

**INDUSTRY CHANGE THROUGH VERTICAL DIS-INTEGRATION:  
HOW AND WHY MARKETS EMERGED IN MORTGAGE BANKING**

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**Abstract**

By providing a theoretical framework that explains *how* and *why* vertical dis-integration happens, this inductive longitudinal analysis of the mortgage banking value chain sheds light on one of the least studied aspects of industry evolution. I find that gains from specialization set off a process of intra-organizational partitioning, which leads to coordination simplification along parts of the value chain; and gains from trade foster inter-firm co-specialization, which leads to information standardization. As a result of standardized information and simplified coordination, new intermediate markets emerge, even in the presence of transactional risks. This breaks up the value chain, allowing new types of industry participants to emerge, thus changing the competitive landscape.

**Keywords:** Vertical Dis-integration; Intermediate Markets; Gains from Trade; Specialization; Evolution

Industry evolution has long been a central concern to management scholars and managers alike. Scholars have studied such facets as the life-cycle of an industry's product and process technology (Abernathy & Utterback, 1978; Klepper, 1997), changes in technology and their impacts on firms' success (Tushman & Anderson, 1987; Henderson & Clark, 1990), and adaptation to changing demands (Winter, 1984; Burgelman, 1991). Yet one aspect of industry evolution that has been relatively neglected by management scholars, despite its great importance, is vertical dis-integration, the emergence of new intermediate markets that divide the previously integrated production process between two different sets of specialized firms in the same industry.

What is particularly interesting about vertical dis-integration is that it often happens even when the underlying products, services, and core technologies remain the same. Thus, while it may be a relatively "invisible" part of industry evolution, it can radically transform the sectors in which it occurs. The automobile sector, once the textbook example of integration, has been on a steady trajectory of vertical dis-integration, with automotive companies giving up parts of the value chain to new specialists and new intermediate markets emerging (Fine & Whitney, 1996; Fine, 1997). Similar trends are evident in semiconductor manufacturing, with the emergence of "fab-less" chip design companies and the corresponding growth of firms that only make, but do not design, their chips (Macher, 1988) and in the biotech sector, with the emergence of specialized research firms, specialized drug testing firms, and so on (Arora, Fosfuri & Gambardella, 2000). The mini-computer and then the personal computer (PC) industries are another example of a sector that witnessed not only technological change but also vertical dis-integration. While mini-computers started off integrated, dominated by companies such as DEC and IBM, they soon opened up, and this process became even more pronounced with the advent of Personal Computers (PC). Far from the integrated structures of pioneers like Apple, PC's today constitute a multitude of segments, including component manufacturers, software and operating system providers, specialized assemblers, re-sellers, consultants who integrate the PCs

into the client companies, etc. (Baldwin & Clark, 2000; Gawer & Cusamano, 2002). Once dis-integration occurred, the nature of the industry, its very definition, and its competitive dynamics were radically transformed, even for the players who chose to remain integrated, keeping all the production processes inside the firm that could now also be done outside it.

Such vertical dis-integration has profound implications. First, it changes the nature of the firms that can participate in an industry. In semi-conductors, for example, the newly available vertically dis-integrated structure enabled engineering firms with no production capabilities or facilities to become significant players. In banking, the fact that data processing became a separate part of the production process, which, through vertical dis-integration could be procured through the market rather than done inside, led firms such as EDS and IBM to become key participants in the financial institutions sector. The nature of capabilities, the types of entrants into an industry, and the structure of competition can all change when dis-integration happens, as the PC industry vividly illustrates (Baldwin & Clark, 2000; Gawer & Cusamano, 2002). To use a biological analogy, vertical dis-integration allows a new, vertically co-specialized ecosystem to compete and partly cooperate with the old, integrated structures, thus altering the landscape for all involved.

Although vertical dis-integration can have profound effects, we know surprisingly little about it beyond what we can garner from anecdotal evidence or from the popular business press (e.g., Evans & Wurster, 1999). The contribution of this paper is to consider *how* as well as *why* dis-integration happens, focusing on the underlying drivers that bring it about.

### **Existing Research on Vertical Dis-integration**

Several strands have indirectly considered vertical dis-integration, although none has really directly focused on it. An exception may be Stigler (1951), who suggested that the extent of specialization (which dis-integration represents) is limited by the size of the market. But while most industrialized countries and most sectors have the requisite scale to support vertical specialization outside the firm, it doesn't always occur. Thus scale is generally not considered to

be a good explanation for dis-integration (see Langlois & Robertson, 1995). There are almost no systematic studies of the emergence of vertical dis-integration, despite substantial research on the social and institutional dynamics of product-category creation (White, 1981; Porac et al., 1995; Carruthers and Babb, 2000), on the social institutions of market exchange in general (Carruthers, 1996; Fligstein, 2001), and research by the new institutional economists who study vertical scope – that is, the amount of value-adding steps in the production process that a firm is active in.

The main reason for the relative dearth of knowledge is that the literature, particularly transaction cost economics (Williamson, 1985, 1999), has largely focused on the analysis of a firm's decision to make versus buy in a given transaction. This level of analysis is below the firm itself and does not look at the entire industry by examining, for example, how markets emerge to create vertical dis-integration. Nevertheless, transaction cost economics may be a useful starting point for understanding vertical dis-integration.

Transaction cost economics focuses on the choices an existing firm makes in deciding whether to make or buy a particular input. If transaction costs (i.e., the costs of using the markets rather than producing in-house) are high, then firms choose to “make” a particular input, thus bypassing the market by integrating. If transaction costs are low, firms rely on the market and “buy”. Transaction costs largely depend on the risk of opportunistic re-negotiation (Williamson, 1985, 1999). The risk for such opportunism emerges when a potential party to a transaction – say, the supplier--needs to make dedicated, long-lasting investments to make that relationship work, which will be valuable in that relationship but not in other contexts. Under such conditions, the party undertaking such “asset-specific” (i.e., relationship-specific) investment may be “held-up” by the buyer, who might have promised to compensate for that investment but will be tempted not to keep that promise. In turn, the supplier, knowing this, is not likely to commit to such a valuable but risky investment (Hart, 1995). As a result, it is impossible to get the benefits of such a specialized investment, except for an iron-clad guarantee of no opportunism, and the main way to achieve this is vertical integration (Williamson, 1985). Thus,

according to this theory, when asset-specificity is high, and hence transaction costs due to opportunism are significant, a firm will be integrated. When it is low, it will not be integrated.

The question of integration on the industry level, however, is not examined in transaction cost economics, nor is the existence of the market as an option on which to rely. Instead, the theory is informed “by the presumption that ‘in the beginning, there were markets’” (Williamson, 1985: 87). It begins with the presumption that the choice of relying on the market exists and explains why firms integrate, bypassing the market. It does not examine how industries evolve and what allows us to ask the question of whether firms *can* “make or buy.” To use a schematic illustration from the computer industry, transaction cost economics can explain why a computer manufacturer may decide to procure a component from the market, or make it in-house; but it cannot explain how the industry changed from consisting of integrated entities, active throughout the value chain, to one in which there is a distinct market for components that the firms can either make or buy (cf. Baldwin & Clark, 2000; 2003). So, given that we know that many industries start off integrated before breaking up into a multitude of co-specialized pieces, linked through the market (cf. Stigler, 1951; Langlois & Robertson, 1995), the lack of a consistent theory and of a corresponding empirical body of evidence examining that process of vertical disintegration leaves both an empirical and a theoretical gap.

Some related research that is pertinent to the analysis of changes in industry scope is work on the historical dimension of transaction costs. Argyres and Liebeskind (1999) and Madhok (2002), for instance, suggested that we have to consider the specificities of firms’ history to understand what drives their choices of scope, but they, too, focus on the individual choices of specific firms that can either make or buy. Silver (1984) and then Langlois (1992, 2003; Langlois & Robertson, 1989, 1995) have argued that transaction costs are dynamic or even transient and hence that they decline over time as potential suppliers and buyers learn to work together. Yet, while all this research has correctly pointed out the need for a historically informed analysis of vertical scope, it has not offered a framework that explains how an industry’s scope evolves—in particular, how

vertical dis-integration happens--nor has it explained why we observe a rapid pace of dis-integration in some settings but not in others.

### **Theoretical Gap and Contribution of this Paper**

This leaves us with an interesting set of opportunities. On the empirical side, it is desirable to better document and explain vertical dis-integration and market creation, as it has significant implications for industries and the firms within them. On the theoretical side, the need to do so becomes particularly important inasmuch as current theory is ill-suited to explaining dis-integration. This may well be the case, for three reasons.

First, existing literature has focused on the individual transaction, as opposed to the changes in the industry that enable a market to appear, but factors that operate on the industry level of analysis are unlikely to be fully reducible to those operating on the individual transaction.

Second, most of the arguments in transaction cost economics are designed to explain why firms abandon the market and opt to integrate instead. One might simply argue that to understand why markets emerge, all we have to do is construct the inverse of the story, using the same factors to explain dis-integration. Yet organizational processes, and in particular processes of institutional change are rarely symmetric. To wit, the theory of organizational growth is not the mirror inverse of a theory of organizational decline (cf. McKinley, 1993); that is, the factors that explain why and how firms grow are *qualitatively different* from the factors that explain why and how firms decline. The causal logic itself may differ in explaining the processes and motivations of growth vs. decline, so that we cannot use theories of growth to fully explain decline, and vice-versa. Likewise, the processes that bring about vertical dis-integration are likely to differ from those that bring about integration: To explain dis-integration we also have to account for what allows for the market to be set up in the first place, and this has not been done by existing literature; neither is it safe to assume that existing theory can be extended to account for it.

Third, most of the existing literature cannot explain how and why transaction costs can be reduced, as it does not focus on the dynamics of the evolution of an industry. Moreover, even in

the limited research on “dynamic transaction costs” (Langlois, 1992), there is no clear analysis of how dis-integration occurs at the industry level, and, more to the point, there is nothing to explain why transaction costs are reduced in some settings and not others. For all these reasons, it seems that we may well obtain new theoretical insights if we study the process of vertical dis-integration without being entirely bound by existing theory.

As a result of these observations, it follows that the best way to understand the emergence of vertical dis-integration is to undertake an inductive analysis, which, while building on existing literature, allows us to glean new analytical insights on how the intermediate markets resulting from dis-integration emerge. To do so, I examined an industry that underwent significant vertical dis-integration, mortgage banking in the U.S. Whereas until the late 1970s mortgage loans were originated, funded, and serviced by integrated financial institutions (banks or savings and loan associations), by the end of the century, the industry had become a collection of vertically co-specialized entities. To understand what drove this vertical dis-integration, I examined the history of the entire industry as it evolved and focused on the emergence of three new markets--three episodes of vertical dis-integration--over a 20-year period. Finally, in addition to studying how these new markets emerged, I also examined *what drove and motivated* this process of vertical dis-integration.

The contribution of this study, then, is two-fold. First, it provides an analysis of the market emergence process, which goes beyond the traditional purview of transaction cost economics, and examines the factors that enable the initial vertical break-up in an industry. Second, it explores the *drivers* of this process: it analyzes *when* and *why* such dis-integration and new market creation comes about. By shifting the level of analysis from the transaction to the industry and the firms within it, this study provides a template that can explain when and why vertical disintegration happens.

As this is an inductive study, I first provide a description of the mortgage banking industry (summarized in Figure 1) and introduce the methods. I then present the induced theoretical

framework and discuss how it relates to existing theory. I conclude by considering the insights offered by this new framing and theoretical approach on the organizational drivers of vertical scope as they affect research and practice alike.

## METHODS AND DATA

### Methods

This paper presents an inductive theory, based on an in-depth, qualitative study of the evolution of the mortgage banking industry. The level of analysis is the entire value chain of one industry. This approach was chosen in order to portray both the process and the context of change along with their interconnections over time (Pettigrew, 1990; Mohr, 1982). As process research, this study focuses on understanding the causal dynamics of a particular setting (Mohr, 1982). The central assumption is that "causation is neither linear nor singular... [hence] explanations of change are bound to be holistic and multifaceted" (Pettigrew, 1990: 269). The causal relations derived here are explained in detail in the main body of the paper and are closely linked to the evidence, so as to allow their internal validity to be assessed (Yin, 1994: 33).

This setting was chosen on conceptual grounds, rather than for representativeness (Miles & Huberman 1994: 27). The aim was to select a setting that would allow isolation of the central concepts pertaining to the research questions. Mortgage banking was thus selected *because* it underwent a process of dis-integration and market creation, and in particular because it witnessed several episodes of vertical specialization. Furthermore, the decision was influenced by the fact that the product / service offered, i.e., the mortgage, had not changed substantially in the period of this study. In other settings that I evaluated (e.g., semiconductors, pharmaceuticals, auto manufacturing), the process of value chain and industry change was often entangled with significant changes in the product provided. Avoiding these complications enabled me to identify the major underlying drivers of market creation for a given production sequence.<sup>1</sup>

This study is based on multiple sources of evidence: archival data, industry publications and manuals, interviews, and direct observation. While it covers a 20-year period of vertical dis-

integration, my direct observation in the field lasted about 38 months. My primary objective was to create an accurate depiction of the evolution of the industry's value chain, something that did not exist when I went to the field.<sup>2</sup> To do so, I used a multitude of sources of evidence--archival data, qualitative evidence, and corroborating quantitative evidence, which was used to create a synthetic map of the industry structure as it evolved.

In terms of data reliability, the study conforms with Yin's (1994: 32) focus on developing construct validity and Guba and Lincoln's (1982) emphasis on confirmability. The theory is built upon representations of phenomena, for which it is essential to ensure accuracy and meaningfulness; that is, the representations must reflect the shared views of industry participants and observers. I used multiple sources of evidence to ensure an accurate representation of the industry's evolution. The archival data were particularly useful in reconciling the diverse views I obtained through my interviews, which are described below. Thus, whenever I encountered a new idea or view, I would put test it against the archival data and reports of the time. If data did not exist, and I had discrepant information, I tried to examine if a particular argument or view was accepted by different constituencies in the mortgage sector. If there was disagreement, I would modify the argument until a reasonable amount of conclusion could be reached and, failing that, would consider it as unsupported. Methodologically, my objective was to ensure I had an accurate depiction of the industry-of *what* had happened--and to provide an interpretation, through inductive theorizing, of what brought about dis-integration.

In keeping with inductive, case-based research (Pettigrew, 1990), while I did come with theoretical constructs in mind when approaching the field, I did not impose them. Instead, I considered how this detailed evidence might inform existing theory or constructs, such as transaction costs. To do so, I examined how the data informed my understanding of (a) the vertical dis-integration and market creation process and (b) what motivates and drives it. Then, with the emerging theoretical framework, I reconsidered the data and clarified particular issues, which led me to refine my theory development, and so on. As my theory developed, I would

communicate it with key industry participants, and in particular with the chief economist of the Mortgage Bankers Association, with whom I worked closely in the project. Thus, I used an iterative process of theory development and data analysis (cf. Eisenhardt, 1989, 1991) that led to the framework proposed in this paper. The process of discovery and then validation of my framework is described in the next section and is summarized in Table 2.

As the evidence is historical, archival evidence was given due attention. The archival data I used included industry manuals, the full set of the monthly publication *Mortgage Banking* from 1968 onwards, the manuals for the School of Mortgage Banking (see Lederman, 1985, 1995), all mortgage-related bulletins of the Federal Reserve, earlier studies of the industry (e.g., Tuchman, 1986), annual reports of major institutions, regulations and congressional acts related to the sector, all academic research on the sector that I could locate, analysts' reports (especially from *Morgan Stanley*, which covers the sector extensively), and other material described below. I also gathered industry statistics and demographics, especially from the Housing Mortgage Disclosure Act (HMDA) database of the Department of Housing and Urban Development, the industry reports of the Mortgage Bankers Association (including the annual *Cost* and *Servicing* studies), and data from private consultancies, such as *Inside Mortgage Finance* and *Wholesale Access*, as well as confidential data assembled by two consultancies.

### **Data Collection**

The study was underwritten by the Mortgage Bankers Association of America (MBAA) and a Research Center sponsored by the Sloan Foundation. It lasted 38 months and proceeded in three stages; Table 1 summarizes the evidence examined, analyzed and used in these three stages.

The first stage of the research took place between August and December 1998 and focused on identifying the key industry participants and getting a good idea of the industry and its evolving structure. I conducted 18 interviews with industry regulators and oversight agencies (such as the Department of Housing and Urban Development and the Office of Federal Housing Enterprise Oversight), as well as the major government-sponsored securitizers (Fannie Mae, Freddie Mac, and Ginnie Mae). These were followed by 32 semi-structured interviews with executives who

had been in the field for a long time and who were able to provide an overview of the sector and its evolution. The evidence was complemented with documents from secondary sources, including the few existing historical studies and descriptions of the sector, and trade publications. During this stage I also participated in the 1998 MBAA National Convention.

The second stage of the fieldwork and archival research was conducted between January 1999 and April 2000. During this period, I delved more deeply into the history of the sector to explore in more detail the specifics of the evolution of the sector, in terms of its products, technology, players, and industry structure. The ongoing support of MBAA proved particularly helpful at this stage, as it provided me with critical contacts and in-house data. I first attended a two-week course for mortgage executives who are either from non-U.S. countries or who are new to the sector; this enabled me to further familiarize myself with the way the industry is organized in the U.S. and abroad. I then conducted 84 semi-structured interviews with industry participants and consulted a large number of articles and manuals, as well as all the published historical accounts of the sector. In this stage, I attended the 1999 MBAA National Convention and two more industry meetings, where I interacted formally and informally with industry participants. I was also allowed to sit in on three industry roundtables organized by the MBAA. Based on the evidence collected during the first two stages, I created a preliminary map of the industry and its evolution, which was checked by the chief economist of the MBAA.

The third stage of the research project, conducted between May 2000 and November 2001, focused on solidifying the view of the industry and its evolution, as well as resolving any remaining discrepancies and complementing the field evidence. I conducted 27 interviews with MBAA senior executives and mortgage bankers. I also conducted follow-up interviews with many informants and had numerous phone calls and short discussions to confirm information and fill in gaps. I also communicated the basic findings of the research and received extensive feedback on the validity and accuracy of my description. This culminated in an industry publication, circulated to several executives ahead of time to solicit their input.

Throughout the study, I selected interviewees so as to maximize the variety of profiles and heterogeneity of perspectives in the industry. I chose respondents from different sized firms, from firms with vastly different strategies and scope, and with different roles (technology, origination, servicing, and so forth). I selected several participants who were not mortgage bankers but were service or technology providers, analysts, regulators, or consultants. The level of seniority also varied, although few interviewees had less than five years of experience in the industry; Figures 2 and 3 provide summary statistics of the interviewees for all three stages. The focus of the discussion depended on the profile of the individual, and I concentrated on the respondents' fields of expertise and activity, except when they volunteered to provide their broader assessment.<sup>3</sup> Major issues and threads that emerged in the interviews were incorporated in subsequent interviews. I undertook all of the interviews. Some, but not all the interviews were taped, as the interviewees were often uncomfortable with tape-recordings. For interviews that were not recorded and transcribed, I kept notes, which I consulted again after the interview and as I was preparing the account of the industry evolution. Finally, because interviewees were concerned about maintaining anonymity, I sometimes use published sources for quotations, rather than primary evidence, to support my conclusions.

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### **The Setting: Mortgage Banking and the Genesis of Three Sets of Intermediate Markets**

A mortgage is a loan collateralized by real estate. To make such a loan possible, a lender, as a conduit for those with excess funds, must be able to find a borrower who needs a mortgage. Roughly speaking, to make a mortgage possible, either one integrated firm or a series of vertically co-specialized firms linked through the market must ensure that the following happens: (a) lenders with excess funds are found; (b) borrowers willing to take a loan are found and steered to the appropriate loan type; (c) borrowers are analyzed for their credit-worthiness, the value of their collateral, etc., and are guided through the paperwork associated with the mortgage--ensuring titles, deeds, and all other legal requirements are taken care of; (d) the loan is

closed, and the transaction consummated and recorded; (e) the loan is serviced for the duration of its length, which means receiving payments from the borrower and managing the account until it is paid off or, alternatively, engaging in foreclosure if necessary; and (f) payments are made to the lenders or other providers of capital.

These six different functions were originally performed in integrated institutions, in particular, in retail banks, which maintained mortgage loans, or savings and loan associations (S&Ls), which focused more on mortgages. For both of these integrated types of firms, liquidity was largely provided by the short-term deposits of retail customers. On the basis of the liquidity created by deposits or through the corporate lending these institutions would engage in, the loans would be funded (Fabozzi & Modigliani, 1992; Lederman, 1985). Banks and S&Ls also sought out the mortgage loan applicants; they would prepare and process applications, and they would service the loans until they expired. This was the earlier, integrated version of the industry.

Mortgage banking, though, started vertically dis-integrating, creating new markets, from the early 1970's onwards. The same functions noted above started being performed by specialized institutions, each with a narrow vertical scope. While the functions and the basic steps in the production process of a loan did not change, the vertical structure of the industry did. With it, the types of industry participants and the nature of competition also changed. By the mid-1990's, each function could be performed by a vertical specialist: finding mortgage borrowers and steering them to the appropriate loan was done by new specialists, called mortgage brokers. Mortgage banks, in turn, would focus on closing (finalizing) loans, funding them, and then servicing them. They held no deposits, nor did they seek funding for the loans through the capital markets. Instead, they would "warehouse" the loan until they could sell the underlying asset (the mortgage loan itself) to new specialists, the "securitizers," who would then take it upon themselves to find the lenders to fund these loans. To fund the loans, mortgage banks would use lines of credit, i.e. working capital which was obtained from commercial banks so as to enable the warehousing of the loans until they were sold to securitizers. Then, securitizers, having purchased individual loans from several different mortgage banks, would bundle loans together

and then turn them into securities (unknown to the borrowers whose loans were being securitized) and sell these Mortgage-Backed Securities to the capital markets, earning fees on the securities they produced (Fabozzi & Modigliani, 1992). Later, some specialized mortgage banks focused more on servicing, others on originating loans. This stunning vertical specialization, depicted in Figure 1, meant that new intermediate markets had arisen to accommodate inter-firm trade: Mortgage brokers would sell their loan leads to mortgage banks; mortgage banks would sell the assets (the funded loans), to the securitizers, while retaining the right to service the loans; and later, some mortgage banks would even trade the right to service a particular loan.

More specifically, between 1970 and 1990, there were three major, distinct episodes of vertical dis-integration. The first one was securitization; the second one was the creation of the mortgage broker segment; and the third one was the creation of the market for servicing rights. Each of these episodes consists of the creation of an entirely different market, in a different part of the value chain, each with its own set of vertically co-specialized buyers and sellers; so the analysis of this industry rests on three, rather than one, instance of vertical dis-integration, as Figure 1 indicates. A brief explanation of each episode follows below.

*Episode I: Loan Ownership and Loan Origination & Servicing Are Separated.* The first episode of dis-integration in the industry was securitization, which enabled the growth of mortgage banks (i.e., non-depository financial institutions.) Although mortgage banks existed prior to securitization, their role was different, their scope limited, and their market share very small. They were used either by the government or by insurance companies to generate and service mortgage loans that were held on the books of insurance companies or the government (which wanted to subsidize particular needy groups), respectively. The big change in the housing finance industry happened at the end of the 1960's and the early 1970's. As a result of shortages in housing finance, especially in the quickly developing "Sunbelt" (Florida, Texas, and California), the government considered supporting an additional means of providing housing finance. Limits in the federal budget made it attractive to rely on capital markets, as opposed to

government funds, to support the availability of housing finance (Lederman, 1985; Tuchman, 1986). Thus, by 1970, the U.S. created three government-sponsored enterprises (GSEs) to facilitate the provision of mortgage finance. In 1972, one of these agencies, Ginnie Mae, created the “mortgage-backed security” – that is, it created a pool of loans, sold shares in these pools, and insured the pool against default (a default would be treated as a prepayment). These loans were issued and serviced according to particular criteria, on behalf of the GSEs, by mortgage bankers. So securitizers would specify in broad terms what loan bundles they wanted; they would then buy them from mortgage bankers; and then they would package the loans they had bought into bundles and sell these bundles to the capital markets. Thus, an alternative mode to the integrated S&Ls or banks came about, which relied on the capital market for funds, on the securitizers for access to funds and a relationship with the lenders, and on the mortgage bankers for the origination of the loans, their servicing, and the payment to securitizers (Fabozzi & Modigliani, 1992; Baldwin & Esty, 1993).

The government, having set up the GSEs, soon reduced its involvement, providing a public company charter to the GSE’s, and listing Fannie to the NYSE (1970 to 1972). While the initial loans GSE’s securitized were government-sponsored loans of the Federal Housing and Veteran Authorities, from 1972 onwards the GSE’s focused on loans made by mortgage banks, which were *not* part of any government initiative (*Fannie Mae*, 1992). The market had taken off, with the GSEs competing with other securitizers (especially Salomon Brothers and First Boston). It is important to note that the government’s intervention was limited and largely focused on the creation of the template that enabled the market to emerge (Tuchman, 1986; *HUD*, 1996). Once that template was set, this dis-integrated ecosystem took off, as shown in Figure 4, which shows the growth of the mortgage bank-cum-securitizer model through the growth of securitized loans. In this particular episode, then, the U.S. government was *market-augmenting*, to use Olson’s (2000) term. Its initiative and resulting regulatory framework enabled a new market between private firms to take off, and as such prompted the emergence of a new mode of organizing.

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*Episode II: Loan Origination Becomes Separated into Brokerage and Warehousing.* The next instance of vertical dis-integration happened within mortgage banks themselves, with *no* intervention from government. Whereas until the 1980's, mortgage banks always generated their own loans, this soon changed. A new, vertically specialized segment emerged--mortgage brokers, who would seek, qualify, and educate customers and prepare mortgage loans. They would then sell the mortgage loan applications to the mortgage banks; mortgage banks could stop worrying about seeking customers and focus on selecting loans, keeping them until they were sold to the securitizers (a process known as warehousing), and then service the loans.

The new mortgage broker segment (and the corresponding intermediate market) partly grew as a result of the recession of 1979-81, when banks laid off loan origination staff but maintained some flexible arrangements with the former employees. When the business cycle improved, in 1982, these arrangements became more permanent (Garrett, 1989). A newly independent segment of brokers, generally former loan officers who would identify a loan customer and prepare the "loan lead," started formally transacting with banks. As this segment grew, a number of mortgage banks began reducing their in-house origination staff and using the market to procure the loans, restricting themselves to the wholesale side of the business. By 1997, the share of this market-based arrangement between mortgage bankers and the new species of brokers had reached 63% of the total volume of loans produced (LaMalfa, 1999), as Figure 5 shows.

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*Episode III: Loan Servicing Becomes Separated from Origination.* In the final episode of market creation, servicing was separated from origination, through the market for mortgage servicing rights. Until the late 1980's, mortgage banks originated a loan, sold the asset to the securitizers, and retained the servicing of the loan, which brought in valuable servicing fees, and there were only a few sporadic purchases of mortgage loan portfolios and no real specialization in servicing or origination. The step-change toward the creation of the market began in 1989,

when the Resolution Trust Corporation (*RTC*, 1992) started selling the loans, as well as the servicing rights of the thrifts that had failed due to adverse economic conditions (Baldwin & Esty, 1993). To do so, the RTC had to find a way of pricing servicing rights, which it did. After these emergency sales were finished, however, the sales of mortgage servicing rights did not stop: as the template for a market exchange had been set up, firms that wanted to specialize vertically and become mostly originators or mostly servicers used that market to do so.

As a result of the first episode of market creation, mortgage banks, i.e., the non-depository institutions that rely on securitizers to generate loans, managed to challenge the vertically integrated banks and S&Ls. As a result of the second and third episodes of market creation, even mortgage banks *themselves* dis-integrated. This transformed mortgage banking. To put it in the words of a seasoned industry executive, in a feature article in the main industry publication:

“The question begs to be asked: “Are there any ‘real’ mortgage bankers left?” The term ‘mortgage banker’ has, until recent years, referred to ... a fully integrated loan origination company... This scenario sounds like ancient history today... Loan origination has shifted to the small mortgage company or loan brokerage... [Servicing also became separated from origination and thus] CEO’s look at servicing growth as just a “make or buy” decision”. (Jacobs, 1993: 23-4).

Despite dis-integration of the value chain in mortgage banking, however, the product remained roughly the same, and the sequence of activities needing to be done did not change dramatically. This ensures that we can isolate the theoretical issue at hand – that is, the changes in the division of labor within a given industry, for a given sequence, *between different institutional arrangements* without the possible confounding effects from product innovation or other structural change. Also, the appearance of intermediate markets does not mean that *all* of the activities that used to be coordinated through integrated firms were now coordinated through markets, though some were. In the mortgage banking industry, the battle between different ecosystems – i.e., between the co-specialized, market-mediated mortgage banking-cum-securitizers’ world and the integrated, traditional world of S&Ls and lending banks – has gone on for a long time. The remainder of this paper focuses on what enabled the new, vertically specialized ecosystem to come about in the first place.

## RESULTS: AN INDUCTIVE THEORY OF MARKET EMERGENCE

In analyzing the case evidence during Stage 2 of the project, I considered whether some of the established theoretical constructs at hand, such as opportunism and asset specificity, were useful predictors of market creation, but the evidence did not point to a significant reduction in asset specificity, at least not to an extent that could justify the extensive creation of markets. Consider, for instance, the first market creation, securitization. There were no real issues of hold-up or co-specialization that were resolved over time. If anything, the mortgage banks currently face huge risks, as their entire operations depend on only two major players (and a handful of smaller ones) who “set the rules” and can in theory opportunistically renegotiate, leaving the vertically co-dependent mortgage banks with few alternatives. What is even more puzzling from a transaction cost economics perspective is that most of the mortgage banking firms usually work with only one of these securitizers, thus creating real dependencies. So the new, securitized system appears to create greater, not lesser potential for transaction costs along the same value chain, and this makes the emergence of markets harder to explain.

A second puzzle is that, as Eccles and White (1986) note, integration does not always resolve the problems of opportunism. For instance, when asked about the dangers of using the market (brokers as opposed to in-house retail branches), a senior vice president of a mortgage bank said,

I don't think this is a major issue. Don't get me wrong—you do get these lemons you talked about everywhere. But I don't think you would choose how to procure your loans on the basis of default risk or fraud. You could have bad apples in your own retail branches—loan officers who make a killing and then go—as you could have greedy brokers or untrustworthy correspondents. I guess that if you trust fly-by-night brokers you can get in trouble, but you can monitor these things.

This might be interpreted as a result of all problems of hold-up having been mitigated in across-firm relationships. Yet I did not find much direct or indirect evidence for reductions in asset specificity or opportunistic behavior. This did *not* imply that I discarded transaction costs; but it did prompt a wider reach for other related explanations, especially because of potential asymmetries between the drivers of integration (given the existence of a market) and the drivers of dis-integration, when the market does not exist and needs to emerge.

Through the iteration of data and theory described in the previous section, I developed my model, summarized in Figure 6, which considers how markets emerge, and what motivates this process. Specifically, I argue that there exist two *motivating factors* which ultimately drive dis-integration: First, gains from specialization, which result when there are differences in the requisite managerial styles or knowledge bases along the value chain (e.g. retail loan production vs. loan warehousing); and second, latent gains from trade, which emerge whenever there are capability differences between specific firms in an industry, or when firms can only grow only one part of the value chain, making the reliance on the market desirable. These motivating factors, in turn, put in motion two respective *enabling processes*: Inasmuch as there are gains from specialization, firms engage in intra-organizational partitioning- that is, they create clear administrative separations along the value chain. Likewise, inasmuch as there are gains from trade, firms engage in a process of vertical co-specialization- that is, they try to seek out ways to reduce transaction costs, and find templates for exchange across firm boundaries. As a result of these two processes, the market emerges when two *necessary conditions* are met: On the one hand, when coordination along different parts of the value chain is simplified, as task interdependence is reduced; and on the other hand, when information becomes standardized, i.e. when it becomes simple, transmissible, and universally understood.

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Insert Figure 6 and Table 2 about here

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Figure 6 summarizes the argument, and Table 2 provides an overview of the process of discovery of the different elements of the framework I induced. It ties in the specific factors mentioned in Figure 6 with the sources I used to initially detect or validate my analysis, as well as the research stage in which I found the initial evidence for, and then the validation of, each of these factors. In the remainder of this section, I consider each of the induced factors, starting from the analysis of the necessary conditions; I then move to the discussion of the enabling processes; and I finally look at what motivates the process of vertical dis-integration. In terms of Figure 6, I move from the top to the bottom, at each stage going deeper in the chain of causation.

I thus gradually shift the focus of the analysis from the question of how vertical dis-integration happens, to why it happens.

**Necessary Conditions: Coordination Simplification and Information Standardization**

*Coordination Simplification: Evidence.* In all three episodes, the market only emerged after coordination was simplified – that is, when task interdependence between the different stages in the production process was reduced (cf. Thompson, 1967). In the first episode, securitization became possible when holding the loan did not have to interfere with originating or servicing that loan. In the second episode, the creation of a separate segment of originating brokers became possible when the production and warehousing of loans became sequentially--rather than reciprocally--interdependent. In the third episode, the market for servicing rights, which enabled servicing and origination to be separated, took place when the origination and the servicing process ceased to have tight connections.

Securitization, i.e. the separation of the ownership of the asset from its origination and servicing, would not have been possible without the arrangements that enabled each of the parts to operate in isolation from the others. The key to making securitization work was to create a structure such that the mortgagees would not know who really owned the loan; they would be dealing with the mortgage bank that originated it. Indeed, many of the readers of this paper may not know their mortgage is really held by a smattering of financial institutions around the globe. Likewise, owners of the asset do not have any idea of the specific details of the loans they own. More important, the securitizer does not have to coordinate with the mortgage bank on anything more than receiving the payments from the loans at the pre-specified intervals; the obligations, in case of foreclosure, are well defined *ex ante*; there is no need for any communication about the loan among the originator/servicer, securitizer, and the owner (Follain & Zorn, 1990). Consider loan foreclosure: Securitization only became possible when an effective arrangement was made that gave the mortgage bank an incentive to execute unsupervised, effective foreclosures, and the holder of the asset (the ultimate loan holder who has the securitized loan) did not have to worry

about when or how foreclosure would actually occur (as this became formalized in the US *Universal Commercial Code*, Article 9).<sup>4</sup> Without a structure to minimize the requisite coordination among all these parties, vertical dis-integration would have been very difficult.

In the creation of the banker-broker market, simplification of coordination was also evident. Before the mid-1970s, the processes of seeking out customers and warehousing the loan (i.e., preparing it for sale to the secondary market) were tightly integrated, as mortgage banks were keen to originate only the loans they knew they could sell at a profit to securitizers. From the late 1970's on, however, securitizers introduced optional delivery schemes. These were intended to get business for the securitizers offering them, yet they also changed the production process, as industry handbooks suggest (Lederman, 1985, 1995). As an executive I interviewed explained,

What you had to avoid [in the old days] was to be stuck with product the market would not want, because you would have to kill it [incur a loss when selling or use valuable and scarce capital if holding it on your books]. On the other hand, if you had an agreed delivery [of closed loans, to an investor], you had to procure all these loans.... The result was that you were on the heels of your production guys to fill your quotas. It would distort your pricing, and you'd have to ensure they were delivering what you wanted or had agreed to.... Now with flexible delivery, you could set your sales guys loose, provided they knew what were the limits they had. It was easier to manage, and you could also use leads coming from outside. It made your life easier as you could focus separately on each piece of the business without worrying about the other.

Such innovations decreased the coupling between origination and warehousing by reducing interactions between the two tasks. If a mortgage banker produced more loans than anticipated, the company need not worry about not being able to sell them to an investor; the flexible arrangements alleviated this concern. Thus, a part of the company could just focus on origination without having to worry about the next step in the value chain – in other words, interdependence became sequential (Thompson, 1967). The availability of larger and more flexible lines of credit from commercial banks had similar effects: it enabled mortgage bankers to construct a buffer between origination and warehousing, reducing task interdependence.

The reduction in coordination difficulties was facilitated by changes in information and communication technology (Schneider, 1994). Cheaply faxing interest rate sheets en masse

every morning to the broker network made real-time loan procurement effective; and the enterprise information systems made it easier for bankers to coordinate effectively with brokers (MSDW, 2000), especially with the advent of automated underwriting (Foster, 1997). Managing brokers became only marginally more complicated than managing the in-house retail production network (Lebowitz, 1995). As an executive put it:

“Nowadays you can buy the product as easily from any source... it used to be easier to rely on your in-house people... but nowadays the systems make managing the brokers just as easy, so you look to all your potential channels.”

A similar pattern underlay the development of the market for servicing rights. In the early days of the industry, the activity of servicing a loan was part and parcel of an integrated process, but in the 1980's, the idea of integration started fading away (Garret, 1993). One reason was that servicing became more dependent on computerized systems that stored information than on the unarticulated knowledge of the loan officer in the branch that originated the loan (Thinakal, 2001), thus obviating the need to be integrated. As a senior VP of a bank noted,

“sure, you have these local shops, and they wax lyrical about their being integrated and all. But I really don't see why you should bundle servicing with origination anymore. I mean, what's the point? The only value I can see is the emotional link between the customer and the originating bank, in terms of cross-selling, and that ain't high. Perhaps it was different before, when you didn't have computer systems and the rest of it, but things changed in the 1990's.”

*Coordination Simplification: Theory.* The first condition that needs to be satisfied for a market to emerge, then, is for the coordination between the adjoining stages of the value chain to be simplified; if this does not occur, then it remains impossible to use an outside party. In the presence of reciprocal or pooled interdependence (Thompson, 1967), it is very hard to enable an activity to be located outside the boundaries of a firm. As Van de Ven (1976), Nadler and Tushman (1978), Gulati and Singh (1998), and Puranam and Singh (2000) have demonstrated, activities that require tight coordination demand the use of mechanisms that a firm can deploy: committees, meetings, or other authority or coordination devices that market-based relations largely lack (Kogut & Zander, 1996; Langlois, 2003). This may also be why Richardson (1972), Teece (1976: 13), and Langlois and Robertson (1989, 1995) argued that integration is needed to

manage a tightly coordinated system. So for the market to be feasible, interactions along the value chain must be minimized; production must become modularized (Baldwin & Clark, 2003).

*Standardization of Information: Evidence.* For dis-integration to occur, however, one more necessary condition must be met: Information must become standardized, i.e. become universally understandable, and easily specified. This happened in all three of the market creation episodes.

In the case of securitization, what enabled the securitizers to sell loan bundles to the capital markets, and what enabled buyers to raise the capital to buy them, was that they standardized the information on these loans (Passmore & Sparks, 1996). This made it possible for the buyers to understand what the securitizers were selling. As a market analyst said in 1986, “Market value was small, that’s where Salomon Brothers came in. They standardized the loans and made them fungible” (an executive of E.F. Hutton, quoted in Tuchman, 1986: 34).

The information standardization that played a role in making securitization possible consisted of two elements: Standardization in the loan characteristics, i.e. homogeneity in terms of loans, and how loans were documented and supported; and second, standardization of the underlying customer / creditworthiness information (i.e. universally understandable and assessable attributes that can describe the loan applicant, the security, and thus the risk the loan entails).

First, loans were standardized in terms of types. A key ingredient of the success in the initial development of the market was that "residential mortgages were quite homogeneous in terms of their design, terms, and underwriting standards” (Vandel, 2000: 1). Indeed, a driver for the vertical dis-integration process in this industry was the increasing share of loans with simpler and more tractable characteristics – initially, the relatively standardized 15- and 30-year fixed-rate mortgages (Lederman, 1985).

Such product standardization also helped vertical dis-integration within the origination process (i.e. the broker-banker split) and between origination and servicing, through the market for servicing rights. Earlier mortgages all had their own attributes and differing term structures, so transferring them from one financial institution to another, in terms of servicing rights or

brokered loans to be warehoused, was simply too complicated. However, for fixed-rate mortgages with set 15- or 30-year terms, with broadly similar characteristics, many of these problems disappeared, and specialization became plausible (Aldrich et al. 2001).

The role of standardization in dis-integration can also be inferred by the fact that even today, integrated institutions specialize in the more complicated adjustable rate mortgages or other loans with unusual clauses or structures. Because these loans are harder to procure from outside brokers, they are produced in-house; their servicing rights are harder to sell to another party, so they are serviced in-house; and finally they are harder to securitize, which is why integrated firms such as S&Ls focus on these unusual loans (Garrett, 1993).<sup>5</sup>

Standardization of the product was also important because it meant that information needed for any potential transaction could be standardized. First, in order for securitizers to be able to sell their loans, uniform production standards (such as common underwriting procedures) had to be devised. Second, along with standardization in terms of product came standardization of the process – in terms of the interface between buyer and seller. So the initial involvement of securitizers in the industry helped by providing a template of loan origination:

Each thrift [had] evolved its own mortgage contract forms, documentation and record-keeping systems. When the cost of raw computation came down in the 1960s and 1970s with the advent of computers, lack of standardization remained a barrier to the transfer and pooling of mortgage assets. By offering to buy [and then sell to the secondary market] mortgages that conformed to certain standards, the [securities] played an important role in providing incentives for the fragmented thrift industry to standardize contracts on single family loans. (Baldwin & Esty, 1993: 40)

Notably, private securitizers such as Lehman and Salomon Brothers used the same criteria and descriptions as the GSEs in buying mortgage loans to sell them to the secondary market. For the sake of simplicity, they maintained the market “language” that had been created, in terms of loan specifications (Slessinger, 1994; Passmore & Sparks, 1996), and pushed standardization further.

The next step in standardizing information was to standardize the certification of loan applicants’ credit-worthiness. By the early 1980’s, consumer credit assessment agencies such as Equifax had developed reliable data on customers, and specialist companies, in particular Fair

Isaac, developed predictive scores for individual customers. *Fico*, Fair Isaac's main mortgage score, became the de facto standard for underwriting decisions (Mara, 1989; Bennett et al, 2001). With the institution of *Fico*, the underlying customer loans became more easily describable. The firm-specific communication short-hands (Pelikan, 1969; Arrow, 1974) that were useful in the past – the means of describing the types of loan applicants that the company wanted to retain – became easily identifiable through a set of scores. As a mortgage broker observed,

“With the *Fico*'s and the automated underwriting anyone could do the job. I mean, why should I be sitting in First National's crappy offices originating the loans, rather than just do the job myself? All they [bankers] want is a pile of loans which is healthy and meets their criteria. And believe you me, this commoditization of information is putting them in a rough spot. I can now go around and sell my loan if I really want to.”

With that information standardization came the ability to specify inside as well as outside the boundaries of the firm the data needed on loan applications to be warehoused, loan types to be purchased for the secondary market, and servicing portfolios potentially to be sold (Bennett et al, 2001; Aldrich et al., 2001).

*Standardization of Information: Theory.* In terms of theory, it appears that the second necessary condition for the market to appear consists of information standardization and the increasing ease of information transfer. This helps create and support the intermediate market, as it becomes possible to certify information. This reduces information asymmetries, and thus reduces the risk of “lemons” that might go through the market (Akerlof, 1970; Passmore & Sparks, 1996).

Yet over and beyond that, it seems that much of what drove the emergence of markets was the ability to specify what would be transacted across firm boundaries, even regardless of the presence of any “lemons” or transactional hazards (cf. Monteverde, 1995; Argyres, 1999). As has been pointed out in the engineering literature, “specification,” i.e., the creation of standardized templates for product or process definition, is indispensable for market procurement (Fine & Whitney, 1996; Baldwin & Clark, 2003) because it replaces each organization's own shorthand and particular ways of describing things (Arrow, 1974; Pelikan, 1969). A standard informational

“syntax and grammar” must arise for communication to happen (Argyres, 1999). Also, if information on what is desired is unclear or difficult to articulate, outside procurement arrangements cannot be set up, as desired items can’t be identified ex ante (Barzel, 1982; Boisot & Child, 1988; Jacobides & Croson, 2001).

Summing up, the field evidence suggests that the costs that keep a market from emerging do not primarily relate to asset-specificity. Specifically, the two necessary conditions for a market to arise are the simplification of coordination and the standardization of information.<sup>6</sup> The next step, though, is to consider what exactly allows these two conditions to be met. The data in this industry revealed that two processes enabled the simplification of coordination and the standardization of information: intra-organizational partitioning, as parts of the value chain become separated in a single organization, and vertical co-specialization.

#### **Enabling Processes: Intra-organizational Partitioning and Vertical co-Specialization**

*Intra-organizational Partitioning: Evidence.* The first process is intra-organizational autonomy and partitioning --i.e. the separation of the production process within the boundaries of organizations, e.g. through the creation of different divisions for each part of the value chain. This creates clearly identifiable internal boundaries, which can then lead to market procurement inasmuch as one division chooses not to transact with another division, but with another *firm* instead. So intra-organizational boundaries pave the way for the use of the market.

This process happened both in the market between bankers and brokers and in the market for servicing rights. During the late 1970's, securitizers and the GSE's instituted “optional” and “forward loan commitments”, which meant that mortgage banks could agree ex ante on the price of loans which would be delivered on a particular date, rather than produce loans without knowing exactly what price they would fetch when sold. These innovations meant that the various processes involved in loan production could become more separable, as banks did not need to worry about how the price a loan that was produced could fetch; they were hedged by the optional commitments, and thus could separate warehousing from retail origination. This led to

and was, in turn, further enhanced by the creation of separate units for the warehousing and retail production of loans and an increase in the autonomy of the loan agents that originate the loans. Part of what enabled that autonomy was, of course, the fact that their performance could be assessed, and the requirements specified, in clearer terms; that measurement improved, which led to intra-organizational separation. The intra-organizational separation changed the way in which mortgage banks were run. This change was noted with disdain by an old-time CEO:

“It is no secret that the strategies for loan origination have changed. Any number of companies have turned the corner from retail to wholesale originations or purchased servicing. [A reason for this is that] many of today’s major industry participants did not ‘grow up’ in the industry. Most are “johnny-come-lately” entrants [and not part of the tightly integrated firms mortgage banks used to be]. Many CEO’s of major mortgage banking firms have never originated, marketed or serviced a loan in their mortgage banking career [and thus do not understand why mortgage banks *should* be integrated].” (Jacobs, 1993: 24)

The structure of the industry had changed, because the structure of the firms had changed.

According to my interviews, the reason why the newer generation of CEO’s did not believe in integration was that organizations that were de-centralized were more efficient. The change of internal structure and the partitioning within organizations had paved the way for dis-integration.

The link between organizational partitioning and vertical dis-integration was more pronounced in the separation of origination and servicing. Until the late 1970s, mortgage banks were small firms that did not have separate divisions for servicing and origination. However, as they grew, the desire to manage their scope better, and a sense that there might be some benefits from specialist departments, led to an increasing separation of the origination and servicing components. In the 1980's, several firms adopted separate units, with profit-and-loss reporting responsibilities for each of these two major activities. The diffusion of this organizational innovation made it more obvious to managers in mortgage banks that there were important differences between these stages of the value chain, as they could both measure their own value-adding processes better, and potentially benchmark with other banks. That was made evident to me in a series of “peer review roundtables” that mortgage banks participate, and where I was allowed to sit in as an observer.

Furthermore, the separation made it clearer that there were managerial differences along these two parts of the value chain. Servicing is a business in which operational efficiencies determine profit margins, and money is made by earning servicing fees. In origination, however, effectiveness (customer orientation), warehousing, and short-run interest-rate management capabilities matter (Garrett, 1993). Furthermore, the intra-organizational transparency made firms identify their strength and led efficient servicers to try expanding their servicing volume by the occasional purchase of the loan portfolio of a competitor. So the organizational separation facilitated both coordination simplification and the comparison of performance across firms.

Finally, this process also happened in the first episode, securitization. The only difference was that, in this context, the process did not relate to the growth of a set of firms but, rather, to the “social engineering” of governmental and legislative agencies, which tried to come up with a means of organizing the industry whereby vertical dis-integration could happen (*HUD*, 1996; Passmore & Sparks, 1996). The institution of Article 9 of the US *Universal Commercial Code* enabled creation of a blueprint, which was further refined by the operation of the Government Sponsored Agencies and the investment banks Salomon Brothers and Lehman Brothers (Lewis, 1989). This framework was effective because it supported a structure whereby one player could work independently of another, and in that, this episode of dis-integration in mortgages is reminiscent of the dis-integration of the PC sector “designed” by IBM (Baldwin & Clark, 2000).

*Intra-organizational Partitioning: Theory.* In general, there seems to be a pattern whereby intra-organizational partitioning leads to the creation of autonomous subunits and, ultimately, market-mediated exchange. Part of this process is motivated by gains from specialization, as explained below, but there also is another part of the process that is simply time-varying: as firms grow, administrative divisions become solidified (DiMaggio & Powell, 1983). As firms restructure into multiple profit-and-loss (as opposed to cost) centers, they consider each division’s operation in more autonomous ways and hence contemplate alternative profit opportunities. Internal shadow prices and true intra-organizational autonomy invariably push

units to consider the make-vs.-buy decision more actively and seek ways to make it happen. There is also a feedback loop: As coordination becomes simpler, administrative partitions are more likely to occur. This process, while not strictly necessary, leads to simplifying coordination as well as identifying or intensifying the pressures to outsource, often by trying actively to change the transactional environment.

*Vertical Co-specialization: Evidence.* As firms start considering their respective strengths and weaknesses more explicitly, the potential for going outside one's boundaries becomes attractive. This leads to the second process, vertical co-specialization, i.e. the process of trying to come up with mutually complementary roles in a market-based transaction. This learning process enables information standardization to come about and creates the institutional background for market transactions (North, 1986; Fligstein, 2001). The fact that it took about six years for the broker-banker arrangements to emerge and solidify suggests that there needs to be a period of trial-and-error learning across firm boundaries for the market to fully develop, as described in the following published account of the market for mortgage brokers:

In 1981 the first rumblings of change began, ... the unraveling and unbundling of the housing finance delivery system.... With no money with which to make mortgages [as a result of the crisis, banks] started round after massive round of layoffs in their loan origination staffs. ...But as loan officers cleaned out their desks and headed for the door, they were often told something like the following: "Listen, Bob, you know we can't afford to keep you, you know that there's almost no business and that we have almost no money to lend. But we've always thought you put together high quality loans and we'd like to stay in touch. You have good contacts with Realtors, so if you can go out on your own and put together some loans, bring them to us and we'll fund them. And we'll figure out some way to split the loan fee." ...

Now things were different. A new kind of mortgage borrower who had access to institutional money appeared. The fellow who had been working at First Federal Savings was now an independent contractor working on his own – but he could place a borrowers loan with First Federal Savings. Initially, those originators who went out on their own would only broker to the institution they had previously worked for. But rates plummeted in August of 1982, and institutional lenders were flush with cash and needed mortgage product. Our broker who had been placing loans with First Federal Savings was now brokering to other institutions. In need of loans, Second Federal Savings approached him with a conversation that went something like this: "We know you worked for and placed loans with First Federal Savings. But if you bring us some loans, maybe we can offer better programs, and perhaps we can offer you a better split on the fees. ..." Before long, our broker was approved to place loans with a great many lenders. Calling themselves

wholesalers, lending institutions set up whole departments not to originate loans at the borrower level, but to take them in from originating brokers. (Garrett, 1989: 30-32)

The effects of this gradual process of vertical co-specialization, which led industry participants to learn from each other how to work with the independent brokers, is evident in the industry's demographics, which reflect the gradual change from integrated production within firms to production of loans through independent brokers, in addition to in-house production. As Figure 4 shows, the amount of brokered production increased over that period, as S&Ls were reducing their own workforces (cf. Mara, 1989; O'Donnel & Divney, 1994). This quote suggests that over time, parties that stand to benefit from a potential transaction find a way around managing *across* the boundaries of a firm that might have once housed them. The gradual adjustment between brokers and bankers, which is alluded to in the last paragraph of the previous quote, consists of the diffusion of the institutional innovations that enable firms to cross their own boundaries and the creation of mutually accommodating (i.e., co-specialized) vertical roles.

In mortgage banking, as in other settings, an increasing menu of choices emerged over time in the marketplace. Whereas brokers initially only provided leads or qualified applications, in the late 1990s, a greater variety of arrangements became available (LaMalfa, 1998). Brokers could provide the lead only or could also close the loan; they could even initially fund it, too, through a practice called "table funding." As time went by, finer separations in the market appeared, offering more choice of vertical scope, with different compensation and quality criteria set for each stage of the value chain completed.

Finally, this process of co-specialization and learning both resulted in the standardization of information and was enabled by it. As a broker remarked,

...as soon as people saw they could do business in this [vertically specialized] way, and as soon as they were able to iron out the details, they were up and running—and driving business away from the integrated guys. You know, little details—faxing the rate information, getting to a code of conduct—helped a lot.

The same pattern happened in the first episode of market creation (Passmore & Sparks, 1996). Securitization started with the standard 15- to 30-year low-risk loans and then moved into loans

with higher risk profiles of underlying customers (as measured by the increasing loan-to-value ratio and credit assessments) and, from 1984 onward, to adjustable rate mortgages. As a Wall Street analyst put it,

“you just get the market figuring it out and moving into the more complex stuff. Once you apply the basic idea in one set of loans, you can then move on and add a few more bells and whistles. You see, it takes some time for the buyers to understand what you’re selling; you got to increase the complexity of what you sell gradually.”

This quote suggests that the market emerges once information becomes standardized and that as information on increasingly complex activities and processes becomes standardized over time, vertical specialization can increase as a result (Bennett et al., 2001). It also suggests that it may well be cumulative experience, learning, and the resulting co-specialization that create the link between industry growth and specialization, rather than scale, as proposed by Stigler (1951).

*Vertical co-specialization: Theory.* To organize a transaction across the boundaries of a firm, potential market participants need to find ways of orchestrating it. To do so, as Langlois (1992: 104) remarked, it takes time for the market to “hit upon institutional arrangements.” Such co-specialization is essentially a gradual learning and enabling process; it sets in once the parties know that there is a benefit from transacting across firm boundaries. It is the manifestation of the effort to standardize information, and it also depends on the context of the parties that are engaged in it. More important, perhaps, co-specialization connotes the ability and interest to engage in a new way of organizing; and the environment for learning new ways of transacting may be enhanced or hindered by the social, legal, or political context. So, the government (Fligstein, 2001) and other social forces (Aldrich & Fiol, 1994) can and often do play a role by shaping the nature of the process that will ultimately lead to the creation of the functional and institutional background for market exchange.

### **Drivers of the Dis-Integration Process: Gains from Specialization and Gains from Trade**

The analysis so far has identified two necessary conditions for and two processes that facilitate market creation dynamics. Still, we have not answered the more fundamental question

of what *drives* this vertical dis-integration process and why this sequence of events unfolds in some settings and not others. Here, I propose that dis-integration is largely driven by the desire of industry participants to take advantage of the gains from specialized production and to realize gains from potential trade.

*Gains from Specialization: Evidence.* The benefits of vertically specialized production are a major driver of the dis-integration process. In our first episode, i.e. the evolution of the secondary loan market, dis-integration happened because many financial institutions were itching to manage the risk/reward profile of mortgage loans but couldn't do so as they lacked capabilities in origination and servicing that came along with managing the capital claim. Hence, once the securitizers managed to find a way of creating marketable securities, finding willing financial institutions or investors to buy the loans without the hassle of producing or servicing them was easy (Follain & Zorn, 1990). The securitizers also found mortgage banks and S&Ls that were happy to sell their loans, as they were efficient in origination or servicing yet had little desire, funding, or stomach for managing the capital risk. Were it not for these gains from specialization, the primary and secondary markets would not have taken off.

In the development of the mortgage broker market, a similar pattern exists. Firms that were more adept in warehousing loans than in origination pushed for the development of an intermediate market for brokered loans, to increase the pool of loans they could warehouse, which is where they made money. As a consultant commented,

...it only made sense for production to fall into the hands of brokers. An independent guy is successful because he can focus on what he can do best – keep in touch with the local community, have a good network, and be an expert salesman who takes customers, holds their hand, and explains the process... Sure, it [vertical specialization] should have happened earlier, but I guess that finding a way to deal with brokers took some time.

So while mortgage banks continued having in-house production, they increasingly relied on the independent agents because of advantages in terms of gains from specialization (Mara, 1989).

The nature of these advantages is best portrayed by the quote of an experienced broker:

Why be a broker and not work in a mortgage bank? Well, first of all, you are in control of your own destiny. I mean, brokers are better at figuring out what the clients need and where the market is going. And letting the brokers loose made this a better industry. Second, it's also about money- while you can be on commission even in a bank, you still make out more money when you're on your own or in a brokerage. Anyway, it's a different mentality, different style, different priorities- it just works better."

*Gains from Specialization: Theory.* This evidence from mortgage banking, then, is consistent with Smith's (1776) work, which suggests that the propensity to trade and barter, in order to take advantage of one's capabilities, can be a major driver of vertical specialization (Richardson, 1972; Demsetz, 1988). And there must be some unrealized gains if the market is to appear.

First, the existence of gains from specialization is due to the fact that unified up- and downstream governance reduces the effectiveness of production, even while it decreases transactional risks. For example, in the broker-banker relation, the very same agent, if employed in a bank as part of an in-house production unit, will be less effective than if he or she were an outside contractor (a mortgage broker selling loans through the market). As an outside contractor, he or she would be allowed to have a much freer hand, without any of the administrative constraints; the management style of the upstream business is quite different from the downstream one. The heterogeneity of knowledge bases or managerial structures along the value chain (Ghemawat & Ricart i Costa, 1993) thus determine the gains from specialization. So in a real sense, there are managerial dis-economies of scope due to differences in the requisite capabilities and styles of each vertical segment (Richardson, 1972). These "managerial dis-economies" drive the latent gains from specialization, which, in turn, create the need for an intermediate market to emerge (Jacobides & Winter, 2004).

Second, more specialized production is more "incentive intensive", to put it in economic terms: an outside or free agent is closer to the market and hence may be more effective (Williamson, 1985: Ch. 6; Milgrom and Roberts, 1992; Zenger and Marshall, 2000). Brokers who moved from banks to form their own firms did so in order to profit more from their abilities. Thus, to the extent that integrated structures stifle such high-powered incentives, specialization

will be preferred. Third, firms may also specialize to reap the benefits of demand smoothing and aggregation (i.e., an outside agent would be selling all the loans, not only those in which the mortgage bank specializes).

*Latent Gains from Trade: Evidence.* Gains from specialization, while related to gains from trade, are analytically distinct. Our evidence suggests that pure gains from trade played a significant role in the push towards vertical dis-integration.

In our first episode, a factor which drove securitization was that, compared to their current competition, S&L's had a very poor set of funding activities. One of the two main GSE's, Freddie Mac, was thus explicitly set up, and originally owned by the association of S&L's (the Federal Home Loan Banks Association), from its inception in 1970, to its public listing in 1989. The reason that Freddie Mac was put together was to enable the S&L's to get rid of the part they knew they were bad at- finding the capital to fund the loans. The idea was that Freddie Mac could help to keep this part out of their value chains, so they could focus where they were good at- generating and servicing loans. So the gains that would result from such vertical dis-integration (where S&L's would originate and service loans, and Freddie would help by outsourcing part of the capital provision to buyers of mortgage-backed securities) motivated the S&L's to put in the time, effort, lobbying and funds to support Freddie Mac (*HUD, 1996*).

In our second episode, a major motivation for the dis-integration between bankers and brokers, was that the banks that were strong in warehousing could not grow their origination segment (in-house brokerage) as quickly and efficiently as they could grow their warehousing functions and hence need increasingly more brokered business coming across their firm boundary. The reason was that origination requires local links with the consumers in a specific geographical area and therefore hinders the organic growth of the efficient warehouse. It is simpler to grow the warehousing operation, which can be leveraged across more loans without much problem. As an industry consultant noted,

“You saw some of the warehousing-focused firms growing aggressively... and they were able to fuel the growth using mortgage brokers. You can’t grow your own retail production that quickly – so brokers were the obvious solution.”

Potential gains from trade also propelled the dis-integration in servicing and the creation of the Market for Servicing Rights (Aldrich et al, 2001). According to industry association studies (Duncan, 1998) and to technology providers (Thinakal, 2001), as well as confidential evidence reviewed for this study, differentials in servicing costs between good and mediocre servicers have grown significantly over the last fifteen years. This has led to the desire to focus vertically in order to reap high potential gains from specialization. As a mortgage banker noted,

“...effective servicers decided that, even with the high purchase prices asked for servicing portfolios, they could still make money –because they were more effective at servicing and they were looking at cross-selling revenues – and so they kept buying [servicing rights].”

As the efficient servicers managed to scale up their operations quickly, they soon sought to create and support a market for servicing rights to leverage their scalable superior capability; as a result, dis-integration between origination and servicing ensued, which caused concentration in servicing to rise faster than concentration in origination.<sup>7</sup>

In addition to established players attempting gains from trade, there are other actors that support dis-integration. First among these are potential entrants who stand to benefit from this dis-integrated industry structure. Such entrants may come even from within the ranks of existing firms (such as the brokers, who wanted to become self-managed entities) or from other segments, such as Wall Street firms that want to get securitization volume to generate fees. To do this, they have to find willing accomplices and also try to ensure that they leverage their own capabilities (in terms of accessing the capital markets and structuring deals) to become active players in a new sector (such as the mortgage banking industry). These potential outsiders, who stand to gain from vertical dis-integration try to shape the institutional environment to fit their capabilities.

A second group of actors are the technology providers, who often precipitate a change of the vertical structure inasmuch as they help transfer information or modularize the production process. In this case, technology suppliers, such as FiServ and AllTel structured their offerings to

accommodate a vertical dis-integration. As a technology executive noted,

“Look, you have to go to the client with a competitive edge. So if you tell them they can do something new--better integrate brokers, accommodate the latest thing, and then explain how this will save them money – you’re more likely to win business. So we try to be proactive.

Such suppliers are often the first to recognize the potential gains from a reorganization of production, and they try to take some of the benefits that result from the vertical reorganization of labor; but these latent benefits must exist for their efforts to be worth the investment, even if the participants are not always convinced *ex ante*. Consider the case of rating agencies, like Moody’s and Standard & Poor’s (for the market for securitized loans) or Fitch IBCA or Fair Isaac, or credit-record agencies for consumers (for the market for brokered loans). These firms, in the process of finding new, profitable business for themselves, created the preconditions for the markets to be created by standardizing information.

The third set of actors includes the government and regulators. The government’s key role in the mortgage banking industry was its early involvement with the GSEs and with jump-starting the secondary market for mortgage loans (*HUD*, 1996), as well as by creating the legal background making securitization possible--especially through the institution of Article 9 of the *Universal Commercial Code*. In doing so, the government created the templates that the market required to operate. However, once the templates were set, it phased out its participation and eventually privatized the GSEs (*U.S. Treasury Department*, 1991). Also, through the Garn-St. Germain Act of 1982, it lifted the statutory limits that forced thrifts to be integrated, thus allowing a dis-integration it had previously prohibited in part of the industry (*U.S. Congress*, 1982). So the involvement of the government here focused on the necessary ingredients for market creation (templates, information standardization), while minimizing any other involvement. More to the point, this involvement worked *because* it unlocked the latent gains from trade, which led to the support for such an action. Without this intervention, intermediate markets might have taken substantially longer to emerge – but could have manifested themselves in some form, as they did in Europe in the late 1990s (Coles, 1999). But governmental or

regulatory intervention is *not* indispensable. In the other two market episodes – the separation between origination and brokerage and between servicing and origination--the involvement of such a central authority was conspicuously absent. Perhaps surprisingly, the mortgage banking industry is the least regulated part of the financial services sector in the U.S.

Regulation tends to either institute or legitimize new rules, such as vertically co-specialized arrangements. As players in each part of the business try to lobby for their interests, they try to promote a structure of the industry that is more profitable for them. In essence, then, the role of the government also appears to be affected by the potential gains from trade, especially by the group that can be organized enough, and potentially stands to win enough, so as to lobby aggressively, e.g. by pushing for standardization and the legitimization of particular ways of organizing (Zelizer, 1979; Abolafia, 1996). As a CFO of a mid-sized mortgage bank said,

“There’s no beating around the bush. As far as regulation goes, it’s clear there’s a battle going on. [The securitizers] want to encroach on our turf, and change the division of labor so they end up with a greater part of the pie. Which is why we spend all these lobbying dollars to ensure we keep the structure of the industry more reasonable.”

So it appears that the institutional background of the industry is driven by the conscious efforts of industry participants to shape it to their advantage. This observation both supports and qualifies the analysis of Olson (2000) on the role of market-augmenting governments. It does support it, in that it indicates that the government can play a significant role through providing the appropriate infrastructure, or even catalyzing the market through its own actions --as it did in the securitization episode. Thus, markets and governments should not be viewed as polar opposites; rather, there is a direct need for governmental support to facilitate the emergence of markets (cf. North, 1986). Our study also qualifies Olson (2000) by pointing to the possibility that governments augment markets not only because they expect growth and as such an increase in their own tax revenues, but rather because of the lobbying pressures and the desire to placate particular constituencies which make the case for the benefit of additional, novel institutional arrangements (cf Olson & Kahkonen, 2000; Azfar & Cadwell, 2003). This is best captured

through the quote of a White House official, reported by De Long (2000: 139), “what you economists don’t see, is that you are pushing for the public interest. But there are other interests that can be more important”.

Our results tentatively concur. While the interplay between government, private interests and institutions requires dedicated analysis that far exceeds the scope of this paper, our evidence points to some interesting possibilities: It indicates that the evolution of institutional form, and even the role of government in shaping it, might depend on the “interests” at hand, and in turn these depend on the structure of production which determines the incentives of different industry participants, through their expected gains from trade. So we do need to understand these gains.

*Gains from Trade: Theory.* Potential gains from trade are necessary for the market to emerge--for an exchange to happen it must be economically motivated and viable (Zenger & Poppo, 1998; Afuah, 2001)-- but they also facilitate the dis-integration process. First, gains from trade occur when the capabilities in an industry are not symmetrically distributed. Whenever a firm is efficient in one part of the production process (say, loan origination) and not in another (say, servicing), it has the incentive to help support the creation of a new market that allows it to eliminate the inefficient part of its organization. So differences in capabilities between firms along the value chain, with some firms being good upstream and others downstream, lead to a push for dis-integration, as it has been elaborated in a quantitative study of the same sector (Jacobides & Hitt, 2004).

A subtler but equally important motivation for a market to emerge is when one part of the value chain is harder to grow quickly or profitably than another. In the presence of such bottlenecks, efficient firms that are trying to expand their volume would want to use outside providers that enable them to grow more quickly and increase total profits (cf. Jacobides, 2004).

Similarly, the presence of economies of scale (such as those reported in the servicing sector) make specialization in the scale intensive sector (for some) and the non-scale intensive sector

(for the rest) more attractive, since not all firms can generate the requisite scale in all parts of the value chain, and as such they focus where they can afford to.

Such latent gains from trade explain why incumbents often *support* rather than fight new specialized firms, such as the brokers (cf. Carroll, 1985). Yet gains from trade do not only regard existing industry participants, who stand to gain from vertical specialization and exchange: They also regard potential entrants, who can only partake in the industry if and when it becomes vertically specialized, or technology and infrastructure providers. Potential entrants and technology providers are keen to see the structure of the industry become specialized. They thus try to push for dis-integration, partnering either with other outsiders, or with incumbents.

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Include Figure 7 about here

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### **A Model of the Drivers and Mechanics of the Process of Vertical Dis-Integration**

Figure 7 shows graphically the full model of vertical dis-integration developed here. This framework helps to explain *why* and *when* vertical dis-integration happens. Going back in the chain of causation, I explained that the real drivers of vertical dis-integration are (a) benefits from specialization – themselves driven by differences in the knowledge base and requisite managerial styles along the value chain; and (b) potential gains from trade, resulting from imbalances of capabilities along the value chain of existing participants or gains that could obtain if new, vertically specialized entrants were to migrate into an industry. For instance, inasmuch as the upstream part of the business relies on financial expertise and managing interest rates, and the downstream part of the business relies on salesmanship, then there are potential gains from specialization within the firm itself. Potential differences in management styles or in knowledge bases make administrative separations between departments more effective than unified management (Lawrence & Lorsch, 1967), which means there are some real managerial benefits to be had by specializing. In the presence of such gains, a process of intra-organizational partitioning is put in motion. For instance, firms create clearly distinct departments of interest rate management and sales, e.g., by creating separate divisions, or even different profit-and-loss

centers for each part of the value chain. This process of intra-organizational partitioning allows the coordination between the two adjoining parts of the value chain to be simplified through a reduction of task interdependence, which further fuels administrative partitioning.

Also, as a function of history and capabilities, some firms are simply better than others in particular parts of the value chain. Inasmuch as there are latent gains from specialization--that is, if some firms are good upstream and weak downstream and vice versa-- then the prospect of being able to specialize becomes attractive for those who stand to benefit from it. Gains from specialization (which mean firms are more likely to be good at one rather than both parts of the value chain) tend to reinforce gains from trade, which may or may not be evident to potential transactors. Additionally, whenever firms cannot grow quickly all the parts of the value chain, the possibility of relying on an outside party to help them grow, through vertical co-specialization, becomes a profitable prospect. Technology vendors and potential entrants who stand to win or at least participate in such a dis-integrated environment also try to push for dis-integration and often facilitate and encourage current industry participants to support specialization, in particular by making the case for specialization and helping turning latent into identified gains from trade. The potential attractiveness of establishing a market increases as a result of intra-organizational partitioning and hence the comparisons of efficiency inside and outside the firm. For all these reasons, firms engage in inter-firm learning, with the objective of enabling vertical co-specialization and benefiting from the potential gains from trade. This process leads to the standardization of information and to ironing out the potential problems that market transactions would induce. In this process, insiders and outsiders may engage regulators and the government, or other industry bodies, which help information become standardized.

As a result, with information sufficiently standardized and coordination simplified, a market can emerge, even if significant problems of opportunism, dependency, and measurement still persist. As the market operates, the problems are gradually addressed, and institutional arrangements are made to cope with them; information also becomes increasingly standardized

and coordination modularized, enabling a growing amount of the value added to be divided through the market; the market itself, then, becomes adept at coordinating increasingly complex activities through a feedback loop of the co-specialization and learning process.

## **DISCUSSION**

This industry study provides a framework to explain the nature and the drivers of vertical dis-integration. It suggests that coordination simplification and information standardization are the necessary conditions for a market to emerge and proposes that these two conditions are met through the processes of intra-organizational partitioning and vertical co-specialization and inter-firm learning, respectively. Moving further back in the chain of causation, I proposed that these two processes are determined by gains from specialization and latent gains from trade and considered when such gains exist: inasmuch as there are differences in the knowledge bases and managerial styles along the value chain, and inasmuch as there are inter-firm differences of capabilities, the process of vertical dis-integration will be put into motion.

The analysis of the process of vertical dis-integration fills a significant gap in the literature by looking at this little analyzed, yet very important aspect of industry evolution. Academic research so far has not examined vertical dis-integration, despite the fact that it radically transforms the industries in which it occurs. Much as the computer industry's identity radically changed with its shift toward a multitude of constituent sub-segments in both the hardware and software sectors, the nature and identity of savings and loans, mortgage banks, and commercial banks involved in mortgage lending was transformed through vertical dis-integration. The birth of a vertically co-specialized ecosystem, shown at the bottom of Figure 1 above, changed the nature of the industry and redefined the potential entrants and competitors, whether firms chose to be integrated or not (Jacob, 1993). The dynamics of vertical dis-integration, such as those that transformed the mortgage banking world, would have gone undetected using the established frameworks of industry evolution, since these do not consider the evolution of the vertical structure; they would

also not have been captured by transaction cost economics, which, focusing on the individual transaction, risks losing sight of the forest for the trees.

This study suggests that by shifting the focus from the individual firm, and from the final market for the product or service offered, to the evolution of the *value chain structure* and of the *process* through which a good or service is produced, we can capture dynamics that have not been directly considered to date. The analysis here, for instance, suggests that the structure of the value chain is not determined by exogenous factors but, rather, is shaped through the conscious, even if occasionally myopic efforts of industry participants and potential entrants. Efforts to dis-integrate are instigated by firms or individuals that break industry norms as they, unlike the rest of the industry, understand the potential from a dis-integrated production structure and are willing to put in the effort to make such dis-integration possible (Schumpeter, 1911; Knight, 1921). The efforts of Wall Street executives of Salomon and Lehman Brothers, such as those captured in Lewis's best-seller, *Liar's Poker* (1989), for example, while motivated by the incentive to profit or profiteer, helped securitization take hold and led to dis-integration.

Yet, at the same time, changes in vertical scope were not the result of a well thought-out plan but, rather, of a quest for near-term profit. Most of the interviewees I spoke to could not even describe the structure of the mortgage banking value chain; part of what made my project interesting to them was the fact that they could get this strategic overview. What they did know was that they were constantly changing their own boundaries to increase their margins, be more effective, or gain market share. This quest for profits and operational efficiency often came at the expense of their strategic prospects. During the time I was conducting the study, I noticed a significant change of attitudes toward some of the finer degrees of dis-integration that were facilitated by information technology. The increasing specialization, originally hailed as efficiency-enhancing, started hitting firms' bottom-lines through intensified competition, and executives came to grips with the fact that their quest for efficiencies or even short-term growth through specialization could ultimately hurt them. This was best captured by a quote by Angelo

Mozillo, the CEO of CountryWide, the largest U.S. mortgage bank, in a 2002 speech: "...for years we have been trying to make the system more efficient and get rid of the middleman... the problem is, we *are* the middleman."

Such a purposeful, even if myopic manipulation of the institutional context is way beyond what transaction cost analysis would posit. Firms, according to that theory, choose from the menu of options, in terms of transactional alternatives, to minimize the sum of production and transaction costs. But the theory does not consider how this menu of transactions evolves over time. By looking at the evolution of an entire value chain over time, we observe that the transactional environment is itself shaped by an evolutionary pattern, affected by the actions of firms that reduce the "mundane transaction costs" either consciously (through trying to standardize information) or unwittingly (by simplifying coordination along the value chain, initially to improve the division of labor within their own scope). So this study suggests that to understand vertical scope, we have to understand, *at the industry level*, the forces that affect it. In particular, this study suggests that we have to examine the forces driving toward dis-integration, rather than simply focus on the micro-analytics of firms' individual make-vs-buy choices (cf. Langlois & Foss, 1999; Jacobides & Winter, 2004).

My findings also qualify transaction cost economics by suggesting that the types of transaction costs operating in the initial dis-integration stage are quite different from those that push the industry (back) to integration. Such costs reflect Coase's (1937) original concept of "friction" – what Williamson (1985) called perhaps dismissively, "mundane transaction costs" (cf. Baldwin & Clark, 2003). These mundane costs are driven by the lack of standardization and the difficulties of coordinating across firm boundaries, rather than by the problems of hold-up discussed by Crawford, Klein and Alchian (1978) or Williamson (1985, 1999). The findings in this study suggest that these costs are quite important: they determine the ability of a firm to rely on the market in the first place, a question that Williamsonian analyses do not even consider.

While a few authors (Langlois, 1992; Langlois & Robertson, 1995) have argued that transaction costs are a dynamic and hence transient phenomenon, their work does not explain when and how these transaction costs are reduced. This study provides a framework that accounts not only for the mechanisms of transaction cost reduction and market emergence, but also looks at the *causes* and underlying factors that explain when and why transaction costs decrease rapidly in some settings, leading to dis-integration, whereas in others they do not. It suggests that it is the nature of the production process, and the resulting gains from specialization and trade, that drive vertical scope, market emergence, and the potential for dis-integration.

This research also complements the work of economic sociologists who have been interested in the nature and role of markets. Sociologists, building on White's (1981) paper, explore how "markets" (i.e., categories of offerings that are perceived as close substitutes by producers and consumers alike) emerge, focusing in particular on the social and institutional dynamics of "product category" creation (White, 1981; Porac et al., 1995; Carruthers & Babb, 2000). They examine the norms that sustain marketplaces – the (well-defined) junctures where goods and services are exchanged (Abolafia, 1996), the norms of production and exchange (Zelizer, 1979) and their social construction (Ruef, 1999), and consider markets as broad societal institutions (Carruthers, 1996), and as social fields (Fligstein, 2001). Yet they have not directly focused, to date, on explaining how markets that link two stages of the value chain arise, or considering how a productive system evolves and endogenously leads to the emergence of new markets. This study does so, and in so doing suggests that, under some conditions, participants of the integrated status quo may have the incentive to *promote* institution-changing innovations (cf. Carroll, 1985)

This qualitative study, then, suggests that the sociological argument that existing actors (dominant firms) try to reproduce their own structures (White, 1992) is not universally applicable. In this setting, the forces to create new markets came from or were immediately supported by existing firms. Incumbents, rather than reproducing existing structures, supported dis-integration (contrast this with Fligstein, 2001: ch. 3 & 4). Despite the fact that these new

markets were supported by the representatives of established firms, dis-integration ultimately became detrimental to them. Likewise, the findings are in contrast to the resource-partitioning view (Carroll, 1985), which suggests that the newly specialized firms have to fight against the (integrated) incumbents. Whereas sociological research by and large suggests that new markets only emerge when they serve the interests of the “status quo,” I found that this is not always the case. In mortgage banking, many established firms *helped* dis-integration happen, even if they eventually found it to be strategically detrimental. Further study could thus help provide a more nuanced view of the social dynamics of new intermediate markets.

This study also affords us some speculation. While markets might be “emergent” (as in the case of the market for mortgage brokers), they also require effort to be set up. In our setting, and possibly in many others, markets are not as self-enforcing as a food market in a rural bazaar (Olson, 2000: Ch. 10). Our analysis suggests that markets are “artifacts” (Simon, 1962), in the sense of being consciously designed either by groups of industry participants or government and regulators. For instance, without the creation of an institutional backbone for exchange, including but not limited to information standards and norms of collaboration, a market could not operate. While law, especially in Anglo-Saxon countries, tends to follow business practice, and as such ratifies and regulates the efficient modes of organizing that have emerged (cf. Cooter, 2000) it is still the case that the legal and institutional framework *must* be such that market creation can be supported (Olson & Kahkonen, 2000). In addition to economic agents who willingly partake when they can see and calculate the benefits from so doing (Callon, 1998), markets also critically depend on the establishment of infrastructure and norms of interaction (MacKenzie & Millo, 2003). These are the result of both trial and error and painstaking design (North, 1986; Coase, 1992), which help partition the value chain and delimit the scope of activities of all involved (Loasby, 2000). So, for the market to emerge, effort must be extended; and it may be that, absent regulatory involvement, no party will find its private benefit from a new market worth the set-up costs, and as such a potentially beneficial new structure may be foregone (Olson, 2000).

## **Limitations and Extensions**

This study has several limitations. This is a study of a particular industry and hence should not be hastily generalized to other settings. Like any other process research (Mohr, 1982), it focuses on understanding the causal dynamics of a particular setting, as opposed to providing information on the generalizability of the findings to other settings. The mortgage banking industry was selected *because* it underwent a process of dis-integration and market creation, in particular because it witnessed several episodes of vertical specialization. This study also looked at a stable industry with limited changes in the product definition in order to isolate the major conceptual issues. It would be interesting to consider how this analysis should be modified to accommodate substantial process and product innovation.

This study has not provided much micro-analytical detail in the changes in coordination or information mechanisms that make dis-integration and market creation possible. It would be useful to study the specific micro-processes by which latent gains to trade become identified and the means through which entrepreneurs or incumbents try to change the industry's structure as a result of that realization. This can help us better understand the “political” and strategic element of the information standardization process (Fligstein, 2001; Gawer & Cusamano, 2002), and generally consider the agency of actors in shaping their institutional and social environment.

A related topic that has not been fully explored herein is the mediating role of government in the vertical dis-integration process. While not every market requires intervention or even support by the government, our evidence does suggest that it facilitates or even prompts the emergence of some markets, as we saw in our securitization episode. The way in which a government or regulator affects vertical specialization and market creation through legislation, through subsuming the “fixed costs” of market infrastructure or through the provision of (tax) incentives; and, even more so, the way in which particular industry participants can affect and shape governmental action, all remain fascinating topics for future research.

Finally, in focusing on delineating the conditions for and drivers of vertical dis-integration,

this study has underplayed the role of historical accident, which does affect industry evolution. In our case, history partly “paid” the cost of the infrastructure of new markets: For instance, when the RTC was endowed with mortgages that someone had to service, it had to come up with a way of selling mortgage servicing rights and thus indirectly subsidized the creation of the market infrastructure. Also, historical conditions can provide the external shock that enables the departure from previously developed routines that are part and parcel to institutional form and vertical scope (Nelson & Winter, 1982; North, 1981). For instance, the layoffs of loan agents in the 1980's brought the latent but previously disregarded gains from specialization and trade to the surface, which ultimately led to the creation of the market for brokered loans: Learning requires some un-learning first, and un-learning often requires a shock or crisis (Polanyi, 1957).

There are several other extensions to this research. At the micro level, we can explicitly study the relationship between organizational identity and vertical scope. We can study how framing, identity and cognitive representations change as a function of changing industry scope; and how changes in identity further shapes the vertical scope of a sector. In our setting, we could study the evolving identity of the mortgage broker segment, as this was both caused by and resulted to an increase of vertical specialization and market creation. We could further look at how mortgage brokers see themselves, and how they differ from those originating loans within integrated firms. Last, we could examine how the emergence of mortgage brokers has changed the identity and nature of loan origination even within integrated firms. More broadly, we could see how the changes in mortgage banking and dis-integration in other sectors, amplified by consultant’s theories (e.g. Evans & Wurster, 1997; Hagel & Singer, 1999) led to a change in identity and to subsequent (sometimes failed) efforts to affect the scope of industries like insurance.

At the meso level, in addition to looking at how managerial differences along the value chain and capability differences between firms affect vertical scope, we can examine how changes in vertical scope affect the capability development process, managerial styles, and the knowledge base. As Jacobides and Winter (2004) have also recently suggested, dis-integration changes the

structure of the organization, and as such changes the process of capability development.

Explicitly linking capabilities and vertical scope, and in particular focusing on how *changes in scope* provide a feedback loop to capability development, could be a promising research venue.

Another extension to this research would be to reconsider “modularity”, i.e., the extent of autonomy between different stages of the production process. In our setting, the modular structure of the industry was the result of an evolutionary, bottom-up process, motivated by gains from specialization and trade, achieved through organizational partitioning and information standardization. This stands in contrast to recent work on organizational theory and modularity (Baldwin & Clark, 2000; Schilling, 2000; Simon, 1962), which examines design problems from the perspective of a “system designer.” Thus, an extension of our study is to consider the “modular emergence” process and examine the conditions that allow such a “bottom-up” modularization in the absence of a “grand designer.”

Finally, at the macro level, we can study the new entrants who come in the newly dis-integrated sectors (e.g., EDS’s entry into banking through information processing) and explore how such firms migrate from one industry to another, often prompting dis-integration. This could provide some new insights into how vertical dis-integration affects the dynamics of competition and help us understand how different sectors converge, often *through* vertical dis-integration.

More generally, this study should be best viewed as only one part of a broader investigation into what Coase (1992) called “the institutional structure of production”, which examines how labor is divided both between different firms, and across the vertical divide (Jacobides & Winter, 2004). Industries do not *only* dis-integrate. They also re-integrate, or recombine on the basis of the newly found possibilities to organize (Fine, 1997). For instance, in automobile manufacturing after the initial stage of vertical dis-integration, several firms are now emerging as “systems providers”, integrating components once produced by independent firms that contracted directly with OEM’s. At the same time, these systems integrators themselves are relying even more on new markets, using several sub-contractors to help create such “systems”. Studying the nature

and the evolution of productive systems, by focusing on their value chains or value networks is a promising path for future research, which can bring to the fore new empirical regularities.

## CONCLUSION

In terms of practice, this framework explains when and why vertical dis-integration occurs and thus provides a tool for managers who want to understand whether their industry is or is not liable to this change. Evans and Wurster (1997) and Hagel and Singer (1999) suggested that the boundaries of organizations and industries would be redrawn. The framework developed here contextualizes such claims; it identifies the conditions under which dis-integration does happen. Evans and Wurster (1999), for instance, argued that many sectors were ripe for dis-integration and reconfiguration; yet many of the sectors they singled out have remained integrated to date. Insurers, for instance, presumably did not manage to simplify coordination sufficiently or standardize the requisite information; and there were not enough gains from trade on the *industry* level to justify specialization. In a world of rapidly changing firm and industry boundaries, analyzing vertical dis-integration and its determinants can help guide practice by providing more robust foundations for strategy and policy alike.

In terms of research, by changing the level and focus of analysis--from the individual firm's static determination of vertical scope to the systemic evolution of the industry's intermediate markets--this study uncovered some dynamics that had not been studied to date. By doing so, it qualified and extended existing research (in particular, transaction cost economics) and also allowed us to go deeper into the chain of causation, showing that *transaction costs are an incidental part of an evolutionary process*. It highlighted the factors that are ultimately responsible for vertical dis-integration and suggested we should not take the vertical structure of an industry for granted. Finally, this study suggests that changes in a value chain's structure have significant implications for all firms, be they integrated or not, and may well be the least studied yet very important part of industry evolution.

## Footnotes

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<sup>1</sup> This kind of purposive choice may raise questions about the external validity of the theory (Yin, 1994), or the extent to which the insights from this study are transferable to other settings (Guba & Lincoln, 1982). However, the usefulness of the generalization from this type of data is analytical rather than statistical (Firestone, 1993). While no claims of statistical significance are made, choosing a setting that allowed the key theoretical constructs to be isolated suggests that the theoretical findings may be applicable to other industry settings and provides a grounded theoretical framework that can be tested in other settings in subsequent research.

<sup>2</sup> As there was no prior “existing theory,” either in the industry, or in academe, on the drivers or even the nature of dis-integration, my investigation required an intensive involvement so that the basic value-chain layout could be derived. I thus had to become familiar with the technical detail of the industry, so as to “speak the language” of the participants of the various bits of the value chain. The questions that I would then ask would not be couched in terms of my own terminology, but rather in the terms used by industry participants.

<sup>3</sup> The four main question areas were: (1) How has your segment evolved? What have been the main differences that you observed? Why did these changes occur at the time that they did? (2) Was there any change in the types of activities that your segment performs? (3) Has there been any change in the scope of activities in your part of the mortgage industry? Why did any such changes occur at the time they did? and (4) (if the participants identified the trend toward disintegration) Can you identify why there has been such a tendency? What factors led to this breakup? Why did it not happen before?

<sup>4</sup> If a loan was foreclosed on within the first year and documentation was not fool-proof, the securitizer had the right to force the mortgage bank to buy the loan back. Also, mortgage banks are dynamically evaluated on the quality of the loans they sell, with the prices they obtain depending on the overall performance of the portfolio over time. Finally, if a loan forecloses, the mortgage bank has to bear the costs of foreclosure; which is why mortgage banks wanted to avoid bad loans (the administrative burden of foreclosing loans being fairly high).

<sup>5</sup> The particularity of the U.S. in terms of the dominance of these simple loans is also one of the main reasons that vertical specialization (and securitization in particular) was quick to develop (Coles, 1999). This explains why in other countries, such as the U.K., despite the efforts to promote securitization, things have been slow to catch on. Loans have a huge variety of product attributes, making a vertically specialized chain harder to orchestrate.

<sup>6</sup> A conceptual question emerges as to the relationship between the two necessary conditions which, while related, are analytically distinct: Simplification of coordination concerns the extent of interactions between activities or decisions, exerted from one part of the value chain to the next, regardless of the information flow, whereas standardization of information relates to the type of information to be transmitted along the value chain. If coordination becomes simplified, the requisite information may become simpler or more reduced, yet it will not necessarily become standardized. Conversely, if information becomes standardized, the interactions along the value chain may well remain, as a number of outsourcers are painfully finding out in failed efforts to cut across firm boundaries. If information becomes standardized and coordination simplified, and if there is a modicum of gains from trade, vertical dis-integration takes place.

<sup>7</sup> Between 1989 and 1999, the top 10 servicers’ share of the market rose from 11% to 41%, while the top 10 originators’ share went from 17% to 36% – so the concentration cumulative growth rate was roughly double. The most efficient firms have gained share more quickly in servicing, and that has happened through the purchase of servicing rights (*Inside Mortgage Finance*, 2000).

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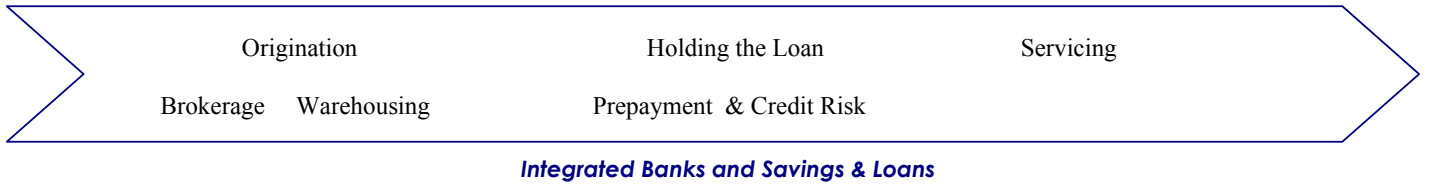
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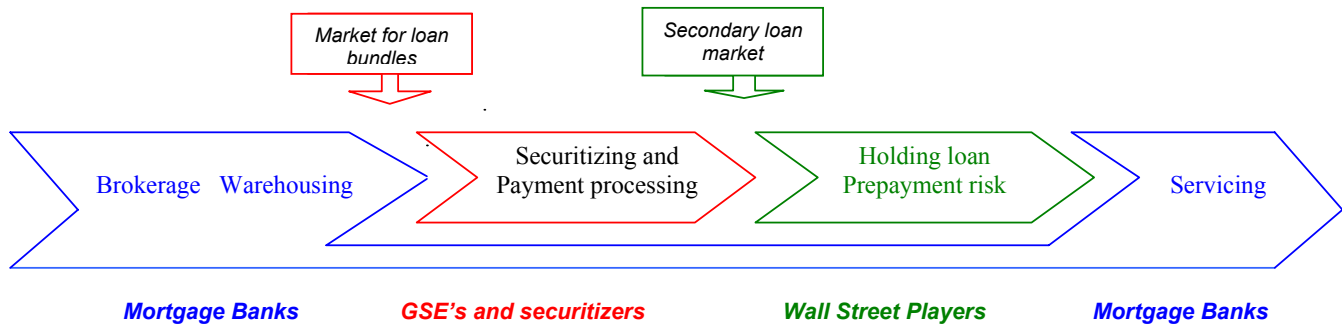
FIGURE 1

**The Empirical Context: The Dis-integrating Mortgage Banking Sector**

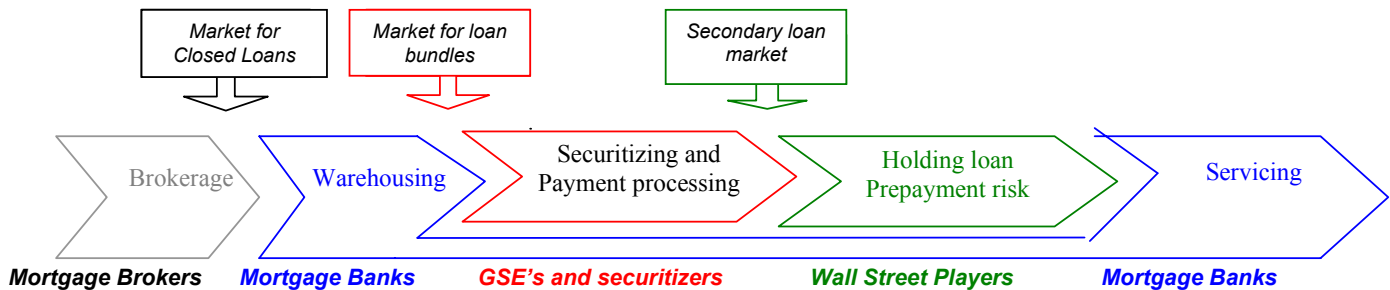
*Original Structure: Integrated Housing Finance Provision*



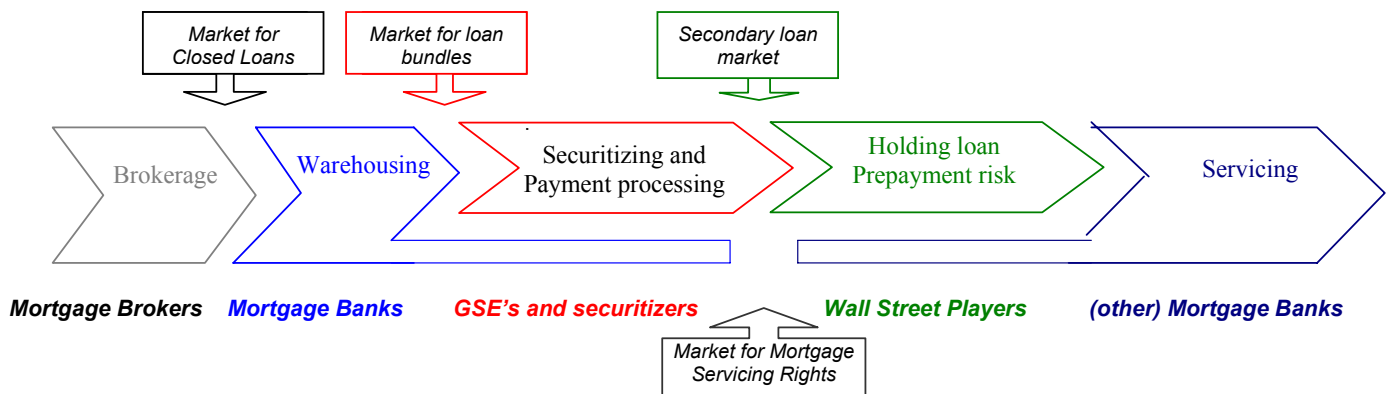
*First Disintegration Episode - Securitization and Secondary Market for Loans (1978=> 1988)*



*Second Disintegration Episode - Brokers and Market for Closed Loans (1983=> 1987)*

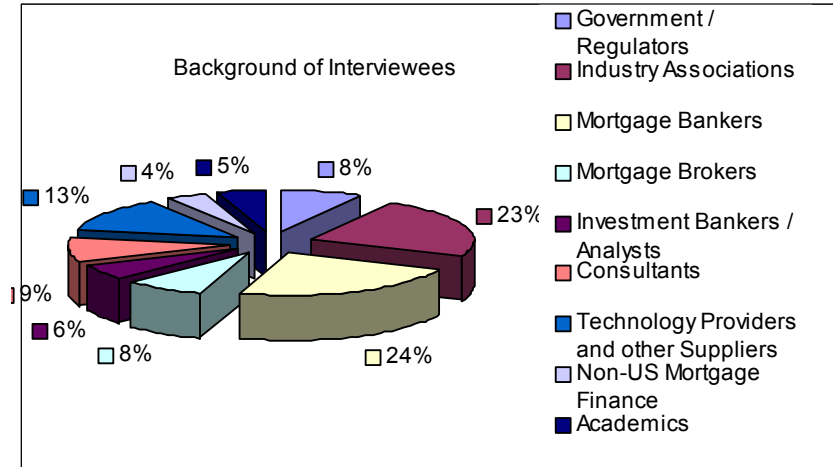


*Third Disintegration Episode - Market for Mortgage Servicing Rights (1989=>1993)*



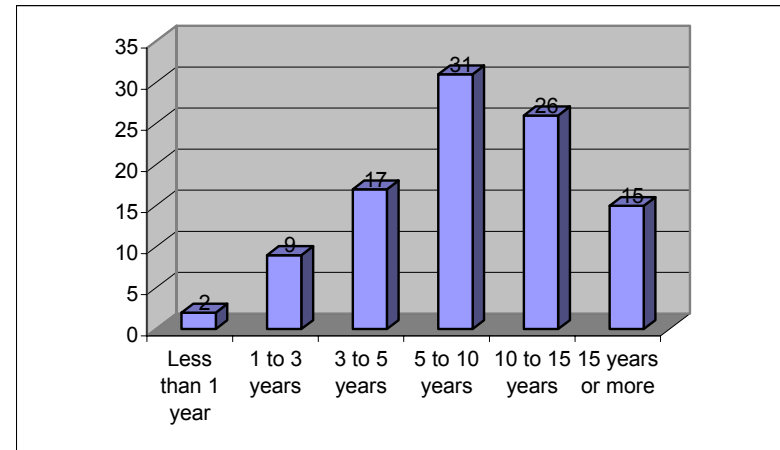
**FIGURE 2**

**Interviewees, per type of Occupation / Involvement**



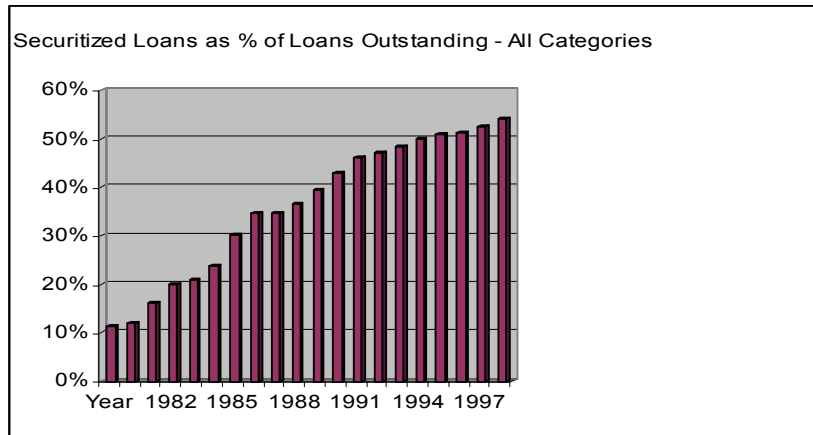
**FIGURE 3**

**Interviewees, per Tenure (years involved in the Mortgage Sector)**



**FIGURE 4**

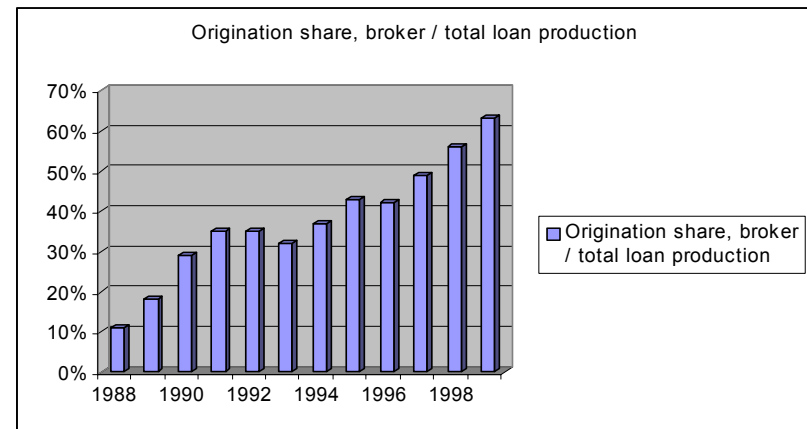
**Securitized Loans as Share of Total Loans, by value**



Source: Federal Reserve Bulletins

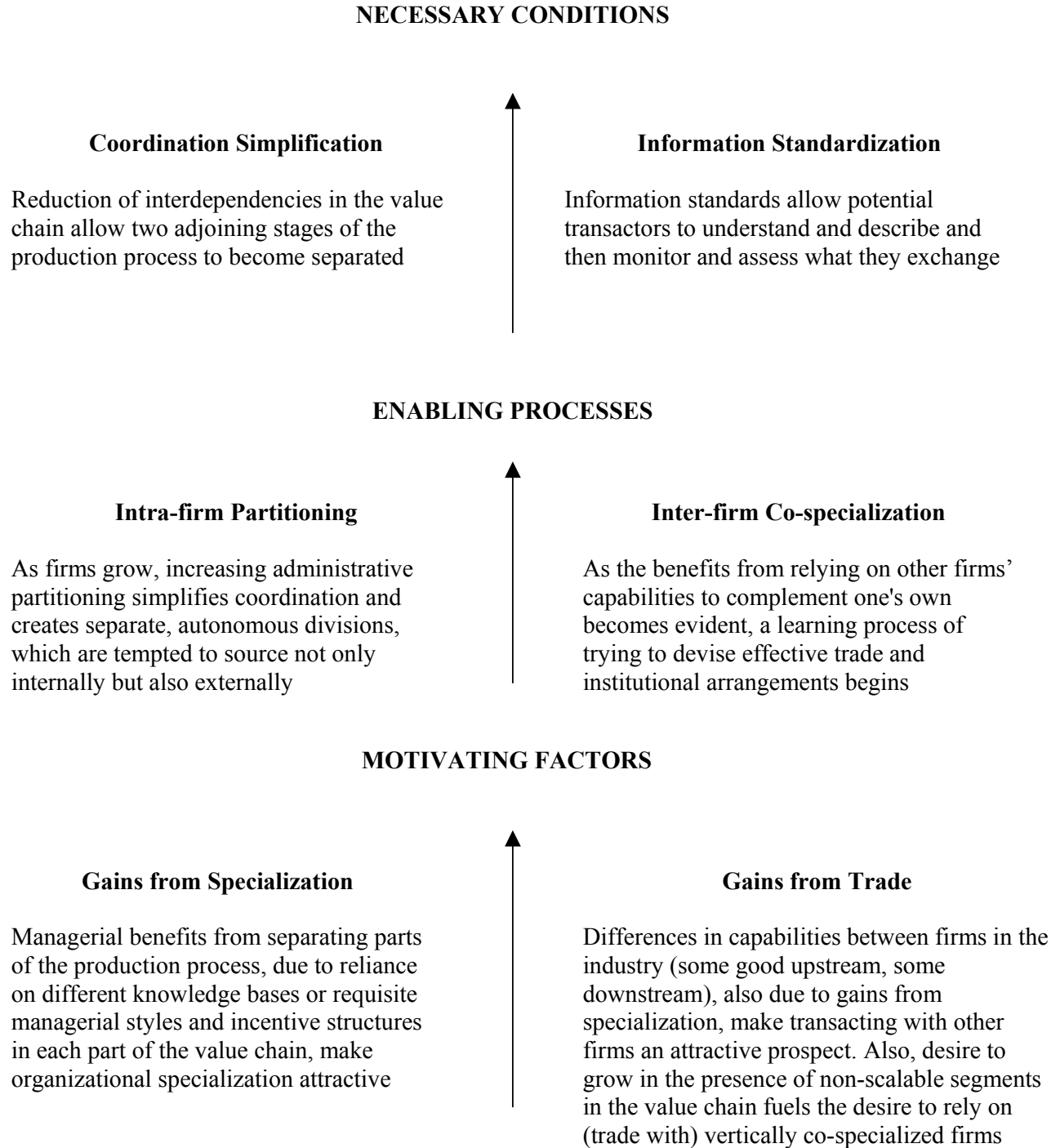
**FIGURE 5**

**Loan Originations by Brokers as a Share of Total Loan Volume Produced**

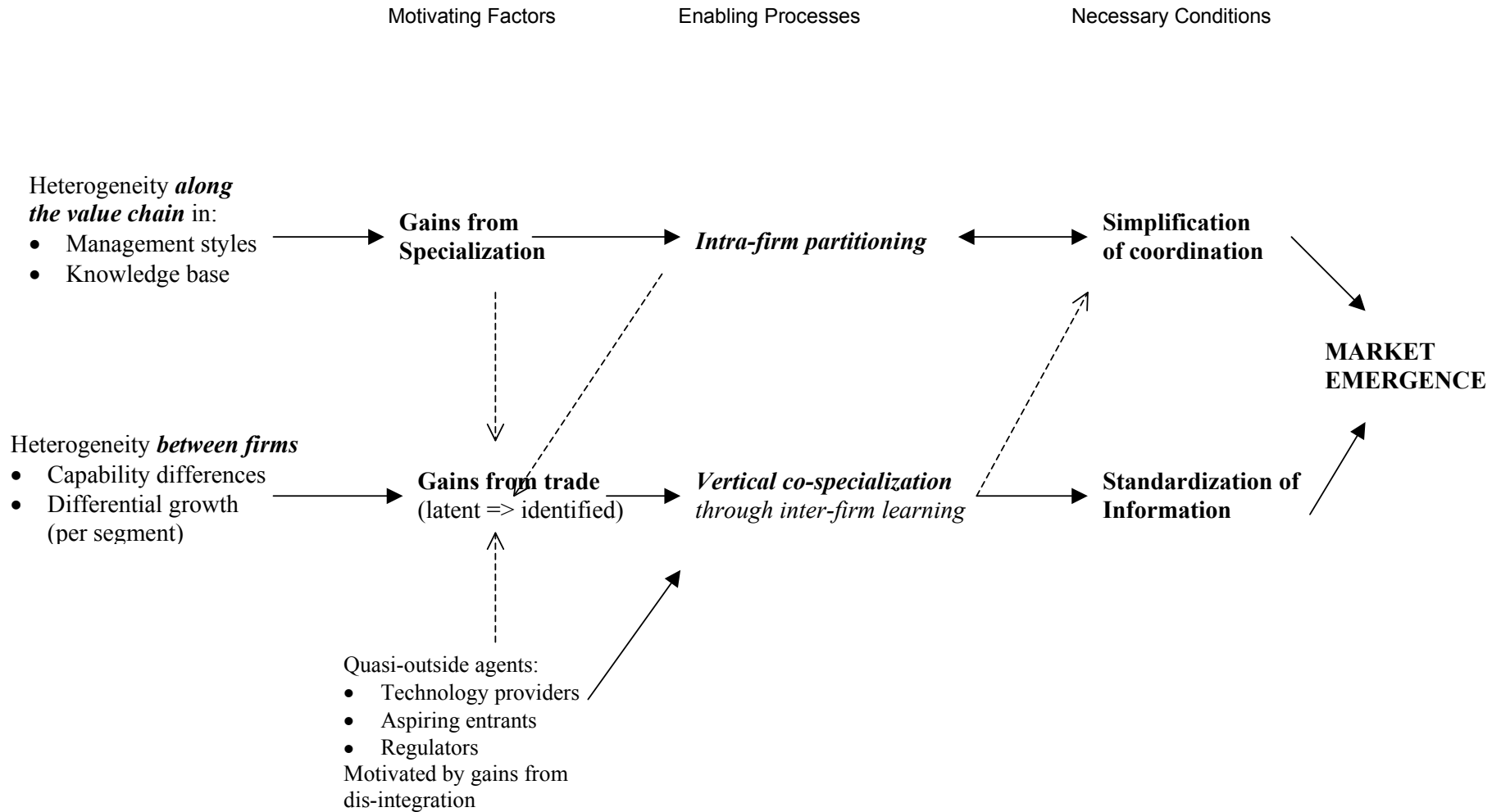


Source: Inside Mortgage Finance and LaMalfa (1991,1998)

**FIGURE 6**  
**What Enables Vertical Dis-integration / Market Creation to Come About**



**FIGURE 7**  
**The Full Model: Drivers and Mechanics of Vertical Dis-integration and Market Creation**



**TABLE 1**

**Overview of Sources of Evidence for and Activities in Each Stage of the Project**

	<b>STAGE 1: August 1998-December 1998</b>	<b>STAGE 2: January 1999-April 2000</b>	<b>STAGE 3: May 2000-November 2001</b>
<b>Objectives</b>	<ul style="list-style-type: none"> <li>• Understanding industry structures and processes.</li> <li>• Exploring evolution of industry structure and market creation.</li> <li>• Familiarizing with industry participants.</li> <li>• Identifying key participants for subsequent interviews.</li> </ul>	<ul style="list-style-type: none"> <li>• Exploring in more detail the specifics of industry changes, in terms of its products, technology, players, and industry structure.</li> <li>• Finalizing map of the industry and its evolution.</li> <li>• Creating map with drivers of vertical dis-integration</li> </ul>	<ul style="list-style-type: none"> <li>• Finalizing mapping of the mechanics and causes of industry evolution and market creation.</li> <li>• Complementing the field evidence.</li> <li>• Resolving remaining discrepancies.</li> </ul>
<b>Interviews</b>	<ul style="list-style-type: none"> <li>• 18 interviews with executives from industry regulators and oversight agencies, including: <i>MBAA; NAMB; HUD; OFHEO; Fannie Mae; Freddie Mac</i></li> <li>• 32 interviews with executives from mortgage banks, industry analysts and consultants</li> </ul>	<ul style="list-style-type: none"> <li>• 84 interviews with industry participants, including: <i>Bankers; brokers; service and technology providers; technology providers; industry analysts; finance consultants; regulators</i></li> </ul>	<ul style="list-style-type: none"> <li>• 27 interviews with MBAA senior executives and mortgage bankers</li> <li>• Follow-up phone calls and short discussions with many informants</li> </ul>
<b>Secondary Sources</b>	<ul style="list-style-type: none"> <li>• Historical studies</li> <li>• Sector descriptions</li> <li>• Trade publications.</li> </ul>	<ul style="list-style-type: none"> <li>• Company manuals</li> <li>• Trade articles</li> <li>• Press releases</li> <li>• Historical accounts of sector evolution</li> </ul>	<ul style="list-style-type: none"> <li>• Historical accounts</li> <li>• Company manuals</li> <li>• Trade publications</li> </ul>
<b>Events involved in</b>	<ul style="list-style-type: none"> <li>• 1998 MBAA National Convention</li> </ul>	<ul style="list-style-type: none"> <li>• Two-week course for mortgage executives</li> <li>• 1999 MBAA National Convention</li> <li>• 2 MBAA industry meetings</li> <li>• 3 “Industry Roundtables”</li> </ul>	<ul style="list-style-type: none"> <li>• Presentation of initial findings to keynote panel of 2000 MBAA National Convention</li> <li>• Presentation of findings to the 2001 MBAA CEO conference</li> </ul>

TABLE 2

Sources of Evidence for Identifying and Validating the Factors Driving Dis-integration and Market Creation\*

Gains from Trade & Specialization	Org. partitioning & Co-specialization	Information Standardization	Coordination Simplification
<p><b>Episode 1: Securitization</b> <i>Evidence, stage 1; Validation, 2</i></p> <ul style="list-style-type: none"> <li>• <b>Interviews:</b> Federal Board of Reserves; Wall Street executives; finance consultants</li> <li>• <b>Public records:</b> Academic research on securitization (e.g., Follain &amp; Zorn, 1990; Allen &amp; Santomero, 1997)</li> </ul>	<p><b>Episode 1: Securitization</b> <i>Evidence, stage 2; Validation, 2 &amp; 3</i></p> <ul style="list-style-type: none"> <li>• <b>Interviews:</b> Wall Street executives; MBAA; finance consultants</li> <li>• <b>Public records:</b> Descriptions of the evolution of securitization in mortgage banking (e.g. Tuchman, 1986)</li> </ul>	<p><b>Episode 1: Securitization</b> <i>Evidence, stage 1; Validation, 1 &amp; 2</i></p> <ul style="list-style-type: none"> <li>• <b>Interviews:</b> HUD; Wall Street executives; MBAA; finance consultants</li> <li>• <b>Public records:</b> Technical analysis on securitization, academic research (Fabozzi &amp; Modigliani, 1992; Nadler, 1994); industry pubs (Slesinger, 1994)</li> </ul>	<p><b>Episode 1: Securitization</b> <i>Evidence, stage 2; Validation, 2&amp;3</i></p> <ul style="list-style-type: none"> <li>• <b>Interviews:</b> Wall Street executives; academics; finance consultants (<i>weak support</i>)</li> <li>• <b>Public records:</b> Academic research on S&amp;L changes (Baldwin &amp; Esty, 1993)</li> </ul>
<p><b>Episode 2: Broker Market Creation</b> <i>Evidence, stage 1; Validation, 2</i></p> <ul style="list-style-type: none"> <li>• <b>Interviews:</b> MBAA; NAMB; GSE; brokers; bankers; consultants; analysts</li> <li>• <b>Public records:</b> Industry publications on mortgage banking (Lederman, 1985, 1995; O'Donnell and Divney, 1994) on broker segment (e.g., LaMalfa, 1990, 1998; Propper &amp; Furino, 1994)</li> </ul>	<p><b>Episode 2: Broker Market Creation</b> <i>Evidence, stage 1; Validation, 2</i></p> <ul style="list-style-type: none"> <li>• <b>Interviews:</b> MBAA; NAMB; brokers; bankers; ; S&amp;L executives; consultants</li> <li>• <b>Public records:</b> Articles on changes in the sector (e.g., Jacobs, 1993); Industry publications on broker/banker relation (LaMalfa, 1998; Wisner and LaMalfa, 1991; Garrett, 1989, 1993)</li> </ul>	<p><b>Episode 2: Broker Market Creation</b> <i>Evidence, stage 1; Validation, 1 &amp; 2</i></p> <ul style="list-style-type: none"> <li>• <b>Interviews:</b> MBAA; NAMB; brokers; bankers; consultants; HUD; technology providers</li> <li>• <b>Public records:</b> Industry publications on automation &amp; brokerage (Schneider, 1994; Lebowitz, 1995; Foster 1997); analyst reports (MSDW, 2000)</li> </ul>	<p><b>Episode 2: Broker Market Creation</b> <i>Evidence, stage 1; Validation, 1 &amp; 2</i></p> <ul style="list-style-type: none"> <li>• <b>Interviews:</b> MBAA; NAMB; brokers; bankers; consultants; technology providers</li> <li>• <b>Public records:</b> Industry publications on broker/banker relation &amp; automation (Foster, 1997, Garrett, 1989; Propper &amp; Furino, 1994, MSDW, 2000) Industry manuals (e.g., Lederman, 1985, 1995)</li> </ul>
<p><b>Episode 3: Servicing Rights Market</b> <i>Evidence, stage 1; Validation, 1 &amp; 2</i></p> <ul style="list-style-type: none"> <li>• <b>Interviews:</b> MBAA; HUD; bankers; consultants; analysts</li> <li>• <b>Public records:</b> Analyst reports; articles on servicing (Wisner &amp; LaMalfa, 1991; O'Donnell &amp; Divney, 1994)</li> </ul>	<p><b>Episode 3: Servicing Rights Market</b> <i>Evidence, stage 1; Validation. No significant support</i></p> <ul style="list-style-type: none"> <li>• <b>Interviews:</b> MBAA; bankers; analysts</li> <li>• <b>Public records:</b> Articles on industry unbundling (Garrett, 1993)</li> </ul>	<p><b>Episode 3: Servicing Rights Market</b> <i>Evidence, stage 1; Validation, 2</i></p> <ul style="list-style-type: none"> <li>• <b>Interviews:</b> MBAA; bankers; MERS executives; consultants</li> <li>• <b>Public records:</b> Articles on servicing market evolution (e.g., Mara, 1989; Wisner &amp; Lamalfa, 1991)</li> </ul>	<p><b>Episode 3: Servicing Rights Market</b> <i>Evidence, stage 1; Validation, 2</i></p> <ul style="list-style-type: none"> <li>• <b>Interviews:</b> MBAA; NAMB; brokers; bankers; consultants (<i>weak support</i>)</li> <li>• <b>Public records:</b> No data</li> </ul>

\* The table reports the stage of the research in which initial evidence was found, or sought, and validation. Abbreviations and interviewee categories in the table are as follows: bankers = mortgage bankers; brokers = mortgage brokers; GSE = executives from Fannie Mae or Freddie Mac; HUD = employees of the Dept. of Housing and Urban Development and its agencies, including OFHEO; MBAA = Mortgage Bankers Association; NAMB = National Association of Mortgage Brokers; and analysts = investment bank analysts

### **Biographical Details**

Michael G. Jacobides ([mjacobides@london.edu](mailto:mjacobides@london.edu)) received his PhD in Strategy at the Wharton School of the University of Pennsylvania. He is an Assistant Professor of Strategic and International Management at the London Business School. His research examines how institutions and firms co-evolve and how this co-evolution affects firms' strategic prospects. In particular, he is currently examining how transaction costs and vertical scope shape the nature of industry participants and the process of capability development -- and vice-versa. As a Principal Investigator in the Leverhulme Trust's Digital Transformations Programme @ LBS, he also examines how Information and Communications Technologies transform firm and industry boundaries and reshape the competitive landscape.