The Impact of Securitization on the Expansion of Subprime Credit

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Abstract

This paper investigates the relationship between securitization activity and the extension of subprime credit. The analysis is motivated by two sets of compelling empirical facts. First, the origination of subprime mortgages exploded between the years 2003 and 2005. Second, the securitization of subprime loans increased substantially over the same time period, driven primarily by the five largest independent broker/dealer investment banks. We argue that the *relative* shift in the securitization activity of investment banks was driven by forces exogenous to factors impacting lending decisions in the primary mortgage market, and resulted in lower ZIP code denial rates, higher subprime origination rates, and higher subsequent default rates. Consistent with recent findings in the literature, we provide evidence that the increased securitization activity of investment banks reduced lenders' incentives to carefully screen borrowers.

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1. Introduction

This paper investigates whether growth in the securitization of subprime mortgages caused increases in the extension of subprime mortgage credit. This is significant because Diamond and Rajan (2009) suggest that a misallocation of resources to the real estate sector, facilitated by activity in the securitization market, contributed to the recent financial crisis. We are motivated by two empirical facts. First, Mian and Sufi (2009) document that mortgage origination growth was 35 percentage points higher in subprime versus prime ZIP codes from 2002 to 2005. The second empirical fact has received less attention to date. We show that the number of originated subprime securitization deals increased over 200 percent between the years 2003 to 2005.[1] Furthermore, we document that increases in subprime securitization activity, particularly in the years 2004 and 2005, were largely driven by the five large broker/dealer investment banks.

Securitization activity and subprime mortgage originations are clearly correlated, but empirically disentangling causality is difficult. We construct a test of causality that differentiates between competing hypotheses. A "securitization-driven" hypothesis states that increased securitization by investment banks increased the supply of credit because securitization activity alters the cost of lending and/or the screening incentives of lenders. A "primary-market driven" hypothesis states that the subprime loan origination increase was driven by an observed (e.g. incomes, house prices) or unobserved (e.g. lender risk preferences) primary mortgage market shock. Under this alternative hypothesis, securitization activity increased as a "take out" mechanism for banks and mortgage originators not wishing to hold mortgages on their balance sheet.

Establishing causality between the primary mortgage market and the securitization market is fraught with endogeneity problems. Tests that estimate the relationship between the percentages of originated loans that are securitized or sold to the secondary market, and the number of subprime loans originated across ZIP codes establish correlation but not causality. A positive correlation may indicate

[1] ABSNet reports that 135 subprime securitization deals were originated in 2003, while 304 deals were originated in 2005.

that increased securitization caused an increase in primary market lending, that increased lending in the primary market caused an increase in securitization, or that some other variable caused an increase in both securitization and lending.

We design our empirical specification to address the omitted variable and simultaneity challenges. We rely on a feature of our data to solve the omitted variables problem. Our unique sample matches individual loans to securitization deals allowing us to identify the specific securitizing bank associated with a securitized subprime loan in a given ZIP code. This detail allows us to compare the securitization activity of different securitizing banks within a ZIP code. Any demographic or macroeconomic variable impacting mortgage originations should impact the securitization activity of banks within a ZIP code equally. Thus, any difference between banks' securitizing activity in a ZIP code should be on account of factors unrelated to macroeconomic, demographic, or other latent factors.

We address the simultaneity issue by constructing a variable, which we call "excess demand," that is designed to capture only securitization market influences. The excess demand variable measures differences in the growth of securitization activity between broker/dealer investment banks and their non-investment bank counterparts. We hypothesize that differences in securitization activity between the two types of banks represent factors correlated with the securitization market and not the primary origination market. Relevant institutional differences that are correlated with the demand for investment banks to securitize mortgages include, but are not limited to, regulatory differences, reliance on the repo market, and product strategy.[2] We find that ZIP codes associated with "excess demand" of 75 percentage points (one standard deviation) resulted in 2.5 percent to 6.5 percent higher subprime mortgage origination rates per household. In analyzing the consequences of credit expansion, we find that ZIP codes with one standard deviation higher excess demand exhibited almost 1 percent higher subsequent default rates.

We analyze the mechanism by which an increase in securitization activity would lead to an extension of credit. At least two possible mechanisms exist. First, an increase in securitization activity among a set of banks could result in a lower cost of capital for mortgage originating banks, allowing

[2] We discuss these institutional features in much greater detail in Section 1.3.

lending banks to move down the credit quality curve. Relatively negative NPV loans for some banks are positive NPV investments for banks with a lower cost of capital. An alternative explanation suggests that securitization lowered the screening incentives of lending institutions (Rajan, Seru, and Vig, 2010a, RSV hereafter). We provide empirical evidence consistent with a reduced screening explanation. Consistent with theoretical predictions of the impact of securitization on screening, conditional on observable hard information, the variance in subprime interest rates declined most in areas with low average credit quality. Further, interest rates on mortgage loans were more sensitive to hard information signals in high excess demand ZIP codes on average. Finally, we document a positive relationship between the origination of low or no documentation loans in areas with high excess demand, further evidence that increased securitization activity reduced lenders' incentives to screen.

In a concluding section of the paper, we consider the robustness of our excess demand variable. In particular, we test whether our excess demand specification does indeed capture secondary market demand, as hypothesized. We exploit an event that impacted the cost of securitizing mortgages but was unrelated to the primary mortgage market. In May of 2004, Standard and Poor (S&P) began to require higher levels of credit enhancement for securitization deals that contained mortgage loans from states with uncertain or vague definitions of assignee liability laws on the grounds that these loans constituted a future liability to the trust issuing the securitization deal.[3] The S&P ratings requirement reflected a change in how S&P would treat already-enacted laws. Thus, while the ratings change had an impact on the cost of securitizing a loan, it should not have directly impacted mortgage originations (except through the securitization channel). We find that the five investment banks that increased their securitization activity substantially between the years 2003 and 2005 also increased their securitization activity at a much lower rate in a state whose assignee liability laws had been in place the longest prior to the change in S&P's treatment of assignee liability laws. A decline in the securitization activities of investment banks

[3] Assignee liability laws increase the cost of securitizing a loan because they increase the amount of credit support required of deals that contain loans from states with these laws. The primary forms of credit support come in the form of increased subordination or excess spread and the costs of providing this support are implicitly borne by the securitizing bank.

surrounding this event suggests that forces specific to the securitization market were driving securitization activity, as opposed to the securitization market simply responding to primary market outcomes.

Mian and Sufi (2009) investigate causes of the expansion in subprime mortgage credit and find evidence consistent with an increase in lending supply that is correlated with securitization activity, as opposed to explanations such as increases in borrowers' incomes or expected house price appreciation. Our work furthers their results by identifying the causal influence of the securitization channel, specifically on lending supply.

This work also further contributes to the literature by investigating the specific mechanisms by which securitization might influence lending supply, either by lowering lenders' cost of capital or reducing lenders' incentives to carefully screen borrowers. Our evidence suggests that securitization's effect on screening incentives is likely at play. This result is consistent with a series of papers by Keys, Mukherjee, Seru, Vig, (2009 and 2010) (KMSV hereafter), Keys, Seru, and Vig (2010) (KSV hereafter), RSV (2010a, 2010b), and Purnanandam (2011). KMSV (2010) show that securitized loans with a credit score slightly above the traditional subprime threshold (FICO 620) were 20 percent more likely to default than securitized loans slightly below the subprime threshold. The result is concentrated in no/low documentation loans and is interpreted as evidence that the prospect of securitizing loans reduces lenders' incentives to screen borrowers carefully. In a similar spirit, Purnanandam (2011) shows that banks active in pursuing an originate-to-distribute model of lending did not expend resources in screening their borrowers.

Finally, the cause of the rapid increase in securitization activity itself is a subject of considerable interest. Gorton and Metrick (2010) attribute the rise in securitization activity, particularly among broker/dealer investment banks, to the investment banks' reliance on the repo market for short term financing. Acharya, Schnabl, and Suarez (2009), and Acharya and Richardson (2009) argue that securitization increased in order to facilitate regulatory capital arbitrage via asset-backed commercial paper programs. Shleifer and Vishny (2010) model securitization as a rational response to mispricing in underlying fundamentals. Our goal is *not* to provide direct evidence on the exact cause(s) of the increase

in securitization; rather, we focus on demonstrating how the increase influenced activity in the primary mortgage market.

2. Theoretical motivation and empirical strategy

Theoretical models of credit rationing posit multiple factors that potentially influence credit extension decisions. The supply of credit could increase in response to factors influencing the attributes of borrowers or lenders. Mian and Sufi (2009) consider borrower and lender factors, including a decline in the expected borrower probability of default on account of a positive shock to borrower incomes, a change in expected collateral values, or a shock to the supply afforded by lenders. They present empirical evidence which rules out borrower income shocks or expected house price appreciation and find evidence more consistent with a change in the supply of credit offered by lenders.

The supply of credit a lender optimally offers could itself be influenced by several factors, securitization among them. A liquid secondary market could impact a lender's cost of capital and its incentive to carefully screen borrowers. Theoretical models focus most specifically on how securitization impacts lenders' incentives to screen potential borrowers. RSV (2010a and 2010b) and Parlour and Plantin (2008) both offer models of securitization's impact on screening incentives. Liquid secondary markets are beneficial in that they allow lenders to liquidate existing loans in order to pursue other profitable lending opportunities. However, liquid secondary markets alter lenders' incentives to gather costly soft information on borrowers, particularly low-credit-quality borrowers on whom soft information is most costly to obtain.[4]

Whether securitization has the effect of lowering a lender's cost of capital or altering incentives to screen, or both, higher levels of securitization should result in increased credit extension in the primary

[4]Of course, secondary market participants rationally anticipate lender's motives to liquidate loans, creating a potential lemons market. However, as long as the probability that the bank is selling a loan for liquidity motives is sufficiently high, as opposed to the disposing of a lemon loan, then loans can be pooled and trade in secondary markets will exist.

mortgage market.[5] However, identifying the causal influence of securitization activity on credit extension decisions can be problematic because the set of borrower characteristics and demographic factors which make loans appealing to mortgage originators would also make loans appealing to participants in the securitization market. Thus, establishing an empirical correlation between mortgage originations and securitization does not uniquely identify the role of securitization in the credit extension process. For concreteness, consider the following simple regression model:

$$Credit\ Extension_{i,t} = \alpha_0 + \beta \cdot Sec.Mkt.Sold_{i,t} + \delta \cdot X_{i,t} + \varepsilon_{i,t}.$$

This specification proposes that credit extension decisions are impacted by the number (or proportion) of originated loans subsequently sold to the secondary market (*Sec. Mkt. Sold)* and a list of controls, *X*. Unobserved variables impacting credit extension outcomes are included in the error term. Any unobserved variables associated with demographics or expected macroeconomic conditions that impact lending outcomes would also impact the loan purchasing decisions of securitizing banks. The omitted variables which influence credit extension decisions are also likely to be positively correlated with secondary purchasing activity. Thus, the presence of omitted variables could result in overestimating the impact of the variable *Sec. Mkt. Sold* on observed credit extension outcomes. To identify the unique impact of securitization on credit extension decisions, we need to specify a variable that is correlated with secondary market activity but independent of other factors that cause credit supply to be different across ZIP codes.

Our identification strategy relies on a comparison of the securitization activity of a treatment sample of banks against the securitization activity of a control sample within a given ZIP code. We assign the five largest broker/dealer investment banks to a pseudo-treatment sample because we hypothesize their securitization activity to be driven by factors unique to the secondary mortgage market. We employ a measure of the differences in securitization activity between the treated and control samples as our key variable in estimating the following simple specification.

[5] In Section 4 of the paper we explore empirical tests which differentiate between cost of capital and lax screening explanations.

$$Credit\ Extension_{i,t} = \alpha_0 + \beta \cdot Excess\,Demand_{i,t} + \delta X_{i,t} + \varepsilon_{i,t},$$ where

$$Excess\,Demand_{i,t} = \left(\frac{\#\,Sec.\,Loans, Treated\ Banks_{i,T}}{\#\,Sec.\ Loans, Treated\ Banks_{i,T-t}} - \frac{\#\,Sec.\,Loans, Control\ Banks_{i,T}}{\#\,Sec.\ Loans, Control\ Banks_{i,T-t}}\right) \cdot$$

The subscript *i* references ZIP codes, subscript *t* references *t* number of years prior to a given year *T*, and *X* is a matrix of demographic and macroeconomic controls. In our empirical tests we measure excess demand using differences in securitization activity from 2003 to 2004, and 2003 to 2005, separately.

The excess demand specification meets the identification requirement in the following way. First, comparing rates of growth in securitization activity among a cross-section of banks within a ZIP code meets the criteria of a variable that is correlated with securitization activity. Second, we believe that the *differences* in securitization activity between the treated sample and the control sample are being driven by factors in the securitization market that are independent of factors that cause credit in the primary market to be supplied differently across ZIP codes.

Our excess demand specification has other advantages. First, it essentially controls for the "natural" rate of securitizing loans from a given ZIP code because it accounts for factors in a ZIP code common to *all* banks that could influence the baseline rate of growth in securitization activity. Second, computing the difference between the treated sample growth rate in securitization activity and the baseline (control) rate of growth identifies the amount of extra credit extension that is unique to the factors influencing only the five broker/dealer investment banks in the treatment sample relative to the control. That is, the factors that make the treatment sample of banks different (and are presumed to be exogenous to primary market lending decisions) impact lending decisions only through the securitization channel. The only remaining concern would be with omitted variables in a ZIP-year pair that are uniquely correlated with only the five treated investment banks and not the control sample of banks through a channel other than the securitization channel. While we cannot rule out that such omitted variables exist, the possibility seems unlikely.

1.2. Documenting an increase in subprime securitization activity

In this section, we lay the foundation for the assignment of broker/dealer investment banks into the treated sample. Figure 1 provides data on the subprime-securitization underwriting activity of various financial institutions through time. During our sample period, as many as 36 different financial institutions were responsible for the creation of a subprime securitization deal, but the bulk of the deal creation was done by relatively few financial institutions. Over 90 percent of the deals were originated by 15 financial institutions, and almost 75 percent of the deals were originated by ten financial institutions. As for deal creation through time, over 50 percent of the deals were originated between 2003 and 2005. Taken together, these stylized facts indicate that the majority of subprime securitization activity was fueled by relatively few banks over a short period of time.

Of particular interest is an observed dramatic shift in the relative market share of the deal-originating banks over this period. In 2003, the five independent broker/dealer investment banks were responsible for 32.1 percent of the deals originated. The five investment banks' market share grew aggressively over the next 2 years, reaching a peak market share of 47.7 percent of originated deals in 2005. In the space of 2 years, the five investment banks essentially increased their relative market share of subprime-securitization deal originations by almost 50%. In Figure 2, using a bank-ZIP-year panel, we provide a plot of securitization activity for the investment banks through time. The solid line represents the average share of all securitized subprime loans that are associated with the five independent broker/dealer investment banks while the dotted lines represent information about the distribution of ownership share across ZIP codes. The plot highlights two features of the market. First, it confirms that, on average, the investment banks increased their securitization activity substantially over 2003 to2005 relative to competing underwriters.[6] Second, the increase in the 5th percentile of market share indicates that the increase in securitization activity was significant across all geographies.

[6] In unreported regression results (for the sake of brevity) we confirm that the change in securitization activity of the five investment banks was statistically significant.

1.3. The assignment of banks to the "treated" or "control" sample

The preceding evidence raises the question: Why did the five broker/dealer investment banks increase their deal activity so dramatically over this period? We hypothesize that the five investment banks were unique in their ability and incentives to increase securitization market share for at least three specific reasons: differences in regulation (capital requirements in particular), reliance on the repo market for short-term financing, and product strategy. Indeed, the evidence we provide is potentially consistent with all three explanations. Moreover, broker/dealer investment banks likely differ from their competing creators of securities in other ways, and securitization activity could have increased for other reasons. Inour view, it is difficult to convincingly determine the exact cause of differences in securitization activity between the two types of banks. That said, the necessary criteria to test a securitization-driven hypothesis is that the *differences* in securitization activity between the two types of banks are correlated with securitization-related factors and exogenous to factors which influence mortgage-origination decisions (except through the securitization channel).[7]

During the securitization boom, broker/dealer investment banks were regulated differently than commercial banks: commercial banks were regulated by the Federal Reserve, and investment banks by the U.S. Securities and Exchange Commission (SEC).[8] The differences in the regulatory environment have consequence in the origination of securitization deals for two important reasons. First, investment banks are not subject to the same leverage restrictions as commercial banks. Higher leverage can be used to free up equity to pursue profitable opportunities. In an SEC postmortem of the Bear Stearns collapse, the SEC Trading and Markets Group recommended that the SEC, in connection with the Federal Reserve, should reassess the leverage limits afforded the five broker/dealer investment banks (SEC 2008). Second,

[7] Put differently, our empirical strategy relies less on pin-pointing the exact reason(s) why the securitization activity of the investment banks increased relative to the non-investment banks than it does on identifying that differences in securitization activity are correlated with the securitization market. We hasten to add that while we cannot identify exact causes of the observed differences in securitization - only that differences are exogenous to the primary market - we *are not* agnostic about the mechanism by which securitization could impact credit extension. We address this issue in Section 4.

[8] Following the collapse of Bear Stearns and Lehman Brothers, and the acquisition of Merrill Lynch, Goldman Sachs and Morgan Stanley elected to become Bank Holding Companies, placing them under the supervision of The Federal Reserve. This occurred after our sample period of interest.

concentration risk among the five broker/dealer banks was apparently not taken as seriously as it could have been by the SEC. As reported in the same SEC document, "The Trading and Markets group did not make any efforts to limit Bear Stearns' mortgage securities concentration" (SEC 2008, pg 18). The anecdotal evidence suggests that the broker/dealer investment banks were able to ramp up activity aggressively on account of some "regulatory slack."

Regulatory differences are important in disentangling the relationship between securitization activity and credit extension decisions because they could be the cause of differences in securitization activity. However, general regulatory differences between investment and commercial banks are not sufficient in explaining why investment banks increased securitization activity relative to commercial banks – only that they could. That is, regulatory differences potentially explain why investment banks could securitize more, but do not rule out that differences in securitization over a short period of time (2003 to 2005) were driven by primary market factors, with investment banks better able to handle the securitization of a huge influx in newly originated mortgages on account of those regulatory differences.

As evidence of a very specific difference in the investment banks regulatory environment that could have influenced securitization demand, we highlight a regulatory change in 2004 that uniquely impacted the capital requirements of the five broker/dealer investment banks relative to competing underwriters. In October 2003, the SEC proposed amending a series of rules which had the effect of reducing capital requirements for the five largest broker/dealer investment banks.[9] Formally adopted in April 2004, the change established an alternative method of calculating the regulatory "haircut" applied to securities on a bank's balance sheet. As stated by the SEC, "This alternative method [for calculating capital requirements] permits a broker-dealer to use mathematical models to calculate net capital requirements for market and derivative-related credit risk" (SEC 2004, page 34428). Under the change,

[9] The change involved the amendment of rules 30-3, 15c-31, 17a-4, 17a-5, 17a-11, 17h-1T, and 17h-2T under the Securities Exchange Act of 1934. The rule change came in response to the European Union's (EU) Conglomerates Directive which required that affiliates of U.S. broker-dealers demonstrate that their consolidated holding companies were subject to supervision by a U.S. regulator. U.S. broker-dealers with subsidiaries operating in the EU that could not meet this requirement would have faced significant restrictions on their European operations beginning January 2005.

banks would essentially be allowed to use their internal risk-based models to calculate a capital adequacy measure consistent with international standards adopted by the Basel Committee on Banking Supervision.[10] Calculating risk weights using internal risk-based models, as opposed to assigning risk weights based on standardized rules, allowed the five banks to take advantage of risk-reducing diversification benefits across asset classes. In a document detailing the rule amendment, the SEC estimated that "broker-dealers taking advantage of the alternative capital contribution would realize an average reduction in capital deductions of approximately 40%" (SEC 2004, page 34445).[11]

Lowering the regulatory haircut that is applied to a security could have one of two effects. Investment banks could maintain their regulatory net capital with a lower level of cash and marketable securities, or they could maintain the same amount of cash and marketable securities and have the appearance of having more net capital.[12] Investment banks do not publicly report the data required to calculate their levels of net capital, which makes it impossible to evaluate what happened to levels of net capital before and after the rule change. We can, however, calculate the amount of cash and marketable securities as a fraction of total assets for the five investment banks. We compare average levels of cash and marketable securities as a fraction of assets over the years 2000 to 2003 and 2004 to 2005. We perform the same calculation over the same time periods for non-investment banks. Cash and marketable securities as a fraction of total assets for investment banks declined 2.3 percentage points in 2004 and 2005 when compared against 2000 to 2003. The two broker/dealer investment banks most active in securitization over the sample period (see Figure 1), Bear Stearns and Lehman Brothers, exhibited a 6.8 percentage point drop over the same time periods. Comparatively, non-investment banks demonstrated an increase of 1.7 percentage points. The evidence indicates that broker/dealer investment banks lowered one type of regulatory capital surrounding this event, while non-investment banks did not. It is possible that

[10] The change did not come without a cost to the broker-dealers. In exchange for being allowed to use internal risk-based models, the investment banks would be required to submit their risk models to an SEC audit each month. In the aftermath of the Bear Stearns and Lehman Brothers collapses, it has been revealed that the proposed SEC audits did not occur with the frequency or intensity originally intended (SEC 2008).

[11] See Federal Register / Vol. 69, No. 118 / Monday, June 21, 2004 / Rules and Regulations, page 29.

[12] A short-hand formula for net capital = cash + (marketable securities – regulatory haircut).

some amount of the regulatory slack afforded broker/dealer investment banks could be allocated to the pursuit of profitable securitization opportunities.[13]

A second possible explanation for the growth in securitization activity of the investment banks relative to commercial banks has to do with investment banks' reliance on the repo market for short-term financing (Gorton and Metrick, 2010). Securitization is relevant to the repo market because the highly rated bonds produced from securitization deals serve as collateral in repo transactions. Hordahl and King (2008) suggest that "(former) top U.S. investment banks funded roughly half of their assets using repo markets."[14] In contrast, Gorton and Metrick (2010) conclude that "commercial banks did not rely heavily on repo." The repo-induced increase in securitization implies that investment banks retained portions of the securitization deals they originated, a hypothesis difficult to confirm empirically.[15] However, the reliance on the repo market for investment banks relative to non-investment banks does provide a potential explanation as to why investment banks ramped up securitization activity--an explanation that is not correlated with the primary mortgage market.

Finally, we posit that one explanation of the rapid increase in securitization activity is simply the decision of the broker/dealer investment banks, particularly Lehman Brothers and Bear Stearns, to be

[13] In discussing the amendment, the SEC estimated that a broker-dealer could reallocate capital to fund business for which the rate of return would be approximately 20 basis points higher. Capital is required in the production of securitization deals for at least two reasons. First, the average subprime mortgage loan is warehoused for 2 to 4 months by the underwriting bank before it is placed into a securitizing structured investment vehicle (SIV). Thus, securitization involves the carrying costs associated with purchasing and warehousing mortgages before the structure can be funded by the sale of the asset-backed securities produced by the deal. Second, most deals require overcollateralization, which comes in the form of an equity tranche funded by the underwriting bank. In our sample of 1,315 securitization deals, the average deal benefitted from 1.75 percent overcollateralization. Given that the average deal was comprised of $985 million in mortgage principle, funding the equity tranche would require a capital outlay of over $17 million, on average.

[14] Lehman Brothers in particular was especially dependent on the repo market. Anton R. Valukas in a 2010 bankruptcy report provides the following evidence, "Lehman funded itself through the short-term repo markets and had to borrow tens or hundreds of billions of dollars in those markets each day from counterparties to be able to open for business."

[15] Erel, Nadauld, and Stulz (2010) provide estimates of the holdings of highly rated tranches of securitizations on banks' balance sheets. The authors are unable to determine whether the subprime bonds held on balance sheets were originated by the bank holding the bonds.

industry leaders in the creation of structured, fixed-income securities.[16] The five broker/dealer investment banks were also near the top of the league table in the origination of various types of collateralized debt obligations (CDOs), including collateralized loan obligations (CLOs) and collateralized bond obligations (CBOs). The product strategy of broker/dealer investment banks also differed from non-investment banks in that the investment banks did not have retail banking operations. Investment banks did not originate mortgages as part of a menu of services offered to retail clients.[17] While the broker/dealer investment banks did purchase some primary market mortgage originators the originators they purchased were wholesale originators, meaning they originated mortgages solely for the purpose of selling them to secondary markets to be securitized.

1.4. Summary of empirical strategy

The preceding sections have described the following: first, securitization activity of broker/dealer investment banks significantly outpaced the securitization activity of non-investment banks between the years 2003 and 2005; second, we provided at least 3 plausible explanations as to why the heightened securitization activity of investment banks was because of factors exogenous to the primary mortgage market; and finally, we have described and motivated the construction of a variable, excess demand, which measures exogenous secondary market demand. Using ZIP code level data, our empirical tests measure the cross-sectional variation in primary market lending outcomes in the years 2004 and 2005, separately, as a function of the cross-sectional variation in excess demand. A second set of tests will evaluate the cross-sectional variation in the performance of 2004- and 2005-vintage loans as a function of the cross-sectional variation in excess demand. Third, we use the excess demand variable to test a lax screening hypothesis as the mechanism by which securitization influenced credit extension decisions.

[16] Industry practitioners at a leading bulge bracket investment bank, in answering our question as to why they increased their securitization activity so dramatically over the 2003-2005 period indicated their desire to be at the top of the league table in the origination of structured products.

[17] This point is important because it rules out the possibility that differences across ZIP codes in securitization activity of investment banks relative to commercial banks were driven by the location of retail mortgage originators. Further, for originators' location to be responsible for securitization differences, it would have to be the case that investment banks were affiliated with originators only in the most active subprime originating ZIP codes and that commercial banks were not.

3. Data and summary statistics

Our analysis of the link between securitization activity and the extension of credit employs mortgage-origination data from the Home Mortgage Disclosure Act (HMDA) data set and data on securitized loans provided by LoanPerformance. LoanPerformance, a subsidiary of First American Trust, reports borrower attributes and loan-level information for about 90 percent of all subprime securitization deals over the past 10 years.[18] Important loan-level attributes include borrower FICO scores, cumulative loan-to-value (LTV) ratios, debt-to-income (DTI) ratios, loan types, and the level of income documentation supporting each loan. We rely on deal summary information provided by ABSNet, a subsidiary of S&P's, to identify the underwriter responsible for the production of each securitization deal. Our analysis also requires data on the credit attributes of all potential borrowers within a given ZIP code. Equifax provides a file of the share of tract residents (which we aggregate to ZIP codes) with high, medium, and low credit scores. In our effort to control for factors that influence mortgage demand in the primary market, we utilize data on median income levels, housing units, homeownership rates, and construction permits made available from the Census Bureau. Data Appendix 1.1 contains a detailed description of the HMDA and demographic data. Appendix 1.2 outlines the matching of LoanPerformance to ABSNet, a necessary step in identifying the bank responsible for the securitization of individual loans.

Our analysis is designed to explain the cross-sectional variation in levels of credit extension at the ZIP code level in the years 2004 and 2005. Panels' A and B of Table 1 describe the cross-sectional variation in the raw data. Using the HMDA's "higher-priced" definition of subprime originations, 3.4 percent of mortgage originations across ZIP codes were financed with a subprime loan. That number jumped to 5.8 percent in 2005. Under the HUD subprime lender definition, subprime loans represented 2.5 percent of loans per household, with a small increase to 2.6 percent in 2005. Differences in reported subprime origination activity between the two measures highlight the need to consider both in our empirical tests.

[18] The coverage of LoanPerformance varies by year, and it is more complete in the later years of our sample.

Matching LoanPerformance to ABSNet deal summaries allows us to create a bank-ZIP panel of securitization activity. Securitized loan data is aggregated to the ZIP-code level by calculating the total number and average attributes of loans associated with investment banks and non-investment banks for a given ZIP code in a given year. Panel C of Table 1 reports summary statistics on securitization activity at the ZIP code level. Between the years 2003 and 2005 investment banks essentially doubled (+107.3 percent) the number of securitized loans, on average. Comparatively, at the ZIP code level, non-investment banks increased their securitization activity by 39.6 percent over the same time period. The difference of 67 percentage points represents the average excess demand in a ZIP code. Panel C also highlights the cross-sectional variation in excess demand. ZIP codes in the lowest 10^{th} percentile exhibited negative excess demand while ZIP codes in the highest 10^{th} percentile exhibited substantial differences in the securitization activity of investment banks and non-investment banks. Final sample sizes in each of our tests are dictated by the number of ZIP codes for which primary market origination data and secondary market securitization data are both available.

4. Evaluating secondary market excess demand and primary market outcomes

3.1. Balancing on observables and event validity

Table 2 shows summary statistics on the bank-ZIP panel. Average FICO scores increased through time, as did average LTV and DTI ratios. On average, across ZIP codes, no consistent differences exist between the types of loans securitized by investment banks as compared to non-investment banks. However, given that our identification comes in comparing cross-sectional differences in securitization activity, we want to ensure that our estimation sample only includes ZIP codes that contain comparable types of loans among the treatment and control sample of banks prior to the change in securitization activity which occurred in 2004 and 2005. To ensure this is the case, in each ZIP code in the year 2003 we calculate the average loan FICO and LTV for the treatment and control sample of banks and remove from the sample any ZIP codes with statistically different average FICO or LTV measures. Balancing the

sample of bank-ZIP observations with comparable pre-event FICO and LTVs reduces the sample by 856 ZIP codes in the 2004 cross-section and by 818 ZIP codes in the 2005 cross-section.

In section 1.2, we provided aggregate evidence that the broker/dealer investment banks substantially increased their securitization activity over the years 2004 and 2005. In this section, we present a quarterly plot of bank-specific excess demand to ensure that the years 2004 and 2005 adequately represent the time period in which all five broker/dealer investment banks increased their securitization activity relative to the control sample. Figure 3 provides a plot of bank-specific excess demand in each quarter, beginning in Q1 2000 running through Q4 2007. The plot shows that the first quarter of 2004 was the first quarter in which *any* bank exhibited positive excess demand over the "event" period. Further, the plot shows that each of the five treatment banks exhibit positive excess demand only during the years 2004 and 2005. Overall, the plot provides evidence that the years 2004 and 2005 uniquely represent a period of time in which the treatment sample investment banks substantially increased their securitization activity relative to their peers, and that the increase in activity over the period was fairly consistent across all five banks.

How were the investment banks able to obtain collateral to ramp up their securitization activity? Bloomberg reports the identities of loan originators for the bulk of the deals in our sample. In circumstances where an entire collateral pool was originated by one lender, Bloomberg reports the name of the lender. In circumstances where collateral was originated by multiple lenders, Bloomberg reports the term "multiple." During the years 2002 and 2003, 90.3 percent of the investment-bank-originated deals had collateral originated by multiple lenders, compared to 63.6 percent in 2004 and 2005.[19] By comparison, during 2002 and 2003, 78.6 percent of commercial-bank-originated deals had collateral from multiple originators, compared to 56.0 percent during 2004 and 2005. This evidence indicates that investment banks increased their deal activity by increasing their purchasing of collateral through single-

[19] We are unable to match deals in our sample originated in 2000 and 2001 to the Bloomberg sample identifying loan originators.

name originators, but not at a meaningfully different rate than non-investment banks over the same period.[20]

3.2. Excess demand and credit expansion

Our tests require a measurement of access to credit in the primary mortgage market. The traditional measure has been the mortgage denial rate (Mian and Sufi, 2009, Dell'Ariccia et al, 2008, Gabriel and Rosenthal, 2007). As suggested by Mayer and Pence (2008), denial rates may not accurately reflect borrowers' access to credit because of potential problems with the measurement of mortgage applications, which serve as the denominator in the denial rate calculation. Subprime mortgage originators were known to have aggressively marketed to potential borrowers, thereby endogenously increasing the number of applications. If mortgages are not originated at the same rate as applications endogenously increase, the denial rate may be biased. In addressing this issue, Mayer and Pence (2008) propose scaling mortgage originations by the total number of housing units in a ZIP code. We follow this convention in calculating our measure of access to mortgage credit. For comparison purposes, we also estimate the impact of securitization activity on the conventional mortgage-denial rate, though it is not our preferred measure.

We estimate the relationship between the fraction of originated subprime loans per housing unit and the mortgage denial rate at the ZIP code level as a function of our measure of excess demand from the securitization market. We control for important factors that impact the demand and supply of mortgage credit. We control for house prices in the year prior to mortgage origination as a proxy for expectations surrounding the value of the loan collateral. Equifax Inc. provides data on the share of tract residents with high, medium, and low credit scores. We aggregate the measures to the ZIP code level, allowing us to control for average borrower credit quality.[21] We also control for median levels of income as an important

[20] The acquisition of wholesale mortgage brokers may be responsible for the increase in investment bank-originated deals with collateral originated by a single-name lender. Bear Stears acquired Rooftop Mortgages and Essex & Capital Mortgage in 2005. Merrill Lynch acquired Mortgages PLC and Ownit Mortgage Solutions and in 2004 and 2005, respectively. Morgan Stanley acquired Advantage Home Loans in 2005, and Lehman Brothers acquired ELQ Hypotheken in 2004.

[21] In our model estimates, the high-level credit category serves as the omitted group.

factor influencing expected default rates. Finally, we control for homeownership rates, housing permits, and the unemployment rate to capture general macroeconomic trends that could impact housing market activity and the demand for credit.[22]

Tables 3 and 4 report the coefficients and *t*-statistics arising from an OLS regression of the log of originated subprime loans per housing unit as a function of our measure of excess demand and control variables. Table 3, Columns 1 and 2 report model estimates when subprime originations are measured using HMDA's "higher-priced" definition. Column 1 estimates the impact of securitization activity on the extension of credit in the cross-section of ZIP codes in the year 2004, when excess demand is measured from 2003 to 2004. Column 2 reports results from the cross-section of ZIP codes in 2005, where excess demand is measured from 2003 through 2005. Columns 1 and 2 of Table 4 report results of the same specification over similar time periods when measuring subprime originations using the HUD subprime-lender list definition.

Qualitatively, the estimates indicate that ZIP codes associated with larger excess demand resulted in higher subprime mortgage origination rates. To better understand the economic magnitude of the results, consider the summary statistics associated with the excess demand variable tabulated in Table 1. In the average ZIP code from 2003 to 2004, the treatment sample investment banks increased their securitization activity 50.2 percentage points more than control sample non-investment banks (i.e., investment banks increased securitization activity 85 percent, while commercial banks increased activity 33 percent).[23] Taken literally, the estimated results using the HMDA higher-priced definition of subprime loans imply that ZIP codes which experienced average excess demand from broker/dealer investment banks resulted in a modest 2.0 percent more originated subprime loans per housing unit (i.e., moving

[22] In each of the specifications, we cluster standard errors at the state level to account for the correlation of some of our independent variables, particularly housing prices, within each state. Other variables, particularly incomes, are likely more correlated within an MSA. Ex ante, it is unclear which approach is more correct. Empirically, in the majority of our specifications for the majority of our variables, particularly house prices and excess demand, the estimated standard errors are much larger when clustered at the state level. To present the more conservative estimates, we report results with standard errors clustered at the state level.

[23] The average full sample difference of 50.2 percentage points does not exactly equal the difference between averages in the growth of securitization activity across the two types of banks (85.4% - 32.8%).

from 5 subprime loans per 100 households to 5.1 subprime loans per 100 households). Using the HMDA estimates in Table 3, when measured from 2003 to 2005, an average increase in excess demand (68 percentage points) resulted in 5.9 percent more subprime loans per housing unit. The economic magnitude of the results is more pronounced when considering a ZIP code in the 25th percentile of excess demand compared to the 75th percentile in excess demand, which is estimated to have had 7.0 percent larger subprime originations per housing unit (i.e., moving from 5 subprime loans per 100 households to 5.35 subprime loans per 100 households). ZIP codes which experienced the largest increase in excess demand from the securitization market (140 percentage points at the 90th percentile) resulted in 5 percent to 13 percent higher rates of originated subprime loans per housing unit, depending on the chosen subprime definition. Estimated coefficients using the HUD subprime-lender list definition of subprime loans are consistent with the higher-priced sample; average investment bank excess demand resulted in 2.3 percent to 5.5 percent more originated subprime loans per housing unit, depending on the specification.

As another means of benchmarking the magnitude of the results, we compare them to estimated results when using the more conventional, but endogenous measure of securitization activity--the percentage of loans sold to the secondary market--as the key explanatory variable. We report these results in Columns 3 and 4 of Tables 3 and 4. A one-standard deviation increase in the percentage of loans sold to the securitization market (from 12.3 percent to 14.5 percent depending on the year) is associated with an increase of 8.5 percent to 20 percent more subprime loans per housing unit. The magnitude of these estimates is larger than estimates using our excess demand measure. We interpret these results as being consistent with our conjecture that measuring securitization activity using the endogenous percentage of loans sold to the secondary market results in biased estimates of the impact of securitization on credit extension.

Table 5 reports results using the conventional mortgage denial rate measure of credit extension. The results are mostly consistent with Tables 3 and 4, with the exception of the estimated coefficient on excess demand measured from 2003 to 2004 (Column 1), which is not statistically significant. When measured from 2003 to 2005, a one-standard deviation increase in excess demand (77 percent) is

associated with almost a 0.6 percent reduction in the mortgage denial rate. Columns 3 and 4 of Table 5 use the conventional percentage-of-loans-sold-to-the-secondary-market measure of securitization. A one-standard deviation increase in the percentage of originated loans sold to the secondary market is associated with a 1.5 percent decrease in mortgage denial rates, further evidence that the percent sold to the secondary market measure overstates securitization's impact.

Lagged rates of house price appreciation may not adequately capture expected rates of house price appreciation. As an alternative, we consider measures of housing supply elasticity as a proxy for expected house price appreciation.[24] In doing so, each ZIP code in our sample is assigned an associated MSA elasticity score, as estimated by Saiz (2009). We then classify each ZIP code as an above- or below-median housing elasticity ZIP code, based on the associated MSA-level elasticity score. Appendix Table 1 recreates the main results of Tables 3 and 4 using a below-median housing market elasticity indicator variable as a proxy for expected house price appreciation. Estimates indicate that low elasticity ZIP codes (high-expected house-price appreciation) are associated with higher levels of subprime credit extension. The estimated coefficients on excess demand are lower in the presence of the below-median housing elasticity but remain qualitatively similar to those produced in Tables 3 and 4, confirming that the excess demand variable captures economic factors aside from variation in expected home price appreciation.[25]

3.3. Consequences of credit market expansion

The previous section provided evidence that securitization activity was associated with an increase in the extension of credit. In this section, we investigate the *consequences* of the credit expansion.[26] An increase in the extension of credit should be accompanied by an increase in subsequent

[24] All else equal, municipalities with low elasticity of supply are less able to increase the housing stock in response to demand shocks. As such, prices in low elasticity municipalities rise more dramatically than prices in high elasticity areas in the presence of a demand shock.

[25] Results presented throughout the paper are also robust to this alternative measure of expected house price appreciation.

[26] One potentially interesting consequence to consider is whether a subsequent contraction in securitization (e.g. 2008–2009) reversed the effects observed during the credit expansion (in the spirit of the tests provided in Keys et al 2010a and 2010b). Unfortunately, the economics motivating the excess demand variable does not lend itself well to time series tests. The excess demand measure has economic meaning and is well motivated between the years 2003-2005 because of the dramatic shift in activity, but would not have a similarly meaningful interpretation in a long time series test.

adverse credit outcomes. Accordingly, we test whether high excess demand ZIP codes were associated with higher subsequent loan delinquency and default rates. We measure delinquency rates as follows. Using LoanPerformance data as of December 2010, for each ZIP code in our sample we calculate separately the percent of loans originated in 2003, 2004, and 2005 that have been 90 days or more delinquent at any point during their existence. We measure default rates as of December 2010 as any loan that has been in the foreclosure process for at least two consecutive months. We calculate the difference in delinquency (default) rates between the 2003 and 2004 vintage loans within each ZIP code. We also calculate the within-ZIP code difference in delinquency (default) rates between 2003 and 2005 vintage loans.

In Table 6, we present the results of separate regressions of changes in ZIP code delinquency and default rates for 2004- and 2005-vintage loans on the excess demand variable. We include the same set of macroeconomic controls as included in previous tables and cluster standard errors at the state level. The results indicate that ZIP codes that experienced higher excess demand over the 2003 to 2005 time period exhibited substantially higher increases in delinquency and default rates. In terms of economic magnitude, within the same ZIP code, all else equal, a one-standard-deviation increase in excess demand contributed to a 0.8 percent increase in 2005 vintage delinquency rates as compared to 2003 vintage delinquency rates. In terms of loan default, one-standard-deviation higher excess demand ZIP codes were associated with a 0.4 percent increase in defaults in the 2005 vintage compared with the 2003 vintage. Table 6 also shows that ZIPs with higher initial rates of house-price appreciation also experienced increases in adverse credit outcomes.

The documented increases in delinquency and default rates as a function of excess demand are further evidence consistent with a securitization-driven credit expansion hypothesis. These results are also consistent with evidence provided by KMSV (2010) and KSV (2010) who document higher delinquencies as a function of securitization as well as Piskorski, Seru, and Vig (2010) who show higher foreclosure rates on securitized loans as compared to bank-held loans.

5. Credit expansion: lower cost of capital or lax s creening?

In this section, we explore the mechanism by which increased secondary market demand influences credit expansion. A decreased cost of capital and lax screening explanation are both consistent with evidence on the expansion of subprime credit presented thus far. In evaluating which explanation was most likely at play, we conduct a test first prescribed by RSV (2010). Under a lax screening hypothesis, RSV argue that a newly originated loans' interest rate should rely more heavily on hard information signals in a high-securitization environment. This is because an active-securitization market lowers the incentive of lenders to gather costly soft information, leaving lenders to price loans based on easily observed hard information. If lenders were to gather costly soft information on poor quality borrowers and price loans accordingly, interest rates would reflect a wider distribution in credit quality than can be observed from hard information signals. As such, conditional on observable hard information, we expect to see the distribution of interest rates to decline as securitization increases.

Empirically, we test the following predictions. Interest rates in a high-securitization regime should exhibit a lower standard deviation than interest rates in a low-securitization regime. The effect should be exacerbated for lower credit quality loans, on whom soft information is the most costly to gather.[27] We measure high-securitization/low-securitization regimes in two ways. First, the data clearly indicate that securitization activity increased each year from 2003 through 2005. As such, we measure the *change* in the standard deviation of interest rates from 2003 to 2004 and from 2003 to 2005. Second, we argue that ZIP codes with high excess demand represent high securitization regimes relative to ZIPs with low excess demand. Conditioning on average ZIP code FICOs, LTV, and DTI ratios, we test whether the standard deviation of interest rates declined more in high excess demand ZIP codes over the 2003 to 2004 and 2003 to 2005 time periods.

[27] RSV show two pieces of evidence consistent with the prediction that interest rates will rely more heavily on hard information signals in a high securitization environment. First, the *r*-squared of a regression explaining interest rates as a function of observable FICOs and CLTVs increases as securitization activity increases. Second, they demonstrate that the distribution of interest rates shrinks as securitization activity increases.

In addition to FICOs, LTV, and DTI ratios, we control for the average level of interest rates in a given ZIP code and for the percent of loans in a ZIP code with adjustable-rate features. We cluster standard errors by state. Table 7 reports the results of our test. Column 1 reports baseline results when the change in the standard deviation of interest rates is measured from 2003 to 2004, while Column 4 reports results for the 2003 to 2005 change. Neither of the estimated coefficients on the excess demand variables is significant. However, ZIP codes with lower (higher) average FICO scores are associated with ZIP codes whose standard deviation of interest rates declined (increased) over the 2003 to 2004 and 2003 to 2005 time periods. Likewise, LTV ratios and DTI ratios exhibit the expected sign. ZIP codes with higher average interest rates, presumably those with lower average credit quality, were also associated with declining standard deviations.

In Columns 3 and 6 we test whether declines in standard deviations were largest in the lowest credit quality ZIP codes. We interact excess demand with a below-median FICO indicator. The below-median FICO indicator is equal to one if the average ZIP code FICO is below the median of the average ZIP code FICOs in the years 2004 and 2005. Consistent with the estimated coefficients using the continuous FICO specification, below-median credit-quality ZIP codes were associated with declining standard deviations. As reported in Column 3, the estimate on excess demand interacted with below median FICO's is positive, opposite the predicted sign, but is not statistically significant. As reported in Column 6 the interaction term is negative, as expected under a lax screening hypothesis, but is not statistically significant. Though estimates on the interaction terms are inconclusive, we interpret the results in Table 7 as more consistent with a lax screening hypothesis than a declining cost of capital hypothesis. As predicted under a lax screening hypothesis, the standard deviation of interest rates declined over the increased securitization active period in ZIP codes with lower quality observables. A lower cost of capital hypothesis predicts the opposite.[28]

[28] Under a lower cost of capital argument, the standard deviation of interest rates should increase as lenders offer credit to borrowers who would not previously qualify for credit. If proper screening mechanism's are in place, lower credit quality borrowers would be a charged a higher interest rate, thereby increasing the overall distribution of interest rates.

A lax screening hypothesis has implications outside of a declining standard deviation in interest rates. Interest rates offered borrowers in a high securitization environment should depend more on observables than interest rates offered in a low securitization environment. Consistent with this prediction, RSV (2010) show that the *r*-squared of a regression of interest rates on FICO's and LTV's increases from 3 percent in 1997 to almost 50 percent in 2006. We perform similar tests using our measure of excess demand as a proxy for securitization activity. We regress the average ZIP code interest rate in the years 2004 and 2005 on ZIP code FICOs, LTV, and DTI ratios. We control for the percent of loans in a ZIP code with adjustable-rate features to ensure that adjustable-rate loans with lower average interest rates do not bias our results. We stratify the sample into ZIPs with positive excess demand, a proxy for high-securitization activity, and negative excess demand, a proxy for low-securitization activity.

Estimates are reported in Table 8. Hard information variables in positive excess demand ZIP codes (Columns 2 and 4) have significantly more explanatory power than in negative excess demand ZIP codes (Columns 1 and 3). In the 2004 estimates, the *r*-squared increases from 38.1 percent in the negative excess demand ZIP code to 51.5 percent in the positive excess demand ZIP code. A similar pattern exists in the 2005 sample. The *r*-squared increases from 43.0 percent to 58.7percent. The results also indicate that the magnitudes of the estimated coefficients are significantly larger in the positive excess demand ZIP codes. Columns 3 and 4 report tests of the differences in the estimated coefficients between the positive and negative excess demand ZIP codes. Positive excess demand ZIP codes predict significantly lower interest rates as a function of FICO scores than negative excess demand ZIP codes. Higher LTV ratios predict higher interest rates in positive excess demand ZIP codes. Overall, the results in Table 8 are consistent with loan pricing relying more heavily on observable hard information in high-securitization ZIP codes.[29] We interpret the evidence as being consistent with a lax screening hypothesis.

A final test of a lax screening hypothesis involves the origination of no or low documentation loans. No orlow documentation loans refer to loans originated without verification of borrower's income,

[29] Note that in the 2005 sample DTI ratios report a statistically significant coefficient of the opposite sign than would be predicted.

which is by definition a type of lax screening. We test whether excess demand is related to the origination of such loans. We calculate the *change* in the percent of no or low documentation loans originated in a given ZIP code between the years 2003 to 2004 and 2003 to 2005 and explain variation in changes as a function of the excess demand variable. Table 9 presents the results. Estimates reported in Column 1 indicate that excess demand, defined from 2003 to 2004, is positively related to increases in the origination of no or low documentation loans. Column 2 reports an even stronger relationship when excess demand is defined over the years 2003 to 2005.

The results in Tables 7, 8, and 9 are consistent with the explanation that the subprime credit expansion was associated with securitization activity which reduced lenders incentives to carefully screen borrowers, particularly with regards to soft information. Consistent with this explanation, we document that the average standard deviation of interest rates declined with credit quality. Second, loan pricing was more dependent on hard information signals in high securitization ZIP codes. Finally, securitization active ZIP codes exhibited larger changes in the fraction of loans originated without full income documentation.

6. Is excess demand driven by securitization-related factors?

Though hypothesized to be correlated with securitization-related factors, the excess demand specification does not conclusively rule out the possibility that differences in securitization activity between investment and non-investment banks over the 2003 to 2005 time period were driven by factors in the primary market. Under a primary-market driven hypothesis, a primary market shock could lead to a boom in origination with differences in securitization activity attributable to differences in regulation between the two types of banks. The differences in capital requirements and leverage restrictions discussed in Section 1.3 could simply reflect differences in how the two sets of banks responded to a primary market shock with investment banks better able to absorb the increased origination volume through securitization.

In this section, we test empirically whether the excess demand variable is capturing securitization-related factors. Our test relies on the rating agencies treatment of "assignee liability" laws

in their rating of securitization deals.[30] The key aspect of anti-predatory lending laws, for the purposes of testing our hypothesis, is that certain state laws provide manipulated borrowers with recourse against the eventual "assignee," or holder, of a mortgage loan that is deemed to have been originated under fraudulent or predatory practices. Purchasers of loans in the secondary market have traditionally been protected against this threat through the representations and warranties provided by the mortgage originator, which essentially certify, among other things, that a loan was not made fraudulently or in a predatory manner. In May of 2004, S&P began to require higher levels of credit enhancement for deals that contained mortgage loans from states with uncertain or vague definitions of predatory loans on the grounds that these loans constituted a potential liability to the trust issuing the securitization deal.[31] Requiring higher credit enhancement of a deal is akin to increasing the cost of creating the securitization structure because the two primary forms of credit enhancement--overcollateralization and excess spread--are provided by the securitizing entity.

We rely on the S&P announcement regarding the treatment of assignee liability laws as an event which specifically increased the expected cost of securitization. However, the experiment suffers from one limitation. States that had assignee liability laws which S&P viewed as unfavorable necessarily had anti-predatory lending laws which adversely impacted mortgage originations. Thus, demonstrating empirically that loans originated in a state with unfavorable assignee liability laws suffer from diminished demand from the securitization market could simply be a manifestation of fewer loans being made available to the securitization market from the primary market because fewer are being originated. Because of this possibility, we focus our experiment on a state listed in the S&P report which passed their anti-predatory and associated assignee liability laws well in advance of the S&P announcement. In this way, the impact of the state-level anti-predatory legislation on mortgage originations will have already

[30] We are not the first to exploit some aspect of anti-predatory lending laws in this literature. KMSV (2010) and KSV (2010) exploit the change in a key law in Georgia and New Jersey which briefly rendered loans "unsecuritizable."

[31] Standard & Poor's listed 15 states and municipalities in which "there is an increased risk that originators or sellers may inadvertently breach a compliance representation or warranty made in good faith." The May 13, 2004 report further states, "The risk [of potential liability] increases for laws that have subjective standards, such as net tangible benefit or vague repayment ability tests, to determine whether a loan is 'predatory.'"

taken effect in the origination market, and the S&P announcement should only have an impact on how the already-enacted state laws impact the cost of securitizing a loan.[32] The state of Massachusetts, known for its strong consumer protection laws, meets these criteria, having originally passed anti-predatory legislation on March 21, 2001.[33] We reiterate that the key to the experiment is not that Massachusetts changed their assignee liability laws, rather, that S&P changed how they viewed the already-enacted laws' impact on the credit ratings of deals with loans from Massachusetts.

The timing of the test allows for an experiment which tests whether the treatment sample of investment banks increased their demand relatively less in a state with a higher expected cost of securitization. We perform this test in two ways. First, we estimate whether the treatment sample of investment banks increased the number of securitized loans and their relative market share in Massachusetts after the 2004 S&P event relative to other banks and other states. Second, we document the marginal impact of excess demand on the extension of credit in Massachusetts relative to other states around this time period.

The sample period for the difference-in-differences experiment runs from 2003 to 2006 and utilizes the bank-ZIP-year panel set of data. That is, we track the securitization activity of each securitizing bank in each ZIP code over the years 2003 to 2006. We begin the sample period in 2003 to allow for the impact of the 2001 Massachusetts legislation on mortgage originations to be taken into account, ensuring that diminished securitization activity is not a manifestation of lower levels of primary market activity. Years 2005 and 2006 are categorized as the "event dummy" in that they capture securitization activity in the two years following the S&P announcement regarding their treatment of assignee liability laws.

Table 10 reports the coefficients arising from a difference-in-differences specification using the bank-ZIP-year panel. We employ three different dependent variables as measures of securitization

[32] Increasing the cost of securitizing a loan could impact primary-market originations, but would do so specifically through the securitization channel.

[33] The vast majority of states and municipalities named in the 2004 S&P report passed state-level legislation in the year 2003. Because of this legislation, it is difficult to distinguish between the effect of the increased cost of securitization and the increased cost of mortgage origination in these states.

activity; the raw number of loans securitized by a bank in a ZIP code in a year, the number of securitized loans per housing unit, and the fraction of total securitized loans in a ZIP code that is securitized by a specific bank (market share). We control for the level effect of Massachusetts across all time periods and the interaction of Massachusetts after the event period. Including these additional interactions allows for the desired interpretation on the triple interaction of Massachusetts loans with the treatment sample investment banks after the S&P announcement. We also control for other ZIP-code specific factors such as house prices, average FICO scores, LTV ratios, DTI ratios, borrower leverage, and the percentage of loans with an adjustable rate that would influence the securitization demand for the loans.[34]

The coefficients on the interaction of interest (Investment banks*Massachusetts*Event Dummy) is negative and significant, suggesting that the treatment-sample investment banks securitized fewer loans from Massachusetts relative to other states after the S&P announcement. The coefficient on the triple interaction reported in Column 2 suggests that the treatment sample investment banks had 25 percentage points lower market share in Massachusetts relative to other states after the S&P announcement. The results tabulated in Column 3 indicate that investment banks securitized 21 percent fewer loans per housing unit in Massachusetts relative to commercial banks after the S&P announcement. The evidence in Table 10 suggests that the demand of the investment banks for subprime loans in Massachusetts declined in the years following the S&P announcement.

Finally, we estimate whether a reduction in the securitization channel impacted the extension of credit in the primary market. Table 11 tabulates the results of an OLS regression of the number of originated subprime loans per household (and mortgage denial rates) as a function of excess demand, where excess demand is interacted with a dummy for ZIP codes in Massachusetts. Excess demand is measured over the period 2003 to 2005 while mortgage originations and the denial rate are calculated as of 2005. The estimated coefficient on the interaction term, which measures the marginal impact of the

[34] In this specification we cluster standard errors by year and by state given that securitization activity is clearly correlated within each year of the sample, as is securitization activity across states on account of similar demographics, particularly housing markets. We also investigate specifications where standard errors are clustered by time and bank. The results are similar when the dependent variable is bank market share and number of loans per housing unit, but not significant at the 10% level for the number of loans securitized.

securitization channel on origination rates in Massachusetts, suggests that the decreased securitization demand documented in Table 10 in ZIP codes in Massachusetts contributed to lower levels of credit extension (less subprime loans per household and higher denial rates) as compared to the impact of the securitization channel in ZIP codes from other states over this time period.[35] The cooling of the securitization channel in Massachusetts resulted in 5.4 percent fewer originated subprime loans per household and a 0.6 percent higher denial rate when compared with the impact of the securitization channel in other states. We interpret the evidence as consistent with the hypothesis that excess demand measures secondary market influences.

5. Conclusion

This paper investigates the relationship between securitization activity and the extension of subprime mortgage credit. While the literature has documented the explosion in the origination of subprime mortgages between the years 2003 to 2005, we are the first to document that the securitization activity of the five largest independent broker/dealer investment banks relative to other securitizing banks exploded even more over the same period. We hypothesize that the differences in securitization activity of the broker/dealer investment banks relative to non-investment banks were driven by factors specific to the securitization market as opposed to factors in the primary market. We propose that investment banks securitized more loans between the years 2003 and 2005 than their competitor banks because of factors unique to their regulatory environment, their reliance on the collateral-dependent repo market for short-term financing, and differences in product strategy. Our identification strategy is not dependent on identifying the specific reason(s) why the investment banks increased their activity, only that the reason(s) for relative differences in securitization activity are exogenous to factors impacting the lending decisions of *all* originators in a ZIP code. Relative differences in securitization activity on account of

[35] It is important to note that the interaction term captures the marginal effect of the securitization channel on origination activity. The total Massachusetts effect, calculated as the sum of the interaction term and the Massachusetts dummy, measures total originations in Massachusetts, which is a function of many factors, not just the securitization channel.

factors exogenous to the primary market allows for the testing of the theoretical belief that the existence of a secondary mortgage market should increase the extension of mortgage credit in the primary market.

The results presented in Tables 3 and 4 provide evidence consistent with our hypothesis; increased securitization activity has a positive, economically meaningful impact on the extension of credit in the primary mortgage market. A ZIP code associated with "excess demand" of 75 percentage points (one standard deviation) resulted in 2.5 percent to 6.5 percent higher subprime mortgage origination rates and 0.5 percent lower denial rates. Loans originated in ZIP codes with higher excess demand subsequently defaulted at higher rates.

We provide empirical evidence that securitization had an impact on originations through its effect on lenders incentives to carefully screen borrowers. Consistent with theoretical predictions, we document that the variance and level of interest rates charged to borrowers depended more heavily on observable hard information in low credit quality ZIP codes. Further, we find that changes in rates of origination of no/low documentation loans varied positively with our measure of excess demand. In a concluding section, we investigate the possibility that our measure of secondary market demand is driven by factors in the primary market as opposed to the hypothesized securitization market. We rely on an event which impacted the cost of securitizing subprime mortgages but did not impact mortgage originations to demonstrate that our measure of excess demand is indeed driven by factors specific to the securitization market.

While we interpret our results as evidence that the practice of securitizing subprime mortgage loans had a causal effect on the quantity and quality of originated subprime loans, we do not readily interpret our results as being applicable to the practice of securitizing mortgage loans in general. A large portion of originated mortgage loans are sold to and securitized by Government Sponsored Entities (GSEs), and the economics associated with the securitization of GSE mortgage loans differs from the securitization of subprime loans along some important dimensions. These differences include underwriting practices and lenders which cater specifically to GSEs' preferences and standards. As a result, some of the implications from this analysis may not readily apply to all securitization-driven

mortgage expansions. That said, it is important to consider why the subprime experience should matter outside of an isolated episode. We believe that certain key aspects of the subprime episode can be used as a laboratory in which we can better understand the impact of secondary market activity on the primary market of an asset class.[36] While secondary markets have the effect of expanding the availability of credit to borrowers in the primary market, in certain situations, they can adversely affect the incentives of lenders to carefully perform their role in screening and monitoring borrowers.

[36] A literature establishing the impact of secondary market activity on primary market activity is gaining traction. For example, Shivdasani and Wang (2009) investigate whether the securitization of corporate loans caused the recent LBO boom, while Nadauld and Weisbach (2010) investigate whether securitization reduced the cost of obtaining corporate debt.

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Appendix 1.1: Mortgage-origination data from HMDA and ZIP-code control variables

Measurement of primary market activity relies on mortgage application and origination data made available by The Home Mortgage Disclosure Act, which requires mortgage originators to report statistics on the attributes of mortgage applications and originations. Avery, Brevoort, and Canner (2007) report that HMDA data cover an estimated 80 percent of all mortgage activity nationwide. HMDA does not classify loans explicitly as being subprime. We classify HMDA loans as subprime using one of two methods. In 2004, originators began reporting whether the interest rate being charged on a mortgage loan was three percentage points greater than the rate on a comparable-maturity treasury security. Loans with at least a three percent rate spread are deemed "higher-priced" loans and are frequently used as a proxy for subprime loans in the literature. We also refer the interested reader to a more thorough description of the HMDA higher-priced data and various definitions of subprime mortgages provided by Mayer and Pence (2008). The second method we use to identify loans as being subprime in the HMDA data set relies on a list of the most active subprime lenders produced by The Department of Housing and Urban Development (HUD). We match each of the mortgage originators in the HMDA dataset to the list produced by HUD in the years 2003 to 2005. Loans originated by lenders on the HUD subprime-lender list are classified as subprime loans.

We briefly discuss a potential bias introduced into our sample using the HMDA "higher-priced" classification as a proxy for subprime activity. Loans classified as "higher-priced" are considered higher-priced relative to a reference asset of comparable maturity. This classification becomes a problem when considering the interest rate on adjustable-rate loans, which technically have a 30-year maturity but whose interest rate is based on short-term rates. The result is that adjustable rate mortgages will be underreported in the HMDA sample, and the magnitude of the bias will change through time depending on the shape of the yield curve. Avery, Brevoort, and Canner (2007) argue that between 2004 and 2005, at least 13 percent of the increase in the number of higher-priced loans in the HMDA data is attributable to a flattening of the yield curve. We believe that this potential bias does not impact our key results because the impact of secondary market activity on our measures of credit extension are estimated on a cross-

section of ZIP codes in the years 2004 and 2005 separately. Any change in the yield curve in a given year should impact all ZIP codes equally.

Our demographic data has been generously provided by Mayer and Pence (2008). Though discussed in more detail in their research, we briefly recap the construction of the data for the purposes of this paper. Equifax Inc. provides data on the share of tract residents with high, medium, and low credit scores. High credit scores are classified as having a Vantage Score greater than 700. Medium credit scores range from 640 to 700 and low scores are below 640. The tract data is aggregated to the ZIP-code level using geolytics software provided by http://mcdc2.missouri.edu/websas/geocorr2k.html. Tract-level median income, homeownership rates, and housing units are provided by the 2000 Census. Median income is aggregated to the ZIP level and sorted into quintiles in the following way. Within each MSA, ZIP-code median incomes are sorted and then split into quartiles according to their relative income ranking and assigned corresponding indicator variables indicating their respective income quintile within the MSA. Where possible, we use ZIP-level house price indexes made available by LoanPerformance. We match ZIP-code house price indexes to loans according to the ZIP code reported in the loan documentation from LoanPerformance. If a house price index is not available for a given ZIP code, we use MSA-level house price indexes and state-level indexes for the rare ZIP code with no other available index. The Census Bureau provides county-level data on permits for the construction of residential 1-4 family housing units. Unemployment data come from the BLS.

Appendix 1.2: Matching LoanPerformance to ABSNet

We briefly discuss the steps required to match loan level data from LoanPerformance to deal summary data from ABSNet. This match is required to identify the securitizing bank associated with each loan. First, we obtain the deal summary for every residential mortgage-backed securitization deal originated between 1997 and 2007 from ABSNet. ABSNet includes information on the deal underwriter, total deal amount, and deal credit ratings, among other information. ABSNet does not classify the residential securitization deals as being subprime. We rely on the classification of subprime loans provided by LoanPerformance. No unique numerical identifier exists between the deal summary data

from ABSNet and the LoanPerformance database, so we match the two sources of data by hand using deal names as the common identifier. The total number of securitized subprime loans that are included in our sample is dictated by the number of subprime loans in the LoanPerformance database that can be matched to the universe of ABSNet deals by hand, which totals 1,315 subprime deals collateralized by 6,891,273 loans.[37] The median securitization deal in our sample has 5,219 mortgage loans serving as collateral. We double check that our hand-matching process correctly matched the LoanPerformance and ABSNet data by examining a sub-sample of deal names and deal summaries from Bloomberg. We then aggregate the total number of loans affiliated with a given bank in each ZIP code of the sample. The result of this matching and aggregating process yields a bank-ZIP-year sample that tabulates the total number of loans securitized by a given bank in a given ZIP code in a given year.

[37] In addressing concerns about whether our final sample of deals is systematically biased in any way, we conclude that our sample likely under-represents deal activity that occurred early in our sample period on account of less complete coverage of subprime activity by LoanPerformance.

Figure 1. Documenting the cross-sectional and time-series dynamics in subprime securitization underwriting activity

We report the total number of subprime residential mortgage-backed securitization deals by underwriter. Deal-level data is obtained from ABSNet.

Underwriter	1997	1998	1999	2000	2001	2002	2003	2004	2005	2006	2007	Total
Lehman Brothers	0	0	4	3	3	8	16	20	31	31	14	130
Bear Stearns & Co. Inc	0	0	3	1	1	1	6	23	34	27	16	112
Greenwich Capital	0	0	1	5	11	9	13	18	20	24	9	110
Morgan Stanley	1	1	0	1	0	4	12	29	29	20	13	110
Credit Suisse	0	1	1	0	8	10	13	23	25	13	6	100
Merrill Lynch	0	0	2	0	1	0	4	12	31	34	9	93
Deutsche Bank Securities Inc.	0	0	1	1	2	7	13	15	20	24	8	91
Goldman Sachs	0	0	0	0	0	3	5	17	20	22	9	76
Bank of America	0	0	0	2	3	8	14	18	11	6	5	67
Citigroup Global Markets Inc.	0	0	0	0	0	2	6	9	16	17	14	64
JP Morgan	0	0	0	0	5	7	7	4	8	21	8	60
UBS	0	0	0	0	0	1	8	13	15	20	3	60
Barclays	0	0	0	0	0	0	0	8	15	19	8	50
RBS Greenwich	0	0	0	0	0	1	3	10	10	6	8	38
Countrywide Securities Corp.	0	0	0	0	0	4	8	14	5	0	0	31
HSBC	0	0	0	0	0	0	0	0	4	13	6	23
Residential Funding Corp.	0	0	0	0	0	0	0	0	5	8	1	14
Washington Mutual	0	0	0	0	0	0	0	0	0	9	0	9
Prudential Securities	0	2	2	2	0	0	0	0	0	0	0	6
Unknown	4	1	0	0	0	0	0	0	1	0	0	6
Nomura	0	0	0	0	0	0	0	0	0	5	0	5
Salomon Smith Barney	0	0	0	0	0	5	0	0	0	0	0	5
GMAC RFC	0	0	0	0	0	0	1	0	3	0	0	4
BNP Paribas	0	0	0	0	0	0	0	0	1	2	0	3
GMACM Mortgage Corp.	0	0	0	0	0	0	3	0	0	0	0	3
Banc One	0	0	0	0	0	0	1	0	0	0	0	1
Bank of New York	0	0	0	0	0	0	0	1	0	0	0	1
Blaylock & Company	0	0	0	0	0	0	1	0	0	0	0	1
Carrington	0	0	0	0	0	0	0	0	0	1	0	1
Chase	0	0	0	1	0	0	0	0	0	0	0	1
Donaldson Lufkin & Jenrette	0	1	0	0	0	0	0	0	0	0	0	1
Residential Asset Securities Corp.	0	0	0	0	0	0	0	0	0	1	0	1
SG Americas Securities LLC	0	0	0	0	0	0	0	0	0	1	0	1
Saxon Asset Securities Company	0	0	0	0	0	0	0	0	0	0	1	1
Utendahl Capital Partners	0	0	0	0	0	0	0	1	0	0	0	1
Total	5	6	14	16	34	70	134	235	304	324	138	1280
5 Broker-Dealer Investment Bank Total	1	1	9	5	5	16	43	101	145	134	61	521
5 Broker-Dealer Investment Bank Share of Total	20.0%	16.7%	64.3%	31.3%	14.7%	22.9%	32.1%	43.0%	47.7%	41.4%	44.2%	40.7%
All Other Banks Total	4	5	5	11	29	54	91	134	159	190	77	759
All Other Banks Share of Total	80.0%	83.3%	35.7%	68.8%	85.3%	77.1%	67.9%	57.0%	52.3%	58.6%	55.8%	59.3%

Figure 2. Broker/dealer investment banks relative market share plotted through time

The solid line represents the average share of all securitized subprime loans that are securitized by the five independent broker/dealer investment banks (referred to as the treatment sample of banks in the text) in each ZIP code of our sample. The dotted lines represent the 95th and 5th percentile.

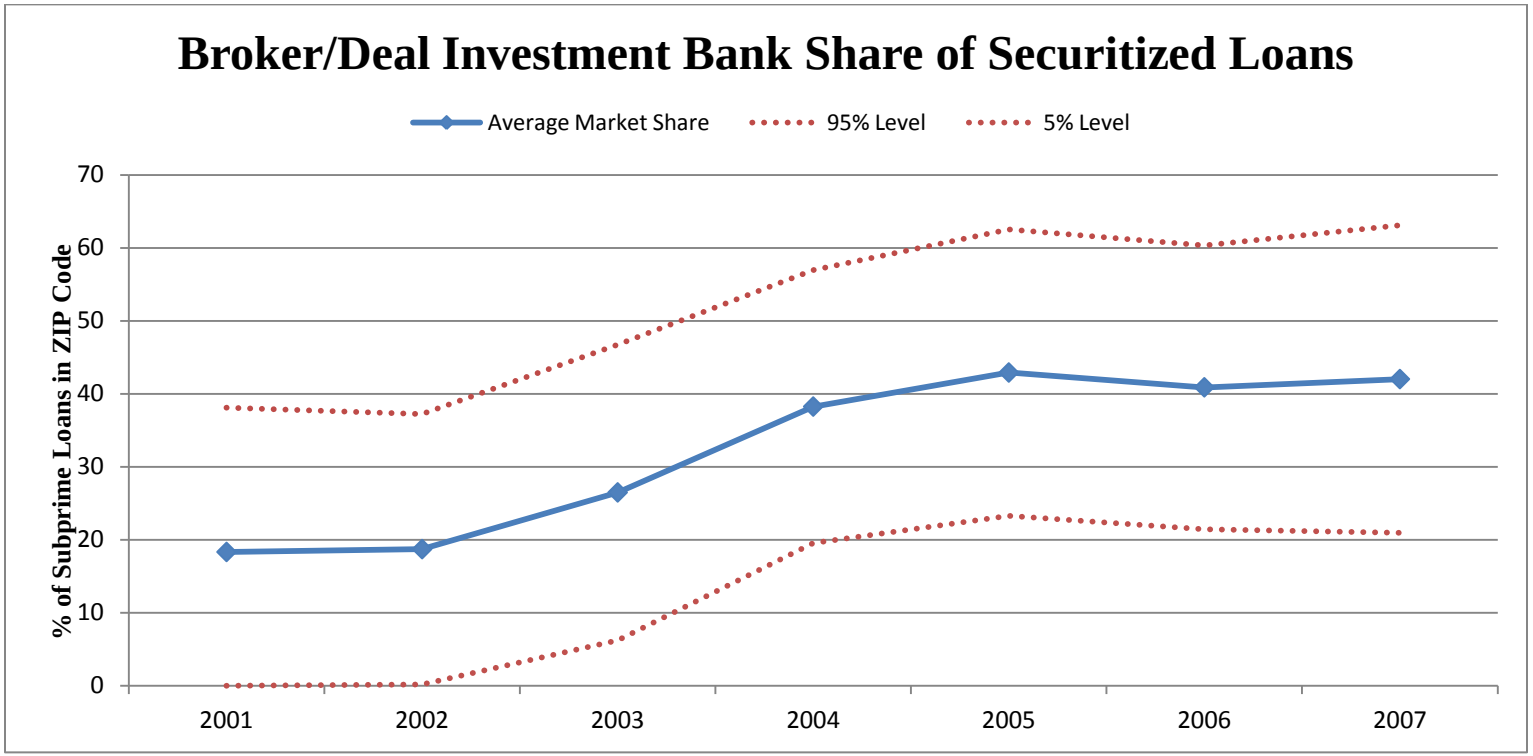

Figure 3. Broker/dealer investment bank "excess demand"

This figure plots investment bank-specific excess demand through time. Excess demand is calculated as the difference between the *growth* in the number of securitized loans of broker/dealer investment banks compared to the *growth* in the number of securitized loans by all other banks. Excess demand is measured at the ZIP code level and is calculated in this chart as:

$$Excess\ Demand_{investmentbanki,t} = \left(\frac{\#\ Sec.\ Loans,\ Investment\ Bank_{i,t}}{\#\ Sec.\ Loans,\ Investment\ Bank_{i,t-1}} - \frac{\#\ Sec.\ Loans,\ All\ Other\ Banks_{i,t}}{\#\ Sec.\ Loans,\ All\ Other\ Banks_{i,t-1}}\right)$$

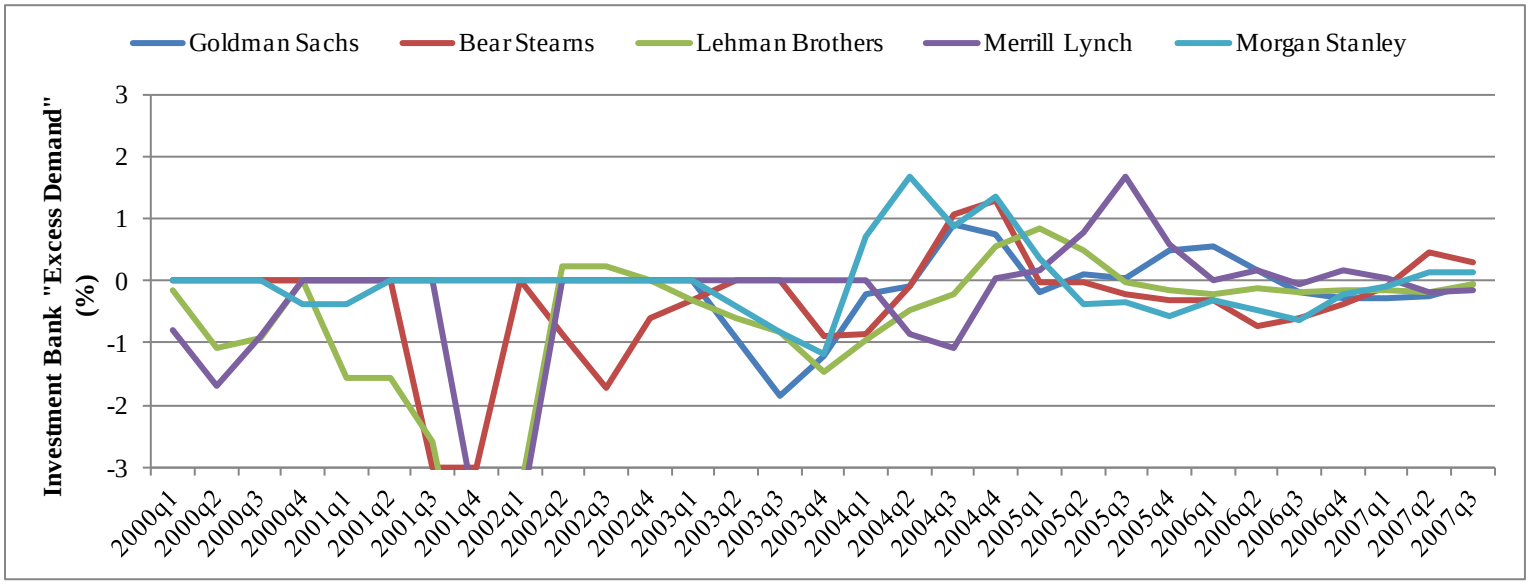

Table 1. Summary statistics of secondary market activity at ZIP level

Panel A reports summary statistics on mortgage origination activity for the "higher-priced" definition of subprime loans using the HMDA data set. Panel B reports summary statistics on mortgage origination activity for the HUD subprime-lender definition of subprime loans in the HMDA data set. Panel C reports summary statistics on secondary market activity for broker/dealer investment banks and non-investment banks. Growth rates from 2003 to 2004, 2004 to 2005, and 2003- to 2005 are computed as the percent change in the total number of subprime loans securitized in a given ZIP code over the respective time periods.

Panel A: HMDA Higher-Priced Summary Statistics

	Year	# ZIPS	10%	Med	Mean	90%	Std Dev
Subprime Loans Per Housing Unit	2004	14,995	0.010	0.022	0.034	0.058	0.057
	2005	15,139	0.017	0.037	0.058	0.116	0.076
Percent of Loans Sold	2004	15,067	0.417	0.654	0.621	0.773	0.145
	2005	15,259	0.500	0.720	0.685	0.814	0.129

Panel B: HUD Subprime Lender List Summary Statistics

	Year	# ZIPS	10%	Med	Mean	90%	Std Dev
Subprime Loans Per Housing Unit	2003	15,353	0.001	0.013	0.019	0.034	0.037
	2004	14,862	0.006	0.016	0.025	0.045	0.039
	2005	13,552	0.006	0.016	0.026	0.049	0.042
Percent of Loans Sold	2003	12,574	0.435	0.700	0.644	0.810	0.202
	2004	16,002	0.532	0.720	0.694	0.813	0.123
	2005	18,361	0.550	0.755	0.724	0.852	0.138

Panel C: Secondary Market Summary Statistics

	Year	# ZIPS	10%	Med	Mean	90%	Std Dev
Inv. Bank % Increase	2003-2004	17,132	0.000	0.887	0.854	3.931	0.649
	2004-2005	20,640	-0.511	0.205	0.207	0.847	0.574
	2003-2005	17,154	0.000	1.098	1.073	1.945	0.716
Non-Inv. Bank % Increase	2003-2004	23,343	-0.405	0.342	0.328	1.061	0.584
	2004-2005	23,951	-0.667	0.000	0.063	0.693	0.550
	2003-2005	22,926	-0.373	0.405	0.396	1.098	0.626
Inv. Bank % minus Non-Inv. Bank %	2003-2004	16,031	-0.405	0.511	0.502	1.406	0.763
	2004-2005	18,941	-0.693	0.193	0.158	0.981	0.742
	2003-2005	16,107	-0.288	0.707	0.674	1.579	0.775

Table 2. Summary statistics on bank-ZIP-year panel data

Our panel data set of bank-zip-years runs from 1997 to 2007. Matching the LoanPerformance and ABSNet data allows for the identification of loans in each ZIP code in each year that were securitized by the five broker/dealer investment banks and non-investment banks. This table reports the average attributes of the bank-ZIP-year data through time. Data on FICO scores and DTI ratios are missing early in the sample period.

	Broker/Dealer Investment Banks					**Non-Investment Banks**				
Year	# Bank-ZIP-Years	CLTV	H.P.A.$_{t-1}$	FICO	D.T.I.	# Bank-ZIP-Years	CLTV	H.P.A.$_{t-1}$	FICO	D.T.I.
1997	1,716	72.46	3.09	-	-	5,345	74.69	2.99	-	-
1998	5,092	75.97	5.09	-	-	9,473	73.75	4.45	374	-
1999	24,884	76.60	5.87	440	25.07	16,122	76.49	6.46	459	31.33
2000	13,408	75.00	7.25	524	19.15	28,298	76.99	7.44	519	24.60
2001	19,312	78.51	7.64	582	17.99	53,848	79.01	7.17	547	28.87
2002	26,047	78.92	7.09	571	28.35	91,400	78.86	7.26	595	21.64
2003	48,830	79.92	8.28	607	28.24	129,681	80.75	8.31	608	26.17
2004	74,950	83.10	9.82	605	31.39	150,535	82.52	10.03	610	26.67
2005	80,511	85.49	11.43	617	32.49	168,461	84.27	11.97	613	25.23
2006	78,076	86.32	9.13	616	36.26	176,853	86.32	9.68	613	33.07
2007	55,653	85.76	4.13	617	35.86	97,113	84.68	4.00	613	35.63

Table 3. Secondary market demand and access to credit: higher-priced definition of subprime

We estimate cross-sectional regressions on data from the years 2004 and 2005 separately. The regressions measure the impact of demand from the secondary mortgage market on the extension of credit in the primary mortgage market. Access to credit in the primary mortgage market is measured as the natural log of the number of originated subprime loans as a fraction of total housing units in a given ZIP code. Subprime loan originations are measured using the HMDA "higher-priced" definition. See data appendix for details. Our "excess demand" measure of secondary market demand is calculated as the *difference* between growth in the securitization activity of the broker/dealer investment banks subtracted by the growth rate in securitization activity for all other securitizing banks. We discuss the construction and aggregation of the control variables to the ZIP code level in the data appendix. Standard errors are clustered at the state level. The symbols ***, **, and * indicate significance at the 1, 5, and 10% levels, respectively.

	(1)	(2)	(3)	(4)
	Log of "Higher-Priced" Subprime Loans Per Housing Unit			
	2004	2005	2004	2005
Inv. Bank % Increase Minus Non-Inv. Bank % Increase (2003-2004)	0.040***			
	(2.803)			
Inv. Bank % Increase Minus Non-Inv. Bank % Increase (2003-2005)		0.087***		
		(4.711)		
% Subprime Sold to Secondary Market			0.604***	1.521***
			(2.789)	(6.195)
H.P.A. Growth Lag 1yr	0.021***	0.025***	0.015***	0.017***
	(4.028)	(6.611)	(2.850)	(4.470)
MSA Avg. Income - Quartile 1	0.250	0.565	-0.131	0.094
	(0.754)	(1.574)	(-0.403)	(0.297)
MSA Avg. Income - Quartile 2	0.303	0.656*	-0.126	-0.062
	(0.909)	(1.861)	(-0.419)	(-0.219)
MSA Avg. Income - Quartile 3	0.217	0.629*	-0.302	-0.094
	(0.601)	(1.782)	(-0.982)	(-0.415)
MSA Avg. Income - Quartile 4	0.192	0.479	-0.245	-0.007
	(0.505)	(1.098)	(-0.718)	(-0.0221)
Percent Low-Bucket Credit	2.265***	1.662***	2.124***	1.700***
	(5.805)	(3.860)	(4.939)	(3.772)
Percent Medium-Bucket Credit	6.309***	6.129***	5.475***	5.911***
	(7.913)	(6.476)	(7.875)	(7.989)
Home Ownership Rate	0.004**	0.002	0.004	0.002
	(2.039)	(0.938)	(1.585)	(0.898)
Housing Permits 1 Year Lag	0.125***	0.124***	0.124***	0.118***
	(5.835)	(7.036)	(5.518)	(6.311)
Unemployment Rate	0.006	0.006	-0.004	0.004
	(0.381)	(0.244)	(-0.260)	(0.216)
Constant	-5.931***	-5.450***	-5.683***	-5.899***
	(-13.37)	(-11.49)	(-11.37)	(-11.27)
Observations	11046	11058	15,028	15,173
Adjusted R-squared	0.315	0.300	0.245	0.271
Cluster by State	Yes	Yes	Yes	Yes

Table 4. Secondary market demand and access to credit: HUD measure of subprime

We estimate cross-sectional regressions on data from the years 2004 and 2005 separately. The regressions measure the impact of demand from the secondary mortgage market on the extension of credit in the primary mortgage market. Access to credit in the primary mortgage market is measured as the natural log of the number of originated subprime loans as a fraction of total housing units in a given ZIP code. Subprime loan originations are measured using the HUD subprime-lender list definition. See data appendix for details. Our "excess demand" measure of secondary market demand is calculated as the *difference* between growth in the securitization activity of the broker/dealer investment banks subtracted by the growth rate in securitization activity for all other securitizing banks. We discuss the construction and aggregation of the control variables to the ZIP code level in the data appendix. Standard errors are clustered at the state level. The symbols ***, **, and * indicate significance at the 1, 5, and 10% levels, respectively.

	(1)	(2)	(3)	(4)
	Log of "HUD" Subprime Loans Per Housing Unit			
	2004	2005	2004	2005
Inv. Bank % Increase Minus Non-Inv. Bank % Increase (2003-2004)	0.033			
	(1.198)			
Inv. Bank % Increase Minus Non-Inv. Bank % Increase (2003-2005)		0.087***		
		(4.019)		
% Subprime Sold to Secondary Market			0.795	1.604***
			(1.529)	(3.619)
H.P.A. Growth Lag 1yr	0.042***	0.036***	0.039***	0.033***
	(5.232)	(7.034)	(4.458)	(5.865)
MSA Avg. Income - Quartile 1	1.056**	1.222**	0.826*	0.850*
	(2.574)	(2.649)	(1.944)	(1.951)
MSA Avg. Income - Quartile 2	1.298***	1.425***	1.023**	0.873**
	(3.603)	(3.478)	(2.648)	(2.065)
MSA Avg. Income - Quartile 3	1.274***	1.371***	0.847**	0.819**
	(3.940)	(3.441)	(2.091)	(2.396)
MSA Avg. Income - Quartile 4	1.386***	1.428**	0.938*	0.948*
	(2.725)	(2.546)	(1.987)	(1.957)
Percent Low-Bucket Credit	1.554***	1.968***	1.620***	2.000***
	(4.234)	(4.666)	(4.240)	(4.662)
Percent Medium-Bucket Credit	6.119***	5.288***	4.410***	3.839***
	(5.646)	(3.706)	(5.129)	(3.548)
Home Ownership Rate	0.023***	0.024***	0.023***	0.024***
	(9.299)	(7.104)	(9.154)	(7.559)
Housing Permits 1 Year Lag	0.143***	0.110***	0.156***	0.124***
	(5.323)	(5.371)	(5.676)	(4.951)
Unemployment Rate	0.036*	0.012	0.033*	0.015
	(1.892)	(0.512)	(1.942)	(0.676)
Constant	-8.401***	-8.417***	-8.517***	-9.085***
	(-17.89)	(-14.92)	(-17.25)	(-15.47)
Observations	9791	9000	14135	13058
Adjusted R-squared	0.298	0.306	0.237	0.265
Cluster by State	Yes	Yes	Yes	Yes

Table 5. Secondary market demand and access to credit: ZIP code denial rate

We estimate cross-sectional regressions on data from the years 2004 and 2005 separately. The regressions measure the impact of demand from the secondary mortgage market on the extension of credit in the primary mortgage market. Access to credit in the primary mortgage market is measured as the fraction of loan applications in a ZIP code that are denied. Subprime loan originations are measured using the HUD subprime-lender list definition. See data appendix for details. Our "excess demand" measure of secondary market demand is calculated as the *difference* between growth in the securitization activity of the broker/dealer investment banks subtracted by the growth rate in securitization activity for all other securitizing banks. We discuss the construction and aggregation of the control variables to the ZIP code level in the data appendix. Standard errors are clustered at the state level. The symbols ***, **, and * indicate significance at the 1, 5, and 10% levels, respectively.

	(1)	(2)	(3)	(4)
	ZIP Code Denial Rate			
	2004	2005	2004	2005
Inv. Bank % Increase Minus Non-Inv. Bank % Increase (2003-2004)	-0.001			
	(-1.019)			
Inv. Bank % Increase Minus Non-Inv. Bank % Increase (2003-2005)		-0.008***		
		(-4.993)		
% Subprime Sold to Secondary Market			-0.074***	-0.117***
			(-5.177)	(-6.456)
H.P.A. Growth Lag 1yr	-0.001***	-0.001***	-0.001**	-0.001***
	(-2.788)	(-4.578)	(-2.143)	(-2.910)
MSA Avg. Income - Quartile 1	-0.054*	-0.053	-0.053*	-0.026
	(-1.967)	(-1.546)	(-1.924)	(-0.746)
MSA Avg. Income - Quartile 2	-0.051*	-0.034	-0.046*	-0.007
	(-1.742)	(-1.121)	(-1.828)	(-0.263)
MSA Avg. Income - Quartile 3	-0.085***	-0.078***	-0.075***	-0.048**
	(-3.209)	(-3.057)	(-3.377)	(-2.223)
MSA Avg. Income - Quartile 4	-0.068**	-0.062**	-0.055**	-0.025
	(-2.653)	(-2.337)	(-2.362)	(-0.910)
Percent Low-Bucket Credit	0.465***	0.457***	0.424***	0.399***
	(22.93)	(24.83)	(22.81)	(17.97)
Percent Medium-Bucket Credit	0.371***	0.353***	0.397***	0.354***
	(4.709)	(5.472)	(5.550)	(5.194)
Home Ownership Rate	0.001***	0.001***	0.001***	0.001***
	(8.853)	(6.666)	(6.850)	(4.540)
Housing Permits 1 Year Lag	-0.005**	-0.007***	-0.005*	-0.006***
	(-2.172)	(-3.063)	(-1.883)	(-2.703)
Unemployment Rate	0.010***	0.010***	0.012***	0.012***
	(6.420)	(5.260)	(7.325)	(5.558)
Constant	0.047	0.084**	0.096***	0.158***
	(1.555)	(2.529)	(3.138)	(4.275)
Observations	11048	11058	15,028	15,173
Adjusted R-squared	0.643	0.624	0.599	0.583
Cluster by State	Yes	Yes	Yes	Yes

Table 6. Consequences of credit expansion: excess demand and adverse credit outcomes

This table presents the results of an OLS regression of changes in mortgage default and delinquency rates on measures of excess demand. Using LoanPerformance data as of December 2010, for each ZIP code in our sample we calculate the percent of loans originated in 2003, 2004, and 2005 separately that have been delinquent or in default at any point during their existence. Delinquency is defined as any loan that has been 90 days or more delinquent at any point during its existence. Default is defined as any loan that has been in the foreclosure process for at least two consecutive months. In Columns 1 and 3, the dependent variable is calculated as the difference in ZIP code-specific delinquency (default) rates between 2003 and 2004 vintage loans. Columns 2 and calculate the change in default rates between the 2003 and 2005 vintage loans. Our "excess demand" measure of secondary market demand is calculated as the *difference* between growth in the securitization activity of the broker/dealer investment banks subtracted by the growth rate in securitization activity for all other securitizing banks. We discuss the construction and aggregation of the control variables to the ZIP code level in the data appendix. Standard errors are clustered at the state level. The symbols ***, **, and * indicate significance at the 1, 5, and 10% levels, respectively.

	ZIP Code % Delinquent as of Dec. 2010		ZIP Code % Defaulted as of Dec. 2010	
	2004 Vintage Delinquency Rate minus 2003 Vintage Delinquency Rate	2005 Vintage Delinquency Rate minus 2003 Vintage Delinquency Rate	2004 Vintage Default Rate minus 2003 Vintage Default Rate	2005 Vintage Default Rate minus 2003 Vintage Default Rate
	(1)	(2)	(3)	(4)
Inv. Bank % Increase Minus Non-Inv. Bank % Increase (2003-2004)	0.173		0.081	
	(0.884)		(0.527)	
Inv. Bank % Increase Minus Non-Inv. Bank % Increase (2003-2005)		1.081***		0.491*
		(3.191)		(1.965)
H.P.A. Growth Lag 1yr	0.047	0.519***	0.057*	0.410***
	(1.034)	(5.651)	(1.940)	(6.585)
MSA Avg. Income - Quartile 1	4.036	12.687**	4.476**	8.346***
	(1.340)	(2.517)	(2.206)	(2.860)
MSA Avg. Income - Quartile 2	1.575	20.607***	1.998	13.057***
	(0.519)	(3.217)	(0.952)	(3.149)
MSA Avg. Income - Quartile 3	0.704	14.506**	1.508	9.055*
	(0.187)	(2.121)	(0.552)	(1.968)
MSA Avg. Income - Quartile 4	0.973	9.143**	0.688	4.068
	(0.355)	(2.079)	(0.353)	(1.250)
Percent Low-Bucket Credit	3.102	1.862	1.270	-1.078
	(1.614)	(0.619)	(0.905)	(-0.454)
Percent Medium-Bucket Credit	-15.742**	0.961	-13.314**	-2.180
	(-2.461)	(0.0884)	(-2.256)	(-0.305)
Home Ownership Rate	0.013	0.004	0.003	-0.008
	(1.240)	(0.167)	(0.392)	(-0.458)
Housing Permits 1 Year Lag	-0.021	0.684***	0.067	0.552***
	(-0.157)	(3.377)	(0.751)	(3.312)
Unemployment Rate	0.191	0.204	0.030	0.022
	(0.898)	(0.476)	(0.209)	(0.0705)
Constant	1.138	-7.874	0.882	-4.497
	(0.523)	(-1.421)	(0.633)	(-1.213)
Observations	11903	11869	11903	11869
Adjusted R-squared	0.003	0.159	0.005	0.161
Cluster by State	Yes	Yes	Yes	Yes

Table 7. Lax screening or lower cost of capital: evidence from the distribution of interest rates

This table presents the results of cross-sectional regressions of changes in the variance of interest rates on measures of secondary market demand. The dependent variable is the *change* in the standard deviation of interest rates within a ZIP code from 2003 to 2004 and 2003 to 2005. Our "excess demand" measure of secondary market demand is calculated as the *difference* between growth in the securitization activity of the broker/dealer investment banks subtracted by the growth rate in securitization activity for all other securitizing banks. Below-median FICO is an indicator equal to one if the average ZIP code FICO is below the median of the average ZIP code FICOs in the years 2004 and 2005, separately. Using our sample of securitized subprime loans, within each ZIP code we calculate the average loan interest rate, FICO score, LTV and DTI ratios, and the percentage of loans with adjustable interest rates. Standard errors are clustered at the state level. The symbols ***, **, and * indicate significance at the 1, 5, and 10% levels, respectively.

	Change in Std. Dev. of Interest Rates (2003-2004)			Change in Std. Dev. of Interest Rates (2003-2005)		
	(1)	(2)	(3)	(4)	(5)	(6)
Inv. Bank % Increase Minus Non-Inv. Bank % Increase * Below Median FICO (2003-2004)			0.012			
			(1.040)			
Inv. Bank % Increase Minus Non-Inv. Bank % Increase (2003-2004)	0.002	0.002	-0.004			
	(0.329)	(0.353)	(-0.490)			
Inv. Bank % Increase Minus Non-Inv. Bank % Increase * Below Median FICO (2003-2005)						-0.002
						(-0.178)
Inv. Bank % Increase Minus Non-Inv. Bank % Increase (2003-2005)				-0.006	-0.005	-0.004
				(-0.831)	(-0.787)	(-0.461)
Below-Median FICO Indicator		-0.054***	-0.060***		-0.035**	-0.033**
		(-5.372)	(-4.764)		(-2.543)	(-2.119)
Average Interest Rate	-0.144***	-0.149***	-0.149***	-0.275***	-0.280***	-0.280***
	(-6.012)	(-5.637)	(-5.632)	(-12.89)	(-13.75)	(-13.73)
ZIP Code Avg. FICO	0.001***			0.001**		
	(4.189)			(2.460)		
ZIP Code Avg. L.T.V.	-0.005***	-0.005***	-0.005***	-0.004*	-0.003	-0.003
	(-2.928)	(-2.888)	(-2.915)	(-1.800)	(-1.660)	(-1.660)
ZIP Code Avg. DTI	0.005***	0.006***	0.006***	0.004**	0.004**	0.004**
	(3.588)	(3.715)	(3.724)	(2.649)	(2.671)	(2.671)
ZIP Code Percent Adj. Rate	0.232***	0.222***	0.224***	0.349***	0.336***	0.336***
	(3.714)	(3.564)	(3.605)	(4.481)	(4.392)	(4.414)
Constant	0.478*	1.343***	1.345***	1.724***	2.384***	2.384***
	(1.949)	(7.090)	(7.096)	(5.613)	(19.80)	(19.73)
Cluster by State	Yes	Yes	Yes	Yes	Yes	Yes
Observations	15699	15699	15699	15739	15739	15739
Adjusted R-squared	0.112	0.112	0.112	0.276	0.276	0.276

Table 8. Lax screening or lower cost of capital: evidence from interest rates

This table presents the results of cross-sectional regressions of average ZIP code level interest rates on measures of credit quality within a ZIP code. The dependent variable is the average interest rate on securitized subprime loans at the ZIP code level. We split the sample into positive and negative excess demand ZIP codes. ZIP codes where the growth in investment bank securitization activity grew more (less) than non-investment bank securitization activity are defined as having experienced positive (negative) excess demand. Control variables include the average FICO score, LTV and DTI ratios, and the percentage of loans with adjustable interest rates. Standard errors are clustered at the state level. The symbols ***, **, and * indicate significance at the 1, 5, and 10% levels, respectively.

	Average ZIP Code Interest Rate 2004			Average ZIP Code Interest Rate 2005		
	Negative Excess Demand ZIP Code	Positive Excess Demand ZIP Code	Difference	Negative Excess Demand ZIP Code	Positive Excess Demand ZIP Code	Difference
	(1)	(2)	(3)	(4)	(5)	(6)
ZIP Code Avg. FICO	-0.013***	-0.016***	-.0026**	-0.016***	-0.021***	-.0054**
	(-7.164)	(-6.498)	(-2.10)	(-8.769)	(-6.127)	(-2.54)
ZIP Code Avg. L.T.V.	0.064***	0.069***	.0049	0.067***	0.082***	.0149**
	(9.863)	(10.06)	(1.22)	(10.40)	(9.259)	(2.83)
ZIP Code Avg. DTI	-0.008***	-0.012***	-.0043	-0.010***	-0.021***	-.0097***
	(-2.712)	(-3.179)	(-1.50)	(-3.713)	(-3.053)	(-3.71)
ZIP Code Percent Adj. Rate	-1.047***	-1.386***	-.3389***	-1.299***	-1.768***	-.4692***
	(-6.075)	(-7.570)	(-3.07)	(-6.495)	(-6.668)	(-3.13)
Constant	11.029***	12.460***		12.835***	15.441***	
	(11.13)	(10.83)		(15.16)	(8.959)	
Cluster by State	Yes	Yes		Yes	Yes	
Observations	3492	12292		2666	13191	
Adjusted R-squared	0.381	0.515		0.430	0.587	

Table 9. Lax screening or lower cost of capital: no or low documentation loans

This table presents the results of cross-sectional regressions of changes in the origination of no/low documentation loans as a function of the excess demand measure of secondary market activity. The dependent variable is calculated as the *change* in the percent of no/low documentation loans in a given ZIP code between the years 2003 to 2004 and 2003 to 2005. Our "excess demand" measure of secondary market demand is calculated as the *difference* between growth in the securitization activity of the broker/dealer investment banks subtracted by the growth rate in securitization activity for all other securitizing banks. Control variables include the average FICO score, LTV and DTI ratios, and the percentage of loans with adjustable interest rates. Standard errors are clustered at the state level. The symbols ***, **, and * indicate significance at the 1, 5, and 10% levels, respectively.

	Change in Percent Loans No Doc/Low Doc (2003-2004)	Change in Percent Loans No Doc/Low Doc (2003-2005)
	(1)	(2)
Inv. Bank % Increase Minus Non-Inv. Bank % Increase (2003-2004)	0.363*	
	(1.935)	
Inv. Bank % Increase Minus Non-Inv. Bank % Increase (2003-2005)		0.910***
		(4.860)
ZIP Code Avg. FICO	0.019**	0.101***
	(2.186)	(6.877)
ZIP Code Avg. L.T.V.	-0.097**	-0.259***
	(-2.494)	(-6.830)
ZIP Code Avg. DTI	0.077**	0.148*
	(2.212)	(1.980)
ZIP Code Percent Adj. Rate	4.349***	10.060***
	(2.993)	(4.162)
Constant	-7.106	-46.471***
	(-1.024)	(-4.182)
Cluster by State	Yes	Yes
Observations	15769	15821
Adjusted R-squared	0.007	0.056

Table 10. The impact of the cost of securitization on excess demand

This table estimates the impact of a change in the expected cost of securitization on measures of secondary market activity. We report the coefficients and *t*-statistics arising from an OLS regression of measures of secondary mortgage market activity on bank dummy variables, event dummy variables, a state dummy variable which captures a change in the expected cost of securitization, and ZIP-code attributes. The dependent variable in Column) is calculated as the natural log of the total number of securitized loans associated with a given bank in a given ZIP code in a given year. Column 2 measures the number of securitized loans per housing unit. The dependent variable in Column 3, bank market share, is calculated as the number of securitized loans associated with a given bank divided by the total number of securitized loans in a given ZIP code in a given year. The text motivates the inclusion of the event dummy variable and the Massachusetts dummy variable. Control variables include the average FICO score, LTV and DTI ratios, and the percentage of loans with adjustable interest rates. Standard errors are clustered at the state level and by year. The symbols ***, **, and * indicate significance at the 1, 5, and 10% levels, respectively.

	(1) Log of Number of Securitized Subprime Loans Sample Period: 2003-2006	(2) Log of Number of Securitized Subprime Loans per Housing Unit Sample Period: 2003-2006	(3) Bank Market Share of Securitized Subprime Loans Sample Period: 2003-2006
Inv. Bank * Mass. Dummy * Event Dummy	-0.078**	-0.248**	-0.214*
	(2.21)	(2.37)	(1.70)
Mass. Dummy * Event Dummy	0.121	0.077	0.059**
	(1.17)	(1.42)	(2.14)
Inv. Bank Dummy * Event Dummy	0.262***	0.512***	0.541***
	(3.75)	(3.37)	(2.92)
Inv. Bank Dummy * Mass. Dummy	-0.071***	-0.109	-0.097
	(3.78)	(1.26)	(1.17)
Mass. Dummy	0.098	0.077	-0.198***
	(1.11)	(1.51)	(4.59)
Investment Bank Dummy	0.070	0.115	0.099
	(1.01)	(0.75)	(0.53)
Event Dummy	-0.142***	-0.101	-0.321***
	(2.75)	(0.85)	(3.81)
ZIP Code H.P.A. t-1	0.036***	0.024***	-0.017***
	(4.30)	(9.98)	(3.49)
ZIP Code Avg. FICO	0.001***	-0.000	-0.001***
	(4.00)	(1.26)	(3.30)
ZIP Code Avg. DTI	0.004***	0.004*	0.002
	(2.68)	(1.96)	(0.82)
ZIP Code Avg. L.T.V.	0.011***	0.007***	-0.005***
	(5.73)	(4.15)	(3.63)
ZIP Code Percent Adj. Rate	0.218***	0.049	-0.186***
	(4.32)	(1.20)	(5.03)
Constant	-1.091***	-7.734***	-1.475***
	(5.41)	(41.47)	(10.41)
Observations	907925	679253	907925
Adjusted R-squared	0.102	0.076	0.084
Cluster Year	Yes	Yes	Yes
Cluster by State	Yes	Yes	Yes

Table 11. Exogenous secondary market demand and primary market outcomes

We report the coefficients and *t*-statistics arising from an OLS regression of measures of subprime mortgage origination activity on measures of secondary market demand and control variables. We measure access to credit in the primary mortgage market as the natural log of the number of originated subprime loans as a fraction of total housing units in a given ZIP code, or the average ZIP code mortgage denial rate. Our "excess" secondary market demand variable is calculated as the difference between the growth rate of secondary market activity for the investment banks subtracted by the growth rate in secondary market activity for all other securitizing banks. In this table we interact the excess demand variable with a dummy variable for ZIP codes from Massachusetts. We motivate the interaction term in Section 4 and discuss the control variables in the text and data appendix. Standard errors are clustered at the state level. The symbols ***, **, and * indicate significance at the 1, 5, and 10% levels, respectively.

	(1) Log of "Higher-Priced" Subprime Loans Per Housing Unit	(2) Log of "HUD" Subprime Loans Per Housing Unit	(3) ZIP Code Denial Rate
	2005	2005	2005
Inv. Bank % Increase Minus Non-Inv. Bank % Increase * Massachusetts (2003-2005)	-0.054*	-0.008	0.006***
	(-1.706)	(-0.254)	(3.224)
Inv. Bank % Increase Minus Non-Inv. Bank % Increase (2003-2005)	0.119***	0.126***	-0.012***
	(4.246)	(4.514)	(-5.449)
Massachusetts	0.076	0.348***	-0.021***
	(1.007)	(5.361)	(-3.228)
H.P.A. Real Growth Lag 1yr	0.025***	0.037***	-0.001***
	(6.252)	(6.841)	(-4.659)
MSA Avg. Income - Quartile 1	0.700*	1.024**	-0.040
	(1.884)	(2.232)	(-1.165)
MSA Avg. Income - Quartile 2	0.680**	1.251***	-0.019
	(2.074)	(2.924)	(-0.631)
MSA Avg. Income - Quartile 3	0.778**	1.225***	-0.071***
	(2.635)	(3.493)	(-3.094)
MSA Avg. Income - Quartile 4	0.532	1.215**	-0.053*
	(1.260)	(2.131)	(-1.986)
Percent Low-Bucket Credit	1.606***	1.961***	0.454***
	(3.567)	(4.923)	(26.69)
Percent Medium-Bucket Credit	6.564***	5.066***	0.370***
	(7.148)	(3.392)	(5.921)
Home Ownership Rate	0.002	0.024***	0.001***
	(0.988)	(7.852)	(6.502)
Housing Permits 1 Year Lag	0.123***	0.114***	-0.006***
	(6.555)	(5.217)	(-2.873)
Unemployment Rate	0.005	0.014	0.010***
	(0.227)	(0.571)	(5.489)
Constant	-5.565***	-8.331***	0.079**
	(-12.50)	(-15.36)	(2.329)
Observations	12,182	10,442	12,183
Adjusted R-squared	0.303	0.290	0.632
Cluster by State	Yes	Yes	Yes

Appendix Table 1. Secondary market demand and access to credit: housing market elasticity and expected rates of house price appreciation.

We estimate cross-sectional regressions on data from the years 2004 and 2005 separately. The regressions measure the impact of demand from the secondary mortgage market on the extension of credit in the primary mortgage market. Access to credit in the primary mortgage market is measured as the natural log of the number of originated subprime loans as a fraction of total housing units in a given ZIP code. Subprime loan originations are measured using the HMDA "higher-priced" definition and the HUD subprime lender list. See data appendix for details. Our "excess demand" measure of secondary market demand is calculated as the *difference* between growth in the securitization activity of the broker/dealer investment banks subtracted by the growth rate in securitization activity for all other securitizing banks. *Inelastic Housing Market Indicator* is a dummy variable equal to one for ZIP codes with a below-median housing market elasticity measure (Saiz 2009). We discuss the construction and aggregation of the control variables to the ZIP code level in the data appendix. Standard errors are clustered at the state level. The symbols ***, **, and * indicate significance at the 1, 5, and 10% levels, respectively.

	(1)	(2)	(3)	(4)
	Log of "Higher-Priced" Subprime Loans Per Housing Unit		Log of "HUD" Subprime Loans Per Housing Unit	
CSE % Increase Minus Non-CSE % Increase (2003-2004)	0.038***		0.016	
	(2.782)		(0.505)	
CSE % Increase Minus Non-CSE % Increase (2003-2005)		0.067***		0.058**
		(3.639)		(2.398)
Inelastic Housing Market Indicator	0.188***	0.327***	0.269***	0.372***
	(3.245)	(4.635)	(2.987)	(4.041)
MSA Avg. Income - Quartile 1	0.470	0.876**	1.601***	1.883***
	(1.505)	(2.625)	(3.622)	(4.370)
MSA Avg. Income - Quartile 2	0.677*	1.196**	2.272***	2.513***
	(1.679)	(2.408)	(3.318)	(3.740)
MSA Avg. Income - Quartile 3	0.476	1.079**	1.920***	2.219***
	(1.316)	(2.521)	(4.468)	(4.267)
MSA Avg. Income - Quartile 4	0.314	0.653*	1.712***	1.777***
	(0.884)	(1.689)	(3.634)	(3.787)
Percent Low-Bucket Credit	2.079***	1.430***	1.136***	1.530***
	(6.332)	(3.888)	(3.324)	(4.383)
Percent Medium-Bucket Credit	6.629***	6.735***	6.726***	6.246***
	(7.299)	(6.157)	(4.976)	(3.776)
Home Ownership Rate	0.003	-0.000	0.020***	0.019***
	(1.622)	(-0.181)	(8.246)	(6.150)
Housing Permits 1 Year Lag	0.129***	0.159***	0.148***	0.162***
	(6.088)	(8.431)	(5.850)	(7.529)
Unemployment Rate	-0.003	-0.015	0.025	-0.011
	(-0.109)	(-0.428)	(0.636)	(-0.233)
Constant	-5.834***	-5.298***	-8.291***	-8.283***
	(-11.83)	(-9.693)	(-13.37)	(-11.32)
Observations	11101	11120	9836	9032
Adjusted R-squared	0.299	0.274	0.239	0.246
Cluster by State	Yes	Yes	Yes	Yes