Abstract

The U.S. single-family residential mortgage market stands at roughly $11 trillion, representing about 21% of all U.S. credit market debt outstanding. This important segment of U.S. credit markets has markedly evolved over the past 30 years. Following the Great Depression, this market maintained a vertically integrated structure whereby federally insured depository institutions predominately originated, serviced, and invested in residential mortgages. Then, during the 1970s and 1980s, government-sponsored mortgage securitization increasingly took hold and ushered in a new dis-integrated market structure that increasingly allowed for the separation of residential mortgage origination and servicing from investment. Significant technological and regulatory changes during the 1990s spurred tremendous growth in both government-sponsored and “private-label” securitization in the 2000s. However, the subprime mortgage crisis of 2007 impaired securitization, making the future industrial organization of the U.S. single-family residential mortgage market uncertain and inextricably linked to forthcoming public policy choices.

Keywords: mortgage; industrial organization; securitization; vertical integration; bank; thrift; government-sponsored enterprise

JEL codes: G18; G28

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The buying of a home is typically the largest purchase transaction undertaken by households. Since almost all home purchases are financed through the use of borrowed funds -- a mortgage -- that accounts for a relatively high percentage of the purchase price, this related borrowing is similarly the largest financial transaction undertaken by most households.

These characteristics alone would make the industrial organization of the U.S. single-family residential mortgage industry worthy of study. But such a study is made all the more worthwhile because of the absolute size of this economic sector; the extent of public policy interventions within it; and the evolution of its industry structure over the past several decades.2 First, in terms of size,

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1 In the U.S. mortgage data, "single-family" really means mortgages on structures with one-four units. Mortgages on structures with five or more units are termed "multi-family".

2 The literature on residential mortgages, borrowing behavior, and lending behavior -- in essence, who lends what to whom and on what terms -- is extensive, and we will not try to summarize that literature here. Recent surveys of important aspects of U.S. residential mortgages and mortgage terms can be found in Green and Wachter (2005, 2007) and Lehnert (2010). None of these surveys employs the industrial organization framework that we adopt here.
the aggregate amount of single-family residential mortgages in the U.S. was $11.0 trillion as of year-end 2008, representing 21% of all credit market debt at that time.\(^3\) Second, with respect to public policies, the federal government encourages the consumption of housing through a broad array of explicit or implicit subsidy programs, some of which operate through mortgage finance: e.g., the deduction of mortgage interest for income tax reporting; U.S. Federal Housing Administration (FHA) and U.S. Department of Veterans Affairs (VA) mortgage insurance programs; and U.S. government-sponsored securitization conduits. Finally, technological and regulatory changes in recent decades resulted in the transformation of the U.S. residential mortgage industry structure from being vertically integrated to dis-integrated. However, the recent U.S. mortgage crisis has raised serious questions about the resilience of the disintegrated structure and the future scope of federal intervention in residential mortgage markets.

This paper describes the evolution of the industrial organization of the U.S. single-family residential mortgage industry in recent decades. Within the discipline of economics, the phrase "industrial organization" has become a term of art. An industrial organization study of an industry often focuses on the structure, conduct, and performance of an industry; and calculations of seller concentration ratios, pricing patterns, and profit ratios are often features of such studies. Underlying such calculations are often discussions of: the industry's technological characteristics and technological changes, economies or diseconomies of scale, vertical integration, product innovation, and government regulation, antitrust, and other public policies that affect the industry. This essay will be somewhat in that tradition; we will emphasize the

\(^3\) Of the $11.0 trillion, $9.9 trillion was first liens, and $1.1 trillion was second liens (i.e., home equity loans or home equity lines of credit).
importance of government policies and technological change for the changing vertical structure of the industry while also addressing the changing horizontal structure of the industry (e.g., the decline of the thrift industry and the ascent, decline, and re-ascent of Fannie Mae and Freddie Mac), important product innovations (e.g., mortgage-backed securities of various kinds), and one market power issue (whether Fannie Mae and Freddie Mac possess and have exercised market power).

This essay will proceed as follows: In Section II we describe the important characteristics of U.S. single-family residential mortgages. Section III discusses the "traditional" vertically integrated structure of U.S. residential mortgage lending by depository institutions, while Section IV follows with an overview of the “modern” dis-integrated securitization approach. In Section V, we discuss the unraveling of the U.S. residential mortgage markets starting in 2007. Section VI concludes with some implications for the future industrial organization of the industry.

II. Key Characteristics of Standard U.S. Single-Family Residential Mortgages

For a household considering the purchase of a house, there are two immediate characteristics of that purchase that are crucial for our discussion: First, the house is a long-lived asset; and, second, its price typically is a multiple of the household's income and exceeds the household’s net worth. Hence, households will seek to borrow a large fraction of the funds that are necessary to purchase the house. The loan to the purchaser, with the house as the collateral for the loan (i.e., the lender can take possession of the house in the event that the borrower defaults on the loan), is the mortgage.

The mortgage lending process introduces a risk that the borrower will not repay the loan
(“credit risk”). The degree of credit risk will depend on both observable and unobservable factors. Observable factors include things like the proportion of the home value that is funded by the mortgage (i.e., the loan-to-value ratio or LTV), the borrower’s credit history, and the proportion of the borrower’s monthly income that is required to make the monthly mortgage payment. Unobservable risk factors arise because of asymmetric information between the borrower and lender. Before the loan is made, the lender faces an “adverse selection” problem. After making a loan, the lender will have difficulty monitoring the borrower so as to be assured that the borrower's circumstances don't change so as to make the repayment of the loan less likely – a “moral hazard” problem. Having the house as collateral for the loan can ease the lender's concerns about credit risk as long as the house value is above the value of the loan (net of disposition costs).

Because the mortgage is typically a long-term lending arrangement, it may also involve material "interest rate risk": As interest rates for similar instruments change during the term of the loan, one side of the transaction will be worse off and the other side better off. For example, if interest rates increase during the term of a fixed-rate loan, the lender is worse off (the lender is earning less than the current opportunity costs), while the borrower is better off (the borrower is paying less than the current opportunity costs).

Specific features/terms of the mortgage loan can be seen as measures that affect the credit risk that is borne by the lender as well as affecting the distribution of the interest rate risk between the borrower and lender. These features include: (1) the length of the loan term and the pattern of amortization; (2) the size of the down payment or borrower equity cushion; and (3) whether the loan is adjustable-rate. The interest rate on the loan will reflect the general market rate for risk-free lending (the opportunity cost of time) plus additional amounts that will reflect the lender’s perception of the credit risk and the interest rate risk.
interest rate is fixed for the life of the loan or periodically adjusts with an index of market interest rates.

**Loan Term and Amortization Pattern.** A longer term increases both the credit risk and interest rate risk. The longer is the term of the loan, the slower is the pay-down of the loan principal, and hence the higher is the probability that the borrower might default with negative equity. Further, the longer is the term, the greater is the interest rate risk, since the longer period of compounding will amplify the effects of any change in interest rates. Thus, more and sooner amortization reduces both kinds of risks. But the whole point of the mortgage is to allow the borrower (the household) to purchase an item (the house) that is far beyond the household's otherwise available resources – suggesting that a short-term loan with rapid amortization would be self-defeating the whole purpose of the loan.

Prior to the late 1930s, this tension was resolved by mortgages with terms of typically five years (or less) and no amortization, so that a large "balloon" payment of the principal amount was required at the end of five years. De facto, the household was expected to refinance at the end of the fifth year, thereby placing a considerable amount of interest rate risk on the borrower (as well as a more general refinance risk). The interest rate risk arose because the new loan would be at the new prevailing mortgage rate, which might have been above or below the initial interest rate. While including this interest rate risk, “refinance risk” also refers to whether the borrower will actually be able to obtain funding at the time that the balloon payment is due.

During the Great Depression of the 1930s, the U.S. Home Owners Loan Corporation bought large numbers of defaulted mortgages, reinstated the borrowers, and converted them into 20-year self-amortizing loans, so that each (equal-size) monthly payment involved a partial repayment of
principal as well as interest on the remaining loan balance and the entire principal was repaid by the end of 20 years. The FHA offered insurance on the loans, which made them marketable to private investors. In the late 1940s the FHA extended the standard self-amortizing mortgage term to 30 years.

**Down Payment Size / Borrower Equity.** The larger is the down payment (as a percentage of the purchase price of the house) or the lower is the loan-to-value ratio (LTV), the greater is the "cushion" for the lender against a decrease in the value of the house that would put the lender at risk. Borrower equity reduces the possibility of moral hazard insofar as it negates the value of the borrower's option to default or "put" the home back to the lender. The borrower's propensity to engage in moral hazard behavior will also be determined by expected reputational costs and whether the lender has recourse against the borrower in the event of default -- i.e., the ability to sue the borrower and make claims against the borrower's other assets in the event of a shortfall from foreclosure.\(^5\)

Prior to the "frothy" U.S. housing markets during the 2000s, the standard down payment requirement by lenders was 20%, or equivalently an LTV of 80%. However, if the borrower qualified for private mortgage insurance (PMI), lenders were often willing to make up to a 95% LTV loan (with the PMI protecting the lender against the first 15% of any foreclosure loss); or, if the borrower qualified for mortgage insurance from the FHA or the VA, which would protect the lender for the entire amount of the mortgage, the borrower would need only a 3% down payment. However, starting in the late 1990s, lenders were increasingly willing to allow some (or sometimes

\(^5\) Whether a lender has recourse against a borrower in the U.S. is a matter of state law and varies among the states; however, as a practical matter it appears that, regardless of state law, most lenders do not pursue further claims against defaulted borrowers.
even all) of the borrower’s down payment to be financed by a second mortgage, which came to be described as a “piggy-back” loan.

**Interest Rate Adjustment.** Adjustable rate mortgages (ARMs) allow the interest rate to adjust over the life of the loan in accordance with an index of market interest rates. By contrast, a fixed rate mortgage (FRM) is fixed for the life of the loan. It is clear that with an ARM, the interest rate risk is borne by the borrower. As a way of easing this burden for the borrower, lenders often supply ARMs that have an initial fixed-rate period and/or have limits (caps and floors) as to the extent to which the contract interest rate on the ARM can change within a given length of time. With a FRM (and if the borrower cannot prepay the mortgage), the interest rate risk is shared between the lender and the borrower: If market interest rates fall below the contract rate, the lender has a more valuable asset, but the borrower is paying interest at a rate that is above current market rates; if market interest rates rise above the contract rate, the lender has a less valuable asset, but the borrower is paying interest at a rate that is below current market rates.

But borrowers always have the ability to prepay their mortgage – effectively, a call option that they pay for either at the time of loan origination in the form of a higher interest rate or at the time of prepayment in the form of a fee. If borrowers have complete flexibility of pre-payment, then with a FRM all of the interest rate risk is borne by the lender: When interest rates rise above the contract rate the lender has a less valuable asset; and when interest rates fall below the contract rate, borrowers will be more likely to pay off the mortgage and refinance at the lower rate, so that the lender does not get the benefit of having a more valuable asset.

**III. The "Traditional" Vertically Integrated Structure.**
There are four essential functions that characterize the "production" of a mortgage. The first is the underwriting, whereby the lender gathers information about the prospective borrower and the property (in efforts to assess credit risk) and decides whether to make the loan offer and, if so, the terms offered on the mortgage. Second is the origination, whereby the lender actually makes the loan and transfers the funds to the borrower. Third is the funding, whereby the lender obtains the funds that are lent to the borrower. Finally, there is the servicing, whereby the lender collects the requisite monthly payments and deals with any delinquencies or defaults.

Prior to the 1980s, the standard "model" for this production process was one of vertical integration. All of the functions occurred under the auspices of a local depository institution -- often a savings and loan institution or savings bank ("thrifts") that had a charter that restricted it largely to making mortgage loans. Since pre-1980s data gathering, assessment, and transmission were (by today’s standards) slow, cumbersome, and expensive, a localized and vertically integrated orientation for mortgages made economic sense. It was too difficult and expensive for a distant party to make the creditworthiness judgments about remote mortgage borrowers and to service their loans.

Funding for these locally originated mortgages largely came from locally gathered deposits. Customer preferences for dealing with an in-person teller at a bricks-and-mortar local institution, reinforced by an ATM-less state of technology, again meant that a localized orientation for depository institutions made economic sense. The localized lending and deposit-gathering processes were reinforced by federal and state laws that prevented interstate branching by depository institutions and that also in many states prevented or restricted intra-state branching. Thus, even if technology had not favored localized lending and deposit-gathering, legal restrictions
would have forced it.

The data in Table 1 show the importance of this vertically integrated model for single-family residential mortgages prior to the 1980s. As can be seen, between 1960 and 1975 thrifts alone accounted for over half of all single-family residential mortgages outstanding, and depository institutions together accounted for over two-thirds of the total.

There were at least two important implications of this localized orientation. First, mortgage interest rates could vary substantially across the country, with depository institutions operating in concentrated markets and/or markets with scarce deposits relative to loan demand charging higher rates (other things being equal). Second, without the ability to diversify geographically, the localized thrifts (as well as localized commercial banks) were largely at the mercy of the economic conditions of their immediate community. Thus, adverse economic conditions in the local community or region would mean difficulties for the local thrift or bank, since loan defaults would rise and the demand for -- and the creditworthiness of -- potential new loans would fall.

Further, because the standard mortgage was a 20- or 30-year FRM (federal regulations required this for federally chartered depository institutions, as did many states for their state-chartered institutions), and because the deposits gathered by the thrift institution were substantially

6 The Federal Home Loan Bank System (FHLBS) was created by Congress in 1932 to provide an additional source of funding to thrift institutions by making loans (“advances”) that are collateralized primarily by mortgages. Since the FHLBS raised its funds (which were then lent to local thrifts) in national credit markets, this somewhat ameliorated the problem of the balkanization of local mortgage lending markets. Because the FHLB banks were willing to lend to their thrift institution members for longer terms than the typical terms of the thrifts’ deposit liabilities, the FHLBS also provided thrifts with some help in dealing with the maturity mismatch between their long-lived mortgage assets and their shorter-term deposit liabilities. For further discussion of the FHLBS, see Frame and Flannery (2006) and Frame and White (2010b).
shorter in term than the expected lives of the mortgages that they funded, the institutions were exposed to substantial interest rate risk. In essence, with a sharp rise in interest rates, the value of the FRMs – the primary assets for a thrift institution – would fall substantially, while the value of its deposit liabilities would remain unchanged or fall only slightly. Equivalently, the thrift’s revenues from those FRM mortgages would remain unchanged (and the higher interest rates would discourage prepayments, thus slowing any roll-over of the mortgage portfolio to new loans with higher interest rates), while the thrift’s interest cost would rise since the thrift would have to pay higher interest rates to its depositors in order to retain those deposits and thus retain the funding for its mortgages. By either measure – the decrease in the value of its assets, or the increase in its interest costs – the thrift institution would experience financial difficulties.

This interest rate risk problem first manifested itself during the mid 1960s. The thrift industry’s solution was to lobby Congress for mandated interest rate ceilings on deposits. The Congress complied in 1966, and the ceilings more-or-less worked for the next decade, since depositors had few good alternatives for their funds since banks had also been covered by deposit rate ceilings since 1933.

When interest rates again rose sharply in the late 1970s and early 1980s, however, deposit rate ceiling were no longer the effective solution, since there was now a reasonably good alternative for depositors: money market mutual funds. In essence, the higher interest rates presented thrifts with the threat – and often the reality – of disintermediation (i.e., deposits leaving the banking system). The interest rate ceilings meant that the thrifts could not pay the higher rates that would have been necessary to retain the deposits (but which also would have meant operating losses). But the flight of the deposits meant that the thrifts would have to sell their (lower interest rate) FRMs at
a loss.

The consequences were devastating for the thrift industry: During the second half of 1981 and the first half of 1982 over 80% of thrifts were running losses.

Thus, the localized and vertically integrated nature of production solved one important problem for mortgage production -- economizing on costly information gathering and transmission that were important for dealing with credit risk issues. However, the problems of localized mortgage markets and especially of the interest rate risk exposure of the relatively small and unsophisticated lenders were left unaddressed.

IV. The Newer Vertically Dis-Integrated (Securitization) Structure.\(^7\)

During the last 25 years, we have witnessed rapid technological improvements in data processing, telecommunications, and risk measurement and management, as well as substantial changes in government policies toward depository institutions and secondary mortgage market institutions. This has allowed for a second, vertically dis-integrated industrial structure for residential mortgages, based on securitization, to arise. Indeed, during the middle years of the decade of the 2000s, it appeared that this newer model would dominate (but not wholly eliminate) the older model.

The data in Table 1 highlight the changes. As can be seen, after 1975 the share of mortgages held by depository institutions steadily declined and dropped below 50% between 1985 and 1990. The brunt of this percentage decline was borne by thrift institutions, whose overall share fell below 50% after 1980 and fell below one-third after 1985. At the same time, the securitization

\(^7\) See Ashcraft and Schuermann (2008) and Fender and Mitchell (2009) for recent surveys of mortgage securitization.
route was on the rise. The percentage increases in the 1980s and 1990s were led primarily by Fannie Mae and Freddie Mac (which are “government-sponsored enterprises”) and also by Ginnie Mae (which is an agency of the federal government). After 2000, “private-label” mortgage securitization (as indicated by the category “ABS Issuers”) was the growing sector.

In the wake of the crash of the mortgage securities markets of 2007-2008, the path forward for the residential mortgage market has been thrown open to question. This is an issue that we address in Section V.

A. Securitization.

At the heart of the dis-integrated mortgage finance model is securitization. Rather than holding the mortgage loans on its own balance sheet (which would primarily be funded by deposits or other forms of debt), the originator bundles a group of loans together and redirects the cash flows from the loans into "mortgage-backed securities" (MBS) that are sold to investors (or the originator sells the bundle of mortgages to a securitizer, who sells the MBS to the investors), who receive the passed-through interest and principal payments (less some intermediary fees) by the borrowers.

The creation of MBS can be beneficial insofar as (1) the underlying mortgage cash flows can be reconstituted in a variety of ways that better satisfies investor demands; and (2) there are some geographic diversification benefits. Nevertheless, the fundamental asymmetric information problem between the borrower and lender remains and is further complicated by the introduction of a secondary market interaction between the initial lender (i.e., the originator) and the investor.

How do originators reassure investors as to the quality of the mortgages collateralizing the MBS? In the first instance, originators offer assurances about the quality of the underlying mortgages (“representations and warranties”) in addition to the reassurance that comes from the
originator’s long-run reputation in the marketplace. Of course, the possibility of an originator’s bankruptcy would limit the value of any prior assurances. Further, standing between the originator and the investor in a securitization is the securitizer. Investors would therefore naturally look to the securitizer for assurances.

Securitization was pioneered in 1970 by the Government National Mortgage Association ("Ginnie Mae"), which is an agency within the U.S. Department of Housing and Urban Development (HUD). Ginnie Mae offers a “full faith and credit” guarantee of payment only on securities that are composed of mortgages that are insured by either the FHA or VA. Wrapping mortgage pools with a federal guarantee eliminated the credit risk to MBS investors and hence spurred securitization.

At about the same time, the federal government chartered the Federal Home Loan Mortgage Corporation ("Freddie Mac") as a government-sponsored enterprise (GSE) to operate in the secondary mortgage market alongside an existing sister institution, the Federal National Mortgage Association ("Fannie Mae"). The GSE charters include several unique provisions that created a halo of government support around each institution; thereby leading to strong investor perceptions that their obligations (debt and MBS) were implicitly guaranteed by the U.S. government. Like Ginnie Mae, Fannie Mae and Freddie Mac each provide blanket guarantees on the MBS that they sell to investors for which they charge insurance premiums or "guarantee fees". Their ability to do this successfully clearly rests on the market’s perception of an "implicit guarantee" from the federal government. As shown in Table 1, the role of “Agency- and GSE-backed mortgage pools” became

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8 See, for example, Frame and White (2004a, 2005) and the references cited therein for information about the specialness of these two financial institutions.
an increasingly important part of mortgage markets during the 1970s and 1980s – growing to 38% of the market after two decades in operation.

Since only Fannie Mae and Freddie Mac possessed GSE status in the secondary mortgage market, the issue of whether they could exercise market power (within the bounds that were determined by the continued presence of the vertically integrated alternative suppliers and, from the late 1990s onward, the private-label alternatives) -- i.e., whether their duopoly position allowed them jointly to maintain wider spreads than a more competitive structure would have generated -- is an interesting one. It appears that they could and did.9

Congress first established minimum leverage and risk-based capital requirements for Fannie Mae and Freddie Mac in 1992. The statutory minimum leverage requirement was set at 2.5% of on-balance sheet assets plus 0.45% of MBS held by other investors (i.e., off-balance sheet liabilities). Risk-based capital rules for Fannie Mae and Freddie Mac took nearly eight years to enact and then never acted as a binding constraint. Banks and thrifts, on the other hand faced a minimum “leverage” requirement of 8% capital (as a percentage of total assets) and risk-based capital requirements of 4% for mortgages and 1.6% for Fannie Mae and Freddie Mac MBS that they held in their portfolios. Consequently, under most circumstances it made good sense for banks and thrifts to swap their conforming mortgages for MBS (even though they would pay a guarantee fee for the privilege), which thereby allowed them to economize on capital costs and gave them a more liquid asset in the bargain.10

9 See for example, Hermalin and Jaffee (1996) and White (1996).

10 As a separate but closely related matter, Fannie Mae and Freddie Mac had lower capital requirements -- 2-1/2% -- for holding mortgages in their portfolios, as compared with the 4% requirements for banks and thrifts. This (along with favorable funding costs that accompanied their
There were, however, limits on the reach of Ginnie Mae and the two GSEs: Ginnie Mae’s reach was limited since only FHA and VA loans could be used for these securities and these loans had a size limit (somewhat above the national median home price) and underwriting criteria. The two GSEs were expected to buy only loans that met high underwriting standards, and there was a maximum size of loan that they could buy or securitize. Loans that meet these criteria are termed "conforming loans", and the maximum size is the "conforming loan limit." The conforming loan limit is linked to an index of housing prices. In 2007, the conforming loan limit was $417,000; but legislation in 2009 raised the conforming loan limit in the parts of the country that have higher housing prices. Thus, in 2009 the conforming loan limit is still $417,000 in most of the U.S. but can be as high as $729,750 in high-price areas (and can be even higher in a few special high-price areas: Alaska, Hawaii, Guam, and the U.S. Virgin Islands). Loans that are above the conforming loan limit are described as "jumbos".

The GSEs grew rapidly through 2003. Accounting scandals – first at Freddie Mac in 2003 and then at Fannie Mae in 2004 – caused their prudential regulator (at the time, the Office of Federal Housing Enterprise Oversight) to require more capital and restrict their growth, especially in the size of the mortgage and MBS portfolios that they held on their own balance sheets. Simultaneously, a housing boom in the U.S., which began in the late 1990s, provided the fuel for (and was also stoked by) a rise in “private-label” securitization – i.e., securitization by private-sector entities. Much of the mortgage lending that underlay these private-label MBS were to borrowers

GSE status) surely encouraged the two GSEs to expand their portfolios at the expense of depositaries. For more discussion, see Frame and White (2005, 2007).

11 The current and historical conforming loan limits can be found in Federal Housing Finance Agency (2009).
who would not have qualified for a conforming loan. Table 1 shows the sharp rise in the percentage of mortgages originated by “ABS Issuers” between 2000 and 2005, with the rise continuing through 2007.

Without an explicit or implicit government guarantee, the issuers of private-label MBS have had to develop alternative forms of credit enhancement so as to reassure investors.\(^\text{12}\) These credit enhancements are not mutually exclusive insofar as many deals incorporate all of these approaches. One approach is to “wrap” some or all of the MBS with financial guarantees provided by a financially strong third party, such as monoline bond insurance companies (e.g., Ambac or MBIA). Another approach is to over-collateralize the pool in an effort to create a buffer or equity layer to protect MBS holders. In addition, the “excess spread” between the amounts that the mortgage borrowers pay and the amounts that the MBS investors receive, net of expenses, can be placed in a reserve account that provides a buffer for the investors. Finally, securitizers may elect to partition (i.e., structure or "tranche") the securities, so that there would be a "junior" security that would be the first to absorb losses from defaults by the underlying borrowers and a "senior" security that would be protected against initial losses (until the losses had mounted so high as to absorb all of the investment in the junior security).\(^\text{13}\)

\(^\text{12}\) An explicit guarantee by the securities issuer is not generally possible, since an important aspect of the securitization is to remove the mortgage assets from the issuer’s balance sheet and thus eliminate a capital requirement for those assets.

\(^\text{13}\) A simple example can illustrate this tranching: Suppose that $100 million in mortgages are to be securitized. There might be a junior tranche that would have a face value of $20 million and that would be the first absorber of default losses on the underlying mortgages, up to $20 million of losses. The remaining $80 million of face value would be the (protected) senior tranche. Since the junior tranche would be more risky than the senior tranche, the former would carry a higher interest rate than would the latter (with the weighted average of the two having to equal the average interest rate on the underlying mortgages, less expenses and any excess spread). Since the interest rates and the loss absorption on the two tranches would not be identical, these securities would no longer
Under any of these credit enhancement arrangements, unless investors had sufficient analytical skills of their own, they would probably want a third-party evaluator (such as a credit rating agency) to opine on the creditworthiness of the arrangements. For a number of important categories of potential investors in such securities – namely, banks and thrifts, insurance companies, pension funds, money market mutual funds, and broker-dealers – financial regulation mandates that the debt instruments in which they invest have ratings and favors instruments with higher (safer) ratings.

It is important to note that, though these credit enhancement mechanisms might buffer investors from credit risk, the investors (as the recipients of the cash flows from the underlying mortgages) would still be fully exposed to the interest rate risk that is associated with these mortgages. Investors could try to arrange hedges for the interest rate risks (e.g., by using interest rate derivatives); or the cash flows from the mortgages (or the MBS) could be "sliced and diced" so as to buffer some investors from interest rate risk (while exposing other investors to heightened interest rate risk).14

B. Comparing the Traditional and the Securitization Models.

With this securitization process described, we can now contrast the vertically dis-integrated industry structure that accompanied securitization (and the concomitant improved technologies of data processing and telecommunications) with the vertically integrated model discussed in the

represent simple pass-throughs of the underlying mortgage payments. In practice, there are almost always more tranches than just two, with the “lower” tranches bearing more risk and the higher tranches bearing less.

14 For example, the cash flows could be structured so that some security holders would receive a more even flow of payments, while the holders of counterpart securities would receive a correspondingly more erratic pattern of payments.
previous Section. Consider again the four essential components of mortgage lending, as they occur in a securitization model:

(a) Underwriting. The data gathering and analysis are now largely conducted by specialized automated underwriting or "mortgage scoring" systems that combine information from the applicant about personal finances, the property, and the proposed mortgage along with the applicant’s credit score derived by and from historical credit data from consumer credit repositories (e.g., Equifax or TransUnion).\textsuperscript{15} Even depository institutions that still adhere to the traditional vertically integrated model now tend to use these third-party data gathering and assessment services. Because improved telecommunications have meant a wider array of potential lenders that are available to potential borrowers, another new element of vertical dis-integration -- the mortgage broker, who helps borrowers select a lender -- has arisen. Nevertheless, the final assessment and decision as to whether to offer the loan and the terms of the loan are still done by the lender.

(b) Origination. There is still a lender that issues the mortgage and transfers the funds to the borrower. But that lender need not be a depository. Instead, it can be a "mortgage banker", who holds the mortgage only briefly before selling it to a securitizer. A depository can choose to function partially as a mortgage banker, in that it may hold in its portfolio some of the mortgages that it originates and may securitize other of its originated mortgages. Depository institutions may also fund mortgage bankers by providing short-term “warehouse funding” for those mortgage portfolios prior to securitization.

(c) Funding. Instead of depositors, the ultimate funding for a securitized mortgage comes

\textsuperscript{15} Much of the credit for the development and spread of automated underwriting systems, which are now used ubiquitously by lenders for residential mortgage decisions, is due to Fannie Mae and Freddie Mac, who vigorously pushed this standardization in the 1990s.
from the purchasers of/investors in the MBS. These can be pension funds, insurance companies, bond mutual funds, hedge funds, individual investors, depository institutions, and Fannie Mae and Freddie Mac. It's worth noting that some of these institutions, such as life insurance companies and pension funds, have long-lived payout obligations and thus would seemingly want to match those obligations with long-lived assets, like MBS.

Also, as was noted above, investors in private-label MBS would likely want a credit rating agency to evaluate the creditworthiness of the securities, including the credit enhancement arrangements. This, then, introduced another new element into the vertically dis-integrated structure.

(d) Servicing. With the originator/lender no longer holding the loans but instead selling them, the servicing of the loans – making sure that borrowers’ payments occur on time and are forwarded to investors, and dealing with delinquencies – is similarly up for grabs. Since the servicer receives a fee (about 25 basis points, or a quarter of a percentage point), the originator might find it worthwhile to retain the servicing rights or sell them to a specialist who is more efficient at mortgage servicing.

Since much of the servicing process is usually routine and electronic, it has been thought to have substantial scale economies. For example, as of year-end 2008, the four largest mortgage servicers accounted for over 55% of the market (Inside Mortgage Finance, 2009). However, since 2007 the processes of dealing with delinquencies, defaults, and loan modifications to forestall defaults appear to be far more labor-intensive, and efficient scale may well be far smaller than was true prior to this time.

The securitization model, then, in conjunction with (as well as supported by) improved data
processing and telecommunications, has allowed multiple parties to enter and provide specialized services at various points in the mortgage production process, in place of the vertically integrated local depository that previously appeared to be the natural method for mortgage production.

C. The advantages and disadvantages of the securitization model.

The potential advantages of the dis-integrated securitization model (as compared with the vertically integrated depository model) can be itemized as follows:

(1) Securitization allows the tapping of a wider array of sources of funding for mortgages, beyond just bank deposits; the added sources of supply should mean lower costs of funding, at least over some infra-marginal range.

(2) By accessing the capital markets as the sources of funding and avoiding the bricks-and-mortar costs of maintaining physical bank branch facilities, the transactions costs of funding may be lower than through the gathering of deposits.

(3) By separating functions, securitization encourages the efficiencies of specialization, by allowing firms to provide just those services at which they are most efficient.

(4) By allowing the "slicing and dicing" of cash flows, securitization better allocates risks to those parties that (so long as they are appropriately knowledgeable) are better able to deal with those risks.16

(5) Securitization helped (along with improved technology generally and regulatory changes) facilitate the national unification of mortgage markets (and the end to localized mortgage markets) in a way that wasn't possible before the legalization of nationwide branching (which occurred only in 1994).

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16 See, for example, DeMarzo (2005).
The disadvantages of securitization are twofold: First, it adds additional layers of informational frictions (adverse selection and moral hazard behavior), on top of the original problems between the borrower and the lender, between the originator and the securitizer and between the securitizer and the investor, which isn't present in the vertically integrated model. If, say, the originator recognizes that the loans are of varying quality and has the financial capability of retaining some of them, the originator will tend to keep the better loans and sell the poorer loans to the securitizer; the latter will be adversely selected against. And if the originator knowingly originates poor-quality loans but sells them to the securitizer with assurances that they are high-quality loans, the former is engaging in moral hazard behavior. As was discussed above, MBS investors were buffered (as it turns out, to varying degrees) by the three mechanisms of explicit government guarantees, implicit government guarantees, and private-sector credit enhancements (supplemented by credit rating agency judgments).

The relationship between originator and securitizer, however, requires separate reassurance mechanisms. For Ginnie Mae, the mortgage insurance provided by FHA and VA has been the solution; and FHA and VA, in turn, have had to establish their own standards for dealing with originators. For Fannie Mae and Freddie Mac, their relationships with originators have been ongoing, with expectations of repeat business, so the two companies would insist on sound underwriting and would expect originators to replace mortgages that were found to be "defective" and would cease doing business with originators that were found to be untrustworthy. In addition, the GSEs relied on private mortgage insurers to provide “first loss” coverage for mortgages where the borrowers’ down payments were less than 20%. But in the middle years of the decade of the 2000s both companies were willing to securitize mortgages that were originated with looser
underwriting standards. A second disadvantage relates to the relationship of the servicer vis-a-vis the MBS investors in the event that a mortgage defaults (which primarily affects private-label MBS). The servicer, as agent for the investors, may not act in their best interests, or may be unsure as to what are their best interests (and may fear being sued by investors for actions with which the latter disagree). In instances where the securities have been sliced and diced, different classes of investors may have different interests with respect to how a defaulted mortgage should be handled (e.g., should the mortgage be renegotiated? or should foreclosure proceedings be started?), which complicates the servicer's choices yet further. By contrast, the integrated depository has a clear and direct interest in finding the least-cost solution to the default problem.

D. Favorable government policies.

Although the inherent advantages (and disadvantages) of securitization surely meant that its advent in 1970, as an innovation, would have involved some encroachment on the vertically integrated model, an array of government policies clearly encouraged and furthered the securitization process beyond the levels that would have otherwise have been achieved with more neutral policies. As we discussed above, the creation of Ginnie Mae and of Freddie Mac as securitization entities meant that they inherently had special governmental advantages (as did Fannie Mae when it began securitization in 1981).

As we also discussed above, for too long in the 1960s and into the late 1970s, thrifts were


18 This has come to be known as “tranche warfare.”
forbidden by federal regulations from offering ARMs to borrowers or from diversifying into other forms of lending. In essence, they were forced to be exposed to extensive interest rate risk from a portfolio of FRMs that were funded by shorter term deposits. When interest rates rose sharply in the late 1970s and early 1980s, the industry was decimated (which further encouraged securitization). When federal regulations were eased so as to allow ARMs in the late 1970s, it was too late. And when thrifts were allowed to diversify into other forms of lending in the early 1980s, their capital levels were so low and the extent of regulatory monitoring was so weak that hundreds of thrifts took the opportunity to take on investments with extensive credit risk -- again with devastating consequences. By the end of the 1980s, the thrift industry was reduced in size and vigor, providing the opportunity during the 1980s and the 1990s for the GSEs and then private-label securitization to expand at the thrift industry's expense. These trends are documented in Table 1.

V. Securitization Comes Apart.

Until early 2007, the securitization model appeared to be the dominant model for the residential mortgage industry. Indeed, as of the end of 2006, almost 56% of residential mortgage assets had been securitized by Fannie Mae, Freddie Mac, Ginnie Mae, and private conduits.

As shown in Table 1, the private-label securitization of mortgages -- as indicated by “ABS Issuers” -- grew steadily from the late 1990s onward. This trend was focused on three mortgage sub-segments: jumbo, subprime, and Alt-A. The first category consists of large loans: above the

19 Further discussion of this experience can be found in White (1991).

20 More complete descriptions are offered by, for example, Gorton (2008), Coval et al. (2009), and Mayer et al. (2009). Perhaps the overall experience is best summarized by Warren Buffet's aphorism, "It's only when the tide goes out that you learn who's been swimming naked."
GSEs’ conforming loan limit (e.g., $417,000 in 2007). The second category consists of borrowers with poor credit histories, and often with moderate incomes and low down payments, who would not qualify for a GSE-conforming loan. The third category involves borrowers with incomplete documentation of incomes or other flaws that would otherwise render them ineligible for a GSE conforming loan. As of year-end 2007, the net amount of private-label MBS outstanding stood at $2.2 trillion, or almost 20% of all single-family residential mortgages.

The pattern of steadily (and substantially) rising home prices from the late 1990s onward meant that few mortgage borrowers (including subprime borrowers) would default on their mortgages, since anyone having difficulty in making payments on a mortgage could either refinance for a larger amount (and thus, at least temporarily, have a liquidity surplus from which payments could be made) or sell the house at a profit and pay off the mortgage. This early experience encouraged more lenders to make yet more loans to borrowers who were increasingly dependent on an expected pattern of continually rising house prices so as eventually to refinance their mortgage or sell their house. But securitizers apparently didn't notice or didn't care (since they too apparently believed that the pattern of rising house prices would continue and would cure all potential mortgage problems), nor did the credit rating agencies nor the final investors in these securities (again, apparently for the same reason).\(^{21}\) Deficient underwriting and inadequate monitoring

\(^{21}\) See Gerardi, et al. (2008), who find that analysts at large investment banks at the time understood that a decline in housing prices would have a serious effect on subprime mortgage default rates but largely believed that a substantial and widespread decline was highly unlikely. An insufficient appreciation of risk by lenders and investors extended beyond mortgage securities. The spreads on "junk" bonds, which a few years earlier had been in the range of 500-600 basis points, were only 300-400 basis points during 2005 and 2006. See Lucas (2008, pp. 151-152) for further discussion. And banks were inserting fewer protective restrictions into the lending agreements that accompanied loans on private-equity leveraged buyouts, thereby coining the term “covenant-lite” loans.
became more common throughout the vertically dis-integrated chain of mortgage production. In essence, the potential problem of moral hazard in the vertically dis-integrated mortgage production had become a real problem.

Around mid-2006 house prices ceased rising and began to decline. By mid 2009, when house prices appeared to have ceased falling (at least, as measured by the Case-Shiller index), house prices had fallen by an average of 35% across the U.S. In some hard-hit areas, such as parts of California, Arizona, Nevada, and Florida, house prices had fallen by more than 50% from their peaks.

With prices falling, borrowers who had anticipated being able to refinance or sell in order to pay off their mortgages could not do so, and defaults soared. Further, even "solid" borrowers who had 20% down payments, if they bought houses in 2006 near the peak in one of the heavily affected areas, would soon find themselves "under water", with homes that were worth less than the mortgages. In such circumstances, borrowers might be tempted to default and find less expensive housing elsewhere. And the softening U.S. economy (which officially entered a recession in December 2007) and rising unemployment meant that borrowers were more likely to experience unexpected adverse circumstances that would impair their repayment possibilities.

In this environment, the problems of credit risk swamped the mortgage sector generally, and securitized mortgages especially. With defaults starting to rise, doubts about the creditworthiness of some mortgage-related securities first arose in the spring of 2007, and their prices began to fall. In the summer of 2007 the three major credit rating agencies began downgrading large numbers of tranches of residential mortgage-backed securities that they had previously rated as AAA. Prices of the securities quickly plummeted. Private-label mortgage securitization ground to a halt -- and has
Rising defaults also meant reduced profits and then rising losses for Fannie Mae and Freddie Mac. Besides a marked uptick in expected losses and hence loan loss provisions for their MBS guarantees, the two housing GSEs were also hit by substantial mark-to-market losses associated with their portfolio holdings of their own MBS (and for which spreads had widened) and downgraded private-label subprime and Alt-A mortgage-backed securities.

With the anticipation of losses at Fannie Mae and Freddie Mac and uncertainty about their future, financial markets became reluctant to fund the institutions despite their special relationship to the government. These developments forced the U.S. Treasury to seek broad authority to invest in housing GSEs in the Housing and Economic Recovery Act of 2008 passed in July 2008. Then, in September 2008, the Federal Housing Finance Agency placed Fannie Mae and Freddie Mac into conservatorship, and the U.S. Treasury entered into $100 billion senior preferred stock agreements with each GSE to ensure that each maintained positive net worth and to provide comfort to senior bondholders and MBS holders.22

Finally, the depository sector has not emerged unscathed. Portfolio lenders with heavy California exposures have suffered losses, and a number -- most notably Countrywide, IndyMac, Washington Mutual, and Wachovia (which had bought a major California thrift, World Savings, in 2006) -- became insolvent.

VI. Conclusion: Whither the Industrial Organization of the Residential Mortgage Industry?

22 See Frame (2008) for a detailed discussion of the federal intervention into Fannie Mae and Freddie Mac. The senior preferred stock agreements were most recently amended in December 2009 to provide unlimited funding commitments for each institution through 2012.
As this essay is written in early 2010, the following points are relevant for the themes that have been developed:

- The private-label mortgage securitization market is non-existent. The breakdown of the subprime securitization process, abetted by the excessively optimistic judgments of the major credit rating agencies with respect to the safety of the senior tranches of the subprime-related securities, has made investors distrustful of all private-label mortgage securitizations. Changes in accounting rules, which make it harder for financial institutions to create off-balance-sheet entities, has also discouraged private-label securitization.

- Although Fannie Mae and Freddie Mac are deeply insolvent and remain in conservatorship with unlimited Treasury support, the two GSEs remain in business and are active mortgage securitizers. The Federal Reserve has been an active buyer of GSE debt and MBS. Neither Congress nor the Obama Administration has indicated its long-run policy plans for the disposition of Fannie Mae and Freddie Mac.

- The FHA has become an increasingly active insurer of mortgages, which can then be securitized through Ginnie Mae; but there are increasing concerns about the financial soundness of the FHA program.

- Banks and thrifts are still in the business of originating mortgages; but their underwriting standards are much higher than was true three years earlier; and they often sell the loans to the GSEs or get insurance from FHA and securitize through Ginnie Mae.

In essence, the mortgage markets are currently heavily dependent on direct and explicit government support for the securitization structure, and there is only modest activity in the vertically integrated structure.
Eventually, the mortgage markets (along with other financial markets) will resume a more orderly existence, with less direct and explicit government intervention. And it is our best guess that there will be some representation of both industrial organization structures -- the vertically integrated depository model, and the vertically dis-integrated securitization model -- in those future mortgage markets, because both have their strengths (as well as their weaknesses). Also, "covered bonds" -- a form of bank debt, where the bond holder has a claim on the underlying collateral (e.g., mortgages) as well as a claim on the bank -- could become widely used, which may help depository institutions hold mortgages on their balance sheets.

But the relative proportions of the two structures are much harder to predict. Since mortgages extend across two areas of extensive government policy and regulatory activity -- housing, and banking/finance -- those proportions will surely be heavily influenced by government policies. As some simple examples, the eventual disposition of Fannie Mae and Freddie Mac, the capital requirements that will apply to mortgages and to MBS that are held by depository institutions, and any legislative or regulatory restrictions on prepayment penalties that are imposed by lenders on FRMs will surely influence those proportions.

Since, as economists, political predictions are not our strong suit, we can only re-affirm our belief that both structures will be represented in that future.

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23 Further, we would not want to rule out the possibility of financial innovations that could yield yet different structures. After all, how many housing or finance economists of 1965 could have predicted that a dis-integrated securitization model would be so important for residential mortgage finance 40 years later? For discussions of financial innovation and its importance, see Frame and White (2004b, 2010a).

24 It is worth noting that covered bonds are fundamentally identical to the “advances” from the FHLBS to member banks and thrifts.


Table 1: Holders of Single-Family Residential Mortgages (Credit Exposures), 1960-2008

<table>
<thead>
<tr>
<th>Year</th>
<th>Total ($ Billion)</th>
<th>Depository Institutions</th>
<th>Commercial Banks</th>
<th>Thrifts</th>
<th>Credit Unions</th>
<th>Fannie Mae, Freddie Mac &amp; Ginnie Mae</th>
<th>Government-sponsored Enterprises</th>
<th>Agency- and GSE-backed mortgage pools</th>
<th>ABS Issuers</th>
<th>Finance Companies</th>
<th>All others (residual)</th>
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% Distribution

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Source: Federal Reserve Flow of Funds: Table L.218.