

Subprime Governance: Agency Costs in Vertically Integrated Banks and the 2008 Mortgage Crisis

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This study uses the 2008 mortgage crisis to demonstrate how the relationship between vertical integration and performance crucially depends on corporate governance. Prior research has argued that the vertical integration of mortgage origination and securitization aligned divisional incentives and improved lending quality. We show that vertical integration improved loan performance only in those firms with strong corporate governance and that this performance-integration relationship strongly decreases and actually reverses as governance quality decreases. We interpret these findings as suggesting that the additional control afforded by vertical integration can, in the hands of poorly monitored managers, offset gains from aligned divisional incentives. These findings support the view that corporate governance influences the strategic outcomes of a firm, in our case, by influencing the effectiveness of boundary decisions.

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Introduction

In this paper we provide evidence that the relationship between vertical integration and performance depends on corporate governance. We study this role of governance in the context of one of the most important market failures in recent history — the 2008 American housing crisis. Recent research in corporate finance on the underlying causes of the crisis has argued that the vertical integration of mortgage origination and securitization aligned divisional incentives and thereby helped banks avoid severe lending quality problems (Purnanandam, 2011; Demiroglu and James, 2012). Yet many of the worst performing lenders, such as Washington Mutual, Wachovia, and New Century Financial, were in fact integrated, having pursued deliberate strategies to control the vertical chain. These lenders subsequently collapsed spectacularly once the housing market weakened in 2008. What explains the poor performance by integrated firms?

We propose that weak corporate governance in vertically integrated banks led to agency problems of the sort that are particularly pronounced in information-intensive industries. Within these firms, “soft” information—such as intangible borrower risk factors—is passed internally between divisions and is difficult for the outside market to validate (Pierce, 2012; Gartenberg, 2014). A deep literature in strategy and economics shows that such information asymmetry makes aspects of corporate governance such as executive compensation (Finkelstein and Hambrick, 1988; Jensen and Murphy, 1990; Harris and Bromiley, 2007; Sanders and Hambrick, 2007), board structure (Johnson, Hoskisson, and Hitt, 1993; Dalton *et al.*, 1998; Westphal and Fredrickson, 2001), and investor composition (Hoskisson *et al.*, 2002; Schnatterly, Shaw, and Jennings, 2008) crucial for aligning top management actions with the interests of shareholders. Without sufficient monitoring by boards (Baysinger and Hoskisson, 1990) or outside investors (Bushee, 1998; Thomsen and Pedersen, 2000), top executives have wide discretion to either shirk responsibilities or else implement strategy and

policies that enable them to achieve compensation, status, and other personal goals at the expense of shareholder value.

Vertical integration extends top managers' span of control over the supply chain. Given this increased control, we propose that weak corporate governance allows two costly types of agency problems. First, managers can pursue self-interested goals by distorting the activities of each division as well as the terms of exchange and information passed between them. Indeed, while recent work suggests that vertical integration did in fact align divisional incentives in banks (Demiroglu and James, 2012), this alignment under weak governance may have served managerial rent-seeking rather than shareholder value. Weak corporate governance enables the top management team to structure compensation systems, reporting hierarchies, and culture within the organization to support the managers' goals of myopic growth and excessive risk (Werner, Tosi, and Gomez-Mejia, 2005). In this way, the increased coordination, shared language, and knowledge that is argued to produce benefits by some organizational scholars (Kogut and Zander, 1992; Grant, 1996; Nahapiet and Ghoshal, 1998; Macher, 2006), can produce the value-destroying distortion highlighted by other scholars (Eccles and White, 1988; Osterloh and Frey, 2000; Nickerson and Zenger, 2004; Bidwell, 2012).

Second, weak governance can also allow passive CEOs or entire top management teams to insufficiently monitor their organizations (Hart, 1983; Harris and Helfat, 1997; Bertrand and Mullainathan, 2003), allowing self-interested managers inside the organization to misrepresent, distort, and withhold information for their own interests (Williamson, 1985; Eccles and White, 1988; Shleifer and Vishny, 1997; Osterloh and Frey, 2000; Nickerson and Zenger, 2004; Bidwell, 2012; Pierce, 2012). As Williamson (1985) repeatedly argues, when high-powered managerial incentives exist with the firm, as is common in the banking industry, the imperfect monitoring and intervention of top managers and owners is frequently insufficient to restrain this distortionary behavior.

We study how corporate governance changes the role of vertical integration by examining the quality of loans issued between 2000 and 2007 by mortgage lenders that vary in both integration levels and governance characteristics. We construct a firm-year measure of lending quality as the incremental likelihood that a mortgage defaults if it is originated by that lender, controlling for the loan characteristics observable by external market participants. If a lender chooses to supply its securitization unit by unobservably lowering loan quality, this distortion is captured by this metric.

We first show that, on average, vertically integrated lenders issue higher quality loans than nonintegrated firms, replicating earlier research (Demiroglu and James, 2012). We then show that this average effect masks significant differences between integrated firms with strong and weak governance. Although integrated firms with strong governance have the lowest mortgage default likelihood, this relationship between integration and default likelihood strongly increases as governance weakens. In firms with the weakest governance, greater integration is actually associated with worse quality lending, the opposite of their strong-governance counterparts. We also examine specific governance dimensions and find evidence that both shareholder and board characteristics moderate the relationship between integration and performance, with inconsistent results on executive compensation. Our results suggest that the advantages of vertical integration are offset in firms with a weak governance structure, which is likely a function of both external and internal monitoring.

This paper contributes to an active strategy literature on firm scope and performance (Rawley, 2010; Zhou, 2011; Zahavi and Lavie, 2013; Rawley and Natividad, 2015) by providing evidence that corporate governance plays a key role in explaining differences in vertical integration, particularly in contexts where information accuracy is critical and hard to verify (Nickerson and Zenger, 2004; Pierce, 2012). In this sense, it contributes to a growing literature that argues that the firm boundary predictions of transaction cost economics and property rights theory interact with firm heterogeneity on other dimensions (Poppo and Zenger, 1998; Jacobides and Winter, 2005; Bidwell, 2010; 2012;

Argyres and Zenger, 2012; Argyres *et al.*, 2012; Helfat and Campo-Rembado, 2015). This paper builds on prior studies of horizontal integration (Gartenberg, 2014) and vertical disintegration (Jacobides, 2005) in the mortgage banking industry to explicitly examine how heterogeneity in governance across vertically-integrated firms directly impacts the efficiency of that organizational structure.

This paper also contributes to a deep literature on the importance of corporate governance in firm strategy and performance (e.g., Jensen and Zajac, 2004; Hambrick *et al.*, 2008; Castañer and Kavadis, 2013). This research stream argues that the incentives embedded in executive compensation, as well as the expertise (Castanias and Helfat, 1991; Westphal and Fredrickson, 2001; Feldman and Montgomery, 2015), independence (Jensen and Meckling, 1976; Boyd, 1994; Westphal and Zajac, 1998), and motivation (Hambrick and Jackson, 2000) of the board of directors, all can shape a firm's strategic direction and performance. Similarly, the involvement of institutional shareholders is argued to shape strategy and performance through both improved information and incentives for monitoring (Shleifer and Vishny, 1986; Schnatterly *et al.*, 2008). Our paper suggests that corporate governance directly influences the appropriate boundary and also the associated outcomes of the firm.

Finally, our paper contributes to the growing literature on the 2008 housing crisis (e.g., Shiller, 2008; Mayer, Pence, and Sherlund, 2009; Shin, 2009). While the economics and finance literature has shown that the housing crisis was preceded by a large deterioration in mortgage quality (Dell'Ariccia, Igan, and Laeven, 2008), it has generally focused on the market level (Demyanyk and Van Hemert, 2011), with only a few papers examining firm-level factors (Purnanandam, 2011; Demiroglu and James, 2012). Our paper, together with Gartenberg (2014), highlights *organizational* factors that have a first order effect on lending differences between firms and are generalizable beyond the mortgage industry and this specific time period. Moreover, although several strategy papers have used the crisis as a motivating example (Lampel, Shamsie, and Shapira, 2009; Jacobides and Winter, 2012), only two papers in strategy to our knowledge have empirically studied it (Balachandran, Kogut, and Harnal,

2010; Gartenberg, 2014). This is despite a host of empirical work on earlier economic crises (Wan and Yiu, 2009; Lee and Makhija, 2009; Lim, Das, and Das, 2009; Dowell, Shackell, and Stuart, 2011).

Motivating example: Washington Mutual, Inc.¹

In this section, we present a short case describing how weak corporate governance transformed vertical integration from a theoretically efficient organizational structure to one rife with weak oversight, perverse incentives, and destructive employee behavior.

Washington Mutual (WaMu), a 119 year-old savings bank, became the largest bank failure in U.S. history in September, 2008. The firm's governance quality was unequivocally poor, earning 14 out of a possible 24 on the widely-used Gompers, Ishii, and Metrick (2003) governance index (where higher scores represent worse governance)—among the worst 5% of all firms included in their study. The industry mean is 8, while the worst lender in our study earned a score of 15.

The board of directors largely rubber-stamped CEO Kerry Killinger's initiatives and approved his compensation of \$100 million between 2003 and 2008. Tellingly, as the housing market began to deteriorate in 2007, and WaMu's mortgages increasingly defaulted, the board approved changes to the compensation packages for the executive team to exclude loan losses and home foreclosures as key performance metrics in determining pay.

Killinger and his top team—particularly the Chief Operating Officer, Chief Financial Officer, the president of the residential lending division and the vice presidents of origination and securitization operations—implemented increasingly aggressive policies to increase firm growth during this period. In 2003, they launched the “Power of Yes” advertising campaign to publicize the firm's commitment to approving loans at all costs. When the Chief Risk Officer, James Vanasek, concerned that this campaign sent the wrong message to loan officers, announced at a company

¹ This section is based on public information from “Wall Street and the Financial Crisis: Anatomy of a Financial Collapse,” Carl Levin,

meeting that this policy should be accompanied by the “wisdom of no,” it was viewed by many as a career-risking statement, as he testified in a congressional hearing on the causes of the crisis:

I stood in front of thousands of senior Washington Mutual managers and executives in an annual management retreat in 2004 and countered the senior executive ahead of me on the program who was rallying the troops with the company's advertising line, “The power of yes.” The implication of that statement was that Washington Mutual would find some way to make a loan. *The tag line symbolized the management attitude about mortgage lending more clearly than anything I can tell you.*

Because I believed this sent the wrong message to the loan originators, I felt compelled to counter the prior speaker by saying to the thousands present that the power of yes absolutely needed to be balanced by the wisdom of no. This was highly unusual for a member of the management team to do, especially in such a forum. In fact, it was so far out of the norm for meetings of this type that *many considered my statement exceedingly risky from a career perspective* (Levin, 146-7, italics ours).

Vanasek retired in 2005 in protest. As financial conditions deteriorated, the new CRO “began to be excluded from key management decisions... he attended all of the Board meetings until the end of 2007 or the beginning of 2008, at which time he was no longer invited.” According to one of his subordinates, he was “not well respected” and did not have “a strong voice” among the executive team and was terminated after complaining to the Chairman of the Board (Levin, pg. 112).

Compensation throughout the ranks at WaMu focused on quantity and ignored quality. The bonus of the head risk manager of the origination division, who had no risk experience when hired and reported primarily to the division president head rather than to the CRO, was based 35% on income and only 25% on risk. Loan underwriters were compensated on volume, particularly of high-risk loans, and not on loan quality.

WaMu’s securitizations grew faster than the industry and performed particularly poorly. In 2002, the beginning of our study period, the bank had no securitization operations despite being the second largest mortgage originator in the country. By 2006, it had grown to the second-largest issuer of mortgage-backed securities and its subprime unit was rated as the worst-performing issuer in the industry. The Senate committee investigating the bank’s failure found extensive evidence of systemic

deception among loan officers to originate loans that did not comply with WaMu's official credit policies. Former employees attributed this deception to the use of volume-based incentive compensation implemented by top management. The committee also found that the bank used opaque and misleading information to disguise loans that were likely to default or fraudulent within their securitizations.

The bank was seized by its regulator on September 25, 2008 and sold to JPMorgan Chase. Had the sale failed, this single failure might have required the entire \$45 billion Federal Deposit Insurance Fund to cover the bank's losses.

In WaMu's case, vertical integration did indeed align division incentives as prior research has suggested (Demiroglu and James, 2012); however, it aligned them toward myopic goals of excessive risk, short-term growth, and deception. These perverse incentives emerged for three governance-based reasons. First, an ineffective board failed to supervise the top management team. Second, given this lack of supervision, top managers supported an aggressive growth strategy by establishing consistent, self-serving compensation policies from themselves down through low-level bank officers. Third, myopic shareholders failed to provide oversight and pressure to consider long-term goals, partly because more the conservative institutional investors did not invest in WaMu.

This combination of vertical integration and systematically poor governance created perverse complementarities that enabled excessive risk and fraud. Without vertically integrating into securitization, the bank could not have found outlets for its loans without external scrutiny. Without its poor governance, it would likely not have embarked on a strategy to grow through the origination and securitization of fraudulent, defective and generally poor quality loans.

Theoretical Background

Why corporate governance matters

Top executives are responsible for designing and implementing the strategy of the firm (Mintzberg, 1979; Finkelstein, Hambrick, and Canella, 2009). Although CEOs typically possess the formal responsibility, a substantial literature emphasizes the importance of other top management team members such as CFOs, COOs and other executives with substantial organizational power (e.g., Wagner, Pfeffer and O'Reilly, 1984; Hambrick and D'Aveni, 1992). Given the broad discretion of this group, researchers across multiple fields have long recognized the central role of corporate governance in regulating top managers' actions (Berle and Means, 1932; Jensen and Meckling, 1976; Fama 1980; Finkelstein and Hambrick, 1988; Baysinger and Hoskisson, 1990; Westphal and Zajac, 1995). Governance represents an incentive and control system whereby ownership (shareholders) attempts to ensure high managerial effort on those activities that improve shareholder value. The control components of governance include both internal monitoring by boards of directors and external monitoring by shareholders (typically institutions). Executive compensation packages that typically include performance-based equity or cash remuneration dictate top managers' incentives to either increase shareholder value or engage in rent-seeking behavior.

Numerous empirical studies have firmly established that corporate governance influences both firm performance and strategy. Strong governance, for example, has been linked to firm-level performance indicators such as stock returns (Gompers, Ishii, and Metrick, 2003), Tobin's Q (Black, Jang and Kim, 2003), bankruptcy avoidance (Daily and Dalton, 1994), and sales growth (Peng, 2004). Strong governance has also been tied to important elements of strategy such as greater patenting and overall innovation (Hill and Snell, 1988; Aghion, Van Reenen, and Zingales, 2012), decisions with long time horizons (Connelly *et al.*, 2010), and internationalization (Tihanyi *et al.*, 2003).

. In firms with high G values, dubbed "Dictatorships," managers operate with considerable discretion without board monitoring or power to punish manager actions. On the other end of the spectrum, in firms with low G-values, so-called "Democracies," managers are subjected to a system of

checks and balances enforced by shareholders. The G-index is increasingly used in the strategy literature to measure corporate governance (Zhou, 2011; Kaul, 2012; Feldman and Montgomery, 2015) because it broadly represents all components of governance: executive compensation, internal monitoring by the board, and external ownership structure.

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Most Beyond aggregate measures of governance, many studies have focused on specific monitoring and incentive components. Research on external monitoring has generally studied the degree and composition of institutional investors, since these shareholders are professional, informed owners who control over fifty percent of all investment capital (Useem, 1996). The level and concentration of institutional investors have generally been associated with better firm performance (Shleifer and Vishny, 1986; Bushee, 1998). This research has also shown a range of links between types of owners and specific firm strategies. In particular, owners with differing regulatory constraints and incentives (such as pension funds, private investment firms, regulated banks, and insurance companies) have different investment preferences (Del Guercio, 1996) and influences on firm strategies (David, Hitt and Gimeno, 2001; Hoskisson *et al.*, 2002; Connelly *et al.*, 2010).

Board monitoring, as measured by the size and composition of the corporate board, has also been related to strategic outcomes (Fama and Jensen, 1983; Baysinger and Hoskisson, 1990), although the evidence has been mixed (Zajac and Westphal, 1994; Dalton *et al.*, 1998). Hermalin and Weisbach,

(2001), for example, conclude that independent boards do appear to implement better policies, but they find no consensus in the literature that this improves financial performance, possibly because independent boards possess less firm-specific knowledge (Feldman and Montgomery, 2015) or are less involved with the firm (Westphal, 1999). Similar mixed evidence exists on whether board size relates to the quality of monitoring (Hermalin and Weisbach, 2001).

Empirical research linking executive compensation and firm performance has similarly produced mixed results and conflicting theories (Murphy, 1999; 2012). Although many argue compensation is an important tool for boards to align managerial interests with those of shareholders (Murphy, 1999), others believe that compensation largely reflects board capture (Boyd, 1994; Westphal and Zajac, 1995; Bebchuk and Fried 2004; Garvey and Milbourn, 2006; Gopalan, Milbourn, and Song, 2010). Furthermore, the origin and efficacy of executive compensation have complex interactions with many other characteristics of the firm (Finkelstein and Hambrick, 1988, Zajac and Westphal, 1994). As with board composition, scholars agree that executive compensation is a crucial component of governance, but not on how well it predicts strategy or performance.

Recent work has argued that governance not only influences the actions of a firm's top managers but also shapes policy and behavior within the firm. As Werner, Tosi, and Gomez-Meija (2005) note, incentive systems throughout the firm tend to reflect incentives at the top of organizations (Fama and Jensen, 1983; Werner and Tosi, 1995). Aguilera *et al.* (2008) link stronger governance to greater internal capability creation and coordination among mid and lower level employees. Similarly, Aoki (2001) shows that insider governance in Japanese firms is associated with higher levels of cooperative production processes. Overall, these papers provide evidence that governance not only influences the types of explicit decisions that top managers make, but also the nature by which they manage the firm and the behaviors that they encourage of their employees.

Corporate governance in vertically integrated firms

Scholars from multiple traditions have explained why vertical integration can facilitate coordination in the vertical supply chain (Poppo and Zenger, 1998; Lafontaine and Slade, 2007). Those based in transaction cost and property rights theory have argued that integration can improve cooperation and adaptation by reducing opportunism and hold-up costs (Grossman and Hart, 1986; Williamson, 1991; Nickerson and Silverman, 2003) and measurement problems (Barzel, 1982; Demsetz, 1988). Proponents of the knowledge-based view have instead focused on benefits from routines, shared language and culture, and common identity that facilitate information flow (Kogut and Zander, 1992; Grant, 1996; Ghoshal and Moran, 1996; Nickerson and Zenger, 2004). Related resource-based explanations argue that vertical integration allows firms to exploit capabilities across multiple divisions (Argyres, 1996; Kapoor, 2013) and engage in systemic innovation over multiple technology lifecycles (Helfat and Campo-Rambado, 2015). More recently, scholars have explored how these theoretical streams are complementary in explaining ownership structure (Argyres and Zenger, 2012; Qian, Agarwal, and Hoetker, 2012). Although each perspective provides a strong case for vertical integration benefits, they have provided little evidence for how corporate governance helps realize these benefits.

In the absence of strong corporate governance, two potential agency problems can occur in vertically integrated firms. First, top management can use the additional control, not for long-term profitability but, instead, for their own personal wealth, status, and goals. In such a case, integration indeed reduces holdup and measurability concerns, and divisions enjoy gains from culture and routines, but the rents of these gains are captured by management. Washington Mutual, discussed above, provides an example of this problem. The CEO and his leadership team provided clear direction and incentives to middle managers, loan officers and employees structuring securitizations for their aggressive, and ultimately failed, strategy—a strategy that was only feasible with joint control over both upstream (origination) and downstream (securitization) operations.

The second agency problem can occur when weak governance leads to inattention by top management to monitoring internal activities. Whereas the focal agents of the first problem are members of the top management team, in this case, the problem stems from both the top managers and the employees inside the organization. Inattentive executives create the environment for employees to politick and rent-seek, a problem that is particularly acute within multi-divisional firms since information sharing between divisions is rife with opportunity for distortion. Moreover, divisional incentives may easily become misaligned with those of the firm (Williamson, 1985; Foss, 2003), particularly when political power and long-term career concerns motivate influence activities (Bradach and Eccles, 1989; Milgrom and Roberts, 1990; Wulf, 2002; Argyres and Mui, 2007).

As Williamson (1985) notes, agency problems are exacerbated when agents retain high-powered incentives and are insufficiently monitored. Such incentives lead to what he calls “accounting contrivances” (Williamson, 1985, p. 138), where agents distort information on both transfer prices and cost. In our case, we are agnostic whether these “contrivances” originate at the senior level (the first problem described above) or within the firm (the second problem). Our basic intuition is that integration increases the opportunities for contrivances overall, and that agents take greater advantage of these opportunities in firms with weak governance.

Despite extensive literature on both vertical integration and governance, few empirical studies have examined their interaction and, particularly, how this interaction affects firm behavior. Although Novak and Stern (2009), Pierce (2012), and Gartenberg (2014) argue that a lack of monitoring, or weak corporate governance, generates poor performance in vertically integrated firms in the automotive and mortgage industries, none of these studies explicitly tested this proposition.

We hypothesize that, while integration may indeed improve performance in information-intensive industries, it may do so only when corporate governance structures are strong:

Hypothesis 1: Information sharing gains from vertical integration will be greater in firms with strong corporate governance.

A natural question is which components of governance—compensation, board monitoring, or shareholder monitoring—matter most. Anecdotal evidence on the bank crisis (such as in our WaMu example) and governance research suggest that all three governance components play important roles in determining excessive risk in integrated banks. These components are highly related (Walsh and Seward, 1990), however, making their individual roles difficult, if not impossible, to disentangle. Each component is both a cause and symptom of weak governance, influencing and being reinforced by the others over time. Captured boards enable aggressive compensation packages (Boyd, 1994) and repel long-term institutional investors (Gompers *et al.*, 2003). Institutional investors actively influence both board composition (Hermalin and Weisbach, 2001) and compensation (David, Kochar, and Levitas, 1998). This simultaneity problem impedes empirical identification of which component most likely enables vertical integration gains. Consequently, we are cautious, like other recent financial crisis research (Erkens, Hung, and Matos, 2012; Beltratti and Stulz, 2012), in interpreting any results on specific governance components without valid instruments or natural experiments; rather, we view them as valuable correlations that suggest how governance composition can be used to predict performance and, specifically, the effects of vertical integration. As such, we have no *a priori* predictions about which component might have the strongest moderating effect.

Empirical Setting

We explore vertical integration and governance in the mortgage industry. We define vertical integration as the combination of mortgage origination and securitization within a single parent firm. Mortgage origination, the “upstream” function, is the process of creating and underwriting individual mortgages. Mortgage securitization, the “downstream” function, is the process of pooling together individual mortgages and issuing mortgage-backed securities (MBS) (i.e., financial instruments backed

by the underlying mortgage pool). With the widespread expansion of credit in 2000s, mortgage securitization grew rapidly (Mian and Sufi, 2009). The increasing demand for mortgage-backed securities in turn increased demand for mortgages and thereby led to deteriorating industry-wide lending standards until the housing bubble burst in 2008 (Demyanyk and Van Hemert, 2011).

Three related conditions allowed top managers of integrated firms to lower lending standards during this period. First, high demand for MBS made securities issuance very profitable. Second, rising home prices masked the true poor quality of underlying loans by artificially suppressing mortgage defaults. Third, the retention of residual cash flows by issuing firms encouraged less thorough screening by investors.

With lax screening by MBS investors and low default rates, we argue that top managers could direct their upstream lending units to expand mortgage supply in order to increase securitization volume and, by extension, short-term profits. Mortgage supply could be expanded in two ways. First, lenders could target a risky customer segment, such as consumers with low credit scores or income. Targeting a riskier segment is not equivalent, however, to low lending standards.

Second, and more problematically, lenders could reduce underwriting quality (screening and matching consumers with appropriate financial products), conditional on customer risk segment. Lower underwriting quality could involve accepting fraudulent applications or exerting less effort in obtaining tacit information about a consumer, such as earnings potential, trustworthiness, or cognitive ability (Gerardi, Goette, and Meier, 2013). This tacit information, particularly important for higher risk segments, has been shown to be a first-order determinant of mortgage default (Rajan, Seru, and Vig, 2015). It could also involve matching consumers with loan structures that are riskier than those for which they are qualified. It is this set of actions that reduce underwriting quality that we predict is driven by weak governance in vertically integrated firms.

Data and Methods

Empirical strategy

We first replicate the earlier finding of Demiroglu and James (2012) that vertical integration is negatively related to default likelihood. This first step establishes that our results can be plausibly attributed to our proposed mechanism and not to differences in the underlying data samples. We then explore the moderation of the vertical integration-default likelihood relationship by governance and how it relates to whether the firm was still operating at the end of 2010.

To implement this strategy, we construct a panel that includes firm-year measures of mortgage default likelihood, our primary dependent variable, which we define as a firm-year measure of the incremental likelihood that a mortgage defaults if originated by that firm. The panel also includes firm controls and the two independent variables of interest: our vertical integration measure and various measures of corporate governance. Our choice to construct a firm-year panel for analysis, rather than using individual loans as the unit of analysis, is based on two related considerations. First, because our independent variables, governance and vertical integration, are firm-level constructs, a loan-level analysis would overstate the number of independent observations. Second, because of differences in firm portfolio size, the loan-level data would overweight large lenders.

Data and sample selection

The data are constructed from several primary sources. The mortgage data come from merging county public records with a national mortgage servicer database through the cooperation of CoreLogic, our data provider. The securitization data were obtained from Thomson SDC. Our governance measures were obtained from SEC 13-F filings, RiskMetrics, and ExecuComp. These main data sources were supplemented with firm data from Compustat. Firm age, merger and survival data (as of the end of 2010) were hand-collected from Capital IQ and other public sources. Macroeconomic data came from Freddie Mac, U.S. Census Bureau and the Bureau of Labor Statistics.

The sample was constructed as follows. Since a comprehensive national dataset was unrealistic to analyze,² we limited the data requested from CoreLogic to the full set of county records between 2000 and 2007 for the top 100 zip codes as ranked by new home construction. This approach provides a geographic sample with a home price index and mortgage default rate nearly identical to national prices and rates, while providing enough records and variation to estimate default likelihood. We then restricted the sample to 105,780 “Alt-A” mortgages to correspond to prior research. This sample excludes subprime and so-called “conforming” mortgages that qualify to be sold to government agencies and, therefore, are underwritten with less discretion by lenders.³ Aggregating to the firm-year level yields a panel of 203 firm-year observations, including 53 firms that both issued sufficient loans to calculate default likelihood and that have governance quality data available. We discuss considerations about sample size and coverage in Appendix B.

Lending quality, vertical integration, and governance

Appendix C describes the detailed methods for calculating *default likelihood*. We calculate this measure by extracting the firm fixed effect from a mortgage-level model of the probability of loan default, conditional on mortgage attributes, macroeconomics factors, and year fixed effects and firm fixed effects (see Appendix B for this model). This approach has been used in strategic management research to estimate emissions testing fraud based on suspiciously high pass rates (Pierce and Snyder, 2008; Bennett *et al.*, 2013) as well as in the health operations literature to measure risk-adjusted hospital or physician performance (Huckman and Pisano, 2006).

We measure *vertical integration* as the log of the total yearly mortgage securitizations issued by the parent firm. Details on how this measure was constructed are in Appendix B. In the robustness section, we discuss three alternative measures that are not based on absolute securitization levels.

² Also, the need to link multiple public records to account for downstream sales and refinancings and multiple liens on a single property made a nationwide random sampling approach infeasible.

³ This sampling decision was made so that our results could be compared to prior research; however, our results are robust to the inclusion of all mortgages in our sample, subprime, Alt-A and conforming.

Our primary *governance* measure is the G-index from Gompers, Ishii and Metrick (2003), a raw count of the standard 24 provisions in corporate charters and bylaws as well as state law that limit shareholder rights, as reported by the Investor Responsibility Research Center (IRRC). The 24 provisions represent five broad categories thought to increase the discretionary power of top managers. *Delay*, for example, represents provisions for impeding hostile takeovers, which provide outside pressure on management to improve shareholder value. *Voting* represents rules designed to protect executives and the board from removal or shareholder override. *Protection* includes provisions that financially protect or compensate executives and directors following termination. These categories can restrict both shareholder voting power (such as limitations to charter and bylaw amendments) and takeover likelihood (such as implementation of staggered boards, golden parachutes and poison pills)— which serve as important checks on top management agency problems (e.g., Shleifer and Vishny, 1997).

Gompers, Ishii and Metrick (2003) use a raw count of all 24 provisions to construct the G-index (or equivalently, the GIM-index). In firms with high G values, dubbed “Dictatorships,” managers operate with considerable discretion without board monitoring or power to punish manager actions. On the other end of the spectrum, in firms with low G values, so-called “Democracies,” managers are subjected to a system of checks and balances enforced by shareholders. The G-index is increasingly used in the strategy literature to measure corporate governance (Zhou, 2011; Kaul, 2012; Feldman and Montgomery, 2015) because it broadly represents a summary measure of aggregate managerial power.

As with Gompers, Ishii and Metrick (2003), we are agnostic about whether restrictions on shareholder voting or hostile takeovers—or which specific provisions—have the strongest influence on top managers’ power and ultimately on the actions of individual loan officers and underwriters. Instead, we rely on the insights from Cremers and Nair (2005) and Bebchuck, Cohen and Ferrell

(2009), each of which provides evidence that both types of restrictions are related to greater manager power and worse firm performance.

In our case, even provisions that may seem distant from the daily actions of loan personnel—such as staggered boards or poison pills—can influence these employees by shielding executives from external discipline and allowing them to direct employees to take destructive actions.

For example, in the case of WaMu, there were numerous warning signs prior to 2008 that the company had inadequate control systems: a fraud investigation in 2005 found close to 40-80% fraudulent loans in some WaMu branches, and a loan insurer in 2006 and 2007 refused to insure WaMu's loans and gave WaMu an "unacceptable" rating, information available to the board. WaMu's regulator pointed out in 2007 that the bank had gone through nine compliance officers in seven years and suggested that "The Board of Directors should commission an evaluation of why smart, successful, effective managers can't succeed in this position...(HINT: It has to do with top management not buying into the importance of compliance and turf warfare and Kerry [Killinger] not liking bad news."⁴ Despite these warning signs, top managers never expressed any concern about losing their jobs or losing control of the firm to hostile owners. More generally, as long as provisions provide credible security against actions by either current or potential activist owners, top executives can resist external pressures to reform, which can in turn influence employees throughout the organization, including loan personnel.

We use the G-index as our main governance measure. However, to capture the provisions that most credibly protect management, we also repeat our baseline tests using the two subsets of the G-index. Cremers and Nair (2005) construct an index (the Anti-Takeover Index, or ATI) from four provisions that capture the degree to which firms are insulated from the threat of hostile takeovers: staggered boards, poison pills, and restrictions on shareholder votes to call special meetings or act

⁴ Levin, Pg 88.

without written consent. Bebchuk, Cohen, and Ferrell (2009) construct the Entrenchment Index (EI) from the six IRRC measures most strongly opposed by institutional investors: staggered boards, poison pills, golden parachutes, limits to bylaw amendments and supermajority requirements for mergers and charter amendments. Both of these additional indices are constructed to capture the most important subsets of provisions that shield managers from external reform and both studies find that a mixture of vulnerability to hostile takeovers and monitoring by current shareholders is related to superior firm performance. One of the implications of these studies is that, if managers feel accountable to the external market, they will implement more effective strategies. For all three indices, a higher score indicates worse governance.

Main specification

Our panel specification is a regression with default likelihood as the dependent variable and governance, vertical integration and their interaction as the independent variables of interest:

$$Default\ Likelihood_{it} = \beta_0 + \beta_1 LogMBS_{it} + \beta_2 G_{it} + \beta_3 (G_{it} * LogMBS_{it}) + X'_{it} \delta + \epsilon_{it} \quad (1)$$

Where *Default likelihood* is the firm-level default likelihood (represented as δ in equation 1 above) for firm i in year t . *LogMBS*, the measure of vertical integration, is the log of residential mortgage-backed securities issued by the firm during year t . G is the G-index measure (“G”), where a higher value indicates worse governance quality. X is a vector of firm-level controls, including both standard financial information from Compustat and several hand-constructed firm attributes such as the firm age and the degree of geographic diversification of the mortgages issued in our database by the firm. See Table 1 for a list of these controls.

Descriptive statistics

Table 1 contains descriptive statistics of the data. Approximately 33% of the firm-year observations are firms that issued MBS during that year, with average principal of \$18,893 million. Statistics for the mortgages used to construct our dependent variable can be found in Appendix A1.

<<< INSERT TABLE 1 HERE >>>

Appendix Table A2 shows the variable correlations. $\text{Log}(MBS)$ is negatively correlated to *Default likelihood*, supporting the prior result that “skin in the game” does matter, although the magnitude is small. The three indices (G, ATI and EI) for weak governance are all positively correlated with default likelihood and negatively correlated to whether the firm still existed in 2010.

Empirical Analysis

Sample validation

We first show in Table 2 that our new data sample produces similar results to Demiroglu and James (2012) using their models. To do so, we reproduce their logistic regression model where the unit of analysis is the individual mortgage and the dependent variable is an indicator of mortgage default. Similarly, we initially restrict our sample to mortgages originated between 2006 and 2007 and use a similar set of control variables that include borrower risk measures (FICO (credit) score, loan-to-value ratio), mortgage characteristics (indicators for floating interest rate, low- or no-documentation, negative amortization and prepayment penalty provisions), and local home price decline.

Column 1 of Table 2 presents the replication results using the DJ time period and control variables. Following their approach, we cluster our errors at the MSA (metropolitan area) level. The coefficient on vertical integration is qualitatively similar to their estimate, with a negative and statistically significant relationship between vertical integration and default likelihood.

<<< INSERT TABLE 2 HERE >>>

Columns 2 through 6 reproduce and then extend this analysis at the panel level, with firm-level default likelihood replacing loan default as the dependent variable. For our dependent variable in Columns 2 through 4, we use a default likelihood calculated in a first stage that includes only the control variables used in DJ. As with Column 1, Column 2 restricts the panel to 2006 - 2007, and we find a negative (albeit insignificant) coefficient. Column 3 expands the panel to include 2000 - 2007

and the coefficient is now negative and significant, corresponding to the results in DJ. Column 4 replaces robust standard errors with more conservative block bootstrapping at the lender level, which treats the error terms within lender as correlated.⁵ The results remain significant. These models provide confidence that our panel yields substantively similar results to those used by DJ.

Columns 5 and 6 replace the dependent variable with one calculated using additional mortgage control variables described in Table 2 and Table A1. Our additional controls are strong default predictors commonly used to assess mortgage risk by both mortgage underwriters and mortgage-backed securities buyers; however, they are typically only available in proprietary and anonymized form. The negative results remain in column 5. However, column 6 adds the firm level controls and the coefficient becomes insignificant.

Three conclusions are apparent from this initial analysis. First, we are able to successfully replicate the results in prior studies. Second, the difference between Columns 1 through 5 and Column 6 indicates that vertical integration may have led firms, on average, to target safer populations, but not necessarily to engage in more diligent underwriting practices. Lastly, this analysis underscores the importance of controlling for firm factors in the analysis: With the full set of controls, the negative relationship significantly attenuates.

Governance, vertical integration, and loan quality

We next examine how governance alters the relationship between vertical integration and loan quality. We begin by dividing all banks at the median G value as “High G” or “Low G” and plotting the relationship between vertical integration and default likelihood in Figure 1a. Figure 1b repeats the plot, replacing the scatter plot with linear fits of both High G and Low G firms. Two patterns are clear from these plots. First, High G firms appear to have higher aggregate default likelihood than Low G firms. Second, the relationship between vertical integration and default likelihood appears to

⁵ Throughout the analysis, we block bootstrap our standard errors (by lender) with 800 repetitions.

be fundamentally different for High G and Low G firms, as is evident from the different slopes in Figure 1b. This second result is preliminary evidence of the main findings of the paper.

Figure 2 provides a related visual depiction of our analysis, showing kernel densities of default likelihood for four subsamples defined by above- and below-median vertical integration and G value. Although the figure shows few differences between non-integrated firms, it shows substantial differences in integrated firms. Low G (well-governed) integrated firms have substantially lower default likelihood than their High G counterparts. Figures 1 and 2 together suggest that governance plays a major role in defining the relationship between vertical integration and default likelihood.

<<< INSERT FIGURES 1 AND 2 HERE >>>

Table 3 provides multivariate results.⁶ Column 1 is the baseline regression, containing the full set of first stage controls to calculate default likelihood. Column 2 further adds the firm-level control variables detailed in Table 1. In both models, vertical integration continues to have a negative relationship with risk, but only for well-governed firms with low G scores. The $G\ Index * \text{Log}(MBS)$ interaction is positive and significant. Based on the estimates in Column 2, for the best-governed firms in our sample (G value of 5), the relationship between vertical integration and default likelihood is a strongly negative -0.1113. For these firms, a one standard deviation increase in vertical integration leads to a 0.4 standard deviation decrease in default likelihood. For the worst governed firms (G value of 15), the relationship becomes a *positive* 0.0897, with a one standard deviation increase in vertical integration associated with a 0.5 standard deviation increase in default likelihood. The relationship crosses 0 at a G value between 10 and 11 (see Figure 3).

<<< INSERT FIGURE 3 AND TABLE 3 HERE >>>

In columns 3 through 6, we repeat our analysis using the Entrenchment Index and Anti-takeover Index and finds nearly identical results, with the relationship between integration and default

⁶ For space purposes and readability, we display only the coefficient estimates for the main independent variables of interest, and suppress the estimates for the control variables. The appendix tables reproduce the main body tables with the controls displayed.

likelihood -0.0715 and -0.0982 for the best firms and 0.1200 and 0.0268 for the worst firms, respectively. The values for the Entrenchment Index and Antitakeover Index are coarser than the G index, which explains the differences in the best and worst estimates. Collectively, these models show our results to be robust to different measures of overall firm governance.⁷

Robustness

Although our core models provide strong evidence that governance moderates the vertical integration-performance link, several concerns may arise about how to interpret this result. One concern is that well-governed and poorly-governed integrated firms differ along other dimensions that could drive our results. Well-governed integrated firms are indeed larger, issue more loans, and are more likely to be depository banks than poorly-governed integrated firms. We therefore replicate the analysis of Table 3 on a matched sample of firms and report results in Table A6. We perform a stringent match, dropping 28% of observations of integrated firms in order to select a subsample in which High G and Low G firms matched on observables (see Table A5). Table A6 shows that the matched sample produces similar results to our main analysis.

A second concern is that our results might depend on our specific measure of vertical integration (the log of issued mortgage-backed securities), which may only be an imperfect measure of vertical integration. The ideal measure would be an average of upstream-to-downstream integration (the percentage of all firm-originated loans that the firm securitizes) and downstream-to-upstream integration (the percentage of all firm-securitized loans originated by the firm). Since the data required for those measures are not available, we instead use the (logged) dollar amount of MBS issued by that firm in a given year, controlling for firm size, as our basic measure (see Appendix B for more

⁷ One observation from our regressions is that the coefficients on our governance indices in all six models are negative. This negative sign should be interpreted as the effect of weak governance on the default hazard of non-integrated firms. This result is consistent with data in Figures 1a and 2 showing slightly lower average hazard for firms with high G-values. Although this seems inconsistent with theory on the role of governance in determining risk, we note that the parameter is only significant at the five percent level in one of the six models in Table 3 and insignificant in four. Although we can only speculate on this imprecise coefficient, one possibility is simply that, because non-integrated mortgage originators have no skin in the game (Demiroglu and James, 2012), there may have been perceived little financial cost to shareholders from excessive risk in their portfolios.

information about the securitization data). Our logic is that since this measure is effectively normalized by size, it should co-vary with the ideal firm vertical integration measure and is therefore a reasonable proxy. In other words, within the set of firms in our sample—all mortgage lenders—if the degree of MBS is high relative to firm size, it is reasonable to believe that most loans issued by that firm will be passed internally to the firm’s own securitization unit. We verified this logic in interviews with industry practitioners when setting up the research design.

While this assumption may be reasonable, we recognize that we cannot prove the accuracy of our proxy with data. Therefore, we also calculate three additional measures of vertical integration that do not rely on the absolute amount of MBS: i) a simple 0/1 dummy whether the firm issued any MBS that year; ii) the amount of MBS divided by the number of loans issued by the firm in the same year in our dataset; and iii) the amount of MBS divided by firm assets.⁸ Importantly, the correlations between these measures and our primary measure range from 0.18 to 0.49, thus indicating that these measures are not simple mechanical substitutes for each other. Appendix Tables A7 through A9 show that they produce nearly identical results.

Specific governance mechanisms

We next analyze the moderating roles of specific components of firm governance. Appendix Table A10 presents correlations between the governance variables used in this analysis. Consistent with the notion that governance components are co-determined, many are correlated, which suggests it is impossible to truly disentangle these factors, at least in our context.

External shareholder composition

In Table 4, we repeated our primary regression analysis from Table 3 to examine outside monitoring by institutional investors. We replaced our summary governance measures with three measures of institutional ownership. Columns 1 and 2 use institutional ownership ratio, calculated as ratio of

⁸ We use logs for the latter two measures in order to produce less skewed distributions.

shares outstanding held by institutional owners to total shares outstanding. Columns 3 and 4 use the number of unique institutional investors. Columns 5 and 6 use IO concentration, measured as the Herfindahl index of all institutional investors. For firms with high levels of institutional ownership, but low overall numbers and high concentration, vertical integration is associated with high default risk. Like the estimates in Table 3, the relationship between vertical integration and default likelihood crosses zero along the continuum of each of the governance measures, such that it is negative for firms with the best governance values and positive for firms with the worst values.

Table 5 presents analysis of two institution types: banks and insurance companies (columns 1 and 2) and investment companies (columns 3 and 4). Integrated firms with high bank and insurance ownership have lower default risk, while those with investment company ownership have higher default risk. These results are consistent with banks and insurance companies being more conservative and informed investors, particularly when investing in banks, while investment companies (e.g., hedge funds) tend to be more aggressive (Del Guercio, 1996; Falkenstein, 1996).

<<< INSERT TABLES 4 AND 5 HERE >>>

Our interpretation of these results is that external monitoring by institutional owners was effective in constraining excessive mortgage risk in vertically integrated banks, but that this efficacy demanded a sufficient number of institutional investors with industry knowledge and long-term perspectives. We cannot disentangle, however, whether these shareholders actually monitored lending behavior more diligently or if they instead better identified and invested in banks with stronger governance. Plausibly, both of these factors—treatment and selection—are present in this context.

Internal governance and incentives

In Appendix Tables A11-A12, we report tests of the moderating effects of CEO and CFO compensation. Altogether, we find some suggestive correlations but no consistent results. The increased default risk in vertically integrated firms with high CEO ownership corresponds to

Balachandran *et al.* (2010), but our more broadly mixed results mirror Fahlenbrach and Stulz's (2011) finding of no relationship between executive ownership or sensitivity to volatility and stock performance. We caution, however, that our null results cannot determine that these features played no role in mortgage lending quality, given the simultaneity of both internal and external governance elements. We can say, conservatively, that these attributes are not as consistently predictive as external shareholder composition. Appendix D contains a more detailed discussion of these results.

Our results on board composition (Appendix Table A13) suggest that vertically integrated firms with small and independent boards were most likely to suffer excess mortgage default. This is inconsistent with common arguments that larger and less independent boards typically have worse governance, but the independence result is consistent with prior work on the financial crisis by Erkens, *et al.* (2012). Although we can only speculate on these results, one possible explanation is that larger boards with more insiders were able to benefit from better expertise and knowledge about internal problems in firms (Feldman and Montgomery, 2015).

Governance, vertical integration, and firm failure

In our last analysis, we investigate the link between governance, vertical integration and firm failure. We interpret our results here cautiously since many factors contribute to the failure of these lenders during the study period. However, we include it as one piece of evidence that higher default likelihood was not a successful strategy, at least as measured by ex post firm survival.

To perform this analysis, we replace default likelihood as the dependent variable with a 0/1 indicator that the lender was still operating at the end of 2010—the case for 46% of the sample's firms—then collapse the observations into a cross-sectional dataset where we demean all control variables from 2003 onward. We do this latter step since the dependent variable varies at the firm and not at the firm-year level. The results are shown in Table 6. Columns 1 and 2 show the results of a logit specification that relates whether the firm was still in operation at the end of 2010 to the default

likelihood used as the dependent variable in earlier analyses. We include firms from our sample, regardless of whether they have G-values. We find a negative correlation between default likelihood and firm failure, providing evidence that firms that engaged in worse lending, as we measured it, were also significantly likelier to fail. Columns 3 through 4 perform the same analysis on the smaller sample of firm with G-values and shows similar results, although with less power. In Columns 5 through 6, we replace default likelihood with governance, vertical integration, and their interaction. As expected, we find negative interaction coefficients; that is, firm failure is predicted only by the combination of weaker governance and vertical integration, and not by either term alone. Given our small sample size, in Columns 7 through 8, we replace our measure of G with a dichotomous “High G” indicator and find that the interaction terms remains negative and consistently significant. There may be alternative explanations for this observed correlation, but it supports the notion that managers of weaker-governed firms used control over broader scope to engage in value-destructive behaviors.

<<< INSERT TABLE 6 HERE >>>

Empirical Challenges

Appendix E addresses five empirical challenges to our results: 1) whether we can interpret higher default likelihood as evidence of worse performance by firms or whether it reflects a differentiated (but optimal) strategy; 2) drawing causal inferences from our results; 3) distinguishing between the CEO rent-seeking behavior we propose in our theoretical framing from behavioral explanations such as hubris or simple myopia; 4) sample size considerations, given the limited number of firms in our panel with available governance data; and 5) alternative definitions of vertical integration. In sum, we do not believe that these challenges significantly alter the interpretation of our results.

Conclusion

This study shows that the relationship between integration and performance strongly depends on the quality of corporate governance. We find that the combination of integration and strong governance

is associated with better firm performance, as measured by mortgage default likelihood. Conversely, the combination of integration and weak governance is associated with worse performance.

These opposite effects reinforce the broad and substantial role of corporate governance in both firm strategy and performance (Finkelstein and Hambrick, 1988; Westphal and Fredrickson, 2001; Hoskisson *et al.*, 2002). They also reinforce recent arguments by strategy scholars that the incentive and coordination gains from vertical integration (or other modes of organizational cooperation) are not independent of other firm characteristics such as technology (Ahuja and Katila, 2001) or, more generally, resources or capabilities (Mayer and Argyres, 2004; Aggarwal and Hsu 2009; Argyres and Zenger, 2012; Argyres *et al.*, 2012; Jacobides and Winter, 2005; 2012).

Although we are wary of designating corporate governance as a capability, governance certainly represents a heterogeneous and persistent resource that affects firm performance. In that sense, our results support the importance of examining the intersection between multiple theoretical approaches—in this case agency theory, transaction cost economics, and knowledge-based and resource-based theories. Finally, this study underscores the importance of integrating otherwise independent research areas on various aspects of a firm’s strategy or structure on performance (in our case, firm boundaries and corporate governance).

Although disentangling specific governance components is difficult, our results suggest that external and internal monitoring are both critical for constraining managerial agency problems. Firms whose investors are conservative (e.g., other banks) have the lowest default risk. Although we cannot definitely explain why larger and less independent boards reduce risk and failure in vertically integrated firms, these results may reflect the importance of insider expertise (Feldman and Montgomery, 2015) in identifying loan origination problems. We note that our result on bank and insurance institutional investors is also consistent with the importance of industry-specific expertise as well as conservative ownership. Finally, while our executive compensation measures do not provide

consistent results, we note that behavioral explanations such as hubris/overconfidence (Hayward and Hambrick, 1997; Galasso and Simcoe, 2011) and other biases (Powell, Lovallo, and Fox, 2011) are widely acknowledged to have played significant roles in the crisis (Shiller, 2008; Kindleberger and Aliber, 2011). Such biases can render standard incentive-based predictions moot.

Vertical integration influences performance through a multitude of mechanisms, many of which interact with other organizational design elements such as incentives, hierarchy, competition, and regulation. Our study can only provide descriptive evidence on how one such element, corporate governance, changes the integration-performance relationship, and thereby illustrates oversights by prior literature. We cannot, however, answer questions of causality nor isolate internal organizational mechanisms. We believe that the gross economic importance of our setting elevates the relevance of our correlational evidence, but we encourage scholars with settings with better internal organizational data or exogenous shocks to governance (e.g., Kogut, Colomer, and Belinsky, 2014) or vertical integration (e.g., Natividad and Rawley, 2015) to further explore these issues.

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Figure 1: Corporate Governance and the Relationship Between Vertical Integration and Default Likelihood

Figure 1A

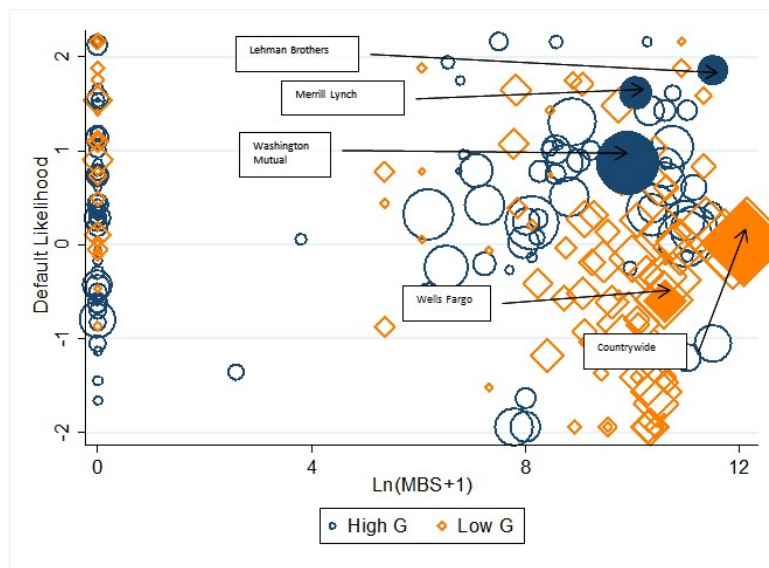
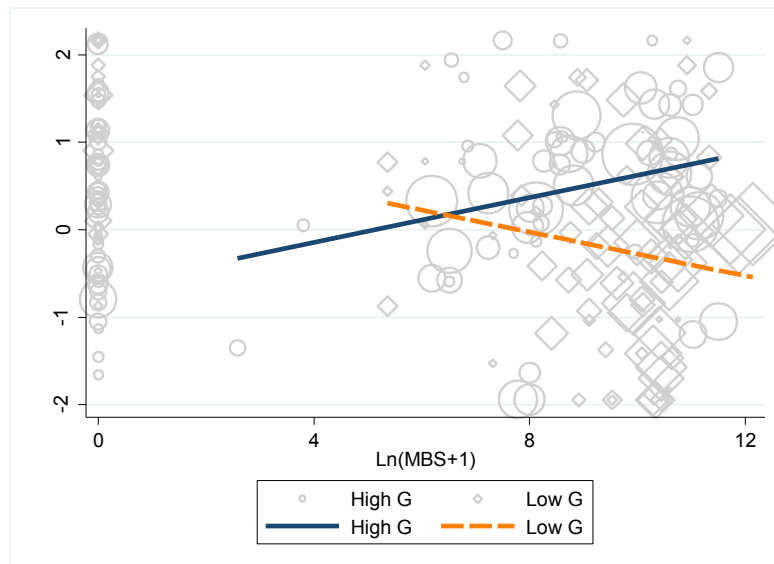
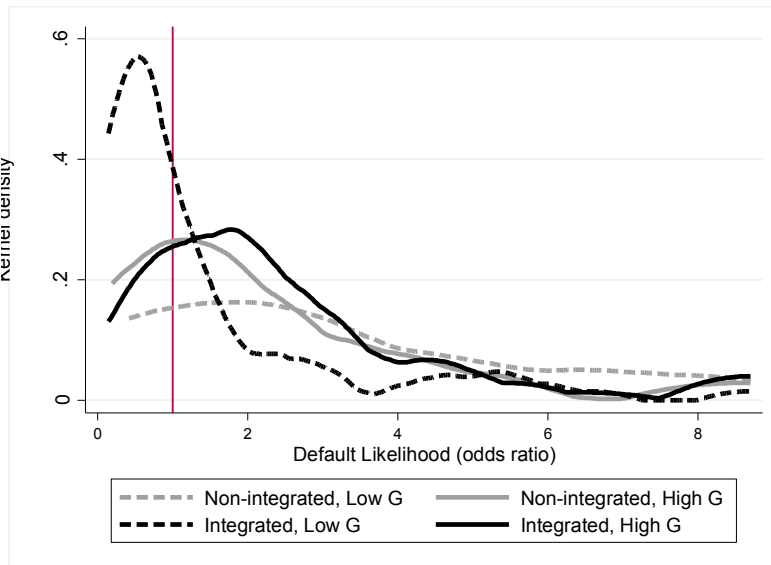


Figure 1B



Each point represents one firm-year observation. The horizontal axis measures the log of mortgages issued by the firm in a given year. The vertical axis represents default likelihood, the likelihood that a mortgage will default conditional on the observable mortgage characteristics. 0 represents the market average, while observations below 0 represent higher loan quality (lower default likelihood), and above 1 is lower loan quality (higher default likelihood). The diamond markers refer to firms with strong governance (G values below median), while the circle markers refer to firms with weak governance (G values at or above median). Each marker is weighted by the number of mortgages. Clustered on the left axis are non-integrated firms (that did not issue MBS), while the remainder of the plot includes the integrated firms that issued MBS.

Figure 2: Corporate Governance and the Relationship Between Vertical Integration and Default Likelihood



Density distribution of default likelihood by governance and integration. “Low G” includes the firms with governance index at or below the median level, where higher values represent worse governance. “High G” firms include firms that are above the median level.

Figure 3: Relationship between Vertical Integration and Default Likelihood by Governance Quality

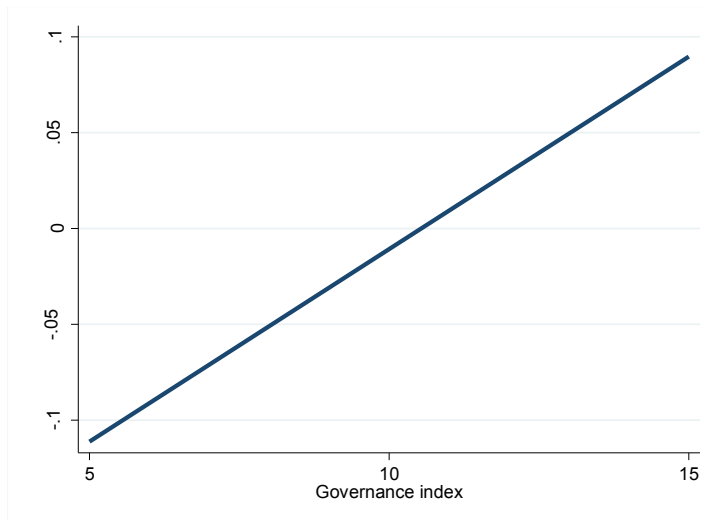


Table 1: Descriptive statistics

	Firm-year obs	Mean	Standard deviation	Source
Default likelihood	203	0.2088	1.0712	First stage estimate
% firm-yr obs issuing MBS	203	0.6798		Thomson SDC
Amount MBS issued	138	25,708	30,709	Thomson SDC
G index	203	9.1626	2.5867	IRCC via Andrew Metrick
Anti-takeover index (ATI)	203	2.2463	0.7502	Cremers and Nair (2005) Bebchuk, Cohen and Ferrell (2009)
Entrenchment Index (EI)	203	2.2266	1.4065	Capital IQ and public sources
Age of firm (years)	203	98	58	
Number annual loans in mortgage db	203	1128	1842	County deeds
Diversification index	203	0.3433	0.2336	County deeds
Total assets (public firms only) (\$000)	203	333,600	428,899	Compustat
% Commercial bank	203	66.50		Compustat and Capital IQ
% Mortgage lenders	203	10.84		Compustat and Capital IQ
Large financial institutions	203	22.66		Compustat and Capital IQ
% Operating in 2010 (firm-level obs)	42	45.24		Public sources

Table 2: Average Relationship Between Vertical Integration and Firm-Level Underwriting Risk

	(1)	(2)	(3)	(4)	(5)	(6)
Time Range	2006-2007	2006-2007	2000-2007	2000-2007	2000-2007	2000-2007
Dependent Variable:	Loan Default	Default Likelihood	Default Likelihood	Default Likelihood	Default Likelihood	Default Likelihood
<i>Log(MBS Total)</i>	-0.0123***	-0.0105	-0.0308**	-0.0308**	-0.0378**	-0.0243
	-0.0039	(0.0235)	(0.0131)	(0.0132)	(0.0160)	(0.0201)
First stage controls	DJ	DJ	DJ	DJ	Full	Full
Second stage controls	--	--	--	--	--	Included
Year FE	Included	Included	Included	Included	Included	Included
Adjusted R-squared	0.229	-0.003	0.134	0.134	0.107	0.268
Error clusters:	MSA	--	--	Lender	Lender	Lender
Observations	41932	67	203	203	203	203

Note: Column (1) analyzes loan default at the loan level, while Columns (2) through (6) analyze default likelihood at the firm-year level. Columns (1) and (2) use a similar time frame to Demiroglu and James (2012), while the other columns use our longer period. Column (1) clusters standard errors at the county (FIPS) level, which parallels the Demiroglu and James MSA approach. Columns (4) through (6) cluster at the lender level, which generally increases standard error size. Controls in (5) and (6) include additional borrower risk measures (loan interest rate, debt-to-income ratio), mortgage characteristics (indicators for floating, hybrid and balloon provisions, interest-only pricing, multiple payment options, new construction) and more detailed geographic and macroeconomic controls (census tract median income, state indicators, Freddie rates and Federal Reserve funds rate). For a list and significance of the DJ and full controls use in the first stage to calculate *Default Likelihood*, refer to Appendix Table A2. Standard errors in parentheses, calculated by block-bootstrapping by lender. *significant at the 10% confidence level, **significant at the 5% confidence level, ***significant at the 1% confidence level.

Table 3: How Governance Influences the Vertical Integration and Underwriting Risk Relationship

Index:	(1)	(2)	(3)	(4)	(5)	(6)
Dependent variable:	G	G	EI	EI	ATI	ATI
	Default likelihood					
<i>Log(MBS)</i>	-0.1874*** (0.0464)	-0.2118*** (0.0693)	-0.1246*** (0.0293)	-0.1098*** (0.0332)	-0.2129*** (0.0467)	-0.1607*** (0.0548)
<i>G Index</i>	-0.0061 (0.0374)	-0.0816 (0.0554)				
<i>G Index X Log(MBS)</i>	0.0168*** (0.0044)	0.0201*** (0.0071)				
<i>E Index</i>			-0.0604 (0.0677)	-0.1559* (0.0877)		
<i>E Index X Log(MBS)</i>			0.0412*** (0.0091)	0.0383*** (0.0121)		
<i>Antitakeover Index</i>					-0.1418 (0.1321)	-0.3134** (0.1573)
<i>Antitakeover Index X Log(MBS)</i>					0.0755*** (0.0201)	0.0625*** (0.0240)
First stage controls	Full	Full	Full	Full	Full	Full
Second stage controls	--		--	Included	--	Included
Year FE	Included	Included	Included	Included	Included	Included
Adjusted R-squared	0.202	0.309	0.217	0.312	0.186	0.290
Error Clusters	Lenders	Lenders	Lenders	Lenders	Lenders	Lenders
Observations	203	203	203	203	203	203

Note: *High GI*, *High EI*, and *High ATI* defined as 0/1 indicators equal to 1 if the underlying governance index (G, Entrenchment and Anti-Takeover Index, respectively) is greater than the mean value in the dataset. Standard errors in parentheses, calculated by block-bootstrapping by lender. *significant at the 10% confidence level, **significant at the 5% confidence level, ***significant at the 1% confidence level

Table 4: Institutional Ownership Models

	(1)	(2)	(3)	(4)	(5)	(6)
Dependent variable:	IO Ratio		IO Number		IO HHI	
Default likelihood	IO Ratio		IO Number		IO HHI	
<i>Log(MBS)</i>	-0.1652*** (0.0593)	-0.1634** (0.0709)	0.0896*** (0.0261)	0.0456 (0.0386)	-0.1715*** (0.0804)	-0.1006** (0.2571)
<i>IO Ratio</i>	-0.1852 (0.6652)	-1.9335** (0.9108)				
<i>IO Ratio X Log(MBS)</i>	0.1906** (0.0882)	0.2450** (0.1119)				
<i>IO Number</i>			0.0004 (0.0004)	0.0001 (0.0006)		
<i>IO Number X Log(MBS)</i>			-0.0002*** (0.0000)	-0.0001** (0.0001)		
<i>IO HHI</i>					-2.9600 (2.9368)	-1.1477 (3.4927)
<i>IO HHI X Log(MBS)</i>					4.0698*** (0.9306)	2.0334* (1.0940)
First stage controls	Full	Full	Full	Full	Full	Full
Second stage controls	--	Included	--	Included	--	Included
Year FE	Included	Included	Included	Included	Included	Included
Adjusted R-squared	0.131	0.291	0.273	0.321	0.181	0.285
Error clusters	Lender	Lender	Lender	Lender	Lender	Lender
Observations	203	203	203	203	203	203

Note: *IO Ratio* refers to the ratio of shares owned by institutional owners to total shares. *IO Number* is the number of institutional owners. And *IO HHI* measures the concentration of institutional ownership (as a Herfindahl measure). *High IO Ratio*, *High Number*, and *High HHI* defined as 0/1 indicators equal to 1 if the underlying institutional ownership measure is greater than the mean value in the dataset. Standard errors in parentheses, calculated by block-bootstrapping by lender. *significant at the 10% confidence level, **significant at the 5% confidence level, ***significant at the 1% confidence level.

Table 5: Institutional Composition

	(1)	(2)	(3)	(4)
Dependent variable:				
Default likelihood		Bank and Insurance	Investment Companies	
<i>Log(MBS)</i>	0.0666 (0.0494)	0.0719 (0.0567)	-0.2183*** (0.0684)	-0.1626** (0.0751)
<i>Bank-Ins Ratio</i>	0.2654 (0.9196)	1.9616* (1.0176)		
<i>Bank-Ins Ratio X Log(MBS)</i>	-0.2965** (0.1308)	-0.2454* (0.1378)		
<i>Invest Co</i>			-0.2037 (0.8737)	-1.4767 (1.0684)
<i>Invest Co X Log(MBS)</i>			0.3297*** (0.1219)	0.2673* (0.1468)
First stage controls	Full	Full	Full	Full
Second stage controls	--	Included	--	Included
Year FE	Included	Included	Included	Included
Adjusted R-squared	0.140	0.288	0.151	0.288
Error clusters	Lenders	Lenders	Lenders	Lenders
Observations	203	203	203	203

Note: *Bank and Insurance* refers to the percent of institutional owners that are depository banks or insurance companies, traditionally conservative, regulated owners. *Investment Companies* refers to the percent of institutional owners that are hedge funds, family offices, or other investment vehicles that are traditionally more aggressive owners. *High Bank-Ins Ratio* and *High Invest Co* are defined as 0/1 indicators equal to 1 if the underlying institutional composition measure is greater than the mean value in the dataset. Standard errors in parentheses, calculated by block-bootstrapping by lender. *significant at the 10% confidence level, **significant at the 5% confidence level, ***significant at the 1% confidence level

Table 6: Firm Failure, Governance, and Vertical Integration

Dependent variable: Firm in operation by end of 2010	(1)	(2)	(3)	(4)	(5)	(6)	(7)	(8)
<i>Default Likelihood</i>	-0.8609*** (0.2248)	-0.8534*** (0.2266)	-0.4304 (0.3758)	-1.4603** (0.7448)				
<i>Log(MBS Total)</i>					0.8720* (0.4629)	0.8673 (1.5050)	0.0923 (0.0928)	0.2439 (0.1833)
<i>G Index</i>					0.0280 (0.3404)	-1.2492 (0.8055)		
<i>G Index X Log(MBS)</i>					-0.1257** (0.0568)	-0.1430 (0.1736)		
<i>High G Index</i>							2.0352 (1.5281)	1.0900 (1.4954)
<i>High G Index X Log(MBS)</i>							-0.6325** (0.2926)	-0.6257** (0.2616)
Received TARP funds	1.1021** (0.5021)	1.7631** (0.7159)	2.4609*** (0.7781)	4.1842* (2.1517)	2.6177** (1.0497)	7.0481*** (2.7109)	2.9684** (1.3317)	3.3038* (1.8220)
Second Stage Controls	--	Included	--	Included	--	Included	--	Included
Pseudo R-squared	0.124	0.236	0.407	0.504	0.406	0.581	0.407	0.504
Observations	154	154	42	42	42	42	42	42

Note: This analysis in this table uses a firm-level cross-sectional dataset constructed from the firm-year panel. The variables in this cross-sectional data were calculated as the averages across the 2003 to 2007 years of the panel. Each model is a logit specification with the dependent variable *Firm in Operation By End of 2010*. Included is a control as an indicator of whether the firm received government support through the emergency TARP funding plan, which significantly improved firms' likelihood to survive. Robust standard errors in parentheses. *significant at the 10% confidence level, **significant at the 5% confidence level, ***significant at the 1% confidence level