



# Housing Supply Challenges and Solutions

#LiveAtUrban

# Housekeeping

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- The recording will be posted online after the webinar
- All participants are muted
- Type your **questions** or **comments** into the Q&A box at any time.





# Housing Supply Challenges and Solutions

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# Freddie Mac Research on Filtering in Owner Occupied Housing

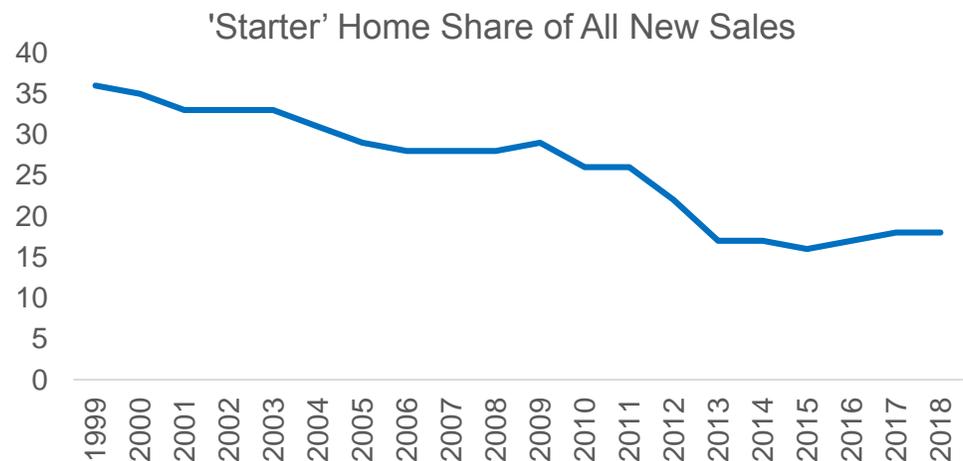
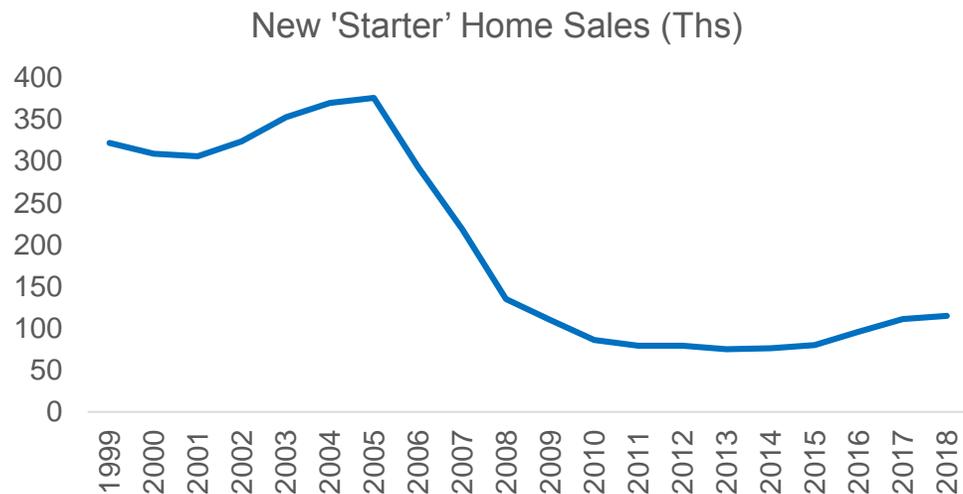
April 2020

*Opinions, estimates, forecasts and other views presented are those of the authors, do not necessarily represent the views of Freddie Mac or its management, should not be construed as indicating Freddie Mac's business prospects or expected results.*

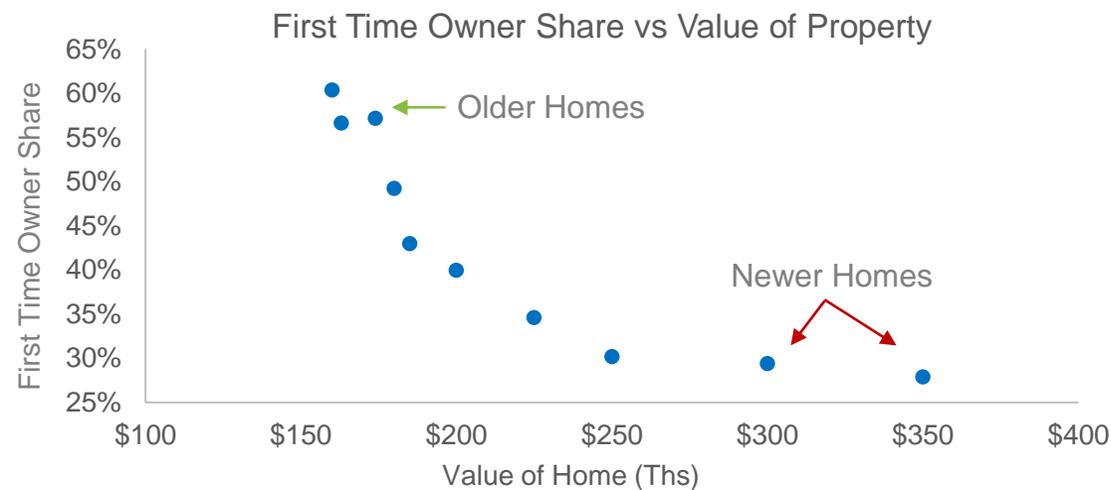
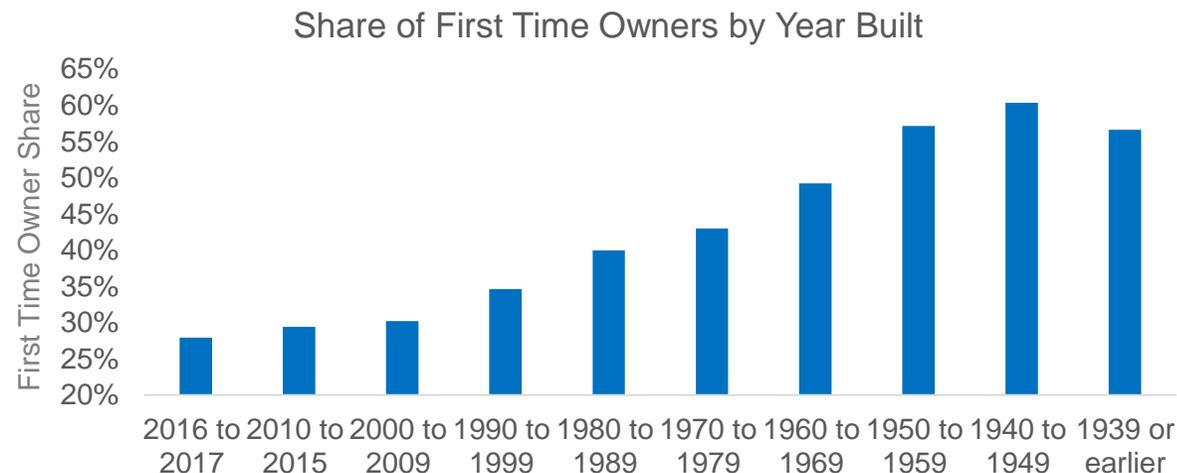
# Why Study Filtering? Most First Time Homebuyers Purchase Older Homes Because they are Affordable



## New Starter Homes Declining to Very Low Levels...



## ...Which Leads First Time Buyers to Purchase an Older Home



Source: Bureau of the Census. Starter homes defined as those under 1,800 square feet.

# How Does the Market 'Produce' Affordable Homes For Entry-Level Buyers? Filtering



- Filtering is the process by which properties age, depreciate into affordability and are purchased by lower income households.
- Most existing research uses traditional Census data which limits geographical granularity and recency of analysis
- New Freddie Mac uses internal data to extend prior research with analysis on metro areas and within metro areas
- Conclusions:
  - » Homes historically have filtered down by about 0.4 percent a year
  - » Substantial variation in filtering rates across MSAs and markets with rapid price appreciation are reverse filtering
  - » Strong intra-metropolitan area spatial filtering rate patterns
  - » Variability of filtering rates across and within metropolitan areas has implications for housing policy
  - » Presentation is based on 'Geographic and Temporal Variation in Housing Filtering Rates,' paper by Liu, McManus, and Yannopoulos.

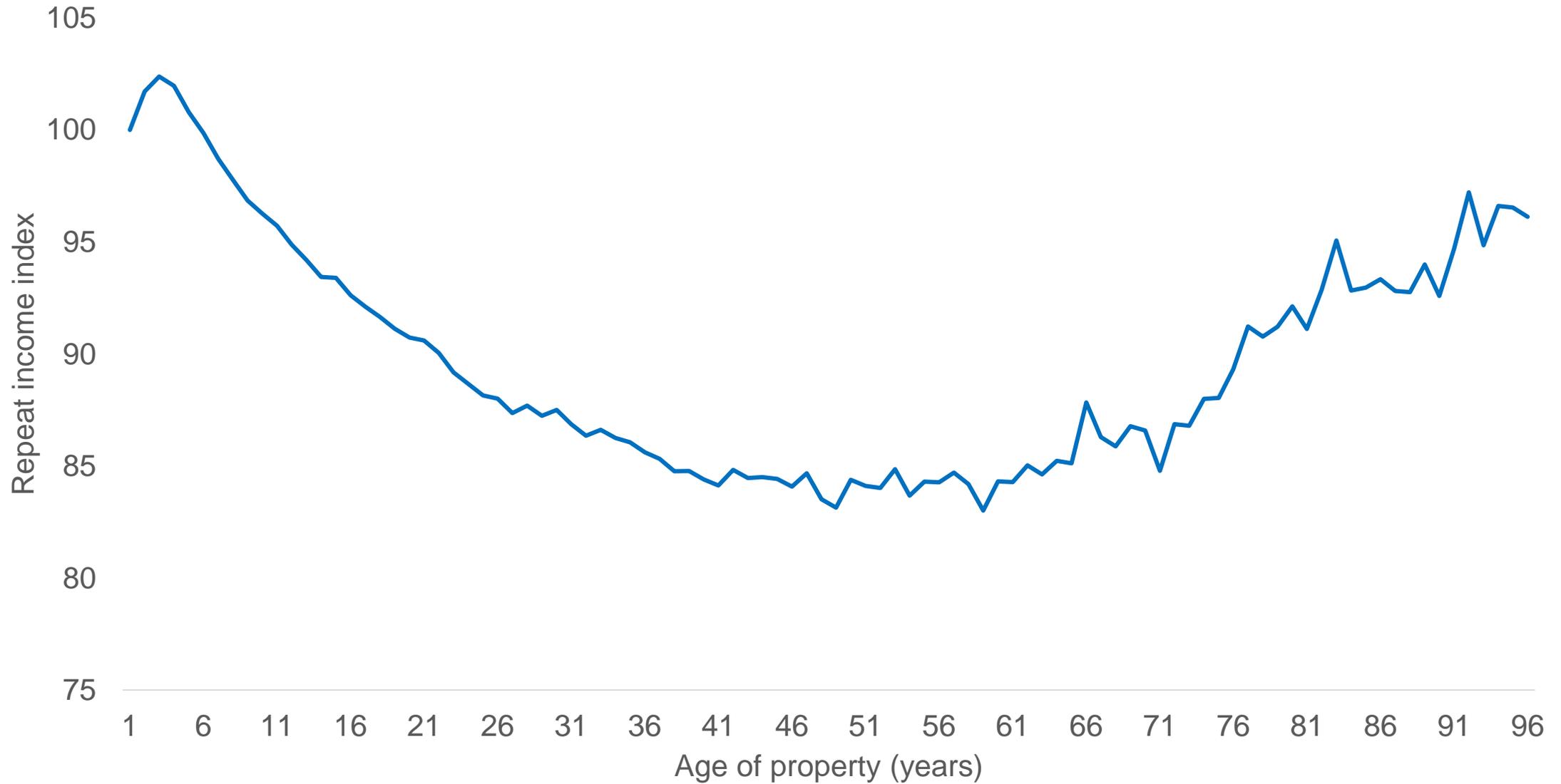
## ■ Data

- » Owner-occupied 1-unit purchase mortgages funded by Freddie Mac
- » Includes mortgages originated from 1993 through 2018 for properties built after 1900
- » Only use repeat pairs where the year built is the same for both sales to exclude teardowns
- » Final sample contains 1.2 million repeat pair transactions.

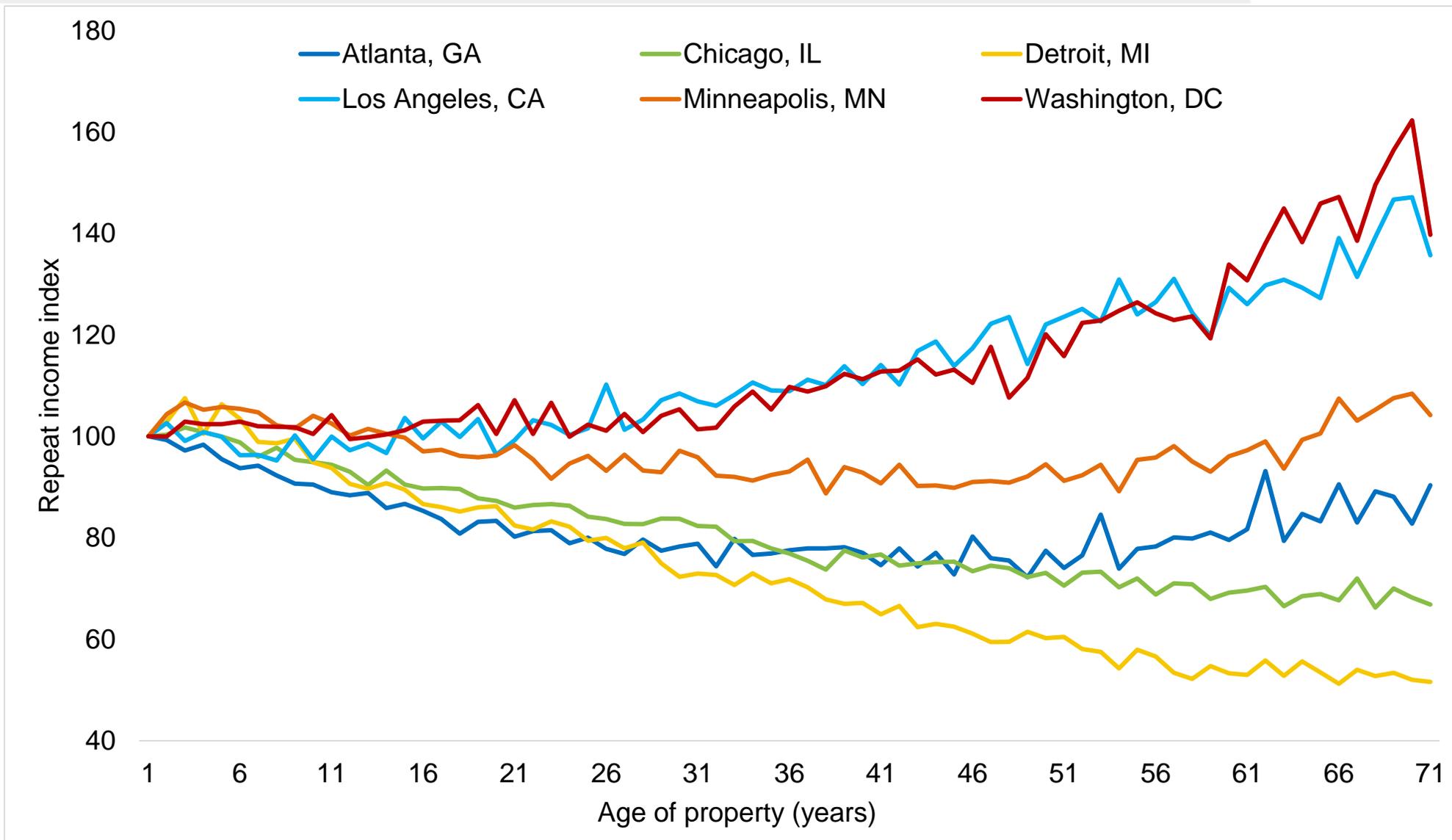
## ■ Method

- » Calculate 'repeat' income for the same property as it transacts over time from the time it was built.
  - For example, a home is built and sold in 2000 to a household with \$10,000 in real monthly income (\$120,000 annual income).
  - The same home sells again in 2018 to a household with \$7,500 in real monthly income (\$90,000 annual income).
  - The annual decline in income for that home is -1.6%, which is the filtering rate
  - Repeat income index shows the estimated income ratio of new occupants relative to the original occupants, for each property age.

# Incomes Filter Down by -0.4% Annually or About 16% for a 40 Year old Typical US Home But Older Homes Reverse Filter



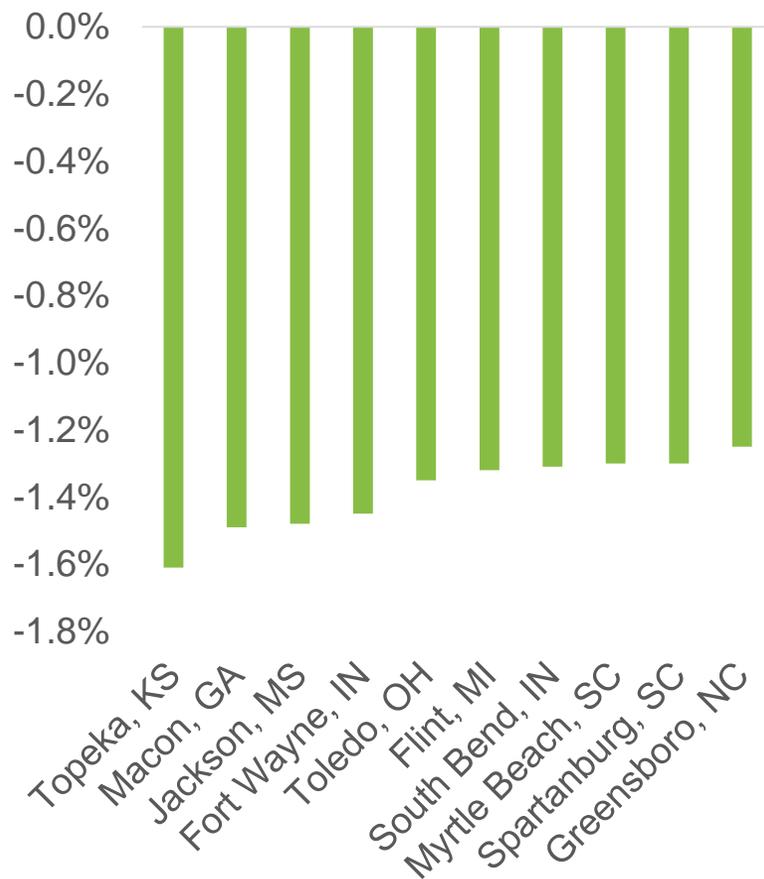
# Income Filtering Rates Widely Differ for Large Metropolitan Areas and Reverse Filtering Occurring in Areas With Most Affordability Issues



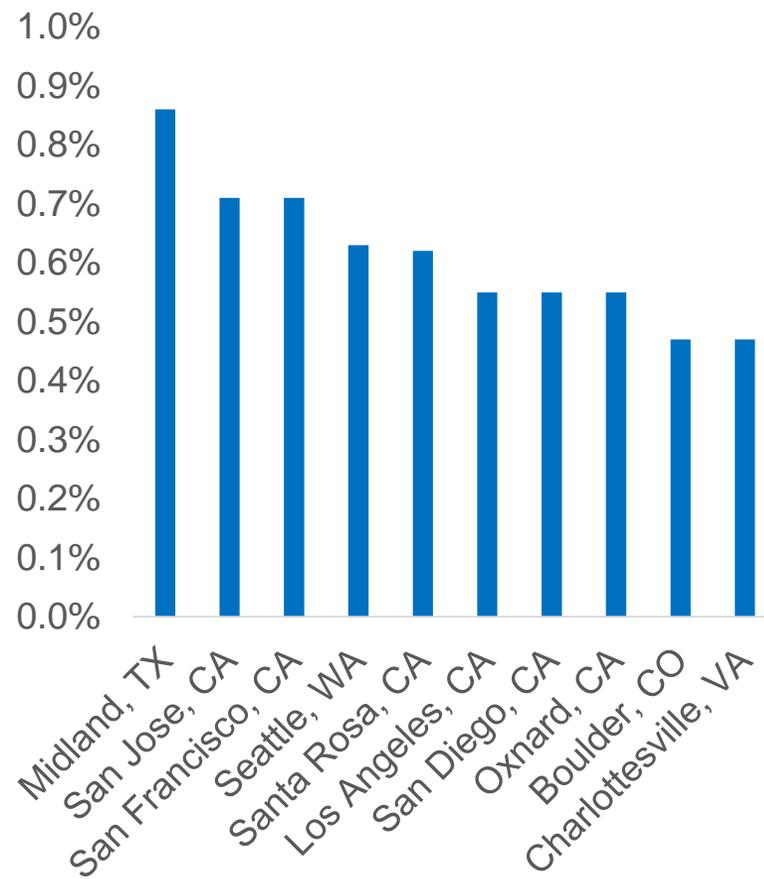
# Substantial Differences in Income Filtering by Metropolitan Areas Due to Large New Supply Differences



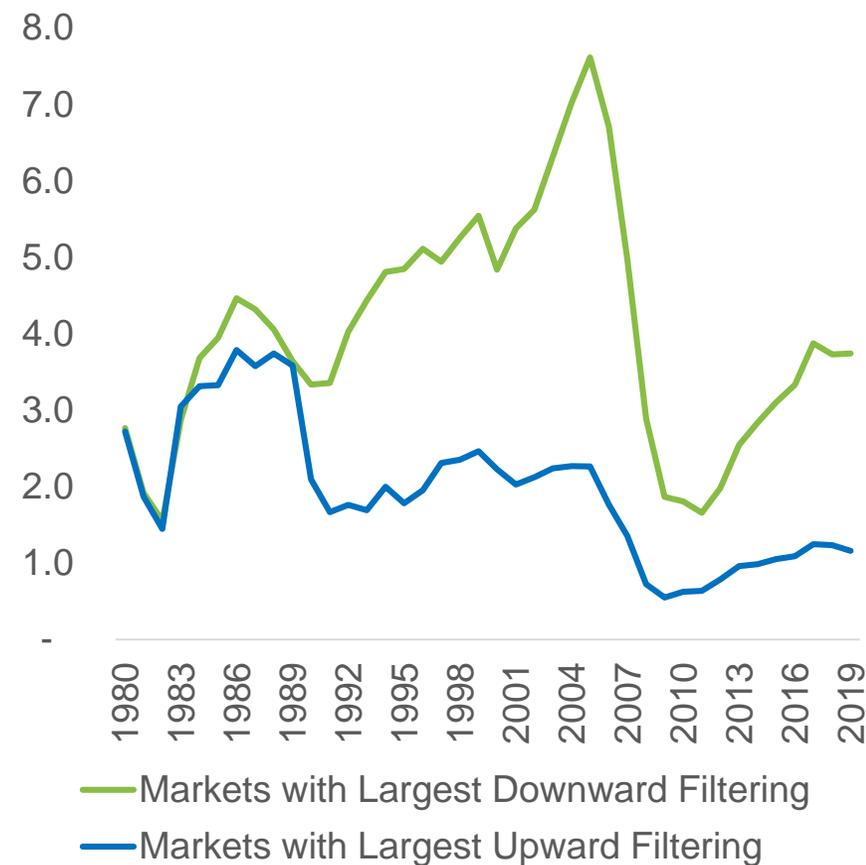
### Markets w/Largest Downward Filtering



### Markets w/Largest Upward Filtering

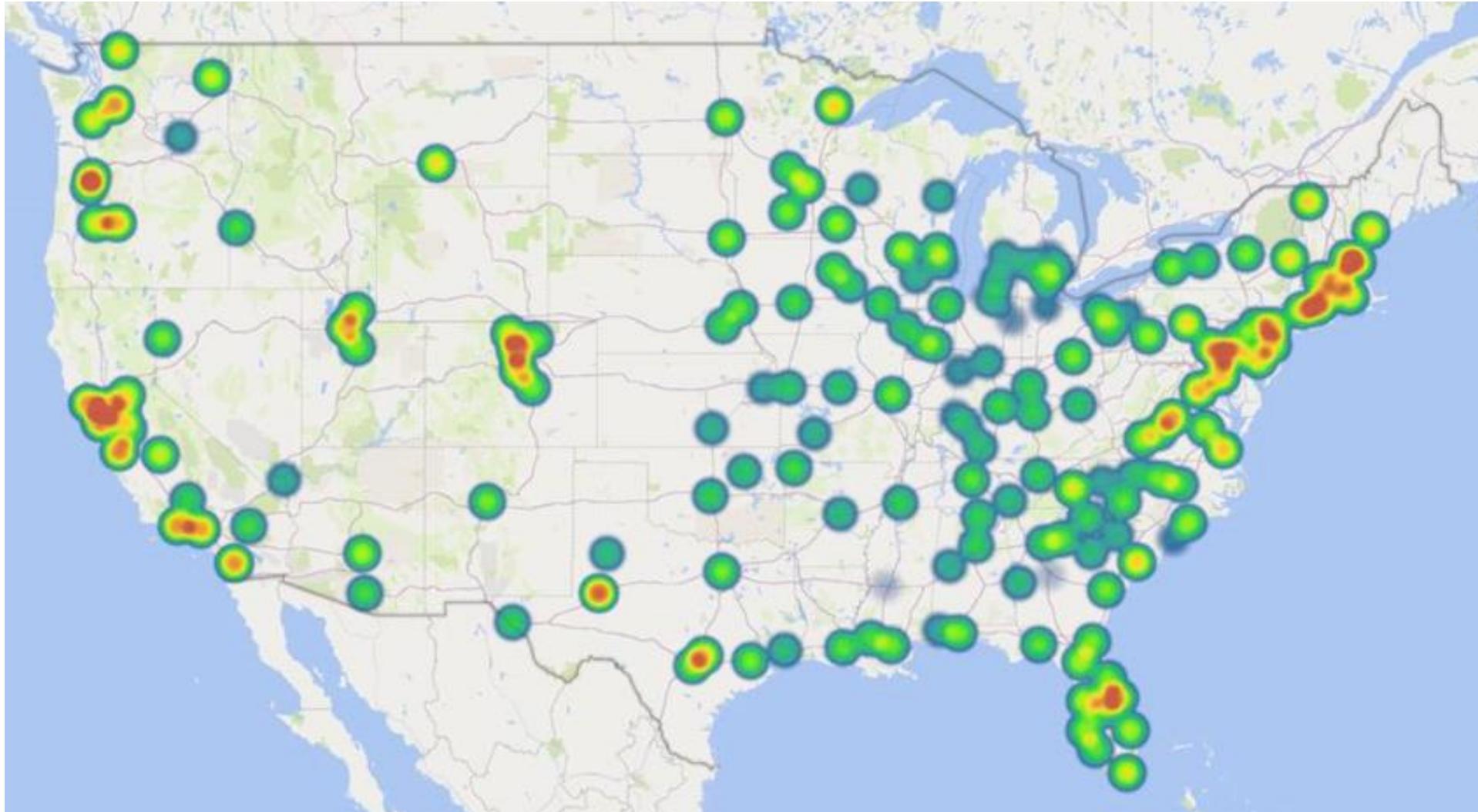


### Per Capita Single Family Construction Permits

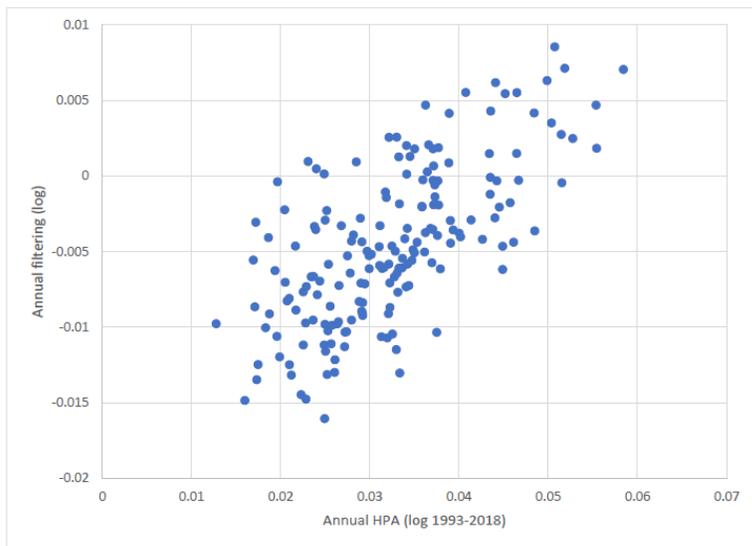


Source: Bureau of the Census

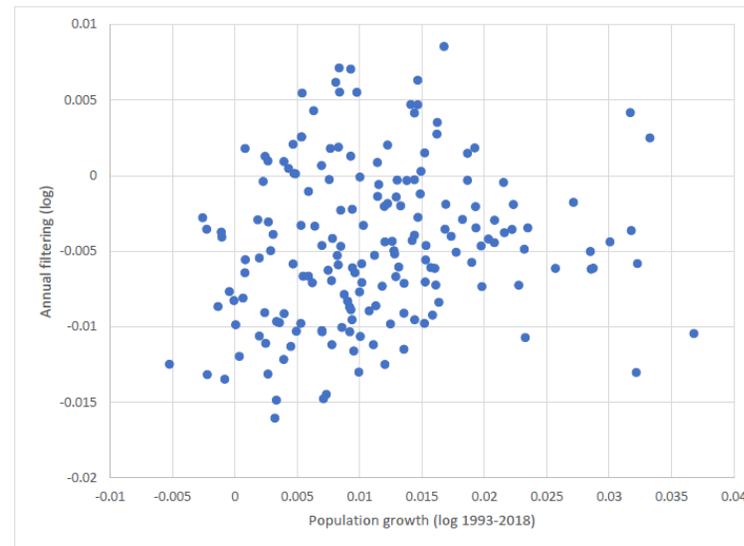
# Upward Filtering Occurring Primarily on Coasts, But Some 'Open West' Markets Exhibit Similar Trends



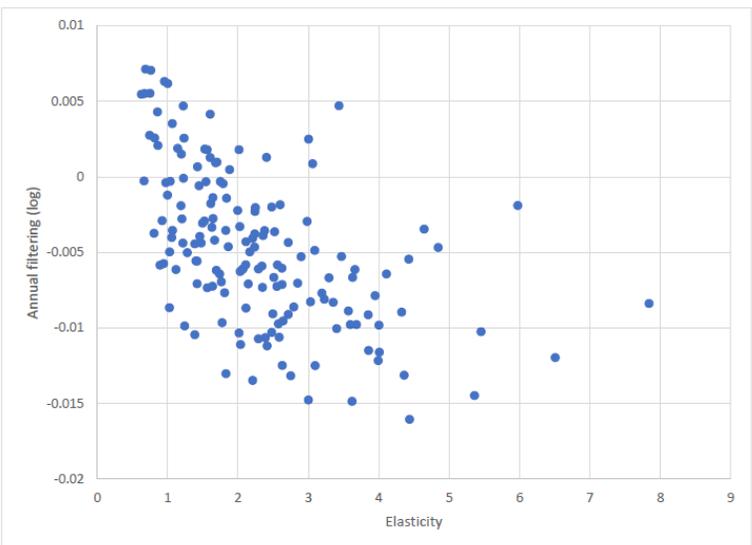
# Filtering is correlated to price growth, income growth and elasticity of markets but not population growth



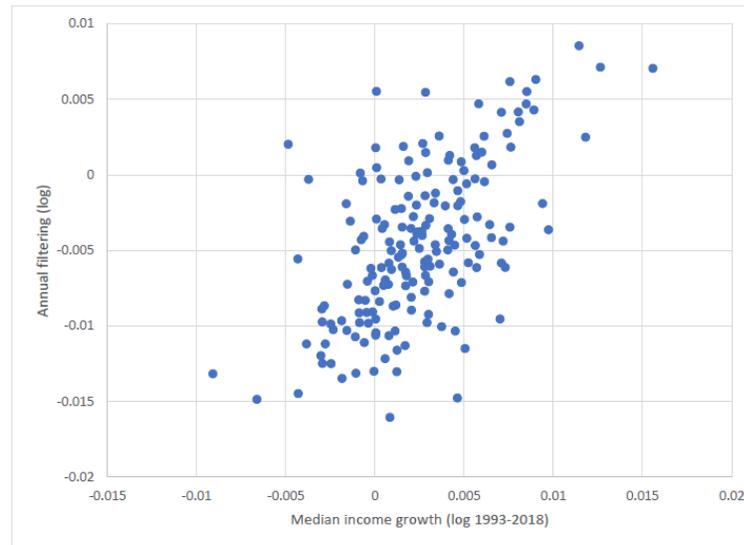
← Filtering positively correlated to home price growth



← Little relationship between filtering and population growth

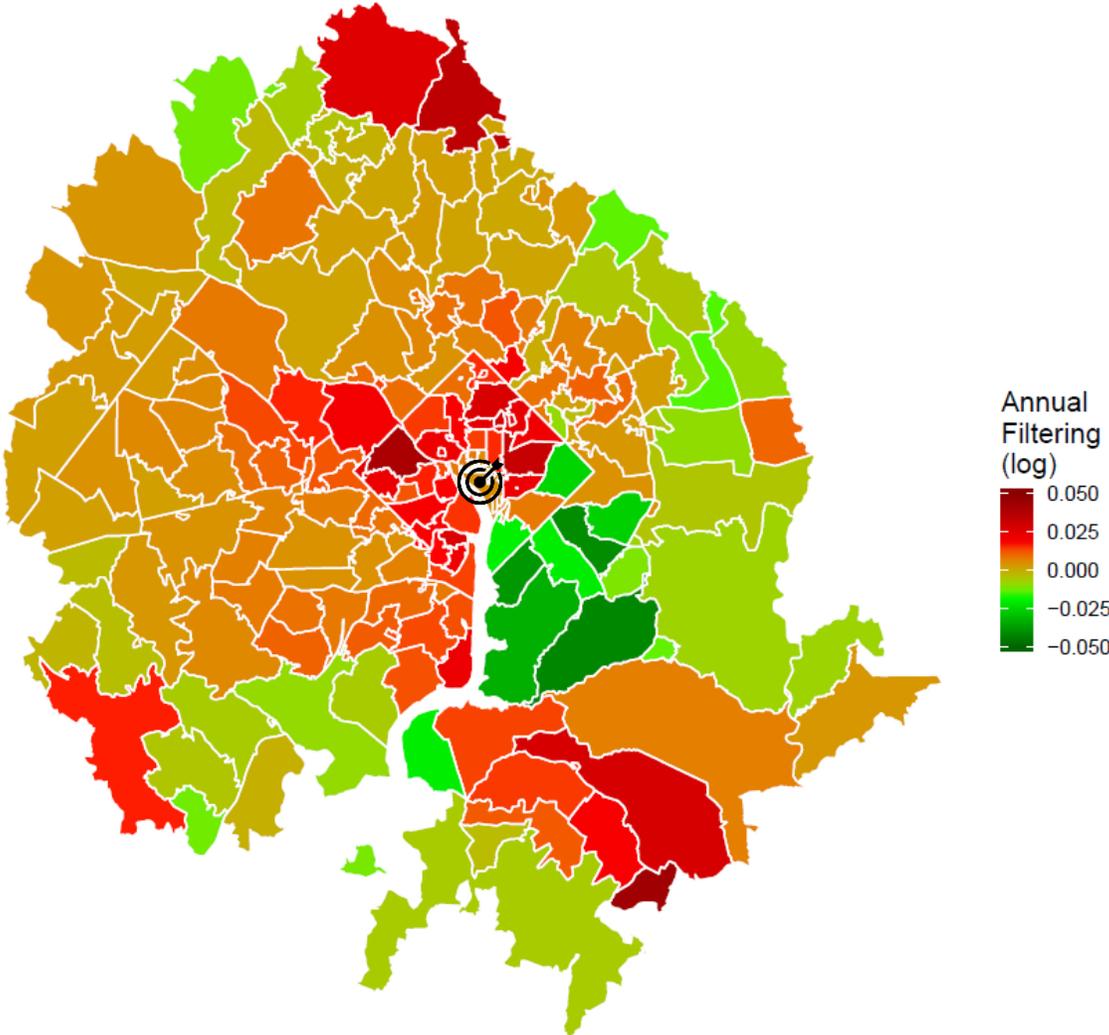


← Filtering negatively correlated to supply elasticity

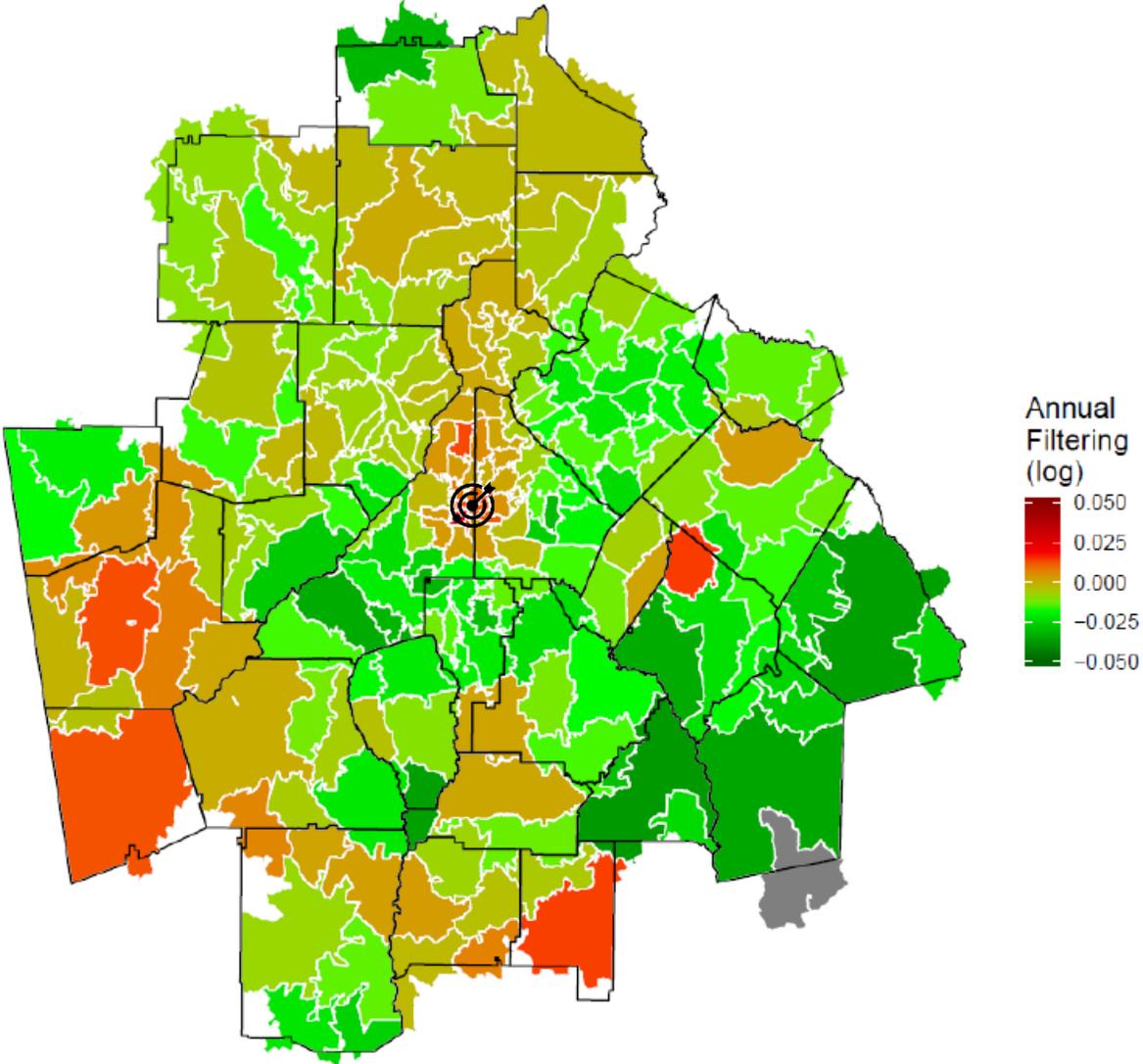


← Positive relationship between income growth and filtering

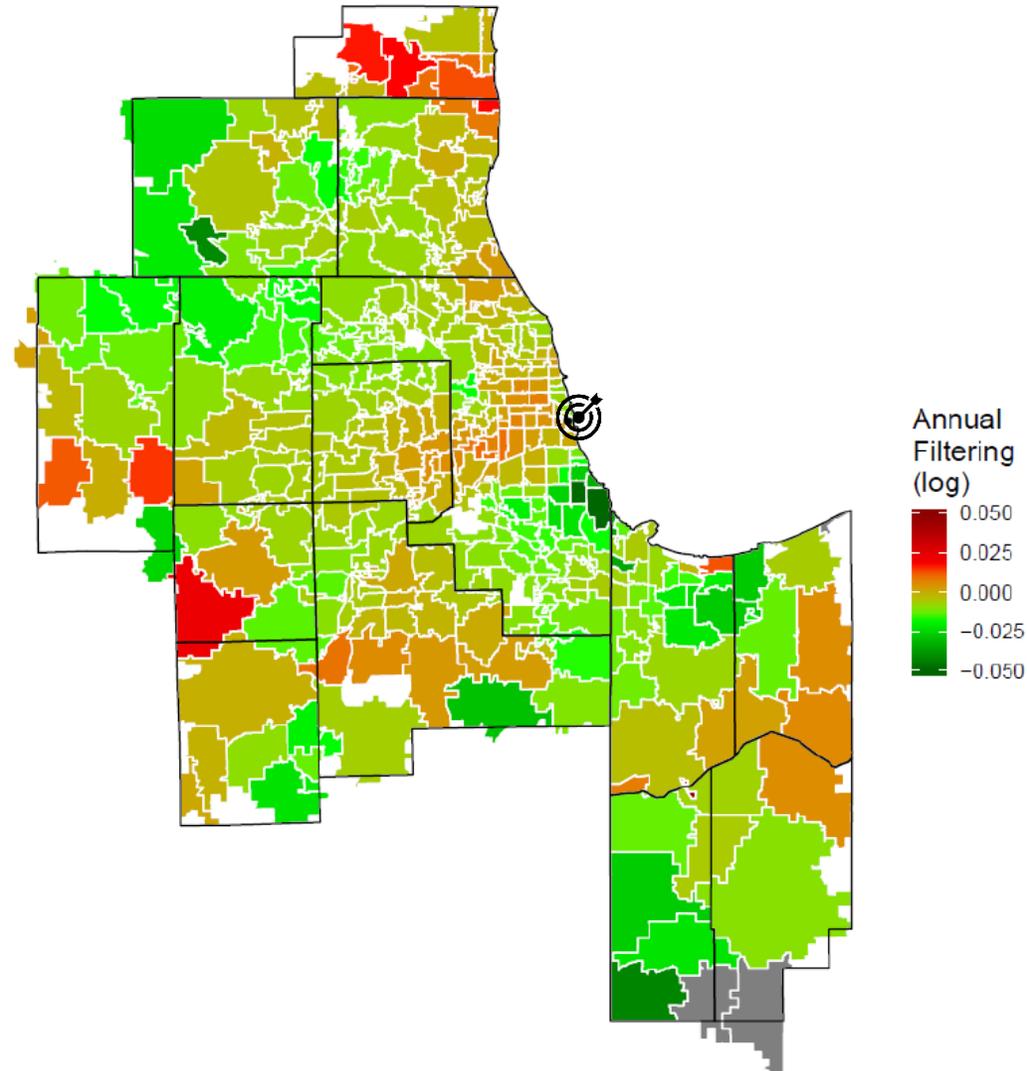
# Washington DC: Upward Income Filtering Rates in DC, Arlington, Alexandria but Downward Filtering in Prince George's



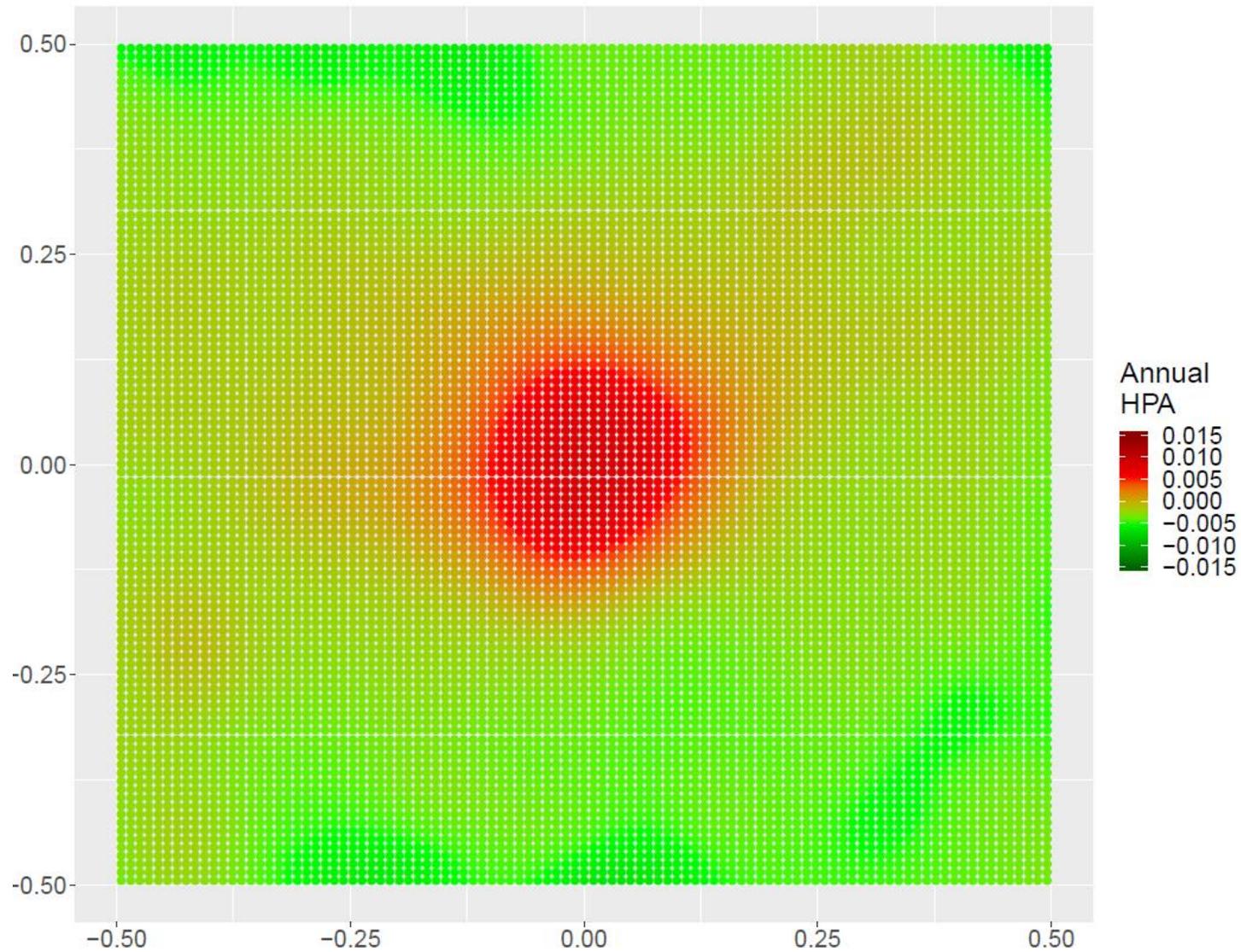
# Atlanta: Income Filtering Rates Higher in CBD but Generally Downward Filtering Outside of Downtown



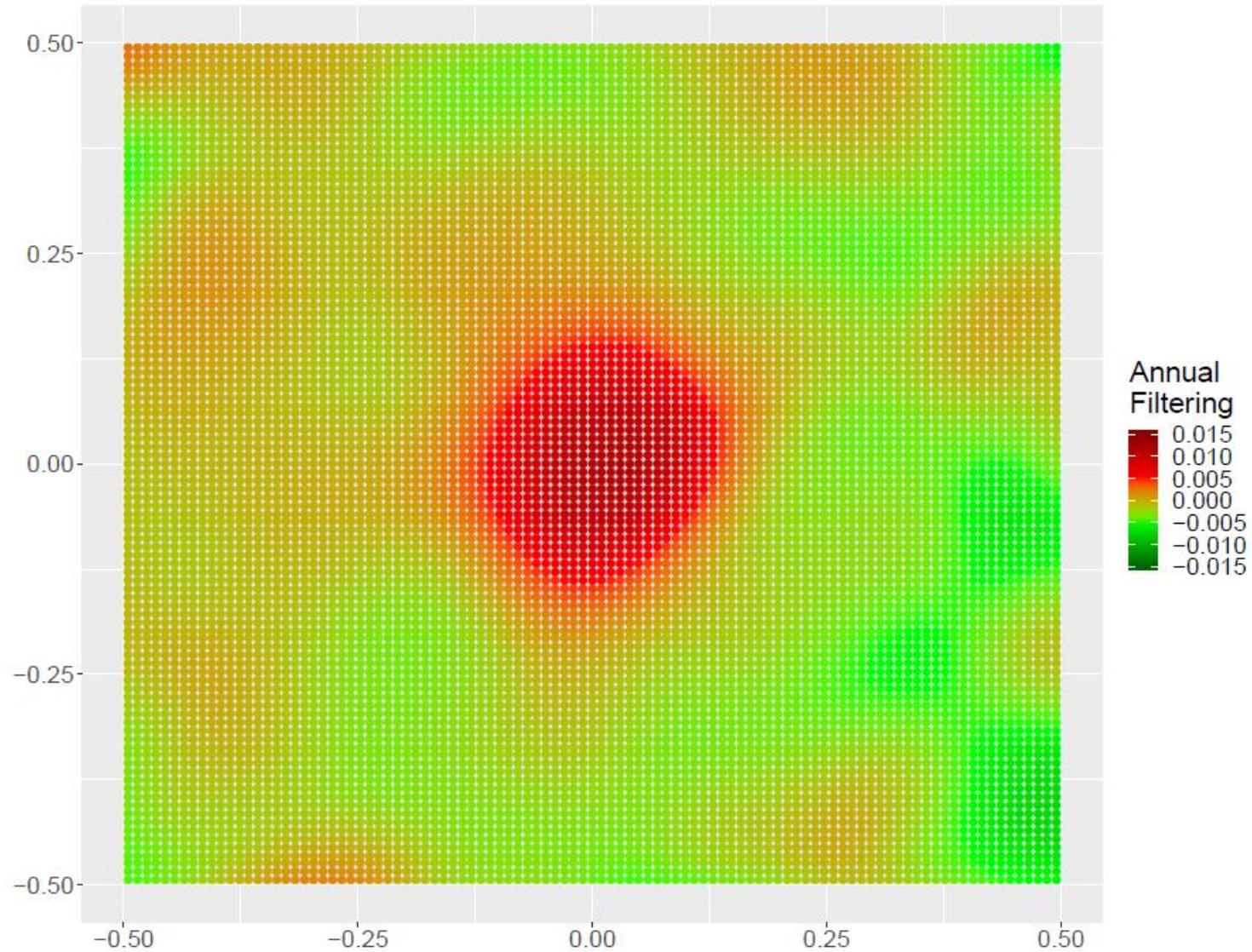
# Chicago: Income Filtering Rates Higher Downtown and West of City, But Overall Chicago is Downward Filtering



# Pooled HPA Deviations for 26 Largest MSAs Shows Annual Home Price Increases Much Higher Near the City Core



# Pooled HPA Deviations for 26 Largest MSAs Shows Annual Income Filtering Much Higher Near the City Core with Modest Filtering in Suburbs



- » Homes historically have filtered down by about 0.4 percent a year and filtering is an important source of supply for low to moderate income households
- » Substantial variation in filtering rates across metros and markets with rapid price appreciation are reverse filtering
- » There is even greater variation in filtering within metropolitan areas, but city cores have more persistent upward filtering
- » Variability of filtering rates across and within metropolitan areas has implications for migration, sorting, homeownership and housing policy



# Housing Supply Challenges and Solutions

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# Using Property Records in Housing Research

## Demonstration from Research on Evictions Under Rent Control

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Brian J. Asquith

W. E. Upjohn Institute

Urban Institute  
"Housing Supply Challenges and Solutions"  
April 21, 2020

## Property-Level Panel Data is Improving Housing Research

- ▶ Growing data availability has been great for research.
- ▶ Previously, had to rely more on Census data, or infrequent local housing surveys, which often comes with data limitations.
- ▶ For example, empirical research on rent control was dormant until recently:
  - ▶ Autor, Palmer, and Pathak (2014) study residential price appreciation after the removal of rent control.
  - ▶ Diamond, McQuade, and Qian (2019) study how tenants and landlords altered behavior when newly-controlled.
- ▶ Other papers in areas such as gentrification (Brummet and Reed (2019); Li (2019)), and evictions (Collinson and Reed (2019)) have also harnessed property-level records to great effect.

# Property Records in Housing Research

- ▶ Property records are to housing research what administrative data is to labor economics research.
  - ▶ These data permit tracking buildings over time, and allow us to control for all sorts of building-specific characteristics.
- ▶ Pros:
  - ▶ Buildings are immobile, change little over time, and are thus relatively easier than people to track longitudinally.
  - ▶ Most building data are public record and can often be acquired for free or a fairly reasonable price.
- ▶ Cons:
  - ▶ Acquisition can be a challenge. Many counties have digitized only a limited number of years.
  - ▶ Data quality is often not a high priority for assessor's offices.
  - ▶ Record linkage to other datasets can usually only occur by address—a notoriously fraught matching field.

## Framing

This talk will discuss overcoming challenges working with property records by means of my own paper on examining eviction patterns under rent control in San Francisco.

- ▶ Paper title: “Do Rent Increases Reduce the Housing Supply Under Rent Control? Evidence from Evictions in San Francisco”

**Research Question: How do controlled landlords change their supply in response to changes in market rents?**

Existing empirical papers on US rent control have exploited one-off events where rent control was added or removed from buildings.

This paper's chief contribution is to use credible variation to empirically study supply dynamics *within* a controlled system.

# Housing Supply Dynamics Under Rent Control

## Why might housing supply dynamics be different under rent control than in the “normal” housing market?

- ▶ Modern rent control regimes try to guarantee:
  - ▶ Secure housing via automatic lease renewal.
  - ▶ Affordable rents via annual rent increase caps.
- ▶ Policymakers allow some evictions, aware that forbidding evictions would create severe moral hazard.
  - ▶ So housing isn't perfectly secure: “just-cause” evictions still exist.
- ▶ They also want landlords to realize some return on their holdings, so that “rent-controlled” is not synonymous with substandard.
  - ▶ Inter-tenancy vacancy decontrol and annual rent increases.
- ▶ Taken altogether, there are substantial incentives for landlords to selectively turnover tenants via at-fault evictions.

## Evictions Also Threaten Long-Run Supply

- ▶ Policymakers do not impose controls on new buildings to encourage fresh supply.
  - ▶ Demolishing and rebuilding your building frees it from rent control.
- ▶ Policymakers have also faced lawsuits alleging undue private property rights infringements.
  - ▶ US cities with rent control thus permit “no-fault” evictions to withdraw housing from the controlled market. In SF, these are:
    - 1 Ellis Act evictions. Landlords hope to win demolition permits of now-vacant buildings.
    - 2 Allow one family member to claim a unit (Owner Move-In).

## Property Data

- ▶ 2,373,721 property-year records (~191,000 residences) acquired from the San Francisco's Assessor-Recorder's Office.
- ▶ From the City Planners Office:
  - ▶ Building Permits, January 1980-February 2016
  - ▶ Demolition Permits, January 1980-February 2016
  - ▶ Certificates of Occupancy, June 2001-June 2014
- ▶ Eviction Data
  - ▶ Controlled Evictions (January 1992-January 2018) from SF Rent Board
    - ▶ The final dataset is a joint collaboration between myself and Kate Pennington of UC Berkeley.
  - ▶ Uncontrolled Evictions (June 2003-February 2014) manually collected from SF Superior Court filings.

The property-to-eviction matching process was done by address - a very slow and painful process.

## Introduction: Testing the Hypothesis

**Objective:** Test whether controlled landlords increase or decrease supply via evictions.

- 1 **At-Fault Evictions** Landlords increase their vacancy rate by tactically evicting individual tenants in response to perceived market movements.
- 2 **No-Fault Evictions** Landlords decrease their housing supply by removing one (OMI) or all (Ellis Act) units for 3-5 years.
- 3 **Repair Permits** Landlords may choose instead to increase (or reduce) their housing maintenance (Arnott and Shevyakhova, 2014).

### **Free-Market Rent Shock Modeling Strategy:**

Technology companies' commuter shuttle stop placements allow me to compare buildings in areas that did and did not experience a free-market price increase.

## Introduction: Testing the Hypothesis



## Tech Shuttle Empirical Strategy

A key problem is now that the shuttles were not randomly distributed in time and space throughout San Francisco, raising the specter of endogeneity bias.

- ▶ Thus, I have to create an instrument for shuttle placement. Or, a series of variables unrelated to condo prices (and latterly, evictions) but can predict shuttle placement.

**Solution:** Exploit preexisting placements of large public bus stops (length  $\geq$  50 ft.), which are the only ones large enough to accommodate the shuttles.

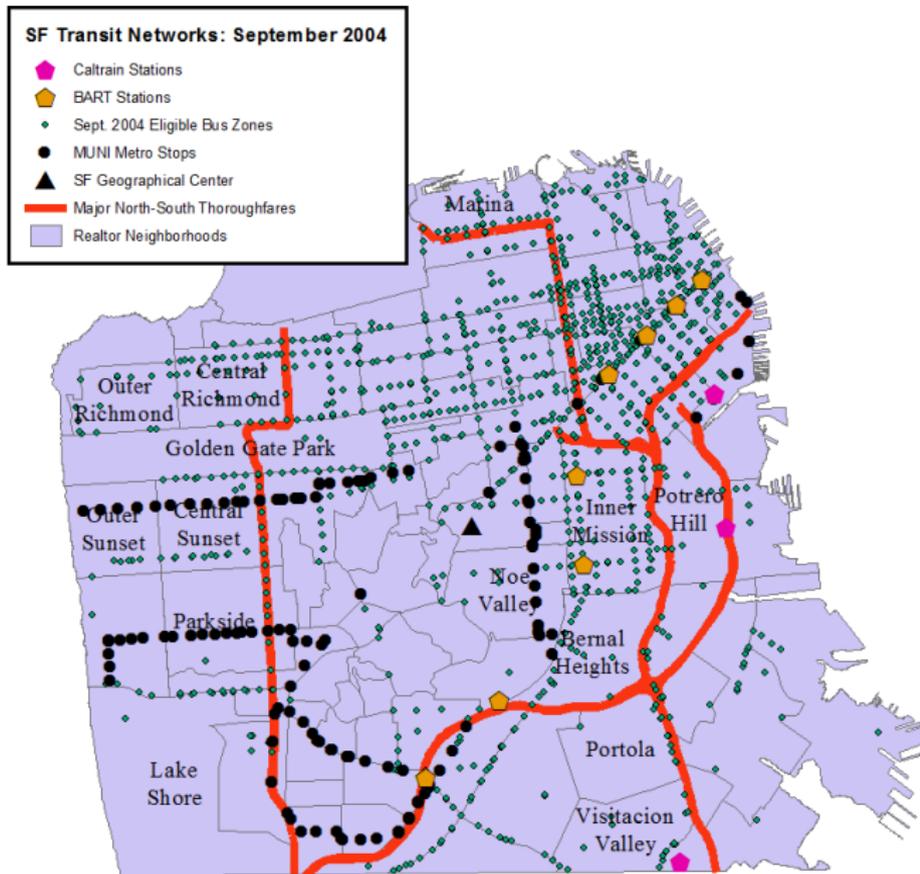
# Tech Shuttle Empirical Strategy



## Public and Private Transit Data

- ▶ Public transit information came from SFMTA, BART, and CalTrain.
- ▶ Shuttle stop location data were hand-collected.
- ▶ All information was merged together in ArcGIS to provide a complete mapping of transit to buildings.

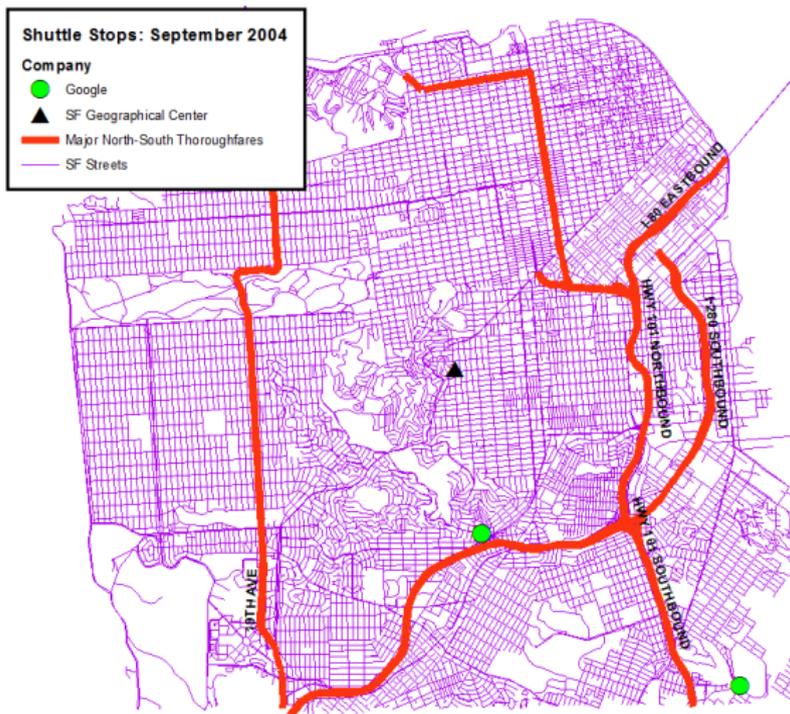
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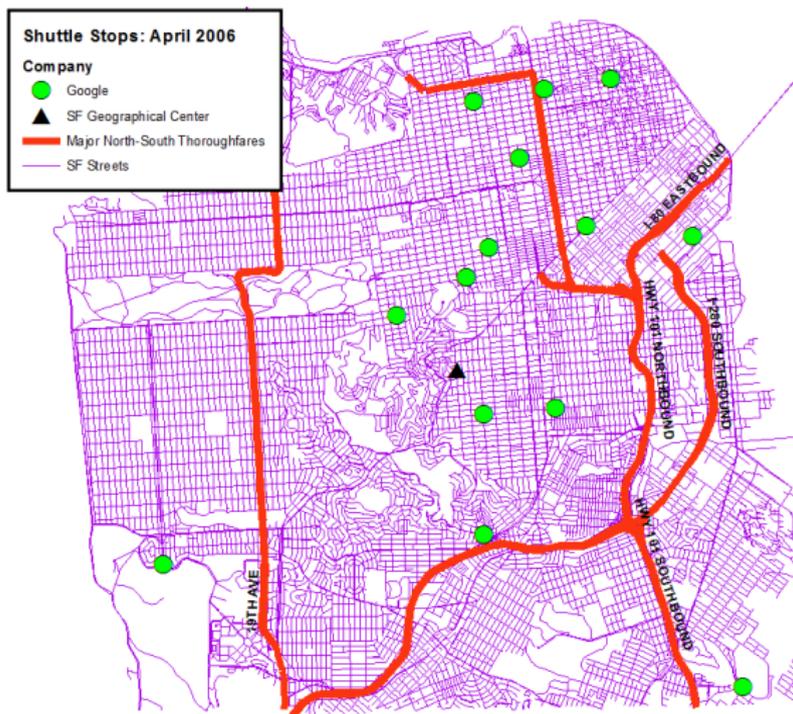
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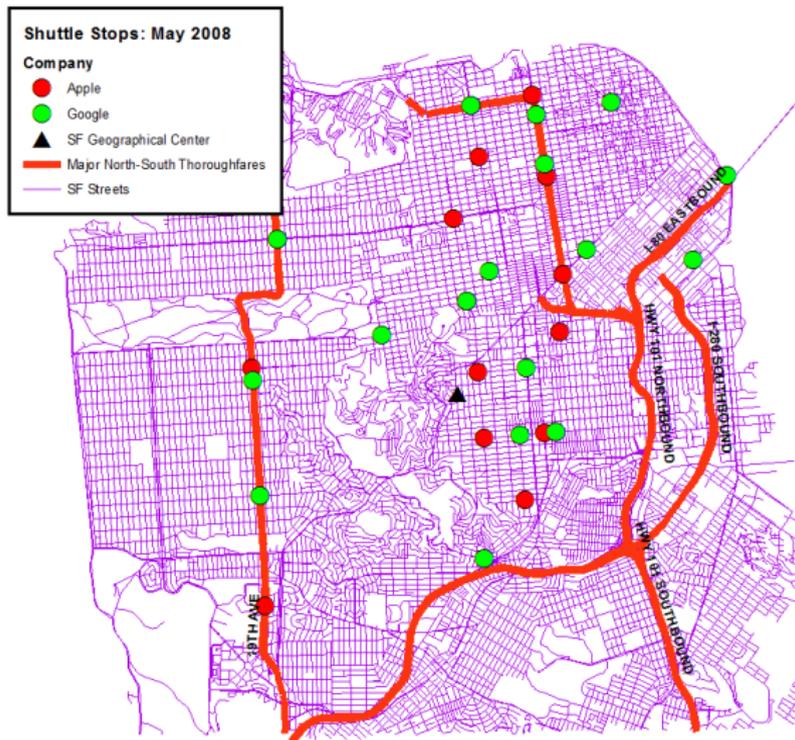
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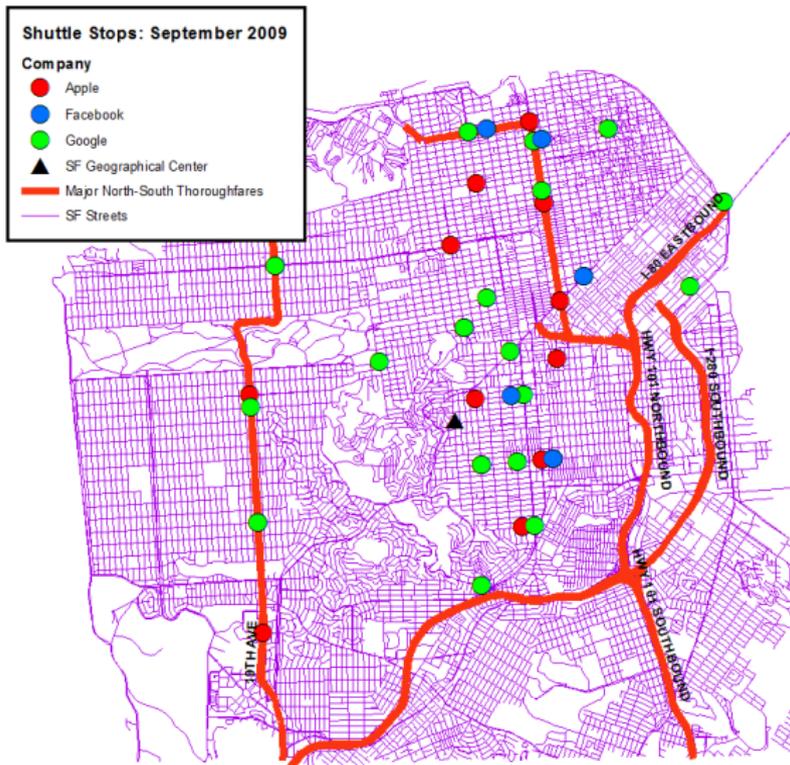
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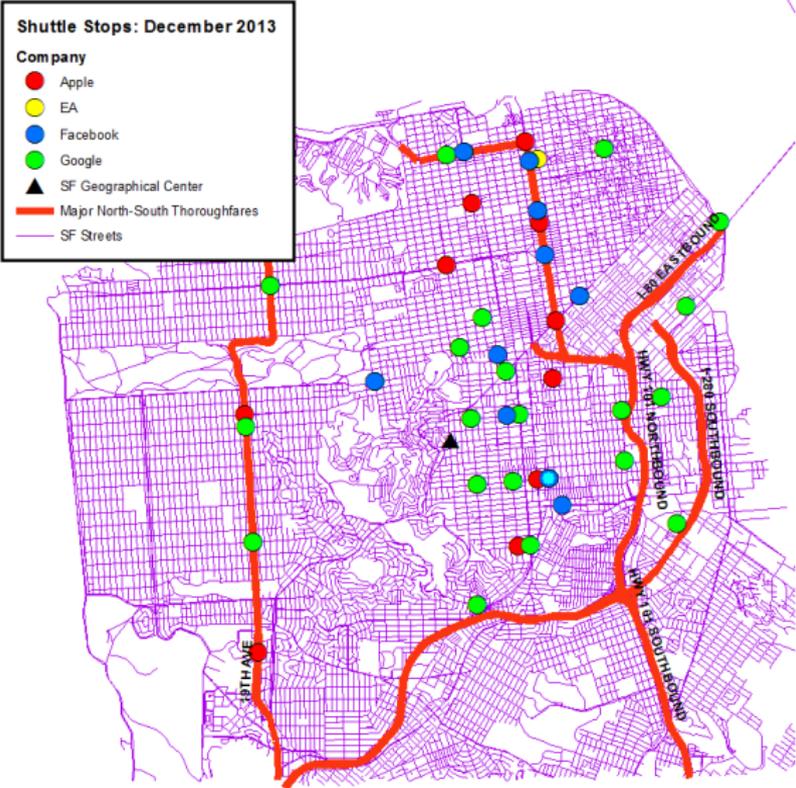
# Public and Private Transit Data



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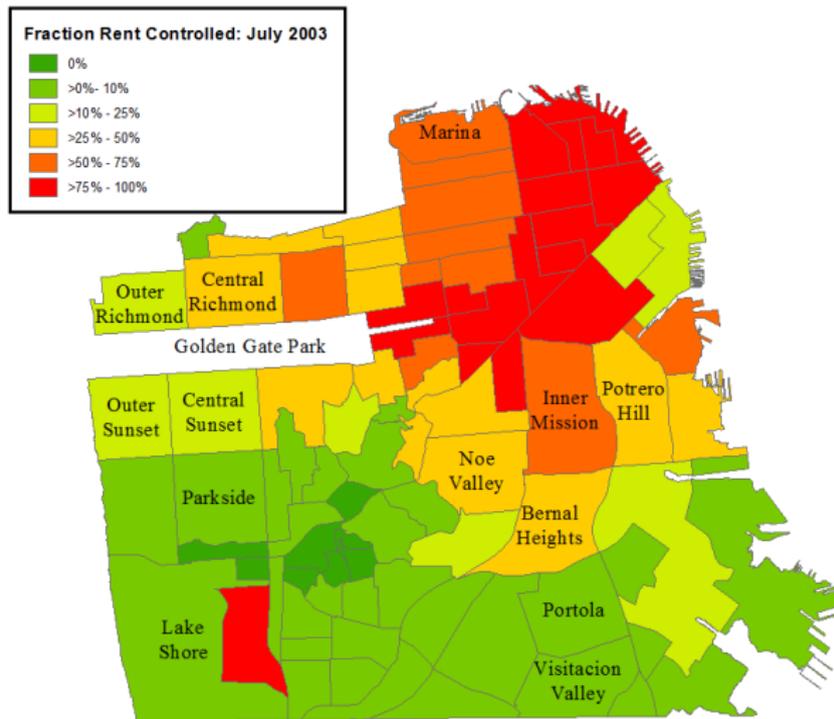
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## Public and Private Transit Data

- ▶ Public transit information came from SFMTA, BART, and CalTrain.
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- ▶ All information was merged together in ArcGIS to provide a complete mapping of transit to buildings.

# Public and Private Transit Data



## Selecting Among Bus Zones

- ▶ As the previous slide makes clear, there are many more bus zones than shuttle stops.
- ▶ The bus zone locations also hardly vary over time.
- ▶ Therefore, need a method to dynamically select among eligible bus zones based on their characteristics.
- ▶ I interact normalized values of Google's stock (NASDAQ:GOOG) before, during, and after its IPO to exogenously predict changes in demand for living in San Francisco by tech-shuttle riders.
- ▶ However, there is little publicly available information on which bus zone features were favored, so model building is still difficult.
- ▶ The sheer number of possible interactions between GOOG and bus zone characteristics may create a greatly overidentified first-stage.

## Machine Learning via LASSO

Belloni, Chernozhukov, Hansen, and Kozbur (2012) pioneered a method to let a LASSO regression predict a sparse yet optimized first-stage from candidate regressors in a panel data setting.

The algorithm supplements a panel fixed effects model via a penalty term:

$$\arg \min_{\beta} \frac{1}{2N} \|\mathbf{y} - \mathbf{X}\beta\|_2^2 + \frac{\lambda}{N} \|\Gamma\beta\|_1$$

The LASSO selects the handful of  $\beta$ 's that best explain the variation in  $\mathbf{y} = Shuttle2km_{it}$  and sets the rest to zero.  $Shuttle2km_{it}$  is defined as:

$$Shuttle2km_{it} = \frac{(2000 - Distance_{it})}{2000} \times \mathbb{1}\{Distance_{it} \leq 2000\}$$

## IV Hedonic Price Effect of Shuttles

**TABLE 1**  
Results for Hedonic Price Regressions

|             |                         | 2SLS                | Quantile Regression |                     |                    |
|-------------|-------------------------|---------------------|---------------------|---------------------|--------------------|
|             |                         |                     | 25th                | 50th                | 75th               |
| Condos      | <b>Shuttle 2km</b>      | 0.184***<br>(0.037) | 0.070<br>(0.043)    | 0.067***<br>(0.025) | 0.049**<br>(0.022) |
|             | Hansen's J p-value      | 0.497               |                     |                     |                    |
|             | First-Stage F statistic | 16.94*              |                     |                     |                    |
| Multifamily | <b>Shuttle 2km</b>      | 0.125***<br>(0.034) | 0.044**<br>(0.021)  | 0.043**<br>(0.017)  | 0.057**<br>(0.023) |
|             | Hansen's J p-value      | 0.217               |                     |                     |                    |
|             | First-Stage F statistic | 17.16*              |                     |                     |                    |

\*  $p < 0.10$ , \*\*  $p < 0.05$ , \*\*\*  $p < 0.01$ .

- Prices increased easily exceeded the highest the annual allowance (2.7%) ever reached over this period.

## Eviction Probability Estimation

A panel fixed effects model is used to estimate a linear probability model for at-fault evictions and repair permits. The Ellis Act and OMI version drops the interaction terms  $\delta_2$  and  $\delta_4$ .

$$\begin{aligned} Eviction_{it} = & \delta_0 + \delta_1 Shuttle_{it} + \delta_2 (Shuttle_{it} * RentControl_i) \\ & + \delta_3 Transit_{it} + \delta_4 (Policies_t * RentControl_i) + \delta_5 YYMM_t \\ & + \theta_i Parcel_i + \theta_{nt} Nbrhd_i * Y_t + \pi GOOG \times Nbrhd_I + \epsilon_{it}, \end{aligned}$$

**Identification Assumption:** There are no other shocks to parcel  $i$  during month  $t$  or year-specific neighborhood shocks coincident with a shuttle stop placement.

# Results —All Buildings

**TABLE 4**  
**IV Probability Estimates for All Buildings, Jul 2003-Dec 2013**

|   | Ellis                | OMI                    | At-Fault            | Repairs               |
|---|----------------------|------------------------|---------------------|-----------------------|
| $\mathbb{1}\{\text{Shuttle}\}$                                | 0.00012<br>(0.00015) | 0.00067**<br>(0.00030) | 0.0164<br>(0.0285)  | -0.00047<br>(0.00126) |
| $\mathbb{1}\{\text{Shuttle}\} \times \mathbb{1}\{\text{RC}\}$ |                      |                        | -0.0165<br>(0.0215) | -0.00075<br>(0.00125) |
| N   | 2,860,046            | 2,860,046              | 2,240,673           | 2,240,673             |
| First-Stage F Stat  | 100.72**             | 100.72**               | 23.84               | 23.84                 |

Note: At-Fault and Repairs specifications use the Kleibergen-Paap Wald first-stage F statistic, which has no known distribution.

\*  $p < 0.10$ , \*\*  $p < 0.05$ , \*\*\*  $p < 0.01$ .

## Results —Large Buildings (7+ Units)

**TABLE 4**  
**IV Probability Estimates for Large Buildings, Jul 2003-Dec 2013**

|   | Ellis                  | OMI                  | At-Fault               | Repairs              |
|---|------------------------|----------------------|------------------------|----------------------|
| $\mathbb{1}\{\text{Shuttle}\}$                                | -0.00104*<br>(0.00054) | 0.00121<br>(0.00135) | 0.13890<br>(0.09678)   | 0.00044<br>(0.00165) |
| $\mathbb{1}\{\text{Shuttle}\} \times \mathbb{1}\{\text{RC}\}$ |                        |                      | -0.13940*<br>(0.07123) | -0.00267<br>(0.0188) |
| N   | 371,977                | 371,977              | 336,942                | 336,942              |
| First-Stage F Stat  | 49.89**                | 49.89**              | 20.35                  | 20.35                |

Note: At-Fault and Repairs specifications use the Kleibergen-Paap Wald first-stage F statistic, which has no known distribution.

\*  $p < 0.10$ , \*\*  $p < 0.05$ , \*\*\*  $p < 0.01$ .

## Results — Small Buildings (2 Units)

**TABLE 4**  
**IV Probability Estimates for Small Buildings, Jul 2003-Dec 2013**

|   | Ellis                 | OMI                  | At-Fault               | Repairs              |
|---|-----------------------|----------------------|------------------------|----------------------|
| $\mathbb{1}\{\text{Shuttle}\}$                                | 0.00033*<br>(0.00019) | 0.00033<br>(0.00057) | -0.00109*<br>(0.00065) | 0.00025<br>(0.00039) |
| $\mathbb{1}\{\text{Shuttle}\} \times \mathbb{1}\{\text{RC}\}$ |                       |                      | 0.00087<br>(0.00065)   | 0.00037<br>(0.00040) |
| N   | 1,384,334             | 1,384,334            | 1,085,363              | 1,085,363            |
| First-Stage F Stat  | 96.68**               | 96.68**              | 43.35                  | 43.35                |

Note: At-Fault and Repairs specifications use the Kleibergen-Paap Wald first-stage F statistic, which has no known distribution.

\*  $p < 0.10$ , \*\*  $p < 0.05$ , \*\*\*  $p < 0.01$ .

## Results Conclusion

- ▶ Evidence suggests that some rent-controlled landlords do look to withdraw one or all units from the controlled market after market demand increases.
  - ▶ The pre-shuttle baseline OMI eviction rate was 0.039%, so a 15.5% average increase in property values translated into a 172% increase in the monthly OMI eviction probability.
  - ▶ This is very likely the very upper bound of reactions, but San Francisco's controlled market is very supply inelastic in price, so it is not inconceivable that there would be a very sharp change in eviction probabilities.
- ▶ Large landlords seem especially disinclined to change supply when prices change. This is likely because they have can more easily manage tenants other ways than via costly evictions.
- ▶ Small landlords on the other hand seem more willing to just exit the market altogether via the Ellis Act.

# Lessons Learned

## Pro-Tips

- 1 Microdata is much harder to use than Census products, but enables use to use more sophisticated tools like panel fixed effect and machine learning models.
- 2 Push for the maximum amount of digitized data available. FOIA is your friend.
- 3 Trust but verify the underlying data & be prepared to do a lot of data cleaning.
- 4 Accept that record linkage by address will be less than perfect.
- 5 The city and county public servants are often your best allies. Don't be afraid to reach out!
- 6 When all else fails, show up in person if you are able to (and there's no pandemic).



# Housing Supply Challenges and Solutions

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*First American*

## The ‘New’ Big Short- The Burden of A Supply Shortage

April, 2020

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## What Does Rent Control Do to the Supply of Housing- Evidence from San Francisco- Brian Asquith

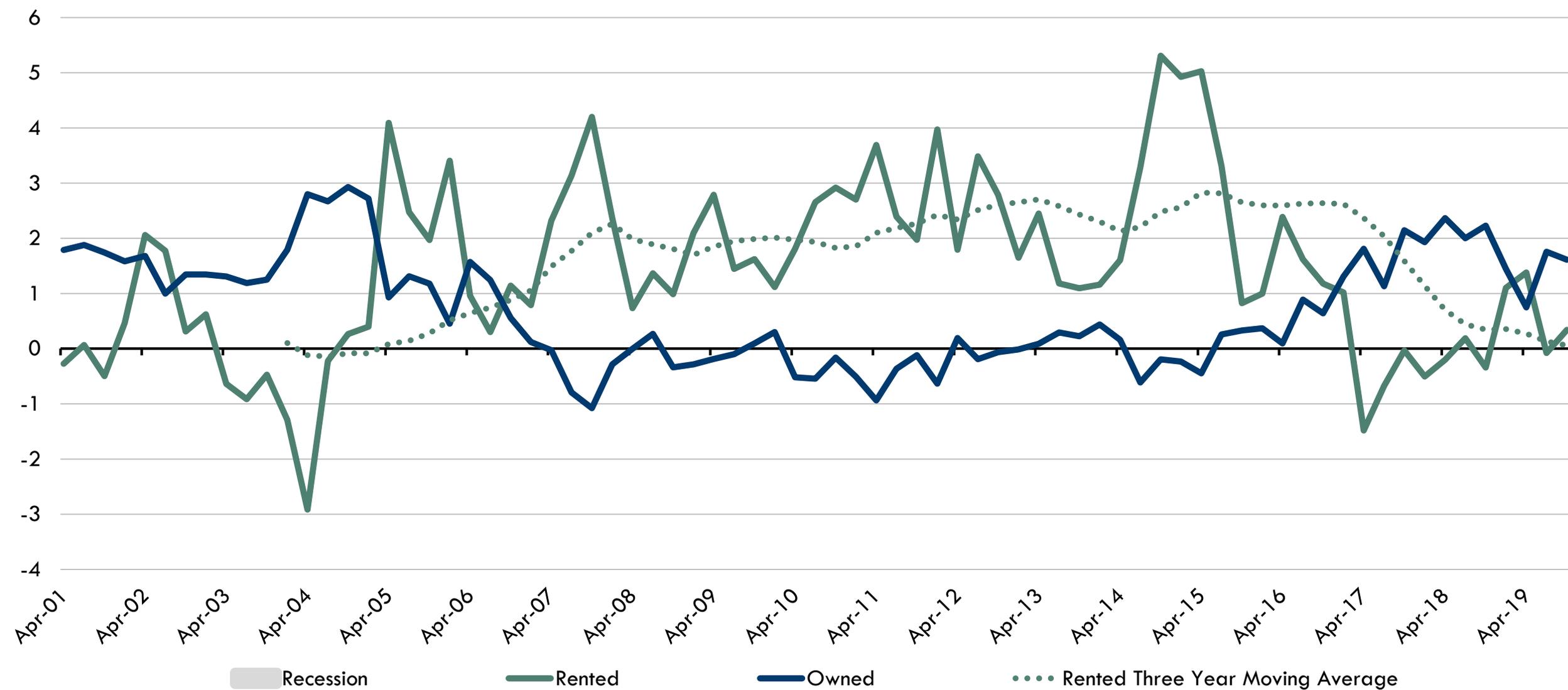
- An Econometric Masterpiece- Using instrumental variables to solve the endogeneity bias and identify the price shock of privately-provided transportation on rent controlled apartment prices as well as the thoroughness of the work is commendable!
- Adverse Selection- Probably because I am not versed in this particular strand of literature I found that framing the market as one of adverse selection and information asymmetry regarding tenure duration particularly helpful and an important “framing concept” for understanding the implications of rent control policies- Information asymmetry raises the costs for everyone!
- It’s probably intuitively self-evident, yet empirically necessary, that the privately provided shuttle service provides a significantly valuable amenity that is strongly capitalized into the market value of nearby properties!
- The unfortunate result in economics speak- “supply controlled housing in San Francisco may not be upward sloping in price.”
- In English- rising prices incents a reduction in the supply of affordable housing! Ohh, and the restriction in supply comes in the form of evictions.
- In economics speak- “highlights the supply side consequences of constraining landlords from being able to use price to allocate their units.”
- In English- Impeding the market with regulatory controls ends up hurting exactly who the regulation is trying to help?
- I can’t help but wonder WHO those new market entrants are socio-economically that cause the price shock in the first place and cause the supply reduction in affordable housing.....

## Is Filtering the Answer to the Housing Supply Shortage- Sam Khater

- Repeat Income Model- I love this novel (and relatively new-2014) approach to the empirical challenge. Especially the classic -1/1 dummy formulation but also the simplifying linear trend and local polynomial regression methods when data pairs become scarce.
- Which gets to an important contribution of this paper- ALL the geographic detail and the insights one can get about what's really going on locally.
- Seeing that filtering isn't always down, but for some entire metropolitan areas up (San Francisco and San Jose are the 8<sup>th</sup> and 9<sup>th</sup> strongest up-filtering markets...Hmmm), and in all metro area a mix of up and down did have me asking why, why, why
- Supply Elasticity, or a lack thereof, driving prices higher. Let's use San Francisco as an example
  - Bounded on three sides by water- Just sayin'
  - Significant regulatory barriers to increasing supply
  - Desirable and growing 21<sup>st</sup> century employment opportunities
  - Renowned cultural, weather, and recreational opportunities
- Also striking- 6 of the top ten up-filtering markets are in California, add Seattle ( a wetter San Francisco), Boulder (at #1 - cultural and weather amenities?).
- The conclusion in economics speak- "a role for policy makers to adopt policies that would increase the elasticity of supply (any supply)...allowing filtering to increase the stock of available affordable housing."
- In English- The best housing affordability policy is a "build more homes, any homes at any level, policy."

# The Tenure Choice Transition is On Again

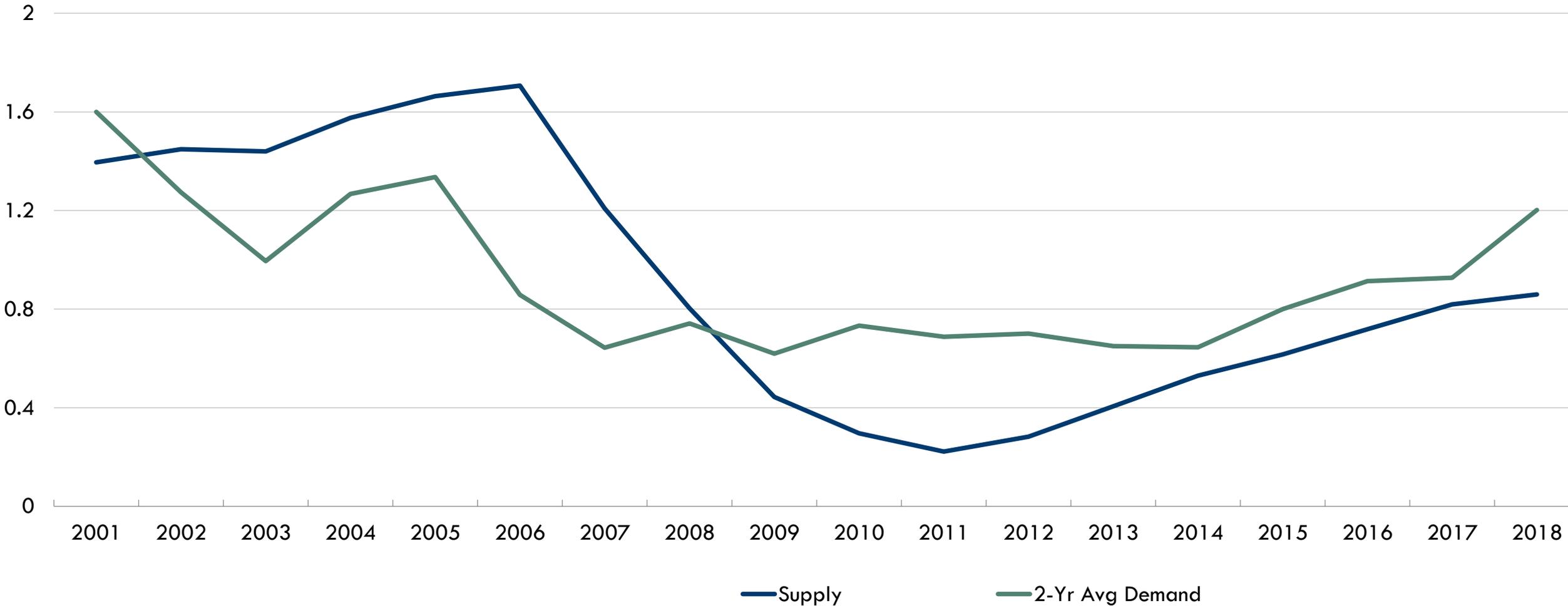
Household Formation by Occupancy Type (Year-Over-Year Inventory Growth, %)



Source: Census Bureau, FRED Q4 2019

# Keeping Up With Increasing Demand- The Big Building Short

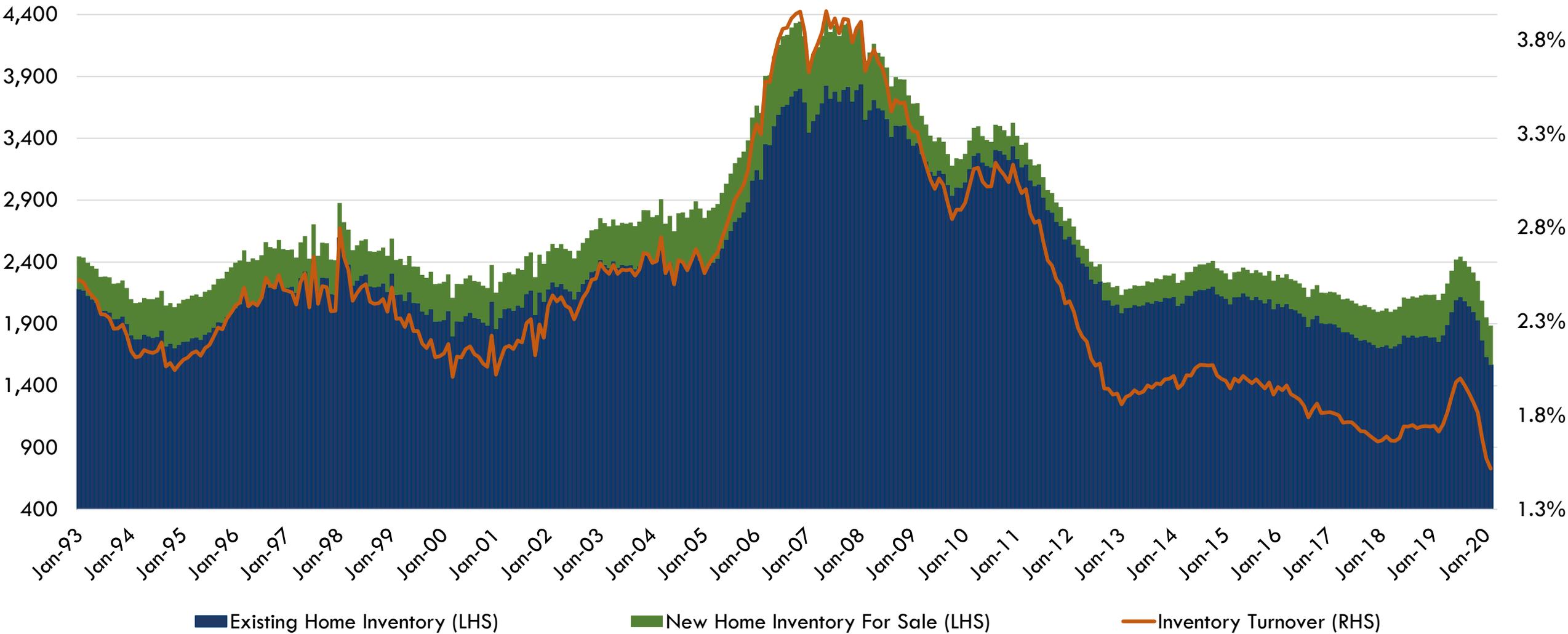
New Housing Units and Households (Year-Over-Year, Millions)



Source: Census Bureau, HUD (obsolescence rate of 0.31% of existing stock), 2018

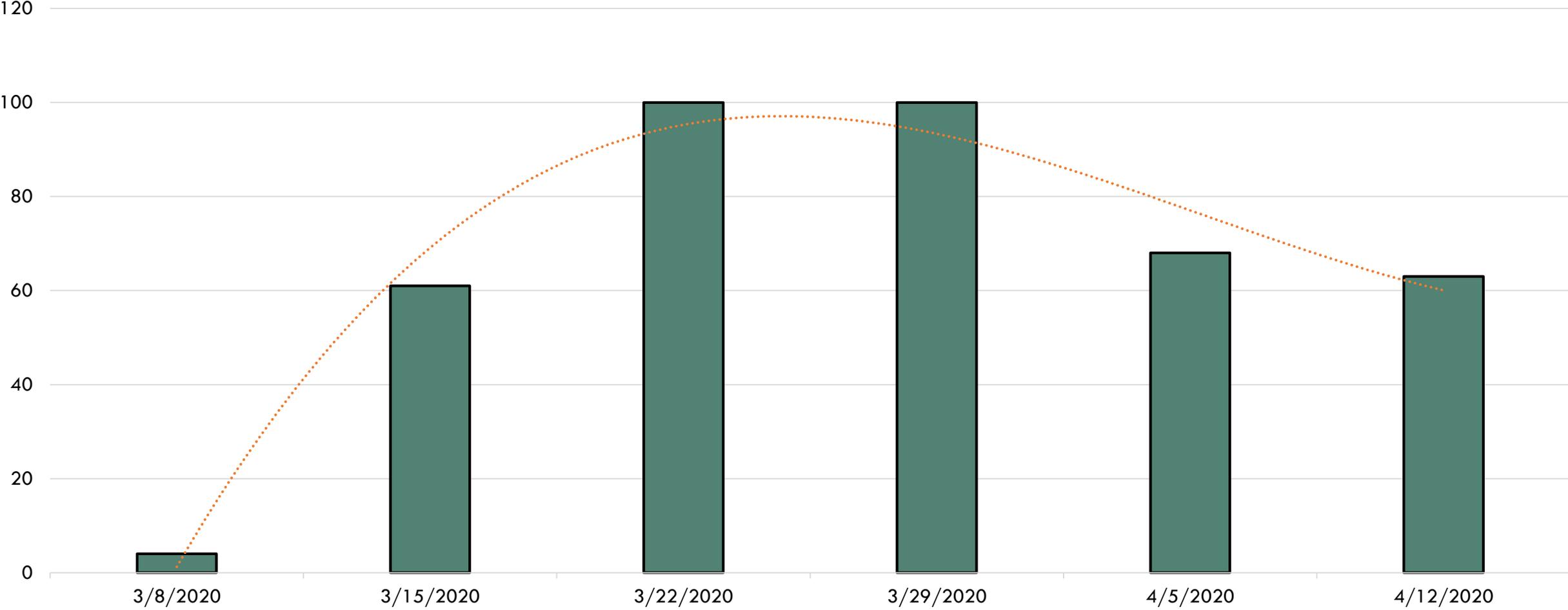
# Supply At Quarter Century Low- Less Filtering than Ever

New and Existing Inventory for Sale (Thousands, SA, % of Households)



Source: NAR, Census, FRB St. Louis, First American Calculations, Feb. 2020

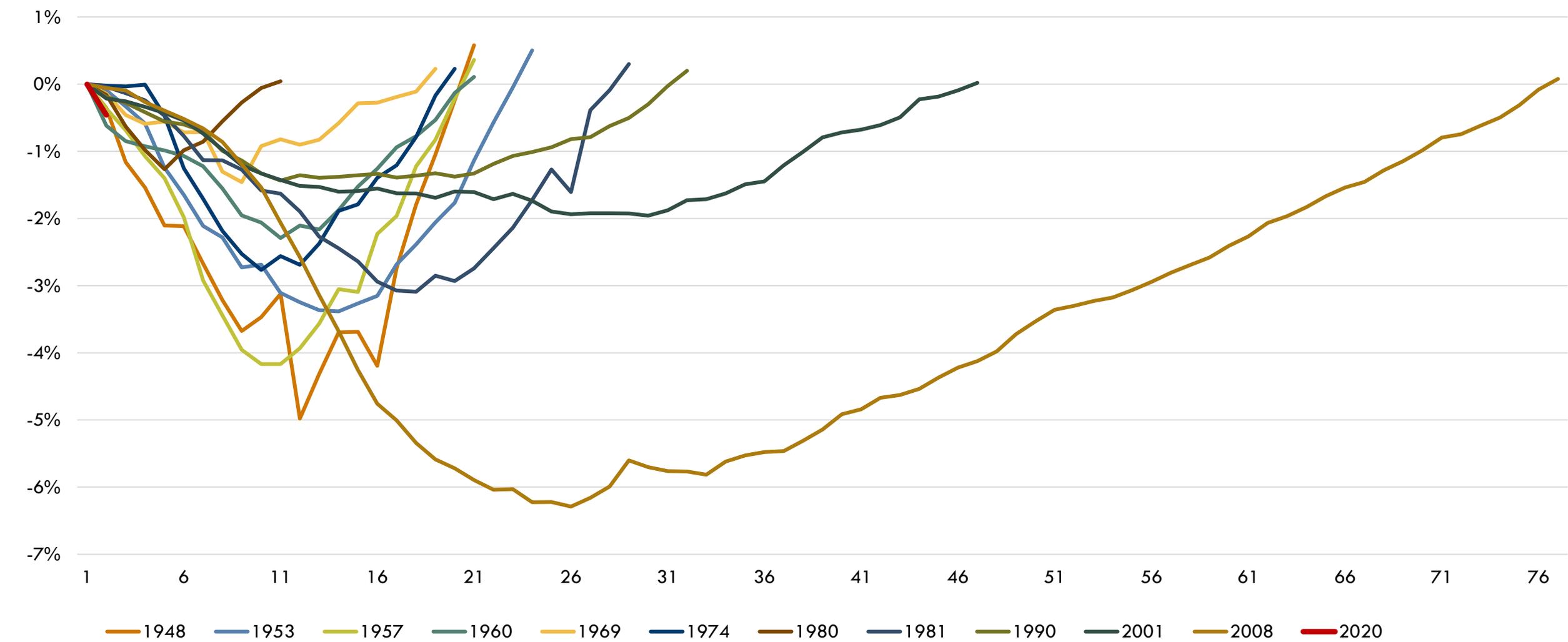
# Google Search for "file for unemployment"



Source: Google Trends, April 2020

# Depth and Duration of Job Losses During Recessions

Percent Job Losses Relative to Peak Employment Month and Number of Months After Peak Employment

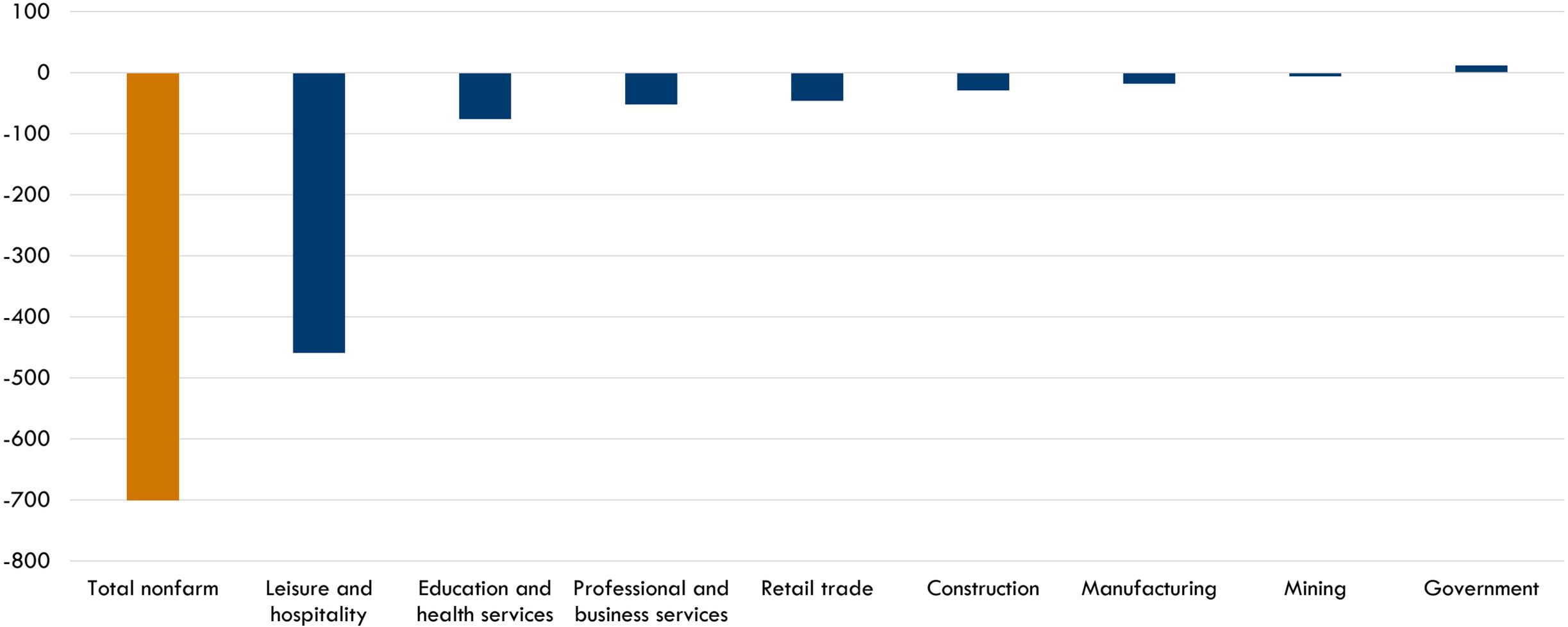


Source: BLS, FRED, March 2020

 @mflemingecon #FirstAmEcon

# March Job Loss by Sector

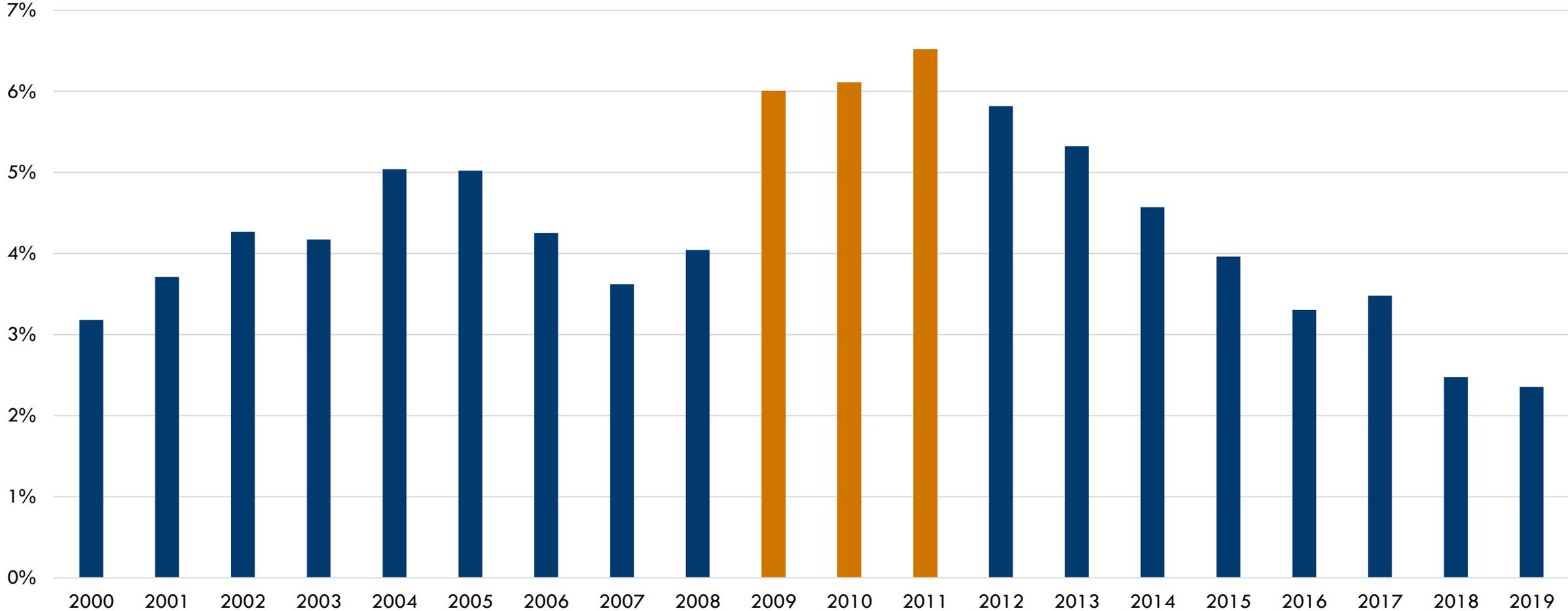
Month-over-Month Change, Thousands



Source: BLS, FRED, March 2020

# The Unemployment Difference

Renter-Owner Unemployment Rate Difference, %



Source: First American Calculations, IPUMS CPS, 2019

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# Housing Supply Challenges and Solutions

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# Audience Q&A

Type your questions in the Q&A box.



# Housing Supply Challenges and Solutions

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