

Geographic Consistency of Subprime Loan Features and Foreclosures

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Abstract

The recent rise in subprime foreclosures has prompted restrictions at the federal, state, and municipal levels against a range of loan features loosely termed “predatory.” The effectiveness of federal regulation depends on the consistency of those features’ impacts on foreclosures in markets nationwide. Using data on subprime refinance and purchase mortgages in ten metropolitan areas, I examine the impact of long prepayment penalty periods, balloon payments, and reduced documentation on the probability of foreclosure. Results indicate that reduced documentation is consistently associated with higher probabilities of foreclosure, while the impacts of the other features are more sporadic.

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1. Introduction

The recent dramatic increase in subprime foreclosures is frequently attributed in large part to “predatory” lending practices, spurring restrictions at all levels of government. In July 2008, the Federal Reserve Board announced several new restrictions on “higher-priced” mortgages designed to “protect consumers from unfair or deceptive acts and practices in mortgage lending, while keeping credit available to qualified borrowers and supporting sustainable homeownership.”¹ This followed several years of states and municipalities enacting regulations intended to reduce subprime foreclosures, as well as calls for similar regulation at the federal level.

In broadest terms, regulators intending to reduce foreclosure rates for future originations have two policy options, either allowing markets’ self-correcting mechanisms to induce lenders and borrowers to tighten lending standards without further regulation, or enacting additional regulations to reduce or eliminate loan features and lending practices that are believed to be strongly associated with higher probabilities of foreclosure.² If the latter course is chosen, a further decision is required, namely at which level of government – federal, state, municipal, or some combination thereof – additional regulations will be most appropriate and effective.

The primary challenge for regulation at any level that is aimed at reducing foreclosures is defining new restrictions and requirements to prevent the origination of loans likely to end in

¹ See Federal Reserve Board (2008). Among other things, the new restrictions: (1) “prohibit a lender from making a loan without regard to borrowers’ ability to repay the loan from income and assets other than the home’s value”, (2) “require creditors to verify the income and assets they rely upon to determine repayment ability”, and (3) ban any prepayment penalty if the payment can change in the initial four years[.] for other higher-priced loans, a prepayment penalty period cannot last for more than two years.” The new restrictions apply to “higher-priced” loans, to be defined as having an annual percentage rate 1.5 percentage points higher than the average prime offer rate published by Freddie Mac.

² Reducing foreclosures is not the only possible rationale for further regulation of subprime originations. Another possible basis for regulation is reducing equity stripping, the loss of equity that can occur if borrowers are trapped in high cost loans or forced into expensive refinancings, even if they do not experience foreclosure. Equity stripping can cause borrowers great financial harm, but reliable data on it is, to my knowledge, unavailable. The effects of potential regulation on the safety and soundness of the banking or mortgage lending industries are also beyond the scope of this paper.

foreclosure without unduly restricting beneficial credit to subprime borrowers. Regulators must strive to find an acceptable balance of reducing the number of “bad” loans without reducing the number of “good” loans. Critical to that effort is an understanding of how suspected loan features relate to the probability of foreclosure.

Federal-level regulation faces an additional challenge, specifically that the combination of restrictions and requirements necessary for an acceptable balance may vary from one market to the next. Real estate markets, by definition, are geographically segmented, and mortgage lending practices may develop differently in different markets. Differences in the prevalence of broker versus bank originators, standards set by different locally dominant lenders, the industry mix (affecting workers’ income levels and stabilities), and prior state and local lending laws can all influence how and how often various loan features are used from one market to the next. This challenge must be set against benefits peculiar to federal-level regulation, including its potential applicability to all lenders, including brokers and national banks, and the setting of a single standard for multi-state lending institutions. Still, an effective federal-level regulation must meet a criterion that is not inherent to regulation at a lower level, or to no regulation.

The premise of this paper is that federal, as opposed to state or municipal, regulation is more appropriate to the extent that the impacts of the lending practices at issue are fairly consistent in mortgage markets across the country. If a given practice is as likely to be benign as to be harmful depending on the locale, then regulation at lower levels may ameliorate the practice’s harmful effects where they exist without imposing distortions in markets where the potential benefit from regulation is limited.

This paper uses data for ten diverse metropolitan statistical areas (MSAs) to examine the consistency of links between the probabilities of foreclosure for subprime home purchase and

refinance mortgages and three loan features: long prepayment penalty periods, balloon payments, and origination based on reduced documentation. The findings indicate that reduced documentation is consistently associated with greater probabilities of foreclosure, with few significant differences in the association across MSAs. Long prepayment penalty periods and balloon payments have more sporadic relationships with the probability of foreclosure, both in the number of MSAs for which the relationships are significant and the frequency of differences in the relationship across MSAs. In addition, results for these two loan features vary more by loan category (refinances versus purchases, adjustable-rate versus fixed-rate) than do the results for reduced documentation.

This is the first paper to compare the relationship between these three loan features and the probability of foreclosure across different MSAs, and examines it across all four loan categories. Doing so makes several contributions to the literature on housing markets, subprime mortgages, and foreclosure. First, the finding of inconsistent relationships for long prepayment penalty periods and balloon payments indicates that previous subprime foreclosure studies using pooled nationwide data mask substantial geographic heterogeneity. This suggests a degree of market segmentation in terms of lending practices that could profitably be incorporated into models of housing markets in general and contagion effects of a housing bubble in particular. Second, the differences across loan categories indicate less consistency for refinances than for purchases. This serves as a reminder of the multiple purposes for which a mortgage holder might refinance (take advantage of lower interest rates, take advantage of an improvement in personal credit rating, inability to afford current mortgage payments, withdraw cash from existing equity), and of the need for greater efforts at distinguishing different types of borrowers based on existing data on both borrower and loan characteristics. Greater understanding of

borrowers' incentives will allow more precise modeling of the predictors of borrower distress. The findings also point to future work investigating the sources of the identified heterogeneity.

Third, the results inform questions regarding the most effective levels for potential subprime lending regulations. Encouraging or requiring full documentation for origination may be reasonable at the federal level, with relatively little risk of generating localized market distortions. It would be more difficult to design federal-level regulation for the other examined loan features with enough subtlety and flexibility to successfully navigate the geographic differences the results reveal. As such, further regulation of long prepayment penalty periods and balloon payments may more appropriately be a question for lower levels of government. At whatever level, policymakers should consider loan features' differing impacts by loan category to minimize potential unintended consequences such as reductions in credit availability that may accompany any regulatory benefits.

The remainder of this paper is structured as follows. Section 2 discusses previous literature on predatory lending and subprime mortgages. Section 3 describes this paper's data sources and the econometric methodology employed. Section 4 presents results from the empirical analysis, and the policy implications derived from the results are discussed in Section 5. Section 6 concludes.

2. Previous Literature

Subprime lending remains a relatively new market, and the literature examining it, with regard either foreclosures or regulation, is accordingly recent. A straightforward argument justifying stricter regulation of subprime lending was developed in a pair of papers by Immergluck and Smith (2004, 2005). Using Chicago-area data, they find statistically significant

reductions in neighboring home values following a foreclosure, generating negative externalities in the form of lost wealth and diminished tax bases. Combining this with their evidence that foreclosures are far more prevalent among subprime mortgages than prime mortgages yields the argument that restrictions on subprime lending can increase social welfare by reducing these externalities, even if the restrictions have unintended negative consequences such as reducing the availability of beneficial credit to subprime borrowers.

While many proposed and enacted regulations of subprime lending focus on specific loan features often termed predatory, there has been relatively little empirical analysis on how such loan features affect the probability of foreclosure. One such analysis by Quercia *et al.* (2005) finds that long prepayment penalty periods and balloon payments are both associated with statistically significant increases in the probability of foreclosure in a nationwide pooled sample of subprime refinance fixed-rate and adjustable-rate mortgages (FRMs and ARMs, respectively) originated in 1999. Danis and Pennington-Cross (2008) find that for originations spanning 1996-2003, prepayment penalties and reduced documentation are associated with greater probabilities of both delinquency and default, with default defined as the lender either initiating a foreclosure or becoming the owner of the property. Rose (2008), using a dataset of Chicago originations from 1999-2003, finds that the effects on the probability of foreclosure of long prepayment penalty periods, balloon payments, and reduced documentation vary greatly depending on loan category and whether a given loan feature is present alone or in combination with another feature. Rose (2008) also finds that for fixed-rate refinance loans (but not other loan categories), long prepayment penalty periods are associated with a reduction in the probability of foreclosure, contrary to results from the geographically pooled samples described above. This finding, robust

to several specifications, raises the possibility that the effect of a given loan feature on the probability of foreclosure can vary across markets.

Much of the literature concerning regulation of subprime lending examines the effects of particular anti-predatory lending laws on the quantity of subprime loan originations, applications, and rejections, and on the prevalence of loan features targeted by the laws. Harvey and Nigro (2003) find that a Chicago law imposing sanctions on banks making high-cost loans resulted in little reduction in subprime originations, with non-bank lenders increasing their originations as banks moved away from subprime lending. Quercia *et al.* (2004) find that a North Carolina law prohibiting prepayment penalties and balloon payments on certain types of loans did indeed curtail the frequency of those loan features, while Harvey and Nigro (2004) find that overall subprime lending contracted following the law's passage.

Studies examining state anti-predatory lending laws more broadly include Li and Ernst (2006), who find such laws associated with reductions in the prevalence of long prepayment penalties and balloon payments, no reduction in overall subprime volume, and similar or lower subprime interest rates. Ho and Pennington-Cross (2006) create an index of state laws and find that while the typical law has little impact on subprime applications and originations and reduces rejections, considering laws' strengths on particular margins yields more complex results; laws with more extensive restrictions or prohibitions reduce the probabilities of application and origination, while laws that cover a broader range of loans increase those probabilities. Expanding on this approach, Bostic *et al.* (2008) construct indices of state anti-predatory lending laws based on the laws' restrictions, their coverage, their enforcement mechanisms, and combinations of the three. They find that each component index has distinct patterns of effects

on subprime originations, applications, and rejections, emphasizing the importance of regulatory design in determining market outcomes.

Mayer *et al.* (2008) and Elliehausen *et al.* (2008) examine potential unintended consequences of restricting prepayment penalties. Mayer *et al.* (2008) find that loans with prepayment penalties have lower default rates and lower interest rates, consistent with the subprime market pricing mortgage credit according to risk. Elliehausen *et al.* (2008) use a simultaneous equations approach controlling for endogeneity among loan interest rates, loan-to-value (LTV) ratios and prepayment penalties. They also find that prepayment penalties are associated with lower interest rates, and that state laws restricting prepayment penalties are associated with higher interest rates. Both papers suggest that restrictions of prepayment penalties interfere with the subprime market's pricing of risk and potentially reduce credit availability for higher risk borrowers.

The present paper is in the vein of Quercia *et al.* (2005), Danis and Pennington-Cross (2008), and Rose (2008), building on their analyses in useful ways. First, this paper includes more recent originations, making the results more directly relevant to the current subprime lending upheaval. While the dataset in Rose (2008) includes fewer than 32,000 loans from only one metropolitan area, this paper's dataset, described in the next section, encompasses over 200,000 loans from ten MSAs around the country. Quercia *et al.* (2005) and Danis and Pennington-Cross (2008) do use loans from a nationwide sample to examine the effects of certain loan features on the probability of foreclosure or default, but do not attempt to evaluate the geographic consistency of those effects. This paper is unique in exploring the question of geographic consistency. The present paper does not explicitly address questions regarding the design and effects of existing subprime lending regulations as do several papers mentioned

above, however it is relevant to that conversation insofar as it informs discussion of at what levels of government those questions are most appropriate.

3. Data and Methodology

The dataset for this paper was purchased from First American CoreLogic LoanPerformance (henceforth LoanPerformance), and consists of monthly loan-level data on subprime refinance and home purchase mortgages from January 2002 through October 2008 that have been packaged into private-label mortgage-backed securities. The data covers ten MSAs, listed in Table 1. The selection of these MSAs was based on a report from the Joint Economic Committee (2007), which provides subprime delinquency rates for every MSA as of February 2007. To ensure that the selected MSAs represent a diverse range of subprime market difficulties, I selected one MSA with a delinquency rate equaling the fifth percentile rate, one MSA with the fifteenth percentile rate, and so on to the ninety-fifth percentile rate. Where more than one MSA had a given percentile rate, an MSA was randomly selected.³ For each selected MSA, all subprime loans originated during 2002-2006 in the LoanPerformance data were initially included in the sample. There are few or no ARMs featuring a balloon payment for most selected MSAs until 2005, so all balloon ARMs are dropped from the sample to avoid distortions. Population figures and the numbers of sample loans and monthly observations are provided in Table 1. The figures indicate that on a per person basis, Fresno has a disproportionately large representation, commensurate with the extent of Fresno's subprime mortgage market. The representation of the other MSAs in the sample is roughly in line with their relative populations.

³ The random selection was constrained by two rules. First, only one MSA from any given state was selected to ensure geographic diversity. Second, to avoid distortions caused by the aftermath of Hurricane Katrina in 2005, Louisiana and Mississippi MSAs were excluded.

The LoanPerformance data contains loan-level data including type (FRM or ARM), purpose (refinance or purchase), origination date, date of a first foreclosure start or prepayment (if any), the loan interest rate, LTV, and borrower FICO score at origination, whether the borrower withdrew cash out (for refinances), whether the loan was based on low- or no-documentation, the length of the prepayment penalty period (if any), and whether the loan required a balloon payment. Borrower demographic information is unavailable in LoanPerformance, so 2000 Census data at the ZIP code level are used as proxies. Specifically, the percentage of residents who are black, the percentage of residents who are Hispanic, and per capita income are included.⁴ Also included are changes since origination in monthly unemployment rates by MSA from the Bureau of Labor Statistics, changes since origination to Freddie Mac's monthly conventional mortgage housing price index (HPI) by ZIP code, changes since origination in the national monthly average effective interest rates from the Federal Housing Finance Board, and an index of state anti-predatory lending laws constructed by Bostic *et al.* (2008).^{5,6} Definitions of all variables are provided in Table 2. Variable means by MSA and loan category are provided in Tables 3a-3d.

Much of the empirical analysis employs a multinomial model, which provides estimates of the impact explanatory variables have on the probability of one outcome relative to other outcomes. The data was structured in event history format, with each observation representing

⁴ Additional Census variables such as median age, average household size, percentage of residents who are married, and the percentage of residents with at least a high school diploma or its equivalent, were also included in various combinations in unrepeated regressions. Results were not substantively different from those presented in Section 4.

⁵ Effective interest rates incorporate the amortization of initial fees and charges at origination.

⁶ Bostic *et al.* (2008) examined all predatory lending laws in effect during 2004-2005 for every state and assigned a separate score for each state based on the laws' coverage (the types of loans covered and any annual percentage rate or points and fee thresholds that trigger the laws), restrictions (restricted or required lending practices and limits on borrower access to courts), and enforcement mechanisms (assignee liability, possible remedies). They then created two cumulative indices, one by multiplying the three component scores, another by summing them. Section 4 presents results using the multiplicative index and discusses results using the additive index or the component scores.

one month in which a loan remains active, in order to include time-varying covariates. In each month, the three possible outcomes for a loan are a first foreclosure start, prepayment, or remaining active. A loan drops out of the sample after a first foreclosure start or prepayment. The model directly controls for the competing risks of foreclosure and prepayment by requiring that the probabilities of the three possible outcomes sum to one. To control for unobserved heterogeneity and possible dependence among observations for the same loan, all econometric estimation was performed using robust standard errors allowing for clustering by loan.⁷

The multinomial logit model assumes that the odds ratio between any two outcomes is independent of any alternative outcomes, and that there is no unobserved heterogeneity across observations. The proportional hazard model, a possible alternative, allows for the estimation of the effects of explanatory variables on survival times without requiring the assumptions about the nature or shape of the underlying hazard function. This model does assume that given two observations with different values for the independent variables, the ratio of the observations' hazard functions does not depend on time. As a robustness check, the multinomial logit analyses described in Section 4 were also performed using a proportional hazard model. Results were similar across the two models, and as the literature suggests, the multinomial logit results appear to be more conservative.⁸

⁷ Ideally, originator fixed effects or a control variable for the type of originator (bank, broker, etc.) would be included in the analysis. While the LoanPerformance data does include fields for the type and identity of originators, in the overwhelming majority of cases these fields are not populated. Other potentially useful information about the supply side of the market, such as the concentration of lenders by ZIP code, also is not readily available.

⁸ Clapp *et al.* (2006) use mortgage termination data to compare the results from four models: a standard multinomial logit with event history data, a proportional hazard model accounting for competing risks, and versions of both of these models with a discrete mass-point approach to better incorporate unobserved heterogeneity. The discrete mass-point approach incorporates unobserved heterogeneity by modeling individual borrowers as coming from a finite number of distinct groups with unobserved characteristics. The proportional hazard model and multinomial logit model using this approach were developed by Deng *et al.* (2000) and Clapp *et al.* (2006), respectively. Clapp *et al.* (2006) generate similar results across the four models, but the standard multinomial logit model produced estimates closer to zero and with less statistical significance.

4. Empirical Analysis

The evidence presented in this section supports two conclusions regarding the geographic consistency of the effects of long prepayment penalty periods, balloon payments, and reduced documentation on subprime foreclosures. First, reduced documentation is widely associated with a greater probability of foreclosure across MSAs for all four loan categories. Second, compared to reduced documentation, both long prepayment penalty periods and balloon payments significantly impact the probability of foreclosure less frequently, and they more often impact the probability of foreclosure in opposite directions across MSAs. As is discussed more in the following section, these conclusions suggest that at the federal level, documentation required at origination is a more appropriate subject for regulation than either long prepayment penalty periods or balloon payments.

4.1 Multinomial Logit Analysis with all 10 MSAs pooled

Before examining geographic consistency across MSAs, I first briefly examine loans from all ten MSAs pooled. Table 4 presents results of multinomial logit analysis of the impacts of the loan features of interest on the probability of foreclosure for each loan category with all ten MSAs pooled.⁹ *Prepay36* is associated with a 42 percent increase in the relative probability of foreclosure for purchase FRMs and a 9 percent increase for refinance FRMs, but is associated with a 6 decrease for purchase ARMs.¹⁰ The signs and significances of the estimates for *Balloon*

⁹ Because the focus of this paper is on the impact of the examined loan features on the probability of foreclosure, for these and subsequent specifications the results concerning the probability of prepayment are presented in the Appendix.

¹⁰ For a given coefficient estimate β , the percentage change in the probability of a first foreclosure start, relative to the probability of a loan remaining active, associated with a one-unit change in a given explanatory variable is calculated as $e^\beta - 1$. For example, the 0.348 shown for *Prepay36* in the Purchase FRM column of Table 4 implies a relative change in the probability of a first foreclosure start of $e^{(0.348)} - 1 = 0.416$, a 41.6 percent increase.

and *LowNoDoc* are consistent across categories, although the magnitudes do vary substantially.¹¹ Balloon loans are associated with a 21-56 percent decrease in the relative probability of foreclosure, and reduced documentation is associated with a 42-72 percent increase. Balloon loans in the sample generally offer lower monthly payments and have balloon payments that are not due for years after the end of the sample period, explaining the lesser probability of foreclosure shown in Table 4.

The loan characteristic controls mostly conform to expectations. Higher FICO scores are associated with lesser probabilities of foreclosure. Loan age is initially positively associated with the probability of foreclosure, but after some months that relationship turns negative. A loan's initial interest rate is positively related to the probability of foreclosure for refinance and purchase ARMs, but negatively related for FRMs. This unexpected result is partially explained by the results concerning the probability of prepayment (see Appendix Table A1), which indicate that high initial interest rates are also associated with a much greater probability of prepayment for FRMs than ARMs. Higher loan-to-value ratios are associated with greater probabilities of foreclosure, while withdrawing cash during a refinancing is not significantly related.

Among the macroeconomic controls, only ΔHPI is consistently related to the probability of foreclosure across all loan categories. Increases in unemployment rates and effective interest rates are positively associated with probabilities of foreclosure, but only for ARMs. Among the demographic controls, *%Black* and *Income* are positively and negatively, respectively, related to the probability of foreclosure in most loan categories. *%Hispanic* is negatively related for ARMs and not significant for FRMs.

Table 5 presents results for each origination year separately, and for two multi-year splits by origination year. The sample is restricted to twenty months since origination so loans from

¹¹ Recall that the dearth of balloon ARMs prior to 2005 required that they be excluded from ARM specifications.

each vintage have an equal time under observation. For brevity, the coefficient estimates and standard errors of only the loan features of interest are shown. Two findings are worth noting. First, the patterns across categories described above (*LowNoDoc* is consistently significant and its effect has greater magnitude for ARMs than FRMs, the effect of *Balloon* has greater magnitude for purchase FRMs than refinance FRMs, *Prepay36* is the least consistent of the three) generally hold over time. Second, the significances and magnitudes of the estimates for these three variables tend to intensify in the later years for the sample. This should perhaps not be surprising given the rise in subprime foreclosure rates that occurred over those years, but it does highlight a complication regarding the design of effective regulation concerning these loan features. To the extent the effects of these loan features on the probabilities of foreclosure are temporally inconsistent, the relative benefits and costs of potential restrictions of their use will similarly be temporally inconsistent, making an evaluation of the restrictions' net effects that much more difficult.

Unfortunately, performing sample splits by origination year for each MSA proved unworkable as in many MSAs the small number of foreclosures of loans of a given category, with given loan features, or from a given origination year, too frequently hindered the convergence of the regression estimates. As a result, I cannot provide evidence about whether temporal considerations affect different MSAs differently, and instead proceed to examine geographic consistency based on the entire sample period.

4.2 Non-parametric Tests for Differences across MSAs

T-test results indicate significant (usually at the 0.1 percent level) differences in means for each variable in Tables 3a-3d across the overwhelming majority of the 45 possible MSA

pairs. These results, not shown for brevity, raise the possibility that there is sufficient variation across subprime mortgage markets to advise against federal-level regulation. Further evidence of variation specifically regarding foreclosures is presented in Table 6. Each number represents the χ^2 statistic from a non-parametric Wilcoxon test of the equality of the survival curves for loans originated in two different MSAs.¹² The results show widespread significant differences, with greater prevalence among ARMs (refinance and purchase) than FRMs. There is also a loose pattern of the MSAs with fewer sample loans (e.g., Great Falls and Parkersburg) more often showing non-significant differences with other MSAs, allowing speculation that larger sample sizes for these MSAs would result in even more significant differences among loan survival curves. Speculation aside, there is ample evidence to warrant multivariate analysis of cross-MSA differences. Differences in variable means across loan categories (not shown) and varying patterns of significance across loan categories in Table 6 support examining each loan category separately, following Rose (2008).

4.3 Multinomial Logit Analysis by MSA

Tables 7a-7d present the results of multinomial logit analysis of the impacts of the loan features of interest on the probability of foreclosure for each MSA and loan category. In all four tables, coefficient estimates for *LowNoDoc* are usually statistically significant and positive, and are never significant and negative, indicating that reduced documentation is consistently associated with a greater probability of foreclosure across MSAs and loan categories. In contrast, *Prepay36* and *Balloon* are statistically significant much less often, and *Prepay36* has instances of significant positive and significant negative relationships with the probability of foreclosure.

¹² See Breslow (1970) and Gehan (1965).

The loan characteristic control variables generally retain the signs and significances from Table 4, although *LTV* is frequently not significant. The macroeconomic and demographic variables also are frequently not significant, and feature significant positive and significant negative relationships with the probability of foreclosure in some tables. A plausible explanation is that within a given MSA, there is only limited variation in the macroeconomic and demographic variables, particularly in those areas with higher incidences of subprime lending.

Differences in coefficient estimates for *Prepay36*, *Balloon*, and *LowNoDoc* across MSAs are summarized in Table 8. The listed pairs of MSAs are those for which the coefficient estimates of a given loan feature variable have opposite signs and are different at the ten percent significance level or better, based on seemingly unrelated regression. These are the cases in which regulation at the federal level is most likely to cause unintended adverse consequences in some markets by eliminating contractual options that some borrowers and lenders may find beneficial without the accompanying benefit of reducing foreclosures. With ten MSAs, there are 45 possible MSA pairs.

The most striking feature from Table 8 is the complete lack of significant opposite-sign differences for purchase FRMs, and very few for purchase ARMs. It should also be noted that the only opposite-sign differences, significant or not, associated with *LowNoDoc* arise from a single coefficient estimate from the Refinance ARM regression for the Parkersburg MSA. Although most estimates for *Prepay36*, *Balloon*, and *LowNoDoc* are fairly robust to alternative specifications (discussed at the end of this section), in many cases the Parkersburg *LowNoDoc* estimate is closer to zero or positive, such that Table 8 would indicate no significant opposite-sign differences associated with *LowNoDoc*.

4.4 Multinomial Logit Analysis with MSA-Loan Feature Interactions

Table 9 provides results from multinomial regressions that explicitly model for the interactive effect of a loan possessing a given loan feature in a given MSA. For each loan category, each specification includes the loan feature and control variables used in Table 7a-7d, MSA indicator variables to control for unobserved heterogeneity (Fresno's is the omitted indicator), and interaction terms for each MSA indicator and each of *Prepay36*, *Balloon*, and *LowNoDoc*. Coefficient estimates for the control variables are similar to those in Table 4, and are omitted from Table 9 for brevity.

Turning first to the non-interacted variables, *Prepay36* is associated with an 18 percent increase in the relative probability of foreclosure for purchase FRMs, but with a 13 percent decrease in the relative probability of foreclosure for purchase ARMs. *Prepay36* is not statistically significant for refinances. *Balloon* is associated with 16 and 52 percent decreases in the relative probability of foreclosure for refinance and purchase FRMs, respectively. *LowNoDoc* is significant all four loan categories, and is associated with a 34-80 percent increase in the relative probability of foreclosure.

As for the MSA-loan feature interaction terms, relatively few are statistically significant and there is no obvious pattern of MSA-loan feature significances across loan categories. There are, however, many MSA pairs with statistically significant differences in the combined estimated impacts of a loan feature variable and the MSA-loan feature interaction variable, as shown in Table 10. Similarly to Table 8, in Table 10 the listed pairs of MSAs are those for which the combined estimated impacts of the loan feature variable and the MSA-loan feature

interaction term are significantly different at the ten percent level or better and have opposite signs.¹³

There are clear similarities between Tables 8 and 10, but the results are not identical. Table 10 indicates no MSA pairs with significant opposite-sign coefficient estimate for *LowNoDoc* other than those involving the Parkersburg estimate for refinance ARMs (which as before is not very robust to alternate specifications). *Balloon* shows fewer opposite-sign differences and almost exclusively they involve the El Paso estimate for refinance FRMs. *Prepay36* shows the most change from Table 8, with opposite-sign differences indicated for every loan category and a much greater total number of such differences. Consistent with Table 8, in Table 10 there are far more opposite-sign differences for refinance loans than purchases.

4.5 Multinomial Logit Analysis with Anti-Predatory Law Index

In the context of evaluating the propriety of federal-level regulation of the examined loan features, perhaps the most relevant source of unobserved heterogeneity in the specifications from Table 9 is existing state anti-predatory lending laws. Table 11 presents results of regressions incorporating the multiplicative index of state anti-predatory lending laws in effect during 2004-2005 constructed by Bostic *et al.* (2008). (See footnote 6 for a description of the index's construction.) For each loan category, the first specification is identical to those in Table 4, only Panel A includes MSA indicator variables while Panel B excludes them. The second specification adds *LawIndex* to evaluate whether the state laws have a general effect on the probability of foreclosure, and the third specification further adds interactions between *LawIndex* and the loan feature variables to determine whether the strength of the state laws has a

¹³ Note that, as an example, the sum of the coefficient estimates of *Prepay36* and *Saginaw*Prepay36* could have the opposite sign as the sum of the coefficient estimates of *Prepay36* and *Rochester*Prepay36* even if the coefficient estimates of *Saginaw*Prepay36* and *Rochester*Prepay36* have the same sign.

relationship with the effect of each loan feature on the probability of foreclosure. Coefficient estimates for the control variables are again similar to those in Table 4, and are again omitted for brevity. These regressions include only loans originated in 2004-2005, the years for which the laws compiled in the index variable are known to have been in effect.

Results in Panel A indicate that *LawIndex* by itself is not significant under any specification. Coefficient estimates for *Prepay36*, *Balloon*, and *LowNoDoc* are essentially unchanged with the introduction of *LawIndex*. There are some movements in magnitude of the loan feature estimates when the *LawIndex* interactions are included, but the signs and significances show few substantial changes. Coefficient estimates of the *LawIndex* interactions are only occasionally significant, indicating that only in isolated circumstances do strong anti-predatory lending laws appear to mitigate the increase in the probability of foreclosure associated with long prepayment penalty periods (for purchase FRMs) and reduced documentation (for refinance FRMs). Comparing the coefficient estimates of those interaction terms and of *Prepay36* and *LowNoDoc* for those loan categories, one can see that even at the highest values for *LawIndex* (maximum value = 66.78), the reduction in the probability of foreclosure associated with the interaction term is not of sufficient magnitude to eliminate or reverse the increase in that probability represented by the coefficient for *Prepay36* or *LowNoDoc*.

Panel B excludes MSA indicators in case correlations among *LawIndex* and MSA indicators skew the results from Panel A. Results indicate only minimal changes to the estimates for *Prepay36*, *Balloon*, *LowNoDoc*, and their interactions with *LawIndex*. This further suggests that existing state anti-predatory lending laws do not significantly alter the relationships between the loan features and the probabilities of foreclosure.

LawIndex itself, however, is positive and significant in most loan categories. That stronger state anti-predatory lending laws would be associated with greater probabilities of foreclosure is an unexpected result. Plausible explanations include (1) states that otherwise have greater probabilities of foreclosure may be more likely to enact stronger state anti-predatory lending laws, and (2) in Panel B *LawIndex* is capturing sources of unobserved heterogeneity that were captured by the MSA indicators in Panel A.

The results from Table 11 ought not to be taken as an indictment of existing state anti-predatory lending laws. Those laws were usually designed to affect the types of loans originated rather than the effects of particular loan features, and the specifications in Table 11 are not designed to evaluate their efficacy in those terms. It should also be noted that Appendix Table A5 indicates that strong state anti-predatory lending laws are often associated with lesser probabilities of prepayment, suggesting that the laws may reduce equity stripping associated with expensive refinancing (see footnote 2). This is speculative; as just noted, the specifications here are not intended to evaluate the laws per se.

4.6 Robustness Checks

As described in Section 1, in July 2008 the Federal Reserve Board approved a rule that bans prepayment penalty periods of any length for high-priced mortgage loans if the payment can change in the loans' first four years, and bans prepayment penalty periods longer than two years for other high-priced mortgage loans. While the main analyses of this paper define a long prepayment penalty period as being three years or longer to maintain consistency with previous literature, the analyses were run using a variable equaling one if a loan features a prepayment penalty period longer than two years, and run again using a variable indicating any prepayment

penalty at all. Results using the two-year definition are essentially identical to those presented in the tables. Results using the existence of any prepayment penalty period show statistical significance for that variable more frequently than are shown in the tables for *Prepay36*, but the larger result of widespread significant opposite-sign differences for *Prepay36* across MSA continues to hold.

Other modifications to the main analyses include using only loans identified as being for owner-occupied properties, and using only loans for single family residences, in both cases attempting to restrict the sample to mortgages on primary residences rather than secondary residences or investment properties. Results based on these restrictions are substantively similar to those based on the full sample.

As noted in section 3, the main analyses were repeated using the proportional hazard model in place of the multinomial logit model, with similar results. Specifically, the coefficient estimates for *LowNoDoc* change very little across models. *Prepay36* is statistically significant more often in the proportional hazard model, while *Balloon* is significant less often. Among control variables, estimates for *Age* and its square change in statistical significance and magnitude in many specifications, as to a lesser extent do the estimates for $\Delta Unemployment$ and ΔHPI . Estimates for other control variables are not substantively different across models.

A concern with the specifications in Table 9 is that having an MSA indicator variable and three MSA-loan feature interaction terms for each MSA introduces sufficient correlations among regressors to bias the results. To check against this, the analyses from Table 9 were repeated first including only MSA-*Prepay36* interactions, second including only MSA-*Balloon* interactions, and third including only MSA-*LowNoDoc* interactions. The estimates change very little, and a summary of cross-MSA significant differences based on the results of the three sets

of specifications is nearly identical to Table 10 in terms of the listed MSA pairs and significance levels.

In Table 11, the use of alternative state anti-predatory loan indices constructed by Bostic *et al.* (2008) (see footnote 6) does not greatly alter the results. Regardless of which of the five indices is used, *LawIndex* remains insignificant in all specifications, and estimates for the loan features show no substantive changes. The interaction terms between *LawIndex* and the loan feature variables show minor changes. The two interaction terms that appear significant in Table 11 generally remain so for all indices, and in addition the interaction term of *LawIndex* and *Prepay36* is positive and significant for refinance ARMs using three of the five indices.

5. Policy Implications

The evidence presented above leads to mixed conclusions regarding the potential for regulation at the federal level concerning the loan features of interest. Federal-level regulation of reduced documentation could be relatively straightforward and generally beneficial. The positive relationship between reduced documentation and the probability of foreclosure is widespread across the examined MSAs, suggesting that federal-level encouragement or requirement of more extensive documentation is unlikely to generate localized market distortions that outweigh the benefits of fewer foreclosures. The relationship is also consistent across loan categories, removing a potential complication in designing effective regulation.

Federal-level regulation of long prepayment penalty periods is more problematic. Relationships between this loan feature and the probability of foreclosure are statistically significant in relatively few instances, and the relationships do not consistently point in the same direction. These findings suggest that successful federal-level regulation would need to be

designed with subtlety and flexibility. An overly broad approach could easily eliminate from certain loan markets contractual options that are mutually useful for some borrowers and lenders, while not contributing toward reducing foreclosures. For this reason, regulation of this loan feature may more appropriately be an issue for lower levels of government.¹⁴

Caution is warranted in drawing conclusions too confidently with regard to balloon loans. The majority of such loans in the sample have balloon payments due fifteen years after origination, well after the end of the sample period. With the due dates for the balloon payments not included in the sample period, one should not be surprised to find no positive significant relationship between balloon loans and the probability of foreclosure in any MSA. Even so, the frequent negative relationship indicates a benefit from these balloon loans in their early years that would need to be weighed against any increase in foreclosures that occurs as the balloon payments draw near. Tables 8 and 10 also indicate multiple opposite-sign differences in the estimated impact of balloon loans for refinance FRMs. Together, these suggest that, as with long prepayment penalty periods, federal-level regulation that does not overly restrict beneficial options in some markets would need to be designed quite carefully.

A final implication of the above results is the importance of considering loan category in any proposed regulation. The greater numbers of cross-MSA differences in refinances than in purchases argue for more skepticism about regulations for refinances than for purchases at the federal level. The contrasting numbers may be a reflection that a refinance can be a sign of improved borrower circumstances (refinancing into a lower cost loan due to declining interest rates or an improved personal credit rating) or worse borrower circumstances (inability to afford the previous mortgage payments). Tailoring regulation to benefit one type of refinance borrower

¹⁴ It is worth reiterating that other rationales for regulating the loan features of interest, including equity stripping as discussed in footnote 2, are potentially valid and are worthy subjects for empirical research. They are nonetheless beyond the scope of this paper.

without simultaneously constraining the other may be a delicate task. More generally, different effects of a given loan feature in a given MSA across the four loan categories suggests that policymakers at any level of government should consider varied treatment by loan category when contemplating regulating subprime lending.

6. Conclusion

This paper investigates the geographic consistency of the relationships among long prepayment penalties, balloon payments, and reduced documentation and the probability of foreclosure on subprime mortgages, with the premise that regulation of those loan features at the federal, as opposed to state or municipal, level may be less effective if the relationships vary significantly from locale to locale. Evidence indicates that among the ten MSAs selected for study, long prepayment penalties and balloon payments have varied effects on the probability of foreclosure, while the effects of reduced documentation are more consistent. This is the first evidence illustrating substantial heterogeneity that is masked by examining the effects of the loan features on foreclosure using a pooled nationwide sample. It also emphasizes the necessity of considering each loan category independently, provides motivation for further investigation to distinguish borrower types, particularly with regard to refinances, and points to future work identifying the sources of the heterogeneity. The evidence supports the conclusion that while federal regulation concerning documentation may effectively reduce foreclosures without extensive unintended consequences, the federal level may not be the most suitable venue for regulation of long prepayment penalties and balloon payments.

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Table 1: Sample MSAs

Subprime delinquency (payments more than 60 days late) rates for the selected MSAs as of February 2007, are taken from the 2007 Joint Economic Committee report “Sheltering Neighborhoods from the Subprime Foreclosure Storm”. Population figures are taken from the U.S. Census Bureau’s annual estimates for July 1, 2006. As of 2004, the Saginaw-Bay City-Midland MSA was split into the Saginaw-Saginaw Township North MSA and the Bay City MSA. For 2004-2006 originations, the sample includes loans from both of these subsequent MSAs.

MSA	Subprime Delinquency		Population		Sample Loans		Sample Observations	
	Rate	Percentile	Number	Percent	Number	Percent	Number	Percent
Saginaw, MI	18.4%	95 th	309,785	6.3%	9,498	4.7%	242,654	5.5%
Rochester, MN	15.5%	85 th	181,082	3.7%	4,046	2.0%	97,154	2.2%
Athens, GA	14.1%	75 th	187,405	3.8%	7,934	3.9%	204,990	4.6%
Great Falls, MT	13.2%	65 th	81,775	1.7%	1,574	0.8%	40,671	0.9%
Milwaukee, WI	12.4%	55 th	1,544,398	31.2%	60,272	29.8%	1,187,520	26.8%
Poughkeepsie, NY-PA	11.5%	45 th	669,915	13.5%	28,576	14.1%	645,024	14.5%
Parkersburg, WV-OH	10.7%	35 th	160,656	3.2%	1,453	0.7%	38,795	0.9%
Fresno, CA	9.6%	25 th	899,348	18.2%	64,826	32.0%	1,327,130	29.9%
Fort Walton Beach, FL	8.6%	15 th	181,499	3.7%	8,119	4.0%	196,201	4.4%
El Paso, TX	7.1%	5 th	734,669	14.8%	16,092	8.0%	455,242	10.3%
Total			4,950,532		202,390		4,435,381	

Table 2: Variable definitions

Variable	Definition
<u>Loan Features:</u>	
<i>Prepay36</i>	Equals 1 if the loan has a prepayment penalty period 36 months or longer from origination, 0 otherwise
<i>Balloon</i>	Equals 1 if the loan has a balloon payment, 0 otherwise
<i>LowNoDoc</i>	Equals 1 if the loan is a low- or no-documentation loan, 0 otherwise
<u>Loan Characteristic Controls:</u>	
<i>FICO</i>	Borrower’s FICO score at origination
<i>InitialRate</i>	Interest rate on the loan at origination
<i>Age</i>	Age of the loan (months since origination)
<i>LTV</i>	Loan-to-value ratio at origination
<i>Cashout</i>	Equals 1 if the loan is a cashout refinancing, 0 otherwise
<u>Macroeconomic, Demographic, and Legal Controls:</u>	
<i>ΔUnemployment</i>	Change in monthly unemployment rate in the borrower’s MSA since origination
<i>ΔHPI</i>	Change in Freddie Mac’s monthly conventional mortgage housing price index in the borrower’s locale (defined by ZIP code) since origination
<i>ΔEffectiveRate</i>	Change in the Federal Housing Finance Board’s monthly estimate of the national average effective interest rate, the interest rate reflecting amortization of initial fees and charges since origination
<i>%Black</i>	Percent of population in the borrower’s locale (defined by ZIP code) that is black
<i>%Hispanic</i>	Percent of population in the borrower’s locale (defined by ZIP code) that is Hispanic
<i>Income</i>	Per capita income in the borrower’s locale (defined by ZIP code), in thousands
<i>LawIndex</i>	Index of state anti-predatory lending laws compiled by Bostic <i>et al.</i> (2008)

Table 3a: Variable means by MSA – purchase FRMs

	Saginaw	Rochester	Athens	Great Falls	Milwaukee	Poughkeepsie	Parkersburg	Fresno	FWB	El Paso	All 10 MSAs
Observations	36,486	21,212	51,860	9,347	161,031	137,123	7,828	282,720	47,730	175,088	930,425
Loans	1,359	807	1,933	363	7,616	5,461	262	12,815	1,763	5,911	38,290
% loans with a foreclosure start	10.3%	4.1%	6.0%	5.8%	5.8%	6.5%	6.9%	4.6%	6.1%	4.7%	5.5%
2002 origination	0.14	0.07	0.06	0.07	0.08	0.08	0.04	0.08	0.07	0.08	0.08
2003 origination	0.17	0.13	0.10	0.11	0.11	0.15	0.16	0.15	0.14	0.15	0.14
2004 origination	0.21	0.19	0.18	0.21	0.22	0.24	0.34	0.20	0.19	0.24	0.22
2005 origination	0.29	0.33	0.35	0.35	0.31	0.30	0.27	0.31	0.36	0.28	0.31
2006 origination	0.19	0.27	0.31	0.26	0.29	0.23	0.19	0.26	0.24	0.25	0.26
<i>Prepay36</i>	0.26	0.17	0.16	0.29	0.19	0.05	0.18	0.27	0.21	0.38	0.23
<i>Balloon</i>	0.22	0.26	0.24	0.14	0.27	0.18	0.13	0.29	0.15	0.14	0.23
<i>LowNoDoc</i>	0.35	0.38	0.41	0.40	0.36	0.55	0.28	0.57	0.51	0.52	0.49
<i>FICO</i>	685.45	702.63	691.17	706.76	681.98	687.02	690.08	692.01	709.66	673.03	686.97
<i>InitialRate</i>	8.80	8.10	8.64	8.00	9.13	8.30	7.84	8.66	7.69	8.33	8.56
<i>Age</i>	21.59	20.53	20.62	19.33	18.47	20.49	22.35	18.83	20.36	21.94	19.96
<i>LTV</i>	92.58	91.08	89.79	88.68	91.87	87.21	89.24	90.24	84.66	88.78	89.58
<i>ΔUnemployment</i>	0.05	0.21	0.24	-0.51	-0.12	0.04	-0.39	-0.73	0.16	-1.17	-0.44
<i>ΔHPI</i>	1.17	8.04	21.53	26.17	20.52	23.07	12.82	28.96	29.68	30.16	24.75
<i>ΔEffectiveRate</i>	0.19	0.22	0.24	0.20	0.19	0.22	0.32	0.19	0.23	0.23	0.21
<i>%Black</i>	9.15	2.37	16.17	1.11	22.86	9.32	0.94	5.21	8.18	3.08	9.24
<i>%Hispanic</i>	5.81	2.39	4.31	2.51	7.74	10.50	0.55	40.25	3.53	74.30	29.83
<i>Income</i>	19.83	24.32	18.19	17.26	20.58	22.20	18.28	16.37	23.06	15.31	18.55
<i>LawIndex</i>	47.94	11.56	33.84	1.00	1.00	25.29	46.88	66.78	8.21	13.65	31.27

Table 3b: Variable means by MSA – refinance FRMs

	Saginaw	Rochester	Athens	Great Falls	Milwaukee	Poughkeepsie	Parkersburg	Fresno	FWB	El Paso	All 10 MSAs
Observations	74,549	30,844	51,160	20,248	325,405	274,361	15,219	415,228	67,786	163,584	1,438,384
Loans	2,380	1,079	1,695	665	13,131	10,029	495	16,684	2,506	5,063	53,727
% loans with a foreclosure start	11.3%	6.7%	7.4%	7.4%	6.7%	7.3%	9.7%	4.5%	6.6%	6.2%	6.3%
2002 origination	0.14	0.11	0.14	0.14	0.09	0.08	0.21	0.07	0.12	0.15	0.10
2003 origination	0.24	0.19	0.19	0.25	0.18	0.24	0.16	0.20	0.17	0.24	0.21
2004 origination	0.22	0.22	0.21	0.21	0.21	0.25	0.21	0.24	0.16	0.24	0.23
2005 origination	0.21	0.25	0.25	0.18	0.26	0.26	0.21	0.28	0.30	0.20	0.25
2006 origination	0.19	0.23	0.21	0.22	0.27	0.17	0.21	0.21	0.25	0.17	0.21
<i>Prepay36</i>	0.55	0.47	0.21	0.54	0.51	0.05	0.51	0.62	0.55	0.17	0.41
<i>Balloon</i>	0.09	0.15	0.08	0.08	0.13	0.06	0.08	0.08	0.07	0.00	0.08
<i>LowNoDoc</i>	0.28	0.26	0.39	0.40	0.27	0.39	0.17	0.40	0.37	0.36	0.35
<i>FICO</i>	656.54	670.37	665.17	672.89	660.24	652.87	638.23	661.48	671.90	627.05	656.09
<i>InitialRate</i>	8.42	8.34	7.90	8.07	8.25	7.30	8.48	7.04	7.53	8.02	7.66
<i>Age</i>	23.47	21.86	23.11	22.56	20.26	21.65	24.14	20.13	20.58	23.77	21.28
<i>LTV</i>	85.55	88.47	80.30	86.15	82.40	73.30	84.39	71.71	76.66	74.66	76.72
<i>Cashout</i>	0.80	0.75	0.64	0.75	0.78	0.87	0.78	0.84	0.81	0.74	0.81
<i>ΔUnemployment</i>	-0.11	0.09	0.37	-0.60	-0.23	-0.05	-0.39	-1.13	0.18	-1.34	-0.53
<i>ΔHPI</i>	2.48	9.71	24.11	27.74	24.15	28.60	13.39	38.66	33.06	30.13	28.79
<i>ΔEffectiveRate</i>	0.20	0.22	0.21	0.16	0.19	0.26	0.11	0.23	0.18	0.20	0.21
<i>%Black</i>	11.05	2.23	16.54	1.02	23.69	8.31	0.99	5.04	8.28	3.06	10.37
<i>%Hispanic</i>	5.46	2.32	4.15	2.33	5.70	9.55	0.54	41.02	3.54	76.04	24.28
<i>Income</i>	19.28	23.24	18.46	17.47	21.18	22.68	18.05	16.18	22.35	14.72	19.11
<i>LawIndex</i>	47.94	11.55	33.84	1.00	1.00	25.30	46.42	66.78	8.21	13.65	31.95

Table 3c: Variable means by MSA – purchase ARMs

	Saginaw	Rochester	Athens	Great Falls	Milwaukee	Poughkeepsie	Parkersburg	Fresno	FWB	El Paso	All 10 MSAs
Observations	45,710	19,095	64,606	5,360	263,530	106,485	7,570	326,653	55,152	100,891	995,052
Loans	2,028	866	2,567	250	14,478	5,074	328	15,885	2,225	3,791	47,492
% loans with a foreclosure start	29.0%	20.7%	16.7%	18.8%	21.1%	16.2%	20.7%	20.4%	15.6%	13.3%	19.5%
2002 origination	0.08	0.05	0.02	0.13	0.09	0.07	0.11	0.04	0.02	0.09	0.06
2003 origination	0.13	0.12	0.05	0.10	0.12	0.11	0.12	0.08	0.05	0.10	0.09
2004 origination	0.25	0.25	0.36	0.25	0.22	0.26	0.18	0.24	0.27	0.23	0.24
2005 origination	0.37	0.42	0.36	0.30	0.33	0.36	0.33	0.42	0.47	0.32	0.38
2006 origination	0.18	0.17	0.21	0.22	0.24	0.20	0.26	0.22	0.18	0.26	0.22
<i>Prepay36</i>	0.31	0.26	0.08	0.19	0.10	0.06	0.18	0.22	0.22	0.30	0.17
<i>LowNoDoc</i>	0.29	0.42	0.27	0.32	0.31	0.53	0.19	0.61	0.55	0.42	0.45
<i>FICO</i>	637.23	659.09	681.33	631.00	641.17	659.58	626.87	677.29	694.86	628.01	659.25
<i>InitialRate</i>	8.01	7.05	6.76	7.80	7.99	7.02	8.42	6.30	5.94	8.12	7.14
<i>Age</i>	17.85	17.43	19.14	16.80	15.73	17.22	18.56	16.49	18.66	19.00	17.01
<i>LTV</i>	87.78	84.81	85.78	84.47	86.46	83.39	88.27	81.71	80.63	85.28	84.12
<i>ΔUnemployment</i>	-0.11	0.13	0.19	-0.39	-0.14	0.02	-0.30	-0.52	0.01	-0.97	-0.30
<i>ΔHPI</i>	0.07	7.19	20.06	22.14	18.77	19.60	9.83	26.42	29.78	26.70	21.73
<i>ΔEffectiveRate</i>	0.25	0.31	0.32	0.15	0.18	0.22	0.16	0.25	0.32	0.20	0.23
<i>%Black</i>	9.99	2.43	16.74	1.05	31.14	9.52	1.05	5.47	6.89	3.05	13.36
<i>%Hispanic</i>	6.03	2.38	4.10	2.41	7.54	10.58	0.56	40.76	3.33	75.69	24.97
<i>Income</i>	19.60	23.86	18.30	17.43	19.20	22.20	17.98	15.97	25.11	14.77	18.37
<i>LawIndex</i>	47.94	11.56	33.84	1.00	1.00	25.30	46.71	66.78	8.21	13.65	33.17

Table 3d: Variable means by MSA – refinance ARMs

	Saginaw	Rochester	Athens	Great Falls	Milwaukee	Poughkeepsie	Parkersburg	Fresno	FWB	El Paso	All 10 MSAs
Observations	99,905	34,796	50,635	9,574	513,439	170,433	12,123	409,010	48,518	49,571	1,398,004
Loans	4,090	1,545	2,059	389	27,489	9,248	461	23,081	2,276	2,051	72,689
% loans with a foreclosure start	27.4%	23.4%	14.3%	17.5%	16.0%	15.2%	21.5%	12.3%	15.6%	10.1%	15.3%
2002 origination	0.13	0.12	0.07	0.15	0.12	0.08	0.14	0.04	0.06	0.14	0.09
2003 origination	0.19	0.19	0.10	0.19	0.16	0.15	0.17	0.11	0.09	0.14	0.14
2004 origination	0.29	0.29	0.37	0.32	0.24	0.28	0.31	0.25	0.19	0.22	0.26
2005 origination	0.28	0.28	0.33	0.21	0.29	0.33	0.25	0.36	0.39	0.27	0.32
2006 origination	0.12	0.13	0.13	0.13	0.19	0.16	0.13	0.24	0.27	0.24	0.20
<i>Prepay36</i>	0.43	0.40	0.11	0.26	0.15	0.06	0.30	0.36	0.40	0.08	0.23
<i>LowNoDoc</i>	0.26	0.29	0.30	0.24	0.25	0.42	0.18	0.47	0.49	0.33	0.35
<i>FICO</i>	605.66	622.86	643.60	609.71	606.23	604.61	598.30	627.45	635.95	582.67	614.13
<i>InitialRate</i>	7.83	7.19	7.01	7.52	7.91	7.24	8.06	6.16	6.35	8.65	7.23
<i>Age</i>	19.19	18.15	19.54	18.94	16.21	16.35	20.46	15.37	16.84	18.99	16.54
<i>LTV</i>	82.68	82.83	82.09	82.08	81.62	75.59	83.54	75.90	74.82	76.37	78.93
<i>Cashout</i>	0.83	0.74	0.65	0.79	0.84	0.90	0.85	0.89	0.86	0.81	0.85
<i>ΔUnemployment</i>	-0.14	-0.01	0.24	-0.55	-0.18	-0.04	-0.41	-0.64	0.09	-0.96	-0.30
<i>ΔHPI</i>	2.58	8.98	20.56	24.04	20.72	21.71	12.20	26.86	22.62	24.95	21.20
<i>ΔEffectiveRate</i>	0.22	0.21	0.29	0.16	0.15	0.22	0.23	0.21	0.20	0.15	0.19
<i>%Black</i>	10.94	2.40	16.96	1.02	30.35	8.55	1.11	5.26	7.11	2.92	15.55
<i>%Hispanic</i>	5.60	2.42	4.46	2.32	6.74	9.88	0.56	41.87	3.38	75.42	19.36
<i>Income</i>	19.18	23.17	18.48	17.60	19.69	22.58	18.05	15.84	23.95	15.22	18.88
<i>LawIndex</i>	47.94	11.56	33.84	1.00	1.00	25.30	46.34	66.78	8.21	13.65	30.72

Table 4: Changes in the probability of a foreclosure start – all 10 MSAs pooled

This table presents results of multinomial logit regressions based on monthly data for loans originated during 2002-2006. Variables are defined as described in Table 2. Each coefficient estimate represents the impact on the probability of a first foreclosure start, relative to the probability of a loan remaining active, of a one-unit change in the corresponding variable. Associated results concerning the probability of a prepayment are presented in Table A1 of the Appendix. The dearth of balloon ARMs prior to 2005 required that they be excluded from ARM specifications. Vintage year indicators, MSA indicators, and a constant term are included in all specifications. Robust standard errors clustered by loan are in parentheses. Levels of significance are indicated by *, **, and *** for 10%, 5%, and 1%, respectively.

	Purchase FRM	Refinance FRM	Purchase ARM	Refinance ARM
<i>Prepay36</i>	0.348*** (0.053)	0.089** (0.043)	-0.059* (0.033)	-0.027 (0.027)
<i>Balloon</i>	-0.810*** (0.072)	-0.241*** (0.067)		
<i>LowNoDoc</i>	0.541*** (0.049)	0.545*** (0.040)	0.351*** (0.025)	0.381*** (0.022)
<i>FICO</i>	-0.011*** (0.0005)	-0.013*** (0.0003)	-0.007*** (0.0002)	-0.006*** (0.0002)
<i>InitialRate</i>	-0.106*** (0.016)	-0.026** (0.012)	0.155*** (0.009)	0.149*** (0.008)
<i>Age</i>	0.113*** (0.008)	0.106*** (0.005)	0.136*** (0.004)	0.137*** (0.003)
<i>(Age)²</i>	-0.002*** (0.0002)	-0.001*** (0.0001)	-0.002*** (0.0001)	-0.002*** (0.0001)
<i>LTV</i>	0.004 (0.002)	0.014*** (0.001)	0.005*** (0.001)	0.020*** (0.001)
<i>Cashout</i>		0.038 (0.052)		-0.037 (0.030)
<i>ΔUnemployment</i>	0.034 (0.022)	0.014 (0.017)	0.064*** (0.011)	0.032*** (0.010)
<i>ΔHPI</i>	-0.004*** (0.001)	-0.007*** (0.001)	-0.007*** (0.0004)	-0.006*** (0.000)
<i>ΔEffectiveRate</i>	-0.090 (0.072)	0.007 (0.054)	0.050 (0.035)	0.095*** (0.030)
<i>%Black</i>	0.012*** (0.002)	0.004*** (0.001)	0.004*** (0.001)	-0.001** (0.001)
<i>%Hispanic</i>	-0.001 (0.002)	-0.001 (0.002)	-0.006*** (0.001)	-0.007*** (0.001)
<i>Income</i>	-0.014** (0.007)	-0.004 (0.005)	-0.013*** (0.003)	-0.010*** (0.003)
Observations	824,825	1,313,676	952,636	1,344,244
Loans	35,080	50,422	46,153	70,735
Pseudo R ²	0.051	0.043	0.061	0.044

Table 5: Changes in the probability of a foreclosure start by origination year – all 10 MSAs pooled

This table presents results of multinomial logit regressions based on data for the first twenty months of loans originated in each year of the sample period, 2002-2006. Variables are defined as described in Table 2. Each coefficient estimate represents the impact on the probability of a first foreclosure start, relative to the probability of a loan remaining active, of a one-unit change in the corresponding variable. Associated results concerning the probability of a prepayment are presented in Table A2 of the Appendix. The dearth of balloon ARMs prior to 2005 required that they be excluded from ARM specifications. MSA indicators and a constant term are included in all specifications. Robust standard errors clustered by loan are in parentheses. Levels of significance are indicated by *, **, and *** for 10%, 5%, and 1%, respectively.

	2002	2003	2004	2005	2006	2002-2003	2004-2006	2002-2004	2005-2006
Purchase FRM									
<i>Prepay36</i>	0.041 (0.360)	0.420 (0.306)	0.531*** (0.206)	0.570*** (0.150)	0.255*** (0.102)	0.240 (0.232)	0.362*** (0.078)	0.392*** (0.153)	0.349*** (0.084)
<i>Balloon</i>	-2.023*** (0.781)	-0.914* (0.498)	-0.332 (0.268)	-0.447*** (0.168)	-0.681*** (0.117)	-1.410*** (0.425)	-0.609*** (0.092)	-0.742*** (0.222)	-0.634*** (0.097)
<i>LowNoDoc</i>	-0.199 (0.310)	-0.113 (0.310)	0.377* (0.199)	0.601*** (0.131)	0.446*** (0.108)	-0.128 (0.212)	0.511*** (0.076)	0.147 (0.142)	0.532*** (0.083)
Refinance FRM									
<i>Prepay36</i>	-0.204 (0.260)	0.004 (0.219)	0.358** (0.175)	0.223* (0.120)	0.006 (0.096)	-0.100 (0.167)	0.132* (0.069)	0.130 (0.121)	0.084 (0.075)
<i>Balloon</i>	0.234 (0.337)	0.081 (0.420)	-0.897 (0.590)	0.016 (0.201)	-0.404*** (0.111)	0.151 (0.250)	-0.308*** (0.096)	-0.165 (0.224)	-0.297*** (0.098)
<i>LowNoDoc</i>	0.738*** (0.226)	0.475** (0.195)	0.357** (0.161)	0.543*** (0.122)	0.582*** (0.088)	0.591*** (0.146)	0.541*** (0.064)	0.490*** (0.108)	0.573*** (0.071)
Purchase ARM									
<i>Prepay36</i>	-0.030 (0.181)	-0.391** (0.196)	0.005 (0.147)	0.019 (0.098)	0.169** (0.070)	-0.194 (0.128)	0.123** (0.053)	-0.126 (0.096)	0.139*** (0.057)
<i>LowNoDoc</i>	0.671*** (0.217)	0.254 (0.157)	0.134 (0.099)	0.426*** (0.062)	0.317*** (0.053)	0.391*** (0.127)	0.346*** (0.037)	0.248*** (0.078)	0.372*** (0.040)
Refinance ARM									
<i>Prepay36</i>	-0.111 (0.117)	-0.094 (0.113)	0.203** (0.099)	0.069 (0.079)	-0.060 (0.067)	-0.107 (0.081)	0.095** (0.044)	0.029 (0.062)	0.040 (0.050)
<i>LowNoDoc</i>	0.295** (0.134)	0.257** (0.109)	0.211*** (0.075)	0.365*** (0.055)	0.544*** (0.051)	0.278*** (0.084)	0.435*** (0.033)	0.252*** (0.056)	0.481*** (0.037)

Table 6: Wilcoxon tests for equality of survival curves across MSAs

Numbers are χ^2 statistics from Wilcoxon tests for the equality of non-parametric survival curves across each pair of MSAs for each loan category. Levels of significance are indicated by *, **, and *** for 10%, 5%, and 1%, respectively.

Purchase FRMs	Saginaw	Rochester	Athens	Great Falls	Milwaukee	Poughkeepsie	Parkersburg	Fresno	FWB
Rochester	32.87***	xxx	xxx	xxx	xxx	xxx	xxx	xxx	xxx
Athens	46.18***	1.44	xxx	xxx	xxx	xxx	xxx	xxx	xxx
Great Falls	9.96***	1.44	0.23	xxx	xxx	xxx	xxx	xxx	xxx
Milwaukee	35.54***	10.46***	11.14***	1.26	xxx	xxx	xxx	xxx	xxx
Poughkeepsie	27.39***	10.24***	9.23***	1.07	0.12	xxx	xxx	xxx	xxx
Parkersburg	7.42***	1.33	0.15	0.01	1.03	0.68	xxx	xxx	xxx
Fresno	88.19***	3.15*	0.46	0.02	22.23***	19.83***	0.02	xxx	xxx
FWB	32.51***	3.36*	0.70	0.00	5.37**	4.01**	0.00	0.04	xxx
El Paso	101.39***	0.13	2.78*	1.50	40.84***	38.88***	1.52	9.79***	7.02***
Refinance FRMs	Saginaw	Rochester	Athens	Great Falls	Milwaukee	Poughkeepsie	Parkersburg	Fresno	FWB
Rochester	15.08***	xxx	xxx	xxx	xxx	xxx	xxx	xxx	xxx
Athens	15.30***	0.42	xxx	xxx	xxx	xxx	xxx	xxx	xxx
Great Falls	4.80**	0.88	0.19	xxx	xxx	xxx	xxx	xxx	xxx
Milwaukee	36.34***	0.64	0.02	0.49	xxx	xxx	xxx	xxx	xxx
Poughkeepsie	20.78***	2.43	0.71	0.01	3.17*	xxx	xxx	xxx	xxx
Parkersburg	1.00	3.67*	2.31	0.77	3.16*	1.33	xxx	xxx	xxx
Fresno	134.03***	5.11**	18.25***	13.10***	61.82***	84.79***	20.46***	xxx	xxx
FWB	30.73***	0.13	1.46	2.71*	3.68*	8.07***	6.23***	5.87**	xxx
El Paso	44.65***	0.06	1.73	1.79	2.85*	9.06***	6.25***	18.84***	0.07
Purchase ARMs	Saginaw	Rochester	Athens	Great Falls	Milwaukee	Poughkeepsie	Parkersburg	Fresno	FWB
Rochester	20.03***	xxx	xxx	xxx	xxx	xxx	xxx	xxx	xxx
Athens	154.13***	20.77***	xxx	xxx	xxx	xxx	xxx	xxx	xxx
Great Falls	3.78**	0.43	10.23***	xxx	xxx	xxx	xxx	xxx	xxx
Milwaukee	31.50***	3.77**	121.36***	0.00	xxx	xxx	xxx	xxx	xxx
Poughkeepsie	123.43***	6.15***	12.22***	5.14**	83.67***	xxx	xxx	xxx	xxx
Parkersburg	10.76***	0.06	7.52***	0.38	2.36	1.71	xxx	xxx	xxx
Fresno	253.41***	15.00***	23.65***	10.03***	319.08***	0.46	2.43	xxx	xxx
FWB	221.00***	55.70***	6.84***	28.18***	195.80***	43.64***	20.84***	77.17***	xxx
El Paso	327.67***	68.20***	19.57***	27.25***	318.37***	73.96***	26.10***	132.38***	1.56
Refinance ARMs	Saginaw	Rochester	Athens	Great Falls	Milwaukee	Poughkeepsie	Parkersburg	Fresno	FWB
Rochester	2.90*	xxx	xxx	xxx	xxx	xxx	xxx	xxx	xxx
Athens	136.61***	70.76***	xxx	xxx	xxx	xxx	xxx	xxx	xxx
Great Falls	8.14***	3.37*	8.98***	xxx	xxx	xxx	xxx	xxx	xxx
Milwaukee	185.34***	41.26***	25.54***	1.30	xxx	xxx	xxx	xxx	xxx
Poughkeepsie	151.23***	44.89***	17.94***	2.10	1.93	xxx	xxx	xxx	xxx
Parkersburg	13.00***	6.25***	10.26***	0.05	0.24	0.64	xxx	xxx	xxx
Fresno	779.00***	272.42***	6.27***	33.83***	395.25***	201.11***	29.46***	xxx	xxx
FWB	204.01***	123.16***	3.04*	23.29***	71.20***	56.62***	24.24***	1.37	xxx
El Paso	239.66***	146.58***	16.94***	31.73***	90.96***	76.48***	39.29***	11.15***	7.20***

Table 7a: Changes in the probability of a foreclosure start by MSA – purchase FRMs

This table presents results of multinomial logit regressions based on monthly data for purchase fixed-rate mortgages originated during 2002-2006. Variables are defined as described in Table 2. Each coefficient estimate represents the impact on the probability of a foreclosure start, relative to the probability of a loan remaining active, of a one-unit change in the corresponding variable. Associated results concerning the probability of prepayment are presented in Table A3a of the Appendix. Vintage year indicators and a constant term are included in all specifications. MSA indicators are included in the “All 10 MSAs” specification. Robust standard errors clustered by loan are in parentheses. Levels of significance are indicated by *, **, and *** for 10%, 5%, and 1%, respectively.

	Saginaw	Rochester	Athens	Great Falls	Milwaukee	Poughkeepsie	Parkersburg	Fresno	FWB	El Paso	All 10 MSAs
<i>Prepay</i> ₃₆	0.603*** (0.211)	0.820* (0.438)	0.050 (0.258)	0.703 (0.544)	0.544*** (0.114)	0.298 (0.232)	0.726 (0.598)	0.208** (0.093)	0.564*** (0.228)	0.534*** (0.150)	0.348*** (0.053)
<i>Balloon</i>	-1.322*** (0.380)	-1.376 (0.881)	-1.477*** (0.432)	-0.042 (0.821)	-0.529*** (0.143)	-0.716*** (0.187)	-2.997** (1.544)	-0.870*** (0.114)	-0.695** (0.334)	-0.881*** (0.283)	-0.810*** (0.072)
<i>LowNoDoc</i>	0.150 (0.198)	1.869*** (0.564)	0.611*** (0.203)	1.449** (0.608)	0.451*** (0.112)	0.470*** (0.115)	1.212* (0.638)	0.703*** (0.095)	0.724*** (0.224)	0.269** (0.136)	0.541*** (0.049)
<i>FICO</i>	-0.004** (0.002)	-0.020*** (0.004)	-0.011*** (0.002)	-0.019*** (0.004)	-0.009*** (0.001)	-0.012*** (0.001)	-0.011*** (0.004)	-0.014*** (0.001)	-0.014*** (0.002)	-0.008*** (0.001)	-0.011*** (0.0005)
<i>InitialRate</i>	-0.042 (0.057)	-0.138 (0.156)	-0.200*** (0.068)	-0.141 (0.170)	-0.128*** (0.032)	-0.138*** (0.038)	0.413* (0.251)	-0.160*** (0.038)	-0.210*** (0.072)	0.067 (0.045)	-0.106*** (0.016)
<i>Age</i>	0.118*** (0.034)	0.204*** (0.081)	0.156*** (0.039)	0.313*** (0.071)	0.084*** (0.022)	0.114*** (0.017)	0.018 (0.084)	0.169*** (0.020)	0.103*** (0.030)	0.133*** (0.023)	0.113*** (0.008)
<i>(Age)²</i>	-0.002*** (0.001)	-0.004*** (0.001)	-0.001*** (0.0004)	-0.002* (0.001)	-0.002*** (0.0005)	-0.002*** (0.0003)	-0.001 (0.001)	-0.003*** (0.0005)	-0.001 (0.001)	-0.001*** (0.0004)	-0.002*** (0.0002)
<i>LTV</i>	-0.015 (0.009)	-0.030 (0.025)	0.008 (0.012)	-0.011 (0.024)	-0.009* (0.005)	0.007 (0.005)	-0.033 (0.026)	0.022*** (0.006)	0.015 (0.011)	-0.002 (0.006)	0.004 (0.002)
<i>ΔUnemployment</i>	0.019 (0.077)	-0.253 (0.269)	-0.008 (0.187)	-0.334 (0.487)	0.340*** (0.098)	-0.078 (0.111)	0.251 (0.460)	-0.002 (0.032)	-0.396** (0.206)	0.020 (0.101)	0.034 (0.022)
<i>ΔHPI</i>	0.014 (0.010)	0.017 (0.059)	-0.044** (0.021)	-0.111** (0.047)	0.025*** (0.007)	-0.005 (0.006)	0.159* (0.085)	-0.002 (0.001)	-0.020*** (0.005)	-0.028** (0.013)	-0.004*** (0.001)
<i>ΔEffectiveRate</i>	0.343 (0.260)	-0.009 (0.577)	-0.734*** (0.275)	-0.213 (0.944)	-0.279 (0.174)	-0.081 (0.176)	-0.647 (0.826)	-0.264 (0.167)	0.057 (0.371)	-0.015 (0.207)	-0.090 (0.072)
<i>%Black</i>	-0.003 (0.006)	0.195 (0.190)	0.004 (0.013)	0.566 (0.944)	0.018*** (0.003)	0.033*** (0.009)	0.323* (0.175)	0.001 (0.009)	-0.058 (0.036)	-0.0003 (0.052)	0.012*** (0.002)
<i>%Hispanic</i>	0.127*** (0.039)	-0.346 (0.282)	-0.026 (0.031)	-0.516 (1.003)	0.013** (0.006)	-0.003 (0.010)	3.034 (2.389)	-0.011*** (0.004)	-0.093 (0.111)	-0.002 (0.018)	-0.001 (0.002)
<i>Income</i>	0.001 (0.042)	-0.126** (0.063)	-0.070* (0.042)	-0.067 (0.184)	0.008 (0.016)	-0.003 (0.018)	0.285** (0.119)	-0.028** (0.013)	-0.014 (0.030)	-0.022 (0.041)	-0.014** (0.007)
Observations	33,714	18,389	47,164	8,368	144,849	123,768	6,296	248,125	38,836	155,316	824,825
Loans	1,299	727	1,816	339	7,052	5,082	224	11,567	1,517	5,457	35,080
Pseudo R ²	0.038	0.068	0.048	0.055	0.033	0.053	0.091	0.059	0.071	0.034	0.051

Table 7b: Changes in the probability of a foreclosure start by MSA – refinance FRMs

This table presents results of multinomial logit regressions based on monthly data for refinance fixed-rate mortgages originated during 2002-2006. Variables are defined as described in Table 2. Each coefficient estimate represents the impact on the probability of a first foreclosure start, relative to the probability of a loan remaining active, of a one-unit change in the corresponding variable. Associated results concerning the probability of prepayment are presented in Table A3b of the Appendix. Vintage year indicators and a constant term are included in all specifications. MSA indicators are included in the “All 10 MSAs” specification. Robust standard errors clustered by loan are in parentheses. Levels of significance are indicated by *, **, and *** for 10%, 5%, and 1%, respectively.

	Saginaw	Rochester	Athens	Great Falls	Milwaukee	Poughkeepsie	Parkersburg	Fresno	FWB	El Paso	All 10 MSAs
<i>Prepay36</i>	0.178 (0.143)	0.425 (0.293)	0.195 (0.237)	0.337 (0.388)	0.166** (0.075)	0.018 (0.159)	-0.294 (0.313)	0.118 (0.091)	-0.147 (0.199)	0.318* (0.190)	0.089** (0.043)
<i>Balloon</i>	-0.694** (0.308)	0.140 (0.355)	-0.672 (0.488)	0.447 (0.538)	-0.060 (0.106)	-0.238 (0.166)	-0.892 (0.755)	-0.419*** (0.136)	-1.097*** (0.382)	1.099 (0.680)	-0.241*** (0.067)
<i>LowNoDoc</i>	0.130 (0.161)	0.635** (0.309)	0.582*** (0.222)	0.399 (0.340)	0.792*** (0.083)	0.514*** (0.081)	1.165*** (0.371)	0.344*** (0.083)	0.807*** (0.195)	0.367*** (0.124)	0.545*** (0.040)
<i>FICO</i>	-0.009*** (0.001)	-0.014*** (0.002)	-0.011*** (0.002)	-0.016*** (0.003)	-0.015*** (0.001)	-0.013*** (0.001)	-0.014*** (0.003)	-0.013*** (0.001)	-0.011*** (0.002)	-0.010*** (0.001)	-0.013*** (0.0003)
<i>InitialRate</i>	-0.117*** (0.043)	-0.200*** (0.077)	-0.101 (0.079)	-0.152* (0.093)	-0.034 (0.023)	-0.029 (0.027)	0.117 (0.108)	-0.019 (0.030)	0.006 (0.055)	0.284*** (0.046)	-0.026** (0.012)
<i>Age</i>	0.088*** (0.015)	0.079* (0.046)	0.094*** (0.037)	0.105* (0.057)	0.101*** (0.011)	0.124*** (0.011)	0.085* (0.048)	0.151*** (0.015)	0.076*** (0.023)	0.120*** (0.020)	0.106*** (0.005)
<i>(Age)²</i>	-0.001*** (0.0002)	-0.001 (0.001)	-0.001*** (0.0003)	-0.001 (0.001)	-0.001*** (0.0002)	-0.002*** (0.0002)	-0.001* (0.001)	-0.002*** (0.0003)	-0.001 (0.0005)	-0.001*** (0.0003)	-0.001*** (0.0001)
<i>LTV</i>	-0.007 (0.005)	0.001 (0.009)	0.019* (0.010)	-0.003 (0.011)	0.010*** (0.003)	0.014*** (0.003)	0.009 (0.010)	0.031*** (0.003)	0.019*** (0.007)	0.019*** (0.007)	0.014*** (0.001)
<i>Cashout</i>	-0.293* (0.159)	-0.033 (0.290)	-0.201 (0.224)	0.398 (0.454)	-0.070 (0.096)	0.216 (0.136)	0.133 (0.451)	0.040 (0.131)	0.356 (0.308)	0.162 (0.202)	0.038 (0.052)
<i>ΔUnemployment</i>	-0.036 (0.060)	0.312 (0.213)	0.067 (0.190)	0.284 (0.185)	0.073 (0.063)	-0.161** (0.080)	0.139 (0.224)	0.007 (0.025)	-0.247 (0.164)	0.041 (0.074)	0.014 (0.017)
<i>ΔHPI</i>	-0.002 (0.007)	0.050 (0.033)	-0.015 (0.027)	-0.009 (0.029)	-0.001 (0.004)	-0.012*** (0.004)	0.003 (0.038)	-0.003** (0.001)	-0.017*** (0.004)	-0.028*** (0.011)	-0.007*** (0.001)
<i>ΔEffectiveRate</i>	-0.087 (0.178)	0.010 (0.415)	-0.382 (0.257)	0.323 (0.536)	-0.116 (0.107)	0.121 (0.127)	-0.395 (0.582)	-0.218 (0.147)	0.460 (0.289)	0.233 (0.184)	0.007 (0.054)
<i>%Black</i>	-0.010** (0.005)	-0.047 (0.098)	0.005 (0.011)	-0.575 (0.492)	0.006*** (0.002)	0.002 (0.008)	-0.001 (0.098)	0.011 (0.007)	0.046* (0.024)	-0.050 (0.055)	0.004*** (0.001)
<i>%Hispanic</i>	0.062** (0.026)	0.033 (0.155)	-0.032 (0.034)	0.480 (0.454)	0.007* (0.004)	0.001 (0.008)	1.836* (1.129)	-0.006* (0.003)	-0.165 (0.103)	-0.013 (0.018)	-0.001 (0.002)
<i>Income</i>	-0.002 (0.026)	0.018 (0.029)	0.038 (0.030)	-0.115 (0.085)	-0.002 (0.011)	-0.007 (0.011)	-0.073 (0.071)	-0.008 (0.010)	0.064*** (0.022)	-0.041 (0.040)	-0.004 (0.005)
Observations	68,576	27,904	47,588	17,919	293,151	253,063	13,561	374,760	62,242	154,912	1,313,676
Loans	2,243	1,000	1,616	611	12,270	9,472	459	15,475	2,364	4,912	50,422
Pseudo R ²	0.037	0.040	0.021	0.035	0.032	0.051	0.039	0.062	0.061	0.033	0.043

Table 7c: Changes in the probability of a foreclosure start by MSA – purchase ARMs

This table presents results of multinomial logit regressions based on monthly data for purchase adjustable-rate mortgages originated during 2002-2006. Variables are defined as described in Table 2. Each coefficient estimate represents the impact on the probability of a foreclosure start, relative to the probability of a loan remaining active, of a one-unit change in the corresponding variable. Associated results concerning the probability of prepayment are presented in Table A3c of the Appendix. The dearth of balloon ARMs prior to 2005 required that they be excluded from ARM specifications. Vintage year indicators and a constant term are included in all specifications. MSA indicators are included in the “All 10 MSAs” specification. Robust standard errors clustered by loan are in parentheses. Levels of significance are indicated by *, **, and *** for 10%, 5%, and 1%, respectively.

	Saginaw	Rochester	Athens	Great Falls	Milwaukee	Poughkeepsie	Parkersburg	Fresno	FWB	El Paso	All 10 MSAs
<i>Prepay36</i>	-0.004 (0.093)	-0.094 (0.195)	0.073 (0.209)	0.184 (0.369)	0.137* (0.074)	-0.161 (0.209)	-0.271 (0.376)	0.190*** (0.051)	-0.114 (0.149)	-0.150 (0.113)	-0.059* (0.033)
<i>LowNoDoc</i>	0.515*** (0.101)	0.391** (0.171)	0.518*** (0.116)	0.809* (0.444)	0.285*** (0.045)	0.353*** (0.079)	0.633* (0.332)	0.285*** (0.042)	0.411*** (0.125)	0.236** (0.106)	0.351*** (0.025)
<i>FICO</i>	-0.006*** (0.001)	-0.007*** (0.002)	-0.008*** (0.001)	-0.006** (0.003)	-0.005*** (0.0004)	-0.008*** (0.001)	-0.0000 (0.003)	-0.007*** (0.0004)	-0.009*** (0.001)	-0.007*** (0.001)	-0.007*** (0.0002)
<i>InitialRate</i>	0.190*** (0.045)	0.351*** (0.079)	0.360*** (0.052)	0.233 (0.157)	0.208*** (0.020)	0.221*** (0.034)	0.247** (0.118)	0.107*** (0.012)	0.084** (0.036)	0.197*** (0.049)	0.155*** (0.009)
<i>Age</i>	0.105*** (0.012)	0.072*** (0.024)	0.124*** (0.025)	0.098* (0.052)	0.125*** (0.006)	0.146*** (0.013)	0.126*** (0.039)	0.147*** (0.008)	0.173*** (0.026)	0.121*** (0.019)	0.136*** (0.004)
<i>(Age)²</i>	-0.001*** (0.0002)	-0.001 (0.0005)	-0.002*** (0.0004)	-0.001* (0.001)	-0.002*** (0.0001)	-0.002*** (0.0003)	-0.002*** (0.001)	-0.001*** (0.0002)	-0.002*** (0.001)	-0.002*** (0.0003)	-0.002*** (0.0001)
<i>LTV</i>	-0.003 (0.005)	-0.001 (0.010)	-0.016** (0.007)	0.030 (0.019)	0.005** (0.002)	0.007 (0.005)	-0.021 (0.015)	0.006*** (0.003)	0.011* (0.007)	-0.005 (0.005)	0.005*** (0.001)
<i>ΔUnemployment</i>	-0.019 (0.037)	0.192 (0.122)	-0.066 (0.109)	0.182 (0.242)	0.164*** (0.035)	-0.057 (0.076)	-0.019 (0.200)	0.078*** (0.015)	-0.315** (0.148)	0.066 (0.070)	0.064*** (0.011)
<i>ΔHPI</i>	-0.002 (0.006)	0.042* (0.023)	0.001 (0.015)	0.001 (0.032)	0.007** (0.003)	-0.005 (0.004)	0.024 (0.035)	-0.003*** (0.001)	-0.012*** (0.004)	0.009 (0.009)	-0.007*** (0.0004)
<i>ΔEffectiveRate</i>	0.173 (0.128)	-0.068 (0.253)	0.379*** (0.153)	-0.504 (0.587)	0.076 (0.060)	0.218* (0.122)	0.322 (0.443)	-0.290*** (0.072)	-0.013 (0.218)	-0.485*** (0.150)	0.050 (0.035)
<i>%Black</i>	-0.005* (0.003)	0.235** (0.098)	-0.012 (0.008)	-0.097 (0.502)	0.005*** (0.001)	0.008 (0.006)	0.198 (0.147)	0.003 (0.004)	0.003 (0.021)	0.044 (0.037)	0.004*** (0.001)
<i>%Hispanic</i>	0.026 (0.016)	-0.308* (0.163)	-0.003 (0.019)	-0.066 (0.449)	-0.001 (0.002)	-0.003 (0.007)	-0.631 (1.094)	-0.008*** (0.002)	-0.143** (0.071)	0.005 (0.013)	-0.006*** (0.001)
<i>Income</i>	-0.023 (0.018)	-0.006 (0.021)	-0.069* (0.022)	-0.094 (0.082)	-0.014** (0.007)	-0.006 (0.011)	0.101** (0.051)	-0.012** (0.006)	0.011 (0.018)	0.013 (0.029)	-0.013*** (0.003)
Observations	44,382	18,176	61,625	5,057	255,330	102,596	7,290	311,664	48,999	97,517	952,636
Loans	1,990	839	2,493	241	14,180	4,963	321	15,373	2,029	3,724	46,153
Pseudo R ²	0.039	0.047	0.048	0.053	0.042	0.058	0.039	0.089	0.072	0.075	0.061

Table 7d: Changes in the probability of a foreclosure start by MSA – refinance ARMs

This table presents results of multinomial logit regressions based on monthly data for refinance adjustable-rate mortgages originated during 2002-2006. Variables are defined as described in Table 2. Each coefficient estimate represents the impact on the probability of a foreclosure start, relative to the probability of a loan remaining active, of a one-unit change in the corresponding variable. Associated results concerning the probability of prepayment are presented in Table A3d of the Appendix. The dearth of balloon ARMs prior to 2005 required that they be excluded from ARM specifications. Vintage year indicators and a constant term are included in all specifications. MSA indicators are included in the “All 10 MSAs” specification. Robust standard errors clustered by loan are in parentheses. Levels of significance are indicated by *, **, and *** for 10%, 5%, and 1%, respectively.

	Saginaw	Rochester	Athens	Great Falls	Milwaukee	Poughkeepsie	Parkersburg	Fresno	FWB	El Paso	All 10 MSAs
<i>Prepay36</i>	0.011 (0.064)	0.282** (0.117)	0.257 (0.193)	-0.227 (0.306)	-0.139*** (0.055)	0.242 (0.165)	-0.063 (0.235)	-0.070 (0.046)	-0.291** (0.125)	-0.299 (0.323)	-0.027 (0.027)
<i>LowNoDoc</i>	0.343*** (0.073)	0.485*** (0.124)	0.182 (0.147)	0.312 (0.290)	0.353*** (0.037)	0.282*** (0.059)	-0.385 (0.306)	0.372*** (0.042)	0.562*** (0.128)	0.408*** (0.152)	0.381*** (0.022)
<i>FICO</i>	-0.003*** (0.001)	-0.009*** (0.001)	-0.007*** (0.001)	-0.004* (0.002)	-0.004*** (0.0004)	-0.005*** (0.001)	-0.002 (0.003)	-0.008*** (0.0004)	-0.007*** (0.001)	-0.007*** (0.002)	-0.006*** (0.0002)
<i>InitialRate</i>	0.234*** (0.028)	0.149*** (0.055)	0.144*** (0.049)	0.314*** (0.084)	0.233*** (0.015)	0.212*** (0.023)	0.297*** (0.096)	0.074*** (0.011)	0.067** (0.032)	0.256*** (0.057)	0.149*** (0.008)
<i>Age</i>	0.100*** (0.009)	0.121*** (0.020)	0.054** (0.024)	0.084* (0.047)	0.142*** (0.005)	0.138*** (0.010)	0.140*** (0.032)	0.169*** (0.008)	0.144*** (0.019)	0.043* (0.027)	0.137*** (0.003)
<i>(Age)²</i>	-0.001*** (0.0002)	-0.002*** (0.0004)	-0.001*** (0.0003)	-0.001 (0.001)	-0.002*** (0.0001)	-0.002*** (0.0002)	-0.001*** (0.0005)	-0.002*** (0.0002)	-0.002*** (0.0004)	-0.0004 (0.0003)	-0.002*** (0.0001)
<i>LTV</i>	0.012*** (0.003)	0.008 (0.006)	0.011 (0.007)	0.006 (0.011)	0.013*** (0.002)	0.018*** (0.002)	-0.001 (0.012)	0.038*** (0.002)	0.030*** (0.005)	0.005 (0.008)	0.020*** (0.001)
<i>Cashout</i>	0.045 (0.090)	-0.215 (0.134)	0.260* (0.156)	0.004 (0.355)	-0.052 (0.046)	-0.174* (0.099)	0.118 (0.332)	-0.099 (0.065)	-0.208 (0.183)	-0.114 (0.213)	-0.037 (0.030)
<i>ΔUnemployment</i>	-0.048* (0.027)	0.110 (0.089)	-0.002 (0.131)	0.244 (0.152)	0.078*** (0.028)	0.108* (0.060)	0.158 (0.138)	0.031** (0.014)	-0.381*** (0.117)	0.090 (0.094)	0.032*** (0.010)
<i>ΔHPI</i>	-0.003 (0.004)	-0.013 (0.017)	0.024 (0.019)	-0.019 (0.027)	-0.0004 (0.002)	0.001 (0.003)	-0.017 (0.027)	-0.003*** (0.001)	-0.016*** (0.003)	0.011 (0.014)	-0.006*** (0.000)
<i>ΔEffectiveRate</i>	0.170* (0.092)	0.085 (0.175)	-0.165 (0.194)	0.594 (0.393)	0.082* (0.049)	0.188** (0.091)	-0.190 (0.321)	-0.127* (0.074)	-0.094 (0.192)	-0.400* (0.228)	0.095*** (0.030)
<i>%Black</i>	-0.012*** (0.002)	0.062 (0.042)	-0.011 (0.008)	-0.572 (0.415)	-0.001 (0.001)	0.013*** (0.005)	-0.159 (0.118)	0.004 (0.004)	-0.015 (0.019)	-0.026 (0.062)	-0.001** (0.001)
<i>%Hispanic</i>	0.038*** (0.012)	-0.077 (0.071)	0.018 (0.020)	0.597 (0.372)	-0.002 (0.002)	-0.029*** (0.006)	-0.118 (0.783)	-0.012*** (0.002)	-0.122* (0.068)	-0.015 (0.020)	-0.007*** (0.001)
<i>Income</i>	-0.009 (0.013)	-0.011 (0.015)	-0.035 (0.023)	0.097 (0.077)	-0.006 (0.004)	-0.016* (0.009)	-0.053 (0.041)	-0.018*** (0.006)	0.034** (0.015)	-0.023 (0.046)	-0.010*** (0.003)
Observations	95,982	32,685	48,613	9,327	494,190	165,597	11,648	392,581	46,124	47,497	1,344,244
Loans	3,966	1,480	2,009	383	26,770	9,059	449	22,411	2,209	1,999	70,735
Pseudo R ²	0.037	0.041	0.032	0.050	0.033	0.039	0.045	0.065	0.072	0.043	0.044

Table 8 – Differences in loan feature coefficient estimates across MSA foreclosure regressions

The listed pairs of MSAs exhibit coefficient estimates for *Prepay36*, *Balloon*, or *LowNoDoc* that (1) have opposite signs and (2) are different at the 10% level of significance or greater, based on seemingly unrelated estimation. Coefficient estimates of unlisted MSA pairs either have the same sign or do not exhibit a statistically significant difference. The dearth of balloon ARMs prior to 2005 required that they be excluded from ARM specifications. Levels of significance are indicated by *, **, and *** for 10%, 5%, and 1%, respectively. There are 45 possible MSA pairs.

	Purchase FRMs	Refinance FRMs	Purchase ARMs	Refinance ARMs
<i>Prepay36</i>	No significant opposite-sign differences	El Paso and FWB* El Paso and Parkersburg* Parkersburg and Rochester*	El Paso and Milwaukee** Fresno and Saginaw*	El Paso and Rochester* FWB and Athens** FWB and Poughkeepsie*** FWB and Rochester*** FWB and Saginaw** Fresno and Athens* Fresno and Poughkeepsie* Fresno and Rochester*** Milwaukee and Athens** Milwaukee and Poughkeepsie** Milwaukee and Rochester*** Milwaukee and Saginaw*
<i>Balloon</i>	No significant opposite-sign differences	El Paso and Athens** El Paso and FWB*** El Paso and Fresno** El Paso and Milwaukee* El Paso and Parkersburg** El Paso and Poughkeepsie* El Paso and Saginaw** FWB and Great Falls** FWB and Rochester** Great Falls and Saginaw* Rochester and Saginaw*	X	X
<i>LowNoDoc</i>	No significant opposite-sign differences	No significant opposite-sign differences	No significant opposite-sign differences	Parkersburg and Athens* Parkersburg and El Paso** Parkersburg and FWB*** Parkersburg and Fresno*** Parkersburg and Great Falls* Parkersburg and Milwaukee** Parkersburg and Poughkeepsie** Parkersburg and Rochester*** Parkersburg and Saginaw**

Table 9: Changes in the probability of a foreclosure start – MSA-loan feature interactions

This table presents results of multinomial logit regressions based on monthly data for loans originated during 2002-2006. Variables are defined as described in Table 2. Each coefficient estimate represents the impact on the probability of a first foreclosure start, relative to the probability of a loan remaining active, of a one-unit change in the corresponding variable. Associated results concerning the probability of prepayment are presented in Table A4 of the Appendix. Coefficient estimates for loan characteristic, macroeconomic, and demographic control variables are similar to those in Table 4, and are omitted here. The dearth of balloon ARMs prior to 2005 required that they be excluded from ARM specifications. Vintage year indicators and a constant term are included in all specifications. Robust standard errors clustered by loan are in parentheses. Levels of significance are indicated by *, **, and *** for 10%, 5%, and 1%, respectively.

	Purchase FRMs				Refinance FRMs			
<i>Prepay36</i>	0.163*				0.028			
	(0.090)				(0.087)			
<i>Balloon</i>	-0.725***				-0.176			
	(0.109)				(0.127)			
		<i>MSA interactions with:</i>				<i>MSA interactions with:</i>		
<i>LowNoDoc</i>	0.587***	<i>Prepay36</i>	<i>Balloon</i>	<i>LowNoDoc</i>	0.306***	<i>Prepay36</i>	<i>Balloon</i>	<i>LowNoDoc</i>
	(0.092)				(0.079)			
<i>Saginaw</i>	0.423**	0.258	-0.811**	-0.278	0.342**	-0.084	-0.716**	0.108
	(0.193)	(0.215)	(0.382)	(0.219)	(0.162)	(0.161)	(0.328)	(0.169)
<i>Rochester</i>	-0.978***	0.772**	-0.882	1.112***	-0.245	0.517*	0.094	0.441
	(0.379)	(0.394)	(0.758)	(0.412)	(0.258)	(0.271)	(0.349)	(0.283)
<i>Athens</i>	-0.042	-0.137	-0.980**	0.056	-0.037	0.145	-0.631	0.422**
	(0.182)	(0.262)	(0.435)	(0.209)	(0.180)	(0.226)	(0.479)	(0.207)
<i>Great Falls</i>	-0.399	0.467	0.340	0.683	0.013	0.405	0.366	0.200
	(0.537)	(0.487)	(0.738)	(0.510)	(0.341)	(0.344)	(0.505)	(0.310)
<i>Milwaukee</i>	-0.116	0.385***	0.049	-0.016	0.013	0.188*	0.013	0.405***
	(0.142)	(0.141)	(0.171)	(0.137)	(0.125)	(0.112)	(0.162)	(0.109)
<i>Poughkeepsie</i>	0.184	0.131	-0.029	-0.151	0.240**	0.014	-0.027	0.220**
	(0.134)	(0.247)	(0.203)	(0.145)	(0.111)	(0.181)	(0.194)	(0.110)
<i>Parkersburg</i>	0.085	0.465	-0.465	-0.145	0.295	-0.455	-0.680	0.821**
	(0.363)	(0.478)	(1.057)	(0.501)	(0.245)	(0.312)	(0.758)	(0.352)
<i>FWB</i>	-0.023	0.170	-0.039	0.165	0.201	-0.364*	-0.628	0.718***
	(0.204)	(0.225)	(0.317)	(0.221)	(0.206)	(0.196)	(0.389)	(0.188)
<i>El Paso</i>	-0.558***	0.288*	-0.003	-0.211	-0.326***	0.035	1.331**	0.166
	(0.172)	(0.161)	(0.292)	(0.155)	(0.130)	(0.178)	(0.600)	(0.142)
		Obs.	Loans	Pseudo R ²		Obs.	Loans	Pseudo R ²
		824,825	35,080	0.051		1,313,676	50,422	0.044
	Purchase ARMs				Refinance ARMs			
<i>Prepay36</i>	-0.141***				-0.009			
	(0.049)				(0.043)			
		<i>MSA interactions with:</i>				<i>MSA interactions with:</i>		
<i>LowNoDoc</i>	0.289***	<i>Prepay36</i>		<i>LowNoDoc</i>	0.334***	<i>Prepay36</i>		<i>LowNoDoc</i>
	(0.040)				(0.040)			
<i>Saginaw</i>	-0.555***	0.130		0.281***	-0.363***	0.013		0.100
	(0.080)	(0.109)		(0.105)	(0.064)	(0.078)		(0.081)
<i>Rochester</i>	-0.405***	0.066		0.143	-0.229***	0.222*		0.094
	(0.120)	(0.197)		(0.163)	(0.091)	(0.120)		(0.125)
<i>Athens</i>	-0.746***	0.267		0.236**	-0.642***	0.233		-0.148
	(0.079)	(0.185)		(0.113)	(0.088)	(0.179)		(0.139)
<i>Great Falls</i>	-0.680***	0.510		0.538*	-0.505***	-0.165		0.063
	(0.224)	(0.357)		(0.329)	(0.168)	(0.297)		(0.281)
<i>Milwaukee</i>	-0.410***	0.300***		0.064	-0.296***	-0.085		0.078
	(0.054)	(0.086)		(0.057)	(0.048)	(0.067)		(0.052)
<i>Poughkeepsie</i>	-0.459***	-0.181		0.014	-0.186***	0.109		-0.012
	(0.068)	(0.210)		(0.082)	(0.054)	(0.162)		(0.069)
<i>Parkersburg</i>	-0.955***	-0.012		0.670**	-0.602***	-0.0004		-0.574*
	(0.167)	(0.373)		(0.317)	(0.134)	(0.221)		(0.303)
<i>FWB</i>	-0.660***	0.034		0.174	-0.424***	-0.244**		0.395***
	(0.098)	(0.153)		(0.119)	(0.102)	(0.129)		(0.119)
<i>El Paso</i>	-0.772***	-0.015		-0.033	-0.840***	-0.400		0.117
	(0.083)	(0.115)		(0.100)	(0.104)	(0.318)		(0.153)
		Obs.	Loans	Pseudo R ²		Obs.	Loans	Pseudo R ²
		952,636	46,153	0.062		1,344,244	70,735	0.044

Table 10 – Differences in coefficient estimates of MSA-loan feature interaction terms in foreclosure regressions

The listed pairs of MSAs exhibit coefficient estimates for interaction terms of MSA indicator variables and *Prepay36*, *Balloon*, or *LowNoDoc* such that (1) the combined estimated impacts of the loan feature variable and the MSA-loan feature interaction variable have opposite signs and (2) the combined estimated impacts are different at the 10% level of significance or greater, based on seemingly unrelated estimation. Unlisted MSA pairs either have combined estimated impacts that do not exhibit a statistically significant difference or have combined estimated impacts of the same sign. The dearth of balloon ARMs prior to 2005 required that they be excluded from ARM specifications. Levels of significance are indicated by *, **, and *** for 10%, 5%, and 1%, respectively. There are 45 possible MSA pairs.

	Purchase FRMs	Refinance FRMs	Purchase ARMs	Refinance ARMs
<i>MSA*Prepay36</i>	Athens and Milwaukee** Athens and Rochester**	FWB and Athens* FWB and El Paso* FWB and Fresno* FWB and Milwaukee*** FWB and Great Falls** FWB and Rochester*** Saginaw and Milwaukee* Saginaw and Rochester*** Parkersburg and Athens* Parkersburg and Milwaukee** Parkersburg and Rochester***	Athens and Poughkeepsie* Great Falls and Poughkeepsie* Milwaukee and El Paso*** Milwaukee and FWB* Milwaukee and Fresno*** Milwaukee and Poughkeepsie**	Athens and El Paso* Athens and FWB** Athens and Milwaukee* Poughkeepsie and FWB* Rochester and El Paso* Rochester and FWB*** Rochester and Fresno* Rochester and Milwaukee*** Saginaw and FWB*
<i>MSA*Balloon</i>	No significant opposite-sign differences	El Paso and Athens*** El Paso and FWB*** El Paso and Fresno** El Paso and Milwaukee** El Paso and Parkersburg** El Paso and Poughkeepsie** El Paso and Rochester* El Paso and Saginaw*** Great Falls and Saginaw*		
<i>MSA*LowNoDoc</i>	No significant opposite-sign differences	No significant opposite-sign differences	No significant opposite-sign differences	Parkersburg and El Paso** Parkersburg and FWB*** Parkersburg and Fresno* Parkersburg and Milwaukee** Parkersburg and Poughkeepsie* Parkersburg and Rochester** Parkersburg and Saginaw**

Table 11: Changes in the probability of a foreclosure start – LawIndex-loan feature interactions

This table presents results of multinomial logit regressions based on monthly data for loans originated during 2004-2005. Variables are defined as described in Table 2. Each coefficient estimate represents the impact on the probability of a first foreclosure start, relative to the probability of a loan remaining active, of a one-unit change in the corresponding variable. Associated results concerning the probability of prepayment are presented in Table A5 of the Appendix. Coefficient estimates for loan characteristic, macroeconomic, and demographic control variables are similar to those in Table 4, and are omitted here. The dearth of balloon ARMs prior to 2005 required that they be excluded from ARM specifications. Vintage year indicators and a constant term are included in all specifications. Robust standard errors clustered by loan are in parentheses. Levels of significance are indicated by *, **, and *** for 10%, 5%, and 1%, respectively.

	Purchase FRMs			Refinance FRMs			Purchase ARMs			Refinance ARMs		
Panel A: With MSA indicators												
<i>Prepay36</i>	0.430*** (0.080)	0.430*** (0.080)	0.669*** (0.125)	0.148** (0.062)	0.153*** (0.062)	0.153* (0.088)	-0.180*** (0.047)	-0.180*** (0.047)	-0.090 (0.091)	-0.067* (0.040)	-0.069* (0.040)	-0.153* (0.080)
<i>Balloon</i>	-0.763*** (0.111)	-0.762*** (0.111)	-0.696*** (0.188)	-0.365*** (0.131)	-0.363*** (0.131)	-0.503*** (0.193)						
<i>LowNoDoc</i>	0.612*** (0.071)	0.612*** (0.071)	0.672*** (0.109)	0.531*** (0.058)	0.531*** (0.058)	0.749*** (0.087)	0.333*** (0.033)	0.333*** (0.033)	0.359*** (0.049)	0.298*** (0.030)	0.298*** (0.030)	0.349*** (0.043)
<i>LawIndex</i>		-0.035 (0.075)	-0.034 (0.075)		0.225 (0.146)	0.224 (0.146)		-0.012 (0.108)	-0.012 (0.108)		-0.082 (0.074)	-0.082 (0.074)
<i>Prepay36*LawIndex</i>			-0.007*** (0.003)			-0.0003 (0.002)			-0.002 (0.002)			0.002 (0.002)
<i>Balloon*LawIndex</i>			-0.002 (0.004)			0.005 (0.005)						
<i>LowNoDoc*LawIndex</i>			-0.002 (0.003)			-0.007*** (0.002)			-0.001 (0.001)			-0.002 (0.001)
Observations	442,006	441,866	441,866	644,033	643,949	643,949	589,870	589,843	589,843	771,956	771,810	771,810
Loans	17,724	17,718	17,718	23,437	23,435	23,435	27,397	27,395	27,395	40,504	40,493	40,493
Pseudo R ²	0.049	0.049	0.049	0.044	0.044	0.044	0.054	0.054	0.054	0.041	0.041	0.041
Panel B: Without MSA indicators												
<i>Prepay36</i>	0.399*** (0.079)	0.393*** (0.079)	0.586*** (0.124)	0.099* (0.053)	0.096* (0.054)	0.097 (0.082)	-0.227*** (0.046)	-0.239*** (0.046)	-0.257*** (0.091)	-0.040 (0.038)	-0.089** (0.039)	-0.206*** (0.080)
<i>Balloon</i>	-0.753*** (0.111)	-0.771*** (0.111)	-0.730*** (0.190)	-0.371*** (0.131)	-0.373*** (0.131)	-0.494*** (0.192)						
<i>LowNoDoc</i>	0.650*** (0.071)	0.638*** (0.071)	0.693*** (0.108)	0.543*** (0.057)	0.542*** (0.057)	0.757*** (0.085)	0.404*** (0.031)	0.372*** (0.032)	0.324*** (0.050)	0.326*** (0.030)	0.316*** (0.030)	0.335*** (0.043)
<i>LawIndex</i>		0.004** (0.002)	0.007*** (0.002)		0.0003 (0.001)	0.003 (0.002)		0.008*** (0.001)	0.007*** (0.001)		0.004*** (0.001)	0.004*** (0.001)
<i>Prepay36*LawIndex</i>			-0.006** (0.003)			-0.0001 (0.002)			0.0004 (0.002)			0.003* (0.002)
<i>Balloon*LawIndex</i>			-0.001 (0.004)			0.004 (0.005)						
<i>LowNoDoc*LawIndex</i>			-0.002 (0.003)			-0.007*** (0.002)			0.001 (0.001)			-0.001 (0.001)
Observations	442,006	441,866	441,866	644,033	643,949	643,949	589,870	589,843	589,843	771,956	771,810	771,810
Loans	17,724	17,718	17,718	23,437	23,435	23,435	27,397	27,395	27,395	40,504	40,493	40,493
Pseudo R ²	0.044	0.044	0.044	0.042	0.042	0.042	0.049	0.050	0.050	0.037	0.038	0.038

Appendix – Multinomial Logit Results concerning the Probability of Prepayment

Table A1: Changes in the probability of a prepayment – all 10 MSAs pooled

This table presents results of multinomial logit regressions based on monthly data for loans originated during 2002-2006. Variables are defined as described in Table 2. Each coefficient estimate represents the impact on the probability of a prepayment, relative to the probability of a loan remaining active, of a one-unit change in the corresponding variable. Associated results concerning the probability of a first foreclosure start are presented in Table 4. The dearth of balloon ARMs prior to 2005 required that they be excluded from ARM specifications. Vintage year indicators, MSA indicators, and a constant term are included in all specifications. Robust standard errors clustered by loan are in parentheses. Levels of significance are indicated by *, **, and *** for 10%, 5%, and 1%, respectively.

	Purchase FRM	Refinance FRM	Purchase ARM	Refinance ARM
<i>Prepay36</i>	-0.247*** (0.020)	-0.071*** (0.016)	-0.294*** (0.019)	-0.176*** (0.014)
<i>Balloon</i>	0.012 (0.018)	0.149*** (0.024)		
<i>LowNoDoc</i>	0.038** (0.017)	0.0001 (0.016)	-0.005 (0.015)	-0.104*** (0.012)
<i>FICO</i>	-0.0004*** (0.0002)	-0.002*** (0.0001)	0.0003** (0.0001)	-0.001*** (0.0001)
<i>InitialRate</i>	0.162*** (0.006)	0.151*** (0.005)	0.100*** (0.006)	0.061*** (0.004)
<i>Age</i>	0.085*** (0.003)	0.043*** (0.002)	0.082*** (0.002)	0.064*** (0.002)
<i>(Age)²</i>	-0.002*** (0.0001)	-0.001*** (0.0000)	-0.002*** (0.0001)	-0.001*** (0.0000)
<i>LTV</i>	0.009*** (0.001)	0.001 (0.0005)	0.002** (0.001)	-0.004*** (0.0004)
<i>Cashout</i>		0.085*** (0.019)		0.072*** (0.015)
<i>ΔUnemployment</i>	-0.051*** (0.006)	-0.022*** (0.005)	-0.043*** (0.006)	-0.027*** (0.004)
<i>ΔHPI</i>	0.004*** (0.0003)	0.008*** (0.0003)	0.012*** (0.0003)	0.010*** (0.0002)
<i>ΔEffectiveRate</i>	-0.213*** (0.024)	-0.176*** (0.020)	0.068*** (0.021)	0.120*** (0.015)
<i>%Black</i>	-0.002*** (0.001)	-0.001* (0.001)	-0.004*** (0.0005)	-0.004*** (0.0003)
<i>%Hispanic</i>	-0.001 (0.001)	-0.001* (0.001)	-0.001 (0.001)	-0.001* (0.001)
<i>Income</i>	0.004* (0.002)	0.001 (0.002)	0.002 (0.002)	-0.002 (0.001)
Observations	824,825	1,313,676	952,636	1,344,244
Loans	35,080	50,422	46,153	70,735
Pseudo R ²	0.051	0.043	0.061	0.044

Table A2: Changes in the probability of a prepayment by origination year – all 10 MSAs pooled

This table presents results of multinomial logit regressions based on data for the first twenty months of loans originated in each year of the sample period, 2002-2006. Variables are defined as described in Table 2. Each coefficient estimate represents the impact on the probability of a prepayment, relative to the probability of a loan remaining active, of a one-unit change in the corresponding variable. Associated results concerning the probability of a first foreclosure start are presented in Table 5. The dearth of balloon ARMs prior to 2005 required that they be excluded from ARM specifications. MSA indicators and a constant term are included in all specifications. Robust standard errors clustered by loan are in parentheses. Levels of significance are indicated by *, **, and *** for 10%, 5%, and 1%, respectively.

	2002	2003	2004	2005	2006	2002-2003	2004-2006	2002-2004	2005-2006
Purchase FRM									
<i>Prepay36</i>	-0.429*** (0.087)	-0.304*** (0.064)	-0.177*** (0.053)	-0.190*** (0.060)	-0.313*** (0.058)	-0.342*** (0.051)	-0.211*** (0.033)	-0.279*** (0.037)	-0.254*** (0.042)
<i>Balloon</i>	-0.228** (0.104)	-0.057 (0.074)	-0.103** (0.052)	-0.046 (0.045)	-0.083* (0.046)	-0.152*** (0.060)	-0.088*** (0.027)	-0.116*** (0.039)	-0.076** (0.032)
<i>LowNoDoc</i>	-0.218*** (0.082)	0.060 (0.058)	0.106** (0.046)	0.034 (0.042)	0.121*** (0.048)	-0.024 (0.046)	0.083*** (0.026)	0.055* (0.032)	0.078*** (0.032)
Refinance FRM									
<i>Prepay36</i>	-0.283*** (0.066)	-0.053 (0.048)	-0.046 (0.045)	-0.003 (0.040)	-0.088** (0.045)	-0.138*** (0.038)	-0.045* (0.025)	-0.120*** (0.029)	-0.042 (0.030)
<i>Balloon</i>	-0.210* (0.116)	0.108 (0.091)	0.104 (0.078)	0.134** (0.064)	0.152*** (0.049)	-0.038 (0.071)	0.106*** (0.035)	0.045 (0.052)	0.141*** (0.039)
<i>LowNoDoc</i>	0.017 (0.065)	-0.010 (0.045)	0.053 (0.041)	0.036 (0.040)	-0.005 (0.043)	0.008 (0.037)	0.026 (0.024)	0.034 (0.028)	0.023 (0.029)
Purchase ARM									
<i>Prepay36</i>	-0.091 (0.075)	-0.331*** (0.066)	-0.021 (0.046)	-0.269*** (0.056)	-0.409*** (0.078)	-0.249*** (0.048)	-0.172*** (0.032)	-0.167*** (0.033)	-0.314*** (0.046)
<i>LowNoDoc</i>	-0.023 (0.079)	-0.032 (0.054)	0.068 (0.034)	0.145*** (0.032)	0.001 (0.050)	-0.029 (0.045)	0.088*** (0.021)	0.046* (0.027)	0.101*** (0.027)
Refinance ARM									
<i>Prepay36</i>	-0.084 (0.052)	-0.061* (0.037)	-0.002 (0.031)	-0.010 (0.032)	-0.166*** (0.047)	-0.081*** (0.030)	-0.030 (0.020)	-0.072*** (0.021)	-0.063** (0.027)
<i>LowNoDoc</i>	-0.153*** (0.060)	-0.129*** (0.037)	-0.089*** (0.025)	0.0002 (0.024)	-0.062* (0.036)	-0.138*** (0.032)	-0.045*** (0.015)	-0.103*** (0.020)	-0.019 (0.020)

Table A3a: Changes in the probability of a prepayment – purchase FRMs

This table presents results of multinomial logit regressions based on monthly data for purchase fixed-rate mortgages originated during 2002-2006. Variables are defined as described in Table 2. Each coefficient estimate represents the impact on the probability of prepayment, relative to the probability of a loan remaining active, of a one-unit change in the corresponding variable. Associated results concerning the probability of a foreclosure start are presented in Table 7a. Vintage year indicators and a constant term are included in all specifications. MSA indicators are included in the “All 10 MSAs” specification. Robust standard errors clustered by loan are in parentheses. Levels of significance are indicated by *, **, and *** for 10%, 5%, and 1%, respectively.

	Saginaw	Rochester	Athens	Great Falls	Milwaukee	Poughkeepsie	Parkersburg	Fresno	FWB	El Paso	All 10 MSAs
<i>Prepay36</i>	-0.189* (0.102)	-0.186 (0.174)	-0.452*** (0.123)	-0.376** (0.193)	-0.300*** (0.046)	-0.506*** (0.114)	-0.316 (0.312)	-0.186*** (0.030)	-0.198* (0.106)	-0.397*** (0.057)	-0.247*** (0.020)
<i>Balloon</i>	-0.138 (0.101)	-0.180 (0.126)	-0.138 (0.091)	-0.041 (0.211)	0.017 (0.035)	-0.049 (0.057)	0.360 (0.332)	0.066** (0.028)	-0.139 (0.114)	0.053 (0.065)	0.012 (0.018)
<i>LowNoDoc</i>	-0.0004 (0.097)	0.371*** (0.139)	0.154* (0.085)	-0.173 (0.184)	0.126*** (0.036)	-0.026 (0.044)	0.381 (0.279)	0.017 (0.028)	0.070 (0.090)	-0.083* (0.050)	0.038** (0.017)
<i>FICO</i>	0.0002 (0.001)	-0.001 (0.001)	-0.001 (0.001)	-0.002 (0.001)	0.0002 (0.0003)	-0.0002 (0.0004)	-0.001 (0.002)	-0.001*** (0.0003)	-0.001 (0.001)	0.0005 (0.000)	-0.0004*** (0.0002)
<i>InitialRate</i>	0.144*** (0.026)	0.289*** (0.035)	0.167*** (0.023)	0.139*** (0.055)	0.131*** (0.011)	0.213*** (0.015)	0.071 (0.077)	0.158*** (0.011)	0.204*** (0.026)	0.150*** (0.017)	0.162*** (0.006)
<i>Age</i>	0.084*** (0.013)	0.094*** (0.022)	0.091*** (0.017)	0.104*** (0.030)	0.049*** (0.006)	0.118*** (0.009)	0.141*** (0.050)	0.106*** (0.005)	0.066*** (0.014)	0.077*** (0.010)	0.085*** (0.003)
<i>(Age)²</i>	-0.001*** (0.0003)	-0.002*** (0.0004)	-0.001*** (0.0002)	-0.001*** (0.0004)	-0.001*** (0.0001)	-0.002*** (0.0002)	-0.002** (0.001)	-0.002*** (0.0001)	-0.001*** (0.0003)	-0.001*** (0.0001)	-0.002*** (0.0001)
<i>LTV</i>	-0.001 (0.005)	0.003 (0.007)	0.015** (0.006)	-0.0001 (0.009)	0.010*** (0.002)	0.005* (0.002)	0.015 (0.010)	0.014*** (0.002)	0.011** (0.005)	-0.001 (0.003)	0.009*** (0.001)
<i>ΔUnemployment</i>	-0.099*** (0.035)	0.102 (0.093)	-0.097 (0.090)	-0.083 (0.102)	-0.006 (0.029)	-0.011 (0.045)	-0.178 (0.190)	-0.070*** (0.007)	0.113 (0.100)	-0.042 (0.033)	-0.051*** (0.006)
<i>ΔHPI</i>	-0.004 (0.005)	0.024 (0.016)	-0.004 (0.011)	-0.020 (0.016)	0.019*** (0.002)	0.011*** (0.002)	-0.035 (0.030)	0.002*** (0.0005)	0.007*** (0.002)	0.018*** (0.004)	0.004*** (0.0003)
<i>ΔEffectiveRate</i>	-0.303*** (0.118)	0.122 (0.182)	0.033 (0.118)	-0.209 (0.264)	-0.119** (0.052)	-0.211*** (0.065)	-0.568 (0.422)	-0.387*** (0.044)	-0.216 (0.150)	0.007 (0.075)	-0.213*** (0.024)
<i>%Black</i>	0.001 (0.004)	-0.047 (0.054)	0.012** (0.006)	-0.018 (0.297)	-0.001* (0.001)	0.002 (0.004)	0.006 (0.142)	-0.005* (0.003)	0.019 (0.013)	-0.022 (0.019)	-0.002*** (0.001)
<i>%Hispanic</i>	-0.054*** (0.017)	0.105 (0.091)	-0.033** (0.014)	-0.091 (0.287)	0.001 (0.002)	-0.004 (0.004)	1.264 (1.112)	-0.002* (0.001)	-0.107** (0.051)	-0.004 (0.006)	-0.001 (0.001)
<i>Income</i>	-0.003 (0.016)	-0.0000 (0.013)	0.026* (0.015)	0.017 (0.049)	0.001 (0.004)	-0.007 (0.006)	-0.010 (0.050)	0.003 (0.004)	0.005 (0.013)	0.011 (0.015)	0.004* (0.002)
Observations	33,714	18,389	47,164	8,368	144,849	123,768	6,296	248,125	38,836	155,316	824,825
Loans	1,299	727	1,816	339	7,052	5,082	224	11,567	1,517	5,457	35,080
Pseudo R ²	0.038	0.068	0.048	0.055	0.033	0.053	0.091	0.059	0.071	0.034	0.051

Table A3b: Changes in the probability of a prepayment – refinance FRMs

This table presents results of multinomial logit regressions based on monthly data for refinance fixed-rate mortgages originated during 2002-2006. Variables are defined as described in Table 2. Each coefficient estimate represents the impact on the probability of prepayment, relative to the probability of a loan remaining active, of a one-unit change in the corresponding variable. Associated results concerning the probability of a first foreclosure start are presented in Table 7b. Vintage year indicators and a constant term are included in all specifications. MSA indicators are included in the “All 10 MSAs” specification. Robust standard errors clustered by loan are in parentheses. Levels of significance are indicated by *, **, and *** for 10%, 5%, and 1%, respectively.

	Saginaw	Rochester	Athens	Great Falls	Milwaukee	Poughkeepsie	Parkersburg	Fresno	FWB	El Paso	All 10 MSAs
<i>Prepay36</i>	-0.069 (0.080)	-0.279** (0.117)	-0.071 (0.116)	-0.219* (0.129)	-0.108*** (0.028)	-0.314*** (0.079)	-0.230 (0.177)	-0.015 (0.028)	0.129 (0.081)	0.318* (0.190)	-0.071*** (0.016)
<i>Balloon</i>	0.127 (0.129)	-0.057 (0.142)	0.111 (0.145)	0.196 (0.209)	0.097*** (0.038)	-0.018 (0.073)	0.080 (0.306)	0.179*** (0.045)	0.047 (0.161)	1.099 (0.680)	0.149*** (0.024)
<i>LowNoDoc</i>	-0.176* (0.097)	0.421*** (0.116)	0.109 (0.096)	-0.269* (0.147)	0.042 (0.034)	0.029 (0.034)	0.191 (0.235)	-0.031 (0.026)	-0.077 (0.083)	0.367*** (0.124)	0.0001 (0.016)
<i>FICO</i>	0.001 (0.001)	-0.001 (0.001)	-0.001* (0.001)	0.0002 (0.001)	-0.002*** (0.0002)	-0.002*** (0.0003)	0.002 (0.002)	-0.002*** (0.0002)	-0.002*** (0.001)	-0.010*** (0.001)	-0.002*** (0.0001)
<i>InitialRate</i>	0.179*** (0.023)	0.182*** (0.032)	0.129*** (0.029)	0.109*** (0.042)	0.137*** (0.009)	0.219*** (0.012)	0.186*** (0.047)	0.182*** (0.010)	0.180*** (0.022)	0.284*** (0.046)	0.151*** (0.005)
<i>Age</i>	0.035*** (0.009)	0.064*** (0.016)	0.015 (0.019)	0.074*** (0.021)	0.014*** (0.004)	0.069*** (0.006)	0.030 (0.020)	0.050*** (0.004)	0.026*** (0.009)	0.120*** (0.020)	0.043*** (0.002)
<i>(Age)²</i>	-0.001*** (0.0002)	-0.001*** (0.0003)	-0.0005*** (0.0002)	-0.001*** (0.0003)	-0.001*** (0.0001)	-0.002*** (0.0001)	-0.0004* (0.0002)	-0.002*** (0.0001)	-0.001*** (0.0002)	-0.001*** (0.0003)	-0.001*** (0.0000)
<i>LTV</i>	-0.010*** (0.003)	-0.011*** (0.004)	-0.004 (0.003)	-0.007 (0.005)	-0.003*** (0.001)	0.001 (0.001)	-0.007 (0.006)	0.006*** (0.001)	-0.005** (0.002)	0.019*** (0.007)	0.001 (0.0005)
<i>Cashout</i>	0.207** (0.106)	0.060 (0.127)	0.177* (0.102)	0.046 (0.152)	0.015 (0.035)	0.124*** (0.049)	0.150 (0.239)	0.134*** (0.035)	-0.015 (0.095)	0.162 (0.202)	0.085*** (0.019)
<i>ΔUnemployment</i>	0.014 (0.033)	0.0001 (0.084)	-0.024 (0.094)	0.007 (0.079)	-0.027 (0.024)	-0.058* (0.035)	-0.074 (0.121)	-0.033*** (0.006)	0.044 (0.069)	0.041 (0.074)	-0.022*** (0.005)
<i>ΔHPI</i>	0.005 (0.005)	0.009 (0.014)	0.014 (0.014)	0.006 (0.014)	0.022*** (0.002)	0.014*** (0.002)	0.007 (0.022)	0.010*** (0.0004)	0.014*** (0.001)	-0.028*** (0.011)	0.008*** (0.0003)
<i>ΔEffectiveRate</i>	-0.243** (0.104)	-0.359** (0.150)	-0.140 (0.128)	0.309 (0.201)	-0.160*** (0.041)	-0.244*** (0.049)	-0.140 (0.235)	-0.394*** (0.039)	-0.520*** (0.108)	0.233 (0.184)	-0.176*** (0.020)
<i>%Black</i>	-0.008*** (0.003)	-0.064* (0.039)	-0.008 (0.006)	-0.164 (0.210)	-0.001 (0.001)	0.010*** (0.003)	0.095* (0.054)	-0.003 (0.003)	0.008 (0.010)	-0.050 (0.055)	-0.001* (0.001)
<i>%Hispanic</i>	-0.025 (0.016)	0.134** (0.066)	-0.004 (0.017)	0.068 (0.185)	0.001 (0.002)	-0.005 (0.003)	0.621 (0.585)	-0.004*** (0.001)	0.007 (0.036)	-0.013 (0.018)	-0.001* (0.001)
<i>Income</i>	-0.022 (0.015)	0.018 (0.012)	0.005 (0.015)	0.045 (0.035)	0.002 (0.003)	0.001 (0.005)	-0.009 (0.035)	-0.009*** (0.003)	0.018** (0.010)	-0.041 (0.040)	0.001 (0.002)
Observations	68,576	27,904	47,588	17,919	293,151	253,063	13,561	374,760	62,242	154,912	1,313,676
Loans	2,243	1,000	1,616	611	12,270	9,472	459	15,475	2,364	4,912	50,422
Pseudo R ²	0.037	0.040	0.021	0.035	0.032	0.051	0.039	0.062	0.061	0.033	0.043

Table A3c: Changes in the probability of a prepayment – purchase ARMs

This table presents results of multinomial logit regressions based on monthly data for purchase adjustable-rate mortgages originated during 2002-2006. Variables are defined as described in Table 2. Each coefficient estimate represents the impact on the probability of prepayment, relative to the probability of a loan remaining active, of a one-unit change in the corresponding variable. Associated results concerning the probability of a foreclosure start are presented in Table 7c. The dearth of balloon ARMs prior to 2005 required that they be excluded from ARM specifications. Vintage year indicators and a constant term are included in all specifications. MSA indicators are included in the “All 10 MSAs” specification. Robust standard errors clustered by loan are in parentheses. Levels of significance are indicated by *, **, and *** for 10%, 5%, and 1%, respectively.

	Saginaw	Rochester	Athens	Great Falls	Milwaukee	Poughkeepsie	Parkersburg	Fresno	FWB	El Paso	All 10 MSAs
<i>Prepay36</i>	-0.223*** (0.077)	-0.176 (0.118)	-0.279** (0.120)	-0.361 (0.251)	-0.319*** (0.040)	-0.625*** (0.112)	0.074 (0.219)	-0.273*** (0.031)	-0.207*** (0.084)	-0.397*** (0.056)	-0.294*** (0.019)
<i>LowNoDoc</i>	0.045 (0.079)	-0.167 (0.107)	-0.010 (0.075)	-0.259 (0.247)	-0.018 (0.027)	0.019 (0.042)	-0.302 (0.238)	-0.007 (0.024)	-0.0001 (0.077)	-0.086 (0.056)	-0.005 (0.015)
<i>FICO</i>	0.001 (0.001)	0.002 (0.001)	-0.0001 (0.001)	0.005*** (0.002)	0.002*** (0.0002)	-0.001* (0.0004)	0.0005 (0.002)	-0.001*** (0.0002)	-0.002*** (0.001)	0.002*** (0.001)	0.0003** (0.0001)
<i>InitialRate</i>	0.082*** (0.033)	0.154*** (0.051)	0.104*** (0.035)	0.215** (0.108)	0.151*** (0.012)	0.089*** (0.019)	-0.019 (0.077)	0.082*** (0.010)	0.032 (0.023)	0.133*** (0.025)	0.100*** (0.006)
<i>Age</i>	0.132*** (0.013)	0.128*** (0.019)	0.104*** (0.015)	0.121*** (0.038)	0.057*** (0.004)	0.125*** (0.009)	0.129*** (0.032)	0.072*** (0.004)	0.037*** (0.011)	0.147*** (0.013)	0.082*** (0.002)
<i>(Age)²</i>	-0.002*** (0.0003)	-0.002*** (0.0004)	-0.002*** (0.0002)	-0.002*** (0.001)	-0.002*** (0.0001)	-0.003*** (0.0002)	-0.002*** (0.001)	-0.002*** (0.0001)	-0.001*** (0.0002)	-0.003*** (0.0002)	-0.002*** (0.0001)
<i>LTV</i>	0.006 (0.004)	0.003 (0.006)	-0.005 (0.004)	-0.006 (0.010)	-0.004*** (0.001)	0.001 (0.002)	0.014 (0.011)	0.004** (0.002)	0.009** (0.004)	0.004 (0.003)	0.002** (0.001)
<i>ΔUnemployment</i>	-0.094*** (0.028)	-0.167** (0.077)	0.039 (0.066)	-0.121 (0.117)	0.016 (0.020)	-0.079* (0.044)	-0.209* (0.128)	-0.033*** (0.007)	0.011 (0.092)	-0.152*** (0.036)	-0.043*** (0.006)
<i>ΔHPI</i>	0.016*** (0.004)	0.020 (0.014)	0.006 (0.009)	0.008 (0.019)	0.034*** (0.002)	0.019*** (0.002)	0.011 (0.025)	0.012*** (0.0005)	0.015*** (0.002)	0.038*** (0.005)	0.012*** (0.0003)
<i>ΔEffectiveRate</i>	0.185* (0.107)	0.180 (0.152)	0.331*** (0.100)	0.002 (0.300)	0.126*** (0.036)	-0.081 (0.065)	0.275 (0.280)	-0.188*** (0.042)	-0.348*** (0.130)	0.173** (0.080)	0.068*** (0.021)
<i>%Black</i>	0.0005 (0.003)	0.038 (0.051)	-0.008 (0.005)	-0.037 (0.268)	-0.005*** (0.001)	0.001 (0.004)	0.032 (0.077)	-0.007*** (0.003)	-0.018 (0.011)	-0.013 (0.020)	-0.004*** (0.0005)
<i>%Hispanic</i>	-0.067*** (0.013)	-0.081 (0.087)	-0.017 (0.012)	-0.022 (0.234)	-0.002* (0.001)	0.002 (0.004)	-0.404 (0.638)	0.002* (0.001)	-0.092** (0.042)	-0.004 (0.007)	-0.001 (0.001)
<i>Income</i>	-0.006 (0.012)	-0.007 (0.011)	0.010 (0.011)	-0.005 (0.025)	-0.0000 (0.003)	0.004 (0.006)	0.064* (0.037)	0.007** (0.003)	-0.037*** (0.010)	0.019 (0.016)	0.002 (0.002)
Observations	44,382	18,176	61,625	5,057	255,330	102,596	7,290	311,664	48,999	97,517	952,636
Loans	1,990	839	2,493	241	14,180	4,963	321	15,373	2,029	3,724	46,153
Pseudo R ²	0.039	0.047	0.048	0.053	0.042	0.058	0.039	0.089	0.072	0.075	0.061

Table A3d: Changes in the probability of a prepayment – refinance ARMs

This table presents results of multinomial logit regressions based on monthly data for refinance adjustable-rate mortgages originated during 2002-2006. Variables are defined as described in Table 2. Each coefficient estimate represents the impact on the probability of prepayment, relative to the probability of a loan remaining active, of a one-unit change in the corresponding variable. Associated results concerning the probability of a foreclosure start are presented in Table 7d. The dearth of balloon ARMs prior to 2005 required that they be excluded from ARM specifications. Vintage year indicators and a constant term are included in all specifications. MSA indicators are included in the “All 10 MSAs” specification. Robust standard errors clustered by loan are in parentheses. Levels of significance are indicated by *, **, and *** for 10%, 5%, and 1%, respectively.

	Saginaw	Rochester	Athens	Great Falls	Milwaukee	Poughkeepsie	Parkersburg	Fresno	FWB	El Paso	All 10 MSAs
<i>Prepay36</i>	-0.275*** (0.049)	-0.105 (0.076)	-0.512*** (0.112)	-0.141 (0.161)	-0.234*** (0.025)	-0.319*** (0.087)	-0.101 (0.164)	-0.100*** (0.020)	-0.203*** (0.066)	-0.198* (0.117)	-0.176*** (0.014)
<i>LowNoDoc</i>	-0.147*** (0.058)	-0.003 (0.087)	-0.135* (0.075)	-0.067 (0.166)	-0.147*** (0.020)	-0.089*** (0.029)	-0.217 (0.190)	-0.066*** (0.019)	-0.246*** (0.070)	-0.153** (0.070)	-0.104*** (0.012)
<i>FICO</i>	0.001* (0.001)	0.0004 (0.001)	-0.002*** (0.001)	-0.001 (0.001)	0.0004** (0.0002)	-0.001*** (0.0003)	0.003 (0.002)	-0.002*** (0.0002)	-0.002*** (0.001)	0.0005 (0.001)	-0.001*** (0.0001)
<i>InitialRate</i>	0.027 (0.018)	0.097*** (0.033)	0.012 (0.024)	-0.006 (0.048)	0.076*** (0.007)	0.084*** (0.011)	0.252*** (0.066)	0.055*** (0.006)	0.038* (0.020)	0.061** (0.026)	0.061*** (0.004)
<i>Age</i>	0.087*** (0.007)	0.092*** (0.014)	0.049*** (0.015)	0.158*** (0.032)	0.032*** (0.003)	0.079*** (0.005)	0.124*** (0.026)	0.073*** (0.003)	0.079*** (0.010)	0.091*** (0.013)	0.064*** (0.002)
<i>(Age)²</i>	-0.001*** (0.0001)	-0.002*** (0.0002)	-0.002*** (0.0002)	-0.002*** (0.0004)	-0.001*** (0.0001)	-0.002*** (0.0001)	-0.002*** (0.0004)	-0.002*** (0.0001)	-0.002*** (0.0002)	-0.002*** (0.0002)	-0.001*** (0.0000)
<i>LTV</i>	-0.013*** (0.002)	-0.007** (0.004)	-0.001 (0.003)	-0.003 (0.006)	-0.004*** (0.001)	-0.004*** (0.001)	-0.023*** (0.007)	-0.002*** (0.001)	-0.005** (0.002)	-0.004 (0.003)	-0.004*** (0.0004)
<i>Cashout</i>	0.050 (0.064)	0.126 (0.089)	0.119* (0.072)	-0.297* (0.160)	0.062*** (0.023)	0.038 (0.046)	-0.060 (0.191)	0.115*** (0.031)	-0.060 (0.092)	0.025 (0.086)	0.072*** (0.015)
<i>ΔUnemployment</i>	-0.021 (0.020)	-0.067 (0.058)	0.100 (0.068)	-0.139 (0.088)	0.016 (0.014)	-0.152*** (0.030)	-0.038 (0.095)	-0.033*** (0.005)	-0.036 (0.073)	-0.040 (0.041)	-0.027*** (0.004)
<i>ΔHPI</i>	0.015*** (0.003)	0.024** (0.011)	0.039*** (0.010)	0.002 (0.015)	0.032*** (0.001)	0.013*** (0.001)	-0.018 (0.020)	0.010*** (0.0003)	0.012*** (0.001)	0.036*** (0.006)	0.010*** (0.0002)
<i>ΔEffectiveRate</i>	0.197*** (0.067)	0.129 (0.099)	0.266*** (0.095)	-0.155 (0.234)	0.062*** (0.024)	0.032 (0.043)	0.410* (0.214)	-0.092*** (0.031)	-0.109 (0.109)	0.356*** (0.096)	0.120*** (0.015)
<i>%Black</i>	-0.005** (0.002)	-0.003 (0.026)	-0.001 (0.004)	0.027 (0.218)	-0.004*** (0.0004)	0.006*** (0.003)	0.034 (0.056)	-0.002 (0.002)	-0.009 (0.009)	0.021 (0.026)	-0.004*** (0.0003)
<i>%Hispanic</i>	-0.029*** (0.010)	0.039 (0.045)	-0.016 (0.012)	-0.070 (0.175)	-0.004*** (0.001)	-0.006** (0.003)	-0.202 (0.532)	-0.0005 (0.001)	0.050 (0.031)	0.004 (0.008)	-0.001* (0.001)
<i>Income</i>	0.009 (0.010)	0.0003 (0.009)	0.014 (0.010)	0.040 (0.040)	-0.003 (0.002)	0.005 (0.004)	0.013 (0.028)	-0.004 (0.003)	-0.012 (0.008)	0.037** (0.019)	-0.002 (0.001)
Observations	95,982	32,685	48,613	9,327	494,190	165,597	11,648	392,581	46,124	47,497	1,344,244
Loans	3,966	1,480	2,009	383	26,770	9,059	449	22,411	2,209	1,999	70,735
Pseudo R ²	0.037	0.041	0.032	0.050	0.033	0.039	0.045	0.065	0.072	0.043	0.044

Table A4: Changes in the probability of a prepayment – MSA-loan feature interactions

This table presents results of multinomial logit regressions based on monthly data for loans originated during 2002-2006. Variables are defined as described in Table 2. Each coefficient estimate represents the impact on the probability of prepayment, relative to the probability of a loan remaining active, of a one-unit change in the corresponding variable. Associated results concerning the probability of a first foreclosure start are presented in Table 9. Coefficient estimates for loan characteristic, macroeconomic, and demographic control variables are similar to those in Table A1, and are omitted here. The dearth of balloon ARMs prior to 2005 required that they be excluded from ARM specifications. Vintage year indicators and a constant term are included in all specifications. Robust standard errors clustered by loan are in parentheses. Levels of significance are indicated by *, **, and *** for 10%, 5%, and 1%, respectively.

	Purchase FRMs				Refinance FRMs			
<i>Prepay36</i>	-0.177*** (0.029)				0.025 (0.028)			
<i>Balloon</i>	0.104*** (0.027)				0.427*** (0.043)			
	<i>MSA interactions with:</i>				<i>MSA interactions with:</i>			
<i>LowNoDoc</i>	<i>Prepay36</i>	<i>Balloon</i>	<i>LowNoDoc</i>		<i>Prepay36</i>	<i>Balloon</i>	<i>LowNoDoc</i>	
	(0.026)			(0.027)				
<i>Saginaw</i>	-0.337 (0.071)	-0.033 (0.103)	-0.273*** (0.096)	0.097 (0.092)	-0.446*** (0.073)	-0.170** (0.080)	-0.322*** (0.127)	0.045 (0.091)
<i>Rochester</i>	-0.358 (0.090)	0.033 (0.155)	-0.108 (0.114)	0.376*** (0.110)	-0.228*** (0.082)	-0.182* (0.098)	-0.619*** (0.136)	0.555*** (0.102)
<i>Athens</i>	-0.478 (0.066)	-0.256** (0.123)	-0.167** (0.084)	0.182** (0.080)	-0.470*** (0.072)	-0.097 (0.103)	-0.386*** (0.141)	0.255*** (0.092)
<i>Great Falls</i>	0.035 (0.115)	-0.225 (0.189)	-0.171 (0.181)	-0.096 (0.162)	-0.056 (0.107)	-0.346*** (0.120)	-0.228 (0.182)	0.040 (0.129)
<i>Milwaukee</i>	0.054 (0.041)	-0.131** (0.056)	-0.144*** (0.044)	0.197*** (0.043)	0.046 (0.041)	-0.132*** (0.039)	-0.391*** (0.056)	0.156*** (0.042)
<i>Poughkeepsie</i>	-0.194 (0.043)	-0.314*** (0.119)	-0.174*** (0.056)	0.005 (0.048)	-0.032 (0.037)	-0.346*** (0.082)	-0.399*** (0.075)	0.050 (0.042)
<i>Parkersburg</i>	-0.698 (0.163)	-0.038 (0.268)	0.109 (0.258)	0.234 (0.254)	-0.413*** (0.114)	-0.298* (0.152)	-0.405 (0.267)	0.291 (0.200)
<i>FWB</i>	-0.354 (0.074)	0.110 (0.101)	-0.110 (0.103)	0.042 (0.086)	-0.309*** (0.075)	0.047 (0.077)	-0.310** (0.152)	0.081 (0.082)
<i>El Paso</i>	-0.565 (0.052)	-0.199*** (0.059)	-0.165*** (0.062)	0.010 (0.052)	-0.406*** (0.047)	-0.243*** (0.072)	0.071 (0.367)	-0.019 (0.054)
	Obs.	Loans	Pseudo R ²		Obs.	Loans	Pseudo R ²	
	824,825	35,080	0.051		1,313,676	50,422	0.044	
	Purchase ARMs				Refinance ARMs			
<i>Prepay36</i>	-0.291*** (0.032)				-0.121*** (0.021)			
<i>LowNoDoc</i>	-0.039 (0.025)				-0.086*** (0.019)			
	<i>MSA interactions with:</i>				<i>MSA interactions with:</i>			
	<i>Prepay36</i>		<i>LowNoDoc</i>		<i>Prepay36</i>		<i>LowNoDoc</i>	
<i>Saginaw</i>	0.114** (0.053)	0.099 (0.079)	0.111 (0.073)		-0.315*** (0.037)	-0.104** (0.049)	0.008 (0.054)	
<i>Rochester</i>	0.362*** (0.065)	0.143 (0.108)	-0.090 (0.091)		-0.200*** (0.051)	0.113* (0.067)	0.100 (0.075)	
<i>Athens</i>	-0.136*** (0.046)	0.037 (0.118)	0.025 (0.073)		-0.249*** (0.041)	-0.338*** (0.108)	-0.083 (0.071)	
<i>Great Falls</i>	0.223** (0.098)	-0.036 (0.206)	0.069 (0.183)		-0.321*** (0.076)	-0.007 (0.137)	-0.015 (0.138)	
<i>Milwaukee</i>	0.485*** (0.031)	-0.077 (0.049)	0.110*** (0.035)		0.143*** (0.022)	-0.120*** (0.030)	-0.023 (0.027)	
<i>Poughkeepsie</i>	0.222*** (0.038)	-0.332*** (0.113)	0.010 (0.045)		0.070*** (0.025)	-0.338*** (0.084)	-0.023 (0.034)	
<i>Parkersburg</i>	-0.020 (0.102)	0.333* (0.198)	-0.237 (0.216)		-0.581*** (0.083)	0.061 (0.139)	0.028 (0.163)	
<i>FWB</i>	-0.266*** (0.058)	0.122 (0.090)	-0.143* (0.076)		-0.196*** (0.046)	-0.079 (0.065)	-0.218*** (0.064)	
<i>El Paso</i>	-0.284*** (0.043)	0.046 (0.055)	0.022 (0.049)		-0.434*** (0.040)	0.028 (0.103)	-0.005 (0.062)	
	Obs.	Loans	Pseudo R ²		Obs.	Loans	Pseudo R ²	
	952,636	46,153	0.062		1,344,244	70,735	0.044	

Table A5: Changes in the probability of a prepayment – LawIndex-loan feature interactions

This table presents results of multinomial logit regressions based on monthly data for loans originated during 2004-2005. Variables are defined as described in Table 2. Each coefficient estimate represents the impact on the probability of prepayment, relative to the probability of a loan remaining active, of a one-unit change in the corresponding variable. Associated results concerning the probability of a first foreclosure start are presented in Table 11. Coefficient estimates for loan characteristic, macroeconomic, and demographic control variables are similar to those in Table A1, and are omitted here. MSA indicators are included in the top regressions, excluded in the bottom ones. The dearth of balloon ARMs prior to 2005 required that they be excluded from ARM specifications. Vintage year indicators and a constant term are included in all specifications. Robust standard errors clustered by loan are in parentheses. Levels of significance are indicated by *, **, and *** for 10%, 5%, and 1%, respectively.

	Purchase FRMs			Refinance FRMs			Purchase ARMs			Refinance ARMs		
Panel A: With MSA indicators												
<i>Prepay36</i>	-0.226*** (0.029)	-0.226*** (0.029)	-0.331*** (0.051)	-0.062*** (0.024)	-0.062*** (0.024)	-0.144*** (0.035)	-0.285*** (0.026)	-0.286*** (0.026)	-0.310*** (0.045)	-0.145*** (0.019)	-0.146*** (0.019)	-0.264*** (0.040)
<i>Balloon</i>	0.064*** (0.024)	0.064*** (0.024)	0.016 (0.039)	0.201*** (0.038)	0.201*** (0.038)	0.036 (0.055)						
<i>LowNoDoc</i>	0.019 (0.023)	0.019 (0.023)	0.061* (0.036)	0.020 (0.023)	0.020 (0.023)	0.094*** (0.036)	0.009 (0.018)	0.009 (0.018)	0.031 (0.027)	-0.091*** (0.014)	-0.092*** (0.014)	-0.076*** (0.022)
<i>LawIndex</i>		0.040 (0.057)	0.041 (0.057)		-0.007 (0.067)	-0.004 (0.067)		-0.147*** (0.040)	-0.147*** (0.040)		-0.091* (0.050)	-0.092* (0.050)
<i>Prepay36*LawIndex</i>			0.003*** (0.001)			0.002*** (0.001)			0.001 (0.001)			0.002*** (0.001)
<i>Balloon*LawIndex</i>			0.001 (0.001)			0.005*** (0.001)						
<i>LowNoDoc*LawIndex</i>			-0.001 (0.001)			-0.002*** (0.001)			-0.001 (0.001)			-0.0004 (0.0005)
Observations	442,006	441,866	441,866	644,033	643,949	643,949	589,870	589,843	589,843	771,956	771,810	771,810
Loans	17,724	17,718	17,718	23,437	23,435	23,435	27,397	27,395	27,395	40,504	40,493	40,493
Pseudo R ²	0.049	0.049	0.049	0.044	0.044	0.044	0.054	0.054	0.054	0.041	0.041	0.041
Panel B: Without MSA indicators												
<i>Prepay36</i>	-0.226*** (0.029)	-0.233*** (0.029)	-0.416*** (0.052)	-0.004 (0.021)	-0.009 (0.022)	0.097 (0.082)	-0.364*** (0.025)	-0.362*** (0.025)	-0.257*** (0.091)	-0.225*** (0.018)	-0.207*** (0.018)	-0.486*** (0.039)
<i>Balloon</i>	0.089*** (0.024)	0.076*** (0.024)	0.026 (0.040)	0.270*** (0.037)	0.263*** (0.038)	-0.494*** (0.192)						
<i>LowNoDoc</i>	0.034 (0.022)	0.022 (0.023)	-0.011 (0.036)	0.021 (0.022)	0.020 (0.022)	0.757*** (0.085)	-0.001 (0.018)	0.012 (0.018)	0.324*** (0.050)	-0.088*** (0.014)	-0.084*** (0.014)	-0.092*** (0.022)
<i>LawIndex</i>		0.003*** (0.0005)	0.001** (0.001)		0.001 (0.0005)	0.003 (0.002)		-0.003*** (0.0004)	0.007*** (0.001)		-0.002*** (0.0003)	-0.003*** (0.0004)
<i>Prepay36*LawIndex</i>			0.005*** (0.001)			-0.0001 (0.002)			0.0004 (0.002)			0.006*** (0.001)
<i>Balloon*LawIndex</i>			0.001 (0.001)			0.004 (0.005)						
<i>LowNoDoc*LawIndex</i>			0.001 (0.001)			-0.007*** (0.002)			0.001 (0.001)			0.0003 (0.0005)
Observations	442,006	441,866	441,866	644,033	643,949	643,949	589,870	589,843	589,843	771,956	771,810	771,810
Loans	17,724	17,718	17,718	23,437	23,435	23,435	27,397	27,395	27,395	40,504	40,493	40,493
Pseudo R ²	0.044	0.044	0.044	0.042	0.042	0.042	0.049	0.050	0.050	0.037	0.038	0.038