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# Predatory Lending Laws and the Cost of Credit

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# Predatory Lending Laws and the Cost of Credit

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**Abstract:** *Various states and other local jurisdictions have enacted laws intending to reduce predatory and abusive lending in the subprime mortgage market. These laws have created substantial geographic variation in the regulation of mortgage credit. This article examines whether these laws are associated with a higher or lower cost of credit. Empirical results indicate that the laws are associated with at most a modest increase in cost. However, the impact depends on the product type. In particular, loans with fixed (adjustable) rates are associated with a modest increase (decrease) in cost.*

Predatory lending laws are today's usury laws. The laws focus on the high cost or subprime segment of the mortgage market and typically restrict certain types of loans such as loans with prepayment penalties and balloon payments. Those borrowers who are still able to get a loan when a law is in place may be required to pay for at least part of the regulatory costs associated with complying or violating the laws (assuming compliance is nontrivial).

This article tests to see whether the existence of a predatory lending law is associated with systematic change in annual percentage rates (APRs)—which represent the full cost of borrowing, including upfront points and fees—or with higher periodic interest rates. In addition, a law index is used to measure the relative strength of each law and test whether stronger laws, in terms of restrictions and coverage, differentially impact the cost of credit.

The major findings of this article are that Home Mortgage Disclosure Data (HMDA), even with the interest rate information collected since 2004, provide insufficient information to learn about the impact of predatory lending laws on the cost of credit. However, using a more detailed and national data set of subprime loans, we find that stronger laws, as measured by their extent of restrictiveness, tend to increase the cost of borrowing on fixed-rate loans. In contrast, stronger laws tend to be associated with a lower cost for adjustable-or hybrid-rate loans. We propose that this potential paradox can be explained by the ability of the lender to pass the costs of regulatory compliance for adjustable-rate loans on to the consumer in ways that do not affect the APR calculation.

The introduction of predatory lending laws at the state, county and city levels has provided substantial geographic variation in the regulation of high-cost mortgage credit. We largely focus on the impact of state laws because they have been the most durable in the face

of legal challenges mounted by lending associations and other forms of government. Because state boundaries reflect political and not economic regions, we compare mortgage market conditions in states with a law in effect[1] with those in neighboring states currently without a predatory lending law. Instead of examining whole states or regions, we focus on multistate metropolitan and micropolitan areas that cross state boundaries with variations in the laws. This geographic-based sampling is similar, at least in spirit, to the approach used by Pence (2006) when studying the impact of state-level foreclosure laws. By examining mortgages in similar labor and housing markets, this sampling approach aids in the identification of the impact of state predatory lending laws on the cost of subprime credit.

## Subprime and Predatory Lending

The subprime mortgage market provides the opportunity of homeownership and access to credit to those who are not eligible to take part in the prime or conventional market. Therefore, the subprime market completes the mortgage market and can enhance welfare (Chinloy and MacDonald 2005). Predatory lending depends on the inability of the borrower to understand the loan terms and the obligations associated with them. For example, interviews held by the U.S. Department of Housing and Urban Development (HUD), the U.S. Department of the Treasury (Treasury) and the Board of Governors of the Federal Reserve System (Federal Reserve Board) indicate that some, perhaps many, borrowers using high-cost loans may not have understood the terms of the loans, leading to extremely high interest rates and upfront fees (HUD-Treasury 2000, Federal Reserve 2002).

In 2002, partly in response to these hearings, the Federal Reserve Board strengthened the existing Home Ownership and Equity Protection Act (HOEPA) as articulated in Regulation Z. HOEPA defines a class of loans that are given special consideration because they are more likely to have predatory features and require additional disclosures. HOEPA-covered loans (loans where HOEPA applies) include only closed-end home equity loans that meet APR and upfront finance fees that trigger coverage. Hence, these are typically referred to as the APR and fees triggers. Home purchase loans and other types of lending backed by a home, such as lines of credit, are not covered by HOEPA.

However, the continuing market penetration of subprime lenders and the geographic concentration of subprime lending in low-income and minority neighborhoods have led to concerns in many communities that HOEPA did not do enough to restrict loans likely to contain predatory features. By the end of 2004 at least 23 states had passed predatory lending laws that are currently in effect; including Arkansas, California, Colorado, Connecticut, Florida,

Georgia, Illinois, Kentucky, Maine, Maryland, Massachusetts, Nevada, New Jersey, New Mexico, New York, North Carolina, Ohio, Oklahoma, Pennsylvania, South Carolina, Texas, Utah and Wisconsin.

These laws follow the structure of HOEPA by defining a class of loans likely to be associated with predation and then restrict certain practices for covered loans. Ho and Pennington-Cross (2006) detail in the Appendix each of the predatory lending laws. We created an index to measure the strength of each law. The index can be broken down into a coverage component and a restrictions component. The coverage category includes measures of loan purpose, APR first lien, APR higher liens and points and fees. In general, if the law does not increase the coverage beyond HOEPA it is assigned zero points. Higher points are assigned if the coverage is more general. The restrictions index includes measures of prepayment penalty restrictions, balloon restrictions, counseling requirements and restrictions on mandatory arbitration. If the law does not require any restrictions on covered loans, then zero points are assigned. Higher points indicate more restrictions. The index is scaled so that each of the eight subcomponents is on average equal to one.[2] Therefore, as shown in Table 1, by design the average index has the value of eight. However, there is wide variation from a low of just less than 1.5 for the laws in Maine and Nevada to over 17 for the law in Illinois. There is also substantial variation in the extent of restriction and coverage. In addition, the restrictions and coverage components are not strongly correlated.[3]

## Literature Review

There is a growing literature relating local and state predatory lending laws to conditions in the subprime mortgage market. Primarily the literature has focused on case studies on a law-by-law basis. Overall there is strong evidence that the introduction of the first state-level predatory lending law in North Carolina did reduce the number of applications and originations of subprime loans (Ernst, Farris and Stein 2002, Quercia, Stegman and Davis 2003, Elliehausen and Staten 2004, Harvey and Nigro 2004) and the laws passed in Chicago and Philadelphia, which are no longer in effect, also had a similar impact (Harvey and Nigro 2003). However, the impacts found in these studies have turned out not to be the typical market response to the introduction of predatory lending laws. In particular, the laws can have no impact on decrease and even increase the number of applications and originations for subprime loans (Ho and Pennington-Cross 2006). One explanation for the increased application rate after a law is passed is that potential applicants may feel more comfortable applying for a subprime loan if a

lending law covers their application.[4] As a result, the subprime market can actually grow after a law has been enacted. In contrast, laws that reduce applications and originations have stronger restrictions. Stronger laws are also associated with lower rejection rates on subprime applications.

In contrast to the growing literature on the flow (applications and originations) of subprime credit much less is known about the impact of the laws on the pricing or cost of credit. Pricing in the subprime market is not as transparent or homogeneous as in the prime market (White 2004, Crews Cutts and Van Order 2005, Chomsisengphet and Pennington-Cross 2006), making identifying the impact of predatory lending laws on the cost of credit more difficult. In particular, different interest rates are charged based on prior mortgage payment history, credit scores, down payments and various loan characteristics. In addition, the growing dominance of adjustable-rate loans in the subprime market (using LoanPerformance data adjustable-rate mortgage originations have grown from 40% of the market in 2000 to over 65% in 2005) requires careful consideration of the detailed characteristics of a loan (*e.g.*, margin, teaser, cap and floor and index).[5] In addition, there is some evidence that subprime borrowers tend to pay much higher fees during origination and underwriting (Stein 2001) making it important to measure the full cost of borrowing in addition to the initial or periodic interest rate on the loan.

Li and Ernst (2005) examine the impact of various state predatory lending laws on the spread between prevailing risk-free rates and the periodic or initial interest rate on subprime loans. Their data set represents securitized subprime loans, which may include A-and Alt-A loans, leased from LoanPerformance as represented in their asset-backed securities (ABS) data sets. This data set provides extensive detail on product types, but does not provide full coverage of the subprime market. All of the United States is included in the sample and 34 dummy variables are used to characterize the different nuances of the lending laws. The results do not provide any consistent evidence that state predatory lending laws have a recognizable impact on periodic interest rates. Some coefficients have negative signs; others have positive signs and over one-half of coefficient estimates are insignificant. Given the number of loans used to conduct the analysis (ranging from over 100,000 to over 450,000), the results should be very precise. Therefore, to date there is no consistent evidence (that we are aware of) that local and state predatory lending laws are associated with a consistent change in the cost of credit in the mortgage market.

**Motivation—Cost of Credit**

If lenders incur higher cost due to the introduction of predatory lending laws, then these

costs might be passed on to consumers in the form of higher fees and higher interest rates on the loans. Lenders must report to local authorities the nature and extent of high-cost (covered) loans they originate and make sure that they are not violating any of the predatory laws. This may be fairly simple to do for a local lender, but for a national lender it is necessary to monitor all state and local lending laws that are pending and in effect, as well as any legal challenges and changes to these laws.

If the laws create a regulatory burden on lenders and this burden or cost is passed on to consumers, then borrower cost should be higher in locations with the law in effect. In addition, the laws could differentially impact periodic interest rates, initial points and fees and product types.

Because adjustable rates are the dominant form of lending in the subprime market it is important to consider differences between the pricing of fixed-rate and adjustable-rate mortgages. Consider a two-period model following the work of Brueckner (1986) and Sa-Aadu and Sirmans (1989).[6] The two-period model allows a simple illustration of the role of uncertainty in the pricing of mortgages and the impact of changing interest rates. The rate on a mortgage in the first time period, *t* = 0 (the initial rate), is defined as

$$r_0 = i_0 + m\,, \tag{1}$$

where $r_0$, the interest rate in the first time period, is defined as the sum of the initial rate on an index $(i_0)$ plus the margin (*m*) over the index. The margin is constant over the life of the loan but the index can change in the second period $(i_1)$ for adjustable-rate loans. The index represents the cost of funds to the lender in the two time periods, *t* = 0 and *t* = 1. The margin compensates the lender for the risk associated with the loan. These risks include interest rate and credit risks.

Loans can also include a discount $(\delta)$ in the first time period below the fully indexed rate in the first period $(r_0)$. Borrowers may also pay additional fees upfront (*f*) to reduce the interest rate, which is often referred to as points paid. Therefore, the initial rate can be represented as:

$$r_0 = i_0 + m - \delta + f. \tag{2}$$

The initial rate is defined as the sum of the index, the margin and upfront fees less the discount. This representation provides the cost of credit in the first time period; however, upfront fees are not included when calculating the fully amortizing payment. Therefore, a mortgage can be structured with the same expected return that includes various levels of initial rates

depending on the margin, discount and upfront fees. In general, when holding returns constant, higher fees and a higher margin or a lower discount should be associated with lower initial rates.

In the second time period, *t* = 1, the rate on the mortgage is uncertain for an adjustable-rate mortgage and depends on the index value $(i_1)$, the margin (*m*) and any limits placed on the fully adjusted rate $(i_1 + m)$ as defined by a cap (*u*) and a floor (*l*).[7] Therefore, the rate of return in the second period can take on three forms depending on whether the cap or floor is binding.

$$\begin{aligned} &i_1 + m < r_0 - l, \text{then } r_1 = r_0 - l, \\ &i_1 + m > r_0 + u, \text{then } r_1 = r_0 + u, \\ &r_0 - l < i_1 + m < r_0 + u, \text{then } r_1 = i_1 + m. \end{aligned} \tag{3}$$

In the second period the rate on the mortgage $(r_1)$, or return to the lender, is the initial rate $(r_0)$ plus the cap (*u*) if the cap is binding, the initial rate less the floor if the floor is binding and the fully indexed rate $(i_1 + m)$ if the cap and floor are not binding. Therefore, the cap can be designed to shift all the interest rate risk to the borrower or the lender. In the limit the cap and floor can be designed so that they are never binding $(u = \infty \text{ and } l = \infty)$ and all the interest rate risk is transferred to the borrower or so that it is always binding$(u = 0 \text{ and } l = 0)$. When *u* =0 and *l* =0 the loan is equivalent to a fixed-rate mortgage. Therefore, a fixed-rate mortgage can be viewed as a subset or special case for adjustable-rate mortgages where the cap and floor are always binding.

The index for the second period can be viewed as a random variable and the expected return for the second period is as follows:

$$\begin{aligned} E(r_1) = &\int_0^{r_0 - f - m} (r_0 - f) f(i_1) di_1 + \int_{r_0 - f - m}^{r_0 + u - m} (i_1 + m) f(i_1) di_1 \\ &+ \int_{r_0 + u - m}^{\infty} (r_0 + u) f(i_1) di_1, \end{aligned} \tag{4}$$

where $f(i_1)$ is the probability density function for interest rates in the second time period. The first terms of the equation represent the rate when the floor is binding and the realized interest rate is $r_0 - f$. The second terms of the equation represent the rate when neither the cap nor the floor are binding and the realized interest rate is $i_1 + m$. The last part of the equation represents the rate when the cap is binding and the realized interest rate is $r_0 + u$. The cap and floor impact on the expected rate and the extent that the caps and floors matters depend on the distribution of interest rates in the second time period $f(i_1)di$. Because the margin is used to compensate for all other costs and risks, the more volatile interest rates or the index, the larger

the margin will need to be to compensate for the lender taking on interest rate risk. The expected rate can also be modified to include a measure of credit risk, which is assumed to occur only when the value of the mortgage is higher than the value of the property, by adding $\int_0^B \frac{B-V}{B} g(V)dV$ to the expected rate.[8] Here *B* is the outstanding balance on the loan, *V* is the value of the mortgage and *g*(*V*) is the probability density function for *V*. Because default is a cost, the required rate in the second period will be higher and the margin can be used to increase the rate to compensate for the credit risk. For a fixed-rate loan the expected rate in the second time period is the initial interest rate $r_0 = i_0 + m$ plus the measure of credit risk $\left(\int_0^B \frac{B-V}{V} g(V)dV\right)$.

This two-period model primarily shows that the margin on a loan is a complicated mixture of many characteristics, including the variance of future rates, credit risks (property values), upfront fees, discounts and caps. In particular, the margin is used to compensate the lender for all costs except for the cost of funds. Fixed-rate loans should require a higher margin to compensate for the lender being exposed to all of the interest rate risk and adjustable-rate loans can be viewed as being in a continuum from full-lender exposure to interest rate risk to no-lender exposure to interest rate risk depending on the cap. In addition, any costs associated with complying with local laws and regulations should be associated with a higher margin to maintain the required rate of return.

**APR**

This section examines the impact of a predatory lending law on the APR of a high-cost loan. HMDA provides broad coverage of most regulated lenders and the loans that they originate as wells as rejections and the purchases of loans in the secondary market over each calendar year. Unfortunately, the breadth of coverage is offset by the lack of details provided. For example, HMDA does not report credit scores, down payments, details on loan type or the interest rate on the loan. As a result, recent research using HMDA has tended to focus on the volume of credit by location and the outcome of applications for credit (Harvey and Nigro 2004, Ho and Pennington-Cross 2006). However, for the calendar year 2004, the HMDA data set provides the spread between the APR on high-cost mortgages and the yield on Treasury bills of comparable maturity (*S*). Using this spread this section will attempt to determine if predatory lending laws have affected the reported APR spread.

The HMDA estimation sample used here includes loans under the conforming loan limit (no jumbo loans) for single-family (one to four units) homes and excludes manufactured homes.

Multifamily (five or greater units) housing is excluded because the pricing of credit is more strongly tied to expected cash flows and capital appreciation rates than to the credit worthiness of the borrower. Therefore, the sample has many different types of loans including loans for owner-occupied housing, investor housing, home improvement, purchase and refinance.

**An Aside About Calculating APRs**

Before discussing the identification strategy and estimation method it may be helpful to provide a more detailed description of what the APR represents and how it can be calculated. The APR represents the effective interest rate the borrower will pay on the loan assuming it is held to term (contractual end of the loan or last payment). The effective rate represents both periodic interest payments and upfront payments made on the loan. Therefore, if there are no upfront fees the APR on a 30-year fixed-rate loan with an interest rate of 8% is 8%. However, most mortgages include many fees that must be paid at or before the loan is originated. If these upfront costs equal 3% of the original balance of the loan and the interest rate is 8% then the APR on this loan is 8.32%.[9]

However, while the APR covers many or even most costs it does not represent the total cost of borrowing. For example, penalties such as late fees and routine fees not paid by the lender, such as home inspection fees, are not included. Typically, items such as discount points, prepaid interest origination fees paid by the lender, closing agent preparation fees and private mortgage insurance fees are all included in the APR. For the purposes of this article HMDA-reported APR requires that lenders calculate APR in compliance with Regulation Z's definition of "Finance Charge." The "Finance Charge" paragraph lists all the specific charges and the many nuances that define what is included or not included in APR calculations.

The Regulation Z rules for calculating APR for adjustable-rate and hybrid-rate loans require that the lender hold the index constant through time and that loans with teasers (low initial rates) adjust up to their fully adjusted rate as quickly as contractually possible.[10] In practice this implies that the lender must calculate a blended or single rate that represents any future changes in interest rates holding the index constant and then incorporate all applicable upfront costs to determine the APR. In summary, while APRs are neither a perfect nor complete measure of borrower cost they are the best available measure.

**Identification and Estimation Strategies**

To aid identification, a geographic-based sampling approach is used. In particular, only loans in metropolitan and micropolitan statistical areas (MSAs) that cross state borders, where only one state has a predatory lending law in effect, are included. Table 2 provides a list of the 35 MSAs included in the estimation.

All loans that meet the loan type and location criteria are included. A variable called *Ineffect* indicates that the loan is located in a location where a predatory lending law is currently in effect. Only locations where the law is in effect before the beginning of 2004 are included. Therefore, if there is a regulatory cost passed on to the consumer, it should be reflected in a positive coefficient estimate for *Ineffect*.

However, HMDA only reports the spread between the APR on high-cost mortgages and the yield on Treasury bills of comparable maturity (*S*) if it is 3 percentage points or higher. The censoring of observations is analogous to a missing variable problem and may lead to biased estimates of coefficients. The solution we adopt here is to follow the two-step Heckman selection correction (Heckman 1979, Greene 1981).[11] The first step is to estimate a probit equation via maximum likelihood to explain the probability of the spread being reported using a set of explanatory variables (*z*). Using the coefficient estimates we construct the "inverse Mills ratio," which is often referred to as lamba ($\lambda_j = \phi(z_j\hat{\gamma})/\Phi(z_j\hat{\gamma})$), where *j* indexes the individual loans, $\phi$ and $\Phi$ are the partial and cumulative normal probability functions and $\hat{\gamma}$ are the estimated coefficients for the vector of variables *z*. It is possible to rely on functional form for identification, but is preferable for *z* to include variables that affect the probability of reporting without impacting the estimated spread. Therefore, ideal candidates to aid identification are variables that are used for screening loans but are not used in the pricing of loans. For example, borrower income and the loan-to-income ratio are not included in subprime pricing tables, but they are likely related to probability of having a poor credit history. Other candidates could include location proxies not used in pricing but correlated with financial stress such as vacancy rates and the urban/rural breakdown.

The second step is to augment the spread regression (*S*) with the inverse Mill's ratio (λ):

$$S_j = \alpha_c + \alpha_p P_j + \alpha_m M_j + \alpha_b B_j + \alpha_l L_j + \alpha_\lambda \lambda_j + \varepsilon_j, \quad (5)$$

where *j* indexes the individual loan originations, *S* is the spread as defined above, *P* indicates whether a loan is in a location with a predatory lending law in effect and the strength of the law as measured by the law index, the law coverage index, the law restrictions index, dummies indicating locations with very strong laws, *M* represents mortgage characteristics, *B* represents borrower characteristics, *L* represents locations characteristics, λ is the inverse mills ratio and ε represents a normally distributed mean 0 random error term with a variance of $\sigma$.[12]

Table 3 describes the variables and indicates the source for the data. Table 4 provides the mean and standard deviation of the variables used in the regressions. The average spread

is 4.15 percentage points above the comparable term Treasury bill and 51% of the sample is in locations with a law. Figure 1 shows the distribution of APR spread for the estimation sample and provides an indication of what proportion of loans would be covered by the predatory lending laws using the APR trigger mechanism only. The APR trigger typically varies from 6% to 10% above the comparable Treasury yield depending on the state and the lien category. For example, under the Maryland law, which has a first-lien APR spread trigger of 7%, approximately 2% of reported first-lien loans would be covered using HMDA national distributions.

Mortgage characteristics are controlled by including dummy variables for loan size and loan purpose (home improvement, investor and refinance). The reference loan is a purchase, owner-occupied and medium-sized loan. It is expected that purchase, owner-occupied loans have a lower risk profile and should have a lower APR. In addition, due to fixed costs associated with underwriting, larger loans are likely to have lower APRs also. Passmore, Sherlund and Burgess (2005) use loan size dummy variables to control for these fixed costs on the cost of credit. Borrower characteristics include borrower ethnicity and a proxy for borrower credit scores. Higher credit scores should be associated with lower APRs, while nonwhite borrowers, due to missing variables such as wealth and health status, are likely be associated with higher APRs. The average Fair Isaac FICO score for the census tract of the property is calculated from 2004-originated subprime loans using the LoanPerformance Asset-Backed Securities (ABS) data set. Metro-and micropolitan area dummies are included to control for location-specific unobserved characteristics and there are no priors regarding their sign or magnitude. The summary statistics indicate that the high-cost HMDA loans come from locations with relatively low credit scores and a substantial fraction of nonwhite borrowers.[13]

**APR Spread and Selection Results**

Table A1 reports the first stage, or probit, estimated coefficient and standard errors. All of the variables included in the second stage are also included in the probit model except the law variables. To aid identification, four additional variables describing the location of the loan and borrower characteristics in more detail are also included. In particular, borrowers with more income are less likely to have an APR spread reported. In contrast, borrower income was found to have no impact on the magnitude of the APR spread and was therefore excluded from the second-stage specification. In addition, the loan-to-income ratio is also found to increase the probability of have an APR spread reported. These finding are consistent with subprime underwriting standards, which use income- and debt-coverage ratios (monthly debt servicing/monthly income) to screen loan eligibility but are not used or have little impact on the

pricing of loans. In addition, consistent with prime and subprime underwriting standards borrowers from locations with high credit scores are less likely to have reported APR spreads.

The second-stage results are reported in Table 5. Model 1 includes the law index. Model 2 includes the coverage and restrictions indexes. Model 3 includes *Ineffect* and dummy variables indicating that the law was strong in terms of coverage or restrictions. Where any version of the law index is included, it is constructed such that the index is zero before the law is passed and only takes on a positive value after a law has been put in effect.

In general the results in Table 5 indicate that predatory lending laws have only a modest impact on the cost of credit. Models 1 and 2 find no relationship between the strength of the predatory lending law and the APR spread. Model 3 indicates that loans in locations with stronger laws, whether measured by coverage or restrictions, paid a rather inconsequential 12.0 to 17.9 basis points less than a comparable loan in locations without a law. In general, these results provide no support for the notion that predatory lending laws impose a regulatory burden that will be passed on to the consumer through higher interest rates or upfront fees. In fact, strong laws seem to be associated with reductions in APRs.

The mortgage, borrower and location controls largely meet expectations. For example, smaller loans have higher spreads likely indicating the role of fixed underwriting costs and potentially higher loss rate relative to jumbo loans.[14] In addition, spreads are higher for home improvement loans and refinances. However, there does not seem to be a premium associated with investor loans. In terms of locations and borrower characteristics, nonwhite households are associated with higher spreads, and Hispanic borrowers are not associated with any detectable difference in spreads. As indicated earlier, if nonwhite borrowers are associated with unobserved characteristics that would increase the cost of borrowing, then this may be reflected in the nonwhite coefficient estimate. The proxy for credit score, the subprime FICO tract-level average, is also associated with lower spreads. The location-specific dummy variables are both positive and negative and are significant a little over one-half of the time. These results indicate that interest rate premiums for subprime loans may reflect perceptions of the risks associated with each location and the legal environment (Ambrose and Buttimer 2005).

In terms of sample selection issues the results indicate that it is important to control for the probability of reporting the APR spread. The inverse Mills ratio is significant and positive in all specifications. We also ran simple ordinary least squares (OLS) regressions that confirm the results presented here. Coefficient estimates are very similar (almost exactly the same). However, the OLS versions of Models 1 and 2 find that the impact of the law index and the coverage index are statistically significant at the 1% level.

## Differences-in-Differences and Interest Rates

While the HMDA specification allows for the study of the full cost of borrowing, as measured by the APR, it does not include important variables used in the pricing and underwriting of subprime loans such as credit scores and down payments.[15] HMDA also does not permit the identification of adjustable- and fixed-rate loan types. To alleviate some of these issues, data from LoanPerformance on securitized subprime loans are used in this section. The data include individual loan down payment, FICO score at origination, great detail about the loan type and adjustable rate details such as the margin and caps on periodic interest rate adjustments. However, the APR is not reported and there is no information on the upfront fees and points paid.[16]

However, the LoanPerformance data do not represent all of the subprime mortgage market. While it does cover a vast majority of the securitized subprime it does not provide good coverage of the higher cost segments (B- & C-grade segments). Therefore, it is best to regard these results as reflecting the impact of laws on the just less than prime segment of subprime or the A-segment.

To remove some unobserved heterogeneity, we limit the sample to first-lien 30-year fixed-and adjustable-(hybrid) rate for purchase and refinance loans secured by single-family property. As with the HMDA-based model we limit the analysis to loans that meet the conforming loan limit. In addition, both owner-occupied and investor loans are included in the sample as well as refinances that take cash out and those that do not. We also limit our attention to the dominant type of adjustable-rate mortgage in subprime, the 2/28 adjustable-rate mortgage (2/28 ARM), which is a hybrid loan whose rate is fixed for the first two years and adjustable for the next 28 years.[17] Adjustments to the periodic interest rate are indexed to the six-month London interbank offered rate (LIBOR). However, the 2/28 ARM still has substantial heterogeneity in terms of adjustment caps, teasers and other factors that will need to be controlled for to create an accurate loan-level measure of the interest rate cost.

As with the previous HMDA analysis, only metropolitan and micropolitan areas with variations in laws are included in the sample. However, the LoanPerformance data are available through time. Time variation can be used to improve identification of the impact of the law coming into effect. We sample loans before and after the law comes into effect. In particular, only loan originations from 6 to 18 months before and 6 to 18 months after the law becomes effective are included in the sample. This “donut” hole sampling approach makes sure that any

temporary adjustments to the law are not included in coefficient estimates.

The key variable of interest is *Ineffect*. This variable indicates that a loan is in a location when and where a predatory lending law is effective, or "in effect." It is defined as zero before the law is effective regardless of law status. *Ineffect* is constructed by interacting the variable *law*, which indicates locations where the law will eventually be in effect, and *postlaw*, which indicates the time period after a law, has become in effect. Therefore, *law* identifies the treatment location and *postlaw* identifies the time period the treatment is in effect. There are no priors regarding the coefficients on *law* or *postlaw*, because they will capture prevailing market conditions that are not controlled for by other variables. Dummy variables are included for each MSA and interacted with both *postlaw* and *law*. Therefore, location- and time-specific effects for each MSA are controlled for by this set of variables.[18] The remaining variation associated with the time period when the law is in effect in the location with a law (*ineffect*) is interpreted as the impact of the law on the spread. This type of dummy structure is commonly referred to as a differences-in-differences estimation due to the time-and location-control variables. In addition, the geographic sampling strategy aids identification of the laws' impact.

**Specification**

Two main features used to determine interest rates are credit history and down payments (or the loan-to-value, (LTV) ratio). It is important to consider whether these variables could be endogenous and jointly determined with the interest or spread on the mortgage. We use the Fair Isaac's FICO score to proxy for credit history. FICO scores are used by prominent lenders such as Countrywide and IndyMac Bank as part of their pricing and interest rate matrices (Crews Cutts and Van Order 2005, Chomsisengphet and Pennington-Cross 2006). However, FICO scores reflect a long history of past payments and are difficult to improve in the short run. In contrast, credit scores can be negatively and dramatically affected by new derogatory information such as a charge-off or bankruptcy. Therefore, we treat FICO as an exogenous variable.

We also use the LTV of the loan at origination because it also plays an important role in the pricing matrices. Larger down payments (smaller LTVs) are used by lenders to help compensate for other risk factors such as weak credit history. Therefore, for borrowers who are not wealth constrained, the down payment can be used to adjust to the prevailing interest rates and thus LTVs and interest rates may be jointly determined. For example, Ling and McGill (1998) show that the demand for mortgage debt is affected by borrower income, wealth and other factors. Ambrose, LaCour-Little and Sanders (2004) use borrower income and age to proxy for wealth to identify the LTV equation in a similar mortgage spread analysis, which

focused on the impact of Fannie Mae and Freddie Mac on the cost of credit. Unfortunately, our data set does not include borrower income or age, but we can use the 2000 Census data on ZIP code average income and age as proxies for wealth.[19] In addition, they also include a measure of prevailing interest rates to proxy for debt servicing cost. We estimate the following system of equations using two-stage least squares in SAS version 9.1 for Windows:

$$ltv_j = \beta_c + \beta_f F_j + \beta_r r_j^{mkt} + \beta_i I_j + \beta_a A_j + \beta_t T_j + \beta_l L_j + \varepsilon_j^l \quad (6)$$

$$S_j = \alpha_c + \alpha_p P_j + \alpha_m M_j + \alpha_b B_j + \alpha_l \hat{ltv}_j + \varepsilon_j^s. \quad (7)$$

In the first equation, *ltv* is the loan-to-value ratio indexed over *j* mortgages, *F* is the Fair Isaac's credit score, $r^{mkt}$ is the prevailing prime 30-year fixed mortgage rate (Freddie Mac Primary Mortgage Market Survey®) in the month of origination), *I* is the ZIP code average income, *A* is the ZIP code average age, *T* is a vector of year dummies from 1998 through 2005 and *L* is a vector of MSA dummies. In the second equation, *S* is the interest rate spread (interest rate less 10-year Treasury yield or LIBOR depending on rate type), *P* represent predatory lending laws and their identification, *M* and *B* represent mortgage, borrower and location characteristics, and $\hat{ltv}$ is the predicted loan-to-value ratio from the first stage. $\varepsilon^l$ and $\varepsilon^s$ represent identically and independently distributed random error terms.

To identify the impact of the law, *P* includes the previously discussed series of MSA dummies and *postlaw* and *law* interacted with the MSA dummies. Vectors *M* and *B* include *FICO,* the borrower's Fair Isaac credit score as well as detailed information on loan type.

Table 6 provides definitions of the variables used and Table 7 provides summary statistics for the estimation samples. The system of equations is estimated separately for fixed and adjustable-rate mortgages. Table 7 reports the aggregate or pooled means for the variables for *law* and *postlaw*, while during the estimation there is a unique *postlaw* and *law* for each MSA. For fixed-rate loans the spread is the difference between the interest rate on the loan and the yield on 10-year treasury bills (*spread_frm*). For adjustable-rate loans the spread is defined as the margin on the loan or the difference between the fully index rate and the index (*spread_arm*). The data set is limited to first-lien 30-year term loans and the adjustable-rate loans are limited to the dominant type that are the 2/28 ARMs indexed to the six month LIBOR, with rate adjusted every six months (after being fixed the first two years).[20]

In general, subprime lenders charge more for lower credit scores and higher LTVs;

therefore, spreads should be higher for loans with higher LTVs and lower FICO scores.[21] Loans for which the borrower provides little documentation (*low doc*) or no documentation (*no doc*) are likely to pay a premium to compensate for inaccurate, unstable or illegal income and wealth sources. As in the HMDA specification, loan size dummy variables are included in the analysis to capture the impact of fixed costs of origination and servicing being spread across larger loans. Therefore, we expect that larger loans should pay lower spreads. Dummies indicating whether the loan is for purchase, refinance with additional cash taken (*refi_cashout*) and refinance without taking additional cash out (*refi_nocash*) may also affect the interest rate. Property that is purchased for investment opportunities (*investor*) or other purposes (*other_purpose*) is also likely to pay a premium. Some of the loans also have Private Mortgage Insurance (*PMI*).[22] *PMI* insures the lender against losses incurred in the event that the borrower defaults on the loan. The borrower, not the lender, pays for this insurance. Therefore, a borrower who uses PMI should also be compensated by the lender with lower interest rates or fees, holding all other variables constant.

As previously discussed, adjustable-rate loans often have caps and floors placed on the extent that the interest rate can change over time. Although we have only referred to caps as if there is only one type, in practice caps can restrict interest rate resets on the first reset date and then on all subsequent reset dates. In particular, we include measures of the caps for the first adjustable time period and all subsequent time periods as percentages of the initial interest rate on the mortgage. Because the rate on a 2/28 ARM is fixed for the first two years, if interest rates go up it could require a large interest rate adjustment to reach the fully indexed rate (index plus margin). Therefore, most loans impose looser caps in the first adjustment than in subsequent periods. For example, the first period cap, *fcap*, is 30% (not percentage points) on average, while the subsequent periodic cap, *pcap*, is 14% on average.[23] Adjustable-rate loans also can include teasers that initially set the interest rate below the fully indexed rate. The average teaser is 32 basis points. In addition, the inclusion of caps means that lenders are subject to interest rate risks. The two-period model theory indicates that, if the index on an adjustable-rate loan is more volatile, the margin should be higher to compensate the lender. We include a measure of index volatility in the adjustable-rate loan model, namely, variance over the prior six months of the six-month LIBOR (*labor_var*).

Ambrose and Sanders (2005) show that interest rates can also be affected by other important market factors. In particular, they examine the impact of the difference between the "AAA" bond index and the "BAA" bond index to proxy for the cost of borrowing as well as a

measure of the yield curve. In addition, consistent with the two-period model used above and from the options pricing framework, the volatility of house prices and interest rates are central to the value of a mortgage and hence it's pricing and mortgage interest rates. To control for these and other unobserved factors, time dummies are included that are specific to each metropolitan area for the one-year sample before and after the law comes into effect. Therefore, these dummies will represent all national and micropolitan area and metropolitan area level factors that could affect interest rates in the mortgage market and spreads associated specifically with subprime lending.

**Results**

Table 7 indicates that the primary difference between adjustable- and fixed-rate loans is that adjustable-rate loans tend to be a little larger and the borrower's credit score tends to be lower (597 vs. 660).

Details on the results of the first stage or LTV results are presented in Table A3. The results largely meet expectations. Tables 8 and 9 report the results for the second stage or the spread results for both the fixed-rate and adjustable-rate specifications (Equation 7) in which the predicted LTV ($\hat{ltv}$) is used. The results differ from those found using HMDA and the results for fixed-rate loans differ from those for adjustable-rate loans. The fixed-rate results emphasize that laws with a lot of restrictions on the types of credit available and the behavior of lenders can modestly increase interest rates on a loan. For example, while the overall index is statistically insignificant the restrictions index is associated with higher interest rates and laws with strong restrictions tend to pay an additional 22 basis points more (the opposite of that found using the HMDA data). This is consistent with the notion that lender compliance cost is fairly minimal for most lenders. In contrast, the impact of the laws on adjustable-rate spreads or margin is much more similar to the findings using HMDA data. In general, stronger laws are associated with slightly lower interest rates and this reduction is driven by the extent of coverage, not the extent of restrictions. In particular, Model 3 indicates that laws with the most broad coverage are associated with an 11 basis point reduction in interest rates.[24]

Control variables for location (MSA dummies), law status (*law* $*$ MSA dummies) and time for each MSA (*postlaw* $*$ MSA dummies) are not reported because we have no priors regarding significance or sign. As expected coefficient estimates vary substantially with about two-thirds being significant. Borrower and mortgage characteristics also perform as expected. For example, higher credit scores are associated with lower spreads for both adjustable- and fixed-rate loans. In fact, many of the coefficients for adjustable- and fixed-rate loans provide similar findings. For example, small loans, low documentation loans, for purchase loans and loans for purposes

other than owner occupation (other purpose or investor) all have higher spreads. However, some variables have different signs and levels of significance. In general, results will reflect the underwriting standards as they are applied to different product types. For example, there should be no inherent difference between an identical refinanced loan and a for-purchase loan; however, refinance loans that do not take any cash out are associated with lowers spreads for both adjustable- and fixed-rate loans. Therefore, this result likely reflects unobserved factors associated with refinances that tend to make them less risky than for-purchase loans.

Mortgage characteristics for adjustable-rate loans perform as expected. For example, as predicted by the two-period model used to motivate differences between fixed and adjustable-rate loans, loans with larger teasers pay a higher spread than loans without teasers. In addition, loans with broad caps (less likely to be binding) on interest rate adjustments pay a lower spread because the borrower is assuming more of the interest rate risk. However, inconsistent with the theory, but consistent with prior empirical estimates, the variance of the index is associated with lower spreads (Sprecher and Willman 1998).

In summary, the results showed a modest positive and negative impact of predatory lending laws on interest spreads for fixed-rate and adjustable-rate loans, respectively. These results may reflect the ability of lenders to adjust the terms of adjustable-rate loans in order to comply with the requirements of a predatory lending law. The decline in interest rates was associated with laws that provided broad coverage, while the rise in fixed rates was tied to the restrictiveness of the law. While it is beyond the scope of this article to definitively determine the cause, it may be that laws that apply to many loans reduce any legal liability or legal uncertainty for lenders and secondary market investors.

**Can the Reported APR be Manipulated to Avoid Law Coverage?**

In this section we examine how the reported APR can be adjusted by manipulating caps and teasers on 2/28 ARMs, while holding lender expected returns constant. As stated earlier, the Regulation Z-compliant APR as reported in HMDA, assumes that the loans is held to the end of the contract and that the index is constant through time. Therefore, a 2/28 ARM that does not have a teaser has the same APR as a 30-year fixed-rate loan (assuming the initial interest rates and upfront fees are identical).

Consider how caps on future changes in interest rates could impact the reported APR. We can use the results in Table 9 (Model 1) to define the fully indexed rate for a loan for various cap strengths that has the same expected return for the lender. Using an “average” representative loan that has no upfront costs and no teaser we can calculate the fully indexed rate for different caps. Because we assume no upfront costs and no teaser the fully indexed rate

is the APR. We define a low cap as one standard deviation below the average, a medium cap as the average and a high cap as one standard deviation above the average. If LIBOR is 5% then the APR for the representative low-cap loan is 13.05%, for the representative medium-cap loan is 11.84% and for the representative high-cap loan is 9.44%. Therefore, by shifting the interest rate risk from the lender to the borrower the APR can be impacted by over 250 basis points.

As a result, it is possible to shift a significant proportion of borrowers so that the predatory lending law does not apply (not covered). Take, for example, the laws in Illinois and Washington D.C., both of which have a first-lien APR spread triggers of 6%. These laws, using the HMDA national distributions in Figure 1, cover about 5.5% of loans, using only the APR trigger. Assuming a one-percentage-point change in the margin roughly corresponds to the same change in the APR, adjusting the caps by 10% in these locations can have the effect of shifting about two-thirds of previously covered loans out of the laws' coverage. As a result, these borrowers will be facing more volatility in interest rates and payments in the future. While this may not be a concern in a "down rate" environment, if interest rates increase substantially these borrowers will experience larger payment shocks than they would have with more stringent caps in place.

In addition, we calculated the percentage change in the cap strength over the prelaw to postlaw period for both control and treatment locations and found that cap measures have loosened more in locations with a law coming into effect. For example, the first-period (periodic) cap loosened by 17% (6.5) in locations without a law, compared with 42.5% (16.9) in locations with a law coming into effect. Therefore, in locations where a predatory lending law comes into effect interest rate risk has been more aggressively shifted to the borrower.

To test whether initial rate teasers could also be used to avoid law coverage consider three representative loans: (1) a loan with no teaser, (2) a loan with an average teaser and (3) a loan with a high teaser (mean plus one standard deviation). Assume that all other variables are evaluated at their means and a 5% LIBOR over the life of the loan. Holding lender-expected returns constant, the initial rate, margin and fully indexed rate can then be calculated using the results in Table 9. Assuming no upfront costs the APR is calculated as the blended rate (internal rate of return) at par.[25] The results indicate that the reported APR would be lowest for the loan without a teaser and highest for the loan with a high teaser (9.44% vs. 10.13%). Therefore, the lender cannot avoid the predatory lending law by using stronger or bigger initial rate teasers.

From the lender's perspective it is important to consider that expected holding period or life of a subprime loan is substantially shorter than 30 years assumed in the Regulation Z APR

calculations. For example, using the same assumptions as above but truncating the holding period to five years the APR on the loan without a teaser stays at 9.44% but the loan with a high teaser is reduced to 7.25%. Therefore, a loan with a teaser has a higher-reported APR but a lower-expected return. These results reinforce the finding that teasers will not be used to avoid predatory lending laws because the reported APR is based on the full 30 years not the expected holding period.

## Summary and Conclusion

Since 1999, state and local predatory lending laws have spread to a geographically and demographically divergent collection of locations, including the states Maine, Maryland and Nevada, among many others. The laws tend to follow the structure of federal regulations as articulated by HOEPA; however, the local nature of the regulation has lead to spatially differentiated predatory lending laws, which have become today's usury laws. This article examines whether these laws are associated with increases or decreases in the cost of credit. Evidence that the cost of credit increases when a law is enacted is consistent with a regulatory compliance cost being passed onto the consumer. In contrast, evidence that the cost of credit decreases when a law is introduced provides additional support for beliefs that (1) predation has been a substantial problem in the subprime mortgage market and/or (2) lenders and borrower have been able to find alternative types of loans not covered by the law.

The results of this article provide two different and potentially contradictory results. For example, in preliminary evidence using HMDA data, the APR (includes the periodic interest rate and upfront points and fees) spread is negatively associated with the introduction of a predatory lending law. That is, the cost of credit is lower when there is a law after controlling for borrower, location and some loan type characteristics. However, this data set suffers because it cannot control for crucial parts of the subprime (risk-based pricing) underwriting paradigm. For example, the endogenously determined down payment and the credit score of the borrower are not available. HMDA also cannot distinguish between adjustable- and fixed-rate loan types and provides no detail on the unique characteristics of adjustable-rate loans, such as teasers, caps on interest rate adjustments and the margin (the premium paid above the index when the rate is fully adjusted).

An alternative set of results, using a different data set that provides great detail about loan type, has substantially different results. This data set provides a time series at the loan level that allows for a more complete differences-in-differences specification that can control for location and the time period before and after the law is approved and put into effect. However,

this data set does not provide any information on upfront fees and points. In a cross-section estimation designed to mimic HMDA (no distinction made on rate adjustment type), the results for the interest rate spread were very similar to the results for the APR spread when using HMDA. However, when a more complete model is formulated, the results indicate that the impact of the law depends on product type. In particular, for consumers using fixed-rate loans the laws that have strong restrictions on allowable lending impose modest regulatory costs that are passed to consumer. In contrast, for consumers using adjustable-rate loans the laws had a small negative impact on the cost of borrowing.

One interpretation of this result is that it is relatively easy to find a substitute adjustable-rate loan that can evade coverage of the law while maintaining the same expected return for the lender. For example, one way to avoid being subject to a law is to reduce the APR below a predetermined threshold. This can be done, while holding constant lender-expected rates of return on an adjustable-rate loan only, by shifting the interest rate risk from the lender to the borrower by adjusting interest rate caps. However, this product shift is also likely to impact default risk.

In summary, the results indicate that state and local predatory lending laws have at most a modest regulatory cost in terms of interest rates, which is passed on to consumers. However, this cost is only directly observable for fixed-rate loans because it is straightforward on adjustable-rate loans to evade law coverage by manipulating interest rate adjustment caps. In addition, while the 2004 release of HMDA may seem like a good source of information on borrower cost, any results are likely biased as a result of missing variables and misspecification.

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## Endnotes

[1] Laws are first enacted by the local legislature and become effective typically at a later date. It is not until the law becomes in effect that lenders are required to follow the new rules and restrictions.

[2] More details on the scaling and creation of the index are available in Ho and Pennington-Cross (2006). Before scaling of the index, points are assigned to each law using the following scheme:
Coverage: *Loan Purpose* (HOEPA equivalent = 0, all loans except government loans = 1, all loans except reverse or open loans = 2, all loans except reverse, business or construction loans = 3 and all loans with exceptions = 4), *APR Trigger first Lien* (8%, HOEPA equivalent = 0, 7% = 1, 6% = 2 and no trigger = 3), *APR Trigger Higher Liens* (10%, HOEPA equivalent = 0, 9% = 1, 8% = 2, 7% = 3 and no trigger = 4), *Points and Fees Trigger* (8%, HOEPA equivalent = 0, 6%–7% = 1, 5% = 2, <5% = 3 and no trigger = 4).
Restrictions: *Prepayment Penalty Prohibitions* (no restriction = 0, prohibition or percentage limits

after 60 months = 1, prohibition or percentage limits after 36 months = 2, prohibition or percentage limits after 24 months = 3 and no penalties allowed = 4), *Balloon Prohibitions* (no restriction = 0, no balloon if term < seven years (all term restrictions) = 1, no balloon in first 10 years of mortgage = 2, no balloon in first 10 years of mortgage and Cleveland = 3 and no balloons allowed = 4), *Counseling Requirements* (not required = 0, and required = 1), *Mandatory Arbitration Limiting Judicial Relief* (Allowed = 0, partially restricted = 1 and prohibited = 2).

[3] There is also a history of laws being changed after market reactions by the primary market, secondary market and rating agencies. For example, the first version of the law in Georgia allowed potentially unlimited punitive damages for violating the law and this liability extended to loan assignees, which includes the securitization trust. As a result, Fitch and Moody refused to rate Georgia-covered loans, Freddie Mac stated that they would not purchase any securities backed by mortgages in Georgia, and many lenders stated they would not lend high-cost loans, including Ameriquest, Chase, Citi, Wells Fargo and others. Not surprisingly, the Georgia law was amended and capped assignee liability.

[4] An alternative explanation is that lenders respond by increasing the promotion or supply of subprime credit after a law is passed because any uncertainty about the legality of the loans has been removed.

[5] Consistent with the expectation theory of interest rates, the market share of adjustable-rate loans has historically been sensitive to the shape of the yield curve. The current time period will help to reveal if subprime loans are equally sensitive to interest issues or if product selection is dominated by other forces such as affordability, need for cash, and so on, mixed with very short expected holding periods.

[6] An alternative approach is to follow options pricing theory (*e.g.*, Buser, Hendershott and Sanders 1985, Hendershott and Shilling 1985, Kau *et al.* 1990).

[7] Because this is a two-period model, no distinction is necessary between floors and caps over the life of the mortgage or from period to period. In actual mortgages both periodic and lifetime limits may apply.

[8] In reality defaults are also associated with trigger events such as divorce, job loss or medical impairment.

[9] The yield or internal rate of return on a mortgage can be solved for by setting the value of the mortgage equal to the present discounted value of all future payments. For example, a fully amortizing 30-year $100 loan with an interest rate of 8% must pay approximately 73

cents per month to pay off the loan (0 =−$100 +Σ$t$ $0.73/(1.08)$^t$). If there was a 3% upfront fee then the borrower only actually receives $97 and the effective yield on the loan increases to 8.32% (0 =−$97 +Σ$t$ $0.73/(1.0832)$^t$).

[10] Adjustable-rate loans typically are indexed to a public interest rate such as a Treasury yield or the LIBOR. The fully adjusted rate is then the index rate plus a spread or margin above the index.

[11] More formally, we assume that there is an underlying regression relationship between the spread (*Sj*) and exogenous explanatory variables ($x_j$), such that $S_j = x_j\beta + \varepsilon_j$. $S_j$ is only observed if $z_j\gamma + v_j > 0$, where $z_j$ is a vector explanatory variables, $\gamma$ are estimated coefficients, $\varepsilon_j \sim N(0, s), v_j \sim N(0,1)$ and $\text{corr}\,(\varepsilon, v) = \rho$.

[12] Greene (1981) shows that the standard errors using Ordinary Least Squares (OLS) can be biased up or down. Greene provides the formula to correct the variance-covariance matrix and the SAS code used to conduct the estimation and correct the standard errors was downloaded from http://support.sas.com/ctx/samples/index.jsp?sid=476 on June 30, 2006. The author of the code is David A. Jaeger, The University of Michigan, davej@umich.edu. In addition, there is another potential sample selection problem because the selection of locations into those who have a law and those who do not is not random. However, due to individual loan data, it is unlikely that the individual-loan-level errors will be correlated with that of a state-level selection equation.

[13] Specification tests including borrower income were insignificant and are not reported.

[14] Loans that do not meet the Fannie Mae and Freddie Mac loan limit (conventional conforming loan limit) are not included in the sample. In addition, concerns that loan size is an endogenous variable are mitigated by including only very gross loan size dummies and are not the focus of this article. Passmore, Sherlund and Burgess (2005) follow a similar strategy and include only a dummy for small loans.

[15] See Chomsisengphet and Pennington-Cross (2006) and Crews Cutts and Van Order (2005) for explanations of subprime underwriting and pricing.

[16] To test whether the same results would be found if upfront fees and points are excluded from the spread, a model is run using the interest rate spread as the dependent variable using 2005 loan originations data from LoanPerformance ABS. The findings were very

similar to those found using HMDA and the APR and are available in Table A2. For example, the impact of the typical law was a reduction in the spread by 0.6 basis points, while the HMDA APR results found a 0.8 basis point reduction in the spread. In addition, we attempted to match HMDA to the LoanPerformance data set to obtain APR information. Our overall 1-to-1 matching rate is 15% while requiring a perfect match on location, loan amount, lien status, loan purpose, property type and occupancy status. We estimate a similar specification, using all available loan information to explain APR spread. We find that the models generally have poor fit, weak precision and some nonsensible coefficient estimates. We conclude that our matching is largely inaccurate and therefore do not report the results.

[17] Over the period 1998–2005 2/28 ARM make up approximately 75% of the adjustable-rate market (calculated from the LoanPerformance database).

[18] One drawback of this approach is that LoanPerformance data quality and market coverage tend to decline the further back you go in time.

[19] The U.S. Census reports ZIP code tabulation areas, which were matched to the five-digit postal ZIP codes provided in the loan-level data. In addition, if neighborhoods change rapidly through time these variables will be measured with additional error.

[20] Over 98% of the 2/28 adjustable-rate loans in our sample have these features.

[21] Additional specification tests were conducted by interacting FICO with LTV to test for evidence that the marginal cost of providing a smaller down payment increases for borrowers with lower credit scores. Evidence was found of this effect for fixed-rate loans, but not for adjustable-rate loans. All other coefficient estimates were not materially affected by including FICO and LTV interactions.

[22] In the prime mortgage market Fannie Mae and Freddie Mac require that loans with less than a 20% down payment also have PMI. As a result, PMI and LTV are almost perfectly collinear. This relationship does not hold in subprime. Many loans with little or even no equity do not have PMI, but they are charged directly through upfront fees and the periodic interest rate for the increased credit risk.

[23] Various specification tests showed that lifetime caps may also play a role, but they are usually insignificant and highly collinear with other cap measures. Therefore, one way to interpret the results on the cap variables is as a general measure of cap strength.

[24] Indicating the importance of controlling for the unique features associated with adjustable-rate loans, additional specification tests that did not include measures of adjustment rate caps lead to larger and more negative coefficient estimates for *Ineffect*.

[25] With two different interest rates (one rate for the first two years and another rate for the remaining 28 years) the blended rate is calculated by numerically searching for the discount rate that equates the 30 years of payments to the initial loan amount.

## Notes


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- We would like to thank the St. Louis Research Division for leasing the data that made it possible to do this research.

## Appendix
**Table 1**
**The law index**

| State | Full Index | Coverage Index | Restrictions Index |
|---|---|---|---|
| Arkansas | 10.06 | 2.73 | 7.33 |
| California | 7.07 | 5.09 | 1.98 |
| Chicago, IL | 12.64 | 10.20 | 2.43 |
| Cleveland, OH | 15.19 | 4.35 | 10.84 |
| Colorado | 16.19 | 12.87 | 3.31 |
| Connecticut | 6.92 | 2.73 | 4.20 |
| Cook County, IL | 12.64 | 10.20 | 2.43 |
| Florida | 1.98 | 0.00 | 1.98 |
| Georgia | 14.88 | 4.13 | 10.76 |
| Illinois | 17.16 | 8.73 | 8.43 |
| Indiana | 7.55 | 2.36 | 5.19 |
| Kentucky | 4.95 | 0.74 | 4.22 |
| Maine | 1.47 | 1.47 | 0.00 |
| Maryland | 10.51 | 5.84 | 4.67 |
| Massachusetts | 9.68 | 4.13 | 5.55 |
| Nevada | 1.47 | 1.47 | 0.00 |
| New Jersey | 6.27 | 3.13 | 3.14 |
| New Mexico | 12.91 | 6.28 | 6.63 |
| New York | 6.82 | 4.13 | 2.69 |
| North Carolina | 5.07 | 1.11 | 3.96 |
| Ohio | 2.38 | 1.47 | 0.90 |
| Oklahoma | 4.59 | 0.74 | 3.85 |
| Pennsylvania | 2.92 | 1.47 | 1.44 |
| South Carolina | 8.83 | 2.36 | 6.47 |
| Texas | 3.79 | 0.74 | 3.06 |
| Utah | 2.55 | 1.47 | 1.08 |
| Washington, D.C. | 14.89 | 10.50 | 4.39 |
| Wisconsin | 2.63 | 1.55 | 1.08 |
| Average | 8.00 | 4.00 | 4.00 |
| Standard Deviation | 4.98 | 3.52 | 2.87 |

**Table 2**
**List of metropolitan and micropolitan statistical areas**

| Variable Name | Metropolitan and Micropolitan Statistical Areas |
|---|---|
| *ar1* | Fayetteville-Springdale-Rogers AM-MO |
| *ar2* | Memphis TN-MS-AR |
| *dc* | Washington-Arlington-Alexandria DC-VA-WV |
| *ga1* | Chattanooga TN-GA |
| *ga2* | Columbus GA-AL |
| *il1* | Burlington IA-IL |
| *il2* | Cape Girardeau-Jackson MO-IL |
| *il3* | Davenport-Moline-Rock Island IA-IL |
| *il4* | Quincy IL-MO |
| *il5* | St Louis MO-IL |
| *in* | South Bend-Mishawaka IN-MI |
| *ky1* | Clarksville TN-KY |
| *ky2* | Huntington-Ashland WV-KY |
| *ky3* | Union City TN-KY |
| *ma1* | Boston-Cambridge-Quincy MA-NH |
| *ma2* | Providence-New Bedford-Fall River RI-MA |
| *md1* | Cumberland MD-WV |
| *md2* | Hagerstown-Martinsburg MD-WV |
| *nc* | Virginia Beach-Norfolk-Newport News VA-NC |
| *oh1* | Parkersburg-Marietta WV-OH |
| *oh2* | Point Pleasant WV-OH |
| *oh3* | Weirton-Steubenville WV-OH |
| *oh4* | Wheeling WV-OH |
| *pa* | Philadelphia-Camden-Wilmington PA-DE |
| *ut* | Logan UT-ID |
| *wi1* | Duluth MN-WI |
| *w12* | Iron Mountain MI-WI |
| *wi3* | La Crosse WI-MN |
| *wi4* | Marinette WI-MI |
| *wi5* | Minneapolis-St Paul-Bloomington MN-WI |

*Notes*: Cross-sectional (HMDA) estimation excludes laws that are passed in 2004 (IL, IN, UT, WI).

**Table 3**

**Definition of HMDA variable**

| Variable | Definition | Source |
|---|---|---|
| Dependent Variables | | |
| *Report* | Dummy indicating that the APR spread on the loan is reported in HMDA. The cutoff is 3% for first liens. | HMDA 2004 |
| *Spread* | Annual Percentage Rate (APR) minus yield on Treasury securities of comparable maturity (%). | HMDA 2004 |
| Identification | | |
| *Ineffect* | Dummy indicates loan is in location with a predatory lending law in effect. Loans in locations without a law in effect are the reference group. | Table 1* |
| *Law index* | Index indicating strength of predatory lending law. | Table 1 |
| *Coverage index* | Index indicating strength of predatory lending law in terms of market coverage. The coverage index plus the restrictions index equals the "full" law index. | Table 1 |
| *Restrictions index* | Index indicating strength of predatory lending law in terms of the extent of restrictions and requirements placed on mortgage types and lending practices. The coverage index plus the restrictions index equals the "full" law index. | Table 1 |
| *High_coverage* | Dummy indicating high coverage index value (>75$^{th}$ percentile). | Table 1 |
| *High_restrictions* | Dummy indicating high restrictions index value (>75$^{th}$ percentile). | Table 1 |
| Mortgage | | |
| *Small_loan* | Dummy indicates loan amounts in the lower quartile of observed loan amounts. The two middle quartiles is the reference group. | HMDA 2004 |
| *Large_loan* | Dummy indicates loan amounts in the upper quartile of observed loan amounts. The two middle quartiles is the reference group. | HMDA 2004 |
| *Home-improv* | Dummy indicates loan is contracted for home improvement purpose. Home purchase is the reference group. | HMDA 2004 |
| *Refi* | Dummy indicates loan is contracted for refinancing purpose. Home purchase is the reference group. | HMDA 2004 |
| *Investor* | Dummy indicates nonowner-occupancy status. Owner occupied is the reference group. | HMDA 2004 |
| Location/Borrower | | |
| *FICO_tract* | Average FICO scores of Census tract. | Calculated from LP database |
| *Hispanic* | Dummy indicates borrower is of Hispanic or Latino ethnicity. The reference group is non-Hispanic | HMDA 2004 |
| *Nonwhite* | Dummy indicates borrower is of a race other than white. The reference group is white. | HMDA 2004 |

| | | |
|---|---|---|
| *Income* | Income of the borrower. | HMDA 2004 |
| *Loan2inc* | Loan-to-income ratio. | Calculated from HMDA 2004 |
| *Urban* | Percentage urban population of census tract. | Census 2000 |
| *Vacant* | Percentage vacant housing units of census tract. | Census 2000 |

*See Ho and Pennington-Cross (2005) for details on each law.

**Table 4**
**Descriptive statistics of HMDA variables**

| Variable | Mean | SD |
|---|---|---|
| Dependent variables | | |
| *Report* | 0.114 | 0.318 |
| *Spread (%)* | 4.149 | 1.128 |
| Identification | | |
| *Ineffect* | 0.512 | 0.500 |
| *Law index* | 3.998 | 4.761 |
| *Coverage index* | 1.808 | 2.347 |
| *Restrictions index* | 2.190 | 2.673 |
| *High_coverage* | 0.039 | 0.193 |
| *High_restricions* | 0.294 | 0.456 |
| Mortgage | | |
| *Small_loan* | 0.206 | 0.404 |
| *Large_loan* | 0.294 | 0.456 |
| *Home_improv* | 0.041 | 0.198 |
| *Refi* | 0.558 | 0.497 |
| *Investor* | 0.090 | 0.285 |
| Location/borrower | | |
| *FICO_tract* | 650.1 | 23.2 |
| *Hispanic* | 0.050 | 0.218 |
| *Nonwhite* | 0.170 | 0.376 |
| *Income* (thousand $) | 94.9 | 106.2 |
| *Loan2inc* | 2.618 | 1.784 |
| *Urban* | 0.876 | 0.270 |
| *Vacant* | 0.051 | 0.055 |

*Notes*: Statistics for variable *spread* is calculated using the high-cost sample (*report* = 1); all other variables are calculated using the full sample.

**Table 5**
**Impact of predatory lending laws on APR spread**

| | Model 1 | | Model 2 | | Model 3 | |
|---|---|---|---|---|---|---|
| **Variable** | **Coeff.** | **Std. Err.** | **Coeff.** | **Std. Err.** | **Coeff.** | **Std. Err.** |
| *Intercept* | 5.450** | 0.289 | 5.433** | 0.289 | 5.418** | 0.289 |
| Identification | | | | | | |
| *Ineffect* | - | - | - | - | 0.035 | 0.056 |
| *Law index* | -0.008 | 0.056 | - | - | - | - |
| *Coverage index* | - | - | -0.013 | 0.056 | - | - |
| *Restrictions index* | - | - | -0.003 | 0.013 | - | - |
| *High_coverage* | - | - | - | - | -0.179** | 0.013 |
| *High_restrictions* | - | - | - | - | -0.120** | 0.014 |
| Mortgage | | | | | | |
| *Small_loan* | 0.383** | 0.014 | 0.381** | 0.022 | 0.379** | 0.013 |
| *Large_loan* | -0.102** | 0.022 | -0.103** | 0.013 | -0.102** | 0.014 |
| *Home_improv* | 0.273** | 0.013 | 0.272** | 0.014 | 0.272** | 0.026 |
| *Refi* | 0.167** | 0.014 | 0.166** | 0.027 | 0.166** | 0.021 |
| *Investor* | -0.082** | 0.026 | -0.081** | 0.021 | -0.081* | 0.033 |
| Location/Borrower | | | | | | |
| *FICO_tract* | -0.314** | 0.013 | -0.309** | 0.014 | -0.308** | 0.022 |
| *Hispanic* | 0.042 | 0.021 | 0.038 | 0.033 | 0.039 | 0.020 |
| *Nonwhite* | 0.213** | 0.031 | 0.212** | 0.020 | 0.213** | 0.021 |
| *ar1* | 0.331** | 0.020 | 0.311** | 0.021 | 0.335** | 0.025 |
| *ar2* | 0.287** | 0.020 | 0.285** | 0.026 | 0.288** | 0.038 |
| *dc* | -0.067** | 0.025 | -0.060 | 0.042 | -0.063 | 0.039 |
| *ga1* | 0.176** | 0.038 | 0.167** | 0.039 | 0.168** | 0.046 |
| *ga2* | 0.251** | 0.039 | 0.224** | 0.045 | 0.222** | 0.087 |
| *ky1* | -0.003 | 0.045 | -0.008 | 0.087 | -0.024 | 0.028 |
| *ky2* | 0.009 | 0.087 | 0.004 | 0.026 | -0.021 | 0.024 |
| *ky3* | 0.374** | 0.026 | 0.373** | 0.024 | 0.371** | 0.065 |
| *ma1* | -0.094** | 0.024 | -0.096 | 0.062 | -0.087* | 0.040 |
| *ma2* | -0.178** | 0.062 | -0.177** | 0.038 | -0.174** | 0.056 |
| *md1* | 0.168** | 0.038 | 0.174** | 0.055 | 0.213 | 0.115 |
| *md2* | -0.012 | 0.055 | -0.007 | 0.114 | 0.021 | 0.060 |
| *oh1* | -0.097 | 0.114 | -0.093 | 0.059 | -0.114 | 0.060 |
| *oh2* | 0.054 | 0.059 | 0.060 | 0.060 | 0.024 | 0.026 |
| *oh3* | -0.045 | 0.060 | -0.040* | 0.021 | -0.076** | 0.021 |
| *oh4* | -0.072** | 0.020 | -0.067** | 0.004 | -0.092** | 0.034 |
| *pa* | -0.098** | 0.001 | -0.095** | 0.004 | -0.144** | 0.028 |
| Inverse Mill's Ratio | | | | | | |
| $\lambda$ | 0.283** | 0.051 | 0.276** | 0.051 | 0.279** | 0.051 |
| Number of loans | 69,139 | | 69,139 | | 69,139 | |

*Notes*: Second stage of Heckman two-step selection correction estimation; HMDA 2004 cross-section; dependent variable is spread between APR and T-bill rate of comparable maturity; *FICO_tract* is expressed in 100s; **indicates significance at the 1% level and * indicates significance at the 5% level.

**Table 6**
**Definition of LoanPerformance variables**

| Variable | Definition |
|---|---|
| Dependent variables | |
| *spread_frm* | Spread on fixed-rate loans: interest rate minus yield on 10-year T-bill (%). |
| *spread_arm* | Spread on adjustable-rate loans: margin = fully indexed rate – 6-month LIBOR (%). |
| Identification | |
| *Law* | Dummy indicates location with a predatory lending law. |
| *Postlaw* | Dummy indicates postlegislation time period. |
| *Ineffect* | Interaction of *law* and *postlaw* indicating property is in a location with a law currently effective. |
| *Law index* | Index indicating strength of predatory lending law. |
| *Coverage index* | Index indicating strength of predatory lending law in terms of market coverage. The coverage index plus the restrictions index equals the "full" law index. |
| *Restrictions index* | Index indicating the strength of predatory lending law in terms of the extent of restrictions and requirements placed on mortgage types and lending practices. The coverage index plus the restrictions index equals the "full" law index. |
| *High_coverage* | Dummy indicating high coverage index value (>75$^{th}$ percentile). |
| *High_restrictions* | Dummy indicating high restrictions index value (>75$^{th}$ percentile). |
| Borrower/Mortgage | |
| *FICO* | Borrower's Fair Isaac Credit score. |
| *ltv* | Loan-to-value ratio. |
| *Small_loan* | Dummy indicates loan amounts in the lower quartile of observed loan amounts. The two middle quartiles are the reference group. |
| *Large_loan* | Dummy indicates loan amounts in the upper quartile of observed loan amounts. The two middle quartiles are the reference groups. |
| *PMI* | Dummy indicates loan has private mortgage insurance. |
| *Lowdoc* | Dummy indicates borrower provides low document. Full document is the reference group. |
| *Nodoc* | Dummy indicates borrower provides no document. Full document is the reference group. |
| *Refi_cashout* | Dummy indicates loan is contracted for refinancing purpose, with cash out. Purchase is the reference group. |
| *Refi_nocash* | Dummy indicates loan is contracted for refinancing purpose, no cash out. Purchase is the reference group |
| *Other-purpose* | Dummy indicates loan is contracted for another purpose. Purchase is the reference group. |
| *Investor* | Dummy indicates nonowner-occupancy status. Owner occupied is the reference group |
| ARM only | |
| *Teaser* | Spread between initial interest rate and fully indexed rate. |
| *fcap* | First-period cap as percentage of initial interest rate. |
| *pcap* | Periodic cap as percentage of initial interest rate. |
| *libor_var* | SD in the index (six-month LIBOR) over the previous six months. |

**Table 7**
**Descriptive statistics of LoanPerformance variables**

| | FRM Sample | | ARM Sample | |
|---|---|---|---|---|
| **Variable** | **Mean** | **SD** | **Mean** | **SD** |
| Dependent variables | | | | |
| *Spread_frm* | 3.290 | 1.495 | - | - |
| *Spread_arm* | - | - | 6.247 | 1.059 |
| Identification | | | | |
| *Law* | 0.338 | 0.473 | 0.281 | 0.450 |
| *Postlaw* | 0.565 | 0.496 | 0.672 | 0.469 |
| *Ineffect* | 0.207 | 0.405 | 0.206 | 0.405 |
| *Law index* | 1.829 | 4.247 | 1.998 | 4.512 |
| *Coverage index* | 0.866 | 2.180 | 0.936 | 2.271 |
| *Restrictions index* | 0.963 | 2.266 | 1.063 | 2.385 |
| *High_coverage* | 0.047 | 0.212 | 0.054 | 0.225 |
| *High_restrictions* | 0.109 | 0.311 | 0.137 | 0.344 |
| Borrower/Mortgage | | | | |
| *FICO* | 659.7 | 72.1 | 596.6 | 57.4 |
| *ltv* | 78.0 | 15.7 | 81.8 | 11.5 |
| *Small_loan* | 0.295 | 0.456 | 0.225 | 0.418 |
| *Large_loan* | 0.200 | 0.400 | 0.173 | 0.378 |
| *PMI* | 0.292 | 0.454 | 0.272 | 0.445 |
| *Lowdoc* | 0.308 | 0.462 | 0.276 | 0.447 |
| *Nodoc* | 0.029 | 0.168 | 0.006 | 0.075 |
| *Refi_cashout* | 0.552 | 0.497 | 0.549 | 0.498 |
| *Refi_nocash* | 0.168 | 0.374 | 0.116 | 0.321 |
| *Other_purpose* | 0.001 | 0.032 | 0.001 | 0.024 |
| *Investor* | 0.146 | 0.354 | 0.073 | 0.260 |
| ARM only | | | | |
| *Teaser* | - | - | 0.324 | 1.518 |
| *fcap* | - | - | 0.300 | 0.119 |
| *pcap* | - | - | 0.140 | 0.042 |
| *labor_var* | - | - | 0.243 | 0.154 |

## Table 8
**Fixed-rate mortgage-spread results**

| | Model 1 | | Model 2 | | Model 3 | |
|---|---|---|---|---|---|---|
| **Variable** | **Coeff.** | **Std. Err.** | **Coeff.** | **Std. Err.** | **Coeff.** | **Std. Err.** |
| *Intercept* | 7.627** | 0.210 | 7.639** | 0.210 | 7.640** | 0.210 |
| Identification | | | | | | |
| *Ineffect* | - | - | - | - | -0.123* | 0.057 |
| *Law index* | 0.004 | 0.003 | - | - | - | - |
| *Coverage index* | - | - | -0.017 | 0.010 | - | - |
| *Restrictions index* | - | - | 0.027** | 0.010 | - | - |
| *High_coverage* | - | - | - | - | 0.032 | 0.067 |
| *High_restrictions* | - | - | - | - | 0.222** | 0.067 |
| Borrower/Mortgage | | | | | | |
| *FICO* | -0.011** | 0.000 | -0.011** | 0.000 | -0.011 | 0.000 |
| $l\hat{t}v$ | 0.046** | 0.003 | 0.046** | 0.003 | 0.046** | 0.003 |
| *Small_loan* | 0.477** | 0.014 | 0.477** | 0.014 | 0.476** | 0.014 |
| *Large_loan* | -0.109** | 0.016 | -0.110** | 0.016 | -0.110** | 0.016 |
| *PMI* | 0.206** | 0.012 | 0.206** | 0.012 | 0.206** | 0.012 |
| *Lowdoc* | 0.154** | 0.012 | 0.154** | 0.012 | 0.154** | 0.012 |
| *Nodoc* | 0.436** | 0.032 | 0.437** | 0.032 | 0.437** | 0.032 |
| *Refi_cashout* | -0.168** | 0.013 | -0.168** | 0.013 | -0.168** | 0.013 |
| *Refi_nocash* | -0.331** | 0.017 | -0.331** | 0.017 | -0.330** | 0.017 |
| *Other_purpose* | 0.255 | 0.164 | 0.252 | 0.164 | 0.254 | 0.164 |
| *Investor* | 0.102** | 0.016 | 0.102** | 0.016 | 0.102** | 0.016 |
| Adjusted $R^2$ | 0.461 | | 0.461 | | 0.461 | |
| Number of loans | 51,197 | | 51,197 | | 51,197 | |

*Notes*: Second-stage results of two stage least squares (2SLS), LoanPerformance panel 1998–2005; dependent variable is *spread* between interest rate and 10-year T-bill; *FICO* and *ltv* are expressed in 10's; $l\hat{t}v$ is predicted value of *ltv* from first stage; coefficients for *MSA*, *law* and *postlaw* dummies are not reported; ** indicates significance at the 1% level and * indicates significance at the 5% level.

**Table 9**
**Adjustable-rate mortgage spread (margin) results**

| | Model 1 | | Model 2 | | Model 3 | |
|---|---|---|---|---|---|---|
| **Variable** | **Coeff.** | **Std. Err.** | **Coeff.** | **Std. Err.** | **Coeff.** | **Std. Err.** |
| *intercept* | 10.388** | 0.197 | 10.395** | 0.197 | 10.391** | 0.197 |
| Identification | | | | | | |
| *Ineffect* | - | - | - | - | -0.058 | 0.044 |
| *Law index* | -0.006** | 0.002 | - | - | - | - |
| *Coverage index* | - | - | -0.024** | 0.009 | - | - |
| *Restrictions index* | - | - | 0.013 | 0.009 | - | - |
| *High_coverage* | - | - | - | - | -0.111* | 0.049 |
| *High_restrictions* | - | - | - | - | 0.068 | 0.052 |
| Borrower/Mortgage | | | | | | |
| *Teaser* | 0.587** | 0.003 | 0.587** | 0.003 | 0.587** | 0.003 |
| *fcap* | -2.275** | 0.034 | -2.275** | 0.034 | -2.275** | 0.034 |
| *pcap* | -7.994** | 0.091 | -7.997** | 0.091 | -7.997** | 0.091 |
| *libor_var* | -0.354** | 0.028 | -0.354** | 0.028 | -0.354** | 0.028 |
| *FICO* | -0.005** | 0.000 | -0.005** | 0.000 | -0.005** | 0.000 |
| $l\hat{t}v$ | -0.013 | 0.004 | -0.013** | 0.004 | -0.013** | 0.004 |
| *Small_loan* | 0.209** | 0.009 | 0.208** | 0.009 | 0.208** | 0.009 |
| *Large_loan* | -0.114** | 0.010 | -0.114** | 0.010 | -0.114** | 0.010 |
| *PMI* | -0.058** | 0.008 | -0.058** | 0.008 | -0.058** | 0.008 |
| *Lowdoc* | 0.102** | 0.008 | 0.102** | 0.008 | 0.102** | 0.008 |
| *Nodoc* | -0.322** | 0.045 | -0.322** | 0.045 | -0.323** | 0.045 |
| *Refi_cashout* | -0.180** | 0.008 | -0.180** | 0.008 | -0.180** | 0.008 |
| *Refi_nocash* | -0.182** | 0.012 | -0.182** | 0.012 | -0.182** | 0.012 |
| *Other_purpose* | 0.435** | 0.141 | 0.434** | 0.141 | 0.435** | 0.141 |
| *Investor* | 0.120** | 0.014 | 0.120** | 0.014 | 0.120** | 0.014 |
| Adjusted $R^2$ | 0.463 | | 0.463 | | 0.463 | |
| Number of loans | 57,747 | | 57,747 | | 57,747 | |

*Notes*: Second-stage results of 2SLS, LoanPerformance panel 1998–2005; dependent variable is *spread* between fully indexed rate and six-month LIBOR (margin); *FICO* and *ltv* are expressed in 10s; $l\hat{t}v$ is predicted value of *ltv* from first stage; coefficients for *MSA*, *law* and *postlaw* dummies are not reported; ** indicates significance at the 1% level and * indicates significance at the 5% level.

**Figure 1**
**APR distribution for first liens—HMDA 2004**

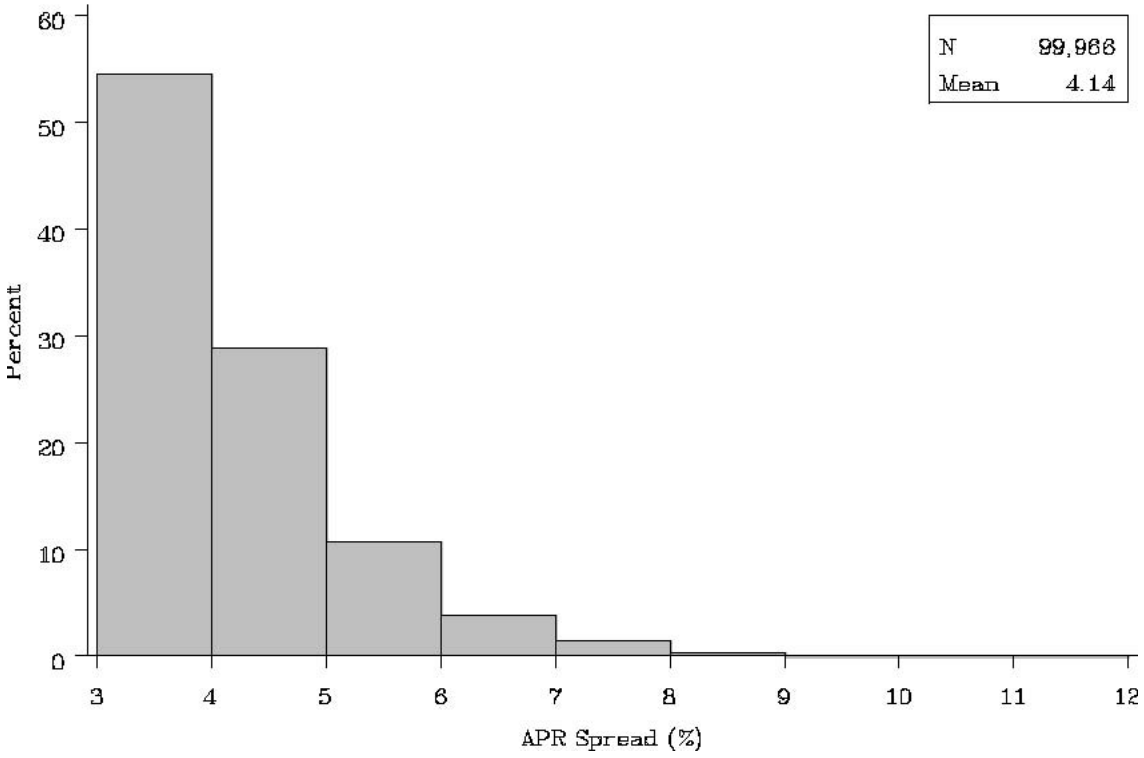

**Table A1**
**Results for selection (probit) equation-HMDA estimation dependent variable is *report.***

| Variable | Coeff. | Std. Err. |
|---|---|---|
| *Intercept* | 5.871** | 0.098 |
| *Income* | -0.110** | 0.004 |
| *Loan2inc* | 0.012** | 0.001 |
| *Urban* | 0.117** | 0.009 |
| *Vacant* | 1.064** | 0.043 |
| *Small_loan* | 0.156** | 0.006 |
| *Large_loan* | -0.025** | 0.007 |
| *Home_improv* | 0.271** | 0.011 |
| *Refi* | 0.222** | 0.005 |
| *Investor* | 0.044** | 0.008 |
| *FICO_tract* | -1.125** | 0.015 |
| *Hispanic* | 0.479** | 0.009 |
| *Nonwhite* | 0.440** | 0.006 |
| *ar1* | 0.032* | 0.016 |
| *ar2* | 0.264** | 0.011 |
| *dc* | -0.215** | 0.009 |
| *ga1* | 0.148** | 0.015 |
| *ga2* | 0.015 | 0.021 |
| *ky1* | 0.031 | 0.023 |
| *ky2* | -0.327** | 0.024 |
| *ky3* | -0.145** | 0.056 |
| *ma1* | -0.385** | 0.009 |
| *ma2* | -0.325** | 0.010 |
| *md1* | -0.210** | 0.035 |
| *md2* | -0.150** | 0.020 |
| *oh1* | -0.444** | 0.028 |
| *oh2* | -0.648** | 0.060 |
| *oh3* | -0.451** | 0.031 |
| *oh4* | -0.483** | 0.031 |
| *pa* | -0.295** | 0.009 |
| Number of loans | 607,630 | |

** indicates significant at the 1% level and * indicates significance at the 5% level. Log likelihood = -193,543.00.

## Table A2

**Interest rate spread results, 2004 cross-section, LoanPerformance data**

| | Model 1 | | Model 2 | | Model 3 | |
|---|---|---|---|---|---|---|
| **Variable** | **Coeff.** | **Std. Err.** | **Coeff.** | **Std. Err.** | **Coeff.** | **Std. Err.** |
| *Intercept* | 6.779** | 0.159 | 6.710** | 0.160 | 6.748** | 0.159 |
| Identification | | | | | | |
| *Ineffect* | - | - | - | - | -0.036 | 0.019 |
| *Law_index* | -0.006** | 0.001 | - | - | - | - |
| *Coverage index* | - | - | -0.028** | 0.003 | - | - |
| *Restrictions index* | - | - | 0.017** | 0.003 | - | - |
| *High_coverage* | - | - | - | - | -0.142** | 0.032 |
| *High_restrictions* | - | - | - | - | 0.027 | 0.024 |
| Borrower/Mortgage | | | | | | |
| *FICO* | -0.012** | 0.000 | -0.012 | 0.000 | -0.012 | 0.000 |
| $l\hat{t}v$ | 0.040** | 0.002 | 0.041** | 0.002 | 0.041** | 0.002 |
| *Small_loan* | 0.258** | 0.011 | 0.252** | 0.011 | 0.255** | 0.011 |
| *Large_loan* | -0.058** | 0.010 | -0.062** | 0.010 | -0.062** | 0.010 |
| *PMI* | 0.202** | 0.009 | 0.202** | 0.009 | 0.203** | 0.009 |
| *Lowdoc* | 0.098** | 0.008 | 0.098** | 0.008 | 0.098** | 0.008 |
| *Nodoc* | -0.672** | 0.027 | -0.671** | 0.027 | -0.671** | 0.027 |
| *Refi_cashout* | -0.286** | 0.009 | -0.283** | 0.009 | -0.284** | 0.009 |
| *Refi-nocash* | -0.436** | 0.014 | -0.434** | 0.014 | -0.434** | 0.014 |
| *Other_purpose* | 1.440** | 0.203 | 1.439** | 0.204 | 1.441** | 0.203 |
| *Investor* | 0.037** | 0.013 | 0.041** | 0.013 | 0.040** | 0.013 |
| Adjusted $R^2$ | 0.296 | | 0.295 | | 0.296 | |
| Number of loans | 117,119 | | 117,119 | | 117,119 | |

*Notes*: See Table 6 for variable definitions. Second-stage results of 2SLS results reported using LoanPerformance data for loans originated in 2004. The dependent variable is spread between interest rate and T-bill rate of comparable maturity regardless of product type. *FICO* and *ltv* are expressed in 10s; $l\hat{t}v$ is the predicted value of LTV from first stage. ** indicates significance at the 1% level and * indicates significance at the 5% level.

**Table A3**
**First-stage estimation of loan-to-value ratio (*ltv*).**

| | FRM sample | | ARM sample | |
|---|---|---|---|---|
| **Variable** | **Coeff.** | **Std. Err.** | **Coeff.** | **Std. Err.** |
| *Intercept* | 72.543** | 3.389 | 48.954** | 2.353 |
| Borrower/Market | | | | |
| *FICO* | 0.012** | 0.001 | 0.053** | 0.001 |
| *frm_30* | -0.463 | 0.248 | -0.069 | 0.184 |
| *Income* | 0.110** | 0.014 | 0.107** | 0.012 |
| *Incomesq* | -0.001** | 0.000 | -0.001** | 0.000 |
| *Age* | 0.295 | 0.167 | 0.302** | 0.114 |
| *Agesq* | -0.009** | 0.002 | -0.007** | 0.002 |
| Time | | | | |
| *y98* | -1.280 | 0.892 | -4.146** | 1.393 |
| *y99* | 0.190 | 0.738 | -2.038** | 0.598 |
| *y00* | 0.120 | 0.667 | -2.698** | 0.478 |
| *y01* | 2.600** | 0.451 | -1.264** | 0.318 |
| *y02* | 2.816** | 0.324 | -1.779** | 0.196 |
| *y0-3* | 0.896** | 0.254 | -1.353** | 0.145 |
| *y04* | 0.362 | 0.277 | -0.523** | 0.141 |
| Location | | | | |
| *ar1* | 2.735** | 0.821 | 1.913** | 0.739 |
| *ar2* | 3.332** | 0.632 | 3.043** | 0.611 |
| *dc* | -5.102** | 0.632 | -3.621** | 0.608 |
| *ga1* | 3.522** | 0.696 | 2.248** | 0.678 |
| *ga2* | 2.803** | 0.820 | 3.051** | 0.834 |
| *il1* | 7.927** | 2.403 | 0.831 | 1.192 |
| *il2* | -0.106 | 1.394 | 3.237** | 1.007 |
| *il3* | 3.903** | 0.828 | 1.945** | 0.672 |
| *il4* | 4.847 | 3.072 | 4.507* | 1.894 |
| *il5* | 0.683 | 0.626 | 0.968 | 0.599 |
| *in* | 3.784** | 0.740 | 1.680** | 0.651 |
| *ky1* | 3.654** | 0.917 | 1.818* | 0.827 |
| *ky2* | 4.207** | 1.071 | 2.544** | 0.871 |
| *ky3* | 4.963* | 2.214 | 2.743 | 1.780 |
| *ma1* | -6.947** | 0.601 | -7.893** | 0.587 |
| *ma2* | -3.462** | 0.659 | -3.111** | 0.610 |
| *md1* | 7.539** | 1.542 | 1.141 | 1.517 |
| *md2* | -1.058 | 0.989 | 0.337 | 0.890 |
| *oh1* | 3.165* | 1.410 | 3.296* | 1.421 |
| *oh2* | 2.074 | 3.071 | 1.144 | 2.684 |
| *oh3* | 5.599** | 1.295 | 1.688 | 1.113 |
| *oh4* | 2.926* | 1.405 | 1.342 | 1.239 |
| *pa* | -1.370* | 0.590 | -1.075 | 0.591 |
| *ut* | -2.819* | 1.283 | -2.011* | 0.966 |
| *wi1* | -0.649 | 0.867 | -0.533 | 0.711 |
| *wi2* | 1.860 | 3.940 | 2.697 | 1.693 |
| *wi3* | 1.383 | 1.625 | 0.674 | 1.028 |
| *wi4* | 0.441 | 1.530 | -0.773 | 0.941 |

| | | | | |
|---|---|---|---|---|
| *wi5* | -4.190** | 0.631 | -2.207** | 0.602 |
| Number of Loans | 51,197 | | 57,747 | |
| Adjusted $R^2$ | 0.079 | | 0.172 | |

*Notes*: *nc* is the excluded metropolitan area; ** indicates significance at 1% level, * indicates significance at 5% level. LoanPerformance data.

Table A3 provides the first-stage results used to calculate the predicted *ltv* for Models 1, 2 and 3 for both the adjustable-and fixed-rate loans as reported in Tables 8 and 9. The results substantially meet prior expectations. For example, the proxies for wealth indicate that older borrowers and borrowers with more income are able to support smaller down payments. However, the relationships are both nonlinear. Also consistent with subprime underwriting requirements, borrowers with worse credit history tend to provide larger down payments to compensate for the increased credit risk associated with lower credit scores. Consistent with Ambrose, LaCour-Little and Sanders (2004) the market interest rate is negatively associated with down payments for fixed-rate loans. The time dummy variables control for changing macroeconomic conditions that could impact subprime interest rates and MSA dummies also proxy for other missing variables such as the affordability of housing. Therefore, we have no strong priors on the sign or magnitude of these variables.