Determinants of Short-term Lender Location and Interest Rates

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Abstract This study tests the degree to which payday and title lenders differentiate their store location and interest rates based on the socioeconomic characteristics of the areas in which they operate. We use store-level lender data, geographically matched IRS income data, and Census Bureau demographic data to answer these questions. In the case of lender location, we find that payday and title lenders tend to locate in areas with lower median age, a larger population of not married households, more restaurants, and more pawn shops. We also find a nonlinear relationship between lender location and individual incomes in the surrounding area. Regarding lender interest rates, we find that competition among lenders reduces average interest rates and that riskiness of borrowers, as measured by defaults, increases average interest rates. We also find that payday and title lenders have higher interest rates in areas with lower educational attainment, smaller proportions of Black residents, and fewer married households. This evidence seems to contradict the argument that payday and title lenders prey on minorities.

1 Introduction

One of the most striking characteristics of the short-term consumer lending industry—as exemplified by payday and title lenders—is the high level of interest rates charged for these types of loans, sometimes in excess of 500 percent in annual percentage rate (APR) terms. Many consumer groups categorize these loans as predatory. However, the results are mixed

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from empirical assessments of these prices or interest rates that include some measurement of outcomes from and determinants of those prices. Using outcomes such as debt delinquency, personal bankruptcy, returned check fees, and complaints against lenders, Morgan (2007), Morse (2011), and Morgan et al. (2012) find evidence that payday lenders are not predatory. In contrast, Melzer (2011), Skiba and Tobacman (2011), and Carrell and Zinman (2013) find evidence that payday lenders decrease welfare using outcomes such as delinquency in mortgage, rent, and utilities payments, personal chapter 13 bankruptcy filings, and military personnel performance.

In addition to the choice of interest rate, payday and title lenders have the potential of targeting their services at different demographic groups by their choice of where to locate. This study tests the degree to which payday and title lenders differentiate their store location and interest rate choice based on the socioeconomic characteristics of the areas in which they operate. For our sample, we use store-level lender data from the state of Utah during 2010. We collected this data ourselves, conducting a survey of all payday and title lenders in the state with a response rate of about 50 percent. We combine that with zip-code level demographic data from the U.S. Census Bureau as well as IRS income tax filings data for the state of Utah by zip code.

The state of Utah is a nice source for payday and title lender data because it has one of the least regulated short-term lending industries in the country. Utah is one of six states that do not limit interest rates or fees on payday and small-dollar loans.[1] This reduces the number of market distortions in the behavior of both lenders and borrowers.

We first estimate the determinants of where payday and title lenders locate using a negative binomial regression model for the number of payday and title lenders in each Utah zip code. An innovation of our approach is to use the number of pawn shops in each zip code as one of the potential determinants of where payday and title lenders might locate. However, because the location decisions of pawn shops might also be effected by the presence of payday and title lenders, we take a two stage instrumental variables approach to our negative binomial regression. We use the number of warehousing and storage companies and the number of gun shops in each zip code as instruments for the number of pawn shops.

We find that payday and title lenders tend to locate in areas with lower median age and a larger population of not married households. We find a nonlinear relationship between lender location and individual incomes in the surrounding area. Payday and title lenders seem to locate more often in middle-income zip codes than in either low- or high- income zip codes. This is consistent with the finding of Stegman and Faris (2003) analysis of Charlotte, North Carolina payday lenders that they tended to favor working-class neighborhoods with median income between $20,000 and $40,000 rather than the city's poorest neighborhoods.

In addition, payday and title lenders tend to locate in areas with more fast food restaurants. We think the significance of fast food restaurants is as a proxy for payday and title lenders's preference to be located in high traffic areas. Lastly, we find that the number of pawn shops in an area is a very significant determinant of the number of payday and title lenders in an area. When we control for the number of pawn shops, the numbers of hospitals and banks in an area lose their statistical significance as a predictor of payday and title locations. In none of our location analysis specifications are any race or educational variables statistically significant determinants of payday and title lender location.

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[1] See Morgan-Cross and Klawitter (2011). Delaware, Idaho, Nevada, South Dakota, Utah, and Wisconsin do not limit interest rates or fees on short-term loans. All the other 44 U.S. States and Washington, D.C. have some form of usury laws that limit the size of interest rates or the amount of small-dollar loans.

A number of recent papers have looked at the determinants of where lenders locate. Our negative binomial regression approach follows Burkey and Simkins (2004). Using North Carolina data, they find that payday lenders are more likely to locate in areas with a larger Black population. This contrasts our finding that race is not a determinant of where payday lenders locate. Prager (2009) uses an OLS approach with county-level data for the entire U.S. and finds a positive relationship between percent Black and number of payday lenders and a negative relationship between percent Hispanic and the number of payday lenders. Damar (2009) uses fixed-effects logit regression with Oregon data to study the market entry behavior of payday lenders. He finds that payday lender entry is positively correlated with banks and Hispanic population and is affected by the level of existing payday lender competition.

Graves (2003) studies payday lender and bank location in metropolitan Louisiana and in Cook County, Illinois. Using spatial analysis, he finds that payday lenders locate in neighborhoods that are poorer and have higher concentrations of minorities and banks favor neighborhoods that are "wealthier and whiter."[2]

The second dimension that we study of payday and title lender choice is the determinants of the interest rates they charge. We use store-level data on average interest rates, average loan amounts, average loan term (duration), and default rates from our survey of Utah lenders and match to the stores the zip-code-level data from the U.S. Census Bureau and the IRS. Our empirical model is a simultaneous system of supply and demand equations. We find that lender cost structure variables of local riskiness as measured by default rates and local competition have the standard effects. Higher local default rates are associated with higher interest rates, and more competition results in lower interest rates. In our simultaneous equations supply and demand model, we find that payday and title lenders have higher interest rates in areas with lower educational attainment, smaller proportions of Black residents, and fewer married households. The evidence that payday and lenders seem to have lower interest rates in areas with larger Black populations and that none of the other race variables is significant runs counter to the argument that payday lenders prey on minorities.

Flannery and Samolyk (2005) ask a similar question to ours with respect to the determinants of interest rates in the payday lending market. They use store-level data from two large payday lenders to study the determinants of the profitability of the stores and whether the high interest rates are justified. A major result of Flannery and Samolyk (2005) that we confirm in our study is that default rates are a significant contributor to the interest rates that payday lenders charge. Our interest rate study has a similar weakness to Flannery and Samolyk (2005), in that default rates are likely endogenous to interest rates and neither study controls for this endogeneity. We could find no good instruments for default rates in our available data.

Many payday lender studies focus on the determinants of demand for these loans, such as Lawrence and Elliehausen (2008), Agarwal et al. (2009), Bertrand and Morse (2009), Elliehausen (2009), Li et al. (2009). Although our interest rate study has a supply equation as well as two demand equations, our focus is on the estimates from the supply equation.

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[2]Although some of the papers cited here find that short-term lenders' location is correlated with demographics, Donald Morgan and Kevin Pan have a post on the Federal Reserve Bank of New York blog (http://libertystreeteconomics.newyorkfed.org/2012/02/do-payday-lenders-target-minorities.html) in which they use the Survey of Consumer Finances and find that minorities are no more likely to use payday or pawn loans once financial characteristics of the individual are controlled for.

Chatterjee et al. (2007) develop a general equilibrium model of unsecured credit, endogenous interest rates, and default in order to match some key macroeconomic patterns and to study the effects of bankruptcy policy. Chatterjee et al. (2008) use a general equilibrium model with imperfect information to focus on the causes of default.

Shackman and Tenney (2006) study the effects of two policy changes on the supply characteristics of the pawn lending industry. Our data approach is similar to theirs in that they collected data on average loan amount, loan-to-value ratio, and store hours by using mail and telephone surveys. Their response rate from pawn lenders was about 3 %.

A key determinant of the interest rate decision of suppliers is the number of payday and title lenders in the area. Stango (2012) looks at competition in the payday loan market from other type lenders (credit unions) from both the supply side and demand side. He finds that the payday lenders are competitive enough in their loan pricing that they force credit unions and banks out of the market. Feinberg (2003) looks at the effects of competition in the bank and credit union markets on the interest rates they offer. DeYoung and Phillips (2009) use loan-level data from Colorado between 2000 and 2006. One of their strong findings is that loan interest rates decreased with competition.

A secondary result that we get from our survey responses is an estimate of the size of the Utah payday and title lending markets relative to their more common revolving consumer credit markets. One benefit of the high response rate among Utah payday and title lenders is that we could impute the data for the lenders who did not respond to the survey and estimate the total size of the Utah payday and title lending markets in 2010. The estimated market size of the Utah payday lending industry in 2010 was a total principal lent of $280.4 million, and the estimated market size of the Utah title lending industry in 2010 was a total principal lent of $34.7 million. Compare these numbers to the size of Utah's more traditional revolving and nonrevolving credit markets of $6.4 billion and $10.8 billion. A finding of this study is that the short-term lending market is small in comparison to the more traditional consumer credit markets.

The paper proceeds as follows. Section 2 describes the payday, title, and pawn industries in the United States broadly. Section 3 describes the data and analysis used to estimate the determinants of where payday and title lenders locate. Section 4 describes the data and analysis used to estimate the determinants of the interest rates that payday and title lenders charge. Section 5 concludes.

2 U.S. short-term lending industries

Stegman (2007), Elliehausen (2009), and Lawrence and Elliehausen (2008) provide descriptions of both the supply side and demand side of the payday lending industry. Table 1 provides a description from the recent literature of consumer credit loan characteristics across a number of different subindustries. Notice that bank overdraft and non-sufficient funds (NSF) charges were included as short-term consumer loans.[3] We focus on the payday, title, and pawn lending industries.

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[3]In effect, the average bank overdraft fee in 2008 was $20, for which the average overdraft amount was $66, and the average duration the account was overdrawn was two weeks. That amounts to the implied APR of 1,067 %. See Bachelder et al. (2008 p. v).

Table 1 Descriptive statistics of U.S. short-term lending industries from literature.The annual percentage rate (APR) is calculated as the percentage rate for the term of the loan (18 percent) multiplied by the number of terms in a year (365 days/14 days $\approx$ 26 terms). Note that this is calculated as a compounded rate but is not actually a compounded rate because the fee paid at the end of the term generally cannot be rolled over

Loan type	Avg. APR	Avg. amount	Avg. term (days)	Default rate
Credit card	13 %	$10,695	+1 year	
Pawn broker	240 %	$67	56	20 %
Title lender	250 %	$350	28	
Payday lender	469 %	$300	14	14 %
Bank overdraft/NSF	1,067 %	$66	14	

Although revolving credit, such as credit card balances, is significantly different from payday, title, and pawn loans, credit cards are clearly an alternative source of borrowing for fringe borrowers (see Agarwal et al. 2009). The Federal Reserve Board (2009) consumer credit statistical release shows that the average credit card interest rate on cards that were assessed interest was estimated to be 13.08 percent in February 2009. This includes credit cards for which the balances are paid every month before any interest accrues.

A major difference between payday loans and the other types of loans listed in Table 1 is that payday loans are arguably least collateralized and, therefore, subject lenders to the greatest loss of principal upon borrower default. Payday loans are clearly less collateralized than a pawn loan or a title loan because the latter two loans require the transfer of a claim on some asset that the lender evaluates at the time of the transaction. Payday loans are more similar to bank account overdraft/NSF fees and revolving credit card debt in that they have no direct recourse on any specific assets or on the borrower's job. However, payday loans do not have the same degree of repeated interaction as bank and credit card transactions.

The credit investigation for a payday loan consists primarily of verification of a bank account and a job. The payday lender has information on both and can use them to collect if the borrower defaults. However, this collection is costly because the payday lender's only method of obtaining repayment upon borrower refusal may be through a small-claims court proceeding. Banks and credit card companies can punish delinquent borrowers with decreased credit scores and with exclusion from other complementary services. Payday lenders have no widely adopted credit reporting system across lenders and across states.

Elliehausen (2009) documents that the largest class of costs for payday lenders is operating expenses. He notes that most of these costs occur when an application is taken or a loan is extended. "Consequently, operating expense is greater relative to loan size for small loans than for large loans. This characteristic of loan costs produces the result that break-even interest rates are higher for small loans than for large loans."

Title loans are somewhat less risky than payday loans because the lender has a lien on the title of an asset that can be repossessed and sold if the borrower defaults. Quester and Fox (2009) report that the average title loan in Missouri in 2001 was $350. Both Quester and Fox (2009) and Peterson (2004) report the average title loan interest rate to be around 250 % APR.

The pawn lender is the most collateralized in that the collateral for the loan is kept on site at the pawn shop, and ownership of the collateral is permanently transferred to the lender in the case of borrower default. The pawn shop is probably both the oldest form

of short-term lending as well as the industry with the worst public image.[4] However, the pawn form of short-term lending is also the most straightforward loan contract treated in this study. It involves a customer bringing in a piece of collateral, the pawnbroker predicting the value at which he thinks he can sell the object quickly, the pawnbroker offering a loan to the customer of some fraction of the value of the collateral, and the customer giving the pawnbroker the right to sell the collateral if the customer does not repay the loan in a given period of time.

The average pawn loan is currently $80, as reported by the National Pawnbrokers Association.[5] This is in line with Caskey (1994, pp. 44–45) who reports that the average pawnshop loan size in 1990 was between $50 and $70. The average loan amount for the publicly traded pawnbroker Cash America International, Inc. (NYSE: CSH) in 1990 was $67.50.[6] Caskey (1994, p. 42) notes that the "loan to collateral ratio varies over time and across pawnshops, but a loan of about 50 percent of the resale value of the collateral is common." The typical loan maturity term is between one and three months.

The largest items in the cost structure of pawnshops are their inventory cost and selling cost. Pawnshops are also required to report to the local police each item they take as loan collateral, which property the police can seize if they find it to be stolen. However, as evidenced by the State of Oklahoma reporting that police seized only 0.1 percent of pawned goods as stolen, Caskey (1994, p. 38) estimates that police seizure of pawnshop property accounts for only a small cost to pawnbrokers.

In a survey of pawnshops in Florida, Iowa, and South Dakota where pawnshop fees are unregulated, Caskey (1994, p. 39) finds that most pawnshops "were charging between 18 and 28 percent a month for a loan of $50." Converting those monthly rates into annual rates, Caskey finds that the typical pawnshop loan APR was 240 percent in 1994. Caskey (1994, p. 41) estimates that only between 10 and 30 percent of pawnshop borrowers do not repay their loans and collect their collateral. Moore (2001) quotes an owner of a pawnshop in Cleveland, Ohio, giving an estimate that 80 percent of his customers did not have bank accounts.

We do not study store level characteristics of the pawn industry in this study because we could not collect enough data on it. The pawn industry is one of the most difficult to collect good data on. However, we do use pawn shop location and count data in both our location analysis for payday and title lenders and our interest rate analysis.

3 Payday and title lender location decision

The first dimension along which payday and title lenders might target their loans at particular demographic groups is where the lenders choose to locate. We use a negative binomial model for count data to estimate the effects of various socioeconomic characteristics of potential borrowers in the zip code of a given store on the predicted number of lenders in that

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[4]In the Mosiac Law of the Old Testament (see James 2000, Exodus ch. 22, vv. 25-27), which conservative estimates date to 1290 B.C., Moses prohibits the Israelites from making loans among themselves based on collateral such as clothing. Whelan (1979, p. 1) states that the "pawnshop in China dates from the last quarter of the fifth century A.D.... (A.D. 479-502)."

[5]This number is reported in the *Pawn Shops Today: the national voice of the pawn industry* website at www.pawnshopstoday.com.

[6]Per shop amount of loans made and renewed $863,058 divided by the per shop number of loans made and renewed 12,786 equals $67.50. See Caskey (1994, Table 3.2).

zip code. We also include the number of banks, hospitals, and fast food restaurants as independent variables that capture some complementary industries to payday lending. Lastly, we include the number of pawn shops in the same zip code as a complementary industry. We account for the endogeneity of pawn shops locating near payday lenders by using the number of gun shops and storage providers in the area as instruments for pawn shops.

We find that Utah payday and title lenders are more likely to locate in zip codes with younger populations and more single households. We also find that Utah short-term lenders seem to gravitate to middle-income zip codes and avoid zip codes with either too high or too low of average incomes.

In addition, Utah payday and title lenders are found more often in zip codes with more fast food restaurants. In one specification, we find that zip codes with more banks are likely to have more payday and title lenders. But that effect becomes nearly zero—both economically and statistically—when we control for the number of pawn shops in the zip code and instrument for the endogeneity of pawn shops and payday and title lenders.

3.1 Location data

We describe the data used in the analysis of where Utah payday and title lenders locate in Table 2. The count of payday and title lenders and pawn lenders per zip code comes from the Utah Department of Financial Institutions (DFI) list and this study's survey data. We study the count of both payday and title lenders because many establishments offer both payday and title loans. Fewer are the instances of lending establishments that combine pawn loans with payday or title loans. The Utah DFI keeps a list of all payday and title lenders. However, because some lenders make combination of payday, title, and pawn loans, we use our survey results to more carefully distinguish which lenders are primarily either payday or title lenders and which ones are primarily pawn lenders. However, the existence of 27 stores in Utah that offer both payday lending and pawn services suggests that these might be complementary industries. The Utah lender survey is described in more detail in Section 4.1.1. The average Utah zip code in our location analysis sample of 283 zip codes has 1.1 payday and title lenders and 0.5 pawn lenders. However, some zip codes have as many as 16 and 14, respectively, of each type of lender.[7]

The individual income data come from the U.S. Internal Revenue Service Compliance Data Warehouse Individual Return Transaction File tax return data aggregated by zip code.[8] We use the median unadjusted gross income per zip code reported on the individual tax returns filed for tax year 2010. We used unadjusted gross income instead of adjusted gross income in order to avoid exemptions and tax credits that might not be related to an individual's ability to service debt. The average across zip codes in our sample of zip-code median unadjusted gross income is $34,412.

We obtained the unemployment rate, percent of adults age 25 and above with a bachelor's degree or higher, and percent of households who speak english "not very well" data from

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[7]Utah has 353 zip codes that are either entirely or partially within the state's boundaries. In the analysis in this section, we uses 283 of those zip codes because they each have a complete set of explanatory and dependent variables.

[8]The IRS zip-code-level tabulations data for the State of Utah were provided by a U.S. Treasury employee from the Office of Tax Analysis. The median statistics use "smeared" data in which the 9 middle observations were averaged to protect confidential information of individual taxpayers.

Table 2 Descriptive statistics of socioeconomic variables in location analysis by zip code, 2010 (283 zip codes in sample)

| Variables | Across zip codes in sample | | | | Utah |
	Mean	Std. Dev.	Min.	Max.	
Payday and title lenders	1.1	2.8	0	16	
Pawn lenders	0.5	1.5	0	14	
Median unajusted individual income	$34,412	$8,895	$7,930	$58,518	
Unemployment rate	6.7 %	7.3 %	0.0 %	57.1 %	8.1 %
Pct. with bachelor's degree or higher, age 25+	22.8 %	15.2	0.0 %	100.0 %	29.4 %
Population	9,764	14,543	34	68,295	7,965
Median age (years)	33.4	6.9	12.7	59.8	29.2
Pct. Black	0.9 %	1.1	0.0 %	8.2 %	1.6 %
Pct. Hispanic	8.5 %	8.3	0.00 %	63.5 %	13.0 %
Pct. who speak English "not very well"	1.0 %	3.0	0.0 %	25.9 %	
Pct. households with spouse present	64.5 %	12.8	9.9 %	84.7 %	61.0 %
Population per square mile (population density)	667	1,440	0.1	9,822	
Hospitals	0.2	0.4	0	2	
Restaurants	3.0	5.2	0	23	
Banks	2.1	3.7	0	24	
Gun shops	2.5	3.7	0	17	
Storage facilities	3.2	5.7	0	32	

the 2006-2011 American Community Survey (ACS) five-year estimates of the U.S. Census Bureau. The 6.7 % unemployment rate in our sample of zip codes was lower than the Utah average unemployment rate of 8.1 % during 2010. And our sample of zip codes had a lower percent of adults with a bachelor's degree or higher (22.8 %) than the Utah average in 2010 of 29.4 %. The percent of households who speak English "not very well" is the product of the variable of the percent of households for which English is not the primary language multiplied by the percent of those households that reported to speak English "not very well".

Population, median age, percent Black, percent Hispanic, and percent of households with spouse present comes from 2010 decennial estimates of the U.S. Census Bureau. The percent Black variable reports for each zip code the percent of respondents who listed black as one of their race descriptions. The average zip code in our sample was just less than 1 % Black. However, the values ranged from 0 to 8.2 %. The percent of households with spouse present captures married households in which the two spouses were still living together.

We include in our analysis a variable for population density, which is population per square mile in each zip code. We created this variable using the population data by zip code from the 2010 decennial Census and dividing those values by the area of each zip code in square miles. We approximated the area of each zip code using ArcGIS software

and the Census Bureau's zip code tabulation areas (ZCTA). It is well known that ZCTA's to not exactly match up with zip codes. But they are close enough to provide a good approximation.

The number of hospitals per zip code was created using the Utah Department of Health hospital listings.[9] We created the variable for the number of fast food restaurants in each zip code by counting the total number of well known fast food restaurants. We defined "well known" fast food restaurants as Burger King, McDonald's, Wendy's, Taco Bell, Subway, Carl's Jr., Taco Time, In and Out, Quiznos, Arby's, Dairy Queen, Del Taco, Panda Express, Jimmy John's, Rubio's, Kentucky Fried Chicken, A&W establishments. For the number of banks in each zip code, we used the BankFind tool of the Federal Deposit Insurance Corporation (FDIC).[10]

The number of gun shops per zip code comes from the Federal Firearms License (FFL) database[11] and the number of storage facilities per zip code comes from the Utah warehousing and storage companies listing from Manta.[12]

3.2 Location estimates

In this section we test how various socioeconomic, geographical, and competitive features affect the number of payday and title lending establishments that are located in a given zip code. Each observation in this analysis will be a Utah zip code during the year 2010. Because the dependent variable is a count variable, we will use a negative binomial regression model. For this data, the negative binomial model is necessary instead of the simpler Poisson model because the data are robustly overdispersed in each specification (see discussion of overdispersion α statistic in Table 3).[13]

Let the count of payday and title lenders in each zip code i be y_i, let the vector of independent variable values for each zip code be $\mathbf{x}_i$, let the vector of coefficients on the independent variables be β, and let ε_i be a zip-code-specific mean-zero random variable. Then the zip code count data y_i are drawn from a Poisson distribution with mean μ_i, where μ_i is defined as follows.

$$\mu_i = \exp\left(\beta \mathbf{x}_i + \varepsilon_i\right) \tag{3.1}$$

The ε_i term is the difference from the standard Poisson regression model and is identified by assuming that e^{ε_i} is drawn from the gamma distribution. This results in the y_i counts being drawn from the negative binomial distribution. The coefficients β are estimated by maximum likelihood. The coefficients β can be roughly interpreted as the percent by which the expected number of payday and title lenders increases or decreases with a one unit increase in the corresponding explanatory variable. We also report in Table 3 for specificaiton (3) the incidence-rate ratio (IRR), which is e^β. The IRR is interpreted as the factor by which the number of payday and title lenders changes with a one unit increase in the corresponding explanatory variable.

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[9]The website is health.utah.gov/myhealthcare/facility.htm.

[10]The website is research.fdic.gov/bankfind.

[11]The website is fflgundealers.net/utah-zip-codes.html.

[12]The website is www.manta.com/mb_43_A9_45/warehousing_storage/utah.

[13]The negative binomial regression model uses the NB2 distribution and has the same mean structure as a standard Poisson regression model for count data, but the negative binomial model accounts for overdispersion in the data by adding a parameter that reflects the unobserved heterogeneity among observations. See Cameron and Trivedi (2013, Section 3.3) and Long and Freese (2001, Section 7.3).

In addition, the negative binomial model has a higher variance than the Poisson model (overdispersion). The $NB\ \alpha$ statistic reported at the bottom of Table 3 is a likelihood ratio test between a fitted Poisson model and the negative binomial model and is distributed $\chi^2(1)$. In each specification, the null hypothesis of the Poisson distribution ($h_0 : \alpha = 0$) is rejected at the 0.001 significance level.

We estimate three specifications of the negative binomial model. The results are presented in Table 3. Specification (1) only includes a limited set of socioeconomic variables in $\mathbf{x}_i$. Zip codes with higher populations, younger populations, and more single (not married) households are likely to have more payday and title lenders. None of the race or education variables is statistically significant.

Median income in a zip code is also a significant determinant of the number of lenders in a zip code, but in a nonlinear way. We included median income squared in our regression and estimated a negative and statistically significant coefficient on the squared term. This implies a concave relationship between median income in a zip code and the number of payday and title lenders in that zip code. Note in the first column of Table 4 that median income only has a correlation with one of the other explanatory variables (percent of households with spouse present) with a value greater than 0.32 in absolute value. If median income were orthogonal to the other explanatory variables, for which there is slight support in Table 4 with most of the variables, then we could calculate the median income that would be associated with the highest number of payday and title lenders.[14]

The median income level that would predict the highest count of payday and title lenders is a zip code according to specification (1) of Table 3 is \$34,700. It implies that zip codes with lower median incomes will have fewer lenders as well as zip codes with higher median incomes. Also note that this median income value of \$34,700 is very close to the average median income in our sample of \$34,412. If low income is defined as "below average", then payday and title lenders locate less often in these low income zip codes. However, it bears repeating that this quantitative interpretation of \$34,700 being associated with the most lenders in a zip code is based on the strong assumption that median income is orthogonal to all other explanatory variables. More reliably, we find evidence that payday and title lenders are attracted to the middle income areas and avoid extremely low income areas and extremely high income areas.

As support for this conclusion, we repeated the analysis in specification (3) of Table 3 replacing the median income and median income squared variables with an indicator variable for median income in a zip code less than \$30,000 and another for median income greater than \$50,000. The excluded group is zip codes with median incomes between \$30,000 and \$50,000. The point estimates on both indicator variables are negative, but only the point estimate on the low income indicator is statistically significant. This finding supports the conclusion of the analysis in Table 3 that the relationship between the number of payday and title lenders in a zip code and the median income is concave and that short-run lenders prefer middle incomes over low or high incomes.[15] If we evaluate the model in specification (3) at the average value of the other explanatory variables, zip codes with

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[14] Let count of payday and title lenders be y_i, let the median income variable be z_i, and let all the other explanatory variables be in the vector $\mathbf{x}_i$. Then the model (3.1) and the estimates in specification (1) in Table 3 imply the following relationship $y_i = \beta \mathbf{x}_i + 0.347 z_i - 0.005 z_i^2$. The count y_i is concave in z_i, and the maximum count is $z_{i,\max} = 34,700$, by solving $\frac{\partial y_i}{\partial z_i} = 0$.

[15] This regression table is available in the Appendix, which is available upon request.

median incomes of $25,000, $35,000, $50,000, and $60,000 would be predicted to have an average of 0.03, 0.63, 1.03, and 0.96 payday and title lenders, respectively.[16]

In Specification (2), we add the number of hospitals, fast food restaurants, and banks per zip code to the regression. Hospitals might be thought of as a complement to payday loans because medical emergencies can impose unexpected and time sensitive costs on households. Another hypothesis is that payday and title lenders might prefer to locate in high traffic areas. We include well established fast food restaurants as an indicator of high traffic areas. Lastly, we include the number of banks in a zip code because banks and payday and title lenders might be complementary industries. In specification (2), income, population, age, and marital status all have the same statistical significance and sign as in Specification (1). And again, none of the racial or educational attainment variables is statistically significant. Hospitals, restaurants and banks are also estimated to have a positive effect, at the 1-percent significance level, on the number of payday and title lenders in a zip code.

Specification (3) is our main specification. We include the number of pawn lenders in each zip code in this regression, because payday and title lenders might be closely related and complementary to the pawn industry. However, in contrast to banks, pawn lenders might also choose to locate near payday and title lenders, thereby creating an endogeneity problem with using the number of pawn lenders in this regression. To solve this, we perform a two-stage instrumental variables negative binomial regression. Let the number of pawn lenders in a zip code be z_i. The first stage of the two-stage process is to estimate the vector of coefficients γ using a negative binomial regression for z_i where the vector of regressors includes at least one instrument. We then take the predicted values of the number of pawn lenders $\hat{z}_i$ and include that new variable as a regressor in the negative binomial regression for the number of payday and title lenders.

Two variables that are plausible instruments for the number of pawn lenders are the number of gun shops in a zip code and the number of warehousing and storage companies in a zip code. Pawn shops differ from payday and title lenders in that they require storage of large inventories of collateral objects and they often buy and sell guns.[17] In specification (3), income, age, and marital status all have the same statistical significance and sign as in Specifications (1) and (2), although the coefficient on income squared is no longer statistically significant. And again, none of the racial or educational attainment variables is statistically significant. Restaurants have a statistically significant positive effect on the number payday and title lenders at the 5-percent level. However, both hospitals and banks lose their statistical significance. The instrumented effect of pawn shops on the number of payday and titles lenders becomes the dominant determinant on payday and title lender location.

Four of the eight explanatory variables that were statistically significant in specification (2) of Table 3 lose their significance when the instrumented pawn lenders variable is added in specification (3). This suggests multicollinearity among the explanatory variables. In Table 4, we present all the pairwise correlation coefficients and their statistical significance for the explanatory variables in specification (3) of Table 3 for the same data sample in that estimation.

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[16]In specification (3), the median income associated with the highest predicted number of payday and title lenders is $52,421. See footnote 13 calculation for specification (1).

[17]We report the first stage regression described here in the Appendix, which is available upon request. The gun shops variable is highly significant in predicting the number of pawn shops.

Of the 91 unique pairwise correlation coefficients in Table 4, 81 (89 %) have an absolute value less than 0.60, and 64 (70 %) have an absolute value less than 0.35. We did not list median income squared in Table 4 as it trivially has a high correlation with median income. As would be expected, the population variable is highly correlated with population density ($\rho = 0.6027$). However, the population variable is also highly correlated with the number of banks, restaurants and the instrumented pawn shops variable. It is, therefore, not surprising that the coefficients on median income squared, population, hospitals, and banks lose their significance moving from specification (2) to (3). As with standard OLS estimation, the multicollinearity increases the standard errors of each estimated coefficient, but the estimates remain unbiased.

The tradeoff in specification (3) is a loss in precision for a possible gain in explanation and intuition by being able to include the endogenous number of pawn shops variable in the analysis. Pawn shops are a complementary industry to payday and title lenders, and specification (3) is our best attempt to include it. We have two nice instruments for pawn shops, and we include all the other explanatory variables in the first stage regression. But pawn shops does remain somewhat highly collinear with the population, restaurants, and banks variables. In the end, specifications (2) and (3) in Table 3 give evidence of essentially the same results.

In summary, payday and title lenders seem to locate more often in middle-income zip codes than in either low- or high- income zip codes. Payday and title lenders are also more likely to be located in zip codes with younger populations, more single households, more restaurants, and more pawn shops. Because of the multicollinearity of the instrumented number of pawn shops variable, the effects of population, hospitals, and banks lose their statistical significance. And none of the race or education variables is a significant determinant of where short-term lenders locate.

Quantitatively, a zip code with a median age of 40 and the other explanatory variables at their means, will have a predicted average number of payday and title lenders of 0.23 while a zip code with a median age of 35 will have a predicted average number of payday and title lenders of 0.53. A decrease in the percent of households with a spouse present from 65 percent to 55 percent results in an increase in the predicted average number of payday and title lenders from 0.61 to 0.87. If the number of restaurants in a zip code increases from 3 to 4, the predicted number of lenders increases from 0.63 to 0.69. And if the number of pawn shops in a zip code increases from 1 to 2, the predicted number of lenders increases from 0.63 to 1.29.

4 Payday and title lender interest rate decision

A second dimension along which payday lenders might target their loans at particular demographic groups is on the interest rate in terms of APR on a loan. We use a simultaneous equations system of supply and demand equations to estimate the effects of demographics and supplier cost characteristics on equilibrium interest rates, loan amounts, and loan terms.

We find that lender cost structure variables of local riskiness as measured by default rates and local competition have the standard effects. Higher local default rates are associated with higher interest rates, and more competition results in lower interest rates. In our simultaneous equations supply and demand model, we find that payday and title lenders have higher interest rates in areas with lower educational attainment, smaller proportions of Black residents, and fewer married households.

Table 3 Negative binomial estimation of determinants of number of payday and title lenders in a zip code, 2010 (283 zip code observations). All three specifications were estimated without a constant term

Independent variables	Specification			IRR
	(1)	(2)	(3)	(3)
Median unajusted individual income ($ thousands)	0.347***	0.245***	0.140**	1.151**
	(0.083)	(0.069)	(0.070)	(0.080)
Median unajusted individual income squared	−0.005***	−0.003***	−0.001	0.999
	(0.001)	(0.001)	(0.001)	(0.001)
Unemployment rate	0.005	−0.007	−0.016	0.984
	(0.031)	(0.029)	(0.030)	(0.030)
Pct. with bachelor's degree or higher, age 25+	0.001	−0.006	0.002	1.002
	(0.010)	(0.008)	(0.008)	(0.008)
Population (thousands)	0.085***	0.035***	0.014	1.015
	(0.010)	(0.009)	(0.009)	(0.009)
Median age (years)	−0.131***	−0.124***	−0.060**	0.941**
	(0.032)	(0.028)	(0.030)	(0.028)
Pct. black	−0.059	−0.124	−0.011	0.990
	(0.144)	(0.122)	(0.120)	(0.118)
Pct. Hispanic	0.018	0.032	0.013	1.013
	(0.023)	(0.020)	(0.020)	(0.021)
Pct. who speak English "not very well"	−0.027	−0.022	−0.011	0.989
	(0.056)	(0.051)	(0.051)	(0.051)
Pct. households with spouse present	−0.066***	−0.046***	−0.026**	0.975**
	(0.015)	(0.012)	(0.013)	(0.012)
Population (thousands) per square mile	−0.023	−0.046	−0.060	0.942
	(0.077)	(0.056)	(0.053)	(0.050)
Hospitals		0.366**	0.236	1.266
		(0.025)	(0.148)	(0.188)
Restaurants		0.087***	0.060***	1.062***
		(0.025)	(0.023)	(0.025)
Banks		0.083***	−0.001	0.999
		(0.030)	(0.033)	(0.033)
Pawn lenders			0.663***	1.941***
			(0.160)	(0.310)
Log likelihood	−224.82	−201.34	−192.58	−192.58
$NB\ \alpha$ ($\alpha = 0$ if Poisson)	0.784***	0.272***	0.197***	0.197***

*Significant at the 10-percent level. ** Significant at the 5-percent level. ***Significant at the 1-percent level

The evidence that payday and lenders seem to have lower interest rates in areas with larger Black populations and that none of the other race variables is significant runs counter to the argument that payday lenders prey on minorities.

Table 4 Pairwise correlations of explanatory variables from Specification (3) in Table 3 (283 zip code observations). The significance levels of pairwise correlations are calculated using the Bonferroni adjustment

	Inc.	Unemp.	Bach. dg.	Pop.	Age	Black	Hisp.	Engl.	Married	Pop dens.	Hosp.	Rest.	Banks	Pawn
Inc.	1.00													
Unemp.	−0.20	1.00												
Bach. dg.	0.22*	−0.07	1.00											
Pop.	0.17	−0.02	0.30**	1.00										
Age	−0.14	0.10	−0.10	−0.35**	1.00									
Black	−0.07	0.00	0.20	0.43**	−0.25**	1.00								
Hisp.	−0.29**	0.11	−0.06	0.37**	−0.25**	0.47**	1.00							
Engl.	−0.32**	0.13	−0.13	0.07	−0.11	0.24**	0.49**	1.00						
Married	0.53**	−0.08	−0.07	−0.10	−0.12	−0.40**	−0.30**	−0.34**	1.00					
Pop dens.	0.00	−0.01	0.30**	0.60**	−0.20	0.50**	0.30**	0.09	−0.35**	1.00				
Hosp.	−0.05	−0.04	0.19	0.32**	−0.14	0.14	0.10	−0.04	−0.17	0.32**	1.00			
Rest.	0.01	0.01	0.22*	0.84**	−0.29**	0.48**	0.40**	0.10	−0.23	0.58**	0.43**	1.00		
Banks	−0.01	0.02	0.28**	0.72**	−0.22	0.53**	0.38**	0.10	−0.34**	0.62**	0.33**	0.83**	1.00	
Pawn	−0.21*	0.06	0.14	0.77**	−0.54**	0.48**	0.60**	0.24**	−0.37**	0.60**	0.41**	0.82**	0.79**	1.00

*Significant at the 5-percent level. **Significant at the 1-percent level

As was noted ealier, the default rates that we use as determinants of interest rates may be endogenous to interest rates. As with Flannery and Samolyk (2005), we have no good instrument for the default rates. This could be an important direction for future research.

4.1 Interest rate data

The data in empirical analysis of the determinants of interest rates come from three sources. The first is from a comprehensive survey of Utah payday and title lenders that was conducted during 2011, collecting store-level data from 2010.[18] We also matched the survey data by zip code with socioeconomic data from both the 2010 U.S. Census and the Internal Revenue Service's Compliance Data Warehouse Individual Return Transaction File for 2009 and 2010. The following subsections describe the sources of the data, and Table 8 gives the descriptive statistics on the 248 lenders used in our sample.

4.1.1 Survey data

We surveyed all of the payday and title lenders in Utah between February and August of 2011, requesting store-level annual average data from 2010. The Utah Department of Financial Institutions (DFI) is the primary regulator of payday and title lenders in the state. DFI maintains a list of all the registered payday and title lenders in the state, along with their contact information and the addresses of each of their physical stores.[19]

With the complete list of all the Utah payday and title lenders from DFI, our survey approach was to send each lender (excluding internet lending) an initial e-mail describing the project and the data that we wanted them to provide. We attached a survey-instructions document to the initial e-mail as well as a nondisclosure agreement to guarantee the privacy of the proprietary store-level data that we were requesting.[20] After sending the initial e-mail, we followed up with at least four phone calls before determining a store to be a nonresponse. Table 5 shows the response rates for the two different lender types.

Response rates of about 50 percent make this survey a comprehensive measurement of the distribution of store-level characteristics of Utah payday and title lenders. Figures 1 and 2 provide evidence of how geographically representative our data sample is. Figure 1 presents a histogram of the number of Utah payday and title lenders within each Utah zip code for zip codes with at least one lender. The average number of payday or title lenders in a Utah zip code is 4.5, with two zip codes having 16 payday and title lenders and 22 zip codes having only 1 lender store. Note that there are 278 Utah zip codes that have no registered payday or title lenders.

If Fig. 1 presents the distribution of lenders across zip codes, Fig. 2 represents the distribution of lenders who responded to the survey by zip code. The average number of payday or title lenders who participated in the survey in a given Utah zip code is 2.1 if we include

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[18]We also surveyed Utah pawn lenders, but their response rate was 6.5 %. For this reason, we do not include the pawn lenders' survey data on interest rates, loan amounts, and loan terms in this analysis.

[19]http://www.dfi.utah.gov/.

[20]The Appendix (available upon request) contains a copy of the initial e-mail that we sent to each lender, the survey instructions that were attached to the initial e-mail, and the nondisclosure agreement.
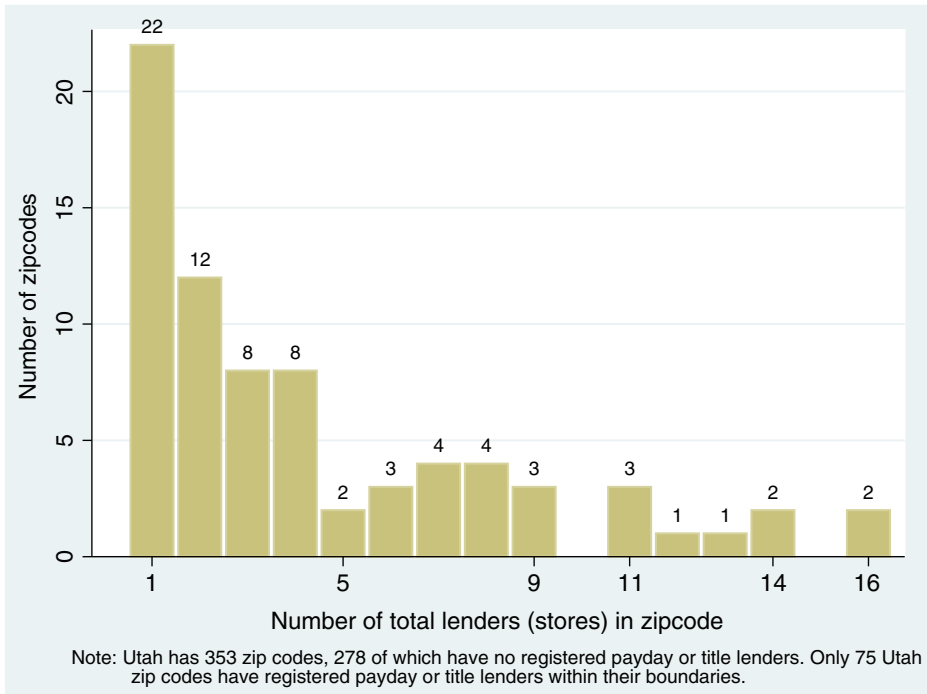
Note: Utah has 353 zip codes, 278 of which have no registered payday or title lenders. Only 75 Utah zip codes have registered payday or title lenders within their boundaries.

Fig. 1 Histogram of number of payday and title lenders in each Utah zip code in 2010 (335 stores)

the 23 zip codes that had lenders but from which none responded. Looking only at zip codes with at least one survey respondent, the average number of respondents per zip code is 3.0 with two zip codes having 8 and 9 responding stores, respectively, and 19 zip codes having only 1 respondent lender. Of the 23 zip codes with at least one registered lender and in which we did not succeed in getting any survey participant, the average number of lenders in those zip codes was 1.8, with 96 percent of those having 4 or fewer registered lenders, and 83 percent having 2 or fewer lenders. The zip codes in which we received no survey responses had few lenders.

Although the geographic distribution of survey participants is fairly representative, the sample distribution with regard to firm size is less so. Some stores are one of many stores owned by the same firm. Other lenders are standalone "mom and pop" stores. Figure 3 shows a histogram of the number of stores for each Utah lender firm in 2010. The average number of stores per payday and title lender firm is 3.4, with 61 of the 98 firms (62 percent) being single-store firms and with 10 of the firms (10 percent) having at least 10 stores. The same shape of histogram results if one controls for lender type.

Figure 4 shows the histogram of the number of stores for each Utah payday and title lender firm that participated in the survey. At the large-firm end of the distribution, 7 out of 10 of the firms with 10 or more stores participated in our survey. However, only 6 out of the 61 single-store lenders participated. Of those 6 single-store firms, 5 were exclusively payday lenders and 1 was exclusively a title lender. The average number of stores per respondent firm is 9.1 stores. Our survey oversamples the larger firms.
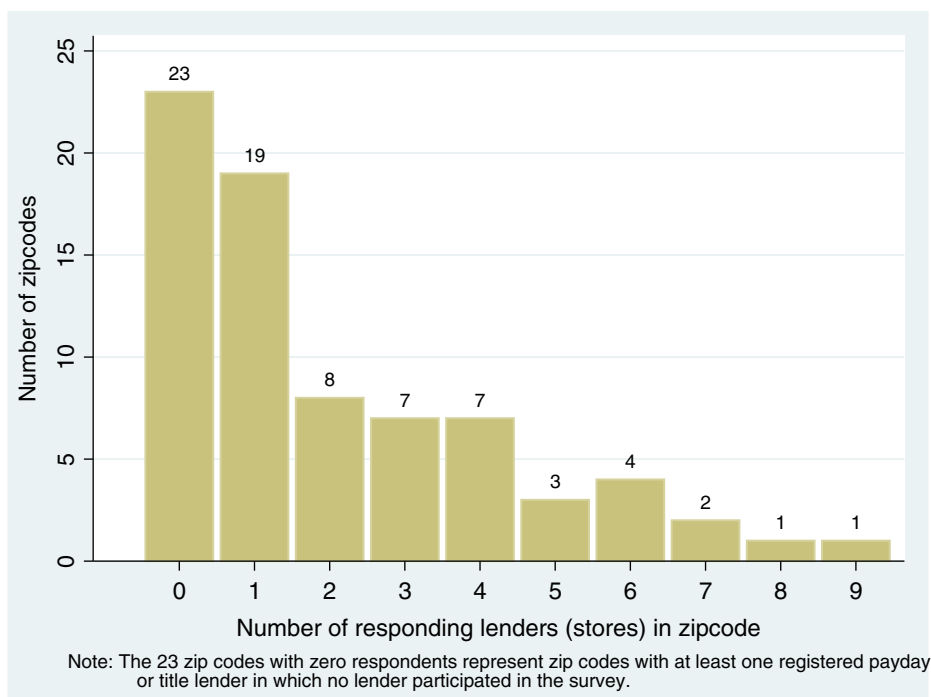
Note: The 23 zip codes with zero respondents represent zip codes with at least one registered payday or title lender in which no lender participated in the survey.

Fig. 2 Histogram of number of payday and title lenders that participated in the survey in each Utah zip code in 2010 (154 stores)

Table 6 presents the descriptive statistics of the survey response data by industry. We collected five statistics from each type of lender. We asked each lender to report the average interest rate in APR terms charged to all of their borrowers in 2010. This variable is an implied interest rate calculation because it includes fees charged on the loans. We also asked for the average principal amount of each loan and the average explicit term (duration) for each loan issued in 2010. The fourth statistic we requested was a soft definition of a default rate, defined as the percent of loans during 2010 that were not paid back in full by the explicit end of the loan term defined on the original contract. The last statistic we requested from payday and title lenders was the total principal lent during 2010.[21]

The first thing to note is that the average interest rates among Utah payday lenders (493 %) and title lenders (268 %) from the survey match closely to the U.S. averages from the literature reported in Table 1. Another evidence of the quality of the survey data is that the standard deviations on the interest rates were not too large for the payday and title lending industries.

The survey data show that the average payday loan in Utah in 2010 was $409.50 and the average loan term was about two-and-a-half weeks. The average title loan was $921.49

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[21] The Appendix (available upon request) includes a copy of the survey instruction sheet that was given to each lender and describes the data that we were requesting.
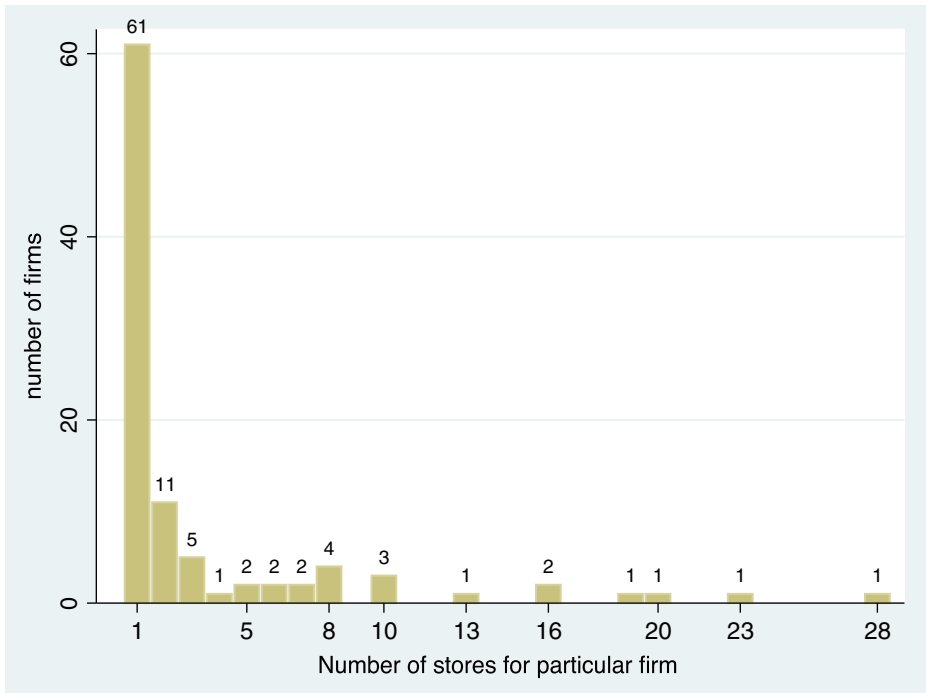
Fig. 3 Histogram of number of Utah payday and title lender stores for each firm in 2010 (98 firms, 335 stores)

for an average loan term of nearly six months. It is worth noting that the standard deviation of the title loan amount is very large. This is mostly due to the outlier firm in the survey data whose reported average title loan amount was $10,000. The median title loan amount is nearly $200 less than the average. The default rates of 14 percent and 17 percent, respectively, in 2010 in the Utah payday and title industries are also an important characteristic to incorporate into a study of the determinants of interest rates.

The last column in Table 6 describes the reported average total principal lent in 2010 by each store among each lender type. The average principal lent by payday lending store locations in 2010 was just over $1 million per store, while the average principal lent by title lending stores was just over $229,500. Because the sample for payday and title lenders has such a high response rate and covers so many of the zip codes in which lenders are located, we can use these data to estimate the total market size of the Utah payday and title industries with a high degree of confidence.

The estimated market size of the Utah payday lending industry in 2010 was a total principal lent of $280.4 million, and the estimated market size of the Utah title lending industry in 2010 was a total principal lent of $34.7 million.[22] Compare these numbers to the size of

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[22]Because we have socioeconomic and market concentration data on all lenders, including those who did not respond to the survey, we run a regression of total principal lent in 2010 on the socioeconomic and market concentration variables for the survey respondents. Then we use the estimated coefficients to impute the total principal lent for the nonrespondents. The estimates of total market size are the sums of the survey responses of total principal lent and the imputed values.
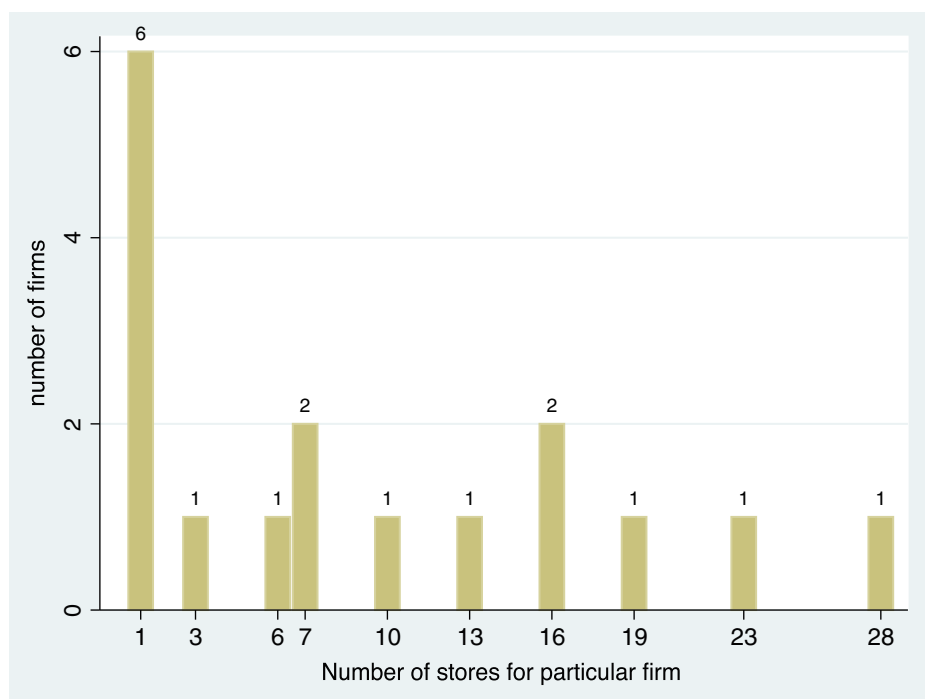
Fig. 4 Histogram of number of Utah payday and title lender stores for each respondent firm in 2010 (17 firms, 154 stores)

Utah's more traditional revolving and nonrevolving credit markets of $6.4 billion and $10.8 billion, respectively, as reported in Summers and Kroes (2009).

In addition to the survey data obtained from the Utah payday and title lenders, we used the comprehensive address lists of each Utah lender store location from DFI and DCP to create six different market concentration variables for each store—both respondents and nonrespondents. Table 7 gives the descriptive statistics of these measures of market concentration for the stores that participated in the survey.

4.1.2 Census data

Because we collected no survey data on Utah borrowers, we use U.S. Census Bureau data from the area surrounding each store as proxies for borrower characteristics. For the Census data, the surrounding area is the zip code.[23] The Census socioeconomic variables in Table 8 come from two sources. The zip code unemployment rate, educational attainment,

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[23]We actually use the Census' zip code tabulation area (ZCTA), which is made to correspond roughly (although not exactly) to postal zip codes.

Table 5 Response rates by lender type from survey. The "Total" row is not the sum of the industry rows because some lenders offered lending products in more than one of the above two lender types

Industry	Total stores	Participated	Response rate
Payday	285	147	51.6 %
Title	204	102	50.0 %
Total	335	154	46.0 %

and English fluency variables come from the 2006-2011 American Community Survey (ACS) five-year estimates. The zip code population, median age, percent Black, percent Hispanic, and percent of households with spouse present came from the 2010 decennial estimates of the U.S. Census Bureau. These are the same socioeconomic variables described in Section 3.1 and used in the location analysis of Section 3.2.

The assumption in using Census data from the zip codes in which lenders are located as a proxy for borrower demand is that most payday borrowers live close to the lender from

Table 6 Descriptive statistics of lender characteristics by industry: 2010. The number of stores represents the number of lender locations that provided data for this variable. Total principal lent represents the total amount of principal lent throughout the year 2010 for each particular loan type

Payday Lenders (147 stores)

Statistics	Avg. interest rate (APR)	Avg. loan amount	Avg. loan term (days)	Default rate	Total principal lent
Average	492.6 %	$410	16.7	0.14	$1,019,344
Median	519.3 %	$407	14.4	0.12	$623,372
Std. Dev.	64.6 %	$91	7.9	0.09	$1,181,052
Maximum	617.1 %	$598	95.0	0.39	$7,494,657
Minimum	354.4 %	$209	10.7	0.01	$19,109

Title Lenders (102 stores)

Statistics	Avg. interest rate (APR)	Avg. loan amount	Avg. loan term (days)	Default rate	Total principal lent
Average	268.6 %	$921	175.9	0.17	$229,508
Median	292.0 %	$733	205.6	0.12	$73,629
Std. Dev.	37.5 %	$974	63.0	0.14	$457,317
Maximum	304.2 %	$10,000	365.0	0.51	$2,471,438
Minimum	120.0 %	$236	49.0	0.00	$3,526

Table 7 Descriptive statistics of market concentration variables (154 observations)

Variables	Mean	Std. Dev.	Min.	Max.
Number same-type lenders within 1 mile	4.0	2.1	1	9
Number same-type lenders within 2 miles	8.1	4.1	1	17
Number same-type lenders within 3 miles	13.1	7.1	1	30
Number same-type lenders within 4 miles	18.7	11.3	1	45
Number same-type lenders within 5 miles	24.0	16.1	1	66
Number same-type lenders in zip code	6.8	3.8	1	14

which they borrowed. This assumption is also present in Damar (2009), who also looks at the correlation between payday lender location and zip code demographics.

The percent Black variable from the Census represents the percentage of the population in each zip code that reported Black or African American as their race in any instance, including in conjunction with other race identifiers. The percent Hispanic variable is the analogous definition for Hispanic race. The percent of households with spouse present represents the percentage of households in a given zip code with a legally married spouse present. This excludes married couples that are separated.

Of particular note in Table 8 is that the average unemployment rates in the cities where the lenders are located were a full percentage point lower than the state average, and education and age were nearly identical to the state averages. However, the percent of households with both husband and wife present was slightly less than the state average. Consistent with the findings of Damar (2009), Utah short-term consumer lenders are located in zip codes that have a larger percentage of minorities than the state average.

4.1.3 IRS data

Essential to the empirical analysis in Section 4.2 is both a zip-code level measure of median income as well as percent change in income and percent change in population variables that are used as instruments for the two demand equations. We use the U.S. Internal Revenue Service Compliance Data Warehouse Individual Return Transaction File tax return data aggregated by zip code.[24] The average of the median unadjusted individual incomes in the zip codes of the lenders in our sample is $32,671.

The number of individual tax returns by zip code is a variable that is a proxy for population. We do not use this variable in the empirical analyses because the Census Bureau provides a good population variable by zip code. But we do use the percent change in tax-returns between 2009 and 2010 as our proxy for the percent change in the population, which variable is one of our instruments for the demand equations. The other instrument we use for the demand equations is the percent change in median adjusted gross income (AGI) by zip code.

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[24]The IRS zip-code-level tabulations data for the State of Utah presented in Table 8 were provided by a U.S. Treasury employee from the Office of Tax Analysis. The median statistics use "smeared" data in which the 9 middle observations were averaged to protect confidential information of individual taxpayers.

Table 8 Descriptive statistics of store characteristics, 2010 (248 lenders in sample)

| Variables | Across lenders in sample (repeated zip codes) | | | | Utah |
	Mean	Std. Dev.	Min.	Max.	
Avg. loan interest rate (APR)	402.0 %	122.3	196.5 %	617.1 %	
Avg. loan amount (dollars)	$581.40	315.00	$208.81	$1,894.24	
Avg. loan term (days)	80.8	86.7	10.7	280.9	
Default rate	15.5 %	11.7	0.0 %	50.7 %	
Number same type lenders within 5-mile radius	24.4	16.1	1	66	
Title lender indicator (=1 if title lender)	0.41	0.49	0	1	
Median unajusted individual income	$32,671	6,724	$17,068	$52,973	
Percent change in median adjusted gross income	1.8 %	1.6	−2.6 %	6.6 %	
Percent change in number of tax returns	−1.6 %	1.7	−6.3 %	2.5 %	
Unemployment rate	7.1 %	1.9	3.9 %	12.8 %	8.1 %
Percent with bachelor's degree or higher, age 25+	26.3 %	10.0	11.1 %	67.0 %	29.4 %
Population	36,752	13,430	7,218	68,295	7,965
Median age (years)	29.4	2.5	22.7	38.2	29.2
Percent Black	2.2 %	1.3	0.4 %	5.6 %	1.6 %
Percent Hispanic	17.2 %	10.3	3.2 %	52.1 %	13.0 %
Percent who speak English "not very well"	1.9 %	3.1	0.1 %	16.6 %	
Percent households with spouse present	56.5 %	12.4	18.8 %	82.1 %	61.0 %

4.2 Interest rate estimates

A linearized empirical version of the supply equation determining the interest rate is the following:

$$avgrt_i = \gamma_0 + \gamma_1 avgamt_i + \gamma_2 avgtrm_i + \gamma_3 defltrt_i + \gamma_4 mktconc_i$$
$$+ \gamma_5 indTL_i + \sum_{j=6}^{J+5} \gamma_j \mathbf{X}_{i,j} + \mu_{s,i} \qquad (4.1)$$

where $avgrt_i$ is the average interest rate (in APR terms), $avgamt_i$ is the average loan amount, $avgtrm_i$ is the average loan term, $defltrt_i$ is the default rate, and $mktconc_i$ is a measure of market concentration for store i in 2010. We also include an indicator variable for title lender, $indTL_i$, in order to control for industry fixed effects. Only using the indicator variable for title lenders implies the strong assumption that all the other explanatory

Table 9 OLS regression estimates of general equilibrium average interest rate equation, 2010 (248 observations)

Independent variables	Dependent variable Avg. interest rate (%)
Default rate	0.528* (0.312)
Number same type lenders within 5-mile radius	−0.785** (0.306)
Title lender indicator (=1 if title lender)	−226.2*** (6.9)
Median unadjusted individual income ($ thousands)	8.377 (6.392)
Median unadjusted individual income squared	−0.084 (0.081)
Percent change in median adjusted gross income	−0.166 (2.413)
Percent chg. in number of tax returns	−0.650 (2.576)
Unemployment rate	−0.818 (2.831)
Percent with bachelor's degree or higher, age 25+	−1.898*** (0.646)
Population (thousands)	−0.139 (0.330)
Median age (years)	−4.957** (2.095)
Percent Black	−14.452** (6.709)
Percent Hispanic	−1.972 (1.462)
Percent who speak English "not very well"	7.263* (3.920)
Percent of households with spouse present	−2.781*** (0.771)
R-squared	0.834

*Significant at the 10-percent level. **Significant at the 5-percent level. ***Significant at the 1-percent level

variables affect interest rates in both industries in the same way. However, we do not have enough data to include all the cross terms necessary to look at the differential effects of each variable by industry. The vector of J demographic and socioeconomic variables $\mathbf{X}_{i,j}$ in the summation term allow for lenders to vary their interest rates based on borrower characteristics. The last term $\mu_{s,i}$ is a supply specific error term. The linear empirical demand equations are written in terms of loan amount and loan term.

$$avgamt_i = \alpha_0 + \alpha_1 avgrt_i + \alpha_2 indTL_i + \alpha_3 \%\Delta pop_i + \alpha_4 \%\Delta medinc_i + \sum_{j=5}^{J+4} \alpha_j \mathbf{X}_{i,j} + \mu_{d1,i} \tag{4.2}$$

Table 10 Simultaneous equations regression estimates of supply equation and two demand equations, 2010 (248 observations)

Independent variables	Dependent variables		
	Avg. interest rate (%)	Avg. loan amount ($)	Avg. loan term (days)
Avg. loan interest rate (APR)		−3.410** (1.584)	−0.092 (0.231)
Avg. loan amount (dollars)	0.011 (0.206)		
Avg. loan term (days)	−0.165 (1.804)		
Default rate	0.902 (0.931)		
Number same type lenders within 5-mile radius	−0.561 (0.634)		
Title lender indicator (=1 if title lender)	−205.0 (248.3)	−331.4 (351.4)	135.6*** (51.2)
Median unadjusted individual income ($ thousands)	9.187 (6.845)	34.812 (35.522)	−3.405(5.180)
Median unadjusted individual income squared	−0.097 (0.078)	−0.375 (0.434)	0.031 (0.063)
Percent change in median adjusted gross income		12.208 (11.922)	−0.307 (1.738)
Percent change in number of tax returns		−7.515 (12.076)	−2.734 (1.761)
Unemployment rate	−0.422 (3.719)	0.720 (13.547)	−2.865 (1.975)
Percent with bachelor's degree or higher, age 25+	−1.965* (1.160)	−1.736 (4.426)	−0.003 (0.645)
Population (thousands)	−0.098 (0.483)	1.101 (1.643)	0.173 (0.240)
Median age (years)	−5.200 (3.710)	−6.376 (14.381)	2.213 (2.097)
Percent Black	−16.107** (6.608)	−43.617 (43.243)	2.667 (6.305)
Percent Hispanic	−2.406 (1.885)	−9.019 (8.006)	−0.574 (1.167)
Percent who speak English "not very well"	8.496 (5.851)	33.100 (24.168)	2.128 (3.524)
Percent of households with spouse present	−2.804*** (0.995)	−6.809 (5.732)	0.165 (0.836)
R-squared	0.831	0.334	0.813

*Significant at the 10-percent level. **Significant at the 5-percent level. ***Significant at the 1-percent level

$$avgtrm_i = \beta_0 + \beta_1 avgrt_i + \beta_2 indTL_i + \beta_3 \%\Delta pop_i + \beta_4 \%\Delta medinc_i$$
$$+ \sum_{j=5}^{J+4} \beta_j \mathbf{X}_{i,j} + \mu_{d2,i} \qquad (4.3)$$

In order to consistently estimate the parameters of the one supply (4.1) and two demand (4.2) and (4.3), we impose some necessary exclusion restrictions. As natural supply shifters, we assume that the default rate ($dfltrt_i$) and the measure of market concentration ($mktconc_i$) in Eq. 4.1 only affect the supply of loans and do not enter in either of the demand equations. For the demand equations, we have assumed that the average loan amount $avgamt_i$ in Eq. 4.2 is not a function of the average loan term $avgtrm_i$. And we have assumed that the average loan term $avgtrm_i$ in Eq. 4.3 is not a function of the average loan amount $avgamt_i$. These exclusion restrictions are necessary for identifying the parameters of the model.

Lastly, we follow the approach of Calomiris and Pornrojnangkool (2009), who estimate a supply and demand system for the pricing of banking financial services. They use the percentage change in sales growth as a demand shifter for corporate demand for financing. In the context of this paper, we will use the percentage growth rate in the number of tax returns by zip code between 2009 and 2010 from the IRS data as a proxy for population growth $\%\Delta pop_i$ and the percentage growth rate in median adjusted gross income (AGI) $\%\Delta medinc_i$ as demand shifters. These two variables should capture increases in demand for payday and title loans and not affect the cost structure of the lending beyond the variables already controlled for in the three-equation system.

In an equilibrium in which markets clear and both the demand and supply equations must hold, the supply (4.1) and the two demand (4.2) and (4.3) can be reduced to functions of the title lender indicator variable, the J socioeconomic variables, and the instruments.

$$avgrt_i = f\left(indTL_i, defltrt_i, mktconc_i, \%\Delta pop_i, \%\Delta medinc_i, \{\mathbf{X}_{i,j}\}_{j=1}^{J}\right) \quad (4.4)$$

$$avgamt_i = g\left(indTL_i, defltrt_i, mktconc_i, \%\Delta pop_i, \%\Delta medinc_i, \{\mathbf{X}_{i,j}\}_{j=1}^{J}\right) \quad (4.5)$$

$$avgtrm_i = h\left(indTL_i, defltrt_i, mktconc_i, \%\Delta pop_i, \%\Delta medinc_i, \{\mathbf{X}_{i,j}\}_{j=1}^{J}\right) \quad (4.6)$$

Table 9 presents the estimation of the equilibrium supply (4.4). All the estimated coefficients in Table 9, except two, include both α and β coefficients from the demand (4.2) and (4.3) as well as the γ coefficients from the supply (4.1). However, the estimated coefficients on the two instruments for the supply equation, $defltrt_i$ and $mktconc_i$, are the same γ coefficients as in the original supply (4.1).

Table 9 shows that the coefficients on the default rate and the degree of market concentration (number of same-type lenders within a 5-mile radius) are both statistically significant at the 10-percent and 5-percent levels, respectively. Each new same-type lender that locates within a 5-mile radius reduces average interest rates by nearly 0.8 percentage points. And for each percent increase in the default rate of borrowers, the average interest rate increases by 0.5 percentage points. These results confirm the standard competitive market results that more competition reduces prices and that higher cost structure and risk increase prices.[25]

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[25] We provide a Table of regression results in the Appendix corresponding to Table 9 in which we included four firm fixed effects indicator variables for the four largest firms. However, many of the coefficients lost their statistical significance due to the scarcity of data. We need more data in order to effectively include firm fixed effects.

The market competition result is particularly interesting in that nearly every geographic area in Utah has zoning ordinances at either the city or county level that restrict the number of payday lenders that can locate in a given area. The market concentration result from Table 9 suggests that these zoning restrictions may be imposing costs on borrowers in those areas through increased short-term lending interest rates.

Table 10 presents the estimation of Eqs. 4.1, 4.2, and 4.3 using instrumental variables simultaneous equations regression to control for the endogeneity of the average loan amount ($avgamt_i$), average loan term ($avgtrm_i$), and average interest rate ($avgrt_i$). As mentioned earlier, the default rate ($dfltrt_i$) and the market concentration variable ($mktconc_i$) for store i are two plausible supply shifters. And we use the percentage change in median adjusted gross income (AGI) and percentage change in the number of tax returns by zip code as demand shifters. The percentage change in the number of tax returns by zip code is a proxy for the percentage change in population by zip code. The three columns of estimates in Table 10 provide unbiased estimates of the γ, α, and β parameters from the empirical supply and demand specifications.

The estimation of the empirical supply (4.1) in the first column of Table 10 is the focus of this paper. The only variables that have a statistically significant effect on the supply of interest rates are the percent of adults with a bachelor's degree or higher, percent Black, and percent of households with spouse present. The estimation suggests that a lender in an area with one-percent more Black residents would charge an interest rate that is 16 percentage points lower. Note from Table 8 that the range in percent of surrounding population that is Black for all the lenders in the sample is between 0.4 and 5.6 %. This suggests that payday and title lenders might actually charge lower interest rates to minorities. However, interest rates are higher for lenders in areas with less educated populations and less married households.

Although not statistically significant, it is also interesting to note that the point estimates on median income and income squared reflect the same nonlinear relationship as in the location estimates from Section 3.2. This is weak evidence of an inverse parabolic relationship between income and interest rates. That is, average interest rates on short-term consumer loans increase as incomes in surrounding areas increase, but at a decreasing rate and only up to a point. Beyond that critical income level, average interest rates decrease as surrounding incomes increase. This would predict that the highest interest rates would be observed from lenders in areas in which the median unadjusted individual income is $47,356. That is significantly higher than the sample average of $32,671.

5 Conclusion

This study provides an analysis of the determinants of where short-term consumer lenders locate and what interest rate they charge. We provide a description of high-response-rate store-level survey data of Utah payday and title lenders for the year 2010. One benefit of the survey data is the ability to estimate the respective size of each industry in that year. The conclusion is that the Utah payday and title lending industries are an order of magnitude smaller than their more traditional consumer lending counterparts.

Using a negative binomial model, we find that payday and title lenders tend to locate in areas with lower median age and a larger population of not married households. We find a nonlinear relationship between lender location and individual incomes in the surrounding area. Payday and title lenders seem to locate more often in middle-income zip codes than in either low- or high- income zip codes.

Further, payday and title lenders tend to locate in areas with more fast food restaurants. We think the significance of fast food restaurants is a proxy for payday and title lenders's preference to be located in high traffic areas. In addition, we use an instrumental variables approach and find that the number of pawn shops in an area is a very significant determinant of the number of payday and title lenders in an area. When we control for the number of pawn shops, the numbers of hospitals and banks in an area loses their statistical significance as a predictor of payday and title locations. In none of our location analysis specifications are any race or educational variables statistically significant determinants of payday and title lender location.

When we look at the determinants of payday and title lender interest rates, we find that lender cost structure variables of local riskiness as measured by default rates and local competition have the standard effects. Higher local default rates are associated with higher interest rates, and more competition results in lower interest rates. In our simultaneous equations supply and demand model, we find that payday and title lenders have higher interest rates in areas with lower educational attainment, smaller proportions of Black residents, and fewer married households. The evidence that payday and lenders seem to have lower interest rates in areas with larger Black populations and that none of the other race variables is significant runs counter to the argument that payday lenders prey on minorities.

An important direction for further work on this topic would be to gather similar data from other states with similar regulatory environments to Utah. Potential candidates are Delaware, Idaho, Nevada, South Dakota, and Wisconsin. Gathering more data from these states would better allow for the estimation of firm fixed effects as well as better evidence of the generalizability of the results.

Appendix: Technical

T.1 Initial survey e-mail sent to lenders

Below is the text of the initial contact e-mail that was sent to each lender in the survey.

Mr./Ms. [Last Name],

My name is Richard W. Evans, BYU Economics Professor, and this e-mail is a request for a few statistics of 2010 data from the Utah lending locations owned by [company name].

I am conducting a research project using Utah payday, title, and pawn lenders to show how different lending characteristics affect average interest rates in the short-term consumer lending industry. Preliminary evidence using broad national industry data shows that the interest rates seen in your industry can be explained by a standard competitive economic model. My research has been funded by a grant from the Consumer Credit Research Foundation and has been endorsed by the Utah Department of Financial Institutions (see attached grant proposal).

Because I am asking for a few simple statistics of your proprietary data from specific store locations, I have attached a nondisclosure agreement to this e-mail. I understand how sensitive and vital this information staying private is to your business. The nondisclosure agreement guarantees that neither I nor my research assistant will share your proprietary data that you share with us with any other party. However, the agreement does allow me to present summary statistics (averages and conditional correlations) in the presentation and publication of this research. It also allows me to share the data with an academic journal referee if they ask for it and only after I have removed any store or company identifiers from the data. In short, I want to make sure that you know that I will take the utmost care in keeping your data private. The only other person who will see the full dataset with its accompanying identifiers will be my research assistant, Taylor Canann, who is also a signatory on the attached nondisclosure agreement.

We are requesting the following five (six for pawn) statistics from 2010 for each of your Utah stores (excluding internet loans) and for each of three applicable loan types-payday, title, and pawn.

i   Average loan interest rate in APR
ii   Average loan principal amount
iii Average loan term in days
iv   Average default rate
v   Total principal lent
vi   (for pawn only) Total value of confiscated or misappropriated collateral

Attached is both a one-page survey data instructions form as well as an Excel spreadsheet in which to record the data.Please send me back the Excel spreadsheet with the appropriate data as well as a copy signed by your company of the nondisclosure agreement. Please feel free to contact me at any time at the number or e-mail address below if you have any questions or comments. Thank you in advance for your participation.

Rick

Richard W. Evans, Assistant Professor, Brigham Young University, Department of Economics, 167 FOB, Provo, Utah 84602, (801) 422-8303, revans@byu.edu

T.2 Survey instructions attached to initial e-mail

Richard W. Evans   Office: (801) 422-8303
Brigham Young University   E-mail: revans@byu.edu

Instructions for Utah Short-term Consumer Lending Survey Data

We are requesting the following five (six for pawn) statistics from 2010 for each of your Utah store locations and for each of three categories of lending: payday, car title, and pawn (excluding internet lending). You can ignore any category that does not apply to a particular store. For example, a particular Utah store that offered payday, car title, and pawn loans in 2010 would provide 16 summary statistics.

	Utah Payday loans, 2010	**Utah Car title loans, 2010**	**Utah Pawn loans, 2010**
1	Average payday loan interest rate in APR	Average car title loan interest rate in APR	Average pawn loan interest rate in APR
2	Average payday loan principal amount	Average car title loan principal amount	Average pawn loan principal amount
3	Average payday loan term (in days)	Average car title loan term (in days)	Average pawn loan term (in days)
4	Average payday loan default rate	Average car title loan default rate	Average pawn loan default rate
5	Total principal lent of payday loans in 2010	Total principal lent of car title loans in 2010	Total principal lent of pawn loans in 2010
6			Total value of confiscated or misappropriated collateral in 2010

1) **Average interest rate in APR.** Please record the average interest rate in annual percentage rate (APR) terms on the specific loan type (payday, car title, or pawn, excluding internet) for all loans of that type for the year 2010.

2) **Average principal amount.** Please record the average principal amount for a loan of specific type (payday, car title, or pawn, excluding internet) for all loans of that type for the year 2010.

3) **Average loan term (in days).** Please record the average number of days in which repayment is due for a specific loan type (payday, car title, or pawn, excluding internet) for all loans of that type for the year 2010. If the term of a particular loan is flexible, please use the time until repayment without being in default in your calculation of the average loan term.

4) **Average default rate.** Please record the percentage of loans of a particular type (payday, car title, or pawn, excluding internet) that were not repaid on or before the expiration of the loan term listed on the original contract. This is a fairly broad definition of default in that many loan contracts have grace periods and have longer periods before they are sent to collection.

5) **Total principal lent.** Please record the total loan principal lent for each specific loan type (payday, car title, or pawn, excluding internet) for the year 2010.

6) [for pawn only] **Total value of confiscated or misappropriated collateral.** Please record the total value of confiscated or misappropriated collateral in 2010 for pawn lenders.

Please use the attached Excel spreadsheet to enter each Utah store's information along with the five (six for pawn) statistics for the year 2010 for each store and for of the three loan types that apply.

Some of the spaces in the spreadsheet have been filled in to give you an example of the store-level data that we need.

Lastly, I remind you that I and my research assistant have provided you with a signed nondisclosure agreement in order to assure you that we will keep your proprietary information private and will only publish industry wide summary statistics. Please contact me at the number or e-mail address above if you have any questions or comments. Thank you.

1

T.3 Nondisclosure agreement with lenders

CONFIDENTIALITY AND NONDISCLOSURE AGREEMENT

This Agreement is entered this _____ day of _____, 2011 (the "Effective Date") by and between _____, a _____ company having its principal place of business at _____, _____, _____, _____ ("Discloser"), and Richard W. Evans Jr. and Taylor J. Canann, who are independent research contractors having an office address at Brigham Young University Department of Economics, 167 FOB, Provo, Utah 84602 (collectively "Disclosee").

RECITALS:

WHEREAS, the Discloser is in the business of making payday loans, car title loans and/or pawn loans (the "Industry"); and

WHEREAS, Richard W. Evans Jr. is an assistant professor of Economics and Taylor J. Canann is his research assistant; and

WHEREAS, the principal of Discloser has developed and accumulated detailed, proprietary and confidential data related to the Industry, all of which Discloser treats as and claims to be Discloser's confidential and proprietary trade secret information (the "Confidential Information" as further defined below); and

WHEREAS, pursuant to research grants and at no cost to Discloser, Disclosee desires to use the Confidential Information, together with similar information obtained by Disclosee from other similar businesses in the Industry, in the statistical analyses and other uses in Disclosee's economic research, publications and analyses, which may have value to Discloser; and

WHEREAS, the parties anticipate that during the course of Disclosee's research and publications that it will be necessary for Disclosee to disclose to third parties or to the public certain portions of details of the Confidential Information but only after removing all identifying information; and

WHEREAS, within the parameters described hereinbelow, Discloser intends to maintain the confidentiality of and otherwise to protect its Confidential Information.

NOW THEREFORE, in consideration of the promises herein, the parties hereto hereby agree as follows:

I.   Confidential Information.

A.   "Confidential Information" means all confidential or proprietary information in the form of Industry related data, with details which would specify a store, a name, a parent company, an address or other contact information which would identify the source of the data ("Identifiers"), belonging to Discloser, whether in written, electronic or oral form, including and limited to the following information:

1.   The average interest rate on 2010 payday loans, the average interest rate on 2010 title loans, and the average interest rate on 2010 pawn loans;

2.   The average loan term for 2010 payday loans, the average loan term for 2010 title loans, and the average loan term for 2010 pawn loans;

3.   The average loan amount for 2010 payday loans, the average loan amount for 2010 title loans, average loan amount for 2010 pawn loans;

4.   The average default rate for 2010 payday loans, the average default rate for 2010 title loans, average default rate for 2010 pawn loans; and

5.   The total 2010 payday loan principal volume, the total 2010 title loan principal volume and the total 2010 pawn loan principal volume.

B.   Confidential Information does not include information which Disclosee can prove:

1.   Becomes generally available to the public in any manner or form through no fault or action of Disclosee, but only from the date it becomes available;

2.   Was rightfully in the possession of Disclosee without obligation of confidentiality prior to receipt thereof from Discloser;

3.   Is independently developed by Disclosee without the benefit of any Confidential Information;

4. Is rightfully received by Disclosee from another source on a nonconfidential basis;

5. Is disclosed in accordance with applicable law or the order of a court or governmental or administrative agency after Disclosee has given notice thereof to Discloser and cooperated with any efforts of Discloser to obtain a protective order or confidentiality agreement with provisions equivalent to the provisions of this agreement; or

6. Is released for disclosure with Discloser's prior written consent.

II.   Nondisclosure. Disclosee agrees that it will not disclose any of the Confidential Information except as permitted herein.   Discloser allows the Disclosee to use the Confidential Information:

A.   To publish and use the results of Disclosee's research and analysis thereof and to present the data from the Confidential Information for publication in summary statistics, averages and conditional correlations without any Identifiers;

B.   To share the original data in the Confidential Information to journal referees and other third parties, as deemed necessary by Disclosee in its sole discretion, for purposes of verifying the Disclosee's research and other such needs, but Disclosee shall not share such any such original data with any person without redacting and removing any and all Identifiers; and

C.   As otherwise expressly permitted by written agreement between Disclosee and Discloser.

III.   Survival of Obligations. Disclosee's obligations of confidentiality and nondisclosure herein are continuing obligations and shall in all events survive the date of this agreement for a period of seven (7) years.

IV.   Objective Relief. Disclosee acknowledges and agrees that a breach by it of any provision of this Agreement may cause Discloser immediate and irreparable harm which cannot be adequately compensated by monetary damages. Accordingly, in the event of a breach or threatened breach by Disclosee, Discloser shall be entitled to injunctive or other preliminary and permanent

equitable relief in addition to such other remedies as may be available to Discloser.

V.   Legal Proceedings. Discloser and Disclosee agree: (1) this Agreement shall be construed in accordance with the laws of the State of Utah; (2) Should any dispute arise concerning this Agreement and/or the Confidential Information, venue shall be laid in Utah County, Utah; and (3) Utah state and federal courts shall have exclusive jurisdiction over any dispute concerning this Agreement and/or the Confidential Information and Discloser and Disclosee hereby consent to the personal jurisdiction of such courts.

VI.   Notices. All notices must be in writing and must be sent by first-class, registered, or certified mail, postage prepaid, or by overnight or express courier, or by facsimile. Notices sent by facsimile shall be effective immediately if during normal business hours of recipient. All other notices shall be effective the first business day after posting. Notices transmitted orally shall be deemed insufficient notice. All notices shall be sent to the relevant party at the address or facsimile number as specified below (or such other address or facsimile number as such party shall designate in writing).

    If to Discloser:

    With copy to:

    If to Disclosee: Richard W. Evans Jr.
                      Brigham Young University Department of Economics
                      167 FOB
                      Provo, Utah 84602

    With copy to: Richard W. Evans, P.C.
                    299 South Main Street, Suite 1300
                    Salt Lake City, Utah 84111

VII.   Modifications. This contract constitutes the whole agreement between the parties. There are no terms, obligations, covenants or conditions between the parties other than those contained herein. No modification or variation hereof shall be valid unless evidenced by an agreement in writing signed by Discloser and Disclosee.

VIII.   This Confidentiality and Nondisclosure Agreement may be executed in any number of counterparts, each of which when executed shall be deemed to be an original, and all of which shall together constitute one and the same instrument, and facsimile signatures shall be deemed to be and accepted as originals.

IN WITNESS WHEREOF, the parties hereto have executed this Agreement on the day and year first above written.

DISCLOSEE:

_____
Name: Richard W. Evans Jr., individually

_____
Name: Taylor J. Canann, individually

DISCLOSER:

_____, a Utah _____ company

By: _____
_____, its _____

T.4 Two-stage negative binomial regression results

Table 11 presents the results from both stages of the two-stage negative binomial estimation from specification (3) in Table 3.

Table 11 First and second stage of negative binomial estimation of determinants of number of payday and title lenders in a zip code, 2010 (283 zip code observations)

Independent variables	First stage Pawn lenders	Second stage Payday and title lenders
Median unajusted individual income ($ thousands)	0.058 (0.101)	0.140** (0.070)
Median unajusted individual income squared	−0.001 (0.001)	−0.001 (0.001)
Unemployment rate	0.006 (0.032)	−0.016 (0.030)
Pct. with bachelor's degree or higher, age 25+	−0.002 (0.011)	0.002 (0.008)
Population (thousands)	0.022* (0.012)	0.014 (0.009)
Median age (years)	−0.076** (0.035)	−0.060** (0.030)
Pct. black	−0.177 (0.171)	−0.011 (0.120)
Pct. Hispanic	0.031(0.024)	0.013 (0.020)
Pct. who speak English "not very well"	−0.003 (0.059)	−0.011 (0.051)
Pct. households with spouse present	−0.017 (0.017)	−0.026** (0.013)
Population (thousands) per square mile	0.117 (0.089)	−0.060 (0.053)
Hospitals	0.107 (0.212)	0.236 (0.148)
Restaurants	−0.027 (0.041)	0.060*** (0.023)
Banks	0.086** (0.035)	−0.001 (0.033)
Gun shops	0.136***(0.037)	
Storage facilities	0.010 (0.024)	
Pawn lenders		0.663*** (0.160)
Payday and title lenders	0.031 (0.044)	
Log likelihood	−133.64	−192.58
$NB\ \alpha$	0.200**	0.197***

*Significant at the 10-percent level. **Significant at the 5-percent level. ***Significant at the 1-percent level

T.5 Negative binomial regression results with median income dummy variables

Table 12 a negative binomial analysis of the determinants of the number of payday and title lenders in a given zip code similar to the analysis of specification (3) in Table 3. However, instead of median income and median income squared, we have included two indicator variables. The first indicator variable equals 1 for zip codes with median income less than $30,000 and equals 0 otherwise. The second indicator variable equals 1 for zip codes with median income greater than $50,000 and equals 0 otherwise. The excluded category is zip codes with median income between $30,000 and $50,000.

The point estimates on both indicator variables are negative, but only the point estimate on the low income indicator is statistically significant. This finding supports the conclusion of the analysis in Table 3 that the relationship between the number of payday and title lenders in a zip code and the median income is concave and that short-run lenders prefer middle incomes over low or high incomes.

Table 12 Negative binomial estimation of determinants of number of payday and title lenders in a zip code with median income dummy variables, 2010 (283 zip code observations)

Median income < $30,000	−0.659*** (0.237)
Median income > $50,000	−0.358 (0.582)
Unemployment rate	0.000 (0.029)
Pct. with bachelor's degree or higher, age 25+	0.013* (0.007)
Population (thousands)	0.010 (0.009)
Median age (years)	−0.013 (0.018)
Pct. black	0.138 (0.106)
Pct. Hispanic	0.011 (0.020)
Pct. who speak English "not very well"	−0.013 (0.053)
Pct. households with spouse present	0.000 (0.008)
Population (thousands) per square mile	−0.048 (0.052)
Hospitals	0.282* (0.145)
Restaurants	0.055** (0.023)
Banks	−0.004 (0.031)
Pawn lenders	0.754*** (0.156)
Log likelihood	−192.75
$NB\ \alpha$	0.183***

*Significant at the 10-percent level. **Significant at the 5-percent level. ***Significant at the 1-percent level

T.6 Equilibrium interest rate regression with firm fixed effects

In this appendix, we give the results from Table 9 both with and without firm fixed effects. In our firm fixed effects specification in the second column of Table 13, we have added four indicator variables—one for each of the four largest firms with greater than 30 payday and title lending locations. The excluded group is all the lenders that are part of firms with thirty or less stores. Note that these store numbers are larger than the ones reported in the histogram in Figs. 3 and 4. This is because the store locations in Tables 9 and 13 count one store that offers both payday and title loans as two separate stores.

The estimated coefficients on each of the four firm fixed effect indicators is statistically significant at the 1-percent level. One of the firms had an average equilibrium interest rate that was 70 percentage points less than the average interest rate at a firm with less than thirty

Table 13 OLS regression estimates ogeneral equilibrium average interest rate equation, 2010 (248 observations)

Independent variables	Without firm fixed effects	With firm fixed effect
Default rate	0.528* (0.312)	−0.450 (0.334)
Number same type lenders within 5-mile radius	−0.785** (0.306)	−0.303 (0.217)
Title lender indicator (=1 if title lender)	−226.2*** (6.9)	−221.9*** (5.117)
Median unadjusted individual income ($ thousands)	8.377 (6.392)	2.439 (4.500)
Median unadjusted individual income squared	−0.084 (0.081)	−0.013 (0.057)
Percent change in median adjusted gross income	−0.166 (2.413)	0.009 (1.690)
Percent chg. in number of tax returns	−0.650 (2.576)	−1.542 (1.853)
Unemployment rate	−0.818 (2.831)	−0.774 (1.986)
Percent with bachelor's degree or higher, age 25+	−1.898*** (0.646)	−0.465 (0.472)
Population (thousands)	−0.139 (0.330)	0.039 (0.232)
Median age (years)	−4.957** (2.095)	−2.128 (1.488)
Percent Black	−14.452** (6.709)	−11.073** (4.709)
Percent Hispanic	−1.972 (1.462)	−0.354 (1.044)
Percent who speak English "not very well"	7.263* (3.920)	3.497 (2.820)
Percent of households with spouse present	−2.781*** (0.771)	−1.437*** (0.547)
R-squared	0.834	0.920

*Significant at the 10-percent level. **Significant the 5-percent level. ***Significant at the 1-percent level

locations. However, the other three indicator variables had positive coefficients, suggesting that those firms had average interest rates higher than their smaller-firm counterparts.

With only 248 observations, adding the four fixed effects indicator variables in column 2 takes away the model's ability to estimate the effect of the default rate and market concentration effectively. Both coefficients lose their statistical significance, and the default rate point estimate switches sign. This suggests a need for a study with more data in order to capture firm fixed effects.

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