Loan Contracting in the Presence of Usury Limits: Evidence from Automobile Lending

DRAFT 2

Brian Melzer*and Aaron Schroeder[†,‡]

September 25, 2015

Abstract

We study the effects of interest rate ceilings on the market for automobile loans. Binding usury limits do not prevent high-risk borrowers from receiving credit. We find instead that loan contracting and the organization of the loan market adjust to facilitate loans to risky borrowers. When usury restrictions bind, auto dealers finance a greater share of their customers' purchases and raise the vehicle sales price (and loan amount) relative to the value of the underlying collateral. By doing so, they arrange loans with similar monthly payments and price credit risk through the mark-up on the product sale rather than the loan interest rate. Meanwhile, risky borrowers that choose non-dealer loans receive lower interest rates as intended by the law, but also receive smaller loans relative to the value of the collateral. Despite having little effect on who

*b-melzer@kellogg.northwestern.edu; Kellogg School of Management, Northwestern University, 2001 Sheridan Road, Evanston, IL 60208

†Aaron.Schroeder@cfpb.gov; Consumer Financial Protection Bureau, 301 Howard St., Ste. 1200 San Francisco, CA 94105

‡The views expressed are those of the author and do not necessarily reflect those of the Consumer Financial Protection Bureau or the United States. We thank Neale Mahoney for helpful suggestions. We are also grateful for feedback received at the Consumer Financial Protection Bureau Bag Lunch, George Washington School of Business-Federal Reserve Board Financial Literacy Seminar, Kellogg Finance Bag Lunch, Midwest Finance Association 2015 Annual Meeting and Yale University-Innovations for Poverty Action Conference on Financial Inclusion. We thank Paolina Medina-Palma for research assistance.

receives credit, usury limits therefore have a substantial effect on who provides credit and on the terms of credit granted.

1 Introduction

Regulation shapes consumer credit markets in many ways, whether by governing the disclosure of loan terms, promoting fair access to credit, or even placing a ceiling on interest rates. In this paper, we explore how interventions of the latter type — usury restrictions — influence the market for automobile loans. Usury restrictions are often motivated by the argument that lenders, if unchecked, will exercise market power and raise interest rates on risky borrowers beyond the level required to compensate for credit losses. Supporters of usury limits thus argue that lenders will respond to interest rate caps by extending credit at lower prices. Opponents counter that price ceilings will cause credit rationing, which reduces access to credit and harms precisely the risky borrowers that supporters of usury limits intend to help.

We find that neither of these theories fully describes the impact of usury limits on the market for subprime auto loans. Instead, we find that auto dealers creatively contract around binding usury limits by financing their customers' purchases and pricing default risk through the mark-up on the vehicle sale rather than through the interest rate. In the resulting equilibrium, we find that few borrowers, if any, are excluded from the market, but that auto dealers provide captive financing for a larger share of auto purchases and borrowers face different loan terms—lower interest rates but larger loan-to-value ratios—than they would in the absence of usury limits.

The strategy pursued by auto dealers is simple. Auto loans are structured as installment contracts that require constant monthly payments for a fixed maturity (typically 3-6 years) and allow the lender to repossess the vehicle if the borrower defaults. Holding fixed the

loan maturity and principal amount, a lender is typically constrained to adjust the monthly payment by changing the interest rate specified in the contract. When prevented from charging an interest rate sufficient for a borrower's credit risk, the lender can only serve the borrower profitably by reducing risk, for example by requiring more collateral relative to the loan amount. For a lender that also serves as the vehicle seller, however, there is an additional degree of freedom. The integrated dealer-lender can design an installment contract with the desired monthly loan payment and similar risk profile by increasing the loan amount rather than the interest rate. This strategy is not feasible without integration of sales and lending, since increasing the loan amount requires the lender to provide more cash to the borrower at origination for no compensation (the monthly loan payment and collateral are unchanged)—indeed, as discussed above, we would expect a third-party lender to reduce the loan amount relative to collateral value. The integrated dealer-lender, meanwhile, internalizes the benefit from selling the vehicle at a larger mark-up, so can subsidize a negative net present value loan with a higher-margin sale. The dealer ultimately trades the same collateral for the same monthly payment, regardless of the contractually-specified loan amount and interest rate, so is indifferent between the interest rate-constrained and the interest rate-unconstrained contract.

Drawing on these insights, we answer the following four questions. First, do usury limits prevent risky borrowers from obtaining auto loans? Second, are auto dealers more likely to provide credit when usury limits are more binding? Third, in transactions where usury limits are more likely to bind, do dealers provide loans with lower interest rates, but similar loan payments and larger loan amounts relative to the collateral value? Fourth, do non-dealer loans display the opposite pattern, with the loan-to-value ratios decreasing (and collateral protection increasing) when the usury limit binds?

Our primary analysis uses detailed data on used automobile transactions compiled by Experian. The data pair information on vehicle transactions—vehicle type, estimated value, lienholder name, dealer name and location—with information from the purchaser's credit

record—loan amount, payment and duration, in addition to credit score. The full sample covers approximately 28 million vehicle sales between January 2011 and August 2013. In further analysis we use the Consumer Financial Protection Bureau's (CFPB) Consumer Credit Panel, a national sample of de-identified consumer credit records.

Despite receiving relatively little attention in recent studies of consumer credit markets, usury limits matter for a significant proportion of auto loan transactions. The majority of states limit interest rates, with ceilings ranging between 17 and 36 percent. Moreover, a thriving market for auto loans exists among subprime customers, which means that many borrowers do not qualify for interest rates beneath these ceilings. In the first half of 2014, 31%, or $70.7 billion, of auto loans went to consumers with credit scores below 640 (Equifax, 2014). Finally, the strategy by which national credit card and mortgage lenders have typically avoided usury limits—chartering as a national bank exempt from state lending laws or locating in a state without usury limits such as South Dakota—proves infeasible for most auto loans. Specifically, the local dealer's involvement as a credit intermediary has led banks to follow the lending laws applicable in the dealer's state rather than their own jurisdiction.

Although usury limits do indeed bind for many borrowers, we find little evidence that these restrictions prevent households from obtaining auto loans. Comparing states with and without usury limits, we observe a similar distribution of borrowing across credit scores. The riskiest borrowers therefore continue to receive auto loans, and comprise a similar share of borrowers, regardless of whether a state imposes an interest rate ceiling. This finding holds not only in the cross-section of states, but also in the time-series for Arkansas, which raised its usury limit from below 10% to 17% in the late-2000s. The share of auto loans granted to subprime borrowers in Arkansas tracks closely with peer states both leading up to, and following, the change in usury limit.

In contrast, we find that the organization of the vehicle loan market changes quite dramatically in the presence of usury limits. Integrated dealer-lenders provide a larger proportion of loans to subprime borrowers in states with usury limits. Notably, the likelihood of dealer

financing is not uniformly higher in these states. Rather, dealer financing increases particularly for subprime borrowers, for whom usury limits are more likely to bind. These findings are consistent with our hypothesis that auto dealers play an important role in facilitating loans for risky borrowers that cannot receive credit from outside lenders.

Next, we examine loan contracting, beginning with dealer-financed loans. In a simple descriptive analysis of loans in Arkansas, the state with the most stringent usury limit, we show striking evidence that loan-to-value ratios adjust upward to price credit risk when interest rates are constrained. Meanwhile, monthly loan payments trend upward with credit risk but do not rise disparately in Arkansas relative to California, the largest state without a usury restriction.

To provide more comprehensive evidence on the impact of usury limits, we use regression analysis to control for heterogeneity in borrowers and vehicles. We use a two-stage regression procedure. First, we predict the likelihood that a borrower faces a binding usury ceiling, given the borrower's credit score and the usury ceiling in his state. Second, we use the first-stage predictions in a model that quantifies the difference in loan terms where the usury ceiling is predicted to bind. The identifying variation in our model comes from variation in the tightness of usury limits across states. This two-stage procedure allows us to avoid using an endogenous measure–the realized interest rate–when measuring the extent to which the usury ceiling binds.

We find that usury limits are effective in reducing interest rates, but also lead to higher loan-to-value ratios in dealer-financed loans. Our estimates imply that a binding usury limit reduces interest rates by six-to-eight percentage points, on average. Consistent with the prediction that borrowers take out larger loans and pay higher prices relative to collateral value, we find that loan-to-value ratios increase substantially, by roughly 70 percentage points, when usury limits bind. For the bottom-line price of credit, the monthly loan payment, we find no difference due to binding usury restrictions.

The final portion of our analysis examines the terms of non-dealer loans. The regres-

sion analysis again shows that interest rates decline when usury limits bind, by a similar magnitude as for dealer-financed loans. Loan-to-value ratios, on the other hand, change in the opposite direction as in the sample of dealer loans: we observe significantly *lower* loan-to-value ratios when the usury limit binds. This evidence suggests that lenders strengthen collateral requirements in order to serve borrowers for whom the interest rate limit binds. The contrast in findings between the dealer and non-dealer samples fits with our predictions outlined above. Dealers can price credit risk by raising sales prices and loan amounts, whereas non-dealers must mitigate risk in order to profitably serve borrowers for whom they cannot charge sufficiently high interest rates. The contrast in findings is also relevant when interpreting the evidence on dealer loans. The elevated loan-to-value ratios that we observe among dealer loans are specific to that subset of loans, and are not symptomatic, therefore, of an omitted variable correlated with state usury restrictions.

Our paper contributes most directly to the literature on usury restrictions. Though our paper is the first to study the impact of usury restrictions on subprime auto lending, we build on a series of related papers (Adams et al. (2009); Einav et al. (2012);Einav et al. (2013)) that use data from a single auto dealer to explore the role of liquidity constraints in borrowing, the effect of credit scoring on firm profitability and the optimal design of loan contracts. This paper also relates to a larger literature on market participants' behavior under constraints, such as Attanasio et al. (2008) and Johnson and Li (2010). Attanasio et al. found, using auto loan data in the Consumer Expenditure Survey, consumers' responsiveness to different loan characteristics change with income. This matches the commonly held belief that high-income, unconstrained consumers shop on total price measures such as interest rate, while subprime consumers focus on periodic costs such as monthly payment and loan term. If consumers indeed focus on some loan outcomes more than others, this would more easily allow lenders to avoid usury limits. Similarly, Assunção et al. (2013) examines the impact of changes in expected return on assets via changes in repossession laws, and finds impacts to both access to credit and terms offered. Additionally, examination of the impacts of

usury cap restrictions on other loan characteristics mirrors the literature on attribute-based regulation, including Ito and Sallee (2014), which examines the impact of basing vehicle gas mileage standards on weight, and finds bunching near the limits occurring as a result. Finally, the ability of some subprime dealers to retain profits from both the financing of the vehicle as well as the overall sale price resembles many features of the captive auto financing market. That industry features in a long line of literature, such as Barron et al. (2008), which examines the changes to credit standards resulting from the bundling of durable goods with financial products.

2 The Market for Vehicle Financing

Automobile dealers play an integral role in facilitating loans for their customers. Among "prime" customers, who have relatively strong credit histories and low risk of default, dealers often arrange financing for the customer at the time of the sale.[1] Although these dealers play a role in brokering and pricing loans, they rarely act as the lender and they serve few customers for whom interest rate restrictions bind.

Our analysis focuses primarily on the segment of the auto dealer market that serves "subprime" customers, for whom default risk is high and for whom interest rate restrictions may bind. Many dealers in this segment of the market do not simply arrange loans, they actually finance their customers' purchases. In industry parlance, these locations are Buy Here Pay Here (BHPH) dealers, meaning that they sell the vehicle and also collect the recurring loan payments at the dealership.

BHPH dealers are typically independent from vehicle manufacturers and sell used cars that are older and of lower value than the inventory carried by dealers serving prime customers.[2] Customers do not shop for a particular vehicle and then negotiate a purchase price

[1] Relatively few customers — less than 20% of those who finance purchases — arrange financing directly with a lender prior to negotiating the final sale of the vehicle. Much more commonly, the dealer arranges financing for the customer at the time of the sale. Davis (2012) estimates roughly 80 percent of consumers who finance a vehicle purchase use this "indirect" method in which the dealer serves as an intermediary.

[2] In principle, our insights apply to vehicle financing of all types, including financing of new car purchases.

contingent on financing. Instead, BHPH transactions usually begin with loan underwriting, as the salesperson reviews the customer's credit history, current income and major expenses, and specifies the maximum monthly loan payment for which the customer qualifies. The customer then examines the vehicles for which this payment qualifies them, and the negotiation proceeds from there to find an acceptable vehicle and agree upon the down payment and loan terms. An important aspect of this sales process, from the perspective of our analysis, is that it treats the purchase and financing as a bundle. The price of the vehicle and the loan are not presented and negotiated separately.

Our study evaluates the role of usury restrictions in encouraging dealer financing. We acknowledge, however, that there are other market frictions that may encourage dealer financing among subprime buyers. Dealers may, for example, gather useful information about borrower credit risk during the sales process, giving them an underwriting advantage over outside lenders. Dealers may also have an advantage in recovering value from defaulted loans since they can avoid transactions costs and liquidate collateral through their own dealership. Our analysis does not examine these motivations for dealer financing.

2.1 Loan Contracting with Arm's Length Financing

To clarify the way in which dealer financing changes loan contracting, we offer a stylized model of the vehicle sales and financing process. Figure 1 summarizes the cash flows among the dealer, customer and lender.

The customer and dealer agree to a sales contract in which the dealer exchanges the vehicle for a price (P), to be funded at the closing through a down payment (D) from the borrower and a payment (L) from the lender to the dealer. The borrower and lender, in turn, agree to a loan contract specifying the loan amount (L, transferred to the dealer on the borrower's behalf), the schedule of promised loan payments to be paid by the borrower, and the collateral that the lender can repossess and liquidate in the event of default. The

Usury restrictions, however, have little practical impact for the vast majority of customers that buy new cars, which have higher values.

loan's interest rate or finance charge is calculated in accordance with state law, r = f(L, PMT). If the loan amount and recurring loan payment imply an interest rate above the usury limit ($r > r_{usury}$), the transaction is not feasible. An important constraint is that the cash transferred to the dealer (L) is recorded as the loan amount and the lender cannot arbitrarily mark up the loan amount in the contract to conform with the usury restriction.

The zero profit constraint for the lender is that the discounted value of expected loan cash flows (loan payments and collateral liquidation) equal or exceed its payment of L to the dealer. If the break-even interest rate exceeds the usury rate, the only way to facilitate a transaction is for the lender to reduce the risk of default, for example by increasing the down payment (and reducing L relative to the collateral value), which lessens moral hazard-related default and allows for a lower break-even interest rate.

2.2 Loan Contracting with Dealer Financing

Figure 2 summarizes the cash flows and contracting for a purchase using dealer financing. Dealer financing expands the set of feasible loan contracts in the presence of usury limits. The reason is that the payment L on the borrower's behalf from the lender to the dealer never changes hands, so does not constrain the stated principal balance in the borrower's loan contract. When a usury restriction limits the interest rate, the loan amount can be adjusted upward to get the desired loan payment. For example, a 36-month amortizing loan with a constant payment of $382 per month can be specified as a $9,000 loan at 30% interest or a $10,280 loan at 20% interest. Whether there is a usury limit at 20% or not, in the end the dealer can exchange the same collateral for the same down payment and promised loan payments. The sales contract likewise can be adjusted to increase the stated sales price P, so that there remains a fair exchange of value in the sale (P = D + L).

While the loan payment can be replicated by raising the loan amount rather than the interest rate, the two loan contracts will differ slightly. A loan with a higher loan amount and lower interest rate will amortize more slowly, so borrowers that repay early owe a larger

repayment amount. For borrowers that make all promised loan payments, then, the cash flows are identical and the borrower is indifferent between the two contracts. Borrowers that anticipate prepaying the contract, however, will prefer the '"unconstrained" contract with higher interest rate and lower loan amount. As a practical matter, the cash flow differences are fairly small. Returning to the sample loan discussed above, Table 1 shows the slower amortization of principal in the 20% interest loan. After one year, the repayment amount on the 20% loan is $7,507, roughly 10% higher than the repayment amount of $6,833 on the 30% loan and after two years the repayment amounts only differ by $200.

Though it is tempting to say that moral hazard is greater for borrowers with larger loan amounts, this is not the case. Moral hazard depends on the present value of loan payments relative to the value of the collateral. If the present value of the loan payments is higher relative to the collateral at a given point in time, then there will be more moral hazard-related default.

The provision of credit through dealers thus nearly eliminates any distortion introduced by usury restrictions. One additional consideration is the market power of dealers. If there is similar competition among dealers as among outside lenders, dealer financing is a good substitute for outside financing. On the other hand, if the dealer market is uncompetitive, then eliminating competition from outside lenders and forcing the financing to run through the dealer may increase the price of credit for consumers.

3 Data Sources and Sample Description

3.1 Data Sources

Our main data source is Experian's AutoCount® database, which contains deidentified information on automobile purchases and consumer credit information. Information within the database includes measures for a consumer credit score, interest rate, loan term, monthly payment, loan amount, vehicle value, and LTV; it does not include the actual sale price of

the transaction or the loan down payment.

A pertinent feature of the AutoCount data is aggregation. While the records underlying AutoCount are at the transaction level, Experian only releases aggregated statistics - the count of transactions and the average transaction characteristics - for specified transaction groupings. The observations underlying our analysis of loan contracts are at the level of dealer-lender-month-credit score bin (20 point intervals). For each "cell" we observe the number of transactions and the average of each variable (e.g. average interest rate, loan amount, vehicle value, etc.) within the cell. The period of analysis covered by the data used here ranges from January 2011 through August 2013.

While the AutoCount data over this period provides information about both type of lender involved in funding the loan and the value of the collateral, it lacks coverage of events where usury limits within a state changed. In order to consider the impacts of such an event we rely on the CFPB's Consumer Credit Panel (CCP), a longitudinal sample of approximately 5 million de-identified credit records that is nationally representative of the credit records maintained by one of the national credit reporting agencies. The data used to estimate auto transactions relative to the general population comes from December 2012, while analysis of loan characteristics relies on tradelines reported by nonbank auto finance companies and appearing on credit reports as of March 2014.

For both sets of data we attempted to control for demographic characteristics, including age, household income, cost of living, public assistance, and employment by using tract-level data from the 2011 5-year American Community Survey sample. We also supplement both sets of data with information on state usury limits. We compiled the usury limits directly from state laws and statutes, cross-checking our list of relevant laws with those reported in the National Consumer Law Center publication The Cost of Credit (2009).

4 Examining the Impact of Usury Limits on the Market for Auto Loans

4.1 Description of Usury Limits Across States

Twenty nine states impose an interest rate ceiling on auto loans. The restrictions follow one of three structures. Most commonly, states impose a single maximum interest rate applicable to all auto loans; twelve states fall into this category.[3] Another group of states impose a maximum interest rate that varies with the age of the vehicle financed. The ceiling is always increasing in the age of the vehicle and typically varies by 2 to 5 percentage points depending on the vehicle age. For example, Pennsylvania allows for interest rates of up to 18% per year on vehicles less than 2 years old and 21% per year on vehicles more than two years old. The remaining states impose a maximum rate that decreases with the initial loan amount, typically with some floor, as in Indiana where the maximum interest charge is 36% per year on the portion of the balance up to $2,000, 21% per year on the portion between $2,000 and $4,000, and 15% per year on the portion above $4,000, with a minimum cap of 25%.

Table 2 summarizes the interest rate caps applicable in each state. The usury rate averages 21.5% per year when evaluated at the minimum usury ceiling within each state, and 25.5% per year when evaluated at the maximum usury ceiling in each state. Figure 3 shows the geographic distribution of usury restrictions. States in the western United States are less likely to impose a usury ceiling. Within the Midwest and East, however, the usury limits are fairly well dispersed geographically. The states with the tightest restrictions, for example, include Nebraska in the Midwest, Arkansas and Tennessee in the South, and Maine, Massachusetts, Rhode Island and Vermont in the Northeast.

Our main analysis relies on cross-sectional variation in state usury limits, which were

[3]While most states with rate limits base them on simple amortizing interest, some (e.g., Texas, Florida) instead allow for a maximum finance charge per year based on the original amount financed. What is stated as a 15% limit on finance charge per year equates to a substantially higher limit on the allowable interest rate. In these cases we show the equivalent simple interest rate for a 3 year loan, and use the equivalent rate given term at the observation level in estimation .

static during the period covered in AutoCount. Arkansas, however, did change its limit in the late-2000s. Prior to the change in law, Arkansas' usury limit was set at the lower of 17% or 5 percentage points above the Federal Reserve discount rate. The resulting limit hovered around 10% between 2006 and 2008, and then fell to a low of 5.5% by the beginning of 2009. In response, then Sen. Blanche Lincoln (D-AR) incorporated text into a federal spending bill that went into effect on June 24, 2009 which overrode the Arkansas regulation and raised the maximum allowable interest rate to 17%. Arkansas voters subsequently approved an amendment to state law, effective in January 2011, to change the usury limit to 17%.

For each loan in the AutoCount data we code the applicable usury ceiling based on the auto dealer's location and the initial loan amount, while in the CCP we code the applicable ceiling based on the consumer state of residence. The AutoCount data used in this paper does not include a measure of vehicle age. In states where the usury rate varies by vehicle age, we apply the rate for older vehicles (4 years or older), which are typical of purchases by subprime buyers, with some recoding based on patterns indicating a particular dealer observed another statutory rate limit.

Although each state can regulate the maximum interest rate allowed, federal banking regulations allow for banks and credit unions to avoid these restrictions, meaning that for loans originated directly between those institutions and the consumer no usury limit may apply. However, the contractual specifics of dealer-mediated vehicle financing–even when the dealer does not provide the eventual financing repaid by the consumer–leaves these institutions unsure of the applicable legal limit; as a result in these cases banks and credit unions typically attempt to follow the state-level usury limit whenever possible to limit potential liability.

4.2 Do Usury Restrictions Cause Rationing?

We begin by investigating whether usury restrictions prevent risky borrowers from obtaining auto loans. As a starting point, we confirm that usury limits do indeed bind for many

borrowers. Figure 4 plots the frequency of loans by interest rate bin for subprime borrowers in states without usury restrictions. A substantial share of those loans carry interest rates between 21% and 25%, which would exceed the maximum usury ceiling in more than a dozen states.

If binding usury restrictions cause credit rationing, then we should observe a smaller fraction of loans granted to risky borrowers in states that restrict interest rates. To test this hypothesis, we compare the distribution of credit scores among customers receiving auto loans in states with and without usury caps.

Using the entire AutoCount sample, which includes 28 million financed automobile purchases, we first estimate the fraction of financed purchases that go to customers in each 20-point credit score bin c. That is, we divide the number of financed purchases in each credit score bin ($FinancedPurchases_c$) by the total number of purchases across all credit score bins($TotalPurchases$). Figure 5 plots the kernel distribution of financed purchases within two subsamples, states that impose a usury limit and states that do not. Counter to the credit rationing hypothesis, low credit score borrowers do not comprise a smaller fraction of loans in states with usury limits. Rather, the distributions are quite similar, with a slight leftward shift for states with usury limits, indicating that high-risk borrowers receive a slightly *greater* share of auto loans.

One might worry that high-risk borrowers comprise a greater share of the population in states with usury limits, and accordingly they might receive a greater share of loans even if they are more likely to be turned down for credit. To provide another perspective that addresses this concern, we examine the fraction of individuals that receive an auto loan in each credit score grouping. We divide the same numerator as above, $FinancedPurchases_c$, by the estimated population of individuals in credit score bin c ($TotalPopulation_c$) as measured in the CCP data. The resulting fraction measures the probability of receiving an auto loan in each credit score grouping. Figure 6 plots this fraction by credit score grouping and by usury status. Across all credit score groupings, the data show higher rates of borrow-

ing in states with usury limits. These differences, however, are fairly constant across credit score groupings and show no sign of high-risk borrowers. Comparing across states with and without usury limits, after removing a fixed effect for states with usury limits, we find no evidence that high-risk borrowers are rationed in state with rate limits.

As a further test of rationing, we examine changes in lending following Arkansas' relaxation of its usury limit in 2009. Using the CCP data, we measure the proportion of auto finance loans granted to subprime borrowers (credit score below 650) in each month. We then carry out a differences-in-differences analysis to evaluate whether the relaxation of usury limits expanded credit access in Arkansas relative to neighboring states. Figure 7 plots the proportion of loans granted to subprime borrowers in Arkansas as well as neighboring states Missouri, Oklahoma, Louisiana, Mississippi and Tennessee. In this figure, the raw data are smoothed using a quadratic local polynomial regression. The proportion of loans granted to subprime borrowers in Arkansas tracks closely with peer states between 2006 and 2014. There is no evidence that subprime lending expanded in Arkansas at a substantively different rate following relaxation of the usury limit.

We conclude that there is little credit rationing due to usury restrictions. Many risky borrowers that we would expect to be rationed continue to receive credit. In the next two sections we explore how the lending market and loan contracting adjust to facilitate loans for these borrowers.

4.3 Do Usury Restrictions Increase the Prevalence of Dealer Financing?

Our discussion in Section 2.2 highlighted the contracting flexibility available for automobile dealers that lend to customers. Due to this we hypothesize that usury restrictions constrain outside lenders, but that dealers can nevertheless provide credit to risky borrowers when interest rate restrictions bind.

Using the full AutoCount sample of 28 million financed purchases (as in the analysis of

credit rationing), we test whether dealer financing becomes more prevalent among borrowers for whom usury restrictions are likely to bind. Collapsing the data by dealer-month grouping, we measure the proportion of transactions financed by the dealer (as opposed to an outside lender).[4] We then estimate the following regression equation:

$$1\{TransactionFinancing_{icst} = BHPH\} = \alpha + \beta Cap_s + \gamma_c + \eta_t + \varepsilon_{icst}$$

The dependent variable in this model is effectively a customer's likelihood of conducting a dealer-financed transaction (the complement being receiving financing from an outside lender) in state s and month t, given a credit score within grouping c. The variable Cap_s indicates whether there is a usury limit in the state: it takes the value of one if state s imposes an interest rate limit for auto loans, and zero otherwise. The vectors γ_c and η_t, are fixed effects for credit score bin and month, respectively. We estimate the model using ordinary least squares, with observations clustered by state in calculating Huber-White robust standard errors.

Our predictions are two-fold: 1) among the set of risky borrowers, a larger share of transactions will use dealer financing in states with usury limits—the estimated coefficient on Cap will be positive; and 2) within states that restrict interest rates the share of dealer financing will increase with credit risk—when interacted with credit score, the coefficient on the Cap will decrease with the credit score.

The regression estimates are displayed in Table 3. Overall, the share of transactions using dealer financing is approximately 2.86 percentage points (p-value < 0.01) higher in states that impose usury limits compared to states that do not. Allowing for differential effects by credit risk, we see that dealer financing increases quite dramatically for the vast majority of subprime borrowers (those with credit scores of 650 or below). Relative to similar buyers in

[4]If the dealer made five financed sales within the credit score range 500-550 and financed two of them, the Share of Dealer Financing would be 0.4 for that dealer-month-credit score range. The complement of this variable measures the share of financed transactions using outside lenders. Non-financed transactions are excluded.

states without a cap, borrowers in the 550 to 650 score range are 4.8 percentage points (p-value < 0.01) more likely to obtain dealer financing in states with usury limits. Furthermore, as credit scores decline, the prevalence of dealer financing increases even more. In states with usury limits, buyers with credit scores in the range 300 to 550 are 14.2 percentage points (p-value < 0.01) more likely to use dealer financing. Given a baseline of 22.7 percent of purchases in states without usury limits by buyers in this credit range take place through dealer financing, this represents an increase of roughly 50 percent in relative terms. As shown in the third column, the pattern of increased dealer financing for subprime customers in states with usury limits is robust to the inclusion of state fixed effects. It is important to note that we control for credit score flexibly in these models, so the increased prevalence of dealer-financed loans in states with usury limits is not driven by the greater proportion of low credit score borrowers in these areas. These results provide within-state evidence consistent with our hypothesis about dealer financing. Dealers provide more credit in states with usury limits, not across the board for all credit score groupings, but specifically for high-risk borrowers.

4.4 Do Usury Restrictions Affect Loan Contracting?

The final portion of our analysis examines contract terms among borrowers for whom usury restrictions are expected to bind. We consider separately loans financed by dealers and non-dealers.

As highlighted in Section 2.2, we conjecture that dealers serve risky borrowers by contracting around binding usury limits — accounting for credit risk by adjusting the sales price and loan amount rather than the interest rate. Our predictions are that interest rates will be lower, loan-to-value ratios will be higher and loan payments will be unchanged due to binding usury restrictions. Conversely, for non-dealer loans our prediction is that lenders will compensate for lower interest rates by requiring increased collateral coverage funded through larger down payments or higher value trade-ins. The prediction in this case is that

interest rates will decline and loan-to-value ratios will *decrease* when usury restrictions bind. Another hypothesis is that interest rate restrictions prevent dealers and lenders from exerting market power.

4.4.1 Sample Description: Dealer-financed Loans

This analysis focuses on a subset of the AutoCount database: loans made by so-called Buy Here Pay Here dealers that provide financing in addition to selling cars.[5]

As noted in Section 3, Experian only releases aggregated statistics on loan contracts. The observations underlying our analysis are at the level of dealer-lender-month-credit score bin (20 point intervals). For each "cell" we observe the number of transactions and the average of each variable (e.g. average interest rate, loan amount, vehicle value, etc.) within the cell. We exclude loans that are missing information on any dimension (interest rate, payment, loan amount, loan term and collateral value). Overall, the sample for our analysis includes 28,155 observations, covering 39,547 transactions. An observation in the data thus reflects 1.4 underlying transactions on average. The modal observation covers a single transaction. Summary statistics for transactions with loan characteristics appear as Table 4. Geographically, the loan contracts are concentrated in Texas and California, as shown in Table 5.

4.4.2 Graphical Evidence for Dealer-financed Loans in Arkansas and California

Before proceeding with more formal statistical analysis, we begin by describing the patterns in loan contracting within two states: California, the largest state without a usury ceiling and Arkansas, the state with the most stringent usury limit.[6]

[5]Experian identifies transactions where the dealer and lender are owned by the same overall company. When we could positively identify cases where the original data identifies a known Buy Here Pay Here lender as another type of lender we included these loans as appropriate. An example here is a firm that has a fully owned captive finance subsidiary with a different name than the dealership.

[6]Strictly speaking, California imposes a usury restriction for auto loans. Practically speaking, however, this constraint does not bind, as the interest rate limit of 20% only applies to loans with original principal balance below 2,500. Very few auto loans have such a small principal amount at origination.

Figure 8 plots average interest rates against credit score for dealer-financed loans in California and Arkansas. Within California, interest rates rise as credit scores decline, with quite rapid increase as credit scores fall from 700 to the mid-500s. Meanwhile, the average interest rate in Arkansas is quite flat in the same credit score range, consistent with the fact that many borrowers face a binding usury restriction that prevents upward rate adjustments. The pattern in loan-to-value ratio is roughly the opposite, as loans in California display a nearly constant loan-to-value ratio of 1.4 and loans in Arkansas show an increasing loan-to-value ratio as credit scores decline. The average loan-to-value ratio is similar in both states at the credit score of 700, where average interest rates are also similar. Strikingly, the loan-to-value ratios diverge in precisely the same credit score range as interest rates, with loan-to-value rising as opposed to interest rates in Arkansas and interest rates rising rather than loan-to-value in California. These figures confirm our main hypothesis about loan contracting: where interest rates are constrained, loan amounts will change instead to account for credit risk. Meanwhile loan payments track each other quite closely in Arkansas and California after subtracting a state-level mean.[7] Despite the disparate increase in loan interest rates in California, the loan payment shows no such disparity with Arkansas.

4.4.3 Regression Analysis of Loan Contract Terms

Our goal with the regression analysis is to understand how binding usury restrictions change the key terms in dealer-financed loan contracts. A natural starting place is to estimate some version of

$$Y_{it} = \beta_0 + \beta_1 Bind_{it} + \Gamma' X_{it} + \varepsilon_{it}$$

The dependent variable is either the interest rate, loan-to-value or monthly payment of individual i in month t and $Bind$ is an indicator for whether the interest rate is equal to the state-prescribed maximum rate. Estimating this specification with OLS, however, would

[7]Incomes and prices are higher in California, as is the value of vehicles purchased, even conditional on credit score. Subtracting a state-level mean payment is one way to adjust for generally higher prices in California than in Arkansas.

produce biased estimates of the impact of rate limits. When examining the interest rate as the dependent variable, for example, the *Bind* indicator is clearly not exogenous since it is a function of the interest rate. For other outcomes, such as the loan-to-value, the problem is less stark but still evident since omitted characteristics that influence loan-to-value (for example the down payment) are likely correlated with the realized interest rate and, in turn, the *Bind* indicator.

To address this problem we evaluate the impact of binding interest rate limits in a two-stage procedure. First, we estimate the likelihood that the usury restriction binds, conditional on the borrower's credit score and the state's usury restriction. We then use the predicted probability of facing a binding restriction as an independent variable in explaining contract terms such as the interest rate, loan payment and loan-to-value ratio. The two regression equations in this Two Stage Least Squares (2SLS) approach include a first stage of

$$Bind_{ist} = \alpha + \lambda' Usury_{is} + \Psi' X_{ist} + \nu_{ist}$$

and a second stage of

$$Y_{ist} = \alpha + \beta \widehat{Bind}_{ist} + \Gamma' X_{ist} + \varepsilon_{ist}$$

The vector X contains control variables included in both stages of the regression analysis: indicators for each 20-point credit score and linear controls for the value of the vehicle and the duration of the loan. The vector $Usury$ contains the variables included in the first-stage regression but excluded from the second-stage. Those variables are: an indicator for whether the state imposes a usury restriction (Cap), a quadratic in the level of the usury restriction ($CapLevel$ and $CapLevel^2$) and the interaction between Cap and each 20-point credit score bin. The $CapLevel$ variable takes the value of zero if the state does not limit the allowable interest rate, and otherwise equals the maximum rate allowable by state law. Accordingly, all variables in $Usury$ take the value of zero in a state without usury restrictions, and loans in those states have an estimated probability of receiving a capped interest rate of close to

zero.

The identifying variation in $\widehat{Bind}_{ist}$ includes cross-state variation in usury restrictions, within-state variation in usury restrictions (within states in which the interest rate limit varies across loans of different size) and within-state variation in the impact of usury restrictions (across individuals in different credit score groupings). The exclusion restriction here requires that the statutory limit on interest rates impact loan characteristic outcomes of interest, including the interest rate itself, through no mechanism other than their impact on whether the loan hit some rate ceiling, after conditioning on other covariates such as the credit score.

4.4.4 Regression Results for Dealer-Financed Loan Contracts

Tables 6 through 9 display second-stage regression results for interest rates, loan-to-value ratios and loan payments. The estimates indicate that usury limits are effective in reducing interest rates. Controlling for borrower credit score, interest rates are estimated to be 7.8 percentage points lower (p-value < 0.01) when the usury restriction binds for certain. After adding a control for vehicle value, the estimated effect of a binding restriction is somewhat larger, at -9.3 percentage points (p-value < 0.01). In the third specification, which includes controls for amount financed and loan term as well, the estimated effect remains roughly the same. Finally, the last column incorporates ZCTA-based demographic information from the 5-year sample of the 2011 ACS. After including these factors the sign remains negative and significant. These results, along with a significant weak instruments statistic and robustness to number of variables used as instruments, reassures us that our specification is successfully picking up the variation of interest, and matches the intuition provided by the figures plotting interest rate against credit score in Arkansas and California.

Table 7 displays analogous results for loan-to-value ratios. While interest rates decline when usury restrictions bind, loan-to-value ratios rise. In the first specification, with controls for credit score alone, the loan-to-value ratio increases by 0.68 (p-value < 0.01) when the

usury restriction binds for certain. After including a control for the vehicle value as well, the estimated effect remains large, positive and statistically significant at 0.51. Results including ACS variables retain similar significance and magnitude. These regression estimates again parallel our findings in comparing loans in Arkansas and California—as usury restrictions bind, borrowers receive lower interest rates but also take out larger loans relative to collateral value. These findings are consistent with our hypothesis that lenders price credit risk through the sales price mark-up, raising loan amounts relative to collateral value when they cannot raise interest rates. Down payments are not measured in the AutoCount data, so are an omitted variable in these models. It is worth noting that the average BHPH transaction includes a down payment of roughly 10% of the purchase price (NIA (2014)). Even if the down payment were reduced to zero in states with usury restrictions, the magnitude of the change in loan-to-value would not be large enough to explain our findings. It must be that price mark-ups are changing as well. Furthermore, the likely adjustment by lenders to a binding usury restriction would be to reduce credit risk by requiring a larger down payment. We find the opposite pattern - for riskier borrowers, where the usury restriction is more likely to bind, we actually find *higher* loan-to-value ratios on average.

Our analysis also considers the impact of a binding usury limit on the maturity of the loan contract. Table 8 shows a decrease of 23 months in loan length (p-value<0.01) associated with receiving a bounded interest rate, while adding other deal characteristics brings the coefficient down somewhere in the range of 13-17 months. It is possible that dealers shorten loan maturity as a means of reducing default risk. Dealers' strategy of pricing credit risk through the product market-up is one way to price credit risk when prevented from changing the interest rate. However, the larger amortized loan balance that results may not appeal to borrowers that anticipate prepaying early. Another alternative for lenders is to take measures that reduce default losses so that they can offer lower interest rates as dictated by usury limits without sacrificing profitability in the loan. Shortening loan maturity is one way to reduce default losses - shorter loans are exposed to less cumulative default risk and

also amortize more quickly, so collateral coverage is stronger throughout the life of the loan. With stronger collateral coverage, the lender's recovery will be larger conditional on default.

Holding fixed the collateral, loan duration and amortization schedule, the bottom line price for a financed vehicle purchase is the monthly loan payment. Our analysis of loan payments, presented in Table 9, finds no difference due to binding usury restrictions. In the first specification, with controls for credit score, the coefficient on $\widehat{Bind}$ implies a \$45 lower monthly payment due to binding usury restriction. However, this coefficient is not statistically significant. Controls for vehicle value and term length, either of which could directly impact the monthly payment, alter the magnitude but not statistical significance of the result. Finally, inclusion of ACS demographics changes the sign of the coefficient, implying an \$80 higher monthly payment for similar collateral when the usury restriction binds for certain. This estimate remains imprecise and is statistically insignificant.

Overall, these regression results provide confirmation of our hypotheses regarding loan contracting. Usury restrictions result in lower interest rates, but higher loan-to-value ratios. While the imprecision of our estimates for loan payments prevents us from drawing strong conclusions, we find no evidence that loan payments change due to usury restrictions.

4.4.5 Regression Results for Non-Dealer Loan Contracts

Table 10 shows regression results for contract terms on non-dealer loans. As in the prior table, we report the estimated effect of a binding usury limit on the loan interest rate, loan payment and loan-to-value ratio. Interest rates show a very similar pattern as in the sample of dealer loans: rates are 5.79 percentage points lower (p-value$<$0.01) when usury limits are predicted to bind. Loan payments and loan-to-value ratios, on the other hand, show very different patterns in the sample of non-dealer loans. Loan payments are lower by \$178.2 (p-value$<$0.01), whereas they showed no significant difference among dealer loans for which the usury limit was binding. Underlying this decline in loan payment are both a decline in interest rate, as discussed above, and a decline in the loan amount. Measured

as a proportion of the collateral value, the loan amount decreases 27 percentage points (p-value$<$0.01) among loans for which the usury limit binds. These results are consistent with the prediction outlined for non-dealer loans in Section 2.1. Third-party lenders continue to serve risky borrowers and provide lower interest rates as dictated by usury limits. At the same time, however, they they require stronger collateral coverage. A second specification that includes the ACS variables provides some suggestion that dealers may attempt to make up for some of the lack of ability to request a highly leveraged loan with lower financing by requesting a longer loan term; however, this imperfectly recovers the impact made by the usury limit. The picture that emerges, then, is that lenders accept lower promised loan payments but demand lower expected credit losses.

In addition to characterizing the impact of usury limits on third-party lending, these results strengthen the prior finding that dealers contract around binding usury limits by raising loan-to-value ratios. Specifically, our findings for dealer-financed loans relied on cross-state variation in usury limits. One concern with that approach is that the elevated loan-to-value ratios that we observe are perhaps caused by omitted variables other than the usury limit—differences, for example, in wages, demographics or other state policies. We would expect such factors, however, to cause similar bias in the sample of non-dealer loans. The fact that we find opposite effects on loan-to-value ratios therefore supports a causal interpretation of the findings, consistent with dealers contracting around binding usury limits.

Our analysis of loan contracting suggests that usury laws are indeed effective at reducing interest rates on automobile loans. However, borrowers do not necessarily benefit, as they either pay larger sales mark-ups on dealer-financed loans or accept either smaller loans or longer term lengths on non-dealer loans.

4.4.6 Within-State Results using CFPB Consumer Credit Panel

To provide further perspective on how usury limits affect loan contracting, we examine changes in loan terms following Arkansas' relaxation of its usury limit in the late 2000s. We use a differences-in-differences approach, comparing changes in loan amounts and interest rates in Arkansas relative to five neighboring states over the same period.[8] The AutoCount data on loan contracts begin after Arkansas changed its usury limit, so are not suited for this analysis. Instead, we use loan data for auto finance companies recorded in the CFPB Consumer Credit Panel (CCP).

These results, using a similar local regression for subprime loans (Those with credit scores of 650 or less, and so those most likely to face binding constraints), appear as Figures 11 - 14. The initial change in the Arkansas usury law, along with the later permanent change, are marked with vertical red lines. In particular the average term over time for Arkansas shows a pronounced, almost symmetrical dip around the date of the first law change with a magnitude not matched by the neighbor states. As time goes on the average term for all areas increases, matching the general finding that loan terms have increased over time since the onset of the Great Recession. Monthly payment follows a similar symmetrical pattern at first, with the additional caveat that instead of stabilizing at pre-recession levels it continues to grow. Total credit follows a similar pattern, with a break relative to the control states occurring at the same time as that for monthly payment, suggesting some potential external factors may have affected Arkansas differently at that time.

For regression analysis, the specification we test follows the form

$$Y_{it} = \beta_0 + \beta_1 S_i + \beta_2 r_t + \beta_3 1\{PostChange\} + \beta_4 1\{PostChange\} * (S_i = AR) + \Gamma' X_{it} + \varepsilon_{it}$$

where Y_{it} represents our outcomes of interest for individual i at origination time t, S represents state of residence, r the Federal Reserve discount rate at the time of the trans-

[8] Louisiana, Mississippi, Missouri, Oklahoma, and Tennessee.

action, $1\{PostChange\}$ an indicator for whether the transaction took place before or after the initial legal change took place in Arkansas, and X stands for the same ACS demographic variables as those used with the AutoCount data, as well as factor variables for credit score with a 20-point range for the bins.

The main result for the above specification is shown in the bottom half of Table 10. Recall that in Arkansas the usury rate increased after the legal change; this means that we should see results with the opposite sign of those in the earlier section. For the results both including and excluding ACS variables we find the sign of results for all four outcomes in concordance, along with significance in most cases. This provides within-state variation to support the cross-sectional variation found using AutoCount.

5 Conclusion

We study the effects of usury restrictions on the market for auto loans. We find little evidence that usury limits cause credit rationing. Instead, our analysis shows that the most substantial effect of usury restrictions is on the organization of the lending market. We find that usury restrictions shift market share away from outside lenders and toward automobile dealers, which can creatively contract around interest rate limits. When usury restrictions bind, automobile dealers finance their customers' purchases and raise the vehicle sales price (and loan amount) relative to the value of the underlying collateral. By doing so, they arrange loans with similar monthly payments and compensate for credit risk through the mark-up on the product sale rather than through the loan interest rate. Thus, borrowers ultimately face similar loan payments even when the usury ceiling reduces the interest rate that they obtain.

Usury restrictions may, through their impact on loan contracting, work in opposition to the goals of truth-in-lending provisions. Prior research suggests that many consumers have difficulty inferring the cost of credit (implied annual interest rate) from other terms of the

loan contract, and in turn have difficulty identifying the cheapest source of credit from a menu of loan contracts (Stango and Zinman, 2011). Enforcement of truth-in-lending laws that mandate disclosure of annual percentage rates (APRs), leads to lower borrowing costs for such individuals (Stango and Zinman, 2011). In this context, binding usury restrictions prevent price discrimination through interest rates, even where APR disclosure is mandated. Given the substantial heterogeneity in vehicle quality and uncertainty about value, it may be difficult for consumers to identify the best deal among offers differentiated in the price mark-up as opposed to offers differentiated separately in the price mark-up and the price of credit, which is much more homogenous. While a sophisticated consumer can adjust for vehicle quality and compare the loan payments across transactions, customers with less sophistication and less time or bandwidth to search may be harmed because the usury restriction prevents them from identifying and negotiating the cost of the loan separately from the cost of the vehicle.

References

Adams, William, Liran Einav, and Jonathan Levin, "Liquidity Constraints and Imperfect Information in Subprime Lending," *American Economic Review*, March 2009, *99* (1), 49–84.

Assunção, Juliano J., Efraim Benmelech, and Fernando S. S. Silva, "Repossession and the Democratization of Credit," *Review of Financial Studies*, 2013.

Attanasio, Orazio P., Pinelopi Koujianou Goldberg, and Ekaterini Kyriazidou, "Credit Constraints In The Market For Consumer Durables: Evidence From Micro Data On Car Loans," *International Economic Review*, 05 2008, *49* (2), 401–436.

Barron, John M., Byung-Uk Chong, and Michael E. Staten, "Emergence of Captive Finance Companies and Risk Segmentation in Loan Markets: Theory and Evidence," *Journal of Money, Credit and Banking*, 02 2008, *40* (1), 173–192.

Davis, Delvin, "The State of Lending in America and its Impact on US Households," Technical Report, Center for Responsible Lending 2012.

Einav, Liran, Mark Jenkins, and Jonathan Levin, "Contract Pricing in Consumer Credit Markets," *Econometrica*, 07 2012, *80* (4), 1387–1432.

_ , _ , and _ , "The Impact of Credit Scoring on Consumer Lending," *RAND Journal of Economics*, 06 2013, *44* (2), 249–274.

Equifax, "Equifax Reports Auto Loan Growth Continues, Subprime Bubble Not Occurring," Press Release October 6 2014.

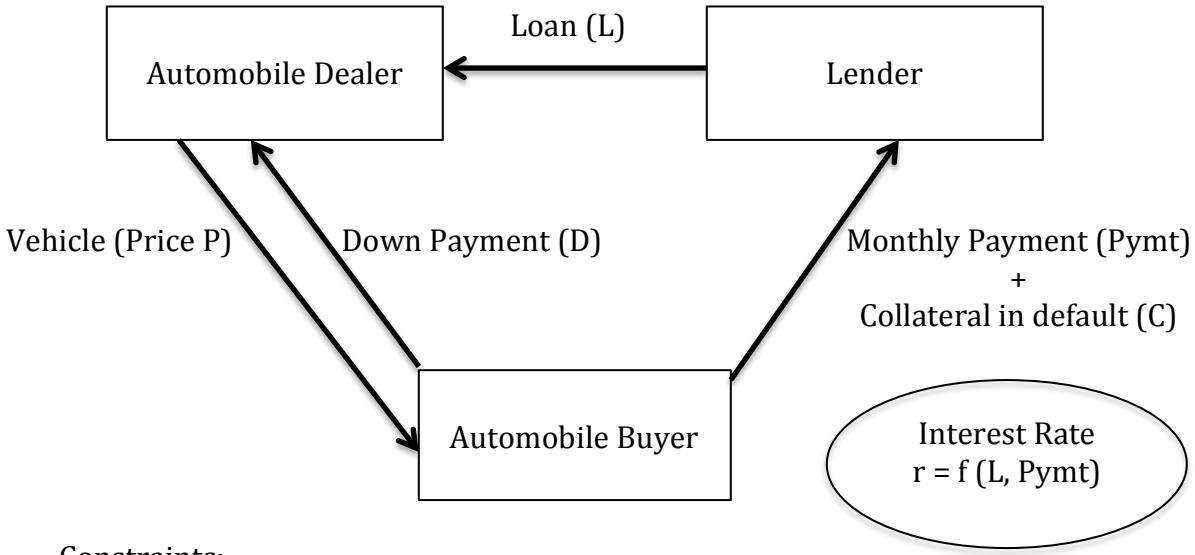
Ito, Koichiro and James M. Sallee, "The Economics of Attribute-Based Regulation: Theory and Evidence from Fuel-Economy Standards," Working Paper 20500, National Bureau of Economic Research September 2014.

Johnson, Kathleen W. and Geng Li, "The Debt-Payment-to-Income Ratio as an Indicator of Borrowing Constraints: Evidence from Two Household Surveys," *Journal of Money, Credit and Banking*, October 2010, *42* (7), 1373–1390.

NIADA, *NIADA's Used Car Industry Report* 2014.

Renuart, Elizabeth and Kathleen E. Keest, *The Cost of Credit*, 4th ed., Boston: National Consumer Law Center, 2009.

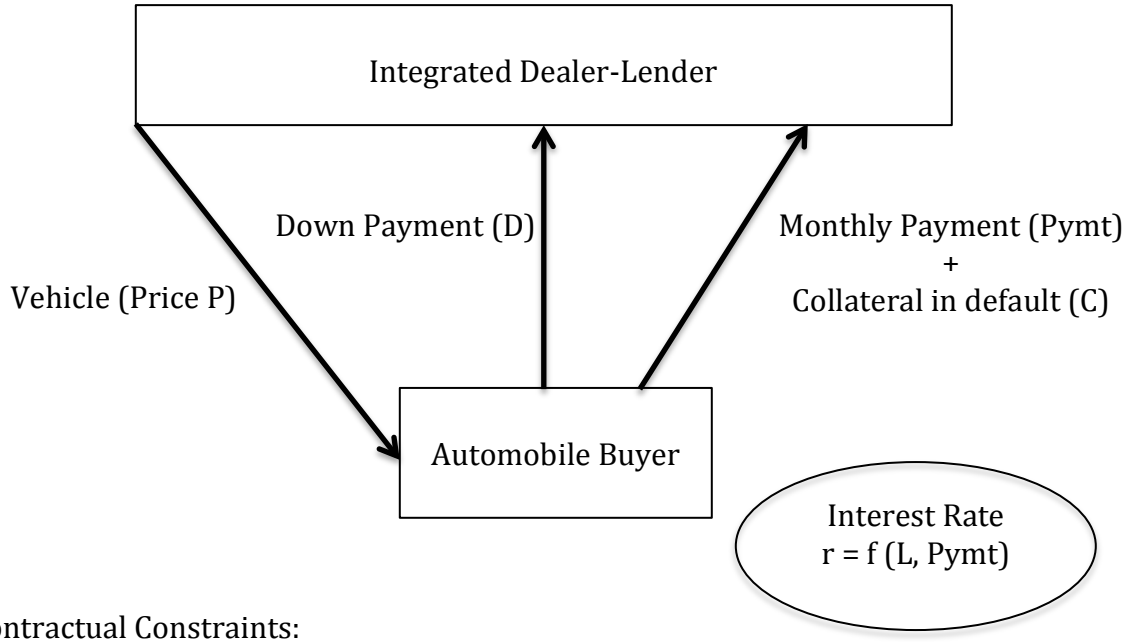
Stango, Victor and Jonathan Zinman, "Fuzzy Math, Disclosure Regulation, and Market Outcomes: Evidence from Truth-in-Lending Reform," *Review of Financial Studies*, 2011, *24* (2), 506–534.



Constraints:

1) Sales contract – equal value exchanged: $P = D + L$
2) Usury limit: $r \leq r_{usury}$
3) Lender zero profit: $L \leq PV(Pymt, C)$

Figure 1: Sale and Loan Contracting with Arm's Length Financing



Contractual Constraints:

1) Sales contract – equal value exchanged: $P = D + L$
2) Usury limit: $r = f(L, Pymt) < r_{usury}$

Figure 2: Sale and Loan Contracting with Dealer Financing

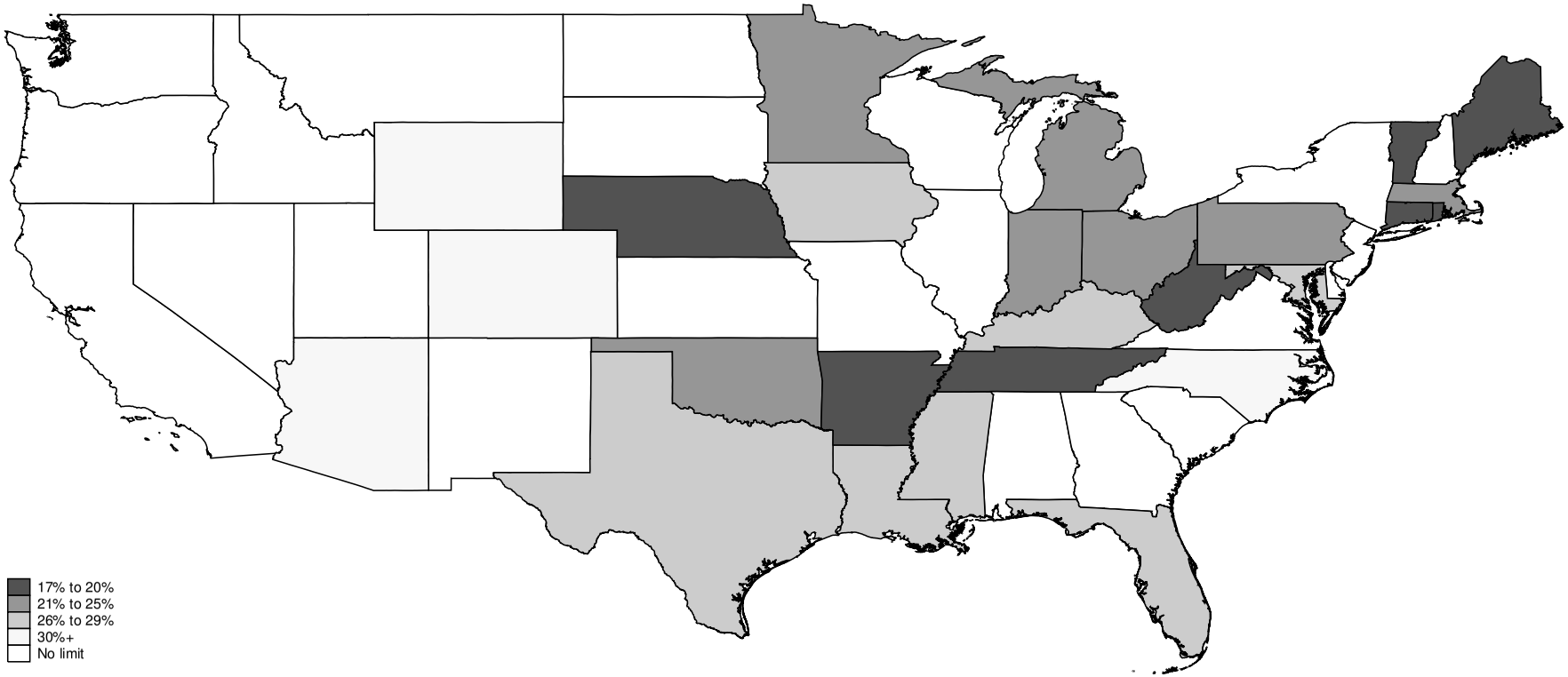


Figure 3: Geographic Distribution of Usury Limits

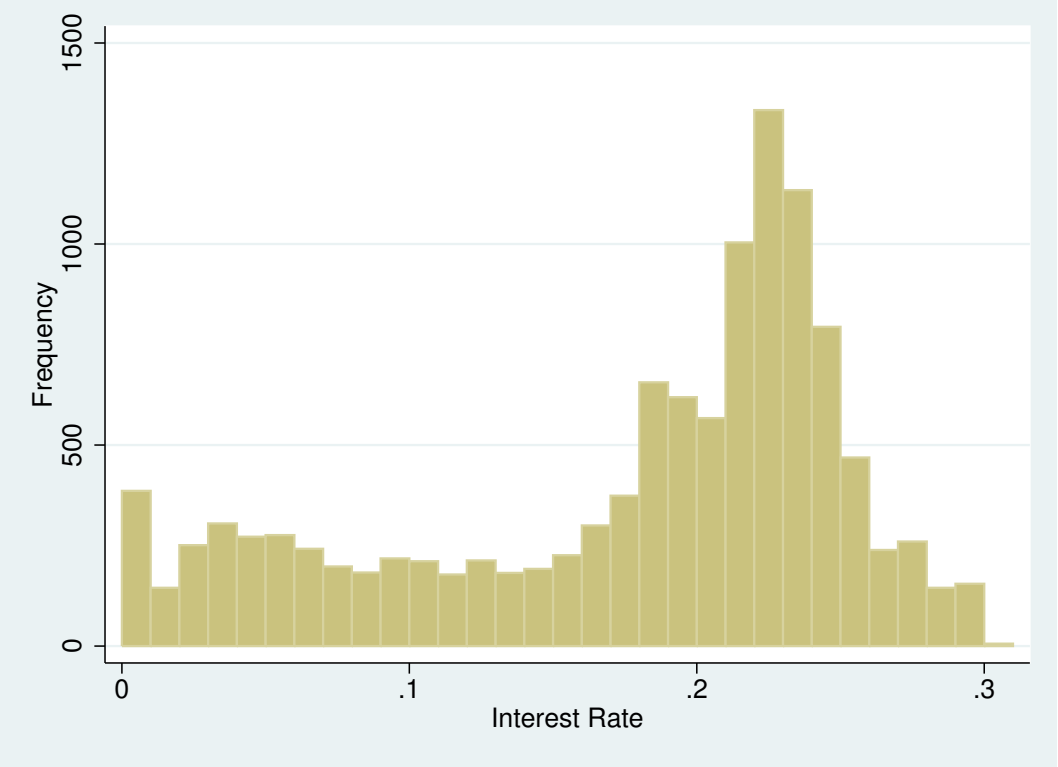


Figure 4: Histogram of Dealer-financed Loans in States without Usury Limits

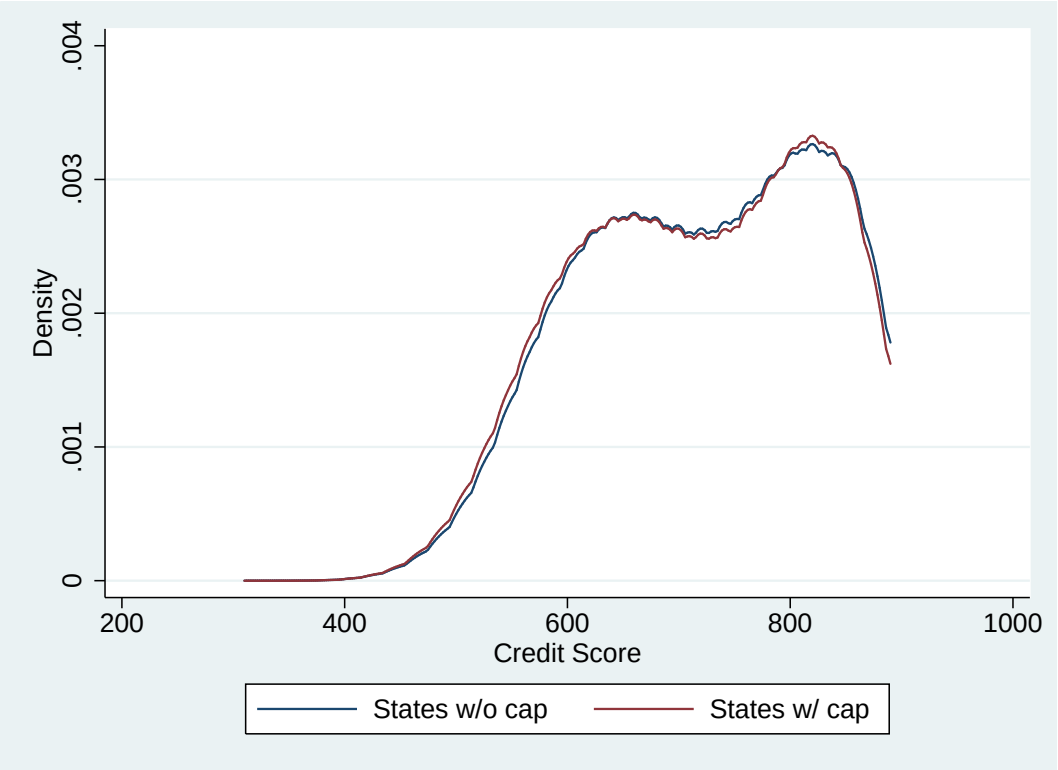


Figure 5: Kernel Density of Credit Scores for Borrowers with Auto Loans, by Usury Cap Presence

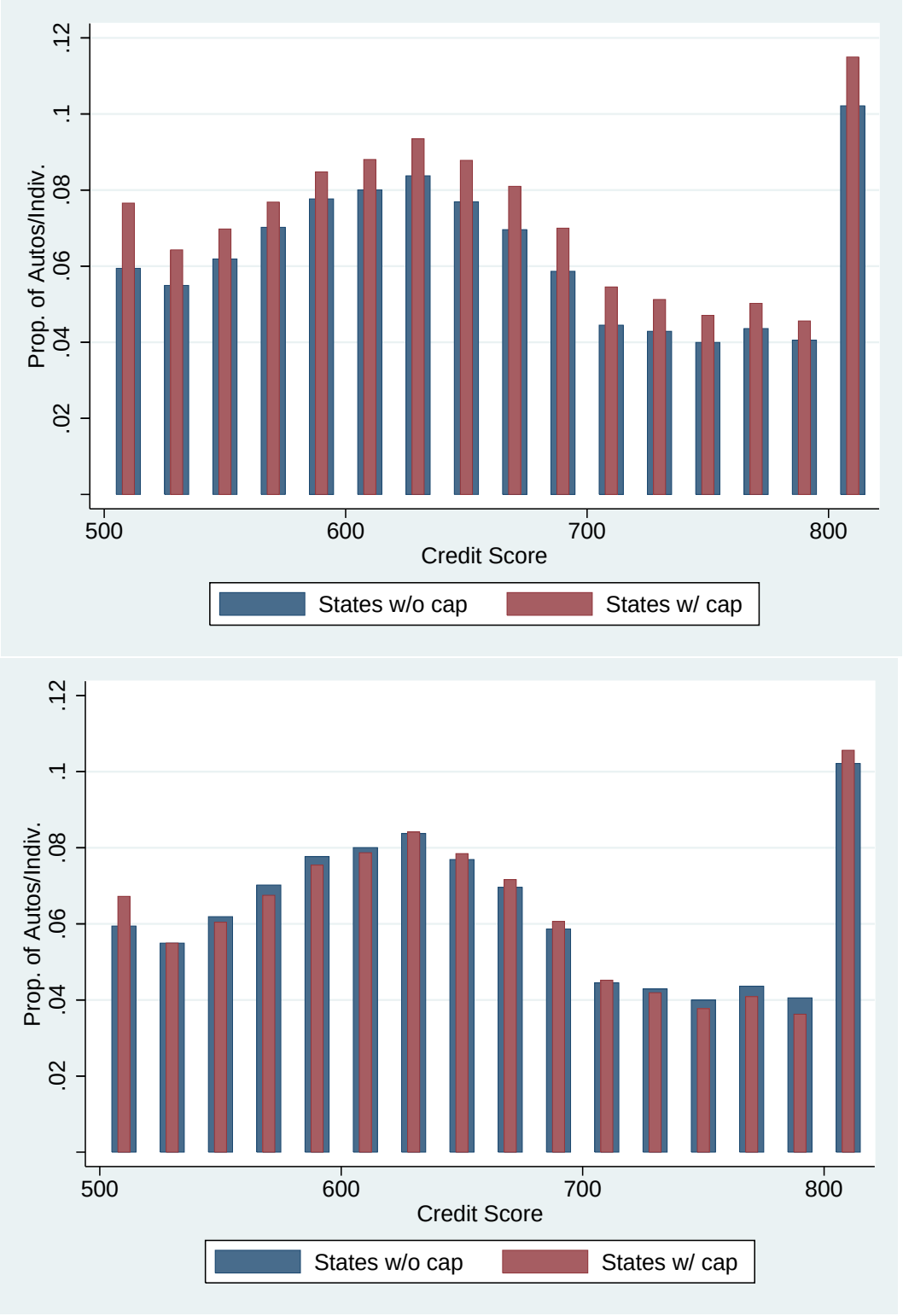


Figure 6: Ratio of AutoCount Loans to CCP Sample Population, by Usury Cap Presence (**Top:** raw, **Bottom:** cap FE removed)

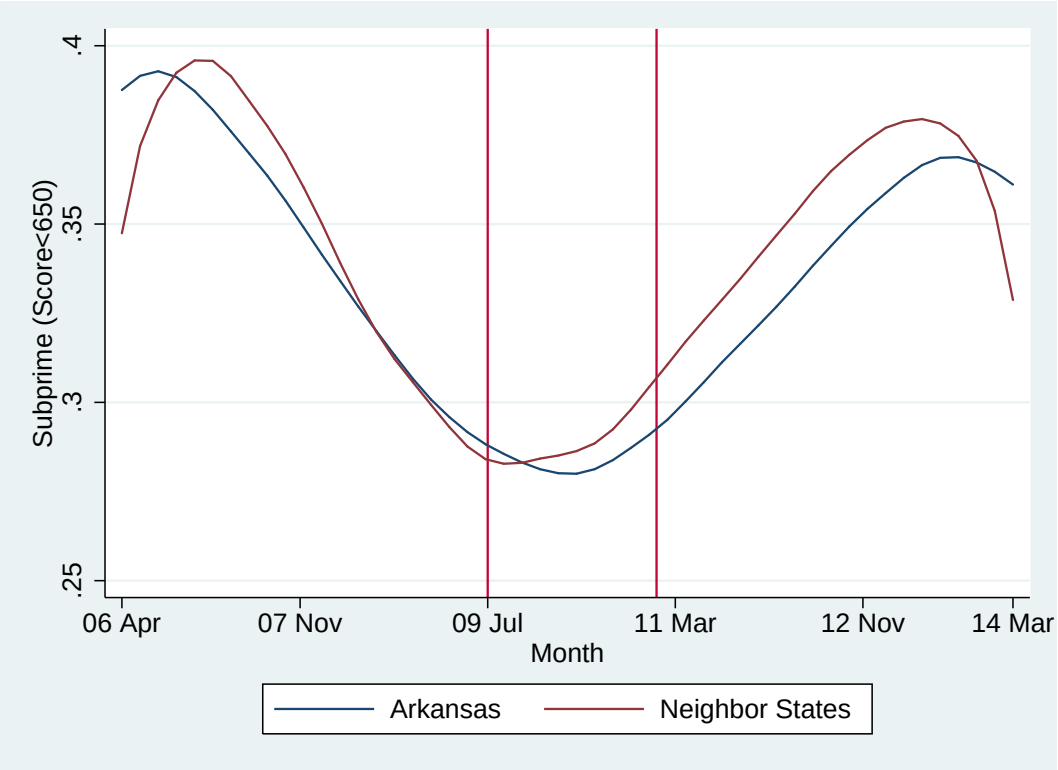


Figure 7: Event Study Analysis of Proportion of Auto Finance Loans Made to Subprime Consumers

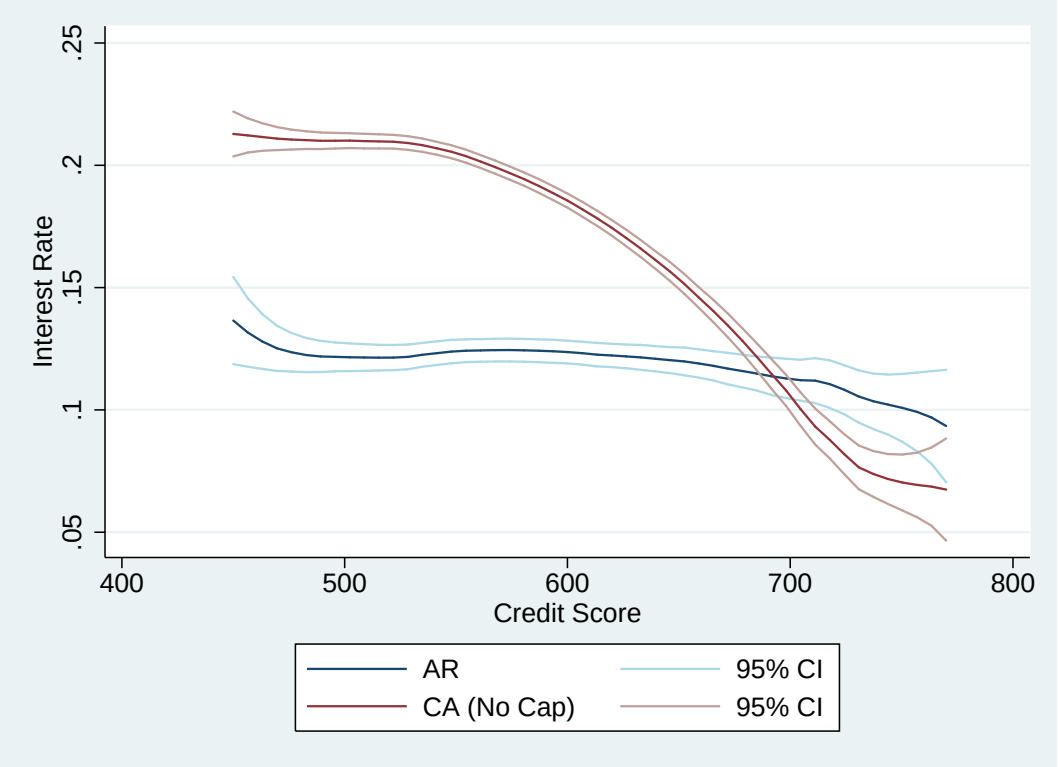


Figure 8: Local Regression of Interest Rate on Credit Scores, AR(Cap) v. CA(No Cap)

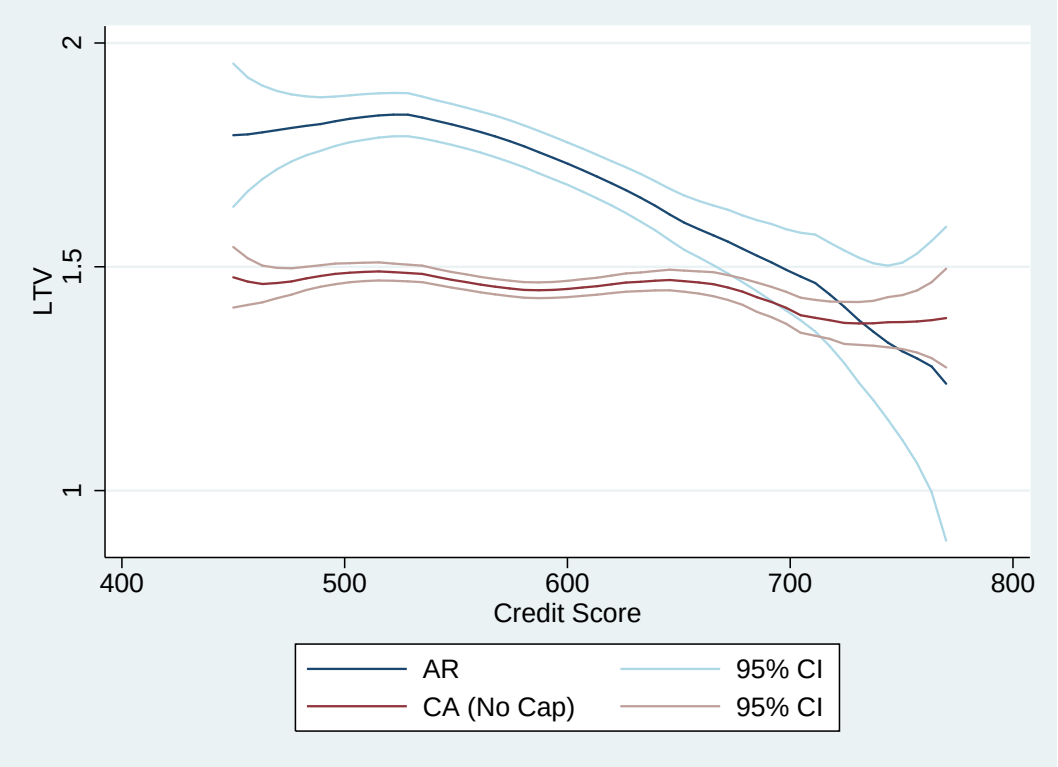


Figure 9: Local Regression of Loan-to-value on Credit Scores, AR(Cap) v. CA(No Cap)

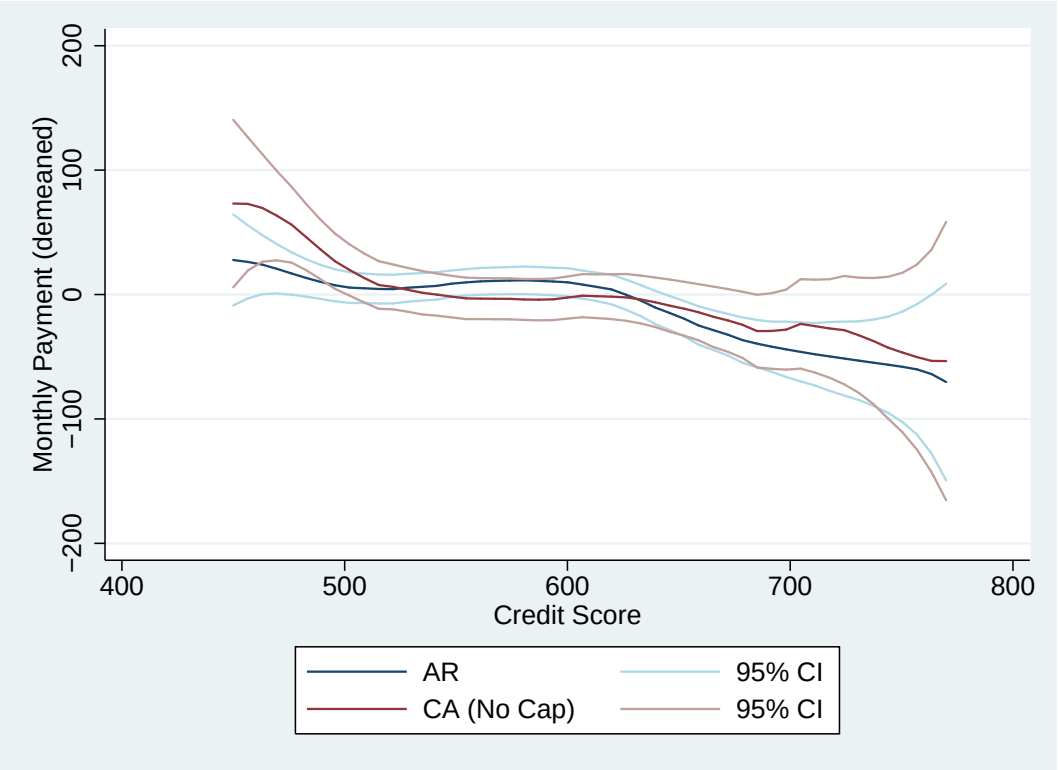


Figure 10: Local Regression of Demeaned Monthly Payment on Credit Scores, AR(Cap) v. CA(No Cap)

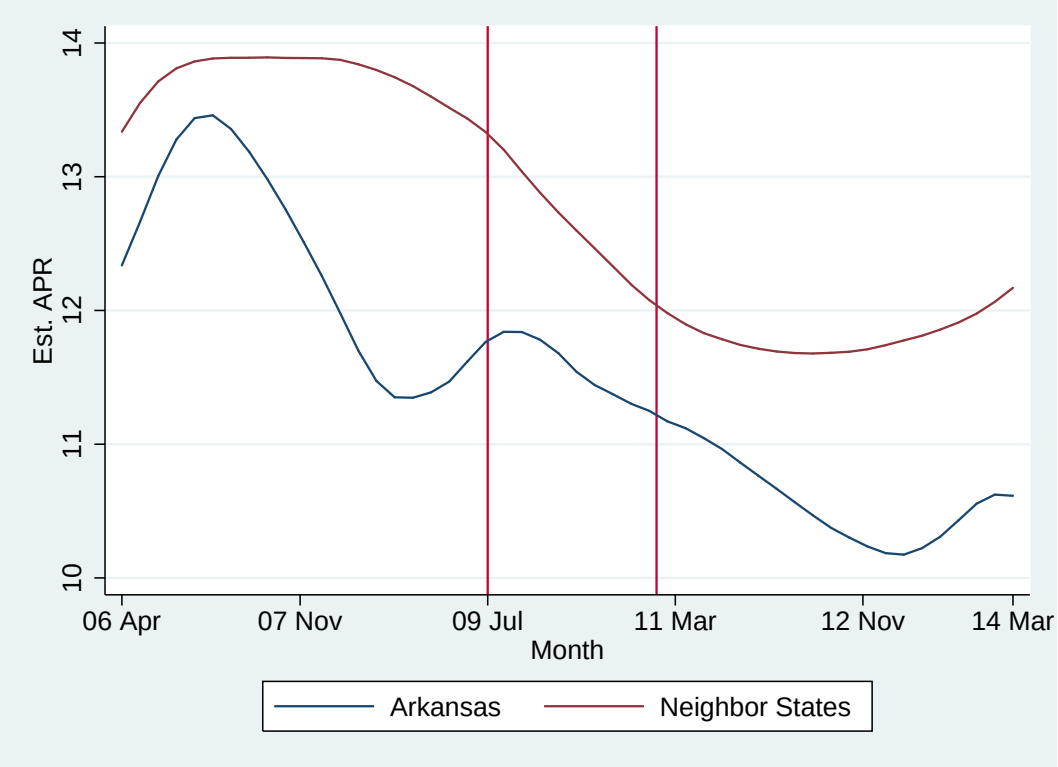


Figure 11: Event Study Analysis of Interest Rate

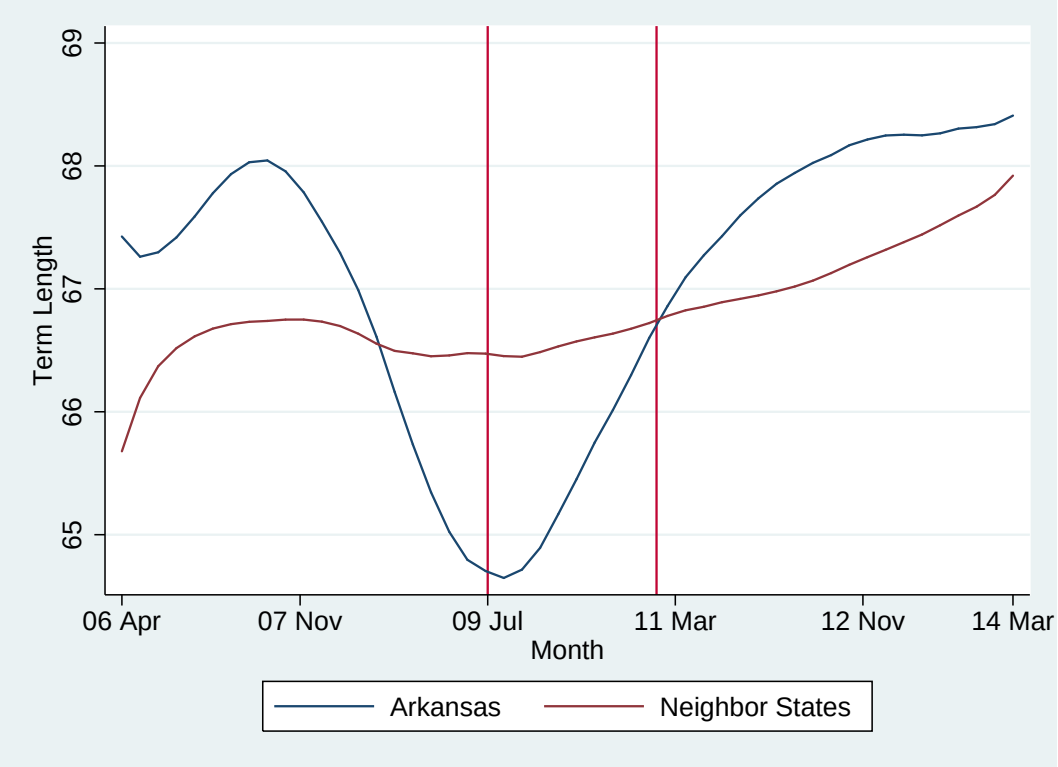


Figure 12: Event Study Analysis of Term Length

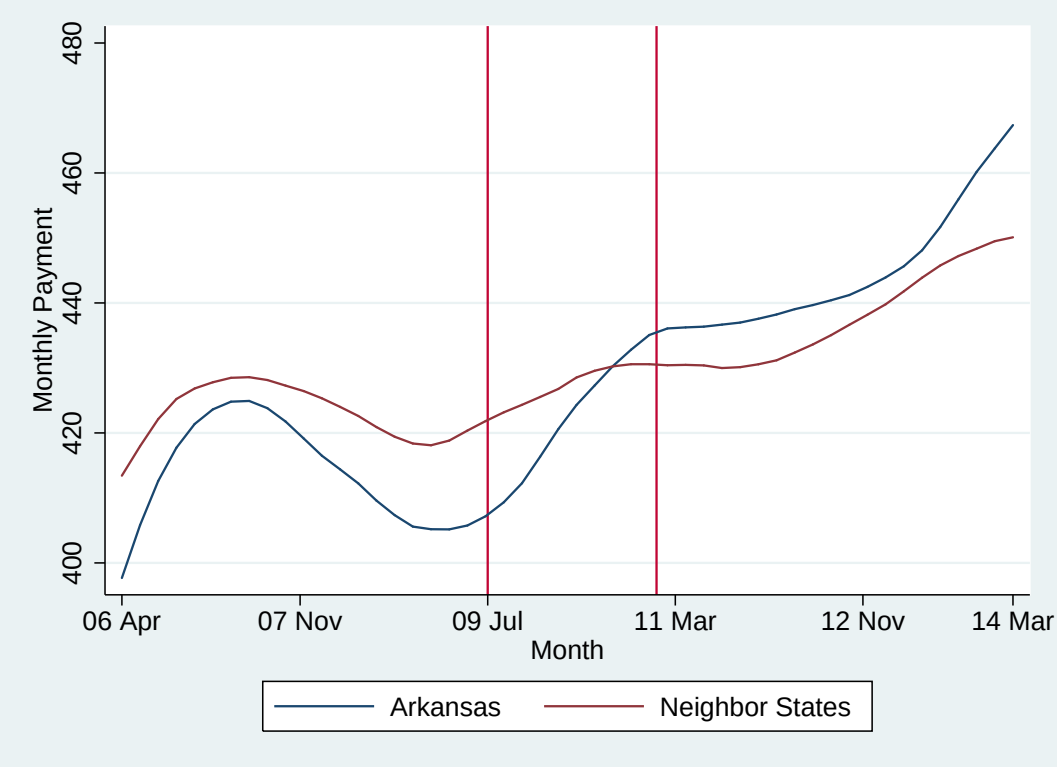


Figure 13: Event Study Analysis of Monthly Payment

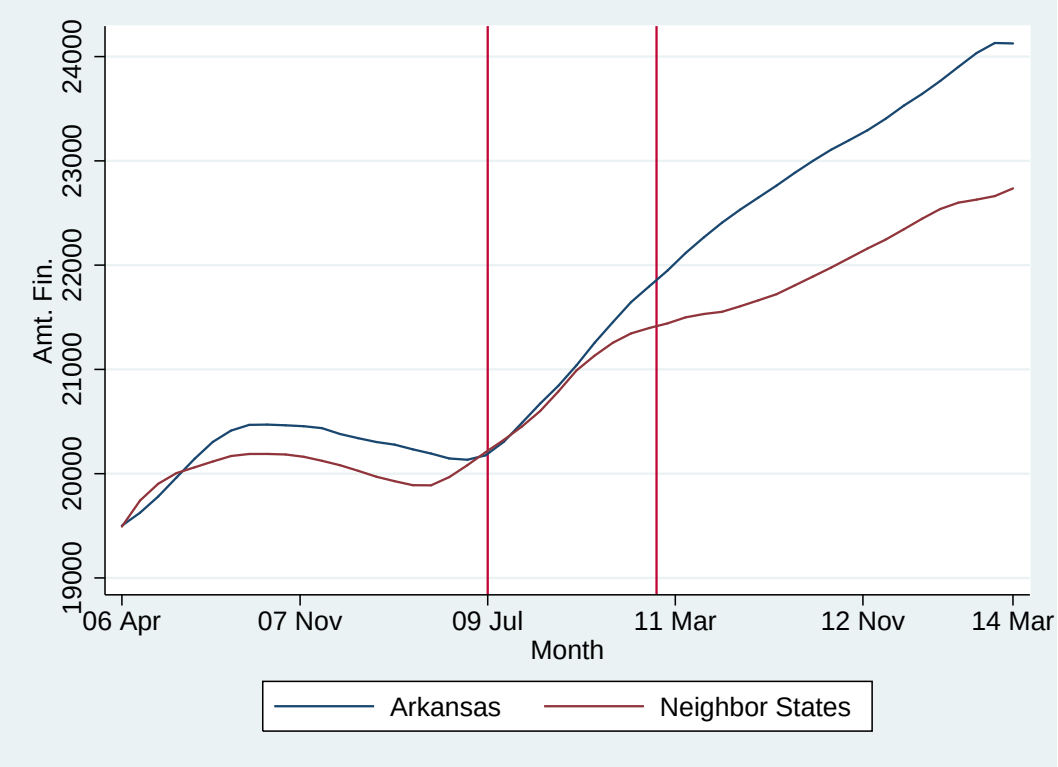


Figure 14: Event Study Analysis of Amount Financed

Table 1: Loan Payment Schedules with Equal Payments, Different Interest Rate-Loan Amount Combination

	Loan 1: $9,000, 30% APR, 36 months				Loan 2: $10,280, 20% APR, 36 months			
Period	Monthly Payment	Principal	Interest	End-of-period Principal Balance	Monthly Payment	Principal	Interest	End-of-period Principal Balance
1	$382	$157	$225	$8,843	$382	$211	$171	$10,070
-								
12	$382	$206	$176	$6,833	$382	$253	$129	$7,507
-								
24	$382	$277	$105	$3,919	$382	$308	$74	$4,124
-								
36	$382	$373	$9	$0	$382	$376	$6	$0

Table 2: Maximum Interest Rate for Auto Loans, by State

State	Limit (%)	Varies by?	State	Limit	Varies by?
AK	24 - 36	Loan amount	MT	None	
AL	None		NC	30.60 - 47	Vehicle age
AR	17		ND	None	
AZ	24 - 36	Loan amount	NE	18	
CA	None		NH	None	
CO	21 - 36	Loan amount	NJ	None	
CT	17 - 19	Vehicle age	NM	None	
DC	23.50 - 28.33	Vehicle age	NV	None	
DE	None		NY	None	
FL	29	Vehicle age	OH	25	
GA	None		OK	21	
HI	24		OR	None	
IA	21		PA	18 - 21	Vehicle age
ID	None		RI	18	
IL	None		SC	None	
IN	25 - 36	Loan amount	SD	None	
KS	None		TN	20	
KY	23 - 26.50	Vehicle age	TX	18 - 26	Vehicle age
LA	21 - 27	Loan amount	UT	None	
MA	21		VA	None	
MD	22 - 27	Vehicle age	VT	20	
ME	18		WA	None	
MI	25		WI	None	
MN	19.75 - 23.25	Vehicle age	WV	18	
MO	None		WY	21 - 36	Loan amount
MS	21 - 28.75	Vehicle age			

Note: "None" includes both states without any rate limits, and those with limits beyond the maximum rate found within the data for that state

Table 3: Does Prevalence of Dealer Financing Loans Vary with Usury Restrictions?

	Dependent variable: Proportion of Financed Purchases with Dealer Financing		
Variable	(1) All	(2) All	(3) All - State FE
Cap Exists	0.0286**		
	(0.0116)		
Cap * Score 300 - 550		0.142**	0.132**
		(0.0630)	(0.0644)
Cap * Score 550 - 650		0.0480**	0.0399**
		(0.0181)	(0.0166)
Cap * Score 650 - 750		0.00825**	0.00323
		(0.00356)	(0.00250)
Cap * Score 750 - 900		0.000988	
		(0.00143)	
Time Effects	Yes	Yes	Yes
Credit Score	Yes	Yes	Yes
Adj. R-sq.	0.304	0.311	0.328
Obs.	27,901,678	27,901,678	27,901,678

Note: State-level clustered standard errors in parentheses, * p<0.10, ** p<0.05, *** p<0.01

Table 4: Summary Loan Characteristics, by Presence of Interest Rate Cap in State of Sale

Variable	No Rate Cap	Rate Cap	Total
Credit Score	588.02	572.65	577.23
	(85.95)	(79.19)	(81.56)
Interest Rate	0.18	0.19	0.19
	(0.09)	(0.07)	(0.08)
Monthly Payment	405.27	402.31	403.19
	(294.61)	(132.06)	(195.15)
Term	46.92	39.92	42.00
	(16.99)	(12.80)	(14.53)
Amt. Fin.	$ 13,211.01	$ 11,971.53	$ 12,340.49
	($ 7,194.90)	($ 5,607.01)	($ 6,148.93)
LTV	1.56	1.67	1.64
	(0.44)	(0.44)	(0.44)
Vehicle Value (KBB)	9,510.39	7,739.72	8,266.80
	(6,321.69)	(4,393.51)	(5,109.54)
Obs.	9,417	18,738	28,155

Table 5: Count of Loans by State, by Presence of Rate Cap

Rate Cap Exists			**No Rate Cap**		
State	*Loan Ct.*	*Pct.*	*State*	*Loan Ct.*	*Pct.*
TX	16,544	59.56 %	CA*	6,152	52.26 %
FL	2,216	7.98 %	IL	706	6.00 %
IN	1,413	5.09 %	AL	632	5.37 %
OH	1,396	5.03 %	MO	592	5.03 %
AR	1,184	4.26 %	GA*	460	3.91 %
PA	1,177	4.24 %	NM	438	3.72 %
TN	866	3.12 %	SC	414	3.52 %
IA	656	2.36 %	VA	394	3.35 %
LA	379	1.36 %	NV	342	2.91 %
NC	353	1.27 %	KS	322	2.74 %
Other	1,591	5.73 %	Other	1,320	11.21 %
Total	**27,775**	**70.23 %**	**Total**	**11,772**	**29.77 %**

Note: CA and GA laws require caps on some loans as a function of loan amount.

Table 6: The Impact of Binding Usury Restrictions on Loan APR

Variable	(1) IV	(2) IV	(3) IV	(4) IV
Pr(Binding = 1)	-0.0782***	-0.0934***	-0.0958***	-0.0668***
	(0.0268)	(0.0302)	(0.0303)	(0.0231)
Vehicle Value (KBB)		-0.00297***	-0.00382***	
		(0.000435)	(0.000841)	
Amt. Financed ('000s)			0.00105	
			(0.000732)	
Term			-0.000143	
			(0.000275)	
Constant	0.227***	0.255***	0.259***	0.229***
	(0.00341)	(0.00613)	(0.0123)	(0.0460)
Time Effects	Yes	Yes	Yes	Yes
Credit Score	Yes	Yes	Yes	Yes
ACS Vars.	No	No	No	Yes
Observations	28,152	28,152	28,149	27,941
K-P F-statistic	3.50	3.48	3.67	4.19
Num. Deg. of Freedom	29	29	29	29
Denom. Deg. of Freedom	3,736	3,736	3,736	3,687
Partial R-sq.	0.10	0.09	0.10	0.08

Note: Instruments incl. rate cap presence, level, and quadratic; credit tier; and cap and credit score interaction. Dealer-state clustered standard errors in parentheses, * p<0.10, ** p<0.05, *** p<0.01

Table 7: Regression Output for LTV Ratio

Variable	(1) IV	(2) IV	(3) IV
Pr(Binding = 1)	0.683***	0.512***	0.730***
	(0.135)	(0.122)	(0.129)
Vehicle Value (KBB, '000s)		-0.0319***	
		(0.00218)	
Constant	1.326***	1.627***	1.324***
	(0.0205)	(0.0279)	(0.290)
Time Effects	Yes	Yes	Yes
Credit Score	Yes	Yes	Yes
ACS Vars.	No	No	Yes
Observations	28,152	28,152	27,941
K-P F-statistic	3.501	3.479	4.186
Num. Deg. of Freedom	29	29	29
Denom. Deg. of Freedom	3,736	3,736	3,687
Partial R-sq.	0.103	0.0938	0.0842

Note: Instruments incl. rate cap presence, level, and quadratic; credit tier; and cap and credit score interaction. Dealer-state clustered standard errors in parentheses, * p<0.10, ** p<0.05, *** p<0.01

Table 8: Regression Output for Loan Length

Variable	(1) IV	(2) IV	(3) IV	(4) IV
Pr(Binding = 1)	-23.16***	-13.16**	-18.61***	-17.20***
	(7.162)	(5.824)	(5.285)	(5.337)
Vehicle Value (KBB)		1.591***		
		(0.118)		
Amt. Financed ('000s)			1.520***	
			(0.0877)	
Constant	58.25***	43.16***	39.49***	74.86***
	(0.824)	(0.956)	(1.229)	(9.409)
Time Effects	Yes	Yes	Yes	Yes
Credit Score	Yes	Yes	Yes	Yes
ACS Vars.	No	No	No	Yes
Observations	28,149	28,149	28,149	27,938
K-P F-statistic	3.50	3.48	3.64	4.19
Num. Deg. of Freedom	29	29	29	29
Denom. Deg. of Freedom	3,736	3,736	3,736	3,687
Partial R-sq.	0.10	0.09	0.10	0.08

Note: Instruments incl. rate cap presence, level, and quadratic; credit tier; and cap and credit score interaction. Dealer-state clustered standard errors in parentheses, * p<0.10, ** p<0.05, *** p<0.01

Table 9: Regression Output for Loan Monthly Payment

Variable	(1) IV	(2) IV	(3) IV	(4) IV
Pr(Binding = 1)	-45.25	78.41	-4.11	85.89
	(137.3)	(96.41)	(170.3)	(96.90)
Vehicle Value (KBB, '000s)		21.08***		
		(2.485)		
Term			1.682	
			(1.531)	
Constant	356.2***	156.7***	258.2	-8.825
	(13.50)	(16.69)	(101.7)	(246.2)
Time Effects	Yes	Yes	Yes	Yes
Credit Score	Yes	Yes	Yes	Yes
ACS Vars.	No	No	No	Yes
Observations	28,152	28,152	28,149	27,941
K-P F-statistic	3.501	3.479	3.349	4.186
Num. Deg. of Freedom	29	29	29	29
Denom. Deg. of Freedom	3736	3736	3736	3687
Partial R-sq.	0.103	0.0938	0.0961	0.0842

Note: Instruments incl. rate cap presence, level, and quadratic; credit tier; and cap and credit score interaction. Dealer-state clustered standard errors in parentheses, * p<0.10, ** p<0.05, *** p<0.01

Table 10: Regression Output for Lender-Financed Loans

	Reg. Type	APR	Amt. Fin ('000s)	Term Length	Payment	LTV
I. AutoCount Results - Lender Financing						
Pr(Binding = 1)	Baseline	-0.0579***	-7.794***	3.370	-178.2***	-0.270***
		(0.0127)	(1.926)	(2.281)	(38.12)	(0.0615)
Pr(Binding = 1)	ACS Incl.	-0.0673***	-2.473	7.492***	-101.6***	-0.183***
		(0.0097)	(1.629)	(1.919)	(31.04)	(0.0406)
II. - CFPB CCP Results - Auto Finance Cos.						
AR post change	Baseline	0.0031***	.5312***	-0.170	15.16***	
		(0.0009)	(.1994)	(0.237)	(3.576)	
AR post change	ACS Incl.	0.0031***	.5670***	-0.162	15.77***	
		(0.0009)	(.1993)	(0.237)	(3.572)	

Note: Instruments for I. incl. rate cap presence, level, and quadratic; credit tier; and cap and credit score interaction. Dealer-state clustered standard errors in parentheses, * p<0.10, ** p<0.05, *** p<0.01