

# What Have We Learned About Mortgage Default?\*

BY RONEL ELUL

**B**y the end of 2009, one out of every 11 mortgages was seriously delinquent or in foreclosure. Economists have devoted considerable energy over the past several years to understanding the underlying causes of this increase in defaults. One goal is to provide a guide to dealing with the existing problems. In addition, a better understanding may help avoid future problems. In this article, Ronel Elul reviews recent research that has shed light on two areas: the extent to which securitization is responsible for the increase in default rates; and the relative contributions of negative equity, compared with “liquidity shocks,” in explaining mortgage default.

The current crisis has seen an increase in mortgage default rates unprecedented since the Great Depression. By the end of 2009, one out of 11 mortgages was seriously delinquent or in foreclosure.<sup>1</sup> In states that have been

<sup>1</sup>“Seriously delinquent” mortgages are defined, in this case, as those mortgages that are 90 or more days delinquent, that is, that have missed three or more payments, without actually being in foreclosure. Many of these mortgages later end up in foreclosure.



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hit hard by the collapse in housing, the figure is even higher: for example, one out of five in Nevada. Concerns about the effect of losses caused by mortgage defaults also led to the collapse of several large financial institutions.

Economists have devoted considerable energy over the past several years to understanding the underlying causes of this increase in default. One goal is to provide a guide to dealing with the existing problems. For example, should troubled mortgages be modified and, if so, how? In addition, a better understanding may help avoid future problems. Recent research has shed light on two areas: the extent

\*The views expressed here are those of the author and do not necessarily represent the views of the Federal Reserve Bank of Philadelphia or the Federal Reserve System.

to which securitization is responsible for the increase in default rates; and the relative contributions of negative equity (that is, having a mortgage balance greater than the value of one’s house), compared with liquidity shocks (for example, job loss or expenses due to unforeseen illness) in explaining mortgage default.

## MORTGAGE SECURITIZATION

Many of the mortgages issued during the boom were securitized. When mortgages are securitized, they are sold by the issuer to a trust (known as a special purpose vehicle, or SPV). The SPV issues securities that are backed by these mortgages, known as mortgage-backed securities (MBS). Mortgage securitization first began in 1970, in part to ease financing constraints that arose when the baby boom generation reached adulthood and began to purchase houses en masse.<sup>2</sup> By 2006, nearly two-thirds of all mortgages originated were securitized.<sup>3</sup>

Traditionally, mortgages were securitized by the three government-sponsored enterprises (GSEs): Fannie Mae, Freddie Mac, and Ginnie Mae.<sup>4</sup> In exchange for a fee, they guaranteed the mortgages in the pool against default. (This guarantee was explic-

<sup>2</sup> See the book by Michael Fishman and Leon Kendall.

<sup>3</sup> Source: Inside Mortgage Finance.

<sup>4</sup> Ginnie Mae is part of the Department of Housing and Urban Development, while Fannie Mae and Freddie Mac are private corporations (although, since September 2008, they have been under the conservatorship of the Federal Housing Finance Agency).

itly backed by the U.S. government for mortgages securitized by Ginnie Mae, and it was widely believed by the market that mortgages securitized by Fannie Mae and Freddie Mac were also implicitly government-backed.)

However, beginning in the early 2000s, the *private securitization* market began to expand. These loans were securitized without government backing (either explicit or implicit). The MBS were issued by large financial institutions such as Lehman Brothers and Countrywide, although in many cases the loans themselves may have been originated by smaller nonbank mortgage lenders. Private securitization can be attractive to issuers for several reasons. First, GSEs were prohibited from guaranteeing mortgages with large balances (known as jumbo mortgages); this was particularly important in markets with high house prices, such as California. Also, the GSEs typically focused on safer loans, known as *prime* loans. By contrast, they were more reluctant to finance *subprime mortgages* made to riskier borrowers.<sup>5</sup> The private securitization market grew rapidly, making up over half of all securitization by 2005 (Figure 1).

When the mortgage market collapsed in mid-2007, these private securitized loans began defaulting at particularly high rates (Figure 2). The popular press laid blame on securitization for encouraging risky lending practices, and the financial reform bill passed in July 2010 requires securitizers

<sup>5</sup> There is no single definition of a subprime loan, but typically these were mortgages made to borrowers with low credit scores, for example, a FICO score below 660. In addition, a related category of loans, known as Alt-A, includes loans made to borrowers with good credit histories, but who are unable or unwilling to provide full documentation of their income or assets. See the article by Christopher Mayer, Karen Pence, and Shane Sherlund for further discussion.

to retain 5 percent of the assets they securitize. The underlying view of this reform is that underwriting practices would improve if the seller had more “skin in the game.”

But how does securitization affect default rates? One possibility is that lenders securitized riskier loans and, in particular, that they took advantage of the fact that investors could not fully distinguish the loans’ risk. The other possibility is that securitized loans defaulted at higher rates because servicers<sup>6</sup> were less likely to work with borrowers who got in trouble after the loans were originated — either

<sup>6</sup> A servicer is an entity responsible for the day-to-day management of the mortgage loan, collecting payments, and transferring them to the lender or the investors in the security. Most important, they are also the ones who work out the details of modifications with borrowers. In some cases, the servicer actually owns the loans it is servicing, whereas, in other cases, the servicing is outsourced; this is the case for securitized loans, in particular.

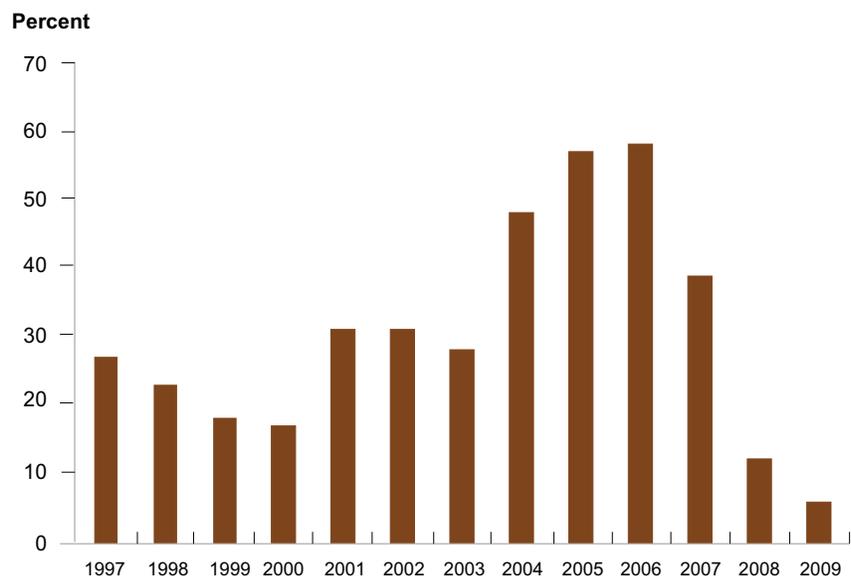
because there was less incentive for them to do so, or because the structure of the securitization made it more difficult to do so.

**Private Securitized Loans Are Riskier.** To see why securitized loans might be riskier when originated, it is useful to understand why banks securitize loans.<sup>7</sup> One reason is regulatory arbitrage; that is, by securitizing loans, banks do not need to hold capital against them (which would be costly). Another reason is to obtain funding through bankruptcy-remote vehicles. That is, securitized loans are isolated from the broader risk of the issuer and would thus be unaffected should it default; this allows the bank to fund these investments more cheaply. One thing to note is that under both of these motivations, lenders would want

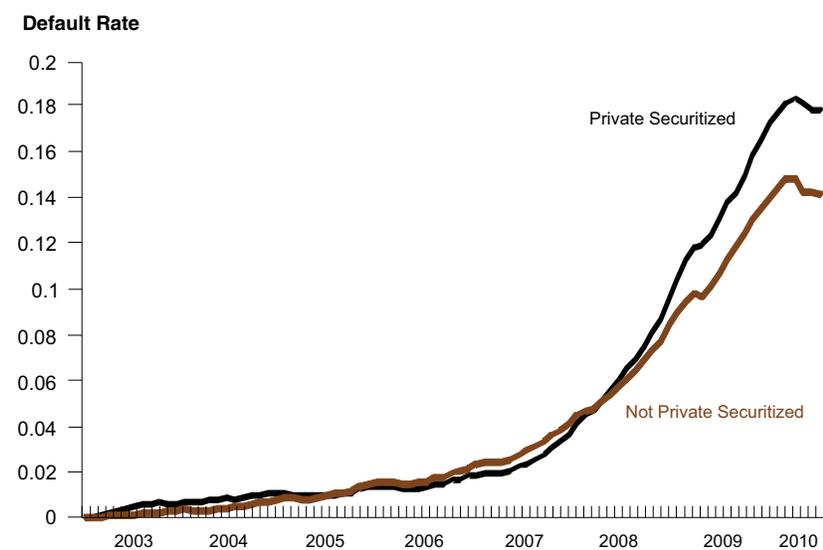
<sup>7</sup> These and other motivations for securitization are discussed in my 2006 *Business Review* article.

**FIGURE 1**

**Private Securitization Share**



Source: Inside Mortgage Finance

**FIGURE 2****Mortgage Default Rates:  
Private Securitized Loans**

Source: LPS Analytics

to securitize relatively *safer* loans, and therefore, this would not explain the higher default risk of securitized loans.<sup>8</sup>

Two other reasons have been suggested for securitization, which are, in fact, consistent with the higher risk observed. The first is risk-sharing, or diversification. By selling loans through securitized pools, banks are able to diversify their balance sheets. This is especially important for banks that lend primarily in a single region, since it facilitates geographic diversification. Note that according to this explanation, the risk of the loan would be priced appropriately; there is no

<sup>8</sup> In the case of regulatory arbitrage, bank lenders would seek to economize on capital by retaining the riskiest loans and selling safer ones (which require the same amount of capital as riskier loans, but for which they can obtain the highest price on the market). Similarly, segregating assets from the risk of the overall firm makes sense when these assets are less risky than the average.

presumption that the seller is taking advantage of the buyer.

A final reason that has been suggested is *adverse selection*, or *cream-skimming*. In this case, securitization would allow banks to lower their lending standards and make *riskier* loans — ones that they would have been less willing to make on these terms if they actually had to bear the full risk of the loan by holding it in portfolio. Moreover, given two loans that appear similar to investors, but which the bank could distinguish on the basis of its *private* information about the borrower, the bank would choose to securitize the one that is actually riskier. Private information that might be available to the lender, but not the investor, could include the existence of second liens that are not reported on the application (so-called silent seconds), or information about the borrower's actual income in the case of no-documentation loans.

Atif Mian and Amir Sufi confirm that riskier loans were, in fact, securitized by using ZIP-code level data on subprime originations, defaults, and securitization rates. They show that those ZIP codes in which securitization was most prevalent were ones in which subprime lending rose the most and default rates subsequently increased most dramatically. One limitation of their work is that they use aggregate data, and so it is difficult to be sure of securitization's actual contribution.

In particular, without detailed information on individual loans, it is not possible to determine whether investors could tell that these loans were riskier and so allow us to distinguish risk-sharing from adverse selection. That is, market participants on all sides may have been aware that these loans were risky, and securitization simply facilitated sharing the risk of the loans. This is an important distinction, because if investors could not distinguish the true risk of the loans, it is possible that a *market failure* occurred, in that the amount of risky lending that took place was greater than was economically efficient.<sup>9</sup>

**There Is Evidence of Adverse Selection.** Benjamin Keys, Tanmoy Mukherjee, Amit Seru, and Vikrant Vig wrote an influential study that uses loan-level data<sup>10</sup> and concludes that adverse selection did indeed occur in the securitized loan market. They show, in particular, that those subprime loans with low or no documen-

<sup>9</sup> A classic discussion of the market failure induced by adverse selection can be found in Nobel Laureate George Akerlof's model of the "market for lemons."

<sup>10</sup> Their loan-level data set includes the status of each loan (current, 30 days delinquent, 60 days delinquent, etc.) as well as loan characteristics (interest rate, loan amount, etc.). By contrast, the aggregate data set used by Mian and Sufi contains only the average default rate and characteristics for loans in a particular ZIP code.

tation of income that were more likely to be securitized were also more likely to default. Keys and co-authors argue that low-documentation loans have more “soft” information that is not easily observable by investors and therefore provide more scope for cream-skimming. On the other hand, they do not find evidence for cream-skimming for either prime mortgage loans (even with low documentation) or for those with full income documentation.

One difficulty with their analysis is that while their database contains loan-level data, all of the loans in the data set are securitized. This creates a problem. If all the loans in the data set are securitized, how can they even ask the question: Are securitized loans more likely to default than unsecuritized loans? Also, what does it mean for a loan to be “more likely to be securitized”?

Keys and co-authors come up with a clever approach. They argue that even in a sample of securitized loans, some of the loans were initially originated expressly with the end of securitization in mind, and others only more incidentally ended up as part of a package of securitized loans. They pose the question: Which loans (at origination) did the lender expect would be more likely to end up being securitized? They use the fact that private securitizations often required additional screening by the lender for loans to borrowers with FICO scores below 620, and so such loans are more “difficult” to securitize. Thus, lenders expect that there is a chance they may end up holding them. Now, all things being equal, the creditworthiness of a borrower with a score just above 620 (say, 621) should be essentially the same as one with a score just below (say, 619), and, if anything, those with scores of 621 should be slightly less likely to default.<sup>11</sup> However, Keys and co-authors show that, in their data

set, the subprime loans with scores just above 620 are actually *more likely* to default than ones with scores just below 620. How can this be explained? They suggest that lenders anticipated that loans with scores below 620 would be more difficult to securitize and thus took more care in underwriting them (using information beyond that contained in the credit score). This, they argue, provides support for the negative effect of securitization on underwriting standards.

Ryan Bubb and Alex Kaufman argue, however, that this “620 cutoff” applied in all markets, both securitized and unsecuritized, and thus cannot be used to draw any conclusions about the role of securitization. In particular, they develop a model that shows that *all* lenders would use such a cutoff rule when it is costly to distinguish between safe and risky borrowers, regardless of whether the loan is expected to be securitized.<sup>12</sup> To support this conclusion, they then show that portfolio loans exhibit a similar jump in default rates when comparing loans with scores just below 620 to those with scores just above. This suggests that while lenders may indeed use a 620 cutoff rule, they do so for both securitized and unsecuritized loans. So, they argue, such a rule cannot be used to identify those loans that are more difficult to securitize.<sup>13</sup>

In my working paper, I address some of the difficulties in previous work. My paper uses loan-level data on both securitized and unsecuritized loans that cover two-thirds of the mortgage market during the period

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<sup>11</sup> Since the relationship between credit scores and default risk is essentially continuous.

<sup>12</sup> That is, lenders will find that the benefits of investigating a borrower outweigh the costs only for those with low credit scores, since they are the likeliest to subsequently default.

2004-2006.<sup>14</sup> I show that private securitized loans are indeed more likely to default than loans that are not securitized, and this is true for both low- and full-doc loans (although the effect is modestly stronger for low-documentation loans). Moreover, I find that this effect is actually strongest in prime markets, unlike Keys and his co-authors, who, by construction, are restricted to examining only subprime loans with credit scores around 620. This may be because only in prime markets did lenders really have a choice of whether or not to securitize a loan, whereas nearly all subprime loans were securitized. In addition, investors in subprime securities may have been more attuned to the potential risks of such loans. To summarize, after examining a broader segment of the market than does the previous work, I find robust evidence that links securitization and mortgage default.

#### **Does Securitization Affect What Servicers Do to Avoid Foreclosure?**

In addition to a possible effect on lending standards, whether a loan is securitized may also affect the likelihood that a lender or servicer modifies a troubled loan or otherwise engages in activities that reduce the likelihood of

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<sup>13</sup> Recently Keys and co-authors have circulated a paper that seeks to refute some of Bubb and Kaufman’s criticisms. In particular, they argue that Bubb and Kaufman’s results stem from their pooling of a wide variety of loans. Keys and co-authors provide two findings that support their original paper. The first is that if one uses Bubb and Kaufman’s data, but focuses solely on low-documentation subprime mortgages that were not insured by the GSEs, the securitization rate drops for borrowers with FICO scores below 620. Also, the default rate for non-GSE-securitized loans goes up as one moves from FICO scores just below 620 to scores just above. However, given the evidence in my study that securitized loans were riskier even in prime markets, this focus on loans with scores around 620 seems too narrow.

<sup>14</sup> Bubb and Kaufman use the same data set as I do in my working paper.

foreclosure. There are several possible reasons why this might be the case. First, modifications and forbearance are costly for the servicer, since they take considerable time and expertise to successfully complete, and a servicer who does not own the loan will not accrue the full benefit from a successful outcome, since it receives only a small percentage of the monthly payments. Also, securitization agreements may place limits on the number or types of loan modifications. Finally, changing these agreements typically requires the unanimous agreement of the investors, which is difficult, since the ownership base is usually very dispersed for these securitizations.<sup>15</sup>

Tomasz Piskorski, Amit Seru, and Vikrant Vig find that, after becoming seriously delinquent, loans held by banks (as opposed to those in securitized pools) are less likely to be foreclosed and more likely to resume making payments. This suggests that securitized loans are less likely to be renegotiated. However, one difficulty with Piskorski and co-authors' analysis is that they cannot identify actual renegotiations and instead focus on whether the loans enter into foreclosure. This may be misleading; for example, some researchers have suggested another possible explanation for these findings: that banks may be delaying foreclosure on the loans they own simply in order to avoid writing down the loan, but they do not actually take any actions to effect a long-term cure.

Two studies by Manuel Adelino, Kristopher Gerardi, and Paul Willen dispute the findings of Piskorski and his co-authors, although they use the same database. Rather than focusing

on outcomes, as do Piskorski and his co-authors, Adelino, Gerardi, and Willen try to infer whether a loan was modified by finding those mortgages for which terms were changed. Significantly, they show that such modifications are very infrequent, occurring less than 3 percent of the time. Moreover, they show no significant difference in modification rates between loans held in portfolio and those in securitized pools. They argue that this is because such modifications are generally not profitable for lenders, whether or not the loans are securitized. The reason is that lenders take into account two costs to modifying a loan. The first is that modification may, in fact, not be necessary, in that the borrower would have continued paying the unmodified loan, with higher cash flow to the lender (Adelino and co-authors term this self-cure risk). The other is that modification might not help, in that the borrower is in such distress that he defaults regardless of the modification, and thus, it is not worth expending resources to renegotiate (redefault risk).<sup>16</sup>

One limitation of their work, however, is that they are generally not able to verify that the loans were actually modified.<sup>17</sup> Also, there may be other types of renegotiations that do not actually change loan terms and so would not be picked up by Adelino and his co-authors' method for identifying renegotiated loans. One example would be forbearance and repayment plans, in which borrowers postpone payments for a number of periods and then make

up the arrears. Finally, they are also not able to observe all of the factors that might explain when modifications succeed, such as a borrower's income or the existence of other liens.

Summing up, to properly evaluate the effect of securitization on foreclosure-mitigation efforts, it would be desirable to have explicit data on loan modifications and other renegotiations, as well as other pertinent information (in particular, information about lenders' policies and more details on the borrower, such as income).

### CONTRIBUTIONS OF ILLIQUIDITY AND NEGATIVE EQUITY TO EXPLAINING MORTGAGE DEFAULT

One striking feature of the current crisis is, of course, the sharp nationwide drop in house prices. Another unusual aspect is that defaults on mortgages rose more rapidly than those on other forms of consumer credit, such as credit cards, whereas in previous recessions quite the opposite was the case (Figure 3). The crisis has thus led to heightened interest in a better understanding of the determinants of homeowners' decision to default on their mortgages. In particular, are defaults driven by falling house prices or by "liquidity shocks" such as job losses? Or perhaps both are important.

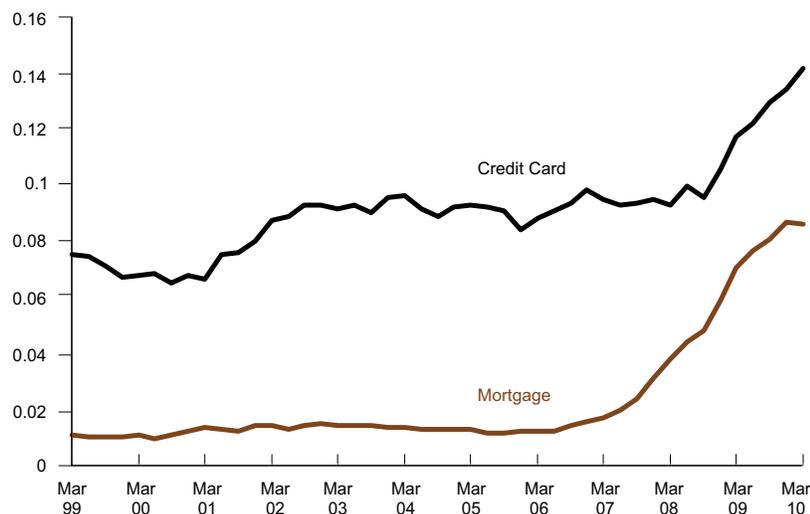
In addition to the value of improving our theoretical understanding of mortgage default, there is also an immediate policy motivation. One important part of the government's efforts to reduce foreclosures has been mortgage modifications that change loan terms. But should mortgage modifications focus more on increasing equity to give homeowners more of a stake or on reducing monthly payments to make them more affordable? Existing government programs now seem to reflect both possibilities.

For example, when the Trea-

<sup>15</sup> See the article by Piskorski, Seru, and Vig and also the studies by Adelino, Gerardi, and Willen for further discussion of the impediments to renegotiating mortgage contracts.

<sup>16</sup> Note that Adelino and co-authors argue that lenders do not find it *privately* profitable to renegotiate most loans. This isn't inconsistent with the possibility that loan modifications could be *socially* beneficial.

<sup>17</sup> But they do test their algorithm on a database of loans that explicitly identifies modifications and find that it performs reasonably well in identifying actual modifications.

**FIGURE 3****Credit Card and Mortgage Delinquency Rates\***

\* Fraction of loans that are 60+ days delinquent.  
Source: Credit bureau data

sury's Home Affordable Modification Program (HAMP) was introduced in March 2009, it focused on adjusting monthly payments so that they do not exceed 31 percent of a borrower's pretax monthly income (by lowering interest rates or by extending the maturity). But recently the HAMP program was also expanded to encourage servicers to instead consider reducing the outstanding principal so that the loan-to-value ratio does not exceed 115 percent.

The traditional "option-theoretic" view of mortgage default provides a way to understand the effect of house prices on the mortgage default decision. According to this model, when homeowners make the monthly payments on their mortgage, they get two things. First, they get the benefit of continuing to live in the house for the current month.<sup>18</sup> In addition, they have an "option" on any future appreciation in the value of the house. That is, they

will profit if their house increases in value. According to this model, the key driver of default will be *negative equity*. That is, if the house is worth less than the mortgage, then, in the extreme case, the homeowner would be better off not paying the mortgage, giving up the house, and buying (or renting) a similar house for less. In a previous *Business Review* article, I provide further details on the option-theoretic model of mortgage default and survey the earlier empirical work in this area.

However, as I discuss, studies have also found that many households with negative equity do not immediately default. Furthermore, default is often associated with indicators of shocks such as high unemployment rates. According to the pure option-theoretic model, these should play no role; only a homeowner's equity position should affect his default decision.

One way of reconciling the theory

and the data is to first observe that default is costly,<sup>19</sup> and so homeowners may prefer to wait before defaulting, to see if house prices recover. However, for someone who is very illiquid (that is, has little cash to spare for the mortgage payment and is unable to borrow), the cost of waiting for prices to recover may be very high, and he or she is likely to default on his or her mortgage sooner rather than later. Thus, a homeowner's liquidity position has a role in the default decision as well.<sup>20</sup>

**The Relative Roles of Negative Equity and Illiquidity.** The empirical question remains: How important are negative equity and illiquidity in the default decision? Because of data limitations, previous research had to use very indirect ways to identify which borrowers had suffered a liquidity shock or were otherwise cash-constrained. For example, earlier studies used local unemployment rates to measure the likelihood that a borrower might have suffered an unemployment shock (see the study by Chester Foster and Robert Van Order). Or they identified characteristics of the mortgage at origination (for example, a low down payment) as evidence that the borrower was already liquidity-constrained when taking out the mortgage (see the study by Patrick Bajari, Sean Chu, and

<sup>18</sup> This model is clearly idealized. For example, even if a homeowner does not pay his mortgage, he will not necessarily be forced to leave his home immediately, since the foreclosure process can take a long time, depending on the state in which the house is located (for example, over a year in New York).

<sup>19</sup> These costs can include limited access to future credit, moving costs, and even the psychological trauma of being thrown out of one's home.

<sup>20</sup> While the popular press often terms equity-driven defaults "strategic" and contrasts them with "involuntary" defaults driven by factors such as job loss, my article suggests that such a sharp distinction is unwarranted.

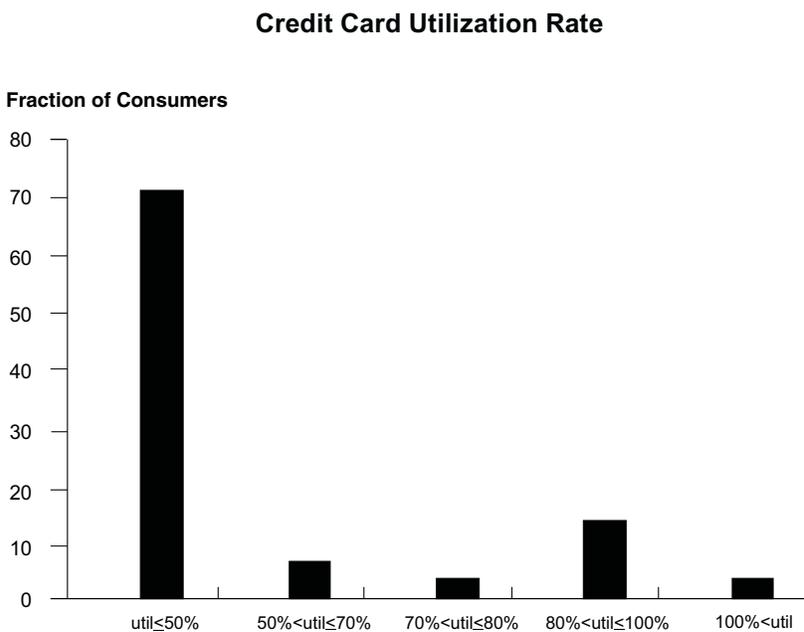
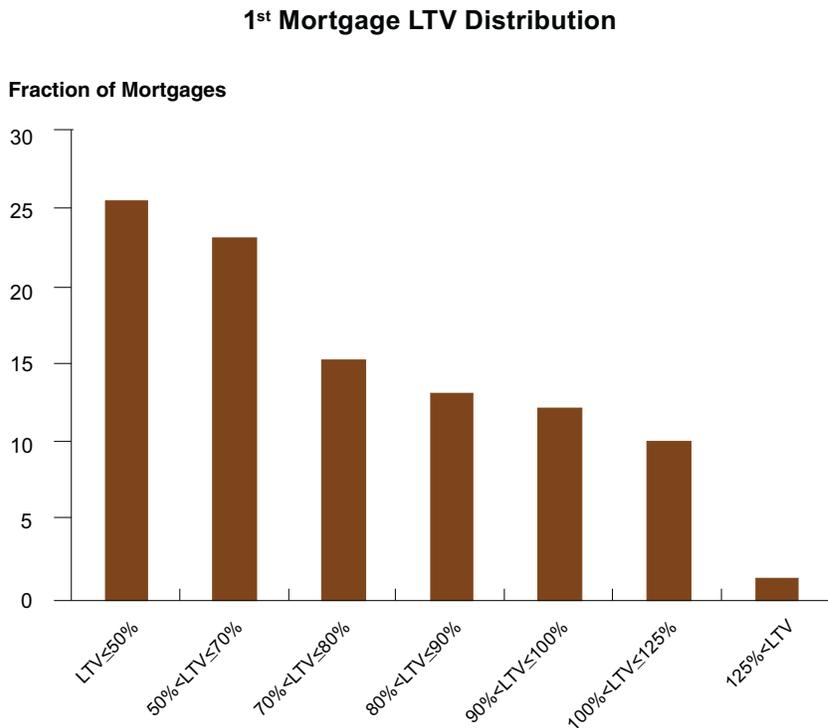
Minjung Park). These studies typically find weak evidence for the role of liquidity. But it may be that imperfect measures of illiquidity used in previous research led to weak results. A further difficulty is that many of these liquidity measures are taken at the state or county level. Since house prices are also typically measured at the state or MSA level, previous research found it difficult to empirically disentangle the effects of house prices and liquidity.

In a 2010 study, my co-authors and I more directly assess the relative importance of these two factors for mortgage default. We combine loan-level data on mortgage performance with information on credit card utilization rates from credit bureau files to obtain a sample of first mortgages originated in 2005 and 2006. The card utilization rate provides a direct way to measure a borrower's liquidity position. All things being equal, a consumer who is using a larger fraction of his credit line is expected to be less liquid and hence more likely to default on his mortgage. Another way to understand why a high utilization rate is associated with increased default risk is that it may reflect shocks that the consumer has experienced in the past (for example, someone who has lost his job is likely to run up a large balance on his credit card).

We find that both low levels of home equity (that is, a high loan-to-value ratio, or LTV) and high card utilization rates are associated with increased default risk and have roughly similar magnitudes. Going from a loan-to-value ratio of below 50 percent to one just above 100 percent (that is, to negative equity) more than doubles the average default rate, from below 1 percent to 2 percent. Similarly, going from a credit card utilization rate of below 50 percent to one above 80 percent has approximately the same effect on default.

**FIGURE 4**

**Distribution of LTV and Utilization Rates\***



\* As of March 2010.  
Sources: LPS Analytics and credit bureau data

To help assess the economic significance of these results, Figure 4 shows the distribution of LTV and credit card utilization rates across the population; from these it is apparent that the fraction of the population with either high LTV or high utilization exceeds 10 percent. We also find evidence of an *interaction* between the two effects: The impact of high utilization is more pronounced when the loan-to-value ratio is also high. This makes sense, since when the loan-to-value is low, the homeowner would lose a lot of equity in the event of default. Such a homeowner will make every attempt to avoid default, even when cash on hand is very low.<sup>21</sup>

## CONCLUSION

Economists have learned about the impact of securitization on mortgage default. There is robust evidence that securitized loans were riskier, and this may have contributed to a general decline in lending standards, which led to the spike in default rates. My co-authors and I have also shown that negative equity and liquidity shocks are of comparable importance in explaining mortgage default. Moreover, it is also

<sup>21</sup> We also find that the effect of utilization is less significant when the LTV is very high (above 120 percent); this may reflect the fact that when equity is very negative, the borrower will not find it worthwhile to keep his home even if he has ample liquidity.

now clear that one should not view each of these in isolation and that the sharp distinction between “strategic” and “involuntary” defaults often found in the popular press is misleading.

However, to date, the literature is inconclusive about the effects of securitization on loan restructurings to cure default and, more generally, on which types of loan modifications are successful. There is also still more to learn about the extent to which investors understood the risks in securitized loans and on how consumers manage different types of credit. 

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