Advertising Expensive Mortgages

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ABSTRACT

We use a unique dataset that combines information on advertising and mortgages originated by subprime lenders to study whether advertising helped consumers find cheaper mortgages. Lenders who advertise more within a region sell more expensive mortgages, measured as the excess rate of a mortgage after accounting for a broad set of borrower, contract, and regional characteristics. These effects are stronger for mortgages sold to less sophisticated consumers. We exploit variation in mortgage advertising induced by the entry of Craigslist across different regions as well as a battery of other tests to demonstrate that the relation between advertising and mortgage expensiveness is not spurious. Our estimates imply that consumers pay on average $7,500 more when borrowing from a lender who advertises. Analyzing advertising content reveals that initial/introductory rates are advertised frequently in a salient fashion in contrast to reset rates, which are rarely advertised. Moreover, the advertised price (APR) is at best uncorrelated with mortgage expensiveness. Our facts reject the canonical models of informative advertising and are instead more consistent with persuasion models, in which the reset rate is shrouded/not salient and advertising is used steer unsophisticated consumers into bad choices by increasing the salience of the initial interest rate.

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I. Introduction

Recent literature shows the importance of search in the mortgage market (Hall and Woodward 2012). Although mortgages are relatively homogeneous products, search frictions create a demand for information about mortgages that lenders can cater to. There are two broad views on how lenders use advertising to supply this information to consumers. On the one hand, the "informative view" claims that advertising allows consumers to find better products (Nelson 1974). On the other hand, the "persuasive view" suggests that advertising is used to steer consumers into bad choices (Braithwaite 1928; Thaler and Sunstein 2008). These views are at the center of a vociferous debate regarding the role of advertising in the mortgage market in the aftermath of the housing crisis. Several policy and regulatory changes that have emerged from these discussions are based on the idea that naïve consumers were duped by advertising to enter expensive mortgages.[1] While anecdotes have been used to justify these claims of deceptive advertising, there is no empirical study that has systematically investigated this issue.[2]

This paper has two goals. The main goal is to provide evidence for deceptive advertising using unique micro data on lending and advertising from the subprime mortgage market. Having found such evidence, the second goal is to compare the performance of a rich set of models of advertising in explaining the data and to show that our facts reject the canonical models of informative advertising.

Our dataset combines the intensity and content of local advertising by subprime lenders with the contract, region, and borrower characteristics of mortgages originated by them. We focus on adjustable-rate mortgage (ARM) loans, and in particular ARM reset rates, because they have been at the center of lawsuits and regulatory scrutiny. The scrutiny is based on the idea that advertising lures consumers into bad choices by focusing their attention on the introductory interest rate, fostering the impression that the (low) rate will be permanent, rather than reset after the first few years.

We empirically confirm the perception that reset rates are "hidden" characteristics of advertised mortgages. In the 37,432 mortgage campaigns in print and direct mail that we analyze, only seven (0.02%) explicitly mention a reset rate. While this result indicates persuasive advertising

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[1] Regulators have penalized lenders for deceptive practices and implemented explicit regulation of mortgage advertising. The FDIC implemented Regulation Z in 2008 and the FTC passed the Mortgage Acts and Practices Advertising rule in 2011, both of which directly regulate advertising of mortgages. The *New York Times* summarized this prevailing view: "One of the most important lessons of the mortgage collapse is that potential borrowers need clear explanations of exactly what kind of commitment they are making" (October 1, 2010). The Fed fined Wells Fargo $85 million for steering consumers into expensive mortgages, and the Department of Justice reached a $175 million settlement with Wells Fargo to resolve fair lending claims (http://www.justice.gov/opa/pr/2012/July/12-dag-869.html) [accessed on February 29, 2013].

[2] In general, lack of data has precluded research on advertising mortgage products (see Agarwal and Ambrose 2011)

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that shrouds reset rates, it is not sufficient to reject informative advertising. Just because reset rates are not advertised does not imply that consumers are unaware of them and therefore make worse choices than they should. The obvious difficulty in separating the informative and persuasive views is that one needs to identify "better" and "worse" mortgages, and then relate the choices of consumers, who may not be otherwise identical, to lender advertising.

We measure whether mortgages are relatively better or worse for the consumer by computing the extent to which identical consumers pay different prices for otherwise similar mortgages in a given market. We contend that cheaper mortgages, all else equal, are better products from the perspective of the consumer. We exploit the richness of our data and measure the relative "expensiveness" of a given mortgage as the excess reset rate of a mortgage after accounting for a broad set of borrower, contract, and regional characteristics associated with a given mortgage, including the initial interest rate. The essence of the relative expensiveness measure is that if identical consumers obtain the same mortgage with different reset rates in the same market, then the difference in the reset rates measures how much worse the choice of the consumer with the higher reset rate was.

We find large differences in average reset rates charged by lenders *within* geographic regions (designated market areas, or DMAs) after conditioning on borrower and loan characteristics and the initial interest rate: the average difference between the 95th and 5th percentile lenders in a given region is 2.8 percentage points. Thus, in the first part of our analysis we find that loans originated by some lenders are, on average, more expensive than others.

Next, we show one of the central results of the paper, that there is a positive correlation between lender expensiveness and advertising *within* a given market. Lenders who advertise more intensively also charge more for the same mortgage. We then extensively address alternative explanations to show our results are not spurious. In particular, we obtain our results by exploiting the variation in relative advertising of lenders within a given location using lender fixed effects. Thus, our finding is not driven by the simple notion that lenders advertise more in regions with higher mortgage prices. In addition, exploiting within lenders variation allows us to allay concerns that it is lender characteristics--such as the lender's brand, other lenders' activities aimed at attracting customers, propensity to renegotiate or securitize, or marginal costs--which may be correlated with advertising, that are driving the results.

Another potential alternative explanation is that advertising attracts a different pool of borrowers who are charged higher reset rates due to their lower ability to repay or due to higher catering costs. This alternative could explain our findings if true borrower "quality" is not captured by our rich set of conditioning variables. We conduct two tests to explore this alternative. First, if advertising lenders lend to borrowers who are less likely to repay a loan then we should find that

such borrowers are indeed less likely to repay a loan in the future. We find that advertisers lend to consumers who, all else equal, default less, making it unlikely that our results are driven by unobservable borrower quality. As well, using another unique dataset, we show that advertising does not attract consumers with higher catering costs.

Second, we exploit variation in mortgage advertising induced by staggered entry of Craigslist across different regions and times. We show that mortgage classifieds represent over 8% of all financial services posts on Craigslist. Thus, Craigslist entry into a market serves as a potentially viable source of variation in mortgage advertising in that market. Indeed, introduction of Craigslist has a significant impact on paid mortgage advertising, with the highest impact on newspaper advertising, for which Craigslist online classifieds substitute most directly. We exploit this Craigslist-induced variation in changes in advertising between lenders and continue to find a positive relationship between the intensity of local advertising and the expensiveness of mortgages extended by lenders.[3] Importantly, Craigslist introduction is unrelated to borrowers' characteristics in that region. Together, these results reaffirm that the explanation that advertising attracts borrowers of different riskiness or catering costs is not likely driving our findings.

The magnitudes that we obtain from our analysis are large and suggest that a consumer who obtains a mortgage from a lender who advertises pays on average approximately $7,440 more in present-value terms. These estimates are on the same order of magnitude as the estimates of losses faced by mortgage borrowers because they do not properly account for broker service fees that are given in Hall and Woodward (2012).

Having established that there is a *positive* relationship between the expensiveness of a lender and the advertising intensity by that lender *within* a market, we next compare the performance of a set of rich models of advertising. Canonical models of informed advertising (e.g., Butters 1977; Robert and Stahl 1993; Bagwell and Ramey 1994) cannot generate the positive correlation we find. In these models lenders use costly advertising to inform consumers of low prices, so cheaper lenders within a market would use this means to attract customers to their mortgages. Therefore these models predict a negative (or no) relationship between lender expensiveness and advertising. We bolster the argument against informative advertising by examining the content of mortgage advertisements. We find that the correlation between advertised interest rates and realized interest rates is at best zero, which violates the fundamental assumption of informative advertising models that advertised prices are equal to transaction prices (e.g., Butters 1977; Robert and Stahl 1993).

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[3] Our identification allows for a market-level increase in overall mortgage advertising, including advertising on Craigslist, because we only exploit the differential change in paid advertising between lenders *within* a market. Moreover, we show that lenders who decrease paid advertising upon Craigslist entry do not offset this advertising decrease through an increase in advertising on Craigslist.

Our results are more consistent with the persuasive view in which advertising causes consumers to enter worse mortgages. Under this view, we should observe that advertising draws consumers to relatively more expensive mortgages—those which contain higher reset rates, all else equal. While there is no one model of persuasive advertising that can deliver all our findings, our results are consistent with forces generated by several models. In particular, we find that reset rates are almost never advertised, in contrast to introductory/initial interest rates. As well, mortgage advertisements contain very little information on the characteristics of mortgages or lenders. The models that are consistent with this feature of advertising are those in which some characteristics of goods, in our case the reset rate, are shrouded/not salient (Gabaix and Laibson 2006, Bordalo, Gennaioli, and Shleifer 2012) and advertising is used to increase the salience of certain other characteristics, the initial interest rate in the case of mortgage advertising.

Moreover, the positive correlation between advertising intensity and pricing is driven by mortgage advertisers who tilt their portfolio toward less-educated borrowers, minority borrowers, and the poor--groups of borrowers identified in the literature as potentially less sophisticated (Hall and Woodward 2012). Therefore, heterogeneity in the degree of consumer sophistication also plays a central role in explaining the persuasive role in advertising.

The rest of the paper is organized as follows: In Section II we discuss the institutional background, including the anecdotal evidence on the deceptive and persuasive use of advertising in mortgage markets. In Section III we present our data sources. Section IV outlines the empirical results relating advertising intensity and mortgage pricing. Section V analyzes the content of advertisements. Section VI discusses the findings, links them to models of advertising and the related literature, and concludes

II. Institutional Background

Anecdotal evidence of persuasive and deceptive advertising in the mortgage market

As we discuss in detail in Section III, lenders target potential consumers through advertisements in local newspapers, in television, radio, and outdoor spots. Several discussions in the popular press as well as policy discussions suggest that mortgage lenders have employed advertising to confuse consumers into making "bad" decisions. A *Wall Street Journal* article on February 15, 2005, describes a then-popular practice of advertising low teaser (initial) rates on ARMs as a way to attract consumers who do not realize that these rates will be substantially higher after the reset date. Consider four typical ARM advertisements, which we present in Appendix B (in Section V we confirm that the features of these ads are indeed typical). They all prominently state the introductory interest rate, making it the focal, salient part of the advertisement. None of

the advertisements mention the reset rate or the index that will be used at the time of reset. The most informative advertisement is by the Pentagon Credit Union in the *Washington Post* on August 5, 2006 (Appendix B.3). It states the annual percentage rate (APR) of 7.045% in addition to the introductory rate of 5.625% for five years. Note that there is no mention of how the APR is computed.[4]

The advertisement presented in Appendix B.1 neglected even to mention that the mortgage is adjustable and offered a "low introductory teaser interest rate" of 1%. According to the settlement agreement between New York Banking Department and Sage Credit Company (formerly named DCG Mortgage), this particular advertisement failed to "clearly and conspicuously disclose the actual terms of repayment of the loans, including that the advertised low interest rate and low monthly payments are subject to increase and do not last over the life of the loan."

Several high-profile lawsuits have been directed at lenders for using false advertising to attract potential consumers and steer them into "bad" mortgages. The Office of the Attorney General's Consumer Protection Section in Colorado has sued or settled with sixteen mortgage lenders regarding "deceptive advertising" by "unscrupulous brokers who were taking advantage of borrowers. … Consumers often were surprised to learn that the fixed payment schedule they believed they had signed up for actually resulted in … owing more than the original loan."[5] Similar lawsuits were filed by the Arizona Office of Attorney General against Home Loan Center for mortgages originated from 2004 to 2007 and against Wells Fargo Bank relating to similar practices and advertising by Wachovia Corporation and Golden West Corporation (both acquired by Wells Fargo).

The lawsuits against mortgage lenders frequently allege that these ads were targeted at minorities, who are potentially more vulnerable to misinformation. For instance, in the lawsuit against Countrywide Financial Corporation/Bank of America by the State of Illinois, the attorney general found that Countrywide steered "prime-eligible" minority community borrowers into high-fee subprime ARM loans relative to similarly situated white borrowers from 2005 to 2007. In another high-profile example, class action documents filed in October 2012 by the ACLU against Morgan Stanley state that the lender discriminated against "African Americans in the

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[4] In general, the APR is supposed to help consumers compare loans on equal terms. However, lenders' APR policies differ. Moreover, APRs may also vary depending on the size of the loan, whether it is adjustable or fixed, and on the lenders' requirements for mortgage and title insurance (see http://loan.yahoo.com/m/primer11.html; accessed on March 4, 2013). According to regulation, the Official Staff Commentary to Regulation Z, Section 226.17 (c) (10) determines how to compute the APR for adjustable loans.
[5] http://www.coloradoattorneygeneral.gov/departments/consumer_protection/mortgage_fraud_information_center/learn_more_about_attorney_general%E2%80%99 (accessed on Feb 29, 2013)

Detroit, Michigan metropolitan area," steering them into exceedingly high-cost and high-risk residential mortgage loans.[6]

Resulting Regulation

In response to concerns about unfair and deceptive mortgage lending and servicing practices, the Board of Governors of the Federal Reserve System issued significant new mortgage lending rules, Regulation Z, which took effect on October 1, 2009. Regulation Z includes several rules to govern mortgage advertisement, especially relating to ARMs. For example, under the new rules, if an advertisement includes an annual interest rate such as a teaser rate, and more than one rate may apply during the loan's term, the advertisement must disclose all interest rates, the time period for which they apply, and the loan's APR. The Federal Trade Commission proposed its own Mortgage Acts and Practices Advertising rule relating to "unfair or deceptive acts and practices that may occur with regard to mortgage advertising." In seeking public comments on this rule, the FTC highlighted that deceptive claims were frequently aimed at borrowers in the subprime market. These contained "claims of low 'teaser' rates and payment amounts, without disclosing that the rates and payments would increase substantially after a limited period of time and misrepresentations that rates were fixed for the full term of the loan."[7]

The other major change in the regulatory landscape following the financial crisis was the establishment of the Consumer Financial Protection Bureau (CFPB).[8] The CFPB proposed Integrated Mortgage Disclosures, aiming to reduce inconsistencies in mortgage disclosure forms. The CFPB proposal suggests forms that use clear language and design to make it easier for consumers to locate key information, such as the interest rate, monthly payments, and costs to close the loan. The CFPB also has authority to consider complaints regarding misleading financial advertisements, and the Dodd-Frank Act provides the CFPB with rule-making authority to prosecute such acts or practices.[9]

III. Data

Our data come from two main sources. The first source provides information on advertising, while the other source provides information on the mortgages. The data on advertising are from the TNS Media Intelligence (TNSMI) database. TNSMI monitors eleven media channels and collects information about advertisements at the national and designated market area (DMA)

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[6] http://www.aclu.org/files/assets/10-15-12-filed_complaint_re_morgan_stanley.pdf (accessed, February 29, 2013)

[7] http://www.ftc.gov/os/fedreg/2010/september/100922mortgageadvertising.pdf (accessed, February 29, 2013)

[8] More specifically, this agency was founded as a result of the Dodd-Frank financial reform legislation.

[9] http://files.consumerfinance.gov/f/201210_cfpb_supervision-and-examination-manual-v2.pdf (accessed, February 29, 2013)

levels. DMA regions are geographic areas in the United States in which the population receives similar television, radio, and newspaper offerings. DMAs define boundaries of targeted local advertising and direct marketing campaigns across multiple media. A DMA typically refers to a certain geographic area rather than a city or county, and may contain zip codes from neighboring states. A record in our advertising database is the amount a firm spent over a month in a given media channel in a DMA. The media channels include TV (network, cable, syndication, and spot), radio (network and local), newspapers (local and national), magazines, and outdoor advertising, which we describe in detail in Appendix A. In our analysis we focus on local DMA-level advertising. Compared with national advertising, local advertising is particularly useful in allowing us to exploit cross-sectional variation across DMAs.

The data on mortgages come from LoanPerformance, a loan-level database that provides a detailed perspective on the nonagency securities market. The data include, as of December 2006, more than 7,000 active home equity and nonprime loan pools that contain more than 7 million active loans with over \$1.6 trillion in outstanding balances. LoanPerformance estimates that, as of 2006, the data cover over 90% of the universe of securitized nonprime loans. The dataset includes all standard loan application variables, such as the loan amount, loan-to-value (LTV) ratio, FICO credit score, interest rate information about the property being financed by the borrower, and purpose of the loan. We have information on the type of mortgage loan (fixed rate, adjustable rate, balloon, or hybrid) and the zip code where the dwelling is located. The data also provide information on monthly loan-level performance for approved loans (delinquency), which we use in some of our analysis.

Typically loans are classified as either for purchase or for refinance. In this paper we focus exclusively on loans for home purchases. We restrict our sample to cover owner-occupied single-family residences, townhouses, or condominiums (single-unit loans account for more than 90% of the loans in our sample). We drop nonconventional properties, such as those that are FHA- or VA-insured or pledged properties, and also exclude buy-down mortgages. Only those loans with valid FICO scores are used in our sample.

Since the advertising and mortgage datasets do not have unique identifiers that allow us to match them directly, we need to rely on matching the datasets using lender names. We proceed in two steps. First, we clean the names of lenders in the two datasets, accounting for spelling errors (e.g., Bank of America, Bnk of America) or abbreviations (e.g., New Century, NC, NC corporation). In the next step we hand-match company names reported by TNSMI to the corresponding mortgage providers using a conservative approach: names for which we cannot identify a unique match are excluded from the sample.

We are able to match unique mortgage provider names from the TNSMI database with 571 out of nearly a thousand company names that exist in the mortgage database. Our matched sample covers 105 of the 210 DMAs, which corresponds to 92% of the population in the United States. Our data reliably cover advertising information between 2002 and 2006, and as a result we will be conducting analysis over this period whenever using information about advertising.

IV. Empirical Analysis

IV.A. Descriptive statistics

The matched mortgage providers in our sample advertised in all of the DMAs over our sample period (January 2002 to December 2006). Los Angeles DMA had the highest number of mortgage advertisers (49 unique mortgage advertisers). New York DMA had thirty-eight and Philadelphia DMA had twenty-seven unique mortgage advertisers throughout the sample period. In terms of total expenditures, the top five DMAs include Los Angeles, New York, San Francisco, Philadelphia, and Chicago. Panel A of Table 1 reports the total advertising expenditures in the top five DMAs.

More than 96% of DMA-level mortgage advertising goes through three main channels: local newspapers, spot TV, and outdoor advertising (i.e., billboards).[10] The average quarterly spending for mortgage lenders in local newspapers, spot TV, and outdoor advertising is $3.255 million, $619,000, and $609,000 respectively. In Figure 1(a), we plot the total advertising expenditures in these three outlets over the sample period by our matched sample of lenders. As can be observed from this figure, there is significant variation in advertising expenditures both over time and within a year: mortgage advertising expenditures are typically 25% lower in the first quarter of the year compared with the average for the rest of the year. Year 2002 advertising expenditures are considerably lower than the rest of the sample ($7 million). The yearly total advertising expenditure increases from $15 million to $23.5 million from 2003 to 2006.

Mortgage lenders use newspapers as the dominant channel of local advertising, accounting for 70% of total advertising expenditures, relative to 14% spent on spot TV and 14% on outdoor advertising. Figure 1(b) shows that there is considerable variation in these expenditure shares over time. For instance, the newspaper expenditure share is lowest in the first quarter of 2003 (53%). By the end of 2006 this amount increases to 80%. Similarly, spot TV (outdoor) expenditures range between 2% (1%) and 31% (25%).

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[10] The remaining 4% is spent in cable TV and magazine categories.

Figure 2 displays the geographic distribution of regional advertising expenditure by mortgage lenders in the 206 DMAs across the United States. This includes DMAs in which our vendor did not collect data (represented in yellow; e.g., Mobile, AL–Pensacola, FL DMA). Orange DMAs signify regions where lenders spent less than 10 million USD on local mortgage advertising over the sample period (e.g., Charleston, SC), while red DMAS are regions where lenders spent between 10 and 50 million USD in local mortgage advertising (e.g., Orlando–Daytona Beach–Melbourne, FL DMA). Finally, DMAs in brown represents regions where lenders spent more than 50 million USD for local advertising (e.g., San Francisco–Oakland–San Jose DMA).

It is worth noting that there is substantial variation in the use of local advertising channels by mortgage lenders. For instance, in Orlando the two dominant channels were newspapers (48%) and outdoor advertising (36%). In contrast, in Charleston, SC, the two main channels were spot TV (56%) and outdoor advertising (30%), and in San Francisco, the two lead channels were newspapers (56%) and spot TV (27%), with the remainder spent on outdoor advertising.

The map clearly shows that there is wide heterogeneity in the intensity and channels of advertising used by lenders across regions. Importantly, there is variation within regions with booming real estate markets leading up to the crisis, which includes coastal markets such as Florida and California. It is this regional variation that will be useful for us to identify the effects of advertising on lending decisions.

Finally, Panels B and C of Table 1 present summary statistics of ARM and FRM loans originated by banks over the sample period. The characteristics of loans originated by these banks are comparable to those in other studies of LoanPerformance data (Keys et al. 2010): the average loan-to-value ratio is 82%, the average FICO score is 654, and the average interest rate at origination is around 8–9%.

IV.B. Main results

In this section we present the main analysis of the paper. We start by computing the degree of relative "expensiveness" of a given mortgage, defined as the price of a mortgage relative to other mortgages after accounting for a rich set of borrower, contract, and regional characteristics associated with a given mortgage. Next, we relate the expensiveness of the mortgage sold by a lender to the degree of advertising by that lender, to study the role of advertising in this market. We then extensively address alternative explanations to show our results are not spurious.

IV.B.1. Measuring mortgage expensiveness

We first measure whether some mortgages are relatively more expensive than others. We start by computing this measure for adjustable-rate mortgages (ARMs) and focus on reset rates, which are anecdotally less salient (see Appendix B for examples) and have been discussed by policy makers as a source of consumers' confusion. We compute expensiveness based on the idea that if two identical consumers obtain two ARMs of equal size and characteristics and with the same initial interest rate, but the reset rate for one consumer is higher, then the consumer with the higher reset rate is worse off, since she obtains a relatively more "expensive" loan. In this simple example, given that consumers are identical, the difference in the reset rates would give the degree of mortgage expensiveness. We apply this intuition in a regression framework and compute mortgage expensiveness as the residual of the following specification:

$$y_{ijlt} = \beta i_{ijlt} + \alpha_t + \alpha_l + \Gamma X_{ilt} + \varepsilon_{ijlt}.$$

In this specification, *i* indexes the loan, *j* indexes the lender, *t* indexes the quarter, and *l* indexes the market (DMA). Our dependent variable is the reset rate on the ARM, y_{ijlt}. The vector X_{ilt} contains loan and borrower characteristics such as the loan-to-value ratio, FICO score, whether the loan has a prepayment penalty, income characteristics and information on income, and racial and educational composition of the census tract in which the loan was issued.

We also condition on the initial interest rate of the loan, i_{ijlt}, in order to hold mortgage characteristics as comparable as possible. The initial interest rate was set using all the information at the lender's disposal. It may therefore incorporate information on borrower quality that is potentially relevant for loan repayment and which we may not possess. The specification also includes quarter fixed effects, α_t, to absorb aggregate shocks to mortgage pricing, which can be driven by aggregate housing demand, interest rate policy, or credit supply expansion. Finally, the specification also includes location fixed effects, α_l, to proxy for local real estate and mortgage market conditions that could affect loan repayment, such as the elasticity of housing supply or competition in the mortgage market.

The results are presented in Table 2. As can be seen from column 1, the observable loan characteristics have the expected coefficients. More creditworthy borrowers, as measured by higher FICO scores, are charged lower interest rates. Mortgages backed by less collateral, with higher loan-to-value ratios, have higher reset rates. The presence of a prepayment penalty reduces the reset rate, and if the loan is low-documentation, it increases the reset rates. The coefficient on the initial interest rate (β) is positive and statistically significant. Thus, conditional on observed borrower characteristics, a high initial interest rate is positively correlated with the

reset rate, indicating that it reflects additional information on the borrower not reflected in other observable characteristics.

Not all the mortgages in our data are ARMs. Approximately 27% are fixed-rate mortgages (FRMs). One downside of using FRMs is that they have only one interest rate. As a result, these regressions cannot condition on as much information as ARMs; we cannot use the initial interest rate to control for lenders' information that is not contained in observable borrower characteristics. Thus, to compute expensiveness for these mortgages, we use the initial interest rate as the dependent variable. As can be observed from column 2 of Table 2, the results are similar to those obtained for ARMs. For instance, as before, the coefficient on credit score is negative, while the loan-to-value ratio coefficient is positive.

Overall, our model does well in explaining the substantial variation in reset rates in our sample with an adjusted R^2 of 56%. The residual from the regression measures the ARM reset rate the borrower was charged relative to the average borrower with the same set of observable characteristics, the same initial interest rate, in the same region and the same quarter:

$$\hat{\varepsilon}_{ijlt} = y_{ijlt} - \left(\hat{\beta} i_{ijlt} + \hat{\alpha}_t + \hat{\alpha}_l + \hat{\Gamma} X_{ilt}\right).$$

Since the measure is computed from residuals it can take negative and positive values. Mortgages with negative (positive) expensiveness are cheaper (more expensive) than the mean mortgage with the same characteristics. It is important to reemphasize that the essence of this metric is that if identical consumers obtain the same mortgage with different reset rates, then the difference in the reset rates measures how much worse the choice of the consumer with the higher reset rate is.

Figure 3(a) plots these residuals for ARMs. We find large differences in reset rates charged to borrowers with the same characteristics in a given location. For completeness, in Figure 3(b) we repeat this analysis for all mortgages and find similar patterns. Note that when we compute expensiveness for all mortgages, we take the residuals for ARM loans using the specification in column 1 of Table 2 and for FRM loans using the specification in column 2 of Table 2.

A simple way of assessing the patterns in expensiveness is to plot the difference in mortgage expensiveness between the 95th and 5th percentiles in a given DMA in a given quarter. We do this in Figure 4(a). The mean difference in reset rates after conditioning on borrower, loan, and regional characteristics is 3.1 percentage points. This is a large difference—in the raw data, without adjusting for any lender, mortgage, or geographic characteristics, this difference is 5.8 percentage points. Such high dispersion in interest rates is not unusual for financial products:

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Hortacsu and Syverson (2004), for example, find substantial dispersion among S&P 500 index funds with the 90-10 percentile price (fee) ratio of 8.2.

Borrowers with the same characteristics obtain substantially different ARM reset rates during the sample period. These rates can differ because there is dispersion in the rates charged by a given lender while all lenders charge on average the same rate; alternatively, lenders may charge on average different mortgage rates, with some lenders being more expensive than others. To compute whether a lender charges on average higher prices than other lenders in the same market in a given quarter, we average the expensiveness of individual loans for this lender in that location and quarter. Formally, let n_{jlt} be the number of loans of lender j in location l in quarter t. Lender expensiveness is computed as:

$$p_{jlt} = \frac{1}{n_{jlt}} \sum_i \hat{\varepsilon}_{ijlt}$$

Computing average lender expensiveness is also useful because we want to use this variable as an input in regressions with advertising, which we observe at the lender level.

Figure 4(b) shows the distribution of differences between the 95th and 5th percentiles of lender expensiveness in a given location and quarter. There are substantial differences in average residual reset rates charged by different lenders. This distribution is somewhat less spread out when compared with the difference across individual loans presented in Figure 3(a). This is expected, since some of the dispersion at the loan level may be due to noise, and aggregating at the lender level decreases the noise. The mean difference in reset rates charged by lenders between the 95th and 5th percentiles is 2.8 percentage points. Thus, there is large variation among the average prices lenders charge for mortgages in a given market in the same quarter.

Measuring expensiveness, $\hat{\varepsilon}_{ijlt}$, is a central input into the rest of the analysis and we want to ensure the results do not rely on the linear specification we used to obtain them. We recompute our main results in the paper relaxing the specification used to compute expensiveness. In particular, we estimate a significantly more flexible version of the specification by using polynomials of second and third degree (with all interactions) of loan observables $y_{ijlt} = P_n(i_{ijlt}, X_{ilt}) + \alpha_t + \alpha_l + \varepsilon_{ijlt}$, in which n is the degree of the polynomial. The results obtained with these measures of expensiveness are robust (Table A1, columns 1 and 2).

Recall that we compute expensiveness based on the idea that if two identical consumers obtain two ARMs of equal size and characteristics and with the same initial interest rate, but the reset rate for one consumer is higher, then the consumer with the higher reset rate is worse off, since

she obtains a relatively "expensive" loan. For robustness, we also ensure our measure maps into this idea more closely. Specifically, we estimate the expensiveness regression

$$y_{ijlt} = \beta i_{ijlt} + \alpha_t + \alpha_l + \Gamma X_{ilt} + \varepsilon_{ijlt}$$

separately for deciles of the initial interest rate and for 20 equally spaced bins of initial interest rate (cut in 5 percentile increments, corresponding to approximately 20 bp intervals). The results obtained with these measures of expensiveness also provide similar inferences (Table A1, columns 3 and 4). In unreported tests we also recompute the distribution estimating the regressions at a much finer level of geography (zip codes rather than DMAs). This alleviates concerns that differences in regional factors vary significantly within the level of location that is defined in our regressions. Our inferences are unchanged.

IV.B.2. Advertising and expensiveness

In this section we explore the central question in the paper: does advertising lure consumers to enter expensive mortgages or does it help consumers find cheaper mortgages? We test these hypotheses by examining whether advertisers are relatively more "expensive." We first examine this hypothesis by plotting the distribution of residual reset rates for advertisers and nonadvertisers in Figure 5. We purge the initial interest rate, borrower characteristics, location, and year fixed effects when plotting the residuals as in Table 2. As can be observed, the distribution of reset rates of advertisers is shifted to the right of nonadvertisers. A Kolmogorov-Smirnov test rejects the equality of the two distributions at the 1% level. Thus, lenders who advertise sell more expensive mortgages.

While this simple cut of the data is suggestive of the persuasive view of advertising, we now explore whether advertisers sell more expensive mortgages more systematically by estimating the following specification:

$$p_{jlt} = \beta advertising_{jlt} + \alpha_j + \alpha_t + \alpha_l + \varepsilon_{jlt},$$

where $advertising_{jlt}$ is the independent variable of interest and measures the total dollar value of local advertising of lender j in market l in quarter t. In subsequent specifications we also use $advertising_{jlt}$ to denote dollar value of local advertising through different media.

When we construct our measure of lender expensiveness, we already condition on borrower characteristics and mortgage characteristics, including the initial interest, and compute the expensiveness of a mortgage relative to other loans in the same location. In effect, we measure

how expensive a lender is in a given location relative to other lenders in the same location. This is our dependent variable p_{jlt}.

The specification includes lender fixed effects α_j, since we are interested in exploiting within-lender variation in advertising. For example, if predatory lenders are likely to advertise, our lender fixed effects will absorb that variation. Similarly, lender fixed effects will control for differences in lenders' propensity to securitize mortgages (see Keys et al. 2010) or provide renegotiations in the case of borrower distress (see Piskorski et al. 2010), or if some lenders are more "consumer friendly," have a better brand, or have cheaper access to capital.

The specification we estimate also includes location fixed effects α_l. Consequently, the results we find are not driven by the notion that lenders advertise more in more attractive locations in which they can charge more for mortgages because of local real estate and mortgage market conditions. The specification also includes quarter fixed effects α_t to absorb aggregate shocks to mortgage pricing that may be correlated with advertising due to trends in advertising in the data. Intuitively, in the specification above we compare whether a lender is more expensive relative to nonadvertisers in regions in which it advertises more.

The results are presented in Panel A of Table 3. The coefficient on the advertising in column 1 is positive and statistically significant at 5%. This implies that, keeping observable borrower characteristics fixed, lenders charge higher mortgage prices relative to other lenders in regions in which they advertise relatively more. This result is inconsistent with the view that advertising provided more information on mortgage pricing to consumers. Instead, it suggests that advertising steered consumers to expensive mortgages, leading them to worse mortgage choices than they would have otherwise made. This is the baseline result of this paper.

We examine whether the relationship between local advertising and mortgage pricing varies across different types of media. Newspapers are the largest medium of local mortgage advertising (see Table 1, Panel A, and Figure 1(b)). Since other advertising media are significantly smaller, we aggregate them into a category called "other" advertising. The results from this analysis are presented in columns 2 and 3. The effect of advertising on expensiveness of ARMs is driven by advertising in newspapers—the coefficient on newspaper advertising is 17% larger than the coefficient on total advertising. This is an economically large effect. The coefficient implies that a one-standard-deviation increase in advertising increases the average reset rate a lender charges in that location by roughly 80 basis points, or approximately one-half of a standard deviation in reset rates. Other advertising has a positive coefficient that is slightly smaller than the coefficient on total advertising and is statistically insignificant.

We also replicate our results by adding data on FRMs in Panel B of Table 3. As mentioned above, we compute expensiveness for all mortgages by taking the residuals for ARM loans using the regression specification in column 1 of Table 2 and for FRM loans using the specification in column 2 of Table 2. We obtain similar inferences as before. Together, the results presented above are consistent with the persuasive view of advertising--lenders use advertising to steer borrowers into more expensive mortgages.

IV.B.3. Who is more susceptible to advertising?

If advertising exploits uninformed consumers and steers them into expensive mortgages, then we would expect mortgage advertising to be most effective with consumers who are potentially less informed about mortgages and therefore more vulnerable to manipulation. Hall and Woodward (2012) show that groups that are likely less informed, such as minorities and the less educated, are charged higher brokerage fees in the mortgage market.

We examine whether the effect of advertising on mortgage pricing differs across these groups. We first compute the share of loans to minorities by weighing each loan by the share of minorities in the zip code in which the loan was issued for each lender/year/quarter. We define observations with a share of minorities below-the-median as low minority share and those with an above-the-median share of minorities as high minority share. We use the same approach to find observations with a high and low share of educated (households with a BA degree) and poor borrowers (as defined by the Census). Next, we reestimate our baseline specification,

$$p_{jlt} = \beta advertising_{jlt} + \alpha_j + \alpha_t + \alpha_l + \varepsilon_{jlt},$$

on the subsamples of loans with high and low minority share, high and low education share, and high and low poverty share.

The results are presented in Table 4. As predicted, the effect of advertising on mortgage pricing is concentrated in lenders with high-minority portfolio areas. This suggests that within lenders, advertising is effective at drawing borrowers into more expensive mortgages only for lenders who lend heavily to minorities. We find no such effect for lenders with a low minority share. Similarly, the effect of advertising is concentrated in lenders who lend to less-educated areas and areas with a higher share of poor borrowers. Together these results strongly suggest that mortgage advertising was used to steer consumers into ARMs with higher reset rates.

IV.B.4. Unobservable borrower quality

We have shown that lenders sell relatively more expensive mortgages in geographical areas in which they advertise relatively more. We interpreted this evidence as suggesting that lenders use advertising to steer consumers into expensive mortgages. A potential alternative explanation is that even after we condition on extensive observable borrower and loan characteristics as well as the region and time period, we only partially capture borrowers' true ability to repay a loan. Advertisers charging higher mortgage rates might simply reflect the fact that they lend to a pool of borrowers who are less likely to repay a loan.

We confront this alternative head-on and test whether advertising is positively correlated with borrowers falling behind on their loan payments using the following regression:

$$delinquent_{jlt} = \beta advertising_{jlt} + \alpha_j + \alpha_t + \alpha_l + \varepsilon_{jlt}.$$

Here, $delinquent_{jlt}$ measurers the percentage of loans made by lender *j* in location *l* in quarter *t* that turned out to be delinquent. We follow the convention in the literature (e.g., Keys et al. 2010) and capture loan performance with an indicator that takes a value of 1 if the borrower becomes late by 90 days or more (90+ delinquent) in making payments within two years of origination, and 0 otherwise. To make the specification comparable to the earlier one, we include location, time, and lender fixed effects, α_l, α_t, and α_j, respectively. Thus, in this specification, similar to those used in Table 3, we will exploit the variation within a lender, in a given location, and in a given quarter.

The results of this exercise are presented in Table 5. If the alternative explanation holds and advertisers attract borrowers who are less likely to repay a loan, we should find that these borrowers are more likely to fall behind on their payments. As a result, we should expect the coefficient on advertising in the regression would be *positive*. In fact, the correlation of advertising and delinquency is *negative*, whether we measure delinquency on the main sample of ARM loans or if we include FRM loans. These findings are at odds with the alternative explanation outlined above.

Our results show that advertising raises the interest rate charged to borrowers. Higher interest rates should directly lead to more delinquency and default since a borrower with a given income stream should have a more difficult time repaying a loan with higher interest payments. This indirect effect of advertising through higher interest rates should generate a *positive* correlation between advertisers, who on average charge higher interest rates, and delinquency.

The fact that we find a negative, albeit statistically insignificant, relationship between advertising and delinquency would suggest that advertising attracts borrowers who are *more likely* to repay a loan. This factor more than offsets the potential indirect effect that advertising has on delinquency because of increased interest rates. Alternatively put, advertisers should charge *lower* reset rates than nonadvertisers to borrowers who look the same on observable characteristics, if pricing only reflected borrower characteristics. Thus, our estimates of the effect of advertising on loan prices are probably an underestimate of the true effect. Using instrumental variables in the next section will allow us to obtain a better estimate of the true effect.

IV.B.5. Differences in ex ante catering costs

Another worry with our analysis could be that the consumers who are being offered expensive mortgages are, in fact, costly to cater to. In a competitive market, some of the additional catering costs would be passed on by the lenders to these borrowers. If advertising lenders lend to many such borrowers, we could potentially observe a positive correlation between advertising and expensiveness. In Section IV.C.5 we show that our estimates are too large to be plausibly explained by differences in such catering costs. Nevertheless, here we try to provide more direct evidence that challenges the plausibility of this alternative.

Testing the alternative requires detailed information on costs borne by lenders when catering to various borrowers. Because such data are highly proprietary, they are not available for the entire sample. Fortunately we do have access to detailed costs borne by a large subprime lender, the third largest in the United States as of 2006, in our sample. The data contain information on the costs borne by the borrower in filling applications, fees charges by loan officers as a part of underwriting and processing applications and detailed borrower information. We merge this with our dataset on advertising by this lender to conduct our analysis.

As shown in Section IV.B.3, we find our effects in the subsamples that are heavily tilted to minority, poor and less educated borrowers. To explain our results these borrowers would have to have significantly higher catering costs. We therefore use information on the background of borrowers and stratify based on whether the borrowers are in a minority or not. We separately analyze costs for ARMs and FRMs and present the results in Panels A and B of Table 6. As can be observed, there are no economically meaningful differences.[11] In fact, if anything minorities are charged total fees that are somewhat lower than non-minorities. In unreported tests we also analyze these differences, stratifying the borrowers into two categories based on their monthly income. Again, we find no differences in cost of originating across the two categories.

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[11] The difference in costs and fees across groups in the entire table is economically miniscule relative to how expensive a mortgage is obtained by consumers who borrow from advertising lenders (discussed in Section IV.C.5).

Notably, this lender is a fairly high advertiser, placing in the top quartile of advertisers in our sample period. In Panels C and D of Table 6, we examine whether the lender actually realizes higher costs of originating loans in periods in which it advertises more. We find no such differences.

Overall, under the reasonable assumption that the lending practices of this large subprime lender are representative for the entire sample, this analysis reveals that our results that advertisers sell more expensive mortgages is unlikely to be due to higher costs faced by these lenders when catering to borrowers.

IV.C. Evidence from Craigslist

In this section we explicitly address the concern that lenders advertise in regions with borrowers who differ on unobservables, by exploiting variation in advertising that is uncorrelated with borrowers' ability to repay/catering costs. We use the introduction of Craigslist into different markets over time to obtain variation in mortgage advertising.

Craigslist is one of the largest online forums for classified advertisement. The advantage of Craigslist is that it is segregated across markets. The website for San Francisco classifieds is separate from the Chicago website. As Figure 6 shows, the introduction of Craigslist has been staggered across the United States, starting in San Francisco in 1999 and continuing through the duration of our sample. While its main business is to provide a forum for free advertising of goods, jobs, apartments for rent, and personal ads, it also provides a forum for free mortgage advertising in its financial services section. In a 2011 survey, 21% of consumers reported that they obtain most information about "Local Housing and Real Estate" from "other websites," defined as a "NOT print or TV news org. site or gov't site, includes nat'l sites that offer local info, such as weather.com, *craigslist* [emphasis added], or patch.com" (Pew Research Center 2011, p. 57). Craigslist's appeal is large enough that it has had a significant impact on job advertising in newspapers (Kroft and Pope 2012).

To ensure that Craigslist is indeed a viable venue for mortgage classifieds, providing a plausible source of variation in mortgage advertising, we collect data on mortgage-related classified ads on Craigslist's financial services page during the period of our sample (see Appendix C for details). Appendixes C.4-C.6 provide historical examples of mortgage classifieds on Craigslist during our sample period for Jacksonville, FL, Washington, DC, and Indianapolis, IN, respectively. Table A2 shows that across all 23 markets with Craigslist presence, mortgage-related classifieds represent a substantial share of Craigslist financial services classifieds, from 4.8% in Dallas, TX, to 12.3% in Pittsburgh, PA. Therefore, Craigslist introduction could plausibly affect the amount of local mortgage advertising in venues other than Craigslist, especially in newspapers.

We use the introduction of Craigslist to perturb the differences in advertising intensity between lenders in a market. Since our identification is driven by the heterogeneous impact Craigslist has on advertisers within a market, our identification is valid even if Craigslist entry affects the market-level pricing of mortgages directly. Given that advertising on Craigslist is free, we expect Craigslist entry to decrease the payoff to paid mortgage advertising.[12] Following this reasoning, we first show that Craigslist's introduction, while unrelated to the mortgage market conditions, indeed decreased mortgage advertising in our data, especially in newspapers. Therefore the difference in paid advertising between lenders in a market decreases after Craigslist entry relative to markets in which it does not enter. In Section IV.C.3 we show that lenders who decrease paid advertising after Craigslist entry do not offset this decrease by substituting into Craigslist advertising. Craigslist entry thus reduces the differences in total advertising between lenders in a market, even accounting for Craigslist advertisements. We then study how this variation in advertising affects relative pricing of mortgages between lenders in a market.

IV.C.1 Descriptive analysis

We first study whether the introduction of Craigslist has the hypothesized effect on mortgage pricing graphically. We expect that mortgage advertising of advertisers relative to nonadvertisers decreases upon Craigslist entry, also decreasing mortgage pricing of advertisers. In Figure 7 we plot the distribution of residual reset rates for advertisers and nonadvertisers across our sample, separated based on whether the observation had a Craigslist presence or not.[13] Nonadvertisers should not be affected by Craigslist entry and are the control group. Note that since all our prices are computed after purging market and time fixed effects, we are only looking at relative pricing in the market. Thus if all lenders advertise on Craigslist, and this depresses or increases the overall level of prices, the direct effect of Craigslist is purged.

Indeed, Craigslist has little effect on pricing of mortgages by nonadvertisers. The modes of the distribution are the same, as is the left tail—the only difference is that reset rates are slightly higher for Craigslist observations in the right tail. Craigslist entry has a different effect on advertisers, which are our treatment group. The distribution of interest rates for advertisers is shifted to the left after Craigslist entry, which includes leftward shift of the mode of the distribution. Notably, the right tail shifts up in the same way as in the control group. Overall, the left shift in the distribution suggests that Craigslist induces advertisers to decrease reset rates relative to nonadvertisers.

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[12] This is akin to Kroft and Pope 2012, who show that jobs advertising in newspapers declines after Craigslist entry.

[13] We purge the initial interest rate, borrower characteristics, location, and year fixed effects.

IV.C.2 Regression analysis

We now more formally examine whether Craigslist entry leads to a relative decrease in advertising, and whether this shift in advertising leads to a change in mortgage pricing. We first estimate the effect that the introduction of Craigslist has on mortgage advertising:

$$advertising_{jlt} = \beta_1 After\ Craigslist\ Entry_{lt} + \alpha_j + \alpha_t + \alpha_l + \nu_{jlt},$$

where $After\ Craigslist\ Entry_{lt}$ is a dummy variable indicating the presence of Craigslist in a given location l in period t. These specifications include market, time, and lender fixed effects, α_l, α_t, and α_j, respectively. Market fixed effects account for the fact that Craigslist potentially enters markets where advertising happens to be high. Time fixed effects control for the possibility that advertising and Craigslist reach expanded during our sample. Lender fixed effects control for the possibility that lenders who advertise happen to do so in markets that Craigslist enters.[14]

We present the results from the first stage in Panel A of Table 7. We find that Craigslist entry in a market decreases the amount of advertising. The economic impact is large and suggests a reduction in amount of advertising by $2,465 per quarter for a given lender. This result is highly statistically significant and exceeds the Stock and Yogo (2005) statistical tests for weak instruments. We next examine whether the effect is larger for newspaper classifieds, which are close substitutes to the free classifieds provided by Craigslist. As is shown in columns 2 and 3, the Craigslist introduction decreases newspaper advertising by $1,553, twice as much as other advertising ($652). These results resonate well with findings in Kroft and Pope (2012), who show that Craigslist had a large effect on job advertising in newspapers.

Now that we have established that the entry of Craigslist had a large and significant impact on mortgage advertising, we want to exploit this variation in an instrumental variable setting to assess the effect of advertising on the overpricing of ARMs. Recall that our calculation of overpricing p_{jlt} already conditions on consumers' observable characteristics and location fixed effects. The endogeneity concern we had in the baseline specification was that *unobservable* consumer characteristics, which affect lenders' profitability, are correlated with advertising.

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[14] A simple example helps illustrate the empirical strategy. Suppose there are two markets, A and B, with Craigslist entering Market A at some point during our sample. Our specification compares the amount of advertising that lender *j* did relative to other lenders in Market A before Craigslist entry with the amount of advertising the same lender did relative to other lenders in this market after Craigslist entry. We compare this change with the change in relative advertising of lender *j* in Market B, which did not experience Craigslist entry.

We exploit the variation in Craigslist entry to estimate the effect of advertising on the pricing of ARMs with the following equation:

$$p_{jlt} = \beta \widehat{advertising}_{jlt} + \alpha_j + \alpha_t + \alpha_l + \varepsilon_{jlt},$$

where $\widehat{advertising}_{jlt}$ is the fitted value from the first stage. The standard errors reported in our analysis account for the generated regressor from the first stage. The analysis from the second stage is presented in Panel B of Table 7. Column 1 shows that the coefficient on advertising is positive and highly statistically significant. We discuss the magnitude of these results in Section IV.C.5.

In columns 2 and 3, we separately estimate the effect of advertising across various types of media and find that advertising in newspapers has the largest effect on mortgage prices. The coefficient on advertising in other media is highly statistically significant, but economically smaller. The effects are similar, both quantitatively and qualitatively, if we include FRMs as a robustness check (Panel D).

IV.C.3 Substituting paid advertising with advertising on Craigslist

One concern with our analysis is that advertisers in our sample may use Craigslist with higher intensity than lenders who did not use paid advertising. Then, after accounting for Craigslist ads, the difference in total amount of advertising between paid advertisers and nonadvertisers would not decrease, as posited earlier. We now explore this issue in detail.

We collect historical data on mortgage postings on Craigslist. Specifically, for each market listed in Table A2, and for all months between 2002 and 2006, we download *all* postings in the financial services section. We then identify the lender name associated with each of the posts. We find 371 unique mortgage lenders who advertised on Craigslist during our sample period, of which only 28 match our data. These 28 unique lenders represent 1.3% of total lenders in our dataset. Approximately half of these lenders advertise at least once in our data. Next, we assess whether the increase in Craigslist advertising could offset the decline in paid advertising by advertising lenders and bias our earlier inferences.

As noted above, the number of lenders in our data who use Craigslist is very small. Moreover, advertisers who use Craigslist do not seem to be large paid advertisers in our data. These lenders spent $22.1 million in paid advertising throughout sample period, which corresponds to just 2.01% of total mortgage advertisement in our main dataset ($1.05 billion). Consequently, we do not expect our estimates in Table 7 (Panel B) to be driven by these lenders.

We show this formally in Table 7 (Panel C). We reestimate the regressions excluding the 28 lenders who advertise on Craigslist. The results show that the estimates are virtually identical to those reported earlier. Together, this analysis rules out the possibility that an increase in advertising on Craigslist could have offset the decline in paid advertisers within lenders, thereby affecting the instrumental variable (IV) estimate.

IV.C.4 Pre- and post- trends around Craigslist introduction

Our identifying assumption when using the Craigslist instrument is that Craigslist does not enter regions in which mortgage advertising has already decreased, and advertising lenders do not experience an increase in unobservable borrower quality relative to nonadvertising lenders in these regions during the same time

We first explore if Craigslist enters areas in which mortgage advertising is in decline by examining the timing of the advertising decline relative to Craigslist entry. The results are presented in Table 8. Advertising starts declining only one quarter before Craigslist entry, but the magnitude of the decline significantly increases upon entry and already doubles a quarter after entry. The one-quarter lead suggests that Craigslist entry into a market is not a complete surprise to the market participants, who decrease their advertising a bit expecting the entry that is soon to follow.[15]

Second, in Table 8 we show that Craigslist entry does not predict changes in the borrower pool relative to regions that did not experience the introduction of Craigslist. This is the case for borrower quality as measured by credit scores, loan-to-value ratios, prepayment penalty, or the share of low-documentation loans. The coefficients around the Craigslist effect are economically small, statistically weak, and unstable. For example, for the loan-to-value ratio the largest coefficient is 0.231, where the mean ratio is 87 and the effect disappears a quarter after Craigslist entry. The case for low-documentation loans is similar, with magnitudes being small and coefficients unstable. The most stable change in observables correlated with Craigslist entry is the prepayment pool, but the magnitudes here are also economically small. Together, these results reaffirm that the explanation that advertising attracts borrowers of different riskiness or catering costs is not likely driving our findings.

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[15] This notion is reasonable since the entry is discussed in several online forums in the few periods before Craigslist enters a given market. In particular, individuals can request that Craigslist add a city in a forum, where user votes can potentially influence such a decision. http://www.ehow.com/how_10065823_city-added-craigslist.html

IV.C.5 Magnitude of the effect

We now provide a simple back-of-the-envelope calculation to interpret the magnitude of our estimates. We use the instrumental variable estimate, because it is identified by the cleanest source of variation. The coefficient of 0.0711 implies that a $1,000 increase in quarterly advertising expenses increases the average reset rate of loans made by that lender by 7.1 basis points. The average lender that advertises spends $25,460 per quarter, which translates into a reset rate 181 basis points higher.

For ease of comparison we provide alternative ways of interpreting these magnitudes. The average mortgage amount in our data is approximately $200,000. To obtain the upper bound of this effect, assume that the mortgages are not prepaid or renegotiated, nor do they default. This calculation would be appropriate for borrowers who continue to obtain mortgages from advertisers and continuously pay the higher rate even upon refinancing a mortgage. For the average ARM in the data, the reset rate comes into effect after two years and lasts for fifteen years. Further, assume a 10% discount rate on the mortgage payments to bring them to present value. This implies that the consumer who obtains a mortgage from an average advertising lender pays approximately $21,250 more than a consumer who obtains a mortgage from a non-advertiser in present-value terms.

As stated, this estimate is an upper bound on the possible overpayment amount through higher interest payments. In reality, mortgages default, are prepaid, or are renegotiated. Therefore, the borrower's effective time of overpayment is shorter than the duration of the mortgage. For instance, if the average borrower pays the reset on an ARM for three years and the overpayment of the current mortgage does not spill into the next mortgage, then the present value of overpayment is approximately $7,440. While this is a substantial amount, it is in the same order of magnitude as the estimates of losses faced by mortgage borrowers because they do not properly account for broker service fees given in Hall and Woodward (2012).

It is worth noting that this back-of-the-envelope calculation relies on several simplifying assumptions. For example, if ARMs have prepayment penalties, and higher reset rates ex post lead to larger penalties, this will increase borrowers' mortgage cost. Therefore, our calculations should be interpreted with appropriate caution. Moreover, the IV estimate that we use represents a local treatment effect, so the usual caution about its broader applicability is in order when interpreting these magnitudes. Further, our calculation only considers the direct cost that borrowers incur from being steered to a more expensive mortgage through advertising. Mortgages with higher interest rates also have the indirect effect of increasing consumers' probability of default. For instance, Rajan et al. (2010) find that increasing the interest rate by a

percentage point significantly increases the probability of default.[16] The cost of this indirect effect is difficult to quantify but can represent a significant welfare loss to the consumer.

V. Advertising Content

We now directly explore the content of mortgage advertisements. Our analysis up to this point shows that advertising is used in mortgage markets to steer consumers to more expensive mortgages. One channel at work might be that consumers have a difficult time understanding resets, possibly because reset rates are less salient or shrouded attributes of a mortgage and advertising is used to exploit this problem. Anecdotal evidence, which claims that advertising increases the salience of initial interest rates in mortgages and downplays the salience of reset rates, provides support for such a channel. Here we examine this claim explicitly by showing that reset rates are almost never advertised. Next, we show that even when explicit interest rates are advertised in this market it is not necessarily that lenders who advertise mortgages with lower interest rates are indeed cheaper. Last, we confirm the idea that mortgage ads are not very informative by showing that very few actual mortgage or lender characteristics are advertised.

We analyze the content of 37,432 mortgage advertising campaigns in print and direct mail collected by Comperemedia during our sample period (2002–2006). Comperemedia tracks direct mail and print (e.g., newspapers and trade publications) advertising campaigns in the United States for several products, including mortgages. A typical advertisement campaign contains information on an "offer" (e.g., "5.375% interest rate for a 5/1 year LIBOR"), advertiser information (e.g., Old Merchants Mortgage Bank), and geographic reach (e.g., New York DMA). Using the details of the advertisement "offer," we extract the information content of these advertisements related to price (interest rate), lender, product (ARM or FRM), the horizon of the mortgage, and other non-price-related characteristics of the mortgage. Our analysis uses information on three different types of advertising a firm potentially uses: (1) to explicitly advertise mortgage interest rates, (2) to advertise non-price characteristics of a mortgage, or (3) to simply advertise the existence of the lender, i.e., brand advertising.

V.A. Salience of initial rates and reset rates in advertisements

One possible reason why advertising can attract consumers to expensive mortgages is that consumers focus on the salient initial interest rate rather than the less salient reset rate. This channel would not be a likely explanation of our results if advertising clearly states both the initial interest rate and the reset rate and places them on the same footing. While anecdotal

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[16] In our data advertising has a negative correlation with borrower defaults, conditioning on borrowers' observable characteristics. From that we infer that the unobservable quality of borrowers who are attracted to advertising is better than suggested by their observable characteristics. Conditioning on borrowers' true underlying quality, higher ARM reset rates would lead to more defaults.

evidence indicates that reset rates are rarely advertised, we now provide systematic analysis to explore this claim.

Panel A of Table 9 shows that advertising interest rates is an important aspect of ARM advertising. In campaigns which are explicit about advertising ARMs, 69% advertise a numerical interest rate. The word "Reset" is mentioned in only thirteen campaigns, or 0.03% of campaigns. [17] This implies that the explicit interest rate mentioned in these campaigns do not advertise reset rates but rather advertise an introductory rate.

Next we explore cases of advertisements that explicitly advertise both the initial interest rate and the reset rate, even if they do not clearly contain the word "Reset" in the advertisements. As shown in Panel B of Table 9, in our sample, 35% of advertisements contain information on two interest rates. The second interest rate in these advertisements in not a reset rate. Instead, in 86% of these campaigns the second interest rate is the stated APR of the loan, and the remaining 13.9% advertised two different products.

To give a sense of whether reset rate is ever advertised we search more broadly across all advertisements in our data. We find only seven campaigns advertised an explicit reset rate. That is, only 0.02% of all the campaigns in the data, both the initial interest rate and the reset rate are advertised. These results clearly illustrate that while advertising initial interest rates is an important part of mortgage advertising, information on reset rates is omitted. This result casts strong doubt on the hypothesis that reset rates and initial rates are given the same amount of prominence in advertisements.

The relative salience of the initial interest rate is not only increased by explicitly stating the initial rate and omitting the reset rate. We also examine how advertising language is used to increase the salience of the initial interest rate. Panel C of Table 9 shows that 13% of advertisements use attention grabbing phrases "as low as," "intro," "initial" or "starting." These phrases are prominently displayed in these advertisements and the interest rate that follows these phrases is the initial interest rate.

V.B. Do low advertised rates designate cheap lenders?

While we have established that reset rates are not advertised, Panel D of Table 9 shows that a large number of advertising campaigns (54%) do contain APR information. We now explore if a

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[17] Similarly, "thereafter", used in the context related to ARM loans shows up infrequently in the advertisements. In particular, 227 advertising campaigns (0.61% of total advertisements in our sample) use "thereafter" to refer to a period after the initial rate expires. Interestingly, the phrase is generally not followed by an actual reset rate. For example, "4.5% for 5 years, thereafter according to prime."

consumer who follows the advertisement with a lower advertised APR[18] finds an inexpensive lender. We conduct this analysis on a sample of 70 lenders (around 6,000 advertisement campaigns) for whom we are able to match the advertising content data and the mortgage data. Specifically, we estimate the following regression:

$$p_{jlt} = \beta apr_{jlt} + \alpha_t + \alpha_l + \alpha_j + \varepsilon_{jlt},$$

in which an observation is an advertisement campaign by a lender j in location l at time t, p_{jlt} measures lenders' expensiveness, and apr_{jlt} measures the advertised APR across advertisements by the same lender in a given location and quarter. It is worth pointing out that there is substantial variation in advertised APR within locations and quarter -- even after conditioning out location and quarter fixed effects the standard deviation of APR is 2.8 percentage points, suggesting that lenders advertise substantially different APR rates. We cluster the standard errors by lender since we could have several advertisements by the same lender in a given location and quarter. We also include lender and time fixed effects in this specification.

Table 10 shows that advertised APR is *negatively* correlated with lenders' expensiveness. As can be seen, these results are estimated with noise once we control for location. At best, the advertised APR is not likely to lead borrowers who follow the advertisement to an inexpensive lender. Worse, it may lead consumers to a more expensive lender. These results show that even when information on interest rates are explicitly mentioned in advertisements -- and these rates (APRs) are easily comparable -- they do not help customers find cheaper lenders.

V.C. What information is contained in mortgage advertisements?

Last, we explore how much information is contained in advertisements about the mortgage product being sold and about the characteristics of the lender.

An analysis of the quantitative information available in an advertisement across the entire sample reveals lack of information on the most basic features of the mortgage. For instance, as Panel D of Table 9 shows, 17% of advertisements have no numbers. Only about 45% of the advertisement mention a dollar figure to indicate a mortgage amount. Similarly, 59% of the advertisements have no mention of the horizon of the mortgage. As mentioned earlier, the mortgage is an ARM or that it adjusts is mentioned in only 16% of advertisements. We also note that around 18% of advertisements (6,563) contain no numeric information.[19] These statistics

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[18] Comperemedia collects advertised APR information from print advertisements. We use this variable in our specification, but we achieve qualitatively similar results if we instead use the APRs we extract from the advertisement language.

[19] Notably, in unreported tabulations we find that 15% of advertisements contain no information on product characteristics or interest rates, and instead contain only basic information on the lender, such as lender name and location.

show that while mortgage advertisements certainly provide some basic information on the mortgage, this information is very limited.

To reinforce this point, we tabulate the top fifty words used in mortgage print and direct mail advertisements and present the results in Table A3. In order to understand whether advertisements contain words that could differentiate mortgages from one another, we eliminated the following words: (1) most common words in English as defined by the Oxford English Corpus;[20] (2) words referring to a price or time period; and (3) words that exist in almost all advertisements (i.e., "mortgage," "loan," and "payments"). Our results reveal that words such as "low," "opportunity," "used," "home," and "based" are the most common words found in the advertisements. Very few, if any, of these words could be used to differentiate mortgages in a particularly targeted way. In addition, we found no evidence that lenders advertised differentiation in characteristics such as their servicing or renegotiation practices.

These simple tabulations reject the notion that advertisements are used to advertise differentiated or specialized mortgages that certain subsegments of borrowers might be attracted to. The information advertised is most rudimentary and is on generic, non-differentiating characteristic such as mortgage length. Moreover, the amount of information disclosed is very limited and it would be quite difficult for even the most sophisticated consumers to obtain a complete picture of the product advertised.

VI. Discussion and Conclusion

VI. A What models of advertising does the evidence support?

Our first set of findings is that firms with a higher advertising intensity in the market charge higher mortgage prices, especially when making loans in areas with a prevalence of minority, less educated, and poor borrowers. Our battery of tests can help rule out several competing explanations for our findings. First, we exploit within lender variation in our analysis. This allows us to avoid concerns that it is lender characteristics—such as the lender's brand, other lenders' activities aimed at attracting customers, propensity to renegotiate or securitize, servicing practices, or marginal costs -- which may be correlated with advertising, that are driving the results. Second, and as discussed in Sections IV.B.4 and IV.B.5, it is unlikely that the expensive mortgages originated by advertisers purely reflect unobservable risk of borrowers or higher costs of catering to these borrowers. We further weaken these alternatives by using the Craigslist instrument in IV.C. Finally, a simple explanation in which advertisers attract consumers and the

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[20] In linguistics, a corpus is a large and structured set of texts, which are used to check occurrences of words or validate linguistic rules within a specific language territory. We obtain the most common word list from http://oxforddictionaries.com/words/the-oec-facts-about-the-language

cost is passed on to consumers cannot explain our findings either. In such a setting one would expect all consumers to sort to cheap nonadvertising lenders.

Our second set of findings, in Section V, analyzes the content of advertisements. We show that a significant share of advertisements explicitly advertise initial interest rates and that reset rates are almost never advertised. Even advertised APR does not help consumers find cheaper lenders. While mortgage advertisements disclose some information other than interest rates, this information is rudimentary and generic, mainly about loan horizons or lending amount. We found no evidence that lenders advertise their own characteristics, such as differences in servicing or renegotiation practices.

Our results broadly reject the informative view of advertising in the mortgage market, favoring the persuasive view instead. We now dig deeper into different models of these views and assess how our results compare with specific empirical predictions of these models. Advertising can basically take two forms. Firms can advertise prices, which translates to advertising explicit interest rates in the mortgage context. Alternatively, they can advertise non-price features, such as the type of products sold by the lender, the type of lender in general, or simply the existence of the lender. We discuss theories that tie to these types of advertising in turn.

VI.A.1 Advertising interest rates

As Bagwell (2007) notes in his survey, market-level predictions of advertising models are difficult to test. The correlation between advertising of firms and the average level of prices (or dispersion of prices) across markets is difficult to estimate due to endogeneity problems (see Glazer 1981). Moreover, different models frequently result in similar qualitative predictions at the market level. Therefore, our analysis focuses on the *cross-sectional* correlation of prices (interest rates) and advertising within a given market, which we find is positive.

An early model of informative price advertising is Butters (1977), in which sellers advertise prices of their products. Consumers do not observe nonadvertising sellers, and their chances of becoming aware of a seller increase with advertising. In equilibrium all firms advertise and also randomize prices. Thus Butters (1977) predicts no correlation between the level of advertising and prices. A similar lack of correlation between advertising and prices arises in Stahl (1994), who extends Butters (1977) to allow for more general advertising and downward sloping demand curves.[21] These predictions are in stark contrast to what we find in the data.

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[21] Single unit demand is not an issue in the mortgage market, since consumers generally require one mortgage.

In Robert and Stahl (1993) consumers engage in optimal search and firms choose advertising and prices simultaneously. Advertisers randomize among low prices and advertise lower prices more frequently; nonadvertisers charge high prices, and sell to consumers who have not seen an advertisement with a lower price. This model demonstrates why informative models of price advertising have a difficult time explaining our facts. Advertising a price is helpful only if the price advertised is lower than other prices the consumer has observed; otherwise the consumer will ignore the advertisement. The marginal benefit to advertising therefore decreases in price. Therefore this model and similar models of informative advertising of prices lead to a negative correlation between advertising and prices. This prediction is inconsistent with a *positive correlation* between advertising and prices of firms within a market, which we observe in the data.

Our analysis of advertised interest rates provides further evidence that is difficult to reconcile with informative models of price advertising. In particular, the *fundamental* assumption underlying informative models of price advertising that we discussed above is that advertised prices perfectly inform a consumer about actual prices. Therefore a consumer following a lower advertised price will purchase a cheaper product. We find that among firms who advertise, a lower advertised APR does not lead borrowers to cheaper lenders. At best, the correlation of advertised APR and lenders' expensiveness is not correlated, and all estimated coefficients are negative. This result violates the fundamental assumption that informative models are built upon.

The analysis of advertising content data also provides some guidance on which models might be able to explain the nature of mortgage advertising. As we show, the initial rate features frequently and prominently in mortgage advertisements, but the reset rate is almost always omitted. Furthermore, the advertised APR, which is supposed to be the sufficient statistic for borrowing costs, is uncorrelated (or negatively correlated) with the actual lender expensiveness. The models that are more consistent with such advertising practices are those in which some characteristics of goods -- in our case the reset rate -- are shrouded or not salient (Gabaix and Laibson 2006; Bordalo, Gennaioli, and Shleifer 2012). Advertising is used, instead, to increase the salience of certain other characteristics -- the initial interest rate in the case of mortgage advertising.

We also find that the positive correlation between advertising expensiveness and mortgage pricing exists only for segments of borrowers who are more susceptible to manipulation because these borrowers are potentially less informed. This lends support to models with heterogeneous consumers, in which some consumers are more susceptible to biases or more confused than others (Hall and Woodward 2012).

VI.A.2 Non-price advertising

Non-price advertising to signal the interest rate

Informative advertising can occur in homogeneous goods markets even if firms do not explicitly advertise prices. Firms can simply advertise their presence—consumers infer the price they would be charged by firms based on the firm's choice of whether and how much to advertise. As we show, 15% of advertisements we analyze do not advertise any characteristics of a mortgage or its interest rate. Bagwell and Ramey (1994) study a model in which consumers observe a level of a firm's advertising activity but do not observe its price until they incur a search cost—in other words, consumers can respond to an advertisement by incurring the cost of contacting a lender and only then do they learn the price. A rational consumer responds to such an advertisement, because in equilibrium firms who advertise heavily also set low prices. If intensive advertisers were to set high prices, then consumers would rationally not respond to non-price advertising in equilibrium. Stores that advertise are compensated by large sales volume, and stores that do not advertise earn the same profits through high prices but low sales volume. Again, as in informative models of price advertising, this model also predicts a *negative* correlation between advertising intensity and prices within a market, rather than the *positive* correlation that we find in the data.

Advertising to match mortgages to borrowers

Another possible way for advertising to be useful to consumers is to inform them that the lender sells mortgages that are differentiated in a way that matches the borrower's preferences. The theories formalizing this intuition require that lenders advertise mortgage characteristics, which allow consumers to differentiate between lenders (Nelson 1964; Meurer and Stahl 1994; Anderson and Renault 2006). Prima facie product differentiation is not a likely source of variation in the market for securitized mortgages because securitization creates substantial standardization in mortgages offered. But we can point to several more direct reasons that suggest it is *unlikely* that product differentiation is the driver of our results.

First, note that we condition on a plethora of observable mortgage and consumer characteristics when estimating our regressions. We find a positive correlation between advertising intensity and mortgage prices conditioning on observable characteristics. As well, we use several additional tests to show that unobservable characteristics of borrowers are also not likely to explain our findings.

Second, and most importantly, as discussed in Section V.C, the mortgage characteristics that are advertised are generic, such as mortgage horizon. Mortgages with these characteristics are

offered by virtually all lenders in the market. We found no evidence of lenders advertising their own characteristics, such as propensity to securitize or renegotiate. These results are difficult to reconcile with the view that advertising language is used to inform about mortgage or lender characteristics, that allow buyers to better match with a lender.

Finally, it is possible that while mortgage advertisers are not explicitly using language to differentiate their product or practices, it is the intensity of advertising that allows borrowers to draw inferences. We find a positive correlation between advertising intensity and mortgage prices using *within lender* variation. Thus, it is unlikely that between-lender differences in servicing, brand, or propensity to renegotiate are driving our results.

VI.B Related literature

In addition models of advertising, our paper is connected to several strands of literature. It is related most directly to the recent literature on the causes and consequences of the financial crisis (e.g., Agarwal et al. 2011; Barlevy and Fisher 2010; Ben-David 2011; Jiang et al. 2012; Keys et al. 2009, 2010; Loutskina and Strahan 2011; Mayer and Pence 2009; Mayer et al. 2011; Mian and Sufi 2009), and in particular to studies that examine the role of predatory lending in fueling the crisis (see Agarwal et al. 2011). Our findings are consistent with those of Agarwal and Evanoff (2013), whose data overlap with our sample period. They conclude that real estate professionals steer higher-quality borrowers to lenders who offer unattractive terms. To the best of our knowledge, ours is the first paper to identify an economically meaningful relation between advertising and lending activity of subprime lenders.

Our paper is also related to the literature on firms' responses to consumers' limited ability to process information and their biases (e.g., Malmendier and DellaVigna 2006). For example, Gabaix and Laibson (2006) and Bordalo et al. (2012) study how consumers may focus on salient product features. Stango and Zinman (2012) find that consumers are less likely to incur overdraft fees after these are made salient, especially if consumers are financially less literate.[22] Our findings are consistent with their view since we find the larger effect of advertising on mortgage prices for less educated consumers.

Our paper also relates to the relatively nascent literature on the effects of limited attention on financial outcomes. This literature argues that uninformed investors tend to ignore information that is critical to firm value if it is not salient, and tend to respond more quickly to information

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[22] Also related is work by Carlin and Manso (2011), who point out that educating customers might be ineffective, because firms respond with further obfuscation.

that catches their attention (Hirshleifer and Teoh 2003).[23] Similar to this work, we present evidence that advertising decreases the well-being of agents who respond to it.

More broadly, our paper is related to literature on how persuasion affects consumer choices (see Bagwell 2007, DellaVigna 2009, and DellaVigna and Gentzkow 2010 for recent reviews). Closest to our paper are studies that relate the use of advertising and pricing of homogeneous products. Hastings, Hortacsu, and Syverson (2011) show that the use of advertising activity of private social security funds in Mexico is related to their pricing. Bertrand et al. (2010) use a field experiment to show that advertising increases demand for consumer loans and study the effect of different advertising features. In this literature, our work is closely related to Agarwal and Ambrose (2011), who assess the effect of advertising on choice of home equity debt contracts by examining a direct mail advertising experiment done by a large bank. Their evidence also supports the persuasive view of advertising in the mortgage market.

Our paper is also related to literature that examines effects of advertising on consumer decisions.[24] In general, DellaVigna and Gentzkow (2010) point out that it is difficult to draw causal interpretations because advertising is endogenous to several firm characteristics. Our paper attempts to draw such a link by exploiting both the richness of our data and the analysis that uses introduction of Craigslist.

VI.C Conclusion

Our analysis reveals that the major theories of informed price and non-price advertising have a difficult time explaining the joint nature of advertising and pricing in the mortgage industry. The models that are more consistent with the data are those in which some characteristics of goods, in our case the reset rate, are shrouded/not salient (Gabaix and Laibson 2006; Bordalo, Gennaioli, and Shleifer 2012), and advertising is used to increase the salience of certain other characteristics, the initial interest rate in the case of mortgage advertising. We also find that the positive correlation between advertising expensiveness and mortgage pricing exists only for segments of borrowers who are more susceptible to manipulation because they are potentially less informed. This evidence lends support to models with heterogeneous consumers, some of whom are less susceptible to biases or less confused than others (Hall and Woodward 2012).

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[23] Several other papers have used advertising as a measure of "attention-grabbing" events, which attract uninformed investors. Grullon, Kanastas, and Weston (2004) show that advertising increases demand of uninformed investors and Lou (2013) shows that firms use advertising to maximize the proceeds from insiders' equity sales.

[24] Gurun and Butler (2012) present evidence that local newspapers slant their news in favor of firms with higher local advertisement expenditures, which in turn increases investors' demand for local stocks. Reuters and Zitzewitz (2006) show that favorable advertisements in personal finance publications are positively correlated with mutual fund recommendations and receive higher subsequent fund flows. Zinman and Zitzewitz (2012) demonstrate that ski resorts engage in deceptive advertisement, which persists despite competition.

We note that our paper is silent on why some lenders advertise and others do not, given that advertising seems to be effective in attracting consumers who overpay for mortgages. One potential reason is that we measure only the direct cost of advertising paid to the media, and do not include other costs of advertising. It is possible that, after accounting for these costs, advertisers do not earn excessive rents relative to nonadvertisers. Alternatively, lenders who advertise could be earning rents, but it may take time for the competition to learn how to imitate effective advertising. The precise channel remains an area for further research.

Our analysis focuses on the role that advertising plays in helping consumers choose the cheapest mortgage from a set of mortgages. We do not explore whether advertising improves consumers' choice of whether to take on a mortgage or select a more suitable mortgage product. The answer to this question would require a benchmark specifying optimal mortgage choices for a given consumer. Establishing such a benchmark to assess the informational role of advertising in helping consumers choose among different types of mortgages requires more research.

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Table 1. Descriptive Statistics

This table presents summary statistics of different datasets used in our analysis. Panel A reports the total advertising expenditures in the top five DMAs between 2002 and 2006. Panels B and C present summary statistics of ARM and FRM loans originated by banks over the sample period. Loan-specific attributes include Reset Rate, Initial Interest Rate, Reset Time, loan-to-value ratio (LTV), Loan Amount, credit score (FICO), Prepay Penalty Indicator, and Low Documentation Indicator. Panels B and C also summarize demographic information of the areas where these loans were given (% Minority, Median Household Income, % Poor, % Educated (college degree), % Female, and Average House Value).

Panel A. Total Advertising Expenditures in top five DMAs (2002–2006) (in thousands)

#	DMAs	Total	Newspaper	Spot TV	Outdoor
1	Los Angeles	31,451	25,131	2,702	2,345
2	New York	15,331	11,265	458	1,577
3	San Francisco	8,101	3,722	727	3,031
4	Philadelphia	5,057	3,591	399	569
5	Chicago	4,924	1,735	1,704	1,157

Panel B. ARM Loans

	Mean	Std. Dev.	N
Reset Rate	8.59	1.59	1,182,080
Initial Interest Rate	7.8	1.32	1,182,080
Reset Time	28.24	6.59	1,182,080
LTV	84.68	8.51	1,182,080
Loan Amount	168,601	107,004	1,182,080
FICO	626.02	53.7	1,182,080
Prepay Penalty Indicator	0.77	0.42	1,182,080
Low Doc Indicator	0.4	0.49	1,182,080
% Minority	25.74	23.24	1,182,080
Median HH Income	47,241	15,035	1,182,080
% Poor	10.86	7.56	1,182,080
% Educated	14.99	23.24	1,182,080
% Female	51.08	2.08	1,182,080
Average House Value	147,978	77,007	1,182,080

Table 1. Descriptive Statistics (contd.)

Panel C. FRM Loans			
	Mean	**Std. Dev**	**N**
LTV	91.55	11.77	464,530
Loan Amount	104,228	101,500	464,530
FICO	640.39	50.82	464,530
Prepay Penalty Indicator	0.59	0.49	464,530
Low Doc Indicator	0.38	0.48	464,530
% Minority	25.02	22.61	464,530
Median HH Income	48,096	15,582	464,530
% Poor	10.87	7.65	464,530
% Educated	15.37	0.08	464,530
% Female	51	2.09	464,530
Average House Value	153,438	81,787	464,530

Table 2. Measuring Mortgage Expensiveness

This table reports the estimation of the following specification: $y_{ijlt} = \beta i_{ijlt} + \alpha_t + \alpha_l + \Gamma X_{ilt} + \varepsilon_{ijlt}$, where i indexes the loan, j indexes the lender, t indexes the quarter, and l indexes the market. The dependent variable is the reset rate on the ARM mortgage (first column) or the interest rate on the FRM loan (second column). Low Doc is an indicator for loans that require low documentation at loan application. Other controls include the demographic information for the zip codes in which the loans are made (% nonwhite, median and mean household income, % poor, % female, % with BA degree, median and mean house value). Standard errors are clustered by quarter and reported in parentheses under coefficient estimates. (***), (**), and (*) denote statistical significance for 1%, 5%, and 10% levels.

	Y=Reset Rate [ARM Loans] (1)	Y = Interest Rate [FRM Loans] (2)
Initial Rate	0.625***	
	(0.0615)	
Reset Time (x10)	-0.206***	
	(0.0347)	
LTV (x10)	0.109***	0.606***
	(0.0214)	(0.044)
Loan Amount (x10,000)	-0.0055***	-0.074***
	(0.0018)	(0.014)
FICO (x100)	-0.295***	-1.090***
	(0.067)	(0.036)
Prepay Penalty	0.196***	-0.210***
	(0.029)	(0.055)
Low Doc	0.112***	0.406***
	(0.036)	(0.052)
Other Controls	Yes	Yes
Quarter Fixed Effects	Yes	Yes
Region Fixed Effects	Yes	Yes
Observations	1,182,080	464,530
R-squared	0.563	0.473

Table 3. Advertising and Expensiveness

In this table, we estimate the following specification: $p_{jlt} = \beta \, advertising_{jlt} + \alpha_j + \alpha_t + \alpha_l + \varepsilon_{jlt}$, where the dependent variable measures how expensive mortgages are in a region from a lender. Lender "expensiveness" is computed by aggregating individual loan level residuals obtained from specification reported in Table 2. *Advertising* is the total dollar value of local advertising of lender j in market l in quarter t. Panel A reports the coefficients using the ARM loan sample. Panel B reports the coefficients using all mortgages. We compute expensiveness for all mortgages using residuals from the specification estimated in column (1) of Table 2 for ARM loans and in column (2) of Table 2 for FRM loans. Standard errors are reported in parentheses under coefficient estimates. (***), (**), and (*) denote statistical significance for 1%, 5%, and 10% levels.

Panel A. ARM Loan Sample

	Y = Lender Expensiveness		
	(1)	(2)	(3)
Advertising (all) (x100)	0.0314**		
	(0.0115)		
Advertising (others) (x100)		0.111	
		(0.082)	
Advertising (newspapers)(x100)			0.0368***
			(0.0122)
Quarter Fixed Effects	Yes	Yes	Yes
Lender Fixed Effects	Yes	Yes	Yes
Region Fixed Effects	Yes	Yes	Yes
Observations	51,895	51,895	51,895
R-squared	0.139	0.139	0.139

Panel B. All Mortgages

	Y = Lender Expensiveness		
	(1)	(2)	(3)
Advertising (all) (x100)	0.0239**		
	(0.009)		
Advertising (others) (x100)		0.089	
		(0.072)	
Advertising (newspapers) (x100)			0.0299***
			(0.009)
Quarter Fixed Effects	Yes	Yes	Yes
Lender Fixed Effects	Yes	Yes	Yes
Region Fixed Effects	Yes	Yes	Yes
Observations	51,895	51,895	51,895
R-squared	0.140	0.140	0.140

Table 4. Advertising and Demographics

In this table we estimate the following specification: $p_{jlt} = \beta \, advertising_{jlt} + \alpha_j + \alpha_t + \alpha_l + \varepsilon_{jlt}$, where the dependent variable measures how expensive mortgages are in a region from a lender. Lender "expensiveness" is computed by aggregating individual loan level residuals obtained from the specification reported in Table 2 using the ARM loan sample. *Advertising* is the total dollar value of local advertising of lender j in market l in quarter t. We split the sample of lender/quarter/DMA observations by the share of loans weighted by the demographic characteristics of the area the loan was made in. High/Low represent observations above/below the median of the characteristic. Educated is the percentage of households with a BA degree. Standard errors are clustered by quarter and reported in parentheses under coefficient estimates. (***), (**), and (*) denote statistical significance for 1%, 5%, and 10% levels.

	Y = Lender Expensiveness					
	Minority % Low	Minority % High	Educated % Low	Educated % High	Poor % Low	Poor % High
	(1)	(2)	(3)	(4)	(5)	(6)
Advertising (all) (x100)	-0.046	0.034***	0.071***	0.006	0.002	0.037**
	(0.056)	(0.011)	(0.019)	(0.013)	(0.019)	(0.013)
Quarter Fixed Effects	Yes	Yes	Yes	Yes	Yes	Yes
Lender Fixed Effects	Yes	Yes	Yes	Yes	Yes	Yes
Region Fixed Effects	Yes	Yes	Yes	Yes	Yes	Yes
Observations	25,922	25,973	26,008	25,887	26,093	25,802
R-squared	0.150	0.158	0.151	0.160	0.157	0.148

Table 5. Advertising and Delinquency

In this table, we estimate the following specification: $delinquent_{jlt} = \beta advertising_{jlt} + \alpha_j + \alpha_t + \alpha_l + \varepsilon_{jlt}$, where the dependent variable is the percent of loans made by lender j in location l in quarter t that turned out to be 90-day delinquent within the first two years of origination. *Advertising* is the total dollar value of local advertising of lender j in market l in quarter t. Panel A reports the coefficients using the ARM loan sample. Panel B reports the coefficients using all mortgages. Standard errors are reported in parentheses under coefficient estimates. (***), (**), and (*) denote statistical significance for 1%, 5%, and 10% levels.

Panel A. ARM Loans

	Y= % of 90-day delinquent loans within 2 years of origination		
	(1)	(2)	(3)
Advertising (all) (x100)	-0.0025		
	(0.0027)		
Advertising (others) (x100)		0.003	
		(0.014)	
Advertising (newspapers) (x100)			-0.003
			(0.004)
Quarter Fixed Effects	Yes	Yes	Yes
Lender Fixed Effects	Yes	Yes	Yes
Region Fixed Effects	Yes	Yes	Yes
Observations	51,895	51,895	51,895
R-squared	0.122	0.122	0.122

Panel B. All Mortgages

	Y= % of 90-day delinquent loans within 2 years of origination		
	(1)	(2)	(3)
Advertising (all) (x100)	-0.002		
	(0.003)		
Advertising (others) (x100)		0.004	
		(0.013)	
Advertising (newspapers) (x100)			-0.003
			(0.003)
Quarter Fixed Effects	Yes	Yes	Yes
Lender Fixed Effects	Yes	Yes	Yes
Region Fixed Effects	Yes	Yes	Yes
Observations	51,895	51,895	51,895
R-squared	0.134	0.134	0.134

Table 6. Differences in Catering Costs

In this table we assess if costs (in dollars) such as application fees, underwriting fees, processing fees and other fees borne during loan origination by a large subprime lender differs across various groups. In Panels A and B we stratify borrowers by based on whether the borrowers are in a minority or not. In Panels C and D we compare years in which the lender advertises versus when it does not. (***), (**), and (*) denote statistical significance for 1%, 5%, and 10% levels. [a] signifies that observations are reported for the total fees column and vary for individual cost categories.

Panel A: ARM Loans

	Application Fees	Underwriting Fees	Processing Fees	Total Fees (excluding interest rate)	Observations[a]
Non Minorities	495	360	275	1150	398300
Minorities	506	353	280	1144	174496
Difference	11***	-7***	5***	-6***	
% Difference	2.2%	-2.0%	1.8%	-0.5%	

Panel B: FRM Loans

	Application Fees	Underwriting Fees	Processing Fees	Total Fees (excluding interest rate)	Observations[a]
Non Minorities	396	327	303	1052	86413
Minorities	406	333	280	1054	28722
Difference	10***	6***	-23***	2***	
% Difference	2.5%	1.8%	-8.2%	0.2%	

Panel C: ARM Loans

	Application Fees	Underwriting Fees	Processing Fees	Total Fees (excluding interest rate)	Observations[a]
Non-advertising periods	500	360	279	1149	346889
Advertising periods	504	355	277	1145	225907
Difference	4***	-5***	-2***	-4***	
% Difference	0.8%	-1.4%	-0.7%	-0.3%	

Panel D: FRM Loans

	Application Fees	Underwriting Fees	Processing Fees	Total Fees (excluding interest rate)	Observations[a]
Non-advertising periods	402	326	305	1053	41340
Advertising periods	397	330	283	1056	73795
Difference	-5***	4***	-22***	3***	
% Difference	-1.3%	1.2%	-7.8%	0.3%	

Table 7. Craigslist Entry and Mortgage Advertising

In this table, we estimate the following specification using 2SLS: $p_{jlt} = \beta advertising_{jlt} + \alpha_j + \alpha_t + \alpha_l + \varepsilon_{jlt}$, where the dependent variable measures how expensive mortgages are in a region from a lender. Lender "expensiveness" is computed by aggregating individual loan level residuals obtained from specification reported in Table 2. *Advertising* is the total dollar value of local advertising of lender *j* in market *l* in quarter *t*. We use Craigslist entry to a region as an instrument in the first stage. Panel A reports the results of the first stage estimation for different measures of advertising (Total, Other, and Newspaper) using the following specification: $advertising_{jlt} = \beta_1 After\ Craigslist\ Entry_{lt} + \alpha_j + \alpha_t + \alpha_l + v_{jlt}$. *After Craigslist Entry* is a dummy variable indicating the presence of Craigslist in a given location *l* in period *t*. Panel B reports the coefficients of the second stage using the ARM loan sample. Panel B reports the coefficients of the second stage using the ARM loan sample omitting lenders who advertised on Craigslist. Panel D reports the coefficients of the second stage using all mortgages. Standard errors are reported in parentheses under coefficient estimates. (***), (**), and (*) denote statistical significance for 1%, 5%, and 10% levels.

Panel A. First Stage -- Craigslist entry

	Y= Advertising		
	Total Advertising	Other Advertising	Newspaper Advertising
	(1)	(2)	(3)
After Craigslist Entry	-1.217***	-0.321***	-0.764***
	(0.247)	(0.079)	(0.170)
Quarter Fixed Effects	Yes	Yes	Yes
Lender Fixed Effects	Yes	Yes	Yes
Region Fixed Effects	Yes	Yes	Yes
Observations	51,895	51,895	51,895

Panel B. Second Stage -- Instrumented Advertising (ARM Loan Sample)

	Y= Lender Expensiveness		
	(1)	(2)	(3)
Advertising (all)	0.072***		
	(0.018)		
Advertising (others)		0.271***	
		(0.087)	
Advertising (newspapers)			0.114***
			(0.027)
Quarter Fixed Effects	Yes	Yes	Yes
Lender Fixed Effects	Yes	Yes	Yes
Region Fixed Effects	Yes	Yes	Yes
Observations	51,895	51,895	51,895

Table 7. Craigslist Entry and Mortgage Advertising (contd.)

Panel C. Second Stage -- Instrumented Advertising (ARM Loan Sample)
(Subsample removing lenders who directly advertised on Craigslist)

	Y= Lender Expensiveness		
	(1)	(2)	(3)
Advertising (all)	0.078***		
	(0.019)		
Advertising (others)		0.274***	
		(0.087)	
Advertising (newspapers)			0.131***
			(0.031)
Quarter Fixed Effects	Yes	Yes	Yes
Lender Fixed Effects	Yes	Yes	Yes
Region Fixed Effects	Yes	Yes	Yes
Observations	50,902	50,902	50,902

Panel D: Second Stage – Instrumented Advertising (All Mortgages)

	Y= Lender Expensiveness		
	(1)	(2)	(3)
Advertising (all)	0.068***		
	(0.016)		
Advertising (others)		0.256***	
		(0.082)	
Advertising (newspapers)			0.108***
			(0.024)
Quarter Fixed Effects	Yes	Yes	Yes
Lender Fixed Effects	Yes	Yes	Yes
Region Fixed Effects	Yes	Yes	Yes
Observations	51,895	51,895	51,895

Table 8. Craigslist Entry and Timing

In this table, we explore the timing of Craigslist entry in a region and advertising and characteristics of lending in that region. *Advertising* is the total dollar value of local advertising of lender j in market l in quarter t. We use the following specification $advertising_{jlt} = \sum_{k=-2}^{2} \beta_i After\ Craigslist\ Entry\ k_l + \alpha_j + \alpha_t + \alpha_l + \upsilon_{jlt}$, where *After Craig List Entry* is a dummy variable indicating the presence of Craigslist in a given location l. k indicates the quarters before, during or after Craigslist entry in a location. $k>=+2$ indicates all the periods two quarters after Craigslist entry. The omitted category is the presence of Craigslist two quarters before it enters a location. Standard errors are reported in parentheses under coefficient estimates. (***), (**), and (*) denote statistical significance for 1%, 5%, and 10% levels.

	Y=Advertising			Y=Observables			
	Total Adv.	Other Adv.	Newspaper Adv.	FICO	LTV	Prepay Penalty	Low Doc.
	(1)	(2)	(3)	(4)	(5)	(6)	(7)
After Craigslist Entry -2	-0.146	0.0151	-0.169	1.274	-0.0240	0.013	-0.004
	(0.179)	(0.097)	(0.099)	(0.827)	(0.120)	(0.008)	(0.008)
After Craigslist Entry -1	-0.512**	-0.118	-0.361***	-0.538	0.274	0.010	-0.012
	(0.183)	(0.068)	(0.123)	(1.033)	(0.164)	(0.011)	(0.007)
After Craigslist Entry 0	-0.796***	-0.219**	-0.499***	0.580	0.231**	0.029**	-0.017**
	(0.269)	(0.100)	(0.151)	(0.769)	(0.107)	(0.011)	(0.006)
After Craigslist Entry +1	-0.925***	-0.184**	-0.660***	0.076	0.106	0.021**	-0.004
	(0.190)	(0.075)	(0.118)	(0.802)	(0.124)	(0.008)	(0.009)
After Craigslist Entry >=+2	-1.646***	-0.413***	-1.088***	0.260	0.043	0.044***	-0.015***
	(0.286)	(0.115)	(0.199)	(0.864)	(0.150)	(0.012)	(0.005)
Quarter Fixed Effects	Yes	Yes	Yes	Yes	Yes	Yes	Yes
Lender Fixed Effects	Yes	Yes	Yes	Yes	Yes	Yes	Yes
Region Fixed Effects	Yes	Yes	Yes	Yes	Yes	Yes	Yes
Observations	42,632	42,632	42,632	42,632	42,632	42,632	42,632
R-squared	0.114	0.204	0.087	0.292	0.233	0.574	0.298

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Table 9. Analyzing Advertising Content

This table presents summary statistics on the content of print and direct mail advertising campaigns. In Panel A, we use textual analysis to identify the existence of ARM loan related search terms in mortgage advertising campaigns. Search terms include "ARM", "Reset", "Adjust" Panel B presents analysis using advertisements where two interest rates were advertised. Panel C identifies mortgages that may promote such as low interest rates (e.g. "AS LOW AS", "INTRO*", "INITIAL", and "STARTING"). In Panel D, tabulate the quantitative information disclosed in these campaigns. "No numerical information" refers to campaigns that do mention an actual number. Explicit interest rate refers to campaigns that mention a specific interest rate. "Below - in reference to a Prime Rate" refers to campaigns that convey information about interest rate and reference to the prime interest rate offered to high FICO mortgage borrowers. "Dollar Amount" refers to advertising campaigns that mention a dollar amount in reference to a down payment requirement. "Horizon" refers to advertising campaigns that mention a specific loan maturity. Finally, "No information" refers to advertising campaigns that do not contain any information on mortgage type (e.g. does not contain terms such as "ARM", "RESET", "ADJUST"), interest rate (e.g. does not refer to a specific interest rate or contains terms like "AS LOW AS", "INTRO*", "INITIAL", "STARTING", "THEREAFTER") or non-price features (e.g. mentioning a horizon (MONTH or YEAR), down payment requirement, or loan purpose ("FHA", "CONSOLI*" or "REFIN*")).

Panel A. ARM Mortgage Related Advertising Campaigns

Search Term	No. Campaigns
ARM	4,238
Reset	13
Adjust	1,885
Explicit interest rate	4234
Total	6,136

Panel B. Advertisement Displays Two Interest Rates

Search Term	No. Campaigns
Second rate is APR	11,387
Multiple products	1,676
Other	128
Total	13,191

Table 9. Analyzing Advertising Content (contd.)

Panel C. Phrases on Low Rates

Search Term	No. Campaigns
As low as	3,632
Intro	769
Initial	346
Starting	608
Total	4,747

Panel D. Quantitative Mortgage Information

Search Term	No. Campaigns
No Numerical Information	6,563
Explicit interest rate	26,863
APR stated	20,146
Below (in reference to a Prime Rate)	969
Dollar Amount	16,702
Horizon (Year, Month)	21,992

Table 10. APR and Expensiveness

In this table we estimate the following specification: $p_{jlt} = \beta apr_{jlt} + \alpha_t + \alpha_l + \alpha_j + \varepsilon_{jlt}$, where the dependent variable measures how expensive mortgages are in a region from a lender. Lender "expensiveness" is computed by aggregating individual loan level residuals obtained from the specification reported in Table 2 using the ARM loan sample. *APR* is the advertised APR of lender *j* in market *l* in quarter *t*. Controls are whether the advertisement advertised a mortgage horizon, the reset horizon, mentioned a below prime initial rate and a count of the terms in the advertisement. Standard errors are clustered by lender and reported in parentheses under coefficient estimates. (***), (**), and (*) denote statistical significance for 1%, 5%, and 10% levels.

| | *Y = Lender Expensiveness* | | | |
	(1)	(2)	(3)	(4)
APR	-0.0205**	-0.0258**	-0.0105	-0.0093
	(0.009)	(0.013)	(0.009)	(0.015)
Controls	No	Yes	Yes	Yes
Quarter Fixed Effects	Yes	Yes	Yes	Yes
Lender Fixed Effects	No	No	No	Yes
Region Fixed Effects	No	No	Yes	Yes
Observations	807	807	807	807
R-squared	0.222	0.230	0.421	0.598

Appendix: Table A1 -- Robustness to Alternative Expensiveness Measures

In Panel A, we estimate the specifications presented in Table 3 (Panel A, Column 1 [baseline specification]) for alternative measures of expensiveness instead of the ones obtained from Table 2. The first two columns compute expensiveness by estimating $y_{ijlt} = P_n(i_{ilt}, X_{ilt}) + \alpha_t + \alpha_l + \varepsilon_{ijlt}$, where P_n designates a polynomial of order n. Column 1 is estimated with second degree polynomials (with all interactions).and column 2 is estimated with and third degree polynomials (with all interactions). In column 3 we estimate separate regression presented in Table 2 for subsamples formed on deciles of the initial interest rate, y_{ijlt}, and in column 4 we form 20 subsamples cut in 5 percentile increments. In Panel B we estimate the specifications presented in Table 5 (Panel B, Column 1 [baseline IV specification]) using these alternative measures of expensiveness. Standard errors are reported in parentheses under coefficient estimates. (***), (**), and (*) denote statistical significance for 1%, 5%, and 10% levels.

Panel A: Baseline Specification

	Y = Lender Expensiveness			
	(1)	(2)	(3)	(4)
Advertising (all) (x100)	0.033***	0.033***	0.022**	0.023**
	(0.011)	(0.011)	(0.010)	(0.010)
Quarter Fixed Effects	Yes	Yes	Yes	Yes
Lender Fixed Effects	Yes	Yes	Yes	Yes
Region Fixed Effects	Yes	Yes	Yes	Yes
Observations	51,895	51,895	51,895	51,895
R-squared	0.135	0.131	0.133	0.132

Panel B: Baseline IV

	Y = Lender Expensiveness			
	(1)	(2)	(3)	(4)
Advertising (all) (x100)	0.062***	0.056***	0.042***	0.041***
	(0.016)	(0.015)	(0.012)	(0.012)
Quarter Fixed Effects	Yes	Yes	Yes	Yes
Lender Fixed Effects	Yes	Yes	Yes	Yes
Region Fixed Effects	Yes	Yes	Yes	Yes
Observations	51,895	51,895	51,895	51,895

Appendix: Table A2 -- Mortgage Classifieds on Craigslist

The data contains information collected from Craigslist financial services using monthly snapshots kept by Wayback Machine (2002 to 2006). The number of snapshots throughout the sample is the number of monthly observations per location. The average number of postings listed in a given snapshot is the average number of postings in the financial services section in a given location. The percentage of posts containing terms "Mortgage" or ("Loan" and "Home") is the share of posts containing terms "Mortgage," or containing terms "Loan" and "Home" in the same post.

| Market	Number of snapshots throughout the sample	Average number of posts per snapshot	Percentage of posts containing terms	
			"Mortgage" or ("Loan" and "Home")	"Mortgage"
Athens, GA	7	72.4	9.3	7.5
Atlanta, GA	35	231.2	5.4	4.4
Austin, TX	32	104.8	7.8	6.1
Baltimore, MD	29	104.5	9.0	7.9
Buffalo, NY	22	75.2	9.6	8.6
Urbana, IL	14	46.7	11.8	10.5
Chicago, IL	34	134.3	7.4	6.3
Cincinnati, OH	20	83.5	8.7	7.4
Cleveland, OH	30	79.4	10.3	8.1
Dallas, TX	37	166.5	5.0	3.9
Denver, CO	34	94.3	9.4	7.5
Detroit, MI	29	73.8	11.4	9.6
Honolulu, HI	30	76.6	9.3	7.6
Houston, TX	34	122.8	7.1	5.6
Las Vegas, NV	37	182.1	5.8	4.5
Los Angeles, CA	35	168.3	4.8	3.6
Miami, FL	32	113.0	10.9	9.1
Minneapolis, MN	22	123.0	8.1	6.9
Nashville, TN	24	75.5	10.6	9.4
New Orleans, LA	24	76.6	7.2	5.6
New York, NY	38	182.6	6.0	5.5
Philadelphia, PA	33	124.9	7.6	6.4
Phoenix, AZ	34	152.2	7.4	5.7
Pittsburg, PA	22	80.4	12.3	10.8
San Diego, CA	36	109.1	8.3	6.3
Seattle, WA	34	89.8	10.7	8.0
San Francisco, CA	13	380.5	6.7	5.5

Appendix: Table A3 -- Top Fifty Words Used in Mortgage Print and Direct Mail Advertisements

In this table we present 50 most popular words used in mortgage print and direct mail advertisements. We eliminate the most common words in English as defined by Oxford English Corpus, words referring to a price (APR, Rate, Fixed, ARM, Prime, Dollar, Amount, Variable, Interest), words referring to a time period (Month, Year, Term), and words that exist in almost all advertisements (Mortgage, Loan, Payments)
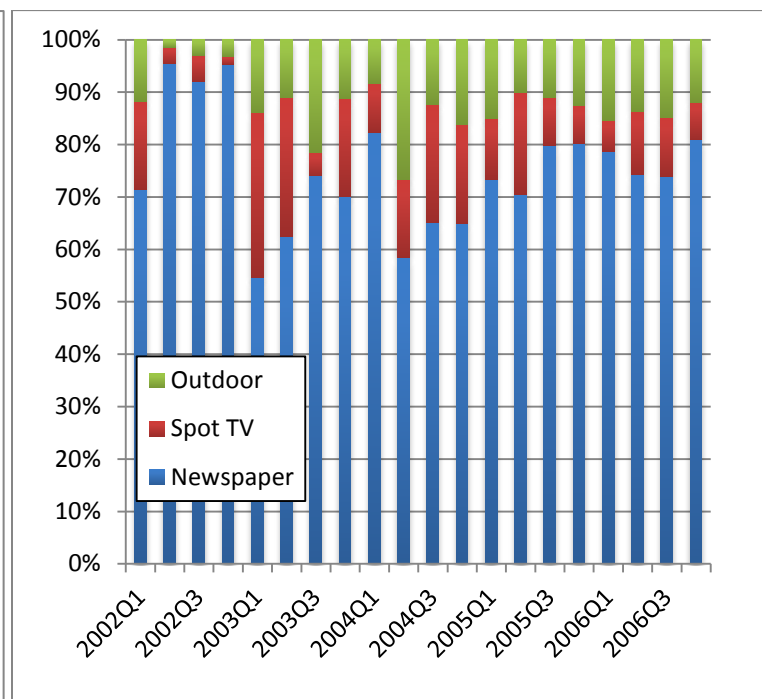
#	Word	Occurrence	%	#	Word	Occurrence	%
1	LOW	14968	1.144%	26	PREAPPROVED	2141	0.164%
2	OPPORTUNITY	11503	0.879%	27	ADJUSTABLE	2002	0.153%
3	USED	7646	0.584%	28	THEREAFTER	1969	0.151%
4	HOME	7616	0.582%	29	REDUCE	1969	0.151%
5	BASED	6276	0.480%	30	CURRENT	1890	0.144%
6	CREDIT	5003	0.382%	31	REPAYMENT	1847	0.141%
7	REFINANCE	4905	0.375%	32	EXISTING	1677	0.128%
8	AMOUNTS	4756	0.364%	33	BORROWERS	1633	0.125%
9	LOWER	4395	0.336%	34	BILLS	1513	0.116%
10	LINE	4344	0.332%	35	INTRODUCTORY	1421	0.109%
11	HOMEOWNERS	4170	0.319%	36	LINES	1340	0.102%
12	CONSOLIDATE	3775	0.289%	37	PURCHASE	1237	0.095%
13	CURRENTLY	3711	0.284%	38	CHANCE	1221	0.093%
14	DEBT	3709	0.284%	39	SAVE	1214	0.093%
15	CUSTOMERS	3685	0.282%	40	BELOW	1169	0.089%
16	CASH	3658	0.280%	41	INFORMATION	1038	0.079%
17	IMPROVEMENTS	3501	0.268%	42	HELP	1026	0.078%
18	PAY	3344	0.256%	43	HIGH	1012	0.077%
19	OFF	2862	0.219%	44	EXPENSES	944	0.072%
20	MORE	2696	0.206%	45	LIFE	943	0.072%
21	ABILITY	2679	0.205%	46	CAR	936	0.072%
22	PURPOSE	2606	0.199%	47	RANGING	926	0.071%
23	MINUS	2588	0.198%	48	MEMBERS	877	0.067%
24	DEBTS	2309	0.176%	49	PREQUALIFIED	876	0.067%
25	EQUITY	2234	0.171%	50	CONSOLIDATION	874	0.067%

Figure 1. Evolution of Mortgage Advertising over Time

This figure plots the time series of advertising expenditures for the matched lenders over the sample period. Figure 1(a) plots the total advertising expenditures and the expenditures in the three outlets over the sample period by our sample of lenders. Figure 1(b) provides the time series evolution of the percent advertising expenditures by the three dominant channels used by lenders in our sample.
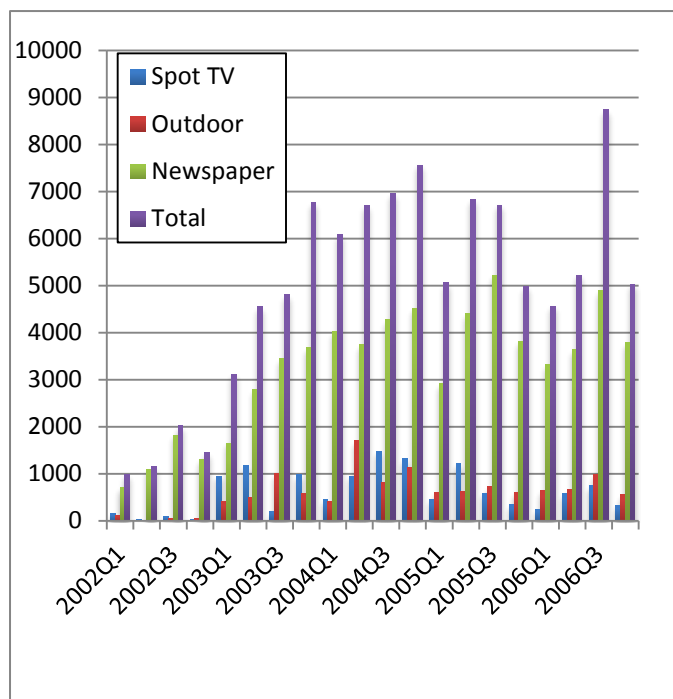
(a) Advertising Expenses in a DMA   *(b) Advertising Expenses in Top Three Outlets*

Figure 2. Geographic Distribution of DMA level Advertising of Mortgage Lenders

This map displays the spatial distribution of DMA level advertising expenditure by mortgage lenders in the 206 DMAs across the U. S over our sample period. We use four colors to represent the total advertising expenditure over our sample period in a given DMA (yellow signifies DMAs for which we do not have advertising information). Advertising numbers in legend are represented in thousands.
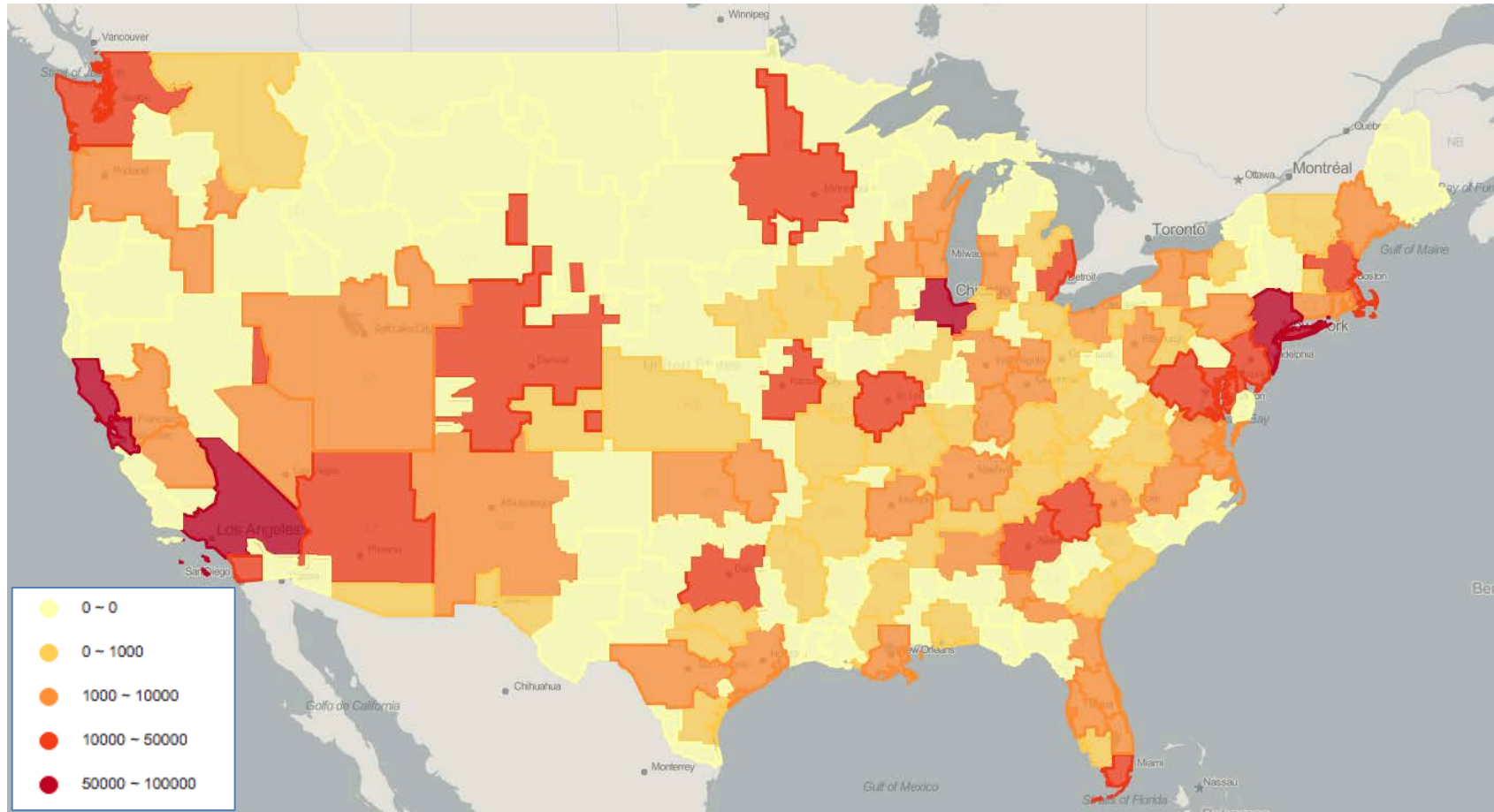
Figure 3: Kernel Density of Residuals

Figure 3(a) plots the kernel density of residual ARM reset rate a borrower was charged. The reset rate residuals are computed from the regression presented in Column 1 of Table 2. Figure 3(b) plots the kernel density of residual interest rate a borrower was charged. The plotted residuals are the combined ARM and FRM residuals from regressions presented in Column 1 and 2 of Table 2.
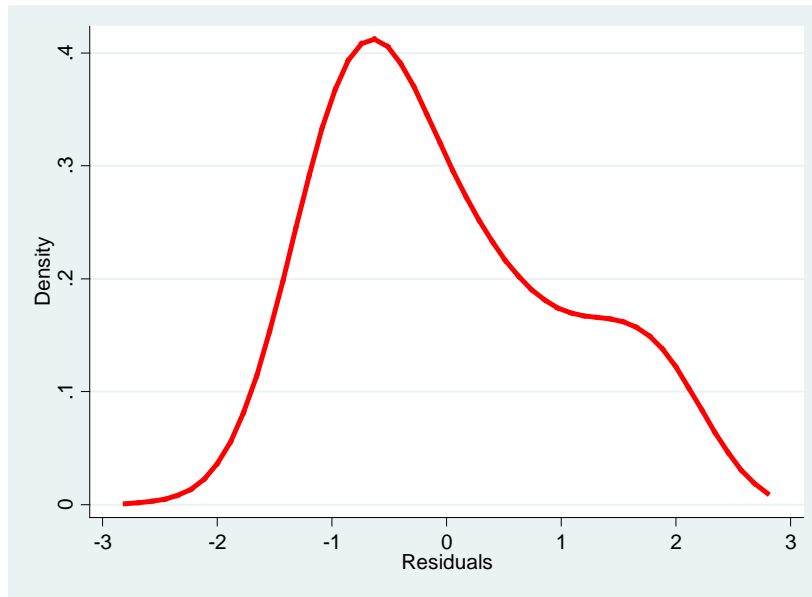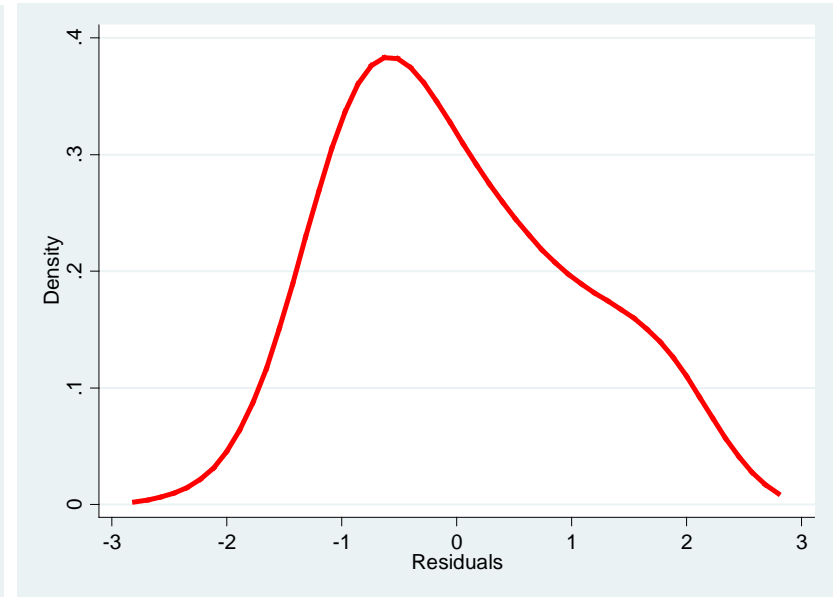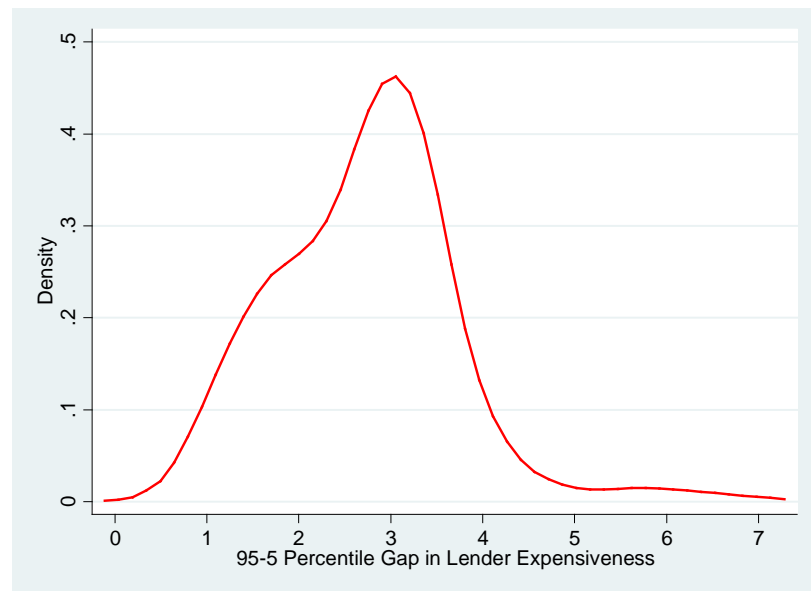

(a) ARM Reset Rate *(b) Interest Rate on All Mortgages*

Figure 4: Kernel Density of Dispersion within Region and within a Quarter

Figure 4(a) plots the kernel density of difference in mortgage expensiveness between the 95th and 5th percentiles in a given DMA in a given quarter. Expensiveness of a loan is defined as the residual ARM reset rate that a borrower was charged relative to the reset rate paid by an average borrower with the same set of observable characteristics, the same initial interest rate, in the same region and the same quarter (the residual from Column 1, Table 2, averaged within lender quarter DMA). Figure 4(b) shows the kernel density of differences between the 95th and 5th percentiles of lender expensiveness in a given location and quarter. Lender expensiveness is computed as the average the expensiveness of individual loans for this lender in that location and quarter (combined residuals from Columns 1 and 2, Table 2, averaged within lender quarter DMA).
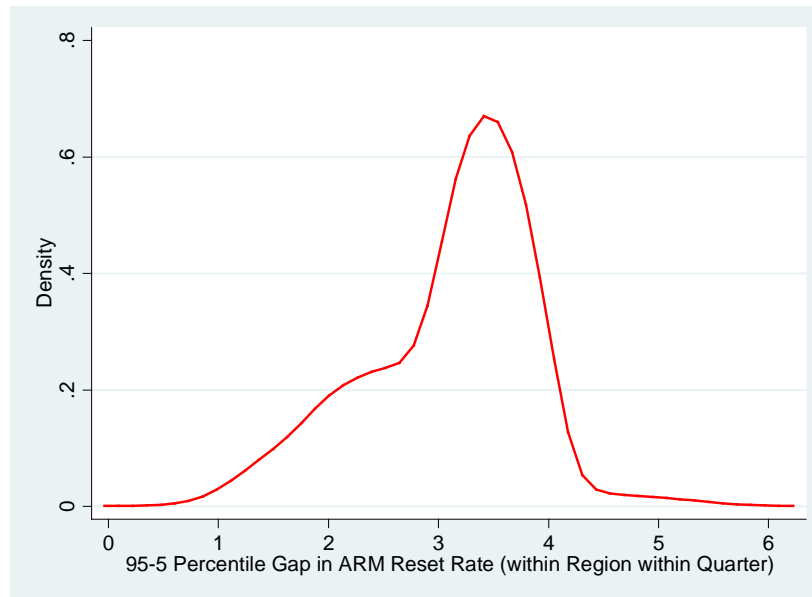
(a) Dispersion in ARM Reset Rate　　　　　　　*(b) Dispersion in Lender Expensiveness*

Figure 5: Kernel Density Plot of Residual Reset ARM Rates for Advertisers and Nonadvertisers

This figure plots the kernel density of residual ARM reset rate a borrower was charged. The residual is computed for the borrower as the reset rate paid by the borrower relative to the reset rate of the average borrower with the same set of observable characteristics, the same initial interest rate, in the same region and the same quarter. We plot the kernel density for lenders who advertise, defined as those with positive advertising spending in a given quarter and DMA and for lenders who do not advertise, defined as those with no advertising spending in a given quarter and DMA.
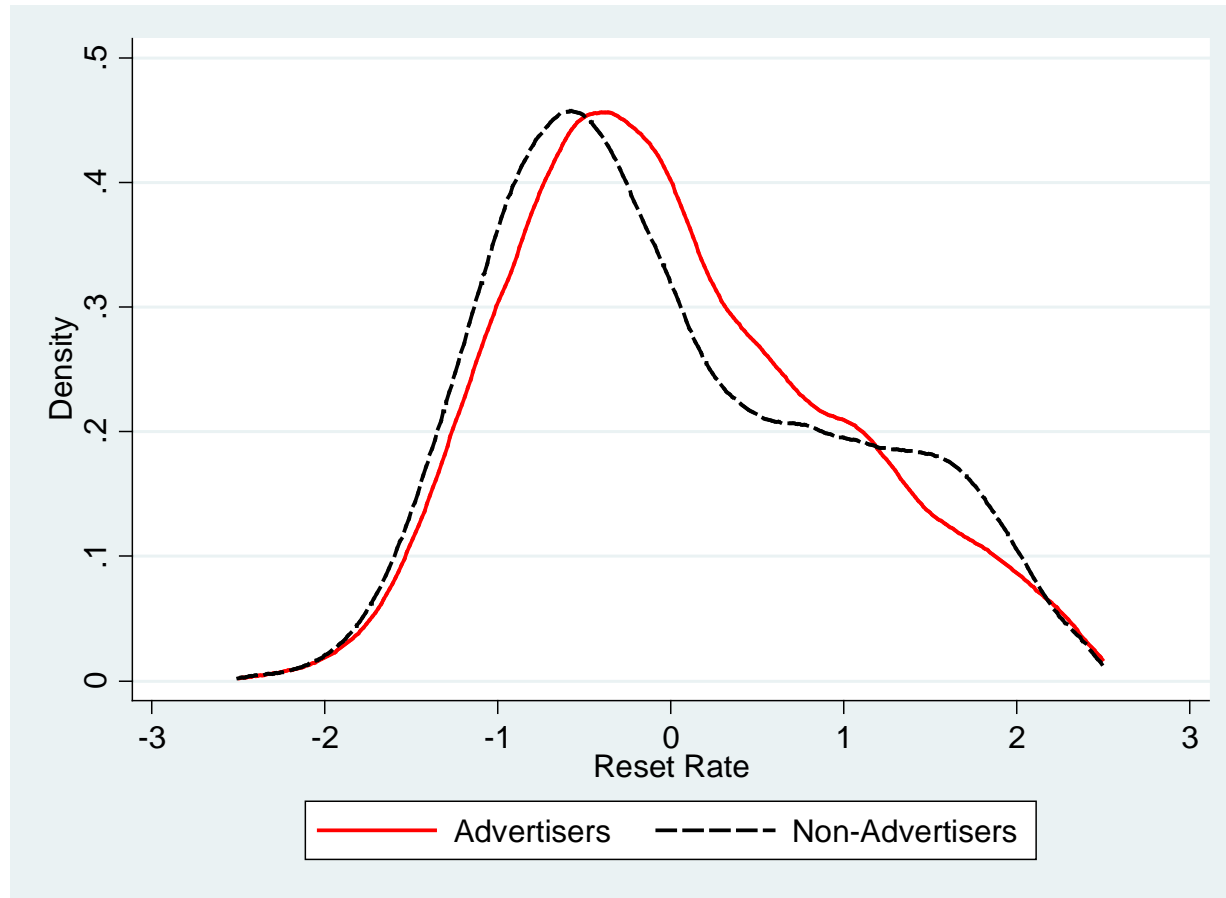
Figure 6. Timeline of Craigslist Entry

This figure plots the time line of the introduction of Craigslist across various states in the United States, starting in 1999 till 2008.
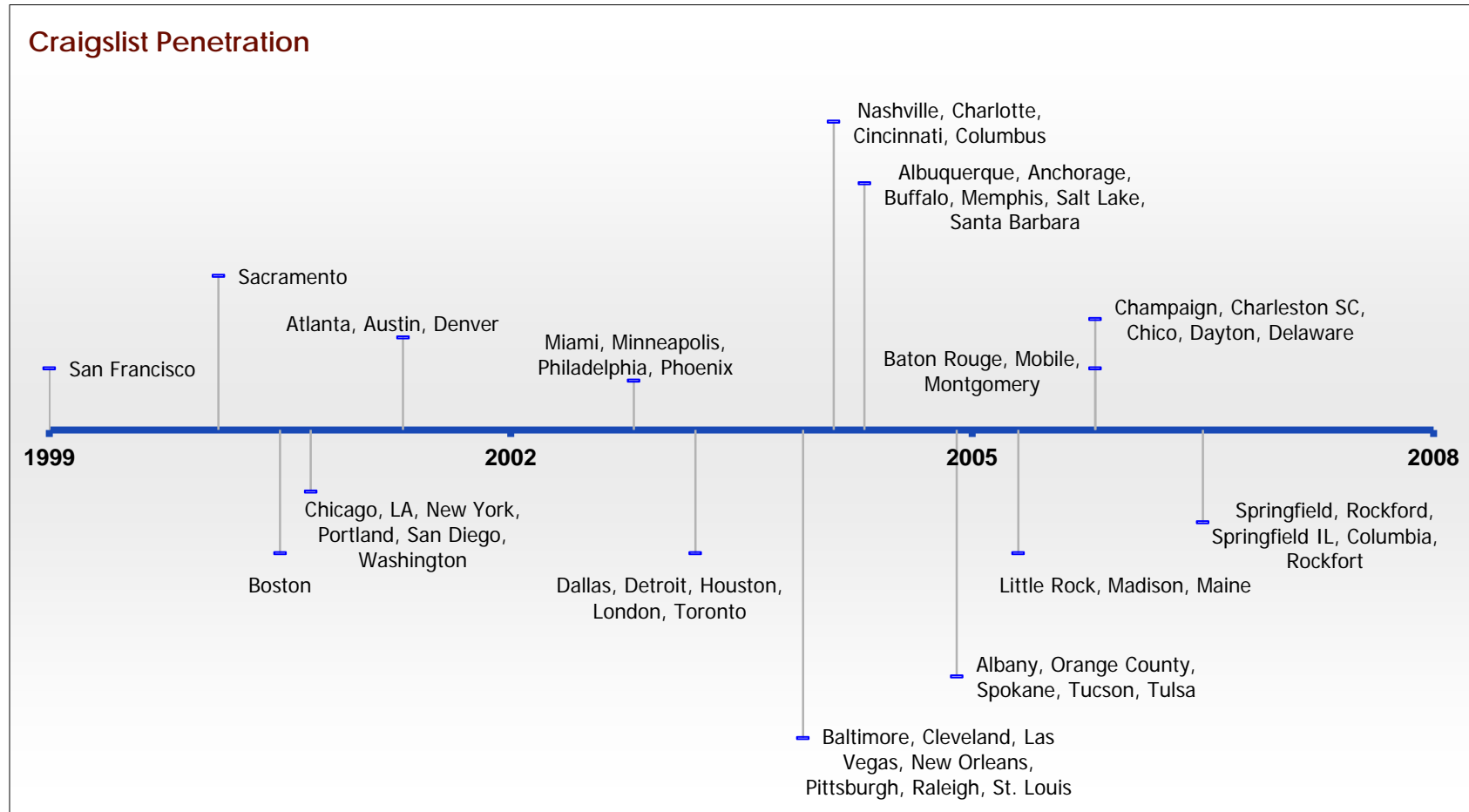(Source: http://www.craigslist.org/about/expansion)

Figure 7. Kernel Density Plot of Residual Reset ARM Rates Pre- and Post-Craigslist for Advertisers and Nonadvertisers

This figure plots the kernel density of residual ARM reset rate a borrower was charged. The residual is computed for the borrower as the reset rate paid by the borrower relative to reset rate of the average borrower with the same set of observable characteristics, the same initial interest rate, in the same region and the same quarter. We plot the kernel density for lenders who advertise, defined as those with positive advertising spending in a given quarter and DMA and for lenders who do not advertise, defined as those with no advertising spending in a given quarter and DMA. In addition, we plot the distributions separately for the period before Craigslist entry in a given location and for the period after Craigslist entry.

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