Advertising Expensive Mortgages

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ABSTRACT

Using information on advertising and mortgages originated by subprime lenders, we study whether advertising helped consumers find cheaper mortgages. Lenders that advertise more within a region sell more expensive mortgages, measured as the excess rate of a mortgage after accounting for borrower, contract, and regional characteristics. These effects are stronger for mortgages sold to less sophisticated consumers. We exploit regional variation in mortgage advertising induced by the entry of Craigslist and other tests to demonstrate that these findings are not spurious. Analyzing advertising content reveals that initial/introductory rates are frequently advertised in a salient fashion, where reset rates are not.

RECENT LITERATURE SHOWS THE importance of search in the mortgage market (Mayer and Pence (2009), Scharfstein and Sunderam (2013)). 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 information view claims that advertising allows consumers to find better products (Nelson (1974)). On the other hand, the persuasion 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 debate on 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 take an expensive mortgages.[1] While

[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

anecdotes have been used to justify these claims of deceptive advertising, there is no empirical study that has systematically investigated this issue.[2]

In this paper, we provide evidence for deceptive advertising using unique micro data on lending and advertising from the subprime mortgage market. We then compare the performance of a rich set of advertising models in explaining the data. The results reject the canonical models of informative advertising.

Our data set 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, particularly ARM reset rates, because they have been at the center of lawsuits and regulatory scrutiny. The concern is 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 view that reset rates are hidden characteristics of advertised mortgages. In the 37,432 print and direct mail mortgage campaigns that we analyze, only seven (0.02%) explicitly mention a reset rate. While this result is suggestive of persuasive advertising that shrouds reset rates, it is not sufficient to reject informative advertising. In other words, the fact that reset rates are not being 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. In particular, assuming that, all else equal, cheaper mortgages are better products from the perspective of the consumer, we measure the relative expensiveness of a given mortgage as the excess reset rate of the mortgage after accounting for a broad set of borrower, contract, and regional characteristics associated with the mortgage, including the initial interest rate. The idea 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. This result suggests that loans originated by some lenders are, on average, more expensive than others.

We next find that lender expensiveness is positively correlated with advertising *within* a given market. Thus, lenders that advertise more intensively also charge more for the same mortgage. To show the above results are not spurious, we first exploit variation in the relative advertising of lenders within a given location using region fixed effects. Our results continue to hold. Thus, our findings are not driven simply by lenders advertising more in regions with higher mortgage prices. Exploiting within-lender variation also allows us to allay concerns that the results are driven by lender characteristics (such as the lender's brand, propensity to renegotiate or securitize, or marginal costs, other lenders' activities aimed at attracting customers) that may be correlated with advertising.

We next examine whether advertising attracts borrowers who are charged higher reset rates due to a lower ability to repay. This alternative could explain our findings if true borrower quality is not captured by our rich set of conditioning variables. If advertising lenders extend loans to borrowers who are less likely to repay a loan, then such borrowers should be less likely to repay a loan in the future. We find that advertisers lend to consumers who, all else equal, default less, which implies that our results are not likely driven by unobservable borrower quality.

Second, we exploit variation in mortgage advertising induced by the staggered entry of Craigslist across different regions and times regions and years. 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, Craigslist entry has a significant impact on paid mortgage advertising, with the highest impact on classified advertisements in newspaper advertising, for which Craigslist online classifieds substitute most directly. We continue to find a positive relationship between the intensity of local advertising and the expensiveness of mortgages extended by lenders. Importantly, Craigslist entry is unrelated to borrower characteristics in that region. These results indicate that catering costs are not likely driving our findings, and thus further support the view that advertising attracts borrowers of different riskiness.

The magnitudes of our results are large and suggest that a consumer who obtains a mortgage from a lender who advertises pays on average roughly $3,000 more in present-value terms if the consumer pays the reset on an ARM for one year before refinancing. These estimates are on the same order of magnitude as the estimated losses faced by mortgage borrowers who do not properly account for broker service fees given by Hall and Woodward ([2012]).

Having established a positive relationship between the expensiveness of a lender and the advertising intensity of that lender within a market, we can compare the performance of models of the information view and the persuasion view 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 use advertising to attract customers to their mortgages. These models therefore predict a negative (or no) relationship between lender expensiveness and advertising. When we examine 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)).

Our results are more consistent with the persuasion view of advertising, according to which advertising induces consumers to enter into worse mortgages. Under this view, advertising draws consumers to relatively more expensive mortgages, those with higher reset rates, all else equal. While no one model of persuasive advertising delivers 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. In addition, mortgage advertisements contain very little information on the characteristics of mortgages or lenders. Models consistent with this feature of advertising 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 (2013)), while advertising is used to increase the salience of other characteristics, in our case the initial interest rate. Finally, 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 (Agarwal and Ambrose (2011)). Therefore, heterogeneity in the degree of consumer sophistication also plays a central role in explaining the persuasive role of advertising.

The rest of the paper is organized as follows. In Section V, we discuss the institutional background, including anecdotal evidence on the deceptive and persuasive use of advertising in mortgage markets. In Section II, we summarize our data sources. Section III presents the empirical results relating advertising intensity and mortgage pricing. In Section IV, we analyze the content of advertisements. In Section V, we discuss related literature and conclude.

I. Institutional Background

A. *Anecdotal Evidence of Persuasive and Deceptive Advertising in the Mortgage Market*

As we discuss in detail in Section II, lenders target potential consumers through advertisements in local newspapers, television, radio, and outdoor spots. Several discussions in the popular press suggest that mortgage lenders employ advertising to confuse consumers into making bad decisions. For instance, a February 15, 2005, *Wall Street Journal* article describes the 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 Section I of the Internet Appendix (in Section IV below we confirm that the features of these ads are typical).[3] 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 of the four advertisements is that by Pentagon Federal Credit Union in the *Washington Post* on August 5, 2006 (Figure IA.3). It states the annual percentage rate (APR) of 7.045% in addition to the introductory rate of 5.625% that applies for five years. Note that there is no mention of how the APR is computed.[4]

The advertisement presented in Figure IA.1 neglects to mention that the mortgage is adjustable and offers a low introductory teaser interest rate of 1%. According to the settlement agreement between New York Banking Department and Sage Credit Company (formerly DCG Mortgage), this particular advertisement failed to clearly and conspicuously disclose the actual repayment terms of the loans, including the fact 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 filed against lenders for using false advertising to attract potential consumers and steer them into bad mortgages. For instance, the Office of the Attorney General's Consumer Protection Section in Colorado has sued or settled with 16 mortgage lenders for "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 the Attorney General against Home Loan Center for mortgages originated from 2004 to 2007 and against Wells Fargo Bank for advertising by Wachovia Corporation and Golden West Corporation (both acquired by Wells Fargo).

The lawsuits against mortgage lenders frequently allege that their ads were targeting 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 over

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[3] The Internet Appendix is available in the online version of the article on the *Journal of Finance* website.

[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 with the size of the loan, whether it is adjustable or fixed, and on lenders' requirements for mortgage and title insurance (see http://loan.yahoo.com/m/primer11.html; accessed on March 4, 2013). The Official Staff Commentary to Regulation Z, Section 226.17 (c) (10) determines how the APR of adjustable loans should be computed.

[5] See http://www.coloradoattorneygeneral.gov/departments/consumer_protection/mortgage_fraud _information_center/learn_more_about_attorney_general%E2%80%99; accessed on February 29, 2013.

the 2005 to 2007 period. In another high-profile example, class action documents filed in October 2012 by the ACLU against Morgan Stanley allege that the lender discriminated against African Americans in the Detroit, Michigan metropolitan area, steering them into exceedingly high-cost and high-risk residential mortgage loans.[6]

B. Resulting Regulation

In response to concerns about deceptive mortgage lending and servicing practices, the Board of Governors of the Federal Reserve System issued new mortgage lending rules, Regulation Z, which took effect on October 1, 2009. Regulation Z includes several rules governing mortgage advertisement, especially that related 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 (FTC) proposed its own Mortgage Acts and Practices advertising rule related to deceptive acts and practices that may occur with regard to mortgage advertising. In seeking public comments on this rule, the FTC noted that deceptive ads were frequently targeting borrowers in the subprime market and claimed low teaser rates and payment amounts without disclosing that the rates and payments would increase substantially after an introductory period, thus misrepresenting the rates as 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 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] In an effort to reduce inconsistencies in mortgage disclosure forms, the CFPB proposed Integrated Mortgage Disclosures. In particular, the CFPB proposal requires forms that use clear language and design so consumers can easily locate key information, such as the interest rate, monthly payments, and costs to close the loan.

II. Data

Our data come from two main sources. The first source provides information on advertising, while the other provides information on mortgages. Data on advertising were from the TNS Media Intelligence (TNSMI) database. TNSMI monitors media channels and collects information on advertisements at the

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

[7] See 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] See http://files.consumerfinance.gov/f/201210_cfpb_supervision-and-examination-manual-v2.pdf; accessed February 29, 2013.

national and DMA levels. DMA regions are geographic areas in the United States in which television, radio, and newspaper offerings are similar. DMAs define boundaries of targeted local advertising and direct marketing campaigns across multiple media. A DMA typically refers to a geographic region 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 Section II of the Internet Appendix. In our analysis we focus on DMA-level advertising. Using DMA-level advertising allows us to exploit cross-sectional variation across regions.

Mortgage data come from LoanPerformance, a loan-level database that provides a detailed perspective on the nonagency securities market. As of December 2006, the data include more than 7,000 active home equity and nonprime loan pools that contain more than seven 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 data set includes all standard loan application variables, such as loan amount, loan-to-value (LTV) ratio, FICO credit score, interest rate, and purpose of the loan. The data also contain information on the type of mortgage loan (fixed rate, adjustable rate, balloon, or hybrid), the zip code in which the dwelling is located, and monthly loan-level performance for approved loans (delinquency), which we use in some of our analysis.

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

Since the advertising and mortgage data sets do not have unique identifiers that allow us to match them directly, we match the data sets using lender names. We proceed in two steps. First, we clean the names of lenders in the two data sets, accounting for spelling errors (e.g., Bank of America, Bnk of America) and abbreviations (e.g., New Century, NC, NC corporation). Second, 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 1,000) company names in the mortgage database. Our matched sample covers 105 of the 206 DMAs, which correspond to 92% of the population in the United States. Our data reliably cover advertising information between 2002 and 2006, and as a result we conduct our analysis over this period whenever we use advertising information.

III. Empirical Analysis

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). The Los Angeles DMA had the highest number of mortgage advertisers (49 unique mortgage advertisers). The New York DMA had 38 and the Philadelphia DMA had 27 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 I reports the total advertising expenditures of 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, Part 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. On a within-year basis, mortgage advertising expenditures are typically 25% lower in the first quarter of the year compared with the rest of year average. On an overtime basis, 2002 advertising expenditures ($7 of million) are considerably lower than the rest of the sample, with annual total advertising expenditures increasing from $15 million to $23.5 million over the 2003 to 2006 period.

Newspapers are mortgage lenders, 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, Panel B shows that there is considerable variation in these expenditure shares over time. For instance, while the newspaper expenditure share is 53% in the first quarter of 2003, by the end of 2006, it is 80%. Similarly, spot TV (outdoor) expenditures range between 2% (1%) and 31% (25%).

Figure 2 displays the geographic distribution of regional advertising expenditure by mortgage lenders in the 206 DMAs in the United States. This figure includes DMAs in which our vendor did not collect data (represented in white; e.g., Mobile, Alabama–Pensacola, Florida DMA). Light gray DMAs are regions in which lenders spent less than 0.3 million USD on local mortgage advertising over the sample period (e.g., Charleston, South Carolina DMA), while slightly darker gray DMAs are regions in which lenders spent between 0.3 and 1 million USD in local mortgage advertising (e.g., Orlando–Daytona Beach–Melbourne, Florida DMA). DMAs in dark gray are regions in which lenders spend between 1 million and 25 million USD (e.g., San Francisco–Oakland–San Jose DMA). Finally, DMAs in black represent regions in which lenders spent more than 25 million USD for local advertising (e.g., the Los Angeles DMA).

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

Table I
Descriptive Statistics

This table presents summary statistics for the different data sets 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 for ARM and fixed = rate = mortgage loans originated by banks over the sample period. Loan-specific attributes include *Reset Rate*, *Initial Interest Rate*, *Reset Time*, *LTV*, *Loan Amount*, credit score (*FICO*), a *Prepay Penalty* indicator, and a *Low Doc* indicator. Panels B and C also summarize demographic information of the areas in which 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 to 2006) (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	53	1,182,080
Prepay Penalty	0.77	0.42	1,182,080
Low Doc	0.4	0.49	1,182,080
% Minority	25.74	23.24	1,182,080
Median Household 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

Panel C: FRM Loans			
	Mean	Std. Dev	N
Interest Rate	9.33	2.15	464,530
LTV	91.55	11.77	464,530
Loan Amount	104,228	101,500	464,530
FICO	640	50	464,530
Prepay Penalty	0.59	0.49	464,530
Low Doc	0.38	0.48	464,530
% Minority	25.02	22.61	464,530
Median Household 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

Panel A. Advertising Expenses in a DMA

Panel B. Advertising Expenses in Top Three Outlets
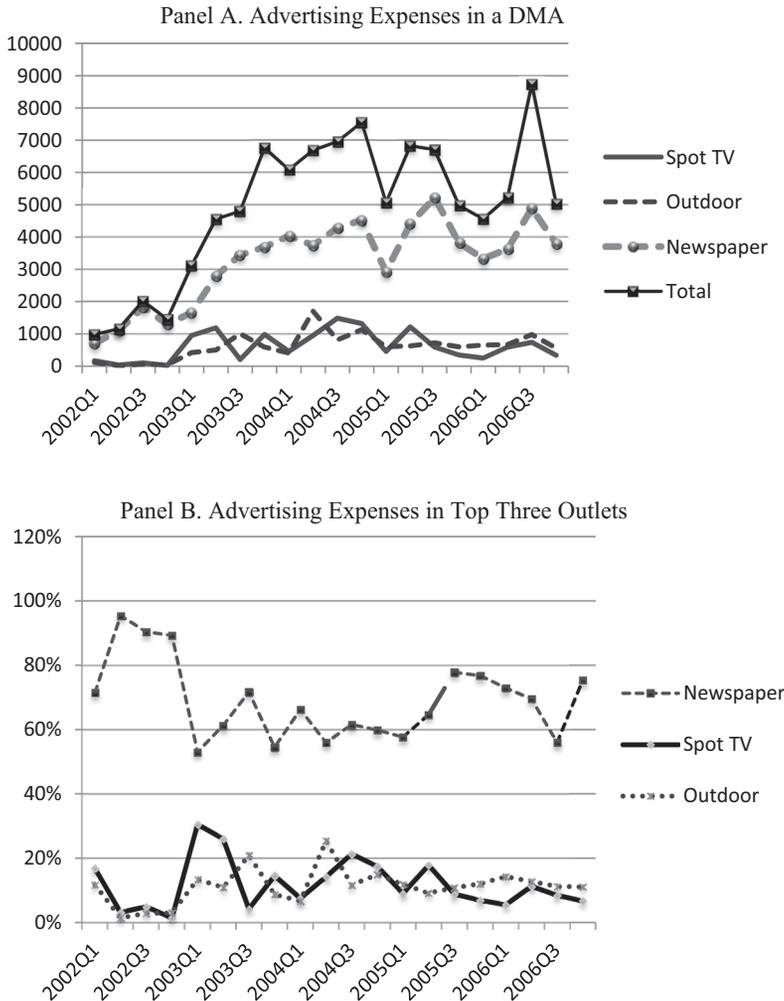
Figure 1. Evolution of mortgage advertising over time. This figure plots the time series of advertising expenditures for the matched lenders over the sample period. Panel A plots the total advertising expenditures and the expenditures in the three outlets over the sample period for our sample of lenders. Panel B provides the time-series evolution of the share of advertising expenditures of the three main advertising channels used by lenders in our sample.

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 are newspapers (48%) and outdoor advertising (36%). In contrast, in Charleston, South Carolina, the two main channels were spot TV (56%) and outdoor advertising (30%), and in San Francisco the two lead channels are newspapers (56%) and spot TV (27%), with the remainder spent on outdoor advertising.
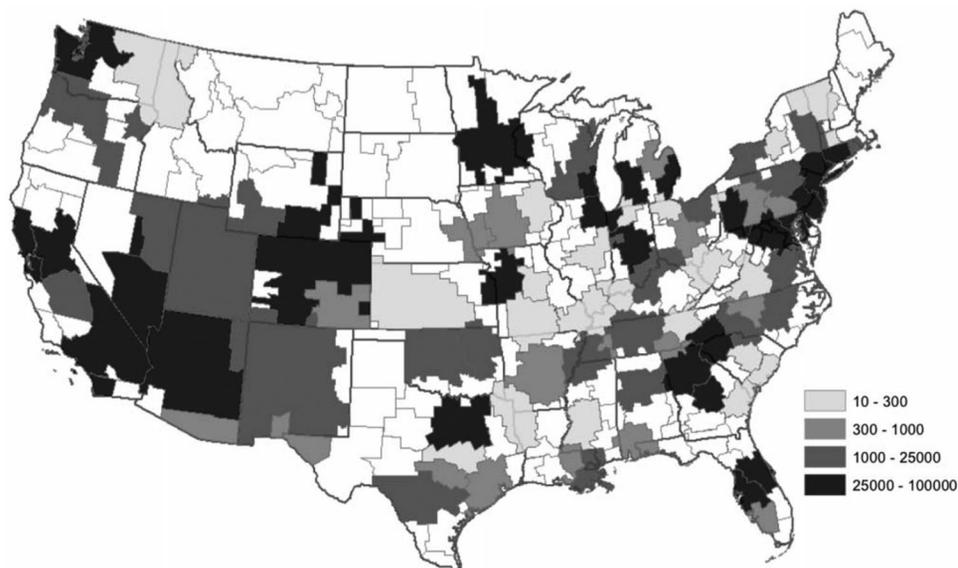
Figure 2. Geographic distribution of DMA-level advertising of mortgage lenders. This map displays the spatial distribution of DMA-level advertising expenditures by mortgage lenders in the 206 DMAs across the United States, over our sample period. Shaded areas represent the total advertising expenditure over our sample period in a given DMA as indicated in the legend (white areas correspond to DMAs for which we do not have advertising information). Advertising numbers in the legend are represented in thousands.

The map clearly shows that there is a large degree of 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 I present summary statistics for ARM and fixed-rate-mortgage (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 LTV ratio is 82%, the average FICO score is 654, and the average interest rate at origination is around 8% to 9%.

B. Main Results

In this section, we present the paper's main analysis. We start by computing a mortgage's relative expensiveness, defined as the price of the mortgage relative to other mortgages after accounting for a rich set of borrower, contract, and regional characteristics associated with the mortgage. Next, we relate the expensiveness of the mortgage sold by a lender to the degree of advertising by

that lender, to shed light on the role of advertising in this market. We then address alternative explanations to check that our results are not spurious.

B.1. Measuring Mortgage Expensiveness

We first examine whether some mortgages are relatively more expensive than others. We start by computing this measure for ARMs and focus on reset rates, which anecdotally are less salient (see Section I of the Internet Appendix for examples) and have been identified by policy makers as a source of consumer confusion. Our expensiveness measure is 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 context, given that consumers are identical, differences in reset rates give a mortgage's relative expensiveness. Applying this intuition to a regression framework, we compute mortgage expensiveness as the residual of the following specification:

$$y_{ijlt} = \beta i_{ijlt} + \alpha_t + \alpha_l + \Gamma X_{ilt} + \varepsilon_{ijlt}, \tag{1}$$

where i indexes the loan, j indexes the lender, t indexes the quarter, and l indexes the market (DMA). The dependent variable is the reset rate on the ARM, y_{ijlt}. The vector X_{ilt} contains loan and borrower characteristics such as the LTV, FICO score, whether the loan has a prepayment penalty, income characteristics and information on income, and the 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}, to hold mortgage characteristics as comparable as possible. Since initial interest rates are set using all the information at the lender's disposal, they may incorporate information on borrower quality that is potentially relevant for loan repayment but that we do 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 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 the degree of competition in the mortgage market.

The results are presented in Table II. 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, as indicated by higher LTV ratios, have higher reset rates. The presence of a prepayment penalty reduces the reset rate. If the loan is low-documentation, it has higher 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

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Table II

Measuring Mortgage Expensiveness

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This table reports estimation results 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 (first column) or the interest rate on the FRM (second column). *Low Doc* is an indicator for loans that require low documentation at loan application. Other controls include demographic information for the zip codes in which the loans are made (*% Minority*, median and mean household income, *% Poor, % Female, % Education*, median and mean house value). Standard errors are clustered by quarter and reported in parentheses under coefficient estimates. ***, **, * denote statistical significance at the 1%, 5%, and 10% levels, respectively.

	$Y =$ Reset Rate ARM Loans (1)	$Y =$ Interest Rate FRM Loans (2)
Initial Rate	0.625***	
	(0.0615)	
Reset Time ($\times 10$)	−0.206***	
	(0.0347)	
LTV ($\times 10$)	0.109***	0.606***
	(0.0214)	(0.044)
Loan Amount ($\times 10{,}000$)	−0.0055***	0.074***
	(0.0018)	(0.014)
FICO ($\times 100$)	−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^2	0.563	0.473

positively correlated with the reset rate, indicating that it captures borrower information not reflected in other observable characteristics.

Not all the mortgages in our data are ARMs—approximately 27% are 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 the information of lenders 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 II, the results are similar to those for ARMs. For instance, as before, the coefficient on the credit score variable is negative, while the coefficient on the LTV ratio is positive.

Overall, our model explains 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, and the same initial interest rate in the same region and quarter:

$$\hat{\varepsilon}_{ijlt} = y_{ijlt} - \left(\hat{\beta} i_{ijlt} + \hat{\alpha}_t + \hat{\alpha}_l + \hat{\Gamma} X_{ilt}\right). \tag{2}$$

Since the expensiveness 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 reiterate that the idea behind 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, Panel A plots these residuals for ARMs. We find large differences in the reset rates charged to borrowers with the same characteristics in a given location. For completeness, in Figure 3, Panel 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 II and for FRM loans using the specification in column (2) of Table II.

A simple way to assess the patterns in expensiveness is to plot the difference in mortgage expensiveness between the 95th and 5th percentiles in a given DMA-quarter. We do this in Figure 4, Panel 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. Hortaçsu and Syverson (2004), for example, find substantial dispersion among S&P 500 index funds with a 90th-10th percentile price (fee) ratio of 8.2.

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

$$p_{jlt} = \frac{1}{n_{jlt}} \sum_i \hat{\varepsilon}_{ijlt}. \tag{3}$$

Computing average lender expensiveness is also useful because we can use this variable as an input in regressions with advertising, which we observe at the lender level. Figure 4, Panel B shows the distribution of differences between the 95th and 5th percentiles of lender expensiveness in a given location-quarter. We find substantial differences in average residual reset rates charged by

Panel A. ARM Reset Rate

Panel B. Interest Rate on All Mortgages
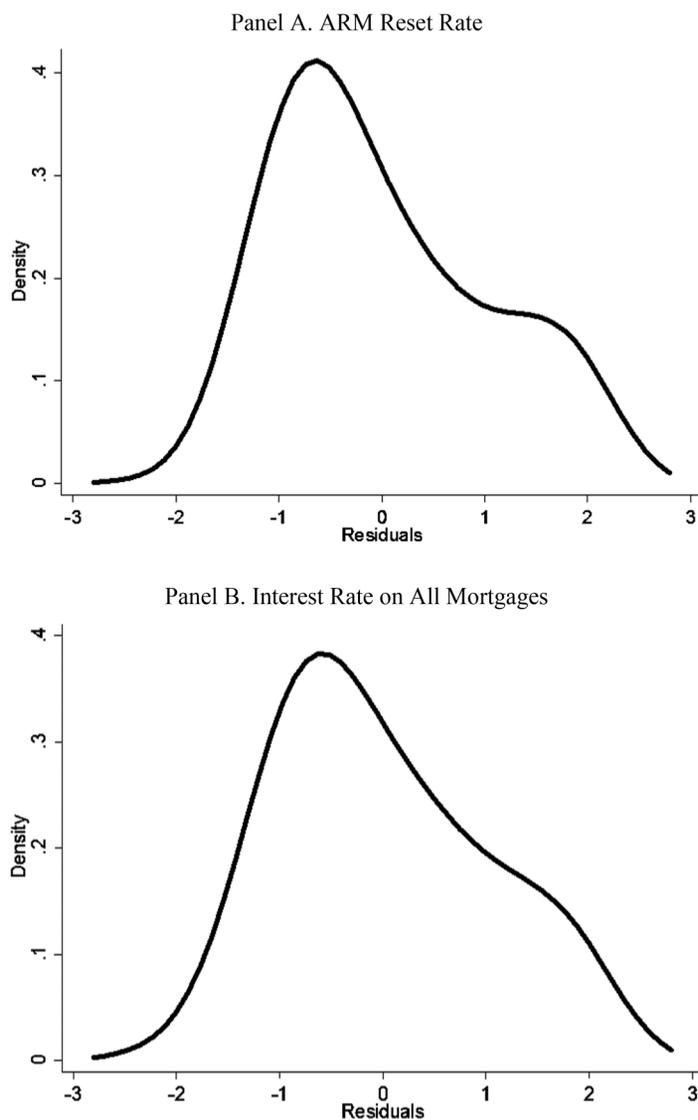
Figure 3. Kernel density of residuals. Panel A plots the kernel density of residual ARM reset rate a borrower was charged. The reset rate residuals are computed from the regression presented in column (1) of Table II. Panel B plots the kernel density of the residual interest rate a borrower was charged. The plotted residuals are the combined ARM and FRM residuals from regressions presented in column (1) and (2) of Table II.

different lenders. This distribution is somewhat less dispersed compared with the difference across individual loans presented in Figure 3, Panel 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 such noise. The mean difference in reset rates charged by lenders between the 95th and 5th percentiles is

Panel A. Dispersion in ARM Reset Rate

Panel B. Dispersion in Lender Expensiveness
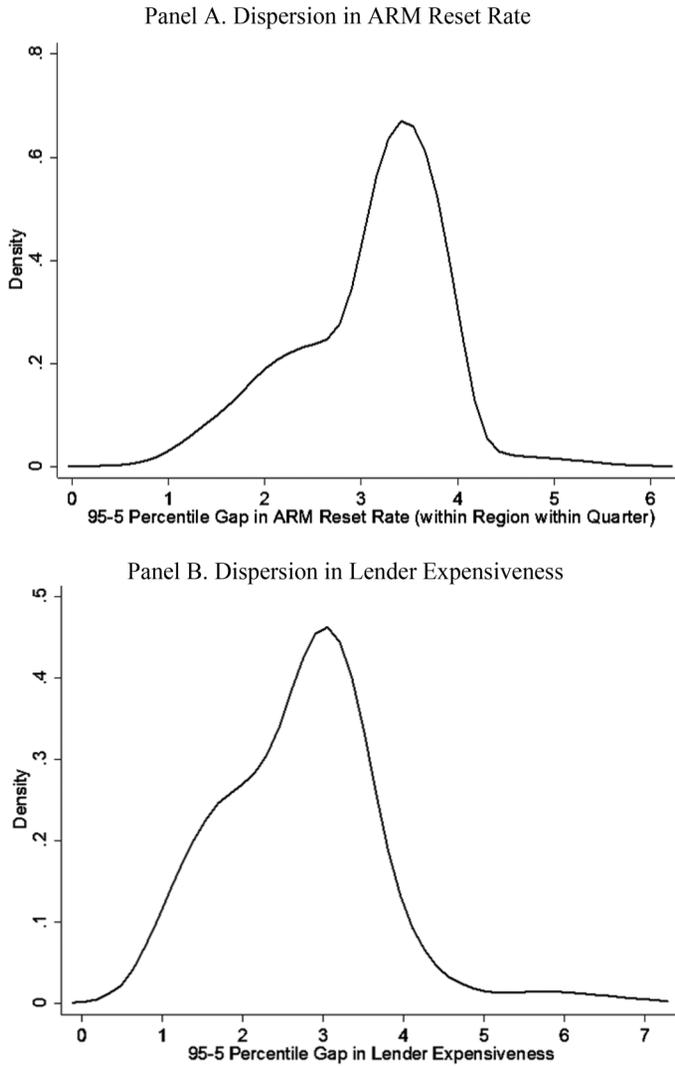
Figure 4. Kernel density of dispersion within region and within a quarter. Panel A plots the kernel density of difference in mortgage expensiveness between the 95th and 5th percentiles in a given DMA quarter. Mortage expensiveness is defined as the residual ARM reset rate that a borrower was charged relative to the reset rate paid by an average borrower with the same set of observable characteristics, and the same initial interest rate in the same region and the same quarter (the residual from column (1), Table II, averaged at the lender-quarter DMA). Panel B shows the kernel density of the differences between the 95th and 5th percentiles of lender expensiveness in a given area and quarter. Lender expensiveness is computed as the average expensiveness of individual loans issued by the lender for the given location and quarter (combined residuals from columns (1) and (2), Table II, averaged lender quarter-DMA level).

2.8 percentage points. Thus, there is large variation in the average prices lenders charge for mortgages in a given market-quarter.

B.2. Robustness of the Baseline Specification

Because expensiveness, $\hat{\varepsilon}_{ijlt}$, is a central input in the rest of the analysis, we want to ensure that the results do not rely on the linear specification used to obtain them. To do so, we recompute our main results relaxing the specification used to compute expensiveness. In particular, we estimate a significantly more flexible version of the specification by using second and third degree polynomials (with all interactions) of loan observables $y_{ijlt} = P_n(i_{ijlt}, X_{ilt}) + \alpha_t + \alpha_l + \varepsilon_{ijlt}$, where n is the degree of the polynomial. The results are robust to using these measures of expensiveness (Table IA.III, 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 as she obtains a relatively more expensive loan. For robustness, we also ensure that our measure maps to this idea more closely by estimating the expensiveness regression,

$$y_{ijlt} = \beta i_{ijlt} + \alpha_t + \alpha_l + \Gamma X_{ilt} + \varepsilon_{ijlt}, \tag{4}$$

separately for deciles of the initial interest rate and for 20 equally spaced bins of initial interest rate (cut in five percentile increments, corresponding to intervals of approximately 20 bps). The results obtained with these measures of expensiveness also provide similar inferences (Table IA.III, columns (3) and (4)).

Last, we relax the assumption that the effects of loan observables do not change across markets or over time. To do so, we interact loan observables with quarter fixed effects and market fixed effects when computing expensiveness. The results are robust to this alternative measure of expensiveness. In unreported tests we also recompute the distribution estimating the regressions at a much finer level of geography (zip codes rather than DMAs) to alleviate concerns that differences in regional factors vary significantly with the level of location that is used in our regressions. Our inferences remain unchanged (Table IA.III, columns (5) and (6)).[11]

B.3. Advertising and Expensiveness

In this section, we explore the central question of the paper: does advertising lure consumers to enter into expensive mortgages, or does it help consumers find cheaper mortgages? We shed light on this question by examining whether

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[11] If advertising affects only initial interest rates and not reset rates, a bias could arise in our main specification. Two sets of results suggest that this bias is not an issue. First, we obtain similar results using FRMs. Second, we find similar results when we use initial interest rate alone to compute our measure of expensiveness.
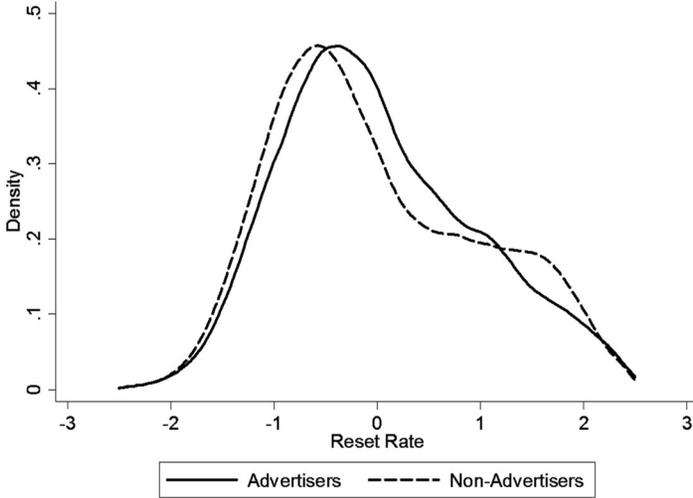
Figure 5. Kernel density plot of residual reset ARM rates for advertisers and nonadvertisers. This figure plots the kernel density of the residual ARM reset rate a borrower was charged. The residual is computed as the reset rate paid by the borrower relative to the reset rate of the average borrower with the same set of observable characteristics and the same initial interest rate in the same region and quarter. We plot the kernel density for lenders who advertise, defined as those with positive advertising expenditures in a given quarter and DMA, and for lenders that do not advertise, defined as those with no advertising expenditures in a given quarter and DMA.

advertisers are relatively more expensive. First, in Figure 5, we plot the distribution of residual reset rates for advertisers and nonadvertisers. We purge the initial interest rate, borrower characteristics, location, and year fixed effects when plotting the residuals as in Table II. As can be seen, the distribution of advertisers' reset rates is to the right of the distribution for nonadvertisers. This figure thus provides initial evidence that lenders that advertise sell more expensive mortgages, consistent with the persuasion view of advertising.[12]

Next, we estimate the following specification:

$$p_{jlt} = \beta Advertising_{jlt} + \alpha_j + \alpha_t + \alpha_l + \varepsilon_{jlt}, \tag{5}$$

where the independent variable of interest, $Advertising_{jlt}$, measures the total dollar value of lender j's advertising in market l and quarter t. In subsequent specifications we also use $Advertising_{jlt}$ to capture the dollar value of local advertising through different media.

Our dependent variable, p_{jlt}, is our measure of lender expensiveness. Recall that when we construct this measure, we already condition on borrower 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

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[12] A one-sided Kolmogorov-Smirnov test implies that the distribution of advertisers first order statistically dominates the distribution of nonadvertisers ($p < 0.001$). We find the same result using a Mann-Whitney test ($p < 0.001$).

measure how expensive a lender in a given location is relative to other lenders in the same location.

Specification (5) includes lender fixed effects α_j, since we are interested in exploiting within-lender variation in advertising. For example, if predatory lenders are more likely to advertise, lender fixed effects will absorb such variation. Similarly, lender fixed effects control for differences in lenders' propensity to securitize mortgages (see Keys et al. (2010)) or to renegotiate in the case of borrower distress (see Piskorski, Seru, and Vig (2010)). Lender fixed effects similarly account for whether some lenders are more consumer friendly, have a better brand, or have cheaper access to capital.

Specifications we estimate also include location fixed effects α_l, to rule out the possibility that the results are driven by the notion that lenders advertise more in locations in which they can charge more for mortgages because of local real estate and mortgage market conditions. Finally, the specification 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. In sum, specification (5) compares whether a lender is more expensive relative to nonadvertisers in regions in which it advertises more.[13]

The results are presented in Panel A of Table III. The coefficient on advertising in column (1) is positive and statistically significant at the 5% level. This implies that, holding 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 provides more information on mortgage pricing to consumers. Instead, it suggests that advertising steers consumers to expensive mortgages, leading them to worse mortgage choices than they would have otherwise made. This is the baseline result of our paper.

We next examine whether the relationship between local advertising and mortgage pricing varies across different types of media. As noted before, newspapers are the dominant medium of local mortgage advertising (see Table I, Panel A, and Figure 1, Panel B).[14] Since advertising expenditures in other media are significantly smaller, we aggregate them into an "other advertising" category. The results from this analysis are presented in columns (2) and (3). We find in Table III, Panel A that the effect of advertising on the expensiveness of ARMs is driven by advertising in newspapers—the coefficient on newspaper

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[13] Note that we have assumed that the estimation error, which arises from the first stage estimate, is classical. Because expensiveness is a dependent variable and not a regressor, classical measurement error should not bias our estimates or standard errors in the second-stage OLS specification. We are aware, however, that this assertion rests on the assumption that errors in the first stage are classical. To alleviate concerns that this might not be the case, we have also bootstrapped our procedure. Our inferences remain unchanged.

[14] Significant survey evidence suggests that newspapers are the dominant channel for real estate advertising. For example, on the consumer side, a 2011 Pew Research Center survey shows that newspapers are the primary source of real estate information across gender, age, education level, and income categories (Rosenstiel et al. (2011). On the advertiser side, a BIA/Kelsey survey of local advertisers indicates that newspapers are the first choice for real estate advertising.

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Table III

Advertising and Expensiveness

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This table reports the estimation result of 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 the individual loan-level residuals obtained from the specification reported in Table II. *Advertising* is the total dollar value of the local advertising of lender j in market l and 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 II for ARM loans and in column (2) of Table II for FRM loans. Standard errors are reported in parentheses under coefficient estimates. ***, **, and * denote statistical significance at the 1%, 5%, and 10% levels, respectively.

Panel A. ARM Loan Sample			
	$Y =$ Lender Expensiveness		
	(1)	(2)	(3)
Advertising (all) ($\times 100$)	0.0314***		
	(0.0115)		
Advertising (others) ($\times 100$)		0.111	
		(0.082)	
Advertising (newspapers) ($\times 100$)			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^2	0.139	0.139	0.139

Panel B. All Mortgages			
	$Y =$ Lender Expensiveness		
	(1)	(2)	(3)
Advertising (all) ($\times 100$)	0.0239***		
	(0.009)		
Advertising (others) ($\times 100$)		0.089	
		(0.072)	
Advertising (newspapers) ($\times 100$)			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^2	0.140	0.140	0.140

advertising is 17% larger than that 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 bps, or approximately one-half of a standard deviation in reset

rates. Other advertising has a positive coefficient that is slightly smaller than that on total advertising and is statistically insignificant.

In Table III, Panel B, we rerun the above analysis, adding data on FRMs. As mentioned above, we compute expensiveness for all mortgages by taking the residuals for ARMs using the specification in column (1) of Table II and for FRMs using the specification in column (2) of Table II. We obtain similar inferences as before. Taken together, the results above are consistent with the persuasion view of advertising—lenders use advertising to steer borrowers into more expensive mortgages.

B.4. 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 more effective for consumers who are less informed about mortgages and therefore more vulnerable to manipulation. The literature shows 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 below-median share of minorities as having low minority share and those with an above-median share of minorities as having minority share. Using the same approach, we classify observations with a high and low share of educated borrowers (households with a BA degree) and poor borrowers (as defined by the Census). Next, we reestimate our baseline specification,

$$p_{jlt} = \beta Advertising_{jlt} + \alpha_j + \alpha_t + \alpha_l + \varepsilon_{jlt} \qquad (6)$$

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 IV. As predicted, the effect of advertising on mortgage pricing concentrates among lenders who serve high-minority areas. This suggests that at the within-lender level, advertising is effective at steering borrowers toward more expensive mortgages only for those lenders that lend heavily to minorities. We find no such effect for lenders with a low minority share. Similarly, the effect of advertising concentrates among lenders that lend to less educated areas and areas with a higher share of poor borrowers. Taken together, these results strongly suggest that mortgage advertising is used to steer consumers into ARMs with higher reset rates.

B.5. Unobservable Borrower Quality

Above we show that lenders sell relatively more expensive mortgages in geographical areas in which they advertise relatively more. We interpret this

Table IV
Advertising and Demographics

This table reports estimation results of the following specification: $p_{jlt} = \beta Advertising_{jlt} + \alpha_j + \alpha_t + \alpha_l + \varepsilon_{jlt}$, where the dependent variable measures the expensiveness of a lender in a given region. Lender expensiveness is computed by aggregating individual loan-level residuals obtained from the specification reported in Table II using the ARM loan sample. *Advertising* is the total dollar value of advertising of lender j in market l and 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 at the 1%, 5%, and 10% levels, respectively.

	Y = Lender Expensiveness					
	% Minority		% Educated		% Poor	
	Low (1)	High (2)	Low (3)	High (4)	Low (5)	High (6)
Advertising (all) ($\times$100)	−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^2	0.150	0.158	0.151	0.160	0.157	0.148

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 capture only part of borrowers' true ability to repay a loan. Advertisers who charge higher mortgage rates might simply be lending to a pool of borrowers that are less likely to repay their loan.

We test whether advertising is positively correlated with borrowers falling behind on their loan payments using the following regression:

$$Delinquent_{jlt} = \beta Advertising_{jlt} + \alpha_j + \alpha_t + \alpha_l + \varepsilon_{jlt}. \tag{7}$$

Here, $Delinquent_{jlt}$ measurers the percentage of loans made by lender j in location l and quarter t that turned out to be delinquent. To make specification (7) comparable to specification (5), 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 III, we exploit the within-lender variation for a given location and quarter.

Following the convention in the literature (e.g., Keys et al. (2010)), we capture loan performance using an indicator that takes a value of one if the borrower becomes 90 or more days late (90+ delinquent) in making payments within two

years of origination, and zero otherwise.[15] The percentage of such delinquencies of ARM mortgages is substantial, averaging over 20%, and is high even during the housing boom: mortgages originated in 2003 had the lowest delinquencies rate of 13.4%.

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

The results show that advertising raises the interest rate charged to borrowers. Higher interest rates should lead in turn 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 thus 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 suggests that advertising attracts borrowers who are more likely to repay a loan. This factor more than offsets the indirect effect that advertising has on delinquency because of increased interest rates. If pricing only reflects borrower characteristics, it follows that advertisers should charge *lower* reset rates than nonadvertisers to borrowers who look the same on observable characteristics. Our estimate of the effect of advertising on loan prices is therefore likely to underestimate the true effect. In Section III.B.6, we use instrumental variables to obtain a better estimate of the true effect.

B.6. Differences in Ex ante Catering Costs

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

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[15] For example, we track a loan originated in March 2006 until March 2008, and examine whether the loan was more than 90 days delinquent at any point during this period. Because our sample extends from 2002 to 2006, we track mortgage delinquency from 2002 through 2008. Time fixed effects absorb the increasing rate of delinquencies later in the sample.

Table V
Advertising and Delinquency

This table reports estimation results of 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 and quarter t that turned out to be 90 days delinquent within the first two years of origination. *Advertising* is the total dollar value of local advertising of lender j in market l and 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 at the 1%, 5%, and 10% levels, respectively.

	Panel A: ARM Loans		
	Y = % of 90-day delinquent loans within 2 years of origination		
	(1)	(2)	(3)
Advertising (all) ($\times 100$)	−0.0025		
	(0.0027)		
Advertising (others) ($\times 100$)		0.003	
		(0.014)	
Advertising (newspapers) ($\times 100$)			−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^2	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) ($\times 100$)	−0.002		
	(0.003)		
Advertising (others) ($\times 100$)		0.004	
		(0.013)	
Advertising (newspapers) ($\times 100$)			−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^2	0.134	0.134	0.134

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 the detailed costs borne by a large subprime lender—the third largest in the United States as of 2006. The data contain the costs borne by the

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Table VI
Differences in Catering Costs
</div>

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 subsample groups. In Panels A and B we stratify borrowers based on whether the borrowers are in a minority group. In Panels C and D we compare years in which the lender advertises versus when it does not. ***, **, and * denote statistical significance at the 1%, 5%, and 10% levels, respectively. "a" indicates that observations are reported for the total fees column and vary for individual cost categories.

	Application Fees	Underwriting Fees	Processing Fees	Total Fees (excluding interest rate)	Observations[a]
Panel A: ARM Loans					
Nonminorities	495	360	275	1,150	398,300
Minorities	506	353	280	1,144	174,496
Difference	11***	−7***	5***	−6***	
% Difference	2.2%	−2.0%	1.8%	−0.5%	
Panel B: FRM Loans					
Nonminorities	396	327	303	1,052	86,413
Minorities	406	333	280	1,054	28,722
Difference	10***	6***	−23***	2***	
% Difference	2.5%	1.8%	−8.2%	0.2%	
Panel C: ARM Loans					
Nonadvertising periods	500	360	279	1,149	346,889
Advertising periods	504	355	277	1,145	225,907
Difference	4***	−5***	−2***	−4***	
% Difference	0.8%	−1.4%	−0.7%	−0.3%	
Panel D. FRM Loans					
Nonadvertising periods	402	326	305	1,053	41,340
Advertising periods	397	330	283	1,056	73,795
Difference	−5***	4***	−22***	3***	
% Difference	−1.3%	1.2%	−7.8%	0.3%	

borrower in filling out applications, fees charged by loan officers for underwriting and processing applications, and detailed borrower information. We merge this information with our data on advertising by this lender to conduct the analysis.

As shown in Section III.B.4 above, we find our effects concentrate among the subsamples that are heavily tilted to minority, poor, and less educated borrowers. To explain the results, these borrowers would have to have significantly higher catering costs. Using information on the background of borrowers, we separately analyze the costs for ARMs and FRMs for minority and nonminority subsamples. We present the results in Panels A and B of Table VI. As can be

seen, there are small differences between the two groups.[16] This is consistent with the view that difference between fees charged to minorities, relative to nonminorities, may not be driving our main findings.

Notably, this lender is in the top quartile of advertisers in our sample period. In Panels C and D of Table VI, we examine whether the lender realizes higher origination costs 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 of the entire sample, this analysis suggests that our findings that advertisers sell more expensive mortgages is unlikely to be due to higher costs faced by these lenders when catering to borrowers.

C. Evidence from Craigslist

In this section, we 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 or catering costs. To proxy for variation in mortgage advertising, we use the entry of Craigslist into different markets over time.

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, for example, is separate from the Chicago website. As Figure 6 shows, Craigslist entered San Francisco in 1999 and continued to expand market coverage over our sample period. 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 Pew Research Center 2011 survey, 21% of consumers reported that they obtain most information about local housing and real estate from websites (Rosenstiel et al. (2011, p. 57)). Craigslist's appeal is large enough that it has had a significant impact on job advertising in newspapers (Kroft and Pope (2014)).

To ensure that Craigslist does indeed serve as a measure source of variation in mortgage advertising, we collect data on mortgage-related classified ads on Craigslist's financial services page during our sample period (see Section III of the Internet Appendix for details). Figures IA.7 to IA.9 provide historical snapshots of mortgage classifieds on Craigslist for Washington, DC; Jacksonville, Florida; and Indianapolis, Indiana. Table IA.III shows that, across the 23 markets with a Craigslist presence over our sample period, mortgage-related classifieds represent a substantial share of Craigslist financial services classifieds, from 4.8% in Dallas, Texas, to 12.3% in Pittsburgh, Pennsylvania. Therefore, Craigslist entry could plausibly affect the amount of local mortgage advertising

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[16] The difference in costs and fees across groups in the table is economically small relative to the expensiveness of a mortgage obtained by consumers who borrow from advertising lenders (see Section III.C.5).
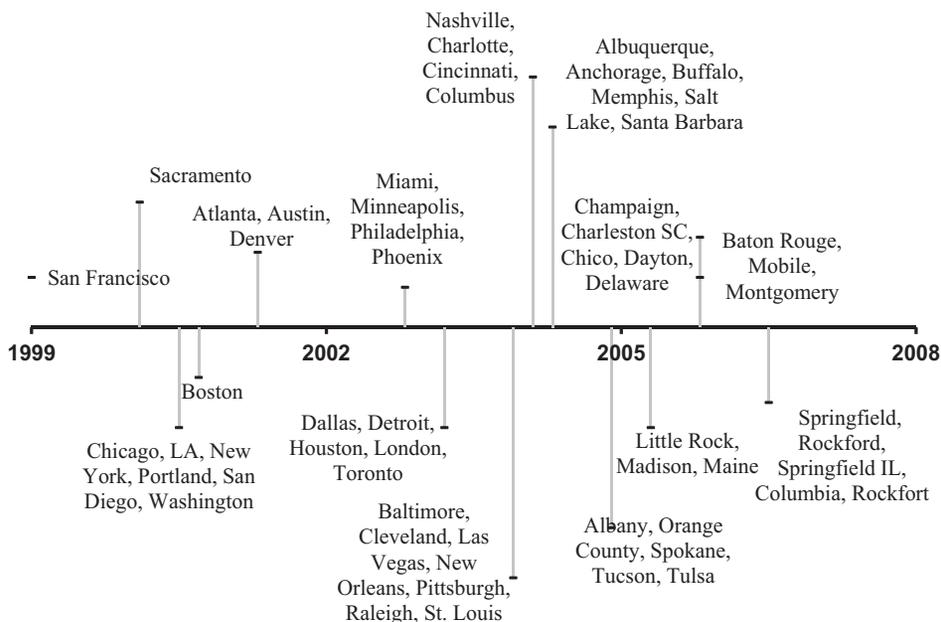
Figure 6. Timeline of Craigslist entry. This figure presents the timeline of the entry of Craigslist across markets in the United States between 1999 and 2008. (Source: http://www.craigslist.org/about/expansion.)

in venues other than Craigslist, especially in newspapers. In Section IV of the Internet Appendix, we find supporting evidence. In particular, using data on circulation shares and amounts as well as the price of advertising classified and display ads before and after Craigslist entry, we find that classified-ad newspapers' circulation share fell significantly after Craigslist entry. Craigslist entry is also accompanied by a significant reduction in classified ad prices, though the prices of display ads do not decline. These effects are consistent with anecdotal evidence suggesting that Craigslist constitutes a direct substitute for newspapers' classified ad business, because Craigslist offers classified ads for free. Moreover, compared to print newspapers, classifieds on Craigslist are easy to search.

We use Craigslist entry into a market to perturb differences in advertising intensity between lenders in a market. Given that advertising on Craigslist is free, we expect Craigslist entry to decrease the payoff to paid mortgage advertising. In line with this reasoning, we first show that Craigslist entry, while unrelated to mortgage market conditions, does indeed decrease 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 Craiglist does not enter. In Section III.C.3, we show that lenders that decrease paid advertising after Craigslist entry do not offset this decrease by substituting into Craigslist advertising. Craigslist entry

thus reduces differences in total advertising between lenders in a market, even accounting for Craigslist advertisements. We then study how this variation in advertising affects the relative pricing of mortgages between lenders in a market.

C.1. Descriptive Analysis

We first illustrate the relationship between Craigslist entry and mortgage pricing graphically. We expect the mortgage advertising of advertisers relative to nonadvertisers to decrease upon Craigslist entry, decreasing the mortgage pricing of advertisers. In Figure 7 we plot the distributions of residual reset rates for advertisers and nonadvertisers in our sample; the distributions are plotted separately for pre- and post-Craigslist entry.[17] Nonadvertisers should not be affected by Craigslist entry and are the control group. Under the assumption that, after conditioning on observables and market fixed effects, any marketwide effects due to Craigslist entry impact advertisers and nonadvertisers similarly, we should be able to identify the effects of Craigslist entry on advertisers.

Consistent with our conjecture, the figures show that Craigslist entry has little effect on the pricing of mortgages by nonadvertisers: the modes of the pre- and postentry 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 is our treatment group. The distribution of interest rates for advertisers is shifted to the left after Craigslist entry, which includes a 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.

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 Craigslist entry has on mortgage advertising:

$$Advertising_{jlt} = \beta_1 After\,Craigslist\,Entry_{lt} + \alpha_j + \alpha_t + \alpha_l + \nu_{jlt}, \qquad (8)$$

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, denoted by 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 both expanded during our sample.

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

Non-Advertisers
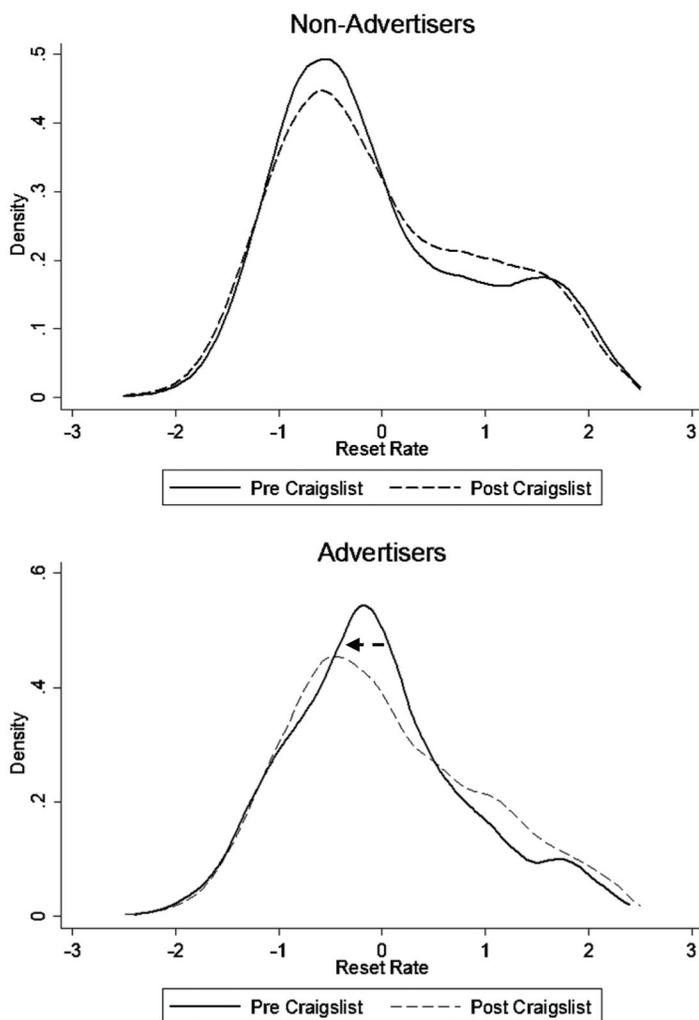
Advertisers

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

Lender fixed effects control for the possibility that lenders that advertise happen to do so in markets that Craigslist enters.[18]

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[18] 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

We present the results from the first stage in Panel A of Table VII. We find that Craigslist entry in a market decreases the amount of advertising. The economic impact is large and suggests a reduction in the amount of advertising of \$2,465 per quarter for a given lender. This result is highly statistically significant and exceeds the Stock and Yogo statistical test 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 shown in columns (2) and (3), the Craigslist entry decreases newspaper advertising by \$1,553, which is twice as much as other advertising (\$652). These results resonate well with our findings in Section IV of the Internet Appendix, as well as in Kroft and Pope (2014), who show that Craigslist has had a large effect on job advertising in newspapers.

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

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

$$p_{jlt} = \beta \widehat{Advertising}_{jlt} + \alpha_j + \alpha_t + \alpha_l + \varepsilon_{jlt}, \tag{9}$$

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 VII. Column (1) shows that the coefficient on advertising is positive and highly statistically significant. We discuss the magnitude of these results in Section III.C.5.

In columns (2) and (3), we separately estimate the effect of advertising across types of media and find that newspaper advertising 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 (Panel C).

Our analysis so far measures the extent of mortgage advertising using advertising expenditures. This metric conflates the effects of Craigslist on advertising prices and quantities. Thus, in principle, it is possible that the decline in advertising expenditures following Craigslist entry is in fact driven by a decline in advertising prices, not a decrease in the amount of advertising directed at consumers. To see whether our findings are driven by a reduction in the amount of advertising, we replicate our analysis using advertising quantities

compares the amount of advertising of lender *j* relative to other lenders in market A before Craigslist entry with the amount of advertising of the same lender 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.

Table VII

Craigslist Entry and Mortgage Advertising

This table reports estimation results of the following specification using 2SLS: $p_{jlt} = \beta \, Advertising_{jlt} + \alpha_j + \alpha_t + \alpha_l + \varepsilon_{jlt}$, where the dependent variable measures the expensiveness of a lender's mortgages in a given region. Lender expensiveness is computed by aggregating individual loan-level residuals obtained from the specification reported in Table II. *Advertising* is the total dollar value of local advertising of lender j in market l and quarter t in Panels A to D. We use Craigslist entry into a region as an instrument in the first stage. Panel A reports the first-stage estimation results for different measures of advertising (Total, Other, and Newspaper) using the specification: $Advertising_{jlt} = \beta_1 \, After \, Craigslist \, Entry_{lt} + \alpha_j + \alpha_t + \alpha_l + \Pi_{jlt}$, where *After Craigslist Entry* is a dummy variable indicating the presence of Craigslist in location l and period t. Panel B reports the coefficients of the second-stage estimation using the ARM loan sample. Panel C reports the coefficients of the second-stage estimation using the ARM loan sample omitting lenders that advertised on Craigslist. Panel D reports the coefficients of the second-stage estimation using all mortgages. Panel E reports the coefficients of the second stage estimation using the ARM loan sample; instead of using advertising expenditures, this panel uses *Advertising Quantity*, the total number of local advertising units of lender j in market l and quarter t. Standard errors are reported in parentheses under coefficient estimates. ***, **, and * denote statistical significance at the 1%, 5%, and 10% levels, respectively.

Panel A. First Stage: Craigslist entry			
	$Y =$ Advertising		
	Total Advertising (1)	Other Advertising (2)	Newspaper Advertising (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

(*Continued*)

Table VII—*Continued*

Panel C: 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

Panel D: Second Stage: Instrumented Advertising (ARM Loan Sample) (Advertising Quantity)

	Y = Lender Expensiveness		
	(1)	(2)	(3)
Advertising quantity (all)	0.107***		
	(0.0311)		
Advertising quantity (others)		0. 385	
		(0.317)	
Advertising quantity (newspapers)			0.213***
			(0.0539)
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 E: 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

rather than advertising expenditures. The first stage, unreported for brevity, produces results similar to Panel A. The results from the second stage are presented in Panel D of Table VII. The results we obtain mirror those using advertising expenditures.

C.3. Substituting Paid Advertising with Advertising on Craigslist

A concern with our analysis is that advertisers in our sample may use Craigslist with higher intensity than lenders that did not use paid advertising. It would then follow that, after accounting for Craigslist ads, the difference in total amount of advertising between paid advertisers and nonadvertisers would not decrease, as posited earlier.

To address the concerns, we collect historical data on mortgage postings on Craigslist. Specifically, for each market listed in Table IA.II, 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 that advertised on Craigslist during our sample period, of which only 28 match our data. These 28 unique lenders represent 1.3% of the lenders in our data set. 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 that use Craigslist is very small. Moreover, advertisers that use Craigslist do not seem to be large paid advertisers in our data. These lenders spent $22.1 million in paid advertising over sample period, which corresponds to just 2.01% of total mortgage advertising in our main data set ($1.05 billion). Consequently, we do not expect our estimates in Table VII (Panel B) to be driven by these lenders.

We show this formally in Panel E of Table VII. We reestimate the regressions excluding the 28 lenders that advertise on Craigslist. The results show that the estimates are virtually identical to those reported earlier. Taken 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 estimate.

C.4. Pre- and Posttrends around Craigslist Entry

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 VIII. Advertising starts to decline only one quarter before Craigslist entry, but the magnitude of the

Table VIII

Craigslist Entry and Timing

In this table we explore the timing of Craigslist entry into 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 and 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, and 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 at the 1%, 5%, and 10% levels, respectively.

	$Y = $ Advertising		
	Total Adv. (1)	Other Adv. (2)	Newspaper Adv. (3)
After Craigslist Entry −2	−0.146	0.0151	−0.169
	(0.179)	(0.097)	(0.099)
After Craigslist Entry −1	−0.512**	−0.118	−0.361***
	(0.183)	(0.068)	(0.123)
After Craigslist Entry 0	−0.796***	−0.219**	−0.499***
	(0.269)	(0.100)	(0.151)
After Craigslist Entry +1	−0.925***	−0.184**	−0.660***
	(0.190)	(0.075)	(0.118)
After Craigslist Entry > = +2	−1.646***	−0.413***	−1.088***
	(0.286)	(0.115)	(0.199)
Quarter Fixed Effects	Yes	Yes	Yes
Lender Fixed Effects	Yes	Yes	Yes
Region Fixed Effects	Yes	Yes	Yes
Observations	42,632	42,632	42,632
R^2	0.114	0.204	0.087

	$Y = $ Observables			
	FICO (4)	LTV (5)	Prepay Penalty (6)	Low Doc. (7)
After Craigslist Entry −2	1.274	−0.0240	0.013	−0.004
	(0.827)	(0.120)	(0.008)	(0.008)
After Craigslist Entry−1	−0.538	0.274	0.010	−0.012
	(1.033)	(0.164)	(0.011)	(0.007)
After Craigslist Entry 0	0.580	0.231**	0.029**	−0.017**
	(0.769)	(0.107)	(0.011)	(0.006)
After Craigslist Entry +1	0.076	0.106	0.021**	−0.004
	(0.802)	(0.124)	(0.008)	(0.009)
After Craigslist Entry > = +2	0.260	0.043	0.044***	−0.015***
	(0.864)	(0.150)	(0.012)	(0.005)
Quarter Fixed Effects	Yes	Yes	Yes	Yes
Lender Fixed Effects	Yes	Yes	Yes	Yes
Region Fixed Effects	Yes	Yes	Yes	Yes
Observations	42,632	42,632	42,632	42,632
R^2	0.292	0.233	0.574	0.298

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 market participants, who start to decrease their advertising ahead of the entry that is expected to soon follow.[19]

Second, in Table VIII we show that Craigslist entry does not predict changes in the borrower pool relative to regions that do not experience Craigslist entry. This is the case for borrower quality as measured by credit score, LTV ratios, prepayment penalty, or the share of low-documentation loans. The coefficients on the Craigslist effect are economically small, statistically weak, and unstable. For example, for the LTV 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 small and unstable coefficients magnitudes. The most stable change in observables correlated with Craigslist entry is the prepayment pool, but the magnitudes are again economically small. Taken together, these results further support the view that advertising attracting borrowers of different risk or catering costs does not likely drive our findings.

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 bps. The average lender that advertises spends $25,460 per quarter, which translates into a 181 bps higher reset rate.

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. Further, assume a 10% discount rate on the mortgage payments to bring them to present value and that, like the typical ARM in our data, the mortgage lasts for 15 years and resets in the second year. This implies that a consumer who obtains a mortgage from an average advertising lender pays approximately $25,000 more than a consumer who obtains a mortgage from a non-advertiser in present-value terms.

As stated earlier, this estimate is an upper bound on overpayment through higher interest payments. In reality, mortgages default, are prepaid, or are

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

renegotiated. Therefore, the borrower's effective time of overpayment is shorter than the duration of the mortgage. Accordingly, suppose the borrower pays the reset on an ARM for one year before refinancing. This is a conservative duration for overpayment relative to the average time of about two years for borrowers with an outstanding balance after the reset in our data. Even under the extreme assumption that these borrowers then do not refinance into an expensive mortgage, which is possible, the present value of overpayment is approximately $3,000. While this is a substantial amount, it is of similar magnitude as the estimated losses faced by mortgage borrowers who 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. Our calculations should thus be interpreted with appropriate caution. Moreover, the instrumental variable 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, Seru, and Vig (2015) find that an increase in the interest rate is strongly associated with an increase in the probability of default.[20] The cost of this indirect effect is difficult to quantify but can represent a significant welfare loss to the consumer.

IV. Advertising Content

We now directly explore the content of mortgage advertisements. Our analysis so far shows that advertising is used in mortgage markets to steer consumers toward more expensive mortgages. One channel at work might be that consumers have a difficult time understanding resets, possibly because reset rates are less salient 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 and show 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 the case that mortgages of lenders that advertise lower interest rates are cheaper. Last, we confirm that mortgage ads are not very informative by showing that very few actual mortgage or lender characteristics are advertised.

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[20] In our data, advertising has a negative correlation with borrower defaults, conditioning on borrowers' observable characteristics. We thus 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.

To conduct the above analysis, we analyze the content of 37,432 mortgage advertising campaigns in print and direct mail collected by Comperemedia during our sample period (2002 to 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 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., the New York DMA). Using the details of the advertisement, we extract the information related to price (interest rate), lender, product (ARM or FRM), mortgage horizon, and other nonprice characteristics of the mortgage. Our analysis uses information on three types of advertising a lender may use: (1) explicit advertising of mortgage interest rates, (2) advertising non-price characteristics of a mortgage, or (3) advertising the existence of the lender, that is, brand advertising.

A. Salience of Initial Rates and Reset Rates in Advertisements

One possible reason why advertising can steer 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 likely explain our results if advertising clearly states both the initial interest rate and the reset rate, placing them on the same footing. While anecdotal evidence indicates that reset rates are rarely advertised, we now provide systematic analysis to explore this claim.

Panel A of Table IX shows that advertising interest rates is an important aspect of ARM advertising. In campaigns that explicitly advertise ARMs, 69% mention a numerical interest rate. The word "reset" is mentioned in only 13, or 0.03% of campaigns.[21] These results imply that the explicit interest rate mentioned in these campaigns does not correspond to the reset rates but rather to an introductory rate.

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

To get a sense of the extent to which reset rates are advertised, we search more broadly across all advertisements in our data. We find only seven campaigns advertise an explicit reset rate. That is, only 0.02% of all the campaigns in the data explicitly mention both the initial interest rate and the reset rate.

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[21] Similarly, "thereafter," used in relating to ARM loans, shows up infrequently in the advertisements. In particular, 227 advertising campaigns (0.61% of 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."

Table IX
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-related search terms in mortgage advertising campaigns. Search terms include ARM, Reset, and Adjust. Panel B presents results of analysis using advertisements in which two interest rates were advertised. Panel C identifies mortgages that may promote low introductory interest rates (e.g., "as low as," "intro-," "initial," and "starting"). In Panel D, we 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 in 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 downpayment requirement. Horizon refers to advertising campaigns that mention specific loan maturity.

Panel A: ARM-Related Advertising Campaigns	
Search Term	No. Campaigns
ARM	4,238
Reset	13
Adjust	1,885
Explicit Interest Rate	4,234
Total	6,136

Panel B: Advertisement Displays Two Interest Rates	
Second Rate Is APR	11,387
Multiple Products	1,676
Other	128
Total	13,191

Panel C: Phrases on Low Rates	
As Low as	3,632
Intro	769
Initial	346
Starting	608
Total	4,747

Panel D: Quantitative Mortgage Information	
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

These results clearly illustrate that, while advertising initial interest rates is an important part of mortgage advertising, information on reset rates is generally omitted. This finding casts strong doubt on the view 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 increased only 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 IX shows that 13% of advertisements use the 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.

B. Do Low Advertised Rates Designate Cheap Lenders?

While we have established that reset rates are not advertised, Panel D of Table IX shows that a large number of advertising campaigns (54%) do contain APR information. We now explore if a consumer who follows the advertisement with a lower advertised APR finds an inexpensive lender.[22] We conduct this analysis on a sample of 70 lenders (around 6,000 advertisement campaigns) for which we are able to match the advertising content data and the mortgage data. Specifically, we estimate the following regression:

$$p_{jlt} = \beta APR_{jlt} + \alpha_t + \alpha_l + \alpha_j + \varepsilon_{jlt} \tag{10}$$

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 quarters. It is worth pointing out that there is substantial variation in advertised APRs within locations-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-quarter. We also include lender and time fixed effects in this specification.

Table X 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, an 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 is explicitly mentioned in advertisements, and these rates (APRs) are easily comparable, they do not help customers find less expensive lenders.

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.

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

Table X
APR and Expensiveness

This table reports estimation results of the following specification: $p_{jlt} = \beta APR_{jlt} + \alpha_t + \alpha_l + \alpha_j + \varepsilon_{jlt}$, where the dependent variable measures a lender's mortgage expensiveness in a region. Lender expensiveness is computed by aggregating individual loan level residuals obtained from the specification reported in Table II using the ARM loan sample. *APR* is the advertised APR of lender j in market l and quarter t. Controls are whether the advertisement states a mortgage horizon, reset horizon, and a below-prime initial rate, as well as 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 at the 1%, 5%, and 10% levels, respectively.

	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^2	0.222	0.230	0.421	0.598

Analysis of the quantitative information available in an advertisement across the entire sample reveals a lack of information on the most basic features of the mortgage. For instance, as Panel D of Table IX shows, 17% of advertisements have no numeric content. Only about 45% of the advertisements mention a dollar figure to indicate a mortgage amount. Similarly, 59% of the advertisements make no mention of the mortgage horizon. As mentioned earlier, only 10% of the advertisements mention that the mortgage is an ARM or that it adjusts. We also note that around 18% of advertisements (6,563) provide no numeric information.[23] These statistics indicate that, while mortgage advertisements provide some basic information on the mortgage, this information is very limited.

To reinforce this point, we tabulate the top 50 words used in mortgage print and direct mail advertisements and present the results in Table IA.IV. To understand whether advertisements contain words that can differentiate mortgages from one another, we eliminate the following words: (1) the most common words in English as defined by the Oxford English Corpus;[24] (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

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[23] 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.

[24] In linguistics, a corpus is a large and structured set of texts that 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.

in the advertisements. Very few, if any, of these words can be used to differentiate mortgages in a particularly targeted way. In addition, we find no evidence that lenders advertised 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 rudimentary and pertains to generic, nondifferentiating characteristics such as mortgage length. Moreover, the amount of information disclosed is limited, and it would be quite difficult for even the most sophisticated consumers to obtain a complete picture of the product advertised.

V. Discussion and Conclusion

A. Which Alternative Explanations Can We Rule Out?

Our first set of findings is that firms with higher advertising intensity charge higher mortgage prices, especially when making loans in areas with a prevalence of minority, less educated, and poor borrowers. A battery of tests can help weaken several competing explanations for our findings.

The first competing explanation is differences in lender practices, which are correlated with advertising. Because we exploit within-lender variation in our analysis, we avoid concerns that lender characteristics, which may be correlated with advertising, are driving the results. These characteristics include the lender's brand, propensity to renegotiate or securitize, and servicing practices. It also includes lenders' costs of financing or issuing mortgages, and other lenders' activities aimed at attracting customers. We further weaken these alternatives by using the Craigslist instrument in Section III.C. To be consistent with our results, Craigslist would have to enter places in which advertising is decreasing for some other reason, and at the same time, as other lender policies are also changing. Moreover, these changes in lender policies would have to occur in spite of the fact that the observed borrower pool in the market remains the same.

The second competing explanation is that consumers, which differ on unobservable dimensions, are differentially attracted to advertising. Note that these unobservable characteristics would have to impose substantial costs on the lender to explain the large magnitudes of our results. As discussed in Section III.B.5, it is unlikely that the expensive mortgages originated by advertisers purely reflect unobservable borrower risk, given that the delinquency of these borrowers is not higher, but rather is a bit lower. It is also unlikely that these borrowers impose large costs on the lender because they require a lot of attention that is difficult to cater to. In Section III.B.6, we examine this alternative directly by looking at evidence for a large lender. We further weaken these alternatives by using the Craigslist instrument in Section III.C. Finally, advertisers attracting consumers and passing the costs on to consumers cannot explain our findings either. In such a setting one would expect all consumers

to sort to cheap nonadvertising lenders. We therefore believe that the preponderance of evidence substantially weakens the case that differences in lender practices or unobservable consumers' characteristics that are correlated with advertising are driving our results.

Our second set of findings, in Section IV, analyzes the content of advertisements. We show that a significant share of advertisements explicitly mention initial interest rates and that reset rates are almost never mentioned. Even advertised APRs do 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 horizon or amount. We find no evidence that lenders advertise their own characteristics, such as differences in servicing or renegotiation practices. Overall, our evidence broadly rejects the information view of advertising in the mortgage market, and favors the persuasion view instead.

B. Related Literature

Our paper is connected to several strands of literature. It is related most directly to recent literature on the causes and consequences of the financial crisis (e.g., Keys et al. (2009, 2010), Mayer and Pence (2009), Mian and Sufi (2009), Agarwal et al. (2011), Ben-David (2011), Loutskina and Strahan (2011), Mayer et al. (2014), Purnanandam (2011), Jiang, Nelson, and Vytlacil (2012), Chernenko, Hanson, and Sunderam (2013), Nadauld and Sherlund (2013), Stroebel (2016)), and in particular to studies that examine the role of predatory lending in fueling the crisis (see Agarwal et al. (2015)). Our findings are consistent with Agarwal and Evanoff (2013), whose data overlap with our sample period. They conclude that real estate professionals steer higher quality borrowers to lenders that 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 consumer biases (e.g., DellaVigna and Malmendier (2006)). For example, Gabaix and Laibson (2006) and Bordalo, Gennaioli, and Shleifer (2013) show how consumers focus on salient product features, especially if they are financially less literate.[25] Our findings are consistent with their evidence since we find a larger effect of advertising on mortgage prices for less educated consumers.[26]

Our paper also relates to a 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 that catches their

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

[26] We discuss the performance of advertising models in explaining our results in Section V of the Internet Appendix.

attention (Hirshleifer and Teoh (2003)).[27] 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 the literature on how persuasion affects consumer choices (see Bagwell (2007), DellaVigna (2009), and DellaVigna and Gentzkow (2010) for recent reviews and Agarwal et al. (2015) for studies related to regulation). Closest to our paper are studies that relate the use of advertising and the pricing of homogeneous products. Hastings, Hortaçsu, and Syverson (2011) show that the use of advertising 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 the choice of home equity debt contracts by examining a direct mail advertising experiment done by a large bank. Their evidence also supports the persuasion view of advertising in the mortgage market.

Finally, our paper is related to the literature that examines the effects of advertising on consumer decisions.[28] 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 entry of Craigslist into different markets at different times.

C. Conclusion

Our analysis reveals that the major theories of informative 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 not salient (Gabaix and Laibson (2006), Bordalo, Gennaioli, and Shleifer (2013)), and advertising is used to increase the salience of certain other characteristics, in our case, the initial interest rate. We also find that the positive correlation between advertising expensiveness and mortgage pricing concentrates among 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.

[27] Several other papers use advertising as a measure of attention-grabbing events that attract uninformed investors. Grullon, Kanastas, and Weston (2004) show that advertising increases demand of uninformed investors and Lou (2014) shows that firms use advertising to maximize the proceeds from insiders' equity sales. Cronqvist (2006) discusses a similar notion in the context of mutual funds.

[28] 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. Reuter 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 (2016) 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 that 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 consumers' selection of a more suitable mortgage product. The answer to these questions 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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Supporting Information

Additional Supporting Information may be found in the online version of this article at the publisher's website:

Appendix S1: Internet Appendix.