Housing Prices and Consumption:

The Role of News Media

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The observed relationships between housing prices and consumption are highly inconsistent over time. This paper sheds light on the heterogeneity by relating behavioral models to the housing wealth effect. As households' beliefs/expectations on house prices are potentially a key driver of fluctuations in the housing market, behavioral models suggest that households extrapolate from past prices available only with a significant lag to infer the unobservable current-period market-wide demand state. By exploiting local newspaper contents in the U.S., I find that more newspaper articles conveying house price information can make household consumption more elastic with respect to regional housing prices. The regression results are statistically significant only for homeowners and only when a housing news article includes real estate terms in its headline. The findings suggest that information on past prices is a main source of housing wealth effects, highlighting the importance of information agents or information interventions in shaping household behaviors in housing markets.

Keywords: Housing Prices, Consumption, Wealth Effect, Newspapers

JEL Codes: D12, D83, D91, E21, L82, R30

1. Introduction

Housing prices can affect a wide range of socio-economic outcomes, particularly homeowner non-housing consumption.[1] It is commonly assumed that lowering interest rates can induce an increase in asset prices including house prices, which can boost consumer spending and ultimately the economy. Therefore, a key question in macroeconomics and monetary policy is how strong is the link between asset prices and aggregate consumption. As a consequence, there exists a large literature on the wealth effect, with housing prices reportedly having larger and more important impacts on spending than do stock prices (Case et al., 2005; Bostic et al., 2009; Carroll et al., 2011; Calomiris et al., 2012; Case et al., 2012). However, the existence of and mechanisms for the effects have been long controversial with somewhat conflicting theoretical predictions.[2] Recent studies provide strong empirical evidence from clean identification (Mian et al., 2013; Aladangady, 2017), but observed effects are still inconsistent over time.[3]

To provide an explanation to the heterogeneity in the observed housing wealth effects, this paper relates behavioral models to the wealth effects. The traditional view in the wealth effect literature is to assume that homeowners are making fully informed utility-maximizing choices, so one would not expect provision of additional information about housing prices to change homeowners' consumption behaviors. However, this paper takes a different view motivated by the behavioral economics literature that suggests that any forms of information disclosure can have a significant impact on household economic

[1] A few more examples are fertility rates (Lovenheim and Mumford, 2013; Dettling and Kearney, 2014), college entrance (Lovenheim, 2011), entrepreneurship (Corradin and Popov, 2015), and portfolio choice (Chetty and Szeidl, 2017).

[2] The standard channel relaxes the household lifetime resource constraint. That is, higher home values have a positive endowment effect, and thus rational households maximize their utility by consuming more. Another channel is collateralized lending. Rising housing prices allow households to borrow more by providing additional collateral. As housing is not only an investment asset but also a consumption good, however, rising home values could raise the future cost of living, and this negative effect could offset the positive wealth effect. Therefore, aggregate housing wealth effects should be small for aggregate non-housing consumption (Sinai and Souleles, 2005; Buiter, 2008; Calomiris, Longhofer and Miles, 2012).

[3] For example, housing prices have already recovered to the pre-crisis level, but economic growth is slowing in the US and many other countries; see the newspaper article (https://www.cnbc.com/2016/08/01/debt-is-holding-back-the-global-economic-recovery-say-central-bankers-dudley-rajan-and-zeti.html).

decisions (Choi et al., 2010; Bertrand and Morse, 2011; Beshears et al., 2018). Housing markets are informationally imperfect, and information about recent house price growth is available only with a significant lag. Under imperfect information, agents rely on learning to form expectations, and households may extrapolate from lagged price information to infer the unobservable current-period market-wide demand state (Glaeser and Nathanson, 2017; Armona et al., 2018). Given this context, local newspaper articles may be a potential housing market information source for homeowners, [4] and media coverage on past housing prices may affect the extrapolative homeowners' consumption decisions. In reality, many homeowners do not actively seek housing price information in their daily lives. If they do not have high level of awareness of their home values, a sizable housing wealth effect can hardly be expected, given the considerable house price fluctuations that occur over time. Therefore, one might expect their consumption decisions to respond to how much or how frequently information on past housing price growth is being disclosed.

To allow the size of the housing wealth effect to vary according to local media coverage on past house prices, I exploit local newspapers in the U.S. People often base their economic, financial, and political decisions on the news that they read in newspapers or watch on television. For example, related studies suggest that geographic areas with reduced local media coverage see less stock trading volumes (Engelberg and Parsons 2011) and lower voter turnouts (Gentzkow, et al. 2011).[5] Therefore, information from local media outlets may increase people's awareness on the given topic, and then the increasing awareness may shape individuals' behaviors and decisions. Literature on the relation between news media and real estate/housing markets is particularly scarce, but several recent studies identify the causal effects of local newspapers and internet social media on homebuyer decisions; Soo (2018) demonstrates that the qualitative tone of local

[4] More than a quarter of all adults in the US read at least one newspaper every day (https://www.statista.com/statistics/183408/number-of-us-daily-newspapers-since-1975/)

[5] Engelberg and Parsons (2011) exploit the daily newspaper of each major U.S. city, and find that local newspaper coverage of earnings announcements significantly increases local trading volumes. Gentzkow et al. (2011) document that reading a newspaper increases the probability of voting by 4 percentage points.

housing news can predict future house prices, and Bailey et al. (2018) show that potential homebuyers rely on information from Facebook. These findings imply that the information channels of both print and online media may play a key role in informing homebuyers and shaping their economic decisions. Therefore, media coverage on past house price growth may lead the extrapolative homeowners to further learn their home values from previous sales or current listings by visiting real estate websites such as Zillow.com, thereby helping them to be more aware of their housing wealth.

This paper relates the local media coverage on housing prices to the housing wealth effects by regressing household-level consumption on the MSA-level housing price index interacted with the number of newspaper articles conveying house price information.[6] First, household-level expenditures are from the public-use microdata of the quarterly Consumer Expenditure Survey (CEX) across 22 MSAs over 11 years from 2006 to 2016. Second, I use the MSA-level house price index provided by the Federal Housing Finance Agency (FHFA). I assume that homeowners learn their home values in part from the regional price growth covered by local newspapers. Last, I exploit local newspaper contents in order to quantify media coverage on recent housing prices. From three newspaper databases, I collected newspaper articles including any of the search queries, "home price," "house price," and "housing price", and then I counted the total number of news articles published by major local newspapers during each quarter in each city.

Regression results robustly show that more newspaper articles conveying housing price information can make homeowner consumption more elastic with respect to regional housing prices. In other words, relative to less informed homeowners, the more informed consume more in response to high housing prices and consume less in response to low housing prices. By stratifying the analysis for homeowners and renters, I find that the regression results are statistically significant only for homeowners; an increase of one standard deviation in the number of housing price news articles is associated with a 0.08

[6] MSA stands for Metropolitan Statistical Area, a U.S. geographical core area containing a substantial population nucleus, together with adjacent communities having a high degree of economic and social integration with that core (https://www.census.gov/programs-surveys/metro-micro/about.html).

increase in homeowners' consumption elasticity and only with an insignificant increase in renters' elasticity. Since rising home values do not clearly benefit renters, this result alleviates the empirical concern regarding unobservable common factors, in particular, expected future income growth. For further causal investigations, I also identify the headline effect. Specifically, only housing news articles that include housing or real estate terms in their headline—headlined housing news—have a significant impact on the wealth effect. However, articles that convey housing price information in their body but do not include any housing or real estate terms in their headline—non-headlined housing news—have no significant effect, thereby providing further support for the causality. It may be random whether or not each housing news article includes housing terms in its headline. That is, similar unobservable factors may influence supply of both headlined and non-headlined housing news articles, but the demand-side homeowner expenditures, respond differently to the textual variation in the headlines.

To the best of my knowledge, this is the first to relate information interventions to the housing wealth effect. Arguably, the dependence of the housing wealth effect on media reporting has a couple of important implications. First of all, this idea can shed light on inconsistent housing wealth effects, given the substantial variation in media reporting across cities and over time. Information interventions may make the aggregate consumption or economy more responsive to asset prices, impacting the effectiveness of related policies. Second, this paper shows that even low-touch information disclosure has a nontrivial effect on homeowner consumption decisions. In contrast with the view that household decisions reflect fully informed and rational behaviors, the result suggests that relevant information from news media can alter household economic decisions by helping them to make more informed choices and/or by making the information salient to the individuals. Thus, the finding has the potential to dramatically broaden our understanding of the role of news media and information interventions across a large number of settings.

2. Data

2.1 Data Sources

For empirical tests, I construct a quarterly dataset for 22 U.S. metropolitan areas by exploiting the Bureau of Labor Statistics' Consumer Expenditure Survey (CEX) public-use microdata from 2006 to 2016.[7] The CEX data provides a good measure of household consumption and consists of two surveys: the Diary survey and the Interview survey. While the Diary survey is designed to capture small expenditures on frequently purchased items such as food over a two-week period, the Interview survey is conducted quarterly for major expenses that occur on a regular basis. Although the surveys are reportedly subject to an underreporting issue, this paper nevertheless uses the Interview survey data[8], following two papers (Bostic, Gabriel and Painter, 2009; Aladangady, 2017) that find significant wealth effects using the data. The Interview surveys collect detailed household-level information on expenditures, incomes, and household characteristics. As each household is interviewed for only four consecutive quarters, with new families entering each quarter, the dataset is basically repeated cross-sections. [9] A limitation is that detailed geographical information is de-identified. Only about 20 major metropolitan areas are identified in the public-use data.

The household-level datasets enable me to compare different responses between homeowners and renters. **Table 1** reports summary statistics of major economic and socio-demographic characteristics for each family or reference person. [10] Both

[7] The CEX data is available from 1986, but the public-use microdata contains MSA-level geographical identifiers from 2006 onward.

[8] This paper assumes that the underreporting is independent of media coverage.

[9] The observation unit in the CEX is called the consumer unit (CU), which consists of any of the following: (1) all members of a particular household who are related by blood, marriage, adoption, or other legal arrangements; (2) a person living alone or sharing a household with others or living as a roomer in a private home or lodging house or in permanent living quarters in a hotel or motel, but who is financially independent; or (3) two or more persons living together who use their incomes to make joint expenditure decisions. However, the terms *consumer unit*, *family*, and *household* are used interchangeably. For further details, see the BLS webpage https://www.bls.gov/cex/ csxfaqs.htm.

[10] According to the Bureau of Labor Statistics webpage (https://www.bls.gov/cex/csxfaqs.htm#PUMD), the reference person for the consumer unit is the first member mentioned by the respondent when asked "What are the names of all the persons living or staying here? Start with the name of the person or one of the persons who owns or rents the home." It is with respect to this person that the relationship of the other consumer unit members is determined. Thus, the two terms *reference person* and *head of household* are used interchangeably in related studies.

expenditures and incomes are noticeably higher for homeowners; as all of the variables of interest, consumption, homeownership decisions and housing prices, may be affected by income levels, I control for household-level income levels in my models. In addition, the majority of homeowners are married, white, and hold a bachelor's degree or higher, while renters are more likely to be single and black, with only 29% holding a bachelor's degree.

Table 1. **Summary statistics of Consumer Expenditure Survey (2006-2016)**

	Home owners (59.5%)		Renters (40.5%)	
	Mean	S.D	Mean	S.D.
Total Expenditure (USD, quarterly)	16,579	14,666	9,814	7,667
Income (USD, annual)	79,403	90,477	37,775	46,012
Family size	2.68	1.51	2.34	1.53
Age	53.55	15.48	43.68	17.24
Public sector employer	0.42	0.49	0.37	0.48
Private sector employer	0.49	0.50	0.57	0.49
Married	0.63	0.48	0.32	0.47
Never married	0.13	0.34	0.39	0.49
Separated/divorced/widowed	0.24	0.43	0.28	0.45
White	0.81	0.39	0.68	0.47
Black	0.10	0.30	0.20	0.40
Asian	0.07	0.26	0.09	0.29
High school or lower	0.29	0.45	0.42	0.49
Some college or Associate's degree	0.27	0.45	0.29	0.45
Bachelor or higher	0.44	0.50	0.29	0.45

Notes: This table summarizes descriptive statistics for variables from the Consumer Expenditure Survey (CEX) data. It presents differences in family characteristics between homeowners and renters. As each household is interviewed for at most four consecutive quarters, the quarterly dataset is repeated cross-sections, and the sample includes 38,938 households or 110,677 observations from Q1.2006 to Q4.2016.

To measure the housing wealth effects, I link the household-level spending data from the CEX to the MSA-level house price index provided by the Federal Housing Finance Agency (FHFA). [11] Many empirical papers rely upon household balance sheet information to examine whether household spending responds to the self-reported market value of their home. Instead of the household-level housing wealth measure, I exploit the local housing price index because this is the most common housing price information that homeowners can obtain from media outlets, assuming that they learn their home values in part from the regional price growth covered by local newspapers.

[11] The FHFA All Transactions House Price Index is used in this study.

By doing so, this study can identify the differential wealth effects on homeowners and renters.

Table 2. **List of newspapers in the sample**

Metropolitan Area	Newspapers Included	Missing Major Newspapers
Atlanta	Atlanta Journal-Constitution	
Baltimore	Baltimore Sun	
Boston	Boston Globe, Boston Herald	
Chicago	Chicago Sun-Times, Daily Herald, Courier-News	Chicago Tribune
Cleveland	Plain Dealer, Akron Beacon Journal	
Dallas	Dallas Morning News, Star-Telegram	
Denver	Denver Post	
Detroit	Detroit News	Detroit Free Press
Honolulu	Honolulu Star-Advertiser	
Houston	Houston Chronicle	
Los Angeles	Daily News Of Los Angeles, Orange County Register, Long Beach Press-Telegram	Los Angeles Times
Miami	Miami Herald	
Minneapolis-St. Paul	Star Tribune, Pioneer Press	
New York City	New York Times, New York Post, Daily News of New York, Star-Ledger	
Philadelphia	Philadelphia Inquirer, Philadelphia Daily News	
Riverside-San Bernardino	Press-Enterprise, San Bernardino Sun	
San Diego	San Diego Union-Tribune	
San Francisco	San Francisco Chronicle, San Jose Mercury News, Oakland Tribune	
Seattle	Seattle Times, Seattle Post-Intelligencer, News Tribune	
St. Louis	St. Louis Post-Dispatch	
Tampa	Tampa Bay Times (St. Petersburg Times), Tampa Tribune	
Washington	Washington Post, Washington Times	

Notes: Table 2 lists 22 metropolitan cities and corresponding local newspapers in my sample covering from January 2006 to December 2016. Most US cities have only one daily newspaper with some exceptions for that I include two major local newspapers (Boston, Philadelphia, Seattle, Tampa, and Washington) or three (New York City). The other cities with multiple newspapers presented in this table are due to the large geographical boundaries of the metropolitan areas in the Consumer Expenditure Survey (CEX) data. In addition, three major newspapers (Chicago Tribune, Detroit Free Press, and Los Angeles Times) are missing in my sample.

Lastly, I depend on three newspaper databases—Factiva, Nexis, and Newslibrary.com—to quantify the media coverage on housing price. First, I identified the dominant local newspapers for 22 cities (**Table 2**). U.S. newspapers have historically been local in nature. The median newspaper sells more than 90 percent of its copies in the county in which it is headquartered (Gentzkow and Shapiro, 2010). Also, the number of US cities that can support multiple daily newspapers is fast declining (Chandra and Kaiser, 2015). When multiple newspapers are presented for one city in **Table 2**, this is mostly due to the geographical boundaries of the metropolitan areas in the CEX data. For example, one sampling unit of the CEX consists of San Francisco, Oakland, and San Jose. As a consequence, in addition to the *San Francisco Chronicle*, both the *Oakland Tribune* and the *San Jose Mercury News* are also included in my sample; this unique local monopoly

(or duopoly) characteristic of newspapers enables researchers to exploit discontinuous cross-sectional variations in media coverage for identification.[12]

Then I collected news articles published by each newspaper, mainly from Newslibrary.com, and used the other two databases, Factiva and Nexis, to complement the datasets. I detail how I construct my measure of media coverage from this collection of newspaper articles in the following subsection.

2.2 Measuring Media Coverage

The single most important variable in this study is a measure of local media coverage on (past) housing prices. A wide range of literature identifies causal impacts of news media, suggesting that information environments influence economic agents' behaviors and decisions.[13] Media news conveying house price information can help extrapolative homeowners to form expectations about current or future housing price growth by informing them about the realized housing price growth. Therefore, this paper is mainly interested in how media reporting can increase awareness about realized housing wealth gains. The quantity of news articles about housing prices may be positively correlated with how well local homeowners are informed about or aware of the values of their homes. In the absence of media reporting, household spending might be less responsive to housing price fluctuations, while it may become more responsive when the information treatment is more frequent.

To quantify the housing price information from local papers, I counted the total number of articles including specific keywords by city–quarter, using the articles collected from the three newspaper archives. More specifically, each article must include "home price," "house price," or "housing price" in its headline or body to ensure that it provides readers

[12] For instance, Engelberg and Parsons (2011) take advantage of the fact that local media outlets often differ in their coverage of the same underlying information events. As another example, Gentzkow, Shapiro and Sinkinson (2011) and Peress (2014) utilize exits and entries of newspapers and reductions in media coverage caused by newspaper strikes, respectively.

[13] Largely in finance (Chan, 2003; Frazzini, 2006; Tetlock, 2007; Tetlock et al., 2008; Fang and Peress, 2009; Tetlock, 2010; Engelberg and Parsons, 2011; Tetlock, 2011; Da et al., 2014) and in political science (Gentzkow, 2006; Gerber et al., 2009; Gentzkow, Shapiro and Sinkinson, 2011).

with explicit information on housing prices. In addition, each article also includes "home," "house," "housing," "real estate," or "property" in its headline. The additional queries further narrow the search results down to articles supposedly written for homeowners or homebuyers. For example, *The Philadelphia Inquirer*'s article in Table 3 includes "home" in its headline and also "home price" in its body. This report provides readers with information on past housing price growth, and more importantly, the headline obviously indicates that the following body of the article is about housing markets and should therefore draw the attention of existing homeowners or potential homebuyers. Notably, the search query restrictions exclude articles that do not include the price keywords even though they discuss some aspects of housing markets or appear in the housing/real estate section. For instance, some housing news articles report on local building permits or new constructions, an important housing price determinant. Such information may also help readers to form expectations regarding their future house price growth, but does not directly inform them about the realized housing wealth growth, which they are likely to extrapolate from.

Table 3. **An example of newspaper articles in the key independent variable**

The Philadelphia Inquirer
August 26, 2009
Region's Home Prices Gain In Second Quarter
Driven by sales in the city, home prices in the Philadelphia region rose by an average 3.8 percent in the second quarter over the previous quarter - the first increase in two years. Data compiled by Kevin Gillen of Econsult Corp. in Philadelphia showed that even with sales volume nearly 50 percent below normal in the second quarter, homes that did sell sold for more. In the city, prices were 6.8 percent higher, while suburban counties showed an average price increase of 2.7 percent, Gillen said...

Notes: This is an example of housing news articles used to generate the key independent variable (I call it "the number of housing news articles") in my sample. The example article includes "home" in its headline, and "home price" in its body, conveying explicit information about local house price growth to readers.

An empirical concern is that the search results for these keywords might possibly capture not only the trends of local housing markets but also those of national or international housing markets that might be less relevant to local housing prices. However, attention to readers' own properties is often triggered by spatially distant markets. A homeowner may search for the list prices of nearby similar properties after reading an article about a housing boom in another city. Bailey, Cao, Kuchler and Stroebel (2018) also find that both

local and out-of-state friends' experiences affect housing investments. This finding implies that all news articles containing housing price information have the potential to influence households' economic decisions, probably by making readers more and better aware of their housing wealth in any context.

3. Empirical Analysis

3.1 Housing Wealth Effect

Before including the MSA-level quarterly number of housing articles as a key independent variable in the econometric models, I first test a simple wealth effect model. The standard empirical functional form to measure the housing wealth effect is given in **Equation (1)**:

(1) $$y_{i,c,t} = \beta\, \rho_{c,t-1} + \boldsymbol{x}'_{i,c,t}\, \boldsymbol{\gamma} + \lambda_t + \phi_{c,j} + \varepsilon_{i,c,t}$$

where $y_{i,c,t} = ln\, Expenditure_{i,\,t}$ is the natural logarithm of the total expenditures of household i in city c in year-quarter t, and $\rho_{c,t-1} = ln\left(HPI_{c,\,t-1}\right)$ is the natural logarithm of the house price index for city c in year-quarter $t-1$.[14] This model controls for a vector of family characteristics ($\boldsymbol{x}_{i,c,t}$: income, family size, age of household head), major factors affecting both consumption and housing demand. Also, I include year-quarter fixed effects (λ_t) and cohort fixed effects determined along seven dimensions ($\phi_{c,j}$: city × housing tenure × employer × occupation × marital status × education × race).[15] As discussed in the previous section, the dataset in this study is not a panel, but repeated cross-sections. In this context, Campbell and Cocco (2007) use sample cohort means from a time series of cross-sections to construct pseudo-panel data, following the methodology

[14] The main assumption of this specification is that consumption responds to home price information conveyed by local newspapers. Such information is usually a quarter lagged because home price indices are published with a few months' lag. Therefore, I let the housing price term refer to the previous quarter (t-1) instead of the current quarter (t).

[15] Individuals sharing the following seven characteristics are grouped into cohorts: 1) MSA; 2) Housing Tenure, with six categories: Owned with mortgage, Owned without mortgage, Owned mortgage not reported, Rented, Occupied without payment of cash rent, or Student housing; 3) Employer, with three categories: Private company, Government, or Self-employed/Family business; 4) Occupation, with four categories: Manager/Professional, Admin/Sales/Retail/Technician, Service, or Laborer/Production/Farming /Armed Forces; 5) Marital status, with five categories: Married, Widowed, Divorced, Separated, or Never married; 6) Education, with four categories: Master/Professional/Doctorate degree, Bachelor's degree, College/Associate degree, or High School/Less; and 7) Race, with three categories: White, Black, or Others.

suggested by Deaton (1985). In doing this, Campbell and Cocco can exploit both time-series and cross-sectional variation to identify wealth effects. To obtain similar results, this study employs the cohort fixed effects that would capture average differences across cohorts in omitted variables; in other words, the regression coefficients of interst are driven by the variation over time within each cohort. Lastly, standard errors are clustered by city × housing tenure to allow for correlation over time within each group in all of the following models. With this log-log specification, the estimated coefficient can be directly interpreted as the elasticity of consumption with respect to housing wealth. [16]

Then I split the variable of interest into two groups: owners and renters (**Equation 2**).

(2) $y_{i,c,t} = \beta_1 \rho_{c,t-1} \times Owner_i + \beta_2 \rho_{c,t-1} \times Renter_i + \boldsymbol{x'}_{i,c,t}\,\boldsymbol{\gamma} + \lambda_t + \phi_{c,j} + \varepsilon_{i,c,t}$

Renters do not clearly benefit from rising house prices. Thus, if this paper finds significantly positive relationship between housing wealth and the spending of renters, the estimated coefficients might be suggestive of an omitted variable bias. It is worth noting that homeownership decisions are endogenous (Campbell and Cocco, 2007). However, the cohort fixed effects can address this concern by exploiting variations within the homeowners or within the renters over time.

Table 4 reports the estimated wealth effects for homeowners and renters. A well-known empirical issue in the related literature is that both consumption and housing prices can be driven by common factors, in particular, expectations about permanent income growth or economic prospects. Another issue of concern is reverse causality: higher consumption may increase local employment and thus lead to higher home values (Aladangady, 2017). Therefore, running the simple OLS models is likely to result in a biased estimate of the housing wealth effects. Indeed, the coefficients for renters are

[16] One is added to the relevant variables to avoid logarithms of zero.

positive and significant across models, confirming this concern.[17] Overall, the results suggest that while common factors may play a role across specifications, there seems to be a causal effect of housing wealth on consumption given that the wealth effects are strong for owners and relatively weak for renters.

Table 4. **Housing wealth effects**

Dep. Var.: ln(Total Expenditure)	(1)	(2)	(3)
Owner × ln(HPI)	0.284***	0.267***	0.224***
	(0.0740)	(0.0546)	(0.0695)
Renter × ln(HPI)	0.166*	0.165**	0.113*
	(0.0967)	(0.0639)	(0.0621)
ln(Income)		0.247***	0.167***
		(0.00721)	(0.00684)
Age		-0.00195***	0.000304
		(0.000428)	(0.000385)
ln(Family Size)		0.244***	0.258***
		(0.00961)	(0.0102)
Fixed Effects			
Year × Quarter	YES	YES	YES
MSA × Housing Tenure	YES	YES	
Cohort			YES
Observations	110,622	96,776	96,776
Adjusted R-squared	0.225	0.477	0.617

Notes: This table presents regression results based on Equation 2. The dependent variable is the log of quarterly non-housing total expenditures of each individual household, and variables of interest are the logarithms of the Federal Housing Finance Agency (FHFA) MSA-level quarterly house price index (HPI) interacted with either a homeowner or a renter dummy. As the dataset is not a balanced panel but repeated cross-section survey data, Model 3 includes the cohort fixed effects defined by City × Housing tenure × Employer × Occupation × Marital status × Education × Race. By doing so, Model 3 can exploit within-cohort temporal variation; the other specifications control for MSA-housing tenure instead of the cohort FEs. Additionally, all models include Year × Quarter fixed effects. Robust standard errors in parentheses are clustered by MSA-housing tenure. *** p<0.01, ** p<0.05, * p<0.1

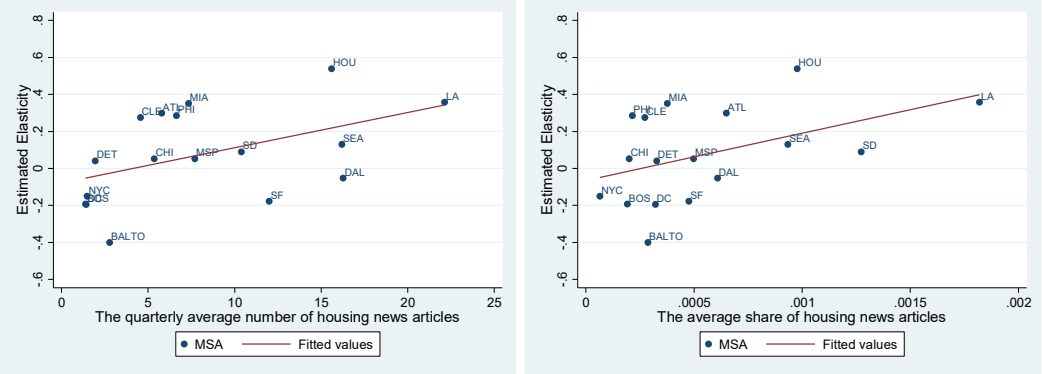
Figure 1 visually presents the cross-sectional and time-series relationships between the housing wealth effect estimates and the media coverage measure. First, I regress the household expenditures on the housing wealth interacted with a group of MSA dummies. By doing so, I can estimate housing wealth elasticity over time for each MSA. Then the estimated elasticity is plotted against the average quarterly number of housing price news articles for the corresponding city (the left graph) or against the average ratio of housing news articles to the total news articles for each city (the right graph) in Panel A. Instead of absolute quantity measures, I also use shares in the right graph because

[17] To address the endogeneity concern, recent empirical work uses the interaction between an exogenous demand shock and housing supply elasticity measured by Saiz (2010) as an instrument for house price growth, and popular demand shifters are national average house prices (Dettling and Kearney, 2014; Chetty and Szeidl, 2017) and long-term interest rates (Chaney et al., 2012; Aladangady, 2017).

some major newspapers are missing in my sample, and thus differences in absolute quantities may not be comparable across cities. Likewise, Panel B plots the estimated quarterly elasticity against each quarter's average number of housing reports and its share of housing reports in the left and right graphs, respectively.

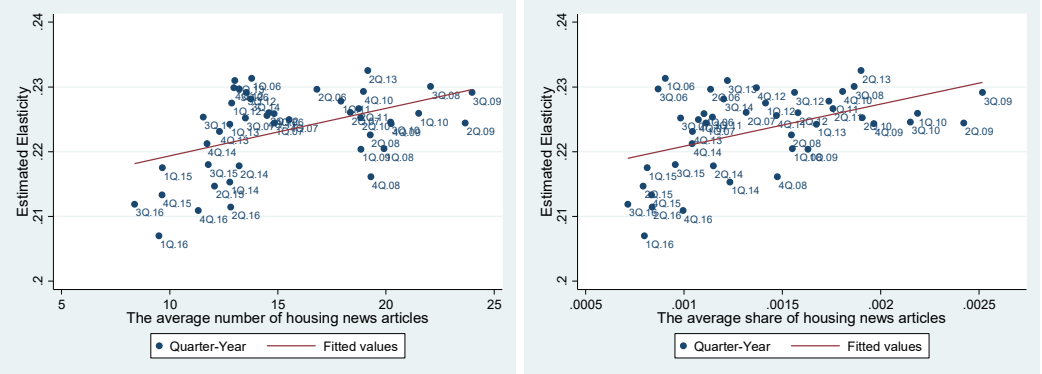
Figure 1. Correlations between wealth effect elasticities and housing news volumes by MSA and by quarter-year

Panel A: By MSA



Notes: Each data point reflects estimated elasticity and a housing news quantity measure for each MSA. The MSA-level elasticity estimates are based on Model 3 of Table 4. By interacting the housing wealth measure with a group of MSA dummies in Equation 2, the estimated parameter on each interaction term can be interpreted as a MSA-specific consumption elasticity with respect to the local housing price index. *The quarterly average number of housing news articles* (Left) and *The average share of housing news articles* (Right) reflect averages over the period from Q1.2006 to Q4.2016. The share is a ratio of the number of housing news articles to the number of all news articles published in the corresponding city.

Panel B: By quarter-year



Notes: All data points reflect elasticities and housing news quantity measures for each quarter-year period. To calculate period-specific elasticities, I interact the housing price variable with a group of quarter-year dummies in Equation 2. *The average number of housing news articles* (Left) and *The average share of housing news articles* (Right) are averages across MSAs during the corresponding period.

The elasticity appears to be correlated with the housing news volumes both across cities and over time. For example, although New York City and Los Angeles are both major American metropolitan cities, New York City sees much less housing news and lower elasticity, while Los Angeles sees more housing news and higher elasticity (Panel A). The housing wealth effects are also larger when more housing reports are published (Panel

B). For example, the effect was relatively large during the housing market bust period from 2008 to 2010, when housing markets received substantial media attention. However, the elasticity estimates declined in the recent years 2014–2016, with less housing news published.

3.2 Baseline Specification

If consumption responses to housing wealth shocks vary systematically with the number of housing news articles, **Equation (3)** can provide a valid identification by characterizing the link graphically displayed in **Figure 1**:

$$\textbf{(3)}\quad y_{i,c,t} = \beta_1\, \rho_{c,t-1}\, z_{c,t} + \beta_2\, z_{c,t} + \beta_3 \rho_{c,t-1} + \boldsymbol{x'}_{i,c,t}\, \boldsymbol{\gamma} + \lambda_t + \phi_{c,j} + \varepsilon_{i,c,t}$$

where $\rho_{c,t-1}$ is the house price index for the previous term $(t-1)$ and is interacted with $z_{c,t}$, the variable of interest in this study, which is the standardized number of housing news articles in city c in year-quarter t.[18] In addition to the same covariates and fixed effects that are used in **Equation (1)**, this specification also controls for a square term of housing prices ($\rho_{c,t}^2$), which could capture the correlation between the housing prices and the number of housing news. Unless publication of housing news (z) is determined by common factors such as expected future income growth, the coefficients for housing prices and squared housing prices would capture the impacts of the omitted variable, thereby recovering an independent effect of media reporting on the elasticity (β_1).

Just like in the previous subsection, this study interacts the three key independent variables with homeowner and renter dummies as in **Equation (4)**. By doing so, I can disentangle the effects on owners and renters:

$$\textbf{(4)}\quad y_{i,c,t} = Owner_i\, [\, \beta_1 \rho_{c,t-1}\, z_{c,t} + \beta_2\, z_{c,t} + \beta_3\, \rho_{c,t-1}] + Renter_i\, [\, \beta_4 \rho_{c,t-1}\, z_{c,t} + \beta_5\, z_{c,t} + \beta_6 \rho_{c,t-1}] + \boldsymbol{x'}_{i,c,t}\, \boldsymbol{\gamma} + \lambda_t + \phi_{c,j} + \varepsilon_{i,c,t}$$

[18] This study standardized the key variable mainly for easier interpretation. Using the logarithm of the number of articles does not make any noticeable differences.

The fully informed utility-maximizing homeowners should consume more than the less-informed in response to high housing prices. But the fully-informed should consume less than the less-informed when housing prices are very low. In other words, more news about housing prices has a positive impact on spending when house prices are high, but a negative impact when prices are low. Therefore, the wealth-spending elasticity should be a function of the volume of housing news, and the function $(\beta_1 z_{c,t} + \beta_3)$ can be obtained by reordering terms (**Equation 5**).[19] Importantly, the validity of this specification depends not only on β_1, but also on β_2. Partial differentiation disentangles housing wealth effects from media effects in **Equation (6)**.[20] Regardless of the volume of housing price news (z), the wealth effect is widely believed to be positive, but more housing reports combined with a positive β_1 could make the consumption response more elastic. That is, an increase of one standard deviation in the number of housing price articles is associated with a β_1 increase in the elasticity. In the meantime, the media effect $(\beta_1\rho + \beta_2)$ is negative when housing prices (ρ) are low enough. Hence, β_2 is expected to be negative. For example, more newspaper articles about distressed housing markets further discourage household consumption. As the housing wealth increases, the media effect becomes positive, and thus β_1 should be positive.

(5) $$y_{i,c,t} = \alpha + \beta_1\rho_{c,t-1}\, z_{c,t} + \beta_2 z_{c,t} + \beta_3\, \rho_{c,t-1} + \varepsilon_{i,c,t} = \left[\alpha + \beta_2\, z_{c,t}\right] + \left[\beta_1 z_{c,t} + \beta_3\right] \rho_{c,t-1} + \varepsilon_{i,c,t}$$

(6) $$y = \alpha + \beta_1\rho z + \beta_2 z + \beta_3\, \rho + \varepsilon \;\Rightarrow\; \partial e = \underbrace{\partial\rho\,(\beta_1 z + \beta_3)}_{Wealth\ Effect} + \underbrace{\partial z\,(\beta_1\rho + \beta_2)}_{Media\ Effect}$$

An empirical concern is unobservable common shocks driving up both housing news publications and the wealth-consumption elasticity. Even when the underlying information is fixed, a local paper's reporting decisions may be correlated to unobserved determinants of the elasticity. For example, a local media outlet is more likely to report

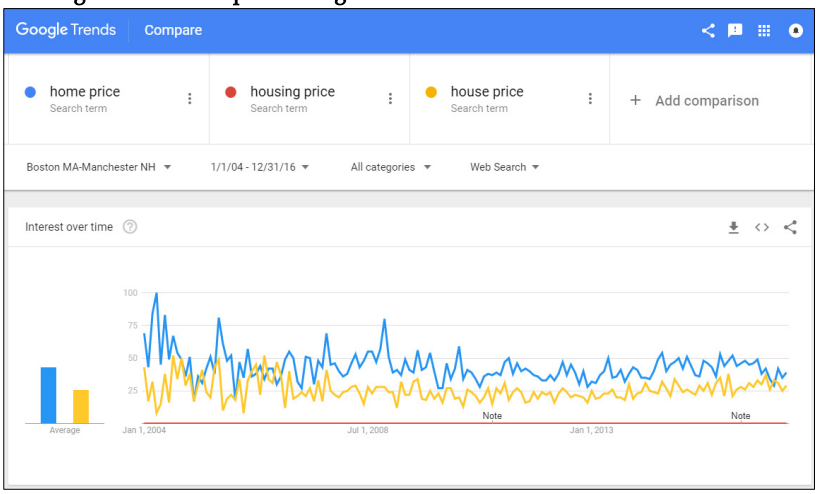
[19] This specification assumes that the elasticity of household expenditures with respect to housing wealth is linear to the housing news volumes.

[20] It is challenging to empirically disentangle the effect of media reporting from the effect of the underlying information reported. Thus, this breakdown simply assumes that each article may be informative in several ways, but the MSA-level housing price index is the only information related to consumption consequences.

housing price dynamics in MSAs where local residents are more interested in the housing market and thus their consumption is more responsive to housing wealth. Therefore, the number of housing news articles may simply reflect local residents' interest in or prior knowledge about housing prices, so it may be endogenous. Basically, this paper addresses this concern by including the cohort fixed effects that capture any time-invariant location- or group-specific heterogeneity. However, it is not impossible that the local citizens' interest in or prior knowledge about local housing prices is time-varying for some reason or other. To further alleviate this concern, I include two additional control variables.

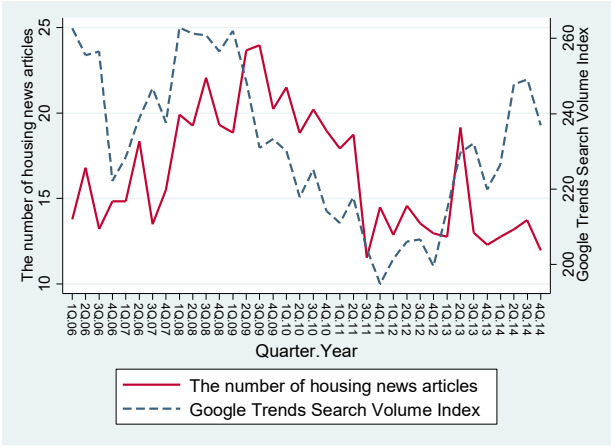
The first control variable is the Google Trends Search Volume Index (GSVI), used as a measure of internet users' attention to certain topics such as housing prices. Google Trends allows users to obtain a query index for a specific phrase. Attention to housing prices may be correlated with Google search volumes, as Google is the most commonly used online information source. Several recent works make use of the search query data to measure internet users' attention. For example, Da et al. (2011) show that an increase in the search volume index predicts an increase in stock prices during the next two weeks, and more recently, Chauvet et al. (2016) develop a mortgage default risk index using the Google data and find that their index is also predictive of housing market sentiment and performance. In this paper, I use "home price," "housing price," and "house price" as search queries on the Google Trends website in order to capture local residents' general interest in housing prices by MSA-quarter; **Figure 2** shows an example for Boston. I then add the indices for the three search terms to construct a quarterly panel for the MSA-level search index. **Figure 3** shows that local searches for housing prices on Google appear to be somewhat predictive of the number of housing news articles published during the U.S. subprime mortgage crisis period and the following Great Recession from 2007 to 2011.

Figure 2. An example of Google Trends Search Index for Boston



Notes: This figure shows a screen shot of the monthly Google Trends Search Indices for the search queries, "home price" (blue line), "housing price" (red line), and "house price" (yellow line) for the metropolitan Boston area. All three indices are normalized so that the period with the maximum search volume takes 100, which is assigned to March 2004 of the "home price" index. As a result, the other values of indices represent relative search volumes instead of absolute volumes. For example, the term "housing price" has relatively zero search volume over the period compared to the maximum value (March 2004, "home price").

Figure 3. Time-series trends of the number of housing articles and the Google search index



Notes: The red solid line denotes the quarterly time-series trend of the MSA-level average numbers of housing news articles published by all newspapers in the sample during each quarter (left axis). The blue dash line presents the average Google Trends Search Volume Index across MSAs in the sample (right axis). To calculate the Google index, I use three search queries, "home price", "housing price", and "house price", for each MSA, and add up the indices from the three search terms to construct a quarterly MSA-level index.

The other control variable is the share of construction and real estate industries in the local GDP. Unobservable industry-specific shocks may exert an influence on media reporting as well as the consumption elasticity for the following two reasons.[21] In MSAs

[21] A typical concern in the housing wealth literature is that the fall in housing wealth and consumption simply reflects the decline in the recession-prone construction industry (Mian, Rao and Sufi, 2013).

where construction and real estate industries account for a larger fraction of the city economy, residents' consumption may be more responsive to housing prices, not only because their current or future incomes are highly correlated with the housing market performance but also because they are likely to obtain more and better house price information from their workplace or peers. At the same time, the large contribution of related industries to the local GDP can possibly affect the number of housing price reports by contributing to the advertising revenues of local newspapers. When newspapers sell more advertising to these industries, the media outlets are more likely to decide to cover topics that are relevant to their clients. To address this issue, I add the share of construction and real estate industries in the state-level GDP, using the Gross-Domestic-Product-by-Industry Data provided by the Bureau of Economic Analysis (BEA). As MSA-level data is available only on a yearly frequency, I instead use the state-level quarterly GDP shares of the industries as a control variable.

Table 5 presents the baseline regression results. Model 1 is a standard specification for the wealth effect, and Model 3 allows the consumption elasticity to vary according to the number of news articles conveying house price information by including the interaction term. The number of housing news articles is strongly correlated with the consumption elasticity. Specifically, an increase of one standard deviation in the number of housing price reports raises homeowners' consumption elasticity by 0.0813 (Model 3). Importantly, in the absence of the interaction term, housing prices have a significant effect on homeowner consumption while the housing news effect is insignificant (Model 2). However, adding the interaction term makes the housing wealth effect disappear, but the media effect becomes significant with a negative sign, as expected (Model 3). The results indicate that the quantity of housing price news reports may be a main driver of the observed housing wealth effects, although interpretation of the coefficient for housing prices has strong limitations due to the omitted common shocks. A concern is that the effect of the interaction term is also economically and statistically significant for renters,

implying that common factors may be driving up both the news publications and the consumption elasticity.[22]

Table 5. **Results: baseline specifications**

Dep. Var.: ln(Total Expenditure)	(1)	(2)	(3)	(4)	(5)	(6)
Owner × ln(HPI)	0.224***	0.220***	-0.299	-1.268	-0.970	-0.134
	(0.0695)	(0.0796)	(0.837)	(0.920)	(1.111)	(1.208)
Owner × z(#Housing News)		0.00576	-0.438***			-0.459***
		(0.00937)	(0.154)			(0.153)
Owner × ln(HPI) × z(#Housing News)			0.0813***			0.0852***
			(0.0280)			(0.0279)
Owner × ln(Google Index)				0.293		0.386
				(0.514)		(0.571)
Owner × ln(HPI) × ln(Google Index)				-0.0579		-0.0742
				(0.0964)		(0.107)
Owner × GDP Share RE-Const.					-1.823	3.980
					(8.506)	(10.64)
Owner × ln(HPI) × GDP Share RE-Const.					0.478	-0.605
					(1.551)	(1.957)
Renter × ln(HPI)	0.113*	0.0828	-0.460	-0.285	-1.115	0.549
	(0.0621)	(0.0553)	(0.865)	(1.049)	(1.085)	(1.367)
Renter × z(#Housing News)		0.0179**	-0.292*			-0.350**
		(0.00892)	(0.154)			(0.164)
Renter × ln(HPI) × z(#Housing News)			0.0564**			0.0672**
			(0.0271)			(0.0290)
Renter × ln(Google Index)				1.404**		1.276*
				(0.696)		(0.747)
Renter × ln(HPI) × ln(Google Index)				-0.265**		-0.240*
				(0.126)		(0.134)
Renter × GDP Share RE-Const.					-2.302	2.336
					(8.667)	(8.919)
Renter × ln(HPI) × GDP Share RE-Const.					0.559	-0.311
					(1.614)	(1.680)
Observations	96,776	90,052	90,052	96,199	96,776	89,475
Adjusted R-squared	0.617	0.617	0.617	0.617	0.617	0.618

Notes: This table presents regression results from Equation 4, the baseline specification. The dependent variable is the log of quarterly non-housing total expenditures of each individual household. *ln(HPI)* is the logarithm of the Federal Housing Finance Agency (FHFA)'s MSA-level house price index. *Owner* and *Renter* are indicators capturing whether the household is a homeowner or a renter. *z(#Housing News)* is the standardized number of housing news articles varying by MSA and quarter-year. *Google Index* denotes Google Trends Search Indices for three search queries, "home price", "housing price", and "house price". *GDP Share RE-Const.* is the share of construction and real estate industries in the state-level quarterly GDP; I use the state-level GDP, as the MSA-level GDP is available only at yearly frequency. As the dataset is repeated cross-sections, all models include the cohort fixed effects defined by City × Housing tenure × Employer × Occupation × Marital status × Education × Race in order to exploit within-cohort temporal variation for identification. All models also control for time-varying household characteristics and Year × Quarter fixed effects. Robust standard errors in parentheses are clustered by MSA-housing tenure. *** p<0.01, ** p<0.05, * p<0.1

Interestingly, the Google search index has a significantly negative effect on renters' elasticity and an insignificant but negative effect on that of owners. One interpretation is that while the number of newspaper articles may be a measure of information that is passively received, the Google search index may reflect the attention of active

[22] Despite the fact that rising house prices could have negative effects on renters because they are potential homebuyers, the estimated coefficients for renters are consistently positive.

information seekers in housing markets, who are mostly renters or potential homebuyers. By googling, they become better informed about housing prices than homeowners, and therefore the search index volumes should have a negative impact on renters' consumption responses to rising house prices, as seen in column 4. Some homeowners may plan to move and therefore probably actively search for housing prices on the internet. That might be the reason for the negative coefficient for homeowners.

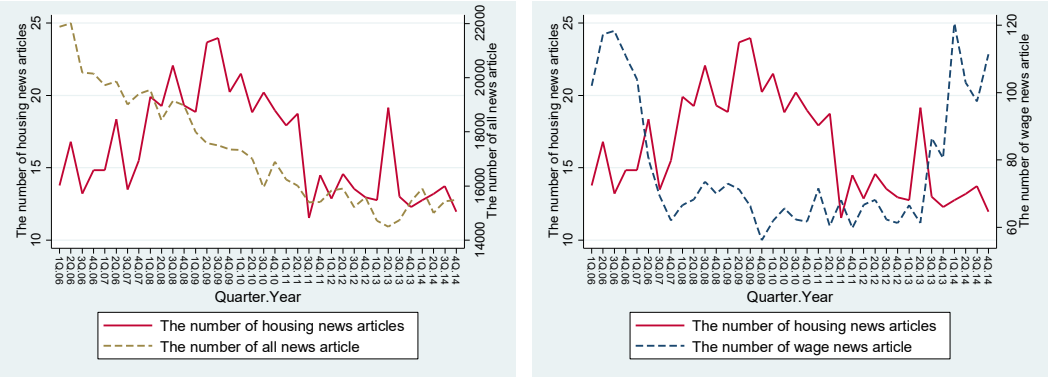
3.3 Placebo Tests

The findings of **Table 5** may be due to random chance as opposed to a true causal effect. To relieve the concern, this paper conducts a couple of placebo tests.

The first placebo treatment is the number of wage news articles. It is plausible that housing price news contains information about incomes or wages that can affect consumption. When house prices go up, wage expectations may go up concurrently. Wage news is identified as newspaper articles that include the keyword "wage" but exclude "home," "housing," and "house". The housing terms are excluded to isolate the effect of information on wages or future income expectations from that of housing price information. If this study finds similar regression results for the wage news conveying no housing market information, then the estimated impact of housing news can be considered badly biased.

The second is the number of all news articles. The number of housing price reports may simply capture general trends in the media markets. The growth of local media markets or advertising revenues is possibly associated with household consumption, not only because more advertising sales are affected by a strong local economy but also because more advertising may boost consumption. Generally speaking, advertising revenues for U.S. newspapers have dropped since 2004, largely due to declining circulation and the growing domination of online advertising options (Chandra and Kaiser, 2015). As a result, the total number of newspaper reports have also declined, as shown in **Figure 4**.

Figure 4. Time-series trends of the number of housing news, all news, and wage news articles



Notes: These figures show time-series relationships between the variable of interest (the number of housing news article) and two control variables (the numbers of all news and wage news articles). The left graph plots the quarterly time-series trends of the MSA-level average numbers of housing news articles (red solid line, left axis) and all news articles (yellow dash line, right axis) published by all newspapers in the sample during each quarter. In the right graph, the blue solid line denotes the MSA-level average number of wage news articles published by all the sample newspapers during each quarter. A wage news includes a keyword, "wage", but excludes all the three queries, "home", "housing", and "house", in its headline and body.

However, both all news and wage news articles present negative impacts (Models 2 and 3 of **Table 6**). A plausible reason for the negative effect of all news is that more information simply means more divided attention to news about a specific topic such as housing prices, considering that people have only limited amounts of time and cognitive resources to process information. As a consequence, household consumption may become less responsive to housing wealth. Also, it may be a spurious correlation. In recent years, housing prices have recovered, whereas the number of newspaper articles has drastically declined. Yet there are no causal relationships between the two trends. The negative coefficient for wage news might be due to macroeconomic policies. Wage-related policies are strongly determined by present economic conditions. During a recession, politicians usually call for an increase in the minimum wage to stimulate consumption, but their concern is the negative impact of high labor costs during the next phases of a business cycle. Thus, such discussions in newspapers may have a countereffect on the consumption elasticity. Media coverage of policy discussions on an increase in the minimum wage could encourage households to consume more even during an economic downturn, when housing prices usually plummet. Notably, using both placebo news articles as additional control variables helps to further recover the causal effect of media coverage (Model 4), implying that the wage information may be to some extent correlated with the housing price information. As the effects of the

interaction and housing price news for renters become insignificant, the endogeneity issue is considerably alleviated.

Table 6. **Results: placebo tests**

Dep. Var.: ln(Total Expenditure)	(1)	(2)	(3)	(4)
Owner × ln(HPI)	-0.134	-2.311*	-2.576**	-1.328
	(1.208)	(1.219)	(1.190)	(1.203)
Owner × z(#Housing News)	-0.459***			-0.368**
	(0.153)			(0.151)
Owner × ln(HPI) × z(#Housing News)	0.0852***			0.0681**
	(0.0279)			(0.0276)
Owner × z(#All News)		0.389*		0.0803
		(0.199)		(0.192)
Owner × ln(HPI) × z(#All News)		-0.0718*		-0.0123
		(0.0381)		(0.0365)
Owner × z(#Wage News)			0.378***	0.325**
			(0.144)	(0.157)
Owner × ln(HPI) × z(#Wage News)			-0.0704***	-0.0609**
			(0.0269)	(0.0293)
Renter × ln(HPI)	0.549	-1.638	-1.765	-0.338
	(1.367)	(1.183)	(1.251)	(1.478)
Renter × z(#Housing News)	-0.350**			-0.269
	(0.164)			(0.216)
Renter × ln(HPI) × z(#Housing News)	0.0672**			0.0524
	(0.0290)			(0.0385)
Renter × z(#All News)		0.179		0.0978
		(0.142)		(0.191)
Renter × ln(HPI) × z(#All News)		-0.0388		-0.0227
		(0.0271)		(0.0351)
Renter × z(#Wage News)			0.132	-0.0136
			(0.196)	(0.216)
Renter × ln(HPI) × z(#Wage News)			-0.0253	0.00238
			(0.0368)	(0.0402)
Observations	89,475	91,734	91,734	88,572
Adjusted R-squared	0.618	0.619	0.619	0.618

Notes: The dependent variable is the log of quarterly non-housing total expenditures of each individual household. *ln(HPI)* stands for the log of the FHFA's MSA-level house price index. *Owner* and *Renter* are indicators capturing whether the household is a homeowner or a renter. *z(#Housing News)* is the standardized number of housing news articles varying by MSA and quarter-year. *z(#All News)* and *z(#Wage News)* are the standardized numbers of all news and wage news articles, respectively. As the dataset is repeated cross-sections, all models include the cohort fixed effects. All models also control for time-varying household characteristics, the *Google Trends Search Index,* the share of construction and real estate industries in the state-level quarterly GDP, and Year × Quarter fixed effects. Robust standard errors in parentheses are clustered by MSA-housing tenure. *** p<0.01, ** p<0.05, * p<0.1

3.4 Headline Effect

For further causal investigations, this subsection identifies the headline effect. The variable of interest in this study is the number of newspaper articles for which the headline includes "home," "house," "housing," "property," or "real estate," and the headline or the body includes "housing price," "house price," or "home price." If an article conveying house price information captures local readers' dynamic interest in housing prices or any other omitted variables that can affect local elasticity, then the

article should do so even without housing terms in its headline. **Table 7** presents an example. The left panel shows one of the articles included in the key variable; it has "home" in its headline and "home price" in its body. The article on the right also provides readers with similar information about housing prices, but its headline does not include any housing term. Considering the underlined phrases, "the first quarter-over-quarter improvement in three years" (left) and "its first quarterly increase in three years" (right), a common information source seems to have influenced both of these articles published on the same date by two neighboring local papers.[23] The article on the left is obviously about housing market trends, and the one on the right is more about general economic conditions. However, both of the articles appear to reflect local readers' interest in housing prices or similar supply-side factors affecting media reporting.

Table 7. **Example: headlined and non-headlined housing news articles**

	Headlined housing news article	**Non-headlined housing news article**
Newspaper	Chicago Sun-Times (Chicago, IL)	Daily Herald (Arlington Heights, IL)
Date	Aug 25, 2009	Aug 25, 2009
Headline	Chicago home prices rise in June	Consumer sentiment improves more than expected
Body	Home prices in the Chicago metropolitan area rose 1.1 percent in June over May, but were down 16.7 percent from a year earlier according to the latest Standard & Poor's Case-Shiller home price index. Nationally, prices rose 2.9 percent in the second quarter from the first quarter, the first quarter-over-quarter improvement in three years. But prices were down 14.9 percent from a year earlier. "For the second month in a row, we're seeing some positive signs," David Blitzer, chairman...	Consumer sentiment rose more than expected in August and expectations hit the highest level since the recession began, indications that Americans' pessimism about the economy may be lifting. The housing sector also showed signs of life as a national measure of home prices posted its first quarterly increase in three years. The New York-based Conference Board said today its Consumer Confidence index rose to 54.1 from an upwardly revised 47.4 in July. Economists surveyed...

Notes: Both the articles were published on the same date by two local newspapers within a metropolitan area. The left article is included in the key explanatory variable whereas the right is included in the control variable. In this study, a housing news article includes "home", "house", "housing", "property" or "real estate" in its headline, and also includes "housing price", "house price" or "home price" in its headline or body. In contrast, a non-housing-headlined news article includes "housing price", "house price" or "home price" in its body, but does not include any of the five terms, "home", "house", "housing", "property", and "real estate" in its headline. As examples, the left article (a housing news article) includes "home" in its headline, as well as "Home prices" in its body. The right (a non-housing-headline news article) includes "home prices" in its body without any housing terms in its headline. Given the underlined phrases, both may be influenced by an unobservable common factor, but have different effects on readers.

[23] It is possible that housing report volumes simply capture time-varying local residents' interests in housing markets or prices that potentially are influenced by other information channels rather than local newspapers in the sample. Therefore, coverage of other media outlets could jointly determine the newspaper reporting and the consumption responses to housing wealth.

Figure 5. Relationships between the numbers of headlined and non-headlined housing articles

Notes: These figures show relationships between the number of headlined housing news articles and the number of non-headlined housing news articles by newspaper (left) and over time (right). Each data point in the left panel reflects the total number of housing news articles and that of non-headlined news articles published by a local newspaper from 2006 to 2016. The right graph plots the quarterly time-series trends of the MSA-level average numbers of housing (red solid line) and non-housing-headlined news articles (green dash line) published by all newspapers in the sample during each quarter.

By taking advantage of this pattern, I estimate the effect of the number of articles in which the body includes "housing price," "house price," or "home price" but whose headline does not include any of the five terms "home," "house," "housing," "property," and "real estate"; I call these "non-headlined housing news" or "non-headlined news" hereafter. The non-headlined news articles largely consist of two groups. Most of them focus on non-housing economic issues but more or less relate the main issues to housing prices. Thus, the number of such reports could capture the extent to which local readers are interested in housing markets. The other group includes reports about the housing market with a less straightforward headline. In this case, I assume that whether the headline includes any of the housing terms is random, so this group can partially capture the treatment effect but does not bias the estimated treatment effect. **Figure 5** displays strong correlations between the headlined and non-headlined housing news articles across newspapers and over time.

However, only headlined housing news has a statistically significant effect on the wealth effect elasticity (**Table 8).** If the number of housing news is endogenous, then the non-headlined news is also likely to have a significant effect, but it does not.[24] Thus this result substantially alleviates the endogeneity issue. Controlling for the number of non-

[24] I assume that it is random whether or not each housing news article includes housing terms in its headline.

headlined news articles, the treatment effect becomes statistically more significant for homeowners (Model 3). Due to the non-headlined news, the treatment effect may largely capture the effect of headlining, and this result is consistent with a recent study's finding that about 60% of news articles are shared on Twitter without even being read (Gabielkov et al., 2016).

Table 8. **Results: headline effect**

Dep. Var.: ln(Total Expenditure)	(1)	(2)	(3)
Owner × ln(HPI)	-1.328	-2.439**	-1.537
	(1.203)	(1.202)	(1.212)
Owner × z(#Housing News)	-0.368**		-0.418***
	(0.151)		(0.156)
Owner × ln(HPI) × z(#Housing News)	0.0681**		0.0780***
	(0.0276)		(0.0286)
Owner × z(#Non-Headlined)		-0.104	0.0718
		(0.124)	(0.121)
Owner × ln(HPI) × z(#Non-Headlined)		0.0173	-0.0152
		(0.0229)	(0.0221)
Renter × ln(HPI)	-0.338	-1.546	-0.579
	(1.478)	(1.491)	(1.503)
Renter × z(#Housing News)	-0.269		-0.286
	(0.216)		(0.269)
Renter × ln(HPI) × z(#Housing News)	0.0524		0.0558
	(0.0385)		(0.0479)
Renter × z(#Non-Headlined)		-0.0584	0.0449
		(0.189)	(0.215)
Renter × ln(HPI) × z(#Non-Headlined)		0.0107	-0.00903
		(0.0345)	(0.0392)
Observations	88,572	88,572	88,572
Adjusted R-squared	0.618	0.618	0.618

Notes: The dependent variable is the log of quarterly non-housing total expenditures of each individual household. *ln(HPI)* stands for the log of the FHFA's MSA-level house price index. *Owner* and *Renter* are indicators capturing whether the household is a homeowner or a renter. *z(#Housing News)* and *z(#Non-Headlined)* are the standardized numbers of respectively headlined and non-headlined housing news articles varying by MSA and quarter-year. As the dataset is repeated cross-sections, all models include the cohort fixed effects. All models also control for time-varying household characteristics, the *Google Trends Search Index,* the share of construction and real estate industries in the state-level quarterly GDP, the standardized numbers of all news and wage news articles, and year-quarter fixed effects. Robust standard errors in parentheses are clustered by MSA-housing tenure. *** p<0.01, ** p<0.05

4. Conclusion

Different economic decisions may come from different information environments. In particular, recent behavioral models offer theoretical and empirical evidence that households extrapolate from past prices to infer unobservable current-period prices in housing markets. To what extent, then, might publicity affect the behavior of the extrapolative homeowners who may not actively seek price information? This paper pays particular attention to the volume and frequency of information on past house prices, and tests whether the lagged housing market information can increase consumption

responses to house prices. By using the number of articles conveying house price information in local newspapers, I robustly find that information from news media can alter homeowner decisions, thereby increasing the elasticity of consumption with respect to housing wealth. The more frequently households are informed about past house prices, the larger consumption growth we can expect in response to similar housing price appreciation. Therefore, these findings suggest that disparity in the amount of information available to different individuals may function as a friction in the macroeconomic policy process and thereby render interventions less effective or less consistent than anticipated.

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