437–63.

Beltratti, Andrea, and René M. Stulz. 2012. "The Credit Crisis around the Globe: Why Did Some Banks Perform Better?" *Journal of Financial Economics* 105 (1): 1–17.

Berger, Allen N., Björn Imbierowicz, and Christian Rauch. 2014. "The Roles of Corporate Governance in Bank Failures during the Recent Financial Crisis." Unpublished.

Berger, Allen N., Thomas Kick, and Klaus Schaeck. Forthcoming. "Executive Board Composition and Bank Risk Taking." *Journal of Corporate Finance*.

Board of Governors of the Federal Reserve System. 2014. "Comprehensive Capital Awards and Review 2014: Assessment Framework and Results." Washington.

Bolton, Patrick, Hamid Mehran, and Joel Shapiro. 2011. "Executive Compensation and Risk Taking." FRBNY Staff Report 456, Federal Reserve Bank of New York, New York.

Brownlees, Christian T., and Robert Engle. 2011. "Volatility, Correlation and Tails for Systemic Risk Measurement." Unpublished, Stern Center for Research Computing.

Chen, Carl R., Thomas L. Steiner, and Ann Marie Whyte. 2006. "Does Stock Option-Based Executive Compensation Induce Risk-taking? An Analysis of the Banking Industry." *Journal of Banking and Finance* 30 (3): 915–45.

Cheng, Ing-Haw, Harrison Hong, and Jose Scheinkman. Forthcoming. "Yesterday's Heroes: Compensation and Creative Risk Taking." *Journal of Finance*.

Chesney, Marc, Jacob Stromberg, and Alexander F. Wagner. 2012. "Risk-Taking Incentives and Losses in the Financial Crisis." Research Paper 10–18, Swiss Finance Institute, Geneva.

Clarke, Thomas. 2007. *International Corporate Governance: A Comparative Approach.* London and New York: Routledge.

Demirgüç-Kunt, Asli, Edward J. Kane, and Luc Laeven. 2007. "Determinants of Deposit-Insurance Adoption and Design." *Journal of Financial Intermediation* 17 (3): 407–38.

DeYoung, Robert, Emma Y. Peng, and Meng Yan. 2013. "Executive Compensation and Business Policy Choices at U.S. Commercial Banks." *Journal of Financial and Quantitative Analysis* 48 (1): 165–96.

Dolde, Walter, and John D. Knopf. 2006. "Impact of Corporate Ownership and Governance on Risk-Taking and Returns at Thrift Institutions." Unpublished, University of Connecticut.

Edelman. 2007. "Edelman Trust Barometer." New York.

———. 2014. "Edelman Trust Barometer." New York.

Ellis, Luci, Andy Haldane, and Fariborz Moshirian. 2014. "Systemic Risk, Governance and Global Financial Stability." *Journal of Banking and Finance* 45: 175–81.

Ellul, Andrew, and Vijay Yerramilli. 2013. "Stronger Risk Controls, Lower Risk: Evidence from U.S. Bank Holding Companies." *Journal of Finance* 68 (5): 1757–1803.

Erkens, David H., Mingyi Hung, and Pedro Matos. 2012. "Corporate Governance in the 2007–2008 Financial Crisis: Evidence from Financial Institutions Worldwide." *Journal of Corporate Finance* 18 (2): 389–411.

European Banking Authority (EBA). 2011. "Guidelines on Internal Governance." London.

Fahlenbrach, Rüdiger, Robert Prilmeier, and René M. Stulz. 2012. "This Time Is the Same: Using Bank Performance in 1998 to Explain Bank Performance during the Recent Financial Crisis." *Journal of Finance* 67 (6): 2139–85.

Fahlenbrach, Rüdiger, and René M. Stulz. 2011. "Bank CEO Incentives and the Credit Crisis." *Journal of Financial Economics* 99 (1): 11–26.

Fernandes, Nuno, and Eliezer M. Fich. 2013. "Does Financial Experience Help Banks during Credit Crises?" Unpublished.

Ferreira, Daniel, David Kershaw, Tom Kirchmaier, and Edmund-Philipp Schuster. 2013. "Shareholder Empowerment and Bank Bailouts." Finance Working Paper 345, European Corporate Governance Institute, Brussels.

Financial Stability Board (FSB). 2009. "FSF Principles for Sound Compensation Practices." Basel.

———. 2013. "Implementing the FSF Principles for Sound Compensation Practices and their Implementation Standards—Second Progress Report." Basel.

———. 2014. "Guidance on Supervisory Interaction with Financial Institutions on Risk Culture—A Framework for Assessing Risk Culture." Basel.

Forssbaeck, Jens. 2011. "Ownership Structure, Market Discipline, and Banks' Risk-Taking Incentives under Deposit Insurance." *Journal of Banking and Finance* 35 (10): 2666–78.

French, Kenneth, Martin N. Baily, John Y. Campbell, John H. Cochrane, Douglas W. Diamond, Darrell Duffie, Anil K. Kashyap, Frederic S. Mishkin, Raghuram G. Rajan, David S. Scharfstein, Robert J. Shiller, Hyun Song Shin, Matthew J. Slaughter, Jeremy C. Stein, and René M. Stulz. 2010. *The Squam Lake Report: Fixing the Financial System.* Princeton, New Jersey, and Oxford: Princeton University Press.

Gropp, Reint, and Mattias Köhler. 2010. "Bank Owners or Bank Managers: Who is Keen on Risk? Evidence from the Financial Crisis." Discussion Paper 10-013, Zentrum für Europäische Wirtschaftsforschung GMBH, Mannheim, Germany.

Group of Thirty. 2013. *A New Paradigm: Financial Institution Boards and Supervisors*. Washington.

Guiso, Luigi, Paola Sapienza, and Luigi Zingales. Forthcoming. "The Value of Corporate Culture." *Journal of Financial Economics*.

Hagendorff, Jens, and Francesco Vallascas. 2011. "CEO Pay Incentives and Risk-Taking: Evidence from Bank Acquisitions." *Journal of Corporate Finance* 17 (4): 1078–95.

Hau, Harald, and Marcel P. Thum. 2009. "Subprime Crisis and Board (In-)Competence: Private vs. Public Banks in Germany." Finance Working Paper 247, European Corporate Governance Institute, Brussels.

Heckman, J. J. 1976. "The Common Structure of Statistical Models of Truncation, Sample, and Limited Dependent Variables and a Simple Estimator for Such Models." *Annals of Economic and Social Measurement* 5: 475–92.

Institute of International Finance (IIF). 2013. "Compensation Reform: Embedding Global Standards." Washington.

International Monetary Fund (IMF). 2009. "Debt Bias and Other Distortions: Crisis-Related Issues in Tax Policy." Washington.

Jensen, Michael C., and William H. Meckling. 1976. "Theory of the Firm: Managerial Behavior, Agency Costs and Ownership Structure." *Journal of Financial Economics* 3 (4): 305–60.

Jokivuolle, Esa, and Jussi Keppo. 2014. "Bankers' Compensation: Sprint Swimming in Short Bonus Pools?" Research Discussion Paper 2-2014, Bank of Finland, Helsinki.

Keeley, Michael C., and Frederick T. Furlong. 1989. "Capital Regulation and Bank Risk-Taking: A Note." *Journal of Banking and Finance* 13 (6): 883–91.

———. 1990. "A Reexamination of Mean-Variance Analysis of Bank Capital Regulation." *Journal of Banking and Finance* 14 (1): 69–84.

Keys, Benjamin J., Tanmoy Mukherjee, Amit Seru, and Vikrant Vig. 2009. "Financial Regulation and Securitization: Evidence from Subprime Loans." *Journal of Monetary Economics* 56 (5): 700–20.

Kim, Daesik, and Anthony M. Santomero. 1988. "Risk in Banking and Capital Regulation." *Journal of Finance* 43 (5): 1219–33.

Klock, Mark S., Sattar A. Mansi, and William F. Maxwell. 2005. "Does Corporate Governance Matter to Bondholders?" *Journal of Financial and Quantitative Analysis* 40 (4): 693–719.

Koehn, Michael, and Anthony M. Santomero. 1980. "Regulation of Bank Capital and Portfolio Risk." *Journal of Finance* 35 (5): 1235–44.

Laeven, Luc, and Ross Levine. 2009. "Bank Governance, Regulation and Risk Taking." *Journal of Financial Economics* 93 (2): 259–75.

Lingel, Anna, and Elizabeth A. Sheedy. 2012. "The Influence of Risk Governance on Risk Outcomes—International Evidence." Applied Finance Centre Research Paper 37, Macquarie University, Sydney.

Macey, Jonathan R., and Maureen O'Hara. 2003. "The Corporate Governance of Banks." *Economic Policy Review* 9 (1): 91–107.

Merton, Robert. 1974. "On the Pricing of Corporate Debt: The Risk Structure of Interest Rates." *Journal of Finance* 29 (2): 449–70.

Minton, Bernadette A., Jérôme Taillard, and Rohan Williamson. Forthcoming. "Financial Expertise of the Board, Risk Taking and Performance: Evidence from Bank Holding Companies." *Journal of Financial and Quantitative Analysis*.

Murphy, Kevin J. 2013. "Regulating Banking Bonuses in the European Union: A Case Study in Unintended Consequences." *European Financial Management* 19 (4): 631–57.

Nuijts, Wijnand, and Jakob de Haan. 2013. "DNB Supervision of Conduct and Culture." In *Financial Supervision in the 21st Century*, edited by A. Joanne Kellerman, Jacob de Haan, and

Femke de Vries. Amsterdam: De Nederlandsche Bank and Springer Verlag.

Parliamentary Commission on Banking Standards. 2013. "Volume I: Summary, and Conclusions and Recommendations (Changing Banking for Good: Report of the Parliamentary Commission on Banking Standards)." The House of Commons, London.

Pathan, Shams. 2009. "Strong Boards, CEO Power and Bank Risk-Taking." *Journal of Banking and Finance* 33 (7): 1340–50.

Prendergast, Canice. 1999. "The Provision of Incentives in Firms." *Journal of Economic Literature* 37 (1): 7–63.

———. 2000. "What Trade-Off of Risk and Incentives?" *American Economic Review* 90 (2): 421–25.

———. 2002. "The Tenuous Trade-Off between Risk and Incentives." *Journal of Political Economy* 110 (5): 1071–102.

Rochet, Jean-Charles. 1991. "Capital Requirements and the Behaviour of Commercial Banks." *European Economic Review* 36 (5): 1137–70.

Sørensen, Jesper B. 2002. "The Strength of Corporate Culture and the Reliability of Firm Performance." *Administrative Science Quarterly* 47 (1): 70–91.

Spamann, Holger. 2010. "The Antidirector Rights Index Revisited." *Review of Financial Studies* 23 (2): 467–86.

Srivastav, Abhishek, Seth Armitage, and Jens Hagendorff. 2014. "CEO Inside Debt Holdings and Risk-Shifting: Evidence from Bank Payout Policies." *Journal of Banking and Finance* 47: 41–53.

Stulz, René M. 2014. "Governance, Risk Management, and Risk-Taking in Banks." Working Paper 20274, National Bureau of Economic Research, Cambridge, Massachusetts.

Tirole, Jean. 2006. *The Theory of Corporate Finance.* Princeton, New Jersey: Princeton University Press.

Tung, Frederick, and Xue Wang. 2011. "Bank CEOs, Inside Debt Compensation, and the Global Financial Crisis." Working Paper 11–49, Boston University School of Law, Boston.

Vallascas, Francesco, and Jens Hagendorff. 2013. "CEO Bonus Remuneration and Bank Default Risk: Evidence from the U.S. and Europe." *Financial Markets, Institutions and Instruments* 22 (2): 47–89.

Viñals, José, Jonathan Fiechter, Aditya Narain, Jennifer Elliott, Ian Tower, Pierluigi Bologna, and Michael Hsu. 2010. "The Making of Good Supervision: Learning to Say 'No.'" IMF Staff Position Note 10/8, International Monetary Fund, Washington.

Viñals, José, Ceyla Pazarbasioglu, Jay Surti, Aditya Narain, Michaela Erbenova, and Julian Chow. 2013. "Creating a Safer Financial System: Will the Volcker, Vickers, and Liikanen Structural Measures Help?" IMF Staff Discussion Note 13/4, International Monetary Fund, Washington.

Wang, Tawei, and Carol Hsu. 2013. "Board Composition and Operational Risk Events of Financial Institutions." *Journal of Banking and Finance* 37: 2042–51.

World Bank. 2013. *Worldwide Governance Indicators*. Washington.

Zinkin, John. 2013. "Setting the 'Tone at the Top.'" In *Rebuilding Trust in Banks: The Role of Leadership and Governance*, 47–70. Chichester, United Kingdom: John Wiley & Sons, Ltd.