

The Transformation of Mortgage Finance and the Industrial Roots of the Mortgage Meltdown\*

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## Abstract

The 2007-2009 financial crisis was centered on the mortgage industry. This paper develops a distinctly sociological explanation of that crisis based on Fligstein's (1996) markets as politics approach and the sociology of finance. We use archival and secondary sources to show that the industry became dominated by an "industrial" conception of control whereby financial firms vertically integrated in order to capture profits in all phases of the mortgage industry including the production of financial products. The results of multivariate regression analyses show that the "industrial" model drove the deterioration in the quality of securities that firms issued and significantly contributed to the eventual failure of the firms that pursued the strategy. We show that large global banks which were more involved in the industrial production of U.S. mortgage securities also experienced greater investment losses. The findings challenge existing conventional accounts of the crisis and provide important theoretical linkages to the sociology of finance.

## Introduction

It is generally agreed that the cause of the financial crisis in mid 2007 that produced a worldwide recession was the sudden downturn in the nonconventional (which includes subprime, Alt-A, and Home Equity Loans) mortgage backed securities market in the U.S. (Aalbers, 2008; 2009; Ashcroft and Schuermann 2008; Arestis and Karakitsos, 2009; Demyanyk and van Hemert, 2008; Sanders, 2008; Lo, 2012). This downturn was caused by a fall in housing prices and a rise in foreclosures. This put pressure on the mortgage-backed security bond market where massive numbers of bonds based on nonconventional mortgages were suddenly vulnerable to default (MacKenzie, 2011). Holders of those bonds had to raise large amounts of money to cover the loans they had taken to buy the bonds, thereby creating a liquidity crisis that reverberated globally (Brunnermier, 2009; Gorton, 2010; Gorton and Metrick, 2010). Starting with the collapse of Lehman Brothers, the entire financial sector rapidly destabilized (Swedberg, 2010).

There is less agreement and less clarity about exactly how this market developed to produce the crisis. Andrew Lo, a financial economist, concludes in a recent review of 21 academic and journalistic accounts of the crisis that “No single narrative emerges from this broad and often contradictory collection of interpretations, but the sheer variety of conclusions is informative, and underscores the desperate need for the economics profession to establish a single set of facts from which more accurate inferences and narratives can be constructed (2012, p. 1).” For their part, economic sociologists have provided analyses that have focused on the structural and institutional conditions for the meltdown, such as banking deregulation (Campbell, 2010), the structure of confidence in the financial markets (Carruthers, 2010) and the broader financialization of the economy (Krippner, 2010). Others have considered the role of

financial instruments (MacKenzie, 2011), credit rating agencies (Rona-Tas and Hiss 2010), or provided useful descriptive accounts of some of the key events (Swedberg, 2010).

This paper works to produce a meso-level sociological account of what happened by establishing a set of key facts about what the banks were doing, why they came to be doing this, and how their tactics locked them into a literal death spiral once the housing price bubble began to break. These “facts” require using sociological theories about market formation as well as insights from the sociology of finance. We do not claim to produce a definitive account of all facets of the crisis, but we do claim to answer one of the most critical questions: why did the banks take on so much risk in the form of mortgage backed securities and why were they so slow to escape those risks once it became clear that the mortgages underlying the bonds were so vulnerable?

The main explanation for what happened in the economics literature is a story of market failure. As securitization vertically disintegrated the mortgage finance business (Jacobides 2005), actors in all parts of the mortgage industry had perverse incentives to take on riskier mortgages because they could pass the risk off to another party. Mortgage originators passed bad loans to mortgage security issuers who packaged them into risky securities and promptly sold them off to unsuspecting investors. Because they did not intend to hold onto the mortgages or the financial products produced from those mortgages, they did not care if the borrowers were likely to default (Ashcroft and Schuermann 2008; Purnanandam, 2011; Immergluck 2009; see Mayer et. al. (2009) for a literature review). Economic sociologists have also developed a closely parallel variant of this argument in which they locate the sources of the crisis in the marketization of a financial system previously governed through large, integrated organizations (Jacobides 2005; Davis 2009; Mizruchi 2010). Though couched in different theoretical terms, this approach is

empirically convergent with the perverse incentives argument as it highlights how market fragmentation promoted opportunistic behavior.

A growing body of empirical data cast doubt on the utility of the disintegration/perverse incentives approach. First, the idea that the crisis occurred because perverse incentives prompted mortgage backed securities producers to sell off all the risk to unwitting investors is undercut by the fact that most of the producers of mortgage backed securities also ended up holding large investments in these bonds (Acharya and Richardson 2009; Diamond and Rajan 2009; Acharya, Schnabl, and Suarez forthcoming; Gorton, 2010). Most of the largest financial firms who originated and securitized mortgages ended up in bankruptcy, merger, or being bailed out (Fligstein and Goldstein, 2010).

Second, the premises of the perverse incentives account do not square with the evolving structure of MBS production markets as the bubble grew during the 2000s. Fligstein and Goldstein (2010) show that by 2007, there were a small number of large financial firms mass-producing mortgage backed securities products in vertically-integrated pipelines whereby firms originated mortgages, securitized them, sold them off to investors, and were investors themselves in these products. These findings raise the key empirical puzzle for our paper: If the structure of the MBS production market was becoming more integrated rather than fragmented, and if the same firms that were producing the risky mortgage backed securities were also holding it as investments, how do we understand the relationship between the organization of the market and the destabilizing forces which ultimately undid it? What caused the race to the bottom?<sup>1</sup>

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<sup>1</sup> Even as the industry was becoming more integrated, we do not mean to suggest that perverse transactional incentives were entirely absent from the structure of the markets. Rather, to the extent that they existed, they do not explain what happened.

The answer to this question lies in understanding the logic of the vertically integrated structure which banks came to embrace for making money at all phases of the mortgage securitization process. Using the “markets as politics” approach, we locate the development of mortgage securitization markets within the context of what can be called an industrial conception of control. Conceptions of control refer to overarching dominant logics of organization and behavior, which shape the tactics firms use to make money (Fligstein 1996; 2001). In this case, financial firms came to understand that they could make money off of all parts of the securitization process. We call this an industrial conception of control because it is predicated on securing a supply of raw mortgages in order to fill the firm’s vertically-integrated pipeline and thereby guarantee itself fees at all parts of the process. Internalization of this whole value chain within large firms, and resulting high-throughput scale economies, represented a kind of industrialization where the goal was to mass produce financial instruments.<sup>2</sup>

Using both secondary and archival sources, we document the growth of this cultural conception in mortgage finance. Countrywide Financial pioneered this model in the 1990s and they did so spectacularly well that most of the largest investment banks, commercial banks, and mortgage lenders aggressively followed suit. We show how the largest financial firms vertically integrated both forwards and backwards in accordance with this model. We also show how the industrial conception shaped the reorientation of the industry toward nonconventional, “subprime” mortgage securitization in response to a supply shock in the prime market in 2004.

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<sup>2</sup> While the idea of an industrial model and vertical integration may strike some readers as odd for financial products, we think that what happened quite closely parallels the way that vertical integration worked in some industries historically. For example, vertically integration in the oil industry began mainly as an effort to control the supply of oil. But by the mid-20<sup>th</sup> century, oil companies were using oil as feed for many kinds of products, some where they would sell petrochemicals to others as well as use them for their own downstream industries (Williamson, 1983).

Finally, we show how this reorientation in turn solidified the industrial model and propelled further vertical integration into more exotic financial products.

The problem that ultimately undid this system was that the industrial model required the input of more and more risky mortgages in order to reap the maximum profit along the entire chain of production. This strategy promoted high throughput over careful scrutiny, thereby prompting banks to securitize any mortgages they could acquire and issue ever-riskier mortgage backed securities. Firms' forward integration into underwriting the highly engineered second-order collateralized debt obligations (which were resecuritizations of existing subprime mortgage backed securities) accelerated this process by creating demand for more of the highest-risk, high-interest raw mortgages to use as inputs. In direct contrast to the perverse incentives account, this view suggests that the disconnection between lending and diligence was driven not by the incentive to pass the risk on to someone else, but instead by the logic of vertical integration. Without mortgages, banks could not feed their pipelines, create financial products, sell them, or leverage and hold them as investments.

The results of multivariate regression analyses provide support for this view. First, we find that vertically integrated banks issued subprime mortgage backed securities (hereafter MBS) that perform significantly worse on average than those issued by non-integrated firms, as our approach suggests. Second, we show how the vertically integrated mass production model locked firms into the business even once it had become apparent to market participants that a crisis loomed in the first two quarters of 2007. Among firms that were major players in any aspect of subprime MBS production, those which were more vertically integrated across production segments were significantly more likely to fail in the wake of the meltdown. Third, we find that firms which adopted the industrial model fared worse as investors. Within a sample

of 163 large, publicly-traded global financial firms, *investment losses* on MBS and collateralized debt obligations (hereafter, CDO) assets in the aftermath of the crash were significantly greater for firms who were more integrated in the *production* of MBS assets than those who were less involved in the production-side of the market.

Donald MacKenzie (2011) has proposed that the financial crisis was caused at least in part by the particular technical assumptions embedded in evaluations of the complex products known as collateralized debt obligations of asset-backed securities (hereafter ABS-CDO). ABS-CDOs represent resecuritizations of existing asset-backed securities such as MBS tranches. Mackenzie argues that evaluations of the riskiness of these products became detached from their underlying financial assets (i.e. mortgages). He argues this was because ABS-CDOs emerged from a different community of financial engineers who were not versed in the housing, mortgage, or MBS markets, and who instead transposed default risk assumptions that had been used in constructing CDO of corporate bonds onto CDO of mortgage bonds. Mackenzie shows how this facilitated the production of products that were high-yield because they were composed of low-rated subprime MBS tranches, but nonetheless attained AAA bond ratings that made them appear to be safe investments (MacKenzie, 2011: 1011).

MacKenzie's account, which focuses on the instruments, is informative but incomplete. Viewed within the context of the vertically integrated production model, the newer ABS-CDO instruments were embraced as product extensions whereby firms could now use what had previously been the output, MBS tranches, as input into a new set of products. He also raises but does not pursue the question of what the effect was of combining these separate businesses on the way that banks operated. Our account is that the advent of ABS-CDOs reinforced and solidified the industrial production model firms were already using, and thereby propelled the

race to the bottom by heightening demand for more risky mortgages to send through the pipelines. Investment banks, like Bear Stearns and Lehman Brothers, began to realize that in order to capture enough of the CDO business; they would need more raw mortgages to package. Commercial banks like Bank of America and Citibank saw the opportunity to move into ABS-CDO as a chance to find further downstream revenues from their existing mortgage origination and MBS businesses. Our findings show that MBS producers who integrated forward into CDO production exhibited significant subsequent declines in the (ex-post) quality of their subprime MBS issues. The effect of CDOs in causing the crisis derived not only from the technical assumptions embedded in the instruments themselves, but in the way that firms' increasing deployment of these products reverberated back to undermine the sustainability of their industrial production model.

It is here that we make our most important theoretical contribution. The sociology of markets and the sociology of finance are subfields that have tended to have distinct research programs. By locating the problem of the construction of financial instruments, their innovation, and their deployment with how such instruments are embedded in firms' strategies to make money, we offer a more satisfying account of what happened. From this perspective, our story and MacKenzie's story are complementary and inform one another. MacKenzie's account focuses on the integration of the financial instruments that evolved separately in the mortgage and corporate banking sectors and became intertwined as banks realized that high-risk mortgages made excellent material for lucrative financial products. We show that this integration occurred not only in the techniques by which financial instruments were produced and evaluated, but how it profoundly altered the structure of banking in the U.S.

### **Theoretical Considerations**

It is useful to begin by characterizing how we intend to combine elements of the sociology of markets and the sociology of finance. The literature on the sociology of finance has often been cast as opposed to a more production-oriented sociology of markets (Knorr-Cetina, 2004). The sociology of finance has focused on the socio-technical aspects of trading and the creation and evaluation of financial models and instruments in order to arrive at accounts of how these markets have evolved. There are two important critiques in this literature of the sociology of markets. First, some of the literature is interested in how the financial products, technologies, and practices themselves create markets by embodying economic principles. Much of the concern is with the role of trading financial products per se in structuring markets (MacKenzie and Millo, 2003; Buena and Stark, 2005; Callon, 1998; Preda, 2007). Here, the goal has been to try and understand how the use of such products and their creation by economists or economic principles produce the social structuring of the market. The critique of productionist approaches is that they fail to consider how the actual structuring of the market results from ideational content embedded in market technologies. Thus, it is not the pre-existing relationships between the firms or actors that create the market but the performance of economic principles.

Knorr Cetina and her co-authors (Knorr Cetina and Bruegger, 2002; Knorr Cetina, 2004; Knorr Cetina and Preda, 2007) have provided a second more general and particularly thoughtful critique of a production-oriented approach to markets. They suggest that a productionist perspective, like that embedded in White's version of the sociology of markets (2002) or Fligstein's "markets as politics" approach (1996; 2001) confounds how the market works with the social structuring of the firms in a market. They argue that the limitations of a productionist perspective are particularly acute in financial markets, which are dependent not just on new forms of financial products, but also on electronic technology and a whole web of market devices

and mediated relations that make the firms themselves less relevant to understanding what is going on. Put another way, their view is that financial markets are more organized around the flow of financial transactions and the processes that create and sustain that flow than productionist approaches, which, by focusing on production and the relationships between firms, fail to grasp the essential features of those markets.

While there is merit to both of these critiques, there is also the possibility that productionist and sociology of finance arguments might actually be combined to produce a more satisfying analysis of the way that financial products and the firms that create, sell, and trade them operate to produce complex markets. To do so requires thinking about the co-evolving relationship between the socio-technical aspects of financial products and more institutional dimensions of market development. It also requires that we consider the role of production in structuring financial markets.

We can think about a recursive dynamic between financial technologies and financial firms' strategies and structures. From this perspective, the creation of new and ever more esoteric financial products that are driven by models, equations, and new forms of classification (Callon 1998; Mackenzie and Millo 2003) deeply affect the relationships between financial firms who are searching around for solutions to their problems of being profitable and surviving the crises in their main product lines (Fligstein 2001). Put another way, White's argument (2002) that firms watch one another in product markets and decide where to place themselves in a role structure implies that firms have to figure out how financial practices and products fit into what they are doing and their competition with other players. We would expect that financial products can be constitutive of the positions and relationships between competing financial firms, as well as their internal organizational structures.

In the case of financial markets, the internal organization of banks and other financial entities are certainly being changed by the new opportunities presented to them by the creation and diffusion of technologies and evaluative practices. But, their use of such products fits the banks' larger narrative about who they are as firms and what kinds of products they produce. It establishes who their peers and competitors are and works to reorganize the role structures of their markets. But those existing structures do affect financial innovation. It is within the larger context of the challenges facing how financial firms make money that the innovation make sense.

In developing our account below, we connect a view of the evolution of the structuring of financial firms in specific product markets to the evolution of the instruments that are being produced in that market. The context of the mortgage securities markets in the U.S. is a perfect place to begin to construct this more synthetic view as that market has evolved in several radically different directions as the products have expanded, imploded, and been elaborated upon and reformed. We show how the creation of these new products was part and parcel the strategies of the largest financial firms to make money off of all phases of the mortgage business. In this way, the creation of new and ever more abstract instruments was embedded in the logic of the production markets of financial firms and shaped their internal organizational structures.

The production perspective we use in this paper is the "markets as politics" approach. This approach offers us a way of how to think about the rise of new markets and changes in the governing conception of control of existing markets (Fligstein, 1996; 2001). We use several ideas from the "markets as politics" approach." New markets emerge when a new conception of control provides a way of how to think about how to organize that market. New markets frequently appear as the result of either a crisis in an old market or the possibility for a whole

new kind of product usually related to those in nearby markets. In the case of the market for mortgages, we consider how the crises in the main markets of savings and loans and commercial banks created new opportunities to change the way that mortgages were purchased and financed providing the impetus for mortgage backed securities. This stimulated the growth of a whole range of financial products that are well documented by MacKenzie (2011).

Many features of markets reflect how firms deal with their competitive struggles. For instance, Fligstein (1996) highlights how vertical integration is a generic strategy which industrial firms pursue in order to control supplies and thereby stabilize their production. We will show that vertical integration became quite important in the evolution of the market for mortgage securitization because financial firms realized that having mortgages was necessary in order to produce the more esoteric products downstream downstream such as MBS and CDO. Without mortgages as the raw material for these products, the production of new financial products was impossible.

We describe the conception of control that emerges by 2000 as an industrial conception of control. The innovation of new financial instruments made sense as it took products already being produced and turned them into new products. As financial products became more abstract and esoteric, they helped bring about a profound shift in the basis of how financial firms were earning money. As late as the 1990, the mortgage market functioned was a way for individuals to finance the purchase of their house and for a long time this was the central way in which many banks made money. But, the market for mortgage securitization ended up not being about mortgages per se, but instead as mortgages being the raw material for financial products that could be turned into securities of greater and greater degrees of complexity (Aalbers, 2008; 2009). Within the context of an industrial conception of control, financial firms of all kinds

embraced the technology of increasingly abstract mortgage-related instruments, and they found that they needed to secure more and more raw mortgages to continue doing so. It is well-established that this created a new set of financial markets, but one of the most interesting and, we argue, consequential elements missed by both the fragmentation story and the sociology of finance perspective is that this transformation also led to the emergence of a whole new kind of financial firm: the integrated bank focused on using mortgages as raw materials to generate fees, produce esoteric financial products, and invest/trade in those products.

Our goal is not just to produce a historical interpretation of a new conception of control guiding financial firms. We want to argue that if such a conception of control exists, we ought to be able to use it to make hypotheses about the behavior of market participants in order to confirm that the conception of control has the consequences that our interpretation of them implies. Indeed, the application of our theoretical perspective points to a key set of factors that have so far been missing from social-scientific explanations of the financial crisis. Our analysis shows how firms that adopted the industrial conception of control were prone to originate nonconventional mortgages, issue riskier MBS, experience greater investment losses on MBS and CDO assets, and be more likely to fail as a result.

### **Background of the Mortgage Securitization Markets**

It is useful to discuss the process of securitizing mortgages in order to provide background to frame our explanatory account. A mortgage backed security is a bond backed by a set of mortgages that entitles the bondholder to part of the monthly payments made by the mortgage borrowers. Figure 1 provides a diagram illustrating the basic role structure of securitization deals. The changing nature of firms' positions across these roles forms the core of

our explanatory account below. Circa 1990, however, each of these roles tended to be filled by different financial firms. Each of these exchanges can be thought of as a separate market. The emergence of this complex transactional structure has been documented in a number of places (Quinn, 2008; Barmat, 1990; Brendsel, 1996; Jacobides, 2005; Green and Wachter, 2005; Ranieri, 1996; Kendall, 1996). Borrowers purchasing homes would take loans from lenders, also known as originators. These originators could be local banks, commercial banks, or specialized mortgage brokers. The originators would sell the loans to issuers, or to wholesalers who would bundle loans together to then sell to issuers. The MBS issuers' role was to serve as an intermediary between mortgage originators and investors, creating the financial instruments out of individual mortgages. The underwriter managed the deal, funded the securitization, and sold the bonds. Often a single firm was both the issuer and underwriter. Mortgagees would make monthly payments to servicers, who would distribute the payments to bondholders.

(Figure 1 about here)

Through the 1990s, the core issuers who organized the securitization market were the government sponsored enterprises (hereafter, GSE)--Fannie Mae, Freddie Mac, and the government-owned mortgage insurer, Ginnie Mae. These financial institutions bought mortgages from originators to package into MBS. These MBS were attractive to investors because credit ratings agencies would rate them "AAA" reflecting the fact that everyone involved believed that the GSE issued bonds were implicitly backed by the federal government. The GSE also made loans directly to consumers. They typically hired an investment bank to underwrite the security and help sell it.

It is important to discuss the various types of mortgage security products and how they map onto the social and regulatory boundaries of the production market. MBS are distinguished

by the underlying mortgages which compose them, such as conventional/conforming, Alt-A, B/C (“subprime”), or home equity loans. The differences between these types relate to both characteristics of the mortgage and the borrower, as well as the regulatory rules governing MBS production. The most important distinction is that only conventional mortgages (“prime”) were eligible for inclusion in the mortgage pools of the GSE-issued bonds. To qualify for a prime or conventional mortgage, a person needed 20% down and a credit score of 660 or above (the average score is 710 on a scale from 450-900). Mortgagees who lacked these qualifications but were willing to pay a higher interest rate and/or higher fees could qualify for various types of nonconventional mortgages. That fact that the GSE’s were generally barred from issuing MBS backed by non-conforming loans created a market segmentation whereby GSEs dominated issuance in the prime market, while securitization of nonconventional loans was conducted almost solely by private firms.<sup>3</sup> The MBS issued by the GSE were known as agency backed MBS and distinguished from non-agency MBS.

The structure of MBS securities tended to become more complex over time. MBS deals were divided into risk-stratified securities called “tranches” starting in the mid-1980s (Ranieri,

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<sup>3</sup> We will use the term nonconventional to describe all of these types of loans and reserve the term subprime for a particular type of nonconventional mortgage (which are also called B/C). Subprime MBS refers specifically to securitizations of B/C mortgage pools. Here are the conditions that could qualify a mortgagee as subprime: two or more loan delinquencies in the last 12 months; one or more 60 day loan delinquencies in the last 24 months; judgment, foreclosure, or repossession in the prior 24 months; bankruptcy in the past 5 years; a FICO score less than 660; and debt service to income ratio of 40% or greater. If one’s credit was a bit better, one could qualify for an intermediate “Alt-A” mortgage, often without any proof of income. Jumbo mortgages refer to mortgages which failed to conform to GSE standards because they were too large. Jumbo loans were typically for luxury homes or in homes in high-cost markets. Home equity loans (HEL) refer to loans that borrow against the equity value of one’s home.

1992). While backed by common pools of mortgages, the various tranches provide different risk profiles. Riskier tranches of a bond pay a higher rate of return but are the first to default in the event of losses. This meant investors could choose their level of risk. In the late-1990s, another more complex type of instrument called a CDO started to become popular. It is this instrument that is the subject of MacKenzie's paper (2011). A mortgage-related CDO (often called ABS-CDO) is a derivative, or re-securitization, of existing MBS tranches. Essentially, packagers would take the lower BB or BBB-rated tranches subprime MBS bonds (called "mezzanine tranches" in the industry jargon) and package them together into a new bond, which theoretically contains a more diversified set of assets. While the complexity of pricing a CDO can be very difficult due to the disparate income streams from which it is constituted, at root it is simply a claim on mortgage backed security tranches, which are in turn claims on income from mortgage payments made by home buyers. See Mackenzie (2011) for a thorough discussion of these bonds).

### **The Transformation of Mortgage Finance and the Rise of an Industrial Conception of Control**

While the roots of mortgage securitization extend back to the late 1960s (Quinn 2008), it was only in the 1980s that it began to dominate the mortgage finance system. Before the 1980s, most Americans got mortgages by borrowing from savings and loans or commercial banks. These firms would usually hold the mortgage asset, thus forming a long-term relationship with the mortgagee. In the 1970s and 1980s, this industry, and in particular the savings and loan banks, experienced a crisis in their basic business model (Barth, 1991). The industry lobbied the

government for deregulation. This deregulation failed miserably and the savings and loan sector was decimated (for an ironic view of these events, see Lewis, 1990).

Meanwhile, by 1990 the commercial banks too were in decline (Davis and Mizruchi, 1999). Commercial banks had also operated historically by maintaining stable relationships with their customers, both households and industrial corporations. Davis and Mizruchi (1999: 219-220) show that from 1970-1990 commercial banks lost their core lending markets to other financial entities. Corporations raised money directly from financial markets. Consumers turned from savings accounts to money market funds and mutual funds. So-called nonbank banks like GE Capital made “industrial” loans while the financial arms of the automobile companies, like GMAC took over the auto loan business. Specialized mortgage originators like Countrywide Financial absorbed market share in the mortgage market. Dick Kovacevich, CEO of Norwest, a large regional commercial bank said in response to his perception of the crisis: “The banking industry is dead, and we ought to just bury it” (James and Houston, 1996: 8). This presented commercial banks and the remaining savings and loans banks with a big problem. They could either find new businesses and/or new ways of doing business or, as happened to many of them, go out of business.

The solution they embraced during the 1990s was to shift from having a customer-focused conception (i.e. “relationships”) to a fee-based conception where their main way of making money was off of charging fees to a large number of customers. Mortgage securitization is a classic fee-generating business. Fees are charged to arrange the loan to a home buyer, selling that mortgage to a wholesaler or issuer, turning the loans into MBS, underwriting the MBS deal, selling the MBS to investors, and servicing the underlying mortgages in the MBS packages.

As mortgage securitization grew during the early 1990s, the “originate-to-sell” model of mortgage finance rose from the ashes of the S&Ls’ old “originate-and-hold” strategy (Jacobides 2005). During this period it was possible, and indeed common, for mortgage loans to pass through as many as five different kinds of financial institutions (originators, wholesalers, underwriters, government sponsored enterprises, and servicers) before settling into investors’ portfolios. These markets were vertically disintegrated and horizontally unconcentrated. Participation was also segmented across different types of regulatory statuses and across different geographic regions of the country. The main concentrated entities were the government-sponsored enterprises and the investment banks who acted as underwriters for issuing MBS (Fligstein and Goldstein 2010).

Astute readers will note that this fragmented structure we have just described is exactly how the perverse incentive perspective imagined the way the market looked in 2007. But, this structure as it emerged in the early 1990s was not the final form that mortgage securitization would assume. The largest financial firms did not remain specialists in one part of the mortgage market but saw advantage to spreading themselves across all segments of the market. Banking firm conglomeration, the erosion of regulatory boundaries, and an increasing orientation towards fees during the latter half of the 1990s formed the building blocks of what would coalesce into a vertically-integrated model of MBS production.

In response to the crises already mentioned, banks (particularly commercial banks) began to search out other market opportunities. They wanted to diversify by entering more lucrative businesses such as investment banking, the buying and selling of stocks and bonds, and insurance. From the mid 1980s, the commercial banks pushed to undermine and circumvent the legal strictures that kept them out of these lucrative businesses (Barth, et. al., 2000). The

commercial banks were generally supported in this effort by the Federal Reserve (Hendrickson, 2001). Throughout the 1980s and 1990s, the regulatory boundaries between various financial product and service markets were blurring as loopholes and new regulations permitted banks more freedom to pursue new markets. The repeal of the Glass Steagall Act in 1999, with passage of the Gramm-Leach-Bliley Act, signaled the final end to the regulatory segmentation of the financial system. This was a crucial precondition for the industrialization of mortgage finance because it allowed individual firms to participate in all roles of the securitization process.

By 1999, bank mergers had created large financial conglomerates that no longer saw themselves as lending institutions but as diversified financial services firms (Hendrickson, 2001; Barth, et. al., 2000). Kaufman (2009: 100) shows that between 1990 and 2000, the 10 largest financial institutions increased their share of industry assets from 10% to 50%. These firms began to reorient their businesses from lending to charging fees for services, much as investment banks had long done. DeYoung and Rice (2003) document this shift across the population of commercial banks. They show that income from fee related activities increases from 24% in 1980 to 31% in 1990, to 35% in 1995, and 48% in 2003. The largest sources of this fee generation in 2003 were in order of importance: securitization, servicing mortgage and credit card loans, and investment banking (DeYoung and Rice, 2003: 42). This shows that commercial banks were moving away from loans to customers as the main source of revenue well before the repeal of the Glass Steagall Act and towards mortgages as the main products for their businesses.

This increased attention to fee generation through securitization and mortgage servicing was accompanied by a huge compositional shift in commercial banks' assets toward real estate debt, mostly in the form of GSE-backed MBS. Banks would originate mortgages, sell them into GSE pools, and then borrow money to buy and hold MBS as investments. Real estate related

investments accounted for 32% of commercial banks' assets in 1986, increasing to 54% of assets in 2003. By 1999, Bank of America, Citibank, Wells Fargo, and J.P. Morgan Chase, had all shifted their businesses substantially from a customer based model to a fee based model centered on real estate. The potential to earn fees from originating mortgages, securitizing mortgages, selling mortgages, servicing mortgages, and making money by holding MBS were enormous.

It was not just commercial banks that saw the potential in doing this. Countrywide Financial started out as a mortgage broker and Washington Mutual Bank (a savings and loans bank) both rapidly entered into all parts of the mortgage business during the 1990s. On the investment banking side, Bear Stearns entered the mortgage origination business by setting up lender and servicer EMC in the early 1990s. Lehman Brothers, another investment bank, was also an early mover into the mortgage banking business, acquiring originators in 1999 and 2003 (Currie, 2007). Industrial product lenders GMAC and GE Capital also both moved into the business of originating mortgages and, eventually, even underwriting MBS issues (Inside Mortgage Finance, 2009).

One measure of the industrialization of the mortgage securitization is the degree to which all raw mortgages were being securitized. In the world of the early 1990s, when smaller and regional banks still dominated the various parts of the mortgage market, there were still a substantial number of mortgages held directly in bank portfolios. Figure 2 presents data on the rate of mortgage securitization for prime and nonconventional loans from 1995 until 2007. Nonconventional loans are securitized at a relatively low rate of 25% in 1995. The rate increases over the period to almost 90% by 2007. A similar pattern can be observed for prime or conforming loans (although this starts at a higher level due to the relative advancement of the GSE-controlled market by the 1990s). Mortgages increasingly became the inputs into mortgage

securities and by the end of the housing bubble almost all mortgages were fed into these financial products.

(Figure 2 about here)

By the turn of the 21<sup>st</sup> century, the mortgage backed securities business was increasingly dominated by a smaller and smaller set of big players. The largest commercial banks, mortgage banks, and investment banks had begun extending their reach both backwards to mortgage origination and forwards to underwriting and servicing. But it is important to reiterate that through even the early 2000s, mortgage finance was still predominated by the prime/conventional sector, and the government sponsored enterprises (GSE) were the mainstay issuers of that market.

### **The MBS and CDO industry 2001-2008**

The central role of the GSE in the mortgage market began to change after 2001. The GSE could not legally underwrite MBS for nonconventional mortgages and the increasing growth of that market pushed financial firms to enter into underwriting and issuing their own MBS based on these riskier mortgages. This was the final push that completed the vertical integration of mortgage securitization and the evolving industrial conception of control.

Figure 3 presents data on the size and composition of mortgage origination volumes from 1990-2008. Beginning in 2001, the overall mortgage origination market began to take off, increasing from \$1 trillion a year in 2001 to almost \$4 trillion in 2003. The main cause of this massive expansion was the low interest rates policy of the Federal Reserve. Low interest rates encouraged households to refinance and to buy new houses. One can see that from 1990-2003, conventional mortgages' share remained high, about 70%. But beginning in 2003, this changed.

By 2006, 70% of loans were nonconventional. In 2005 and 2006, the peak years of the bubble, financial firms issued \$1 trillion of nonconventional MBS in each year, up from only \$100 billion in 2001. It is this shift in the market that brought the integration process into its final phase. In essence, because the GSE could not package MBS from nonconventional loans until 2006, a lucrative opportunity opened up for financial firms.

(Figure 3 about here)

Why did the nonconventional market take off in 2004? After a record year in 2003, the mortgage securitization industry experienced a supply crisis in 2004. Figure 3 shows the 2004 drop-off in new mortgages was severe, with monthly origination volumes *declining over 70%* from \$200 billion in August 2003 to under \$60 billion a year later. Several factors were at play, including a slight uptick in interest rates from their historic lows. But the foremost cause was that the 2003 refinancing boom had run its course. Of the \$3.8 trillion of new mortgages written in 2003, \$2.53 trillion, about two thirds, was attributable to refinancing as borrowers took advantage of low rates.

The precipitous drop in mortgage originations posed a major source of concern for industry actors given that the dominant business model was based on high throughput. Interest rates were still relatively low and there still existed a large demand for MBS from investors. Moreover, originators had grown their operations and needed more mortgages to fill their suddenly excess capacity. As an editorial in the Mortgage Bankers Association trade newsletter wrote:

“Mortgage originators who geared up their operations to capitalize on the boom now face a dilemma. Given a saturated conforming market that is highly sensitive to interest rates, where can retail originators turn for the new business they need to support the organizations they have built?”(Mortgage Banking, May 1, 2004).

Concerns about mortgage supply reverberated across banks. Barclays Capital researcher Jeff Salmon noted in May 2004 that, “The recent dearth of supply has caught the securitization market off guard” (Asset Securitization Report, May 17, 2004). If the financial industry was to keep the mortgage securitization machine churning, firms would somehow need to find a new source of mortgages. This crisis pushed industry actors to stabilize their supply of mortgages for securitization by collectively settling on using non-conforming mortgages. This is in line with the “markets as politics” argument that firms in a crisis will try and stabilize their positions (Fligstein, 1996).

Reporting on discussions at the June 2004 American Securitization Forum in Las Vegas, the trade journal *Asset Securitization Report* noted that limited mortgage supply remained the “hot topic”, but also noted the generally “harmonious agreement” amongst analysts from the major banks that the largely untapped nonconventional market segments could offer a solution to the supply crunch (Asset Securitization Review, p.10, June 14, 2004). An editorial in *National Mortgage News* from March 2005 also highlighted the compensatory logic driving the growth of the nonconventional markets: “The nonconventional market is booming this year. Taking up the slack (as it did last year) for the big drop off in prime lending, and keeping record numbers of people employed in the mortgage industry” (March 2005).

Countrywide Financial was one of the most successful beneficiaries of this shift, and they became a model that other firms emulated in order to profit from nonconventional lending. Their annual report boasted:

“Countrywide’s well balanced business model continues to produce strong operational results amidst a transitional environment. Compared to a year ago, the total mortgage origination market is smaller as a result of lower refinance volume. This impact has been mitigated by

Countrywide's dramatic growth in purchase funding and record volumes of adjustable rate, home equity, and nonconventional loans". (2005)

The rapidity with which the main players reoriented toward nonconventional lending and securitization after 2003 is evident in figure 3. By 2005, the formerly niche nonconventional lending and securitization sectors had been rapidly transformed into a core business for the largest financial institutions in the country. In 2001 the largest conventional originator (Citibank) did 91% of its origination business in the conventional market, and only 9% in the non-prime market. In contrast, by 2005 the *largest conventional* originator (Countrywide) was doing *less than half* of its origination business within the conventional sector (Inside Mortgage Finance 2009). Subprime origination and securitization turned out to be enormously profitable. According to a study by the consulting firm Mercer Oliver Wyman, nonconventional lending accounted for approximately half of originations in 2005, but over 85% of profits (Mortgage Servicing News 2005).

Commercial banks, mortgage banks, and investment banks learned to profit from nonconventional MBS in multiple ways simultaneously, earning money both from fees on MBS production and investment income on retained MBS assets. They could fund both the production and investment with cheap capital, which meant enormous profit margins. Figure 4 considers how the non-conventional mortgage securitization business came to be an increasingly core activity for the larger financial sector. It shows the degree to which the largest 25 financial firms in the United States (in terms of total assets) were also among the top-25 firms in nonconventional mortgage securitization segments. In 1998, only 4 (24%) of the 25 largest financial firms in the country were in the top 25 of any of the segments of nonconventional MBS. By 2006, 14 of the 25 (56%) were involved in the nonconventional MBS market.

(Figure 4 about here)

In sum, the shift toward nonconventional markets was caused by both a crisis and an opportunity. The crisis was the decline of the prime market for mortgages that began in 2004. But the crisis did not spell the end of the industrial model. In fact, this conception of control shaped the reaction of the firms as they sought to stabilize their supplies and further industrialize in nonconventional markets. The opportunity was the realization that originating, packaging, and holding onto nonconventional MBS would generate higher returns than prime mortgages. The absence of the GSEs allowed integrated firms to capture all the fees at every step. Moreover, the riskier nature of the mortgages allowed the issuing and underwriting firms to charge a higher percentage fee for the more elaborate financial engineering which these non-agency-backed MBS required. The resulting MBS also paid out higher returns as riskier loans had higher interest rates attached to them. Given the continuously rising price of housing, the credit rating agencies' models kept finding that these loans could be packaged into low-risk securities. Attaining AAA ratings for nonconventional MBS made them appear to be one of the best investments around (for a thoughtful sociological discussion of why ratings works to produce confidence in financial markets, see Carruthers and Stinchcombe, 1999). After 2003, the large banks invaded nonconventional segments aggressively, and, along with a few of the larger new mortgage firms like Countrywide, applied the vertically integrated business model, and grew these formerly marginal niche segments into a multi-trillion dollar a year business.

### **Vertical Integration Explored**

The expansion of the nonconventional market inadvertently promoted the final integration of the industrial mass-production model. Investment banks that had eschewed the

messy and unglamorous world of retail lending began acquiring nonconventional originators aggressively after 2003 in a bid to feed their securitization machines (McGarity 2006; Levine 2007). Investment banks were also the leaders in the new CDO products, and integrating backwards into origination assured them of additional material for these financial products. By 2005 Lehman Brothers was self-originating almost two-thirds of the mortgages contained in its \$133 billion of MBS/CDO issues (Currie 2007: 24). Meanwhile, the larger commercial bank holding companies who already had nonconventional mortgage origination operations as part of their large retail businesses sought to integrate forward into MBS underwriting and CDO production in order to capture fee revenue (Levine 2007).

Figure 5 presents data on the extent of vertical integration in subprime (B/C) production by tabulating the number of vertical market segments of the 25 financial firms who were amongst the largest participants in any of these segments. The four vertical segment categories included here are origination, MBS issuance, underwriting, and mortgage servicing. In 2002, only 25% of these firms which had large market share in any nonconventional production segment participated in three or four vertical segments in that market. But by 2006, this had risen to 45%. In 2002, nearly 40% of these firms participated in only one segment of the market and by 2006, this had fallen to less than 20%.

(Figure 5 about here)

So far we have discussed the trend by which firms expanded to multiple vertical segments as a key element of the industrialization of MBS/CDO production. But it is important to show how this vertical integration strategy was embedded within a larger industrial conception of control. Actors understood the need to be involved in all vertical segments as not simply a

form of diversification to generate fees, but as a linked production system in which each of their positions reinforces the others with the goal of maximizing throughput.

Levine (2007) concludes:

“Why have the Wall Street firms so aggressively embraced this vertical integration strategy? The answer is to protect and leverage their returns from their mortgage underwriting and securitization desks. In fact, revenues from the fixed income divisions currently represent the largest components of the revenue mix for commercial and investment banks.”

This analysis comports with the contemporaneous rationales voiced by executives of the leading players. In a 2006 interview, Jam Remis, senior managing director at Bear Stearns, explained the need for backward integration because the industrial model was viable only so long as a firm could secure a ready supply of inputs:

"Wall Street firms require a major investment to maintain a successful securitization platform in the areas of research, sales and trading. To optimize this investment requires a steady source of raw materials--mortgages--which can be packaged into securities to support the capital-markets activities" (quoted in McGarity 2006).

Anthony Tufariello, head of the Morgan Stanley's Securitized Products Group, voiced a similar logic in announcing Morgan Stanley's purchase of mortgage originator Saxon Capital:

“The addition of Saxon to Morgan Stanley's global mortgage franchise will help us to capture the full economic value inherent in this business. This acquisition facilitates our goal of achieving vertical integration in the residential mortgage business, with ownership and control of the entire value chain, from origination to capital markets execution to active risk management” (Morgan Stanley, 2006)

According to Jeff Verschleiser, then co-head of mortgage trading at Bear Stearns:

“The key point to remember is that it's not just the buying that counts. It's the integration. Simply buying a mortgage originator and having it operate in a stand-alone capacity without leveraging the infrastructure of your institution is not something I would consider vertical integration.” (quoted in Currie 2007).

Of course, this integration was never entirely complete throughout the industry. Some medium-sized mortgage originators remained independent and continued to sell mortgages to

issuers in an originate-to-distribute model. Many others integrated forward into nonconventional MBS issuance, but hired investment banks to underwrite the deals. A few underwriters like Goldman Sachs never integrated backwards into origination. Nonetheless, integration was the dominant logic. By 2006, three quarters of all subprime mortgage originations were conducted by firms who also issued MBS (authors' calculation from Inside Mortgage Data).

### **CDOs and the Completion of Vertical Integration**

The reorientation toward nonconventional mortgages coincided with the rapid growth of the second-order ABS-CDO market. As noted above, the most significant type of these products were “mezzanine” ABS-CDO, which resecuritized high-yielding MBS bonds backed by the riskiest mortgages. Mackenzie (2011) examines the socio-technical processes by which actors and their model came to evaluate these instruments as being low-risk AAA investments. From the point of view of our theoretical perspective, the significance of the rapid growth of this new set of instruments was that it reinforced and propelled the industrial dynamics that were already occurring as firms sought to deploy this new technology in the context of the industrial conception of control. The creation of new derivatives from existing derivatives can be thought of as a further forward extension of the value chain. In this case, ABS-CDOs created an additional downstream product from otherwise difficult-to-sell, low-grade MBS tranches. It also meant an additional point at which to extract fee revenue from the intensive financial engineering which these instruments involved. These products became incorporated into the industrial structure quite rapidly. Already in 2005, ABS-CDO ate up *fully 100%* of the mezzanine MBS tranches produced that year (Immergluck 2008).

The reason mezzanine ABS-CDOs yielded high returns is because they consolidated the highest-risk MBS tranches created from the highest-risk mortgages. Their growing popularity thereby heightened demand for more highest-yielding nonconventional mortgages to feed through the pipelines. This deepened the industrial structure as banks integrated forwards to produce these lucrative products, and backwards in order to capture the risky mortgages to create them.

One of our key assertions has been that the major financial firms also invested in MBS and CDO, thereby completing the mortgage's internal voyage from originator to investor. This is one of the more subtle elements of the industrial model. Acharya and Richardson (2009) offer data showing that securitizers themselves – not outside investors – came to be the primary investors in ABS-CDO tranches after 2004. For instance, from 2002-2007 nonconventional securitized asset holdings double at the lender IndyMac and increase by over 800% for Bank of Citibank, Bank of America, Wells Fargo, and Countrywide Financial. All have over \$15 billion in such holdings by 2007 (Fligstein and Goldstein 2011). This growth included both MBS and ABS-CDO. It reflected growth in holdings of both the highest-rated senior and super-senior tranches, as well as lower-rated, subordinated tranches (Acharya and Richardson 2009).

Two processes undergirded this accumulation of MBS and ABS-CDO investments by the producers. One was that the structuring of ABS-CDOs tended to result in a large quantity of so-called “super-senior tranches.” These were supposedly the safest, but netted only modest yields. This made them difficult to sell to investors, hence they tended to accumulate on producers' books or off-book vehicles. But ABS-CDO holdings were not just an industrial byproduct. The banks came to realize that they made lucrative investments. Even the AAA-rated senior tranches paid modest but still higher rates of return than other AAA investments because they were

composed of high-risk, high-yield MBS tranches. More importantly, the AAA ratings meant that under the Basel accounting standards and recent regulatory changes that allowed for risk-weighted capital adjustments, investment and commercial banks could hold very large quantities of ABS-CDO with minimal regulatory capital charges (though often they had to place assets in off-balance sheet “special-purpose vehicles”). Together, this facilitated a strategy in which banks could leverage highly and realize investment returns by holding a portion of their industrial output (Acharya and Richardson 2009; Acharya et. al., forthcoming ).

(Figure 6 about here)

In the face of the expanding nonconventional mortgage market, all types of banking firms dramatically increased their operations in all of the segments of those markets. They would originate mortgages, act as issuers and underwriters for bonds based on those mortgages, create esoteric financial derivatives from MBS, find customers for those bonds at home and around the world, and profit by using the low rates of interest available to them to borrow in order to hold some MBS and/or CDO bonds for their own investment portfolios. Figure 6 presents the ideal-typical industrial model employed by the majority of the 25 largest financial firms in the U.S. on the eve of the market crash. The system in place at the end did not resemble the “originate-to-sell” strategy implied by the perverse incentives approach. Instead, there is ample evidence that financial firms embraced vertically integrated mortgage and securitization pipelines and in many cases became one of their own best customers for their financial products.

### **The Industrial Model and the Meltdown**

It has been well established in the aftermath of the crisis that the securitization bubble coincided with worsening risk control throughout the process. Loan underwriting standards were declining and the prevalence of low-documentation, stated income loans was increasing, both of which were later associated with heightened defaults (Keys et al 2009; Mayer, Pence and Sherlund 2009). And over time, firms produced MBS and CDO tranches that tended to perform significantly worse relative to their initial ratings (Fligstein and Goldstein 2010)

The voracious appetite for high-yield loans to pass through their nonconventional pipelines helps make sense of evidence that banks were slackening underwriting standards and marketing deceptively affordable products to consumers. This disconnect between diligence and lending did not stem from the perverse incentives of the originators to pass on potentially bad mortgages. Instead, the decline of interest in the riskiness of mortgage loans (or rather the appetite for risky loans) stemmed primarily from the desire of securitizers to capture more and higher profits on every mortgage.

At the hearings of the Joint Economic Committee of Congress, Kurt Eggert, a law professor testified:

“I think we’ve had a presentation of the secondary market as mere passive, you know, purchasers of loans, that it’s really the originators who decide the loan. But if you talk to people on the origination side, they’ll tell you the complete opposite. They’ll say, you know, our underwriting criteria are set by the secondary market. They tell us what kind of loans they want to buy. They tell us what underwriting criteria to use. And that’s what we do because we are selling to them.”

William Dallas, CEO of bankrupt mortgage owner Ownit, which was partially owned by Merrill Lynch, told the New York Times:

“Merrill Lynch told me we should offer more low-documentation loans in which the borrower’s income is not verified. They wanted these loans because they could make more money off of them. They told me that if we did not provide these loans, we would forego profits.” (New York Times, November 7, 2008).

Bear Stearns' Managing Director Jay Remis also noted that backwards integration allowed the firm to maximize production of the particular types of high-yield, nonconventional loans needed as inputs for their CDO products:

“An investment bank with its own mortgage origination company is better able to design and price products that the investment community wants. [...] If you own an originator or have a captive source, you can introduce new [mortgage] products that take advantage of all your heavy-duty analytics. You can intelligently price and design [mortgage] products that are tailor made to investors' needs,” Remis says” (quoted from McGarity 2006).

The above discussion implies two alternative hypotheses about the relationship between the structure of MBS/CDO production markets and the race to the bottom to produce ever-riskier MBS composed of the riskiest mortgages. The perverse incentives theory suggests that misaligned incentives encouraged insufficiently diligent and/or fraudulent practices at each stage of the securitization process. This implies that less integrated issuers should issue MBS that turns out to be of lower quality since it is exposed to more perverse transactional incentives (Immergluck 2008). In contrast, our industrialization account implies that banks' integration strategies were never about reducing risk by asserting control over the contents of their MBS securities, but rather were intended to capture the maximum quantity of risky raw mortgages to feed through their securitization machines. This argument suggests that both forward integration into CDO production and backward integration into origination fed back to undermine the quality of subprime MBS since both occur as part of a broader strategy of pushing as much volume as possible through fee-generating assembly lines. This brings us to the following hypothesis:

*Hypothesis 1: The more vertical production segments of the nonconventional mortgage securitization market in which a firm operated, the worse the (ex-post) quality of the subprime MBS issued by that firm.*

Focusing on the organizational dynamics of the integrated production model, which was composed of tightly interwoven revenue streams, also helps us to account for the seemingly anomalous fact that MBS/CDO producers remained deeply enmeshed in the business even as signs of the mortgage market's mounting crisis began to accumulate. The second half of 2006 augured trouble in the real estate market as housing prices started to decline, delinquency rates rose steeply, and several home builders went out of business. Discussion of a housing price bubble became increasingly prevalent in the business press as the bubble grew (Zuckerman 2010). Nonetheless Wall Street continued to expand aggressively in nonconventional mortgages through early 2007. During late 2006 and early 2007, Bear Stearns, Merrill Lynch, and Morgan Stanley all acquired additional nonconventional originators. The degree to which the industrial conception of control shaped these seemingly irrational expansionary strategies is suggested by an excerpt from a brief published in early 2007 by the trade group the American Securitization Forum:

“In the past, predicting what investment banks would do at this stage of the housing cycle used to be simple. Having ramped up the business while the going was good, they would then shutter it at the first sign of trouble. That’s what happened with the mortgage conduit business in the 1980s, and again in the early 1990s. This time, it’s different. Wall Street seems to have thrown out its old and trusty playbook. Instead of pulling back in 2006, several major firms went on a spending spree. That might sound strange to some. Buying at the start of downturn surely risks overpaying for an asset whose business is in decline. So why do it? Well, despite the gloomy outlook, competition is not letting up. First, clients [of investment banks] have been setting up capital-markets desks to securitize their own loans in their own version of vertical integration. Countrywide is the most renowned for doing this, but others from SunTrust to IndyMac have taken the plunge, and still others are following. Second, more players are trying to buy loans that are still for sale. That’s especially true of the mortgage market, where vertical integration has been most rampant. “In 2000 we’d have maybe five or six groups bidding on a loan sale,” says Commaroto. “Now there are 20 or more. [...] The more bidders, the higher prices can go, and that, of course, can undermine the economics of a securitization. It also means a desk has more chance of not getting enough loans in a timely manner.”

The broad implication of this is that the industrial model that financial firms used to maximize their nonconventional business locked them into the business and rendered executives

less responsive to signs of impending trouble. Even at J.P. Morgan, which adopted a relatively cautious MBS strategy and was a laggard in terms of vertical integration, Gillian Tett documents reluctance amongst top executives to “shut the spigots” of the nascent mortgage pipeline they had worked so hard to build once subprime defaults began to rise (2008, p.123-4). Failure to continue acquiring even highly risky mortgages would mean choking off tightly coupled revenue streams, which for many integrated firms had become the largest chunk of their business. This was exemplified in the famously cavalier quip from Citigroup CEO Charles Prince as the housing bubble began to unravel that “As long as the music is playing, you’ve got to get up and dance. We’re still dancing.” (New York Times, July 10, 2007).

This argument suggests that the industrial mass-production model induced both cognitive and organizational lock-in. Even in the face of declining housing prices in late 2006 and increasing early default rates among nonconventional mortgagees, the industrial conception of control had oriented actors toward expanding production levels. Vertically-integrated firms were either unable or disinclined to extricate themselves and wind down their pipelines. These firms simply had no other way to continue making money. Their entire organizations had been built to feed off of the mortgage boom. This leads us to our second hypothesis:

*Hypothesis 2: Financial firms who were more vertically integrated in the nonconventional mortgage market are more likely to have failed after the market turned down in 2007.*

We know that many of the largest producers increased their own investment holdings of MBS and CDO significantly from 2002-2007 (Acharya and Richardson 2009; Fligstein and Goldstein 2011). But upward trends in total pre-crisis holdings could nonetheless mask adverse selection whereby producers strategically sold off the worst assets to outside investors, especially during the endgame of 2007. One prominent and illustrative case of this occurred at Goldman

Sachs, which used its privileged information about the underlying riskiness of CDOs to bet against them on the investment end while continuing to profit from their production (Lewis, 2010). Individual trading groups at several other MBS/CDO producers, including Bear Stearns and Morgan Stanley, also either tried to short the subprime market or sold instruments which they knew to be toxic. Such duplicitous behavior is consistent with a perverse incentives account.

Given our argument that the industrial model contributed to the crisis by encouraging producers to use their production pipelines to increase their investment holdings, it is worth considering the net effect of the industrial model on firms' investment losses in the wake of the crisis. Globally, accounting write downs on MBS and mortgage-based CDOs investments among large financial firms totaled more than \$315 billion from mid-2007 to mid-2009 (Bloomberg 2010). There were likely several factors at play here, including a widespread belief among high-level executives that hedges in the form of credit default swaps amounted to insurance on default risk. Institutional constraints on short-selling also created a structural tendency toward bullishness, and may have impeded the ability of traders who were skeptical of the subprime market to act (Zuckerman 2010).

Our account suggests that the industrial model may have also played an important role by encouraging the accumulation of vast quantities of super-senior debt, and by inducing lock-in. It is worth noting here that the one firm which successfully shorted the subprime market and emerged from the meltdown least scathed, Goldman Sachs, was also one of the least integrated in MBS production. This was not for lack of involvement in the production side: Goldman was the fourth largest underwriter of mortgage-related CDOs (Bennett-Hart, 2009). But it had achieved this position without constructing an integrated pipeline. Currie (2007) notes the "conspicuous absence" of Goldman from the rush to acquire non-prime originators in 2005 and

2006. We suspect the lack of an industrial pipeline made it easier for such firms to extricate themselves from MBS positions (or for traders to convince managers of the wisdom of such a strategy) insofar as doing so would not undermine other significant pieces of the firm's business.

This leads us to our final hypothesis:

*H3: Banking firms that were more integrated in nonconventional production experienced greater subsequent losses on MBS/CDO investments.*

## **Data and Methods**

We construct three data sets to test each of the three hypotheses above. We assess the effect of vertical integration on subprime MBS quality by modeling the average magnitude of ex post credit downgrades for each firm's MBS B/C tranches issued from 2002 through 2007. Ex post credit downgrades are a commonly used measure to capture the underlying quality of the bonds (Benmelech and Dlugosz 2009; Barnett-Hart 2009). The basic argument is that the revealed quality of the bonds will come out as the number of downgrades will reflect the real default rates of those mortgages. Beginning in mid-2007, the credit ratings agencies "came clean" and began downgrading MBS and CDOs en masse. This measure is calculated by summing the difference (in full letter-grades) between the credit rating at time of issuance and as of May 31, 2009 for each subprime tranche issued by a given firm, and then dividing by the number of subprime tranches issued by the firm that year. Greater values denote more severe overrating, i.e. lower quality relative to the original rating.

The data set in this analysis is comprised of annual firm-level data on for the top 25 subprime (B/C MBS) issuers, which comes from Inside Mortgage Finance (2009). This data is matched to data on the subsequent ratings history of B/C MBS securities issued by these firms,

which was reported by Bloomberg (2009). The unit of analysis is the firm-year. We make no attempt to account for censoring since the top 25 issuers account for over 90% of the market throughout this period. The unit of analysis is the firm-year and the data are gathered for the years 2002-2007. We estimate a fixed effects panel model for the analysis.

The two main independent variables of interest are backward integration by issuers into origination, and forward integration by originators into CDO issuance. We measure these using a dummy variable indicating whether the subprime issuer was also a top-25 firm in subprime origination or a top-10 producer of mortgage-related ABS-CDOs. By coding and hypothesis, the perverse incentives perspective predicts a negative association between integration and downgrade magnitude, while the “markets as politics” thesis predicts a positive association.

The model includes controls for competitive pressures as measured by changes in each issuers' market share, and growth as measured by the rate of change in its volume of B/C MBS issuance. Firms may face pressures to cut corners at various stages of the securitization process as their share of the increasingly competitive market diminishes. They may also be more likely to sacrifice quality as they pursue a strategy of rapid growth in the subprime market. Evidence suggests vertical integration occurred as part of a larger growth strategy, but it is important to understand the effects of integration on bond quality independently of the increasing issuance volume with which it may also be associated.

We include national-level variables on the overall size of the prime and subprime mortgage markets in order to index the overall growth of the mortgage bubble and to capture any effects of shifts in overall mortgage supply. The quality of MBS bonds packaged in a given year may be partly a function of the scarcity of subprime mortgages and alternative mortgage markets

in the preceding year if scarcity spurs firms to become more desperate in seeking out any mortgages they can find.

Finally, the model includes an indicator for whether the issuing firm had been involved in the prime origination market during the preceding year in order to control for the possibility that backwardly integrating subprime issuers experienced declines in bond quality simply because they had no prior experience or capabilities in origination. All covariates are lagged one year to preclude reverse causation.

The data sample for the firm death analysis includes firms that were a top-20 player in any subprime (B/C) business segment (mortgage origination, MBS issuance, MBS underwriting, or servicing) during 2007. This produces 30 firms. Vertical integration is measured by counting the number of vertical segments in which each firm participated, which ranges from one to four. We define firm failures to include distressed merger or takeovers, bankruptcy, or nationalization between July 2007 and July 2009. In all these cases the firm either ceases to exist or undergoes a substantial shift in ownership. Firms that survive through government bailouts or by changing their regulatory status are treated as surviving.

One potential problem with our definition of failure in this case is that many firms who survived only did so through the “exogenous” intervention of government bailouts. We note, however, that this approach is effectively conservative in regards to testing our hypothesis of a positive relationship between vertical integration and firm death. For instance Citigroup, the firm which took the largest losses of all on MBS and which was widely considered the most likely to fail in the absence of the TARP funds, was also one of the most vertically integrated.

The effective firm-level unit of analysis is the parent financial firm. The death of a mortgage or securitization subsidiary is not treated as a death unless the financial parent firm

dies as well. The one exception is in cases where the ultimate parent is primarily a non-financial firm. For instance, although General Motors entered bankruptcy in 2009, we do not code its surviving mortgage subsidiary, GMAC, as failing since the parent firm's failure was not directly related to the mortgage securities meltdown. This coding decision is again conservative in regards to our hypothesis insofar as the surviving GMAC mortgage unit was fully vertically integrated.

The model includes controls for the firm's total volume of business in nonconventional origination, underwriting, issuance, and servicing. We also include measures of the firm's involvement in other mortgage securitization markets like Alt-A since this segment was also a source of significant write-downs. To further control for size and diversification we include dummy variables for a) whether the firm is also a major player in prime mortgage-related markets, and b) whether the firm is one of the 30 largest financial firms in the US market (Compustat total assets). Larger, more diversified firms may have more resources to weather a crisis in the nonconventional unit compared to mortgage finance specialists and/or specifically nonconventional specialists. They were also more likely to be considered "too big to fail" and thereby benefit from government bailouts.

The third empirical test examines the association between firms' cumulative investment losses on MBS/CDOs during the crisis period from Q2-2007 through Q3-2009, and their degree of integration in MBS production preceding the crisis. The firm data sample for this analysis differs considerably from the two above because the aim is to analyze investment losses not only within the population of non-conventional MBS producers, but across a broader set of publicly banking, investment, and securities firms from around the world. Specifically, the data sample includes publicly-traded banking, investment, and securities broker firms with assets over \$10

billion included in the Compustat North America and Compustat Global databases. It does not include insurance companies. This sample comprises a total of 163 firms from 22 countries. Although the sample does not purport to be representative of all MBS investors (several significant classes of investors such as hedge funds, pension funds, and sovereign wealth funds are not included), it does cover the vast majority of large, publicly-traded banking and investment-banking firms that were at the center of the crisis.

Investment losses on MBS assets are measured using accounting data (write downs). Write-down data were acquired from Bloomberg's WDIC database. Bloomberg collected information from financial statements, announcements, and financial news sources in order to track firms' cumulative write downs as a result of the crisis. For the present analysis we include only write downs on assets which were directly tied to mortgages. (This includes the Bloomberg categories RMBS, SUB, CDOs, and “other mortgage related assets”). This means that the DV purposely excludes losses on loan portfolios, investments in other firms, and other non-mortgage-related investments. The rationale for this is to separate direct losses from MBS-related investments from the broader liquidity crisis which they spawned.

One further issue is censoring on the dependent variable. The Bloomberg WDIC database reports losses only for firms with total cumulative asset write downs in excess of \$100 million. Firms included in the Compustat database but omitted from the Bloomberg database are coded as having zero write downs. Of course some censored cases reported as zeros may have small but non-zero losses. But since the study sample is confined to large firms with assets in excess of \$10 billion, this censoring should have little substantive impact (Erkens, Hung and Matos 2011). In all censored cases, losses represent less than 1% of total firm assets.

The dependent variable is measured as the natural logarithm of one plus total mortgage-related write downs over the period Q1.2007-Q4.2009. We take the log in order to compensate for the skewed distribution of losses. Using a scaled ratio measure of (non-logged) write downs-to-assets yields very similar results.

The main explanatory variable of interest is the number of vertical segments of the non-conventional MBS production chain in which the firm was a major (top-20) player during 2005 or 2006. But note that here the measure ranges from 0-4 (rather than 1-4) because the data sample includes MBS investors that were not involved in MBS production. By hypothesis and coding, integration should be positively associated with write downs.

We control for firm size in the model as measured by the logarithm of total assets. Larger firms will obviously tend to experience greater absolute losses. Size also proxies for a host of other firm characteristics which may have contributed to losses on MBS. For instance, larger, less nimble firms may have been less capable of reacting quickly once the market began to unravel and liquidity dried up. Including firm size also helps guard against spurious correlation due to risk-taking incentives associated with the “too big to fail” hypothesis. We include a dummy indicator for whether the firm is foreign- or U.S.-based (foreign subsidiaries are treated as foreign) since geographic proximity to the U.S. market may affect both the degree of involvement in the mortgage industry as well as investment losses. Approximately 56% of the firms in the sample are from outside the United States. Only 10% of the foreign firms in the sample were major players in U.S. MBS production. We also include a cross-product interaction term between log assets and foreign/domestic, as the effect of size may differ for foreign banks.

## **Results**

Table 1 presents the fixed-effects estimates of factors affecting the average magnitude of credit downgrades for subprime MBS issued by a given firm in a given year. Turning first to the control variables, the results provide some marginally significant evidence that firms diluted quality in response to competitive pressures. Each 1% drop in an issuer's market share was associated on average with a .14 letter grade increase in overrating during the following year. Coefficients for the total size of prime and subprime origination sectors show that diminishing quality in the subprime MBS sector tracked the expansion of the market and the decline of the prime sector. This is significant because it shows that the average riskiness of subprime MBS increased even as the aggregate availability of subprime mortgages expanded.

(Table 1 about here)

More importantly for our argument, the results show that the same relationship attains at the firm-level: issuers significantly diminished the quality of their subprime MBS issues after gaining access to mortgages by entering the origination business. Overrating of a firm's AA-AAA securities increased on average by a full letter grade after the firm integrated backwards into origination and began issuing bonds composed of self-originated pools. Models 3 and 4 show that firms' forward integration into CDOs issuance was also associated with a further letter grade increase in the average overrating of its AA and AAA-rated MBS. Taken together, these results provide strong support for hypothesis 1. The regression results suggest the progressive industrialization of non-conventional MBS production played a significant role in propelling the declining quality of subprime MBS that occurred after 2003. This result also provides further evidence against the perverse incentives perspective. Issuers' internalization of the origination function actually propelled the downward slide in subprime MBS quality as firms came to focus on maximizing the quantity of MBS produced.

Hypothesis 2 proposes that those firms which were more vertically integrated would be more likely to fail. To test this thesis, we specify a cross-sectional logit and probit regression to see whether the firm's level of integration in subprime MBS production (measured by number of segments in which it participated circa 2007) heightened the likelihood of subsequent failure. Of the thirty firms who were a top-20 player in any one of subprime issuance, origination, underwriting, or servicing during 2007, twenty died via bankruptcy or forced merger by July 2009.

Table 2 presents results of logit and probit estimations testing hypothesis 2. The degree to which the firm is vertically integrated across nonconventional securitization markets (origination, issuance, underwriting, servicing) as of July 2007 exerts a sizeable and significant effect on the odds of subsequent death. Conditional on the *amount* of business a firm conducts in nonconventional markets, a one unit increase in integration increases the estimated ratio of the odds of dying versus the odds of surviving by a factor of fifty-four in the logit specification. The effect is statistically significant in both the logit and probit estimations despite the small number of observations (n=30). More importantly, the effect attains independently of the magnitude of the firm's stake in each of many mortgage-related businesses. In other words, it is not simply that firms with large stakes in nonconventional markets got hit when the market collapsed, but integration across these markets significantly heightened susceptibility to death. This result - along with the negative effect of backward integration on bond quality offers some evidence that the industrialization of nonconventional securitization was as key to the field's demise as its growth. The firms' who most aggressively pursued this model were the most likely to die.

(Table 2 about here)

The observed positive effect of integration is generally robust to alternative specifications. We experimented with several alternative measures of horizontal diversification within the mortgage finance sector, including total number of market segments and a simple dummy for whether the firm was involved in prime mortgage-related businesses in addition to nonconventional. All produce substantively identical results. We also sought data to control for each firm's degree of leverage, but could only acquire this data for twenty-four of the thirty firms since private mortgage companies are not required to report this information. Supplementary analyses show that a positive effect of integration on failure likelihood attains net of leverage, but we do not report these models since the limitation to a sample of only 24 firms results in low degrees of freedom and unstable parameter estimates.

Hypothesis 3 predicted that the more vertical production segments in which a banking firm was involved, the greater its subsequent investment losses on MBS-related assets. Table 3 shows the regression results for this analysis. The estimates lend strong support to hypothesis 3. The sign on the production segments variable is positive and the magnitude of the effect is quite substantial: across both of the two specifications, a one unit increase in the number of vertical segments in which a firm was a major participant is associated with 146%-164% greater write downs on MBS-related assets.

This result is robust to several alternative specifications. We experimented with additional firm size controls including total firm employment as well as non-logged linear and quadratic parameterizations of assets. These unreported specifications yield similar coefficient estimates for the production segments variable (in the range of 1.4-1.8). Given the zero-inflated distribution of the production segments variable, we also experimented with treating it as categorical rather than interval measure. Consistent with the above result, this approach shows

intercept estimates increasing roughly linearly across the range of production segments in which the firm participated. This implies that the positive effect of production integration on investment losses does not simply reflect a difference between producers and non-producers (zeros versus non-zeros), but that increasing *degrees of integration* in the production side are associated with more substantial investment losses in a log-linear fashion.

### **Discussion and Conclusion**

We began this paper by asking a focused question about the recent financial crisis: why did the banks take on so much risk in the form of mortgage backed securities and why were they so unable to escape those risks once it became clear that the mortgages underlying the bonds were so vulnerable? Our paper provides a clear and coherent answer to that question. The conception of control that came to dominate the largest financial firms in the U.S. produced an industrial model of vertical integration that brought them to mass-produce MBS and CDO in order to make money off of all phases of the securitization process. The “industrial” model was enormously profitable as long as house prices went up and the supply of mortgages was sufficient to feed the pipeline.

But this strategy also sent them on a race to the bottom as they sought to get their hands on as many risky mortgages as possible to feed their securitization machines. The average quality of subprime issuers’ B/C securities declined significantly after they integrated backwards into subprime origination and after they integrated forward into repackaging of MBS into ABS-CDOs. Most of these firms did not exit the market even as house prices began to turn down because their core business model depended on interdependent revenue streams at all phases of the process. We note that our account and empirical findings provide more evidence that the “perverse incentives” explanation of the crisis is wrong. The predictions of this perspective fail

largely because they depart from inaccurate premises; i.e. that financial firms were using an “originate to sell” model throughout the mortgage chain.

One important agenda in terms of future work is to examine more closely the link between the banks and the housing bubble particularly in the subprime part of the market from 2004-2007. Implicit in our argument is the possibility that as banks needed more and more mortgages to feed their vertically integrated structures, they had an impact on housing prices by trying to sell more and more mortgages to people with shakier and shakier credit. While, we have no evidence for this, it is plausible that the need to sell mortgages actually caused part of the bubble.

Some caveats are in order. We have not claimed to offer a general explanation that accounts for all facets of the financial crisis. Instead, we have tried to illuminate at the meso-level how the strategies, structures, and products of financial firms shaped the evolution of the mortgage finance sector, and how the crisis emerged from this industrial configuration. Much work needs to be done to flesh out and synthesize other aspects of this development. We have barely mentioned the role of regulators, deregulation, and government in facilitating the processes we discuss. We have also not considered the role of the credit rating agencies in enabling the rapid expansion of nonconventional MBS and CDO (though this has been dealt with elsewhere, for example see Rona-Tas and Hiss 2010). Finally, we have not discussed the array of financial products including credit default swaps (CDS) which were used as insurance by some financial firms to offset their investment in nonconventional MBS and CDO.

Our findings have both empirical and theoretical implications for the economic sociology of financial markets. Mackenzie (2011) outlines how the new financial products produced by

investment banks, CDO, were used to redefine the MBS business. He views the socio-technical construction and evaluation of esoteric financial instruments that were more abstracted from the basic asset (i.e. mortgages) as core to understanding how the meltdown occurred. Our paper advances MacKenzie's account in several important ways.

First, we locate the growth of the new ABS-CDO instruments in a more general re-orientation of the financial industry towards the mortgage market. MacKenzie's intervention helps us understand how in the late 1990s and early 2000s, the evaluation practices of the CDO business came to connect with the enormous size and productive power of the mortgage business. We show how this linking had a profound effect on the financial industry. It attracted ever more players, particularly the big investment banks, ever-deeper into mortgage finance. Fourteen of the twenty-five largest financial firms in the U.S. were involved by 2007. The shift to the nonconventional market increased profit dramatically. Krippner (2005) shows that in 2003, when almost \$4 trillion of mortgages were financed, the financial sector account for almost 40% of the total profits in the American economy.

Second, we show how the effects of these new technologies derived not just from the technical assumptions embedded in the evaluations of them, but from the way in which their deployment reshaped the MBS production market. As producers integrated forward to produce ABS-CDO, their profitability and growing popularity in turn fed back to heighten demand for ever-more quantities of high-risk, high-yield MBS assets that could be engineered into low-risk, high-yield CDO.

Our results usefully show that integrating ideas from the sociology of finance which focus on financial products and their exchange with notions of firm and market structure from

the sociology of markets can produce more complete explanations of financial market phenomena. The internal organization of financial firms and their modes of competing with each other evolved as their main markets were threatened or collapsed. Financial innovation around mortgages became the central business for most of the largest financial institutions in the U.S. from the mid-1990s on. The borrowing of CDOs from industrial bonds markets as MacKenzie (2011) documents, is the result of investment and commercial banks realizing that financial instruments they were using for one purpose could be applied to entirely new purposes.

We agree that the economic sociology of markets perspective can gain by engaging more seriously with insights from the sociology of finance. Our analysis has sought to begin doing so by considering the effects of new financial technologies, specifically how they interact with conceptions of control to reshape existing markets. But we also think the sociology of finance can gain from the production-oriented focus in sociology of markets. Our analysis shows how firms and production remain both empirically consequential and analytically useful in the context of contemporary financial markets. Financial firms, their conceptions of their main businesses, and their crises and opportunities structure the deployment, and effects of new financial products. Firm strategies also shape organizational linkages between systems of financial production and systems of financial exchange/trading through firms' positioning as both producers and traders of financial instruments. Our results show that the organization of banks' production activities significantly affected their outcomes in investment markets.

We suspect that the erosion of regulatory boundaries between different types of financial market activities since the 1990s has wrought all sorts of complex interconnections between different types of action across multiple arenas of finance. In this context, scholars should be especially weary of separating financial modeling, investment, and trading as a separate realm of

study from firms, industry structures, and production activities. Our intervention points to the need for further efforts to develop a more integrative theoretical framework for the economic sociology of contemporary financial markets.

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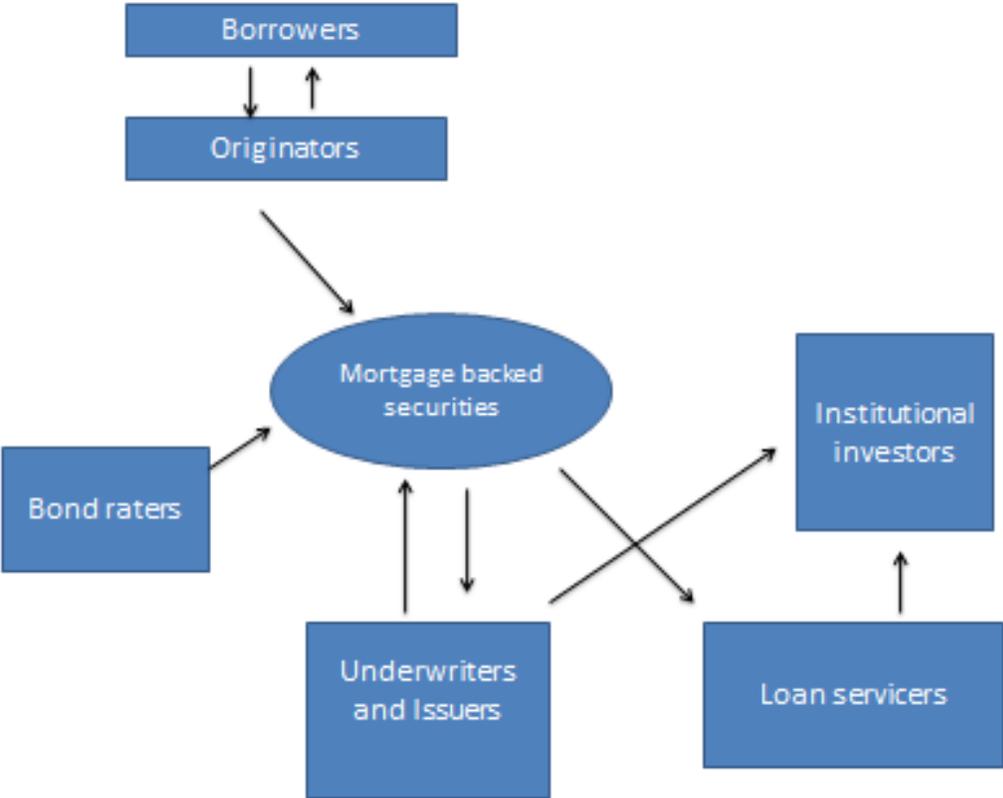
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Figure 1: The role structure of the mortgage securitization industry circa 1990



**Figure 2: Percentage of all originated mortgages that were securitized**

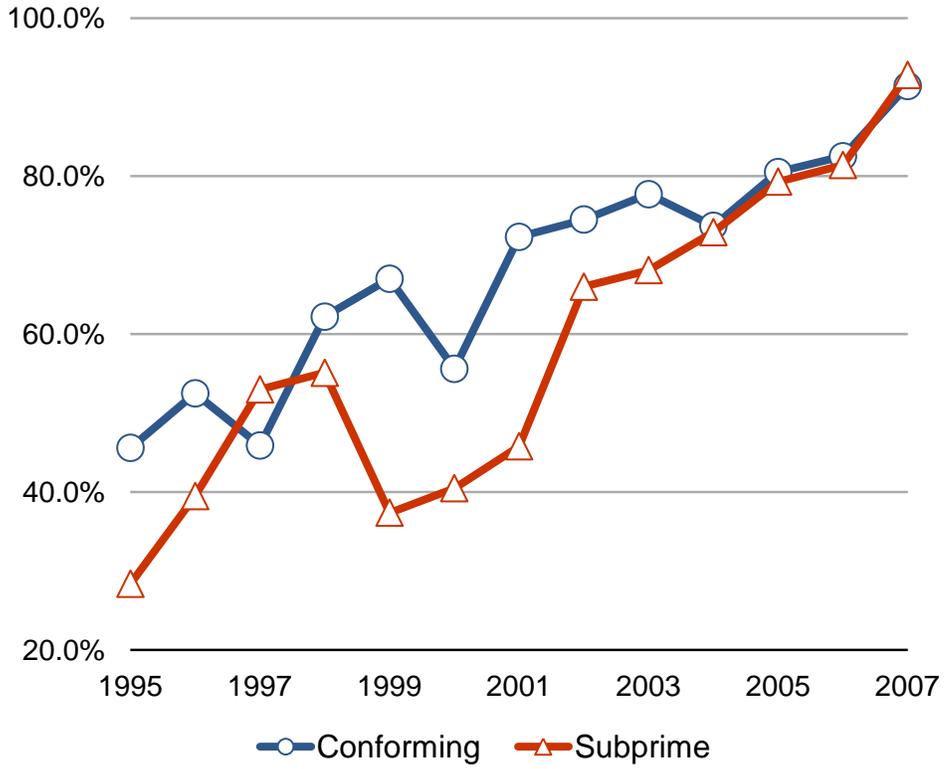
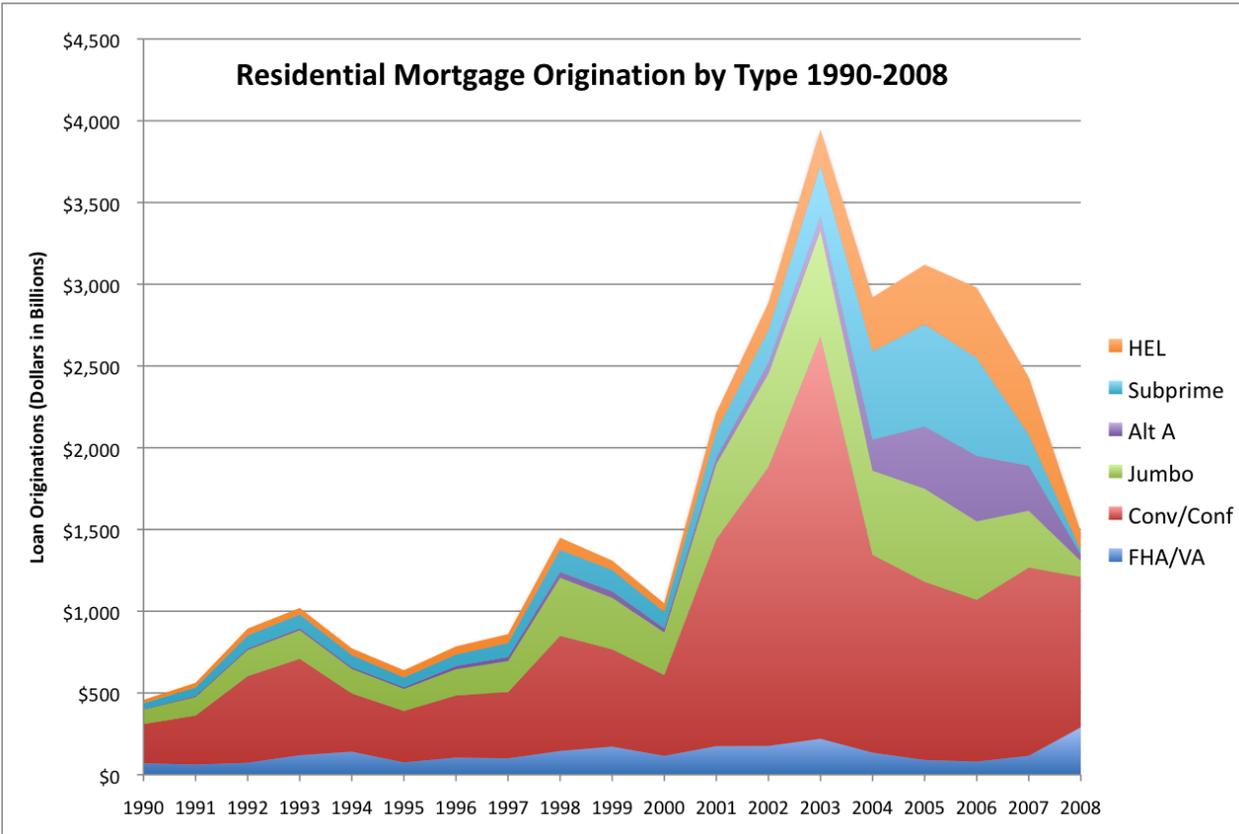
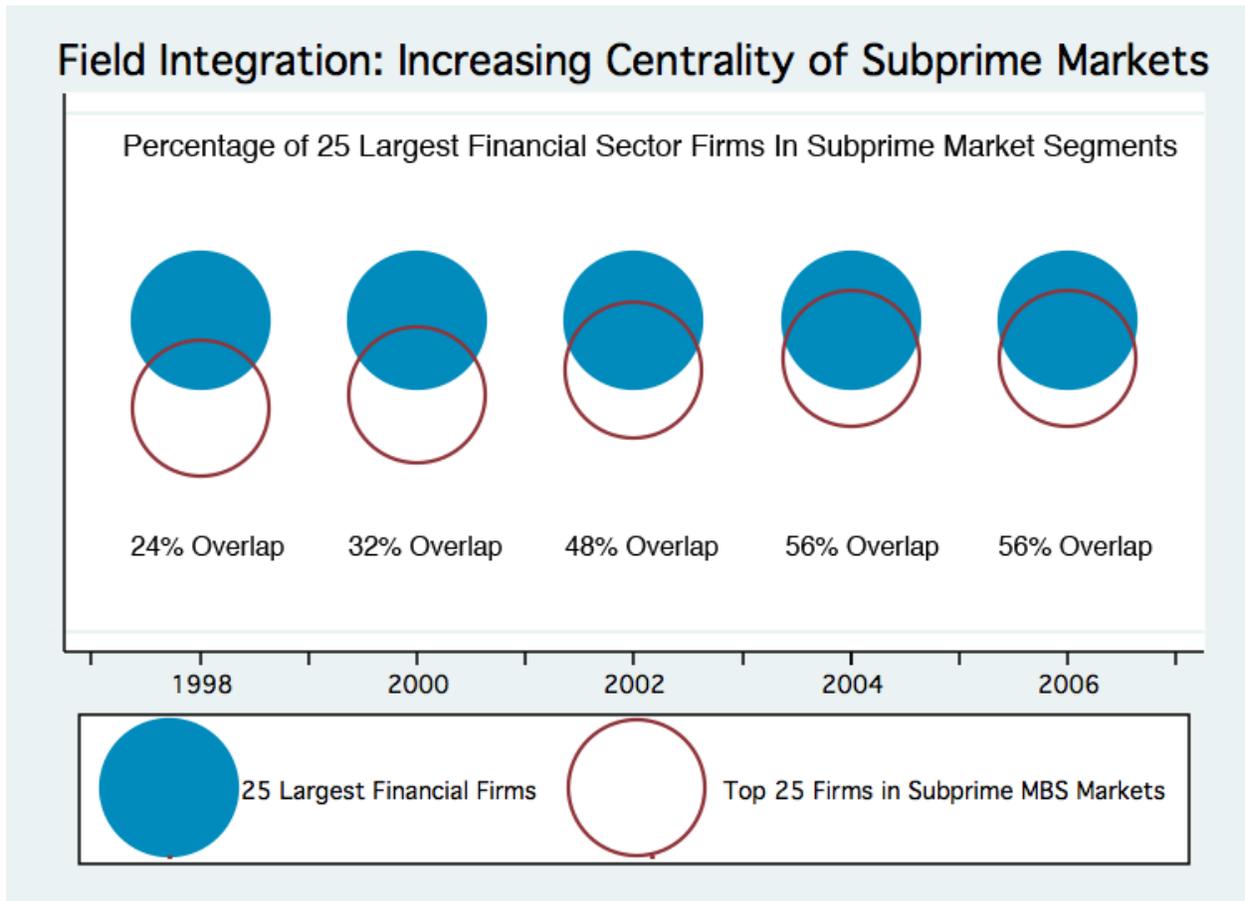


Figure 3:



Source: Fligstein and Goldstein (2010) and Inside Mortgage Finance (2009).

Figure 4:



Source: Compustat (2009) and Inside Mortgage Finance (2009).

Figure 5:

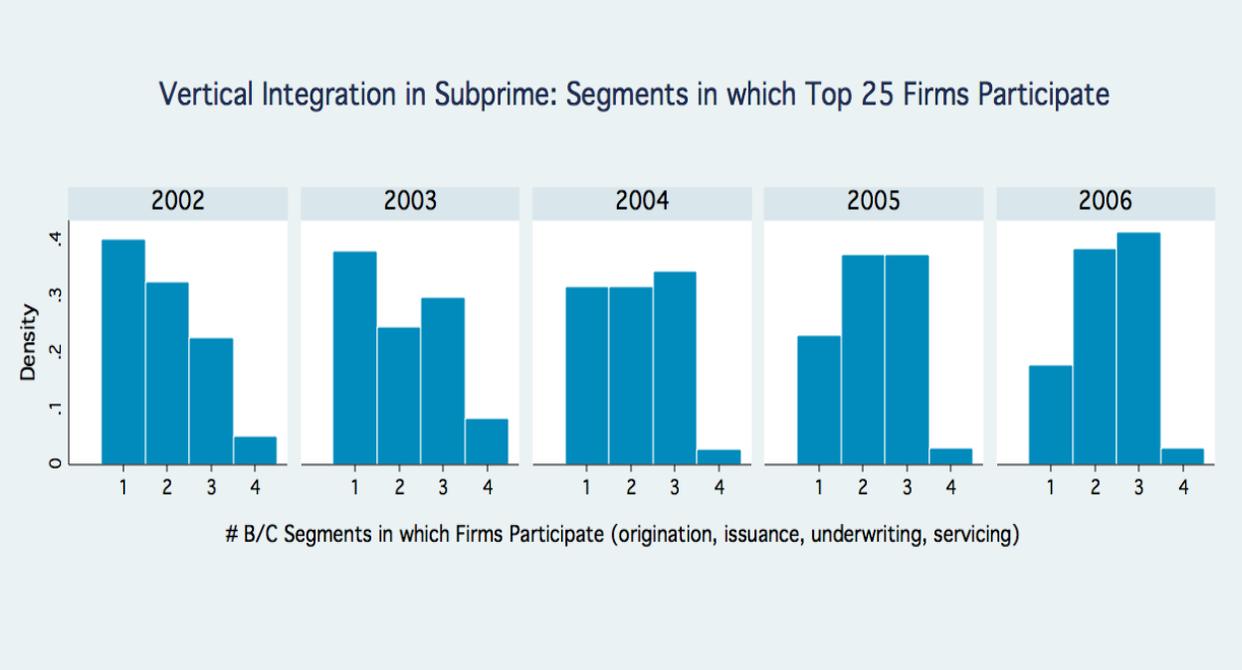
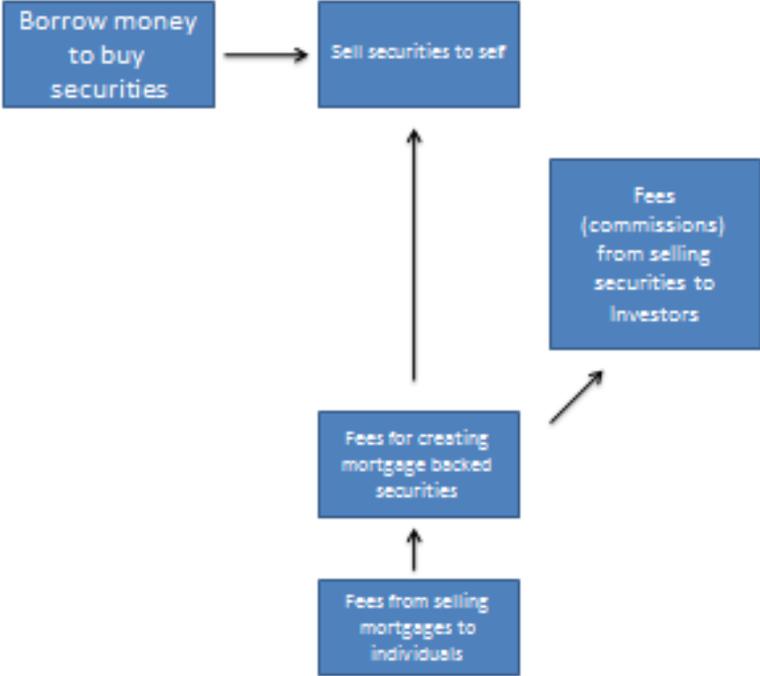


Figure 6: The Industrial Conception of Control



**Table 1: Firm-level Fixed-effects Models of Subprime MBS Overrating: Average Magnitude of Subsequent Credit Downgrades by Issuer**

Variable	1	2	3	4
B/C Issuance Market Share	-9.111 (8.479)	-13.67 (8.522)	-7.995 (8.154)	-12.86 (8.098)
[delta] B/C issuance volume	-0.0000220 (0.0000151)	-0.0000243 (0.0000148)	-0.0000219 (0.0000145)	-0.0000243* (0.0000140)
Total B/C Origination (national)	0.00348*** (0.000946)	0.00315*** (0.000934)	0.00282*** (0.000948)	0.00242** (0.000927)
Total Conventional Origination (national)	-0.000922*** (0.000262)	-0.000989*** (0.000257)	-0.00104*** (0.000256)	-0.00112*** (0.000249)
Subprime Originator (dummy)		1.004** (0.477)		1.089** (0.454)
CDO Issuer (dummy)			0.895** (0.366)	0.954*** (0.352)
Constant	4.021*** (0.591)	3.862*** (0.580)	4.094*** (0.568)	3.927*** (0.551)
Observations	91	91	91	91
Number of Unique Firms	28	28	28	28
R-squared	0.550	0.582	0.592	0.630
Standard errors in parentheses				
*** p<0.01, ** p<0.05, * p<0.1				

**Table 2: Predictors of likelihood of subprime (B/C) MBS producers going out of business or being taken over between 2007 and 2009.**

Maximum Likelihood Estimates of 2-year Firm Death		
	Logit	Probit
Likelihood of Firm Death		
Vertical Integration (subprime segments)	3.990* (2.203)	2.206683** (1.12816)
Subprime Issuance Volume	0.000289 (0.00023)	0.000177 (0.00013)
Alt-A Issuance Volume	0.000124 (0.00016)	0.000074 (0.00009)
Other MRS Issuance Volume	0.000013 (0.000011)	0.000007 (0.00001)
Subprime Deal Underwriting Volume	-0.000170 (0.00016)	-0.000099 (0.00009)
Subprime Origination Volume	0.000453* (0.00027)	0.0002731* (0.00016)
Subprime Servicing Volume	-0.0909 -0.06	-0.052703 (0.03264)
Prime Mortgage Sector Participant (dummy)	-7.089** (3.313)	-3.998805** (1.72829)
Top 30 Financial Sector Firm (dummy)	-4.226 (2.762)	-2.371330 (1.53861)
Constant	-5.830* (3.020)	-3.361902 (1.68235)
Observations	30	30
Standard errors in parentheses		
*** p<0.01, ** p<0.05, * p<0.1 (two-tailed test)		

**Table 3: Regression estimates of effects of MBS production involvement on firms' MBS-related investment losses**

	(log) write down on MBS/CDO	
	(1)	(2)
	-	-
Constant	5.333*** (1.672)	9.650*** (2.68)
Production Segments 2005-2006 (0-4)	1.643*** (0.239)	1.455*** (0.254)
Foreign Headquartered Bank (dummy)	0.604 (0.552)	7.245** (3.287)
(log) Total Assets 2006	0.560*** (0.163)	0.978*** (0.26)
Foreign X Total Assets		-0.603** (0.295)
Observations	163	163
R-squared	0.435	0.449

Standard errors in parentheses \*\*\* p<0.01, \*\* p<0.05, \* p<0.1