A City on Fire:
Effect of Salience on Risk Perceptions

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Does salience affect households' environmental risk perception?

- Evidence?
  - Lab experiments (e.g., Tversky and Kahneman 1974)
  - Choice theory model with salient payoffs (Bordalo et al. 2012)
  - For households' choices?

- Does risk salience affect home purchases?
  - Important financial decision

What we do?

- Examine wildfire risk salience on Southern California real estate prices
  - $>$2m observations over 16 years
- Quasi-experimental design with DiD, property fixed effects, and stringent spatial sample definitions
- Investigate which forms of risk salience trigger a behavioral response
  - A new risk zone designation
  - Exposure to damages from natural disasters

What do we find?

- Assignment to new risk zone reduces home prices by 10.3% to 11.1%
  - Likely indicates new designation triggers greater risk salience
- Burn scar view within 2km lowers home prices by 4.2% to 5.0%, and by 1.9% to 3.2% in 3-4km
  - Strongly significant only for first year post-fire
  - Unlikely to be fully attributable to the loss of visual amenities
  - Suggests exposure to visual damages affects risk salience

Related literature

- Effect of risk perceptions on home prices
  - Risk correlated with amenities (e.g., Bakkensen and Barrage 2018)
  - Changes in insurance take-up, premiums, and/or coverage often vary with risk salience (e.g., Gallagher 2014)

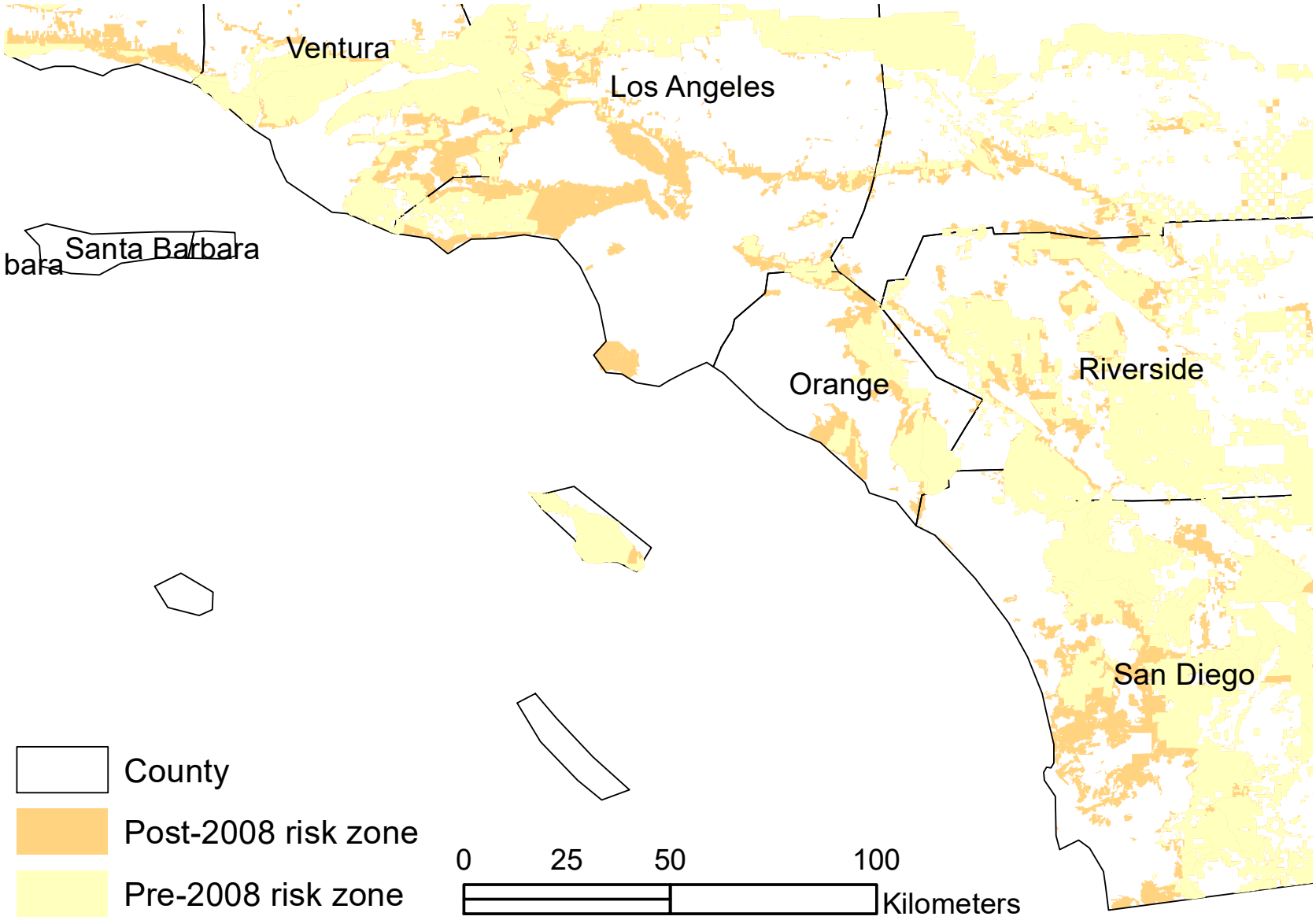
- Effect of policy intervention on salience: updated risk maps one year after Sandy lower home prices by 5% (Gibson et al. 2018)

- Effect of damages from natural disasters on salience (McCoy and Walsh 2018; McCoy and Zhao 2018)

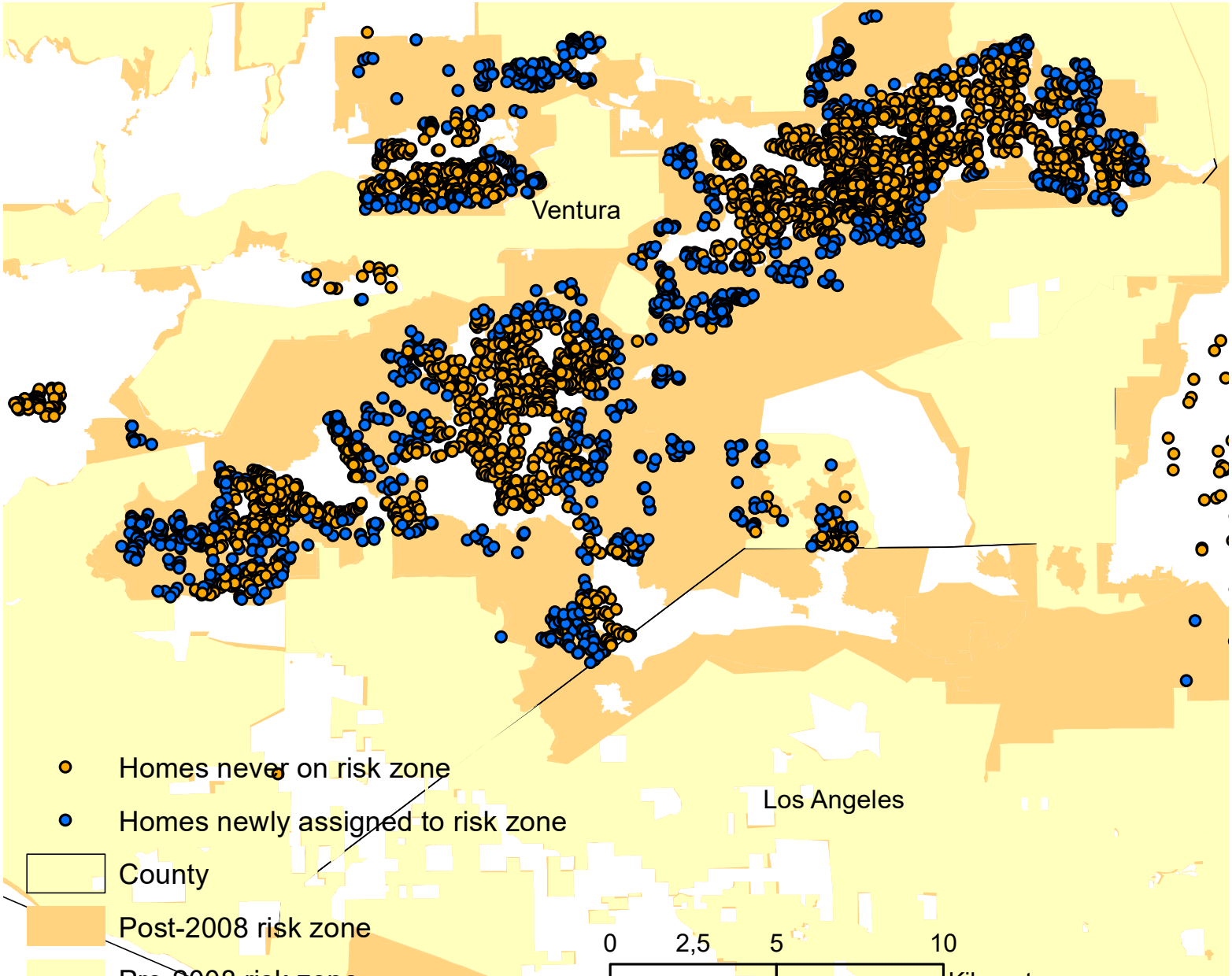
Data

- Real estate sales transactions for LA and SD basins
  - >1million homes after data cleaning ($\approx$ 1.5 million sales; median home price: \$500k)
  - $\approx$ 400k repeat sales homes (800k sales)
- Spatial data from CAL FIRE
  - Wildfire data ($\approx$ 250 fires; 50 to 270k acres; mean 6k acres)
  - Wildfire risk zones (Fire Hazard Severity Zone)
- In ArcGIS
  - Slope and elevation, distance to all burn scars, distances to nearest forest, park, main road
  - Viewshed analysis

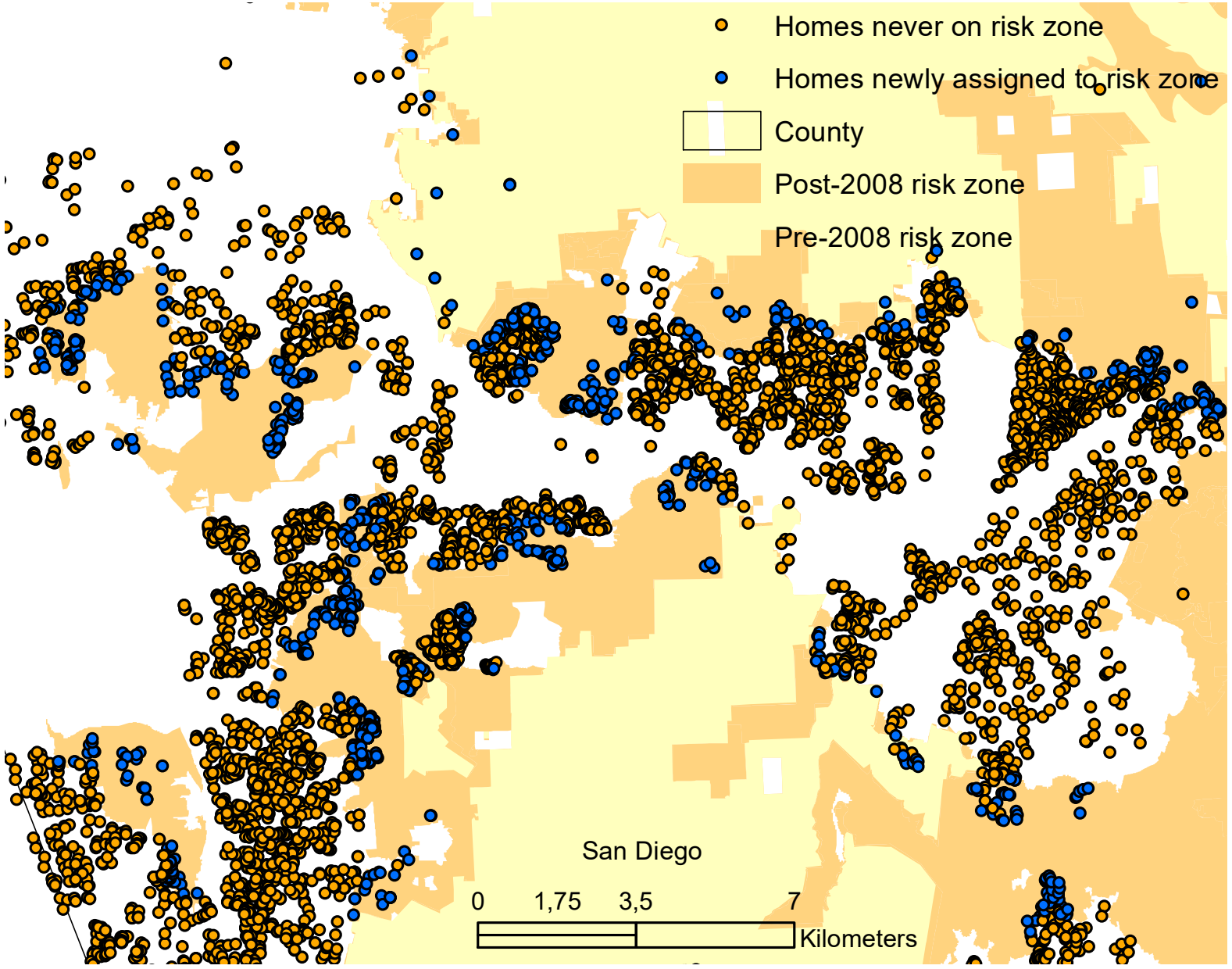
California wildfire risk zones, incl. new designation



Example of homes newly assigned to risk zone (treatment) and those always off risk zone (control) in Ventura County



Example of homes newly assigned to risk zone (treatment) and those always off risk zone (control) in San Diego County

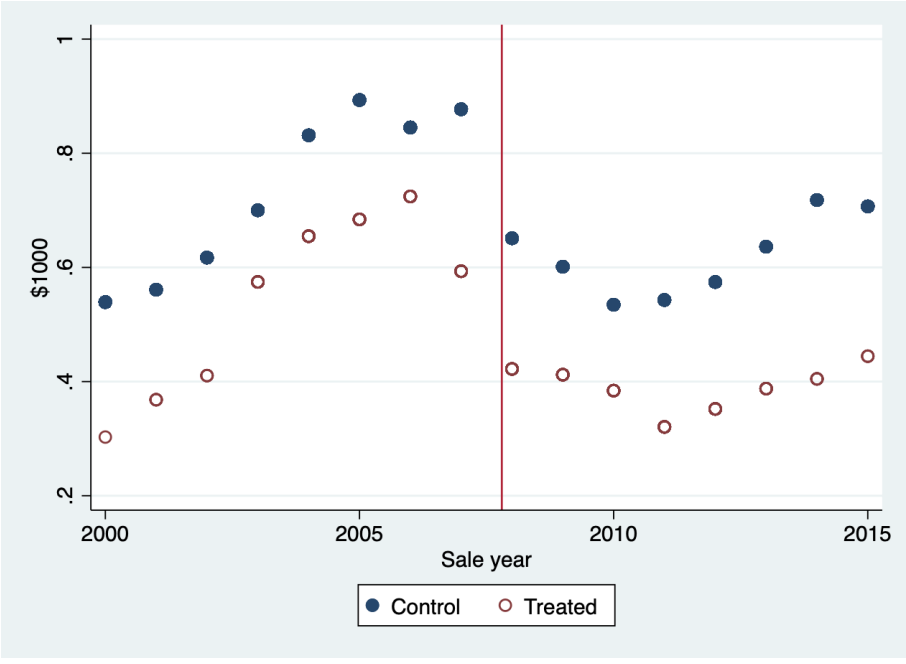


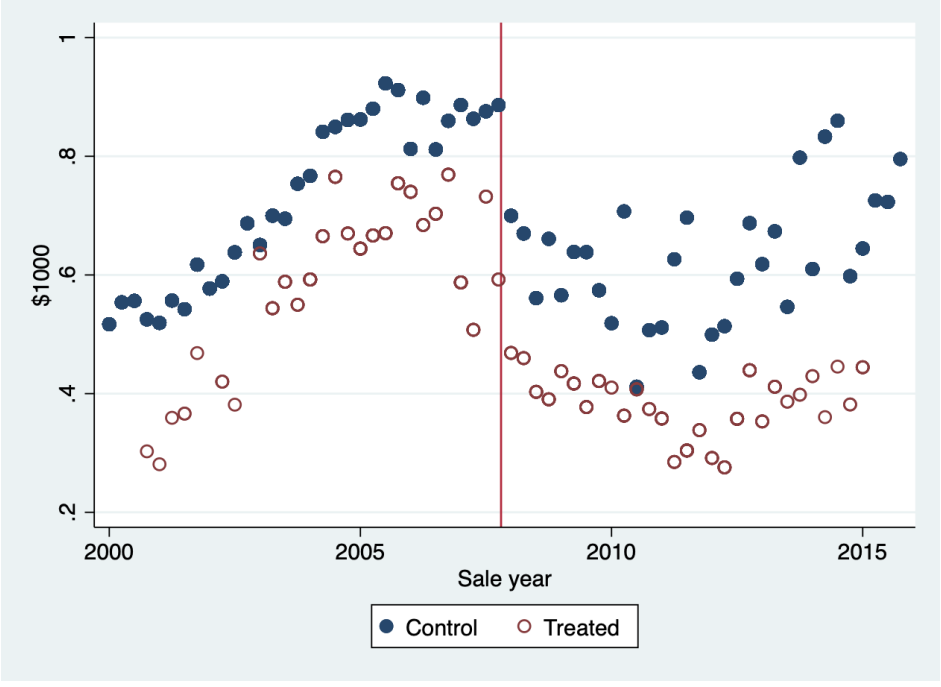
Empirical model of the new risk zone designation on home prices

- Sample definitions: repeat sales & selling within 1km of new risk zone
- Risk zone designation *discontinuous*, but underlying risk *continuous*
  $\rightarrow$ effect of salience and changes in insurance premiums

$$\ln p_{it} = \beta \Delta RiskZone_{it} + \gamma Post_{it} + \delta \Delta RiskZone_{it} \times Post_{it} + \lambda_i + \mu_{it} + \epsilon_{it}$$

Visual evidence for the common trends assumption for homes within 500m of new risk zone (qualitatively similar for 500m to 1km)





Effect of the new risk zone designation on home prices

	Sample restrictions around the risk zone			
	0-500m		500m-1km	
	(1)	(2)	(3)	(4)
ΔRiskZone×PostRezoning	-0.103***	-0.111***	-0.108**	-0.119**
	(0.0301)	(0.0343)	(0.0538)	(0.0589)
Quadratic county trends	Yes		Yes	
Year×Quarter	Yes		Yes	
County×Year×Quarter		Yes		Yes
N	2992	2992	3010	3010
R^2_{adj}	0.819	0.845	0.864	0.873

Note: Each specification includes Property fixed effects. Robust clustered standard errors at the census-tract level in parentheses. * p<0.1, ** p<0.05, *** p<0.01

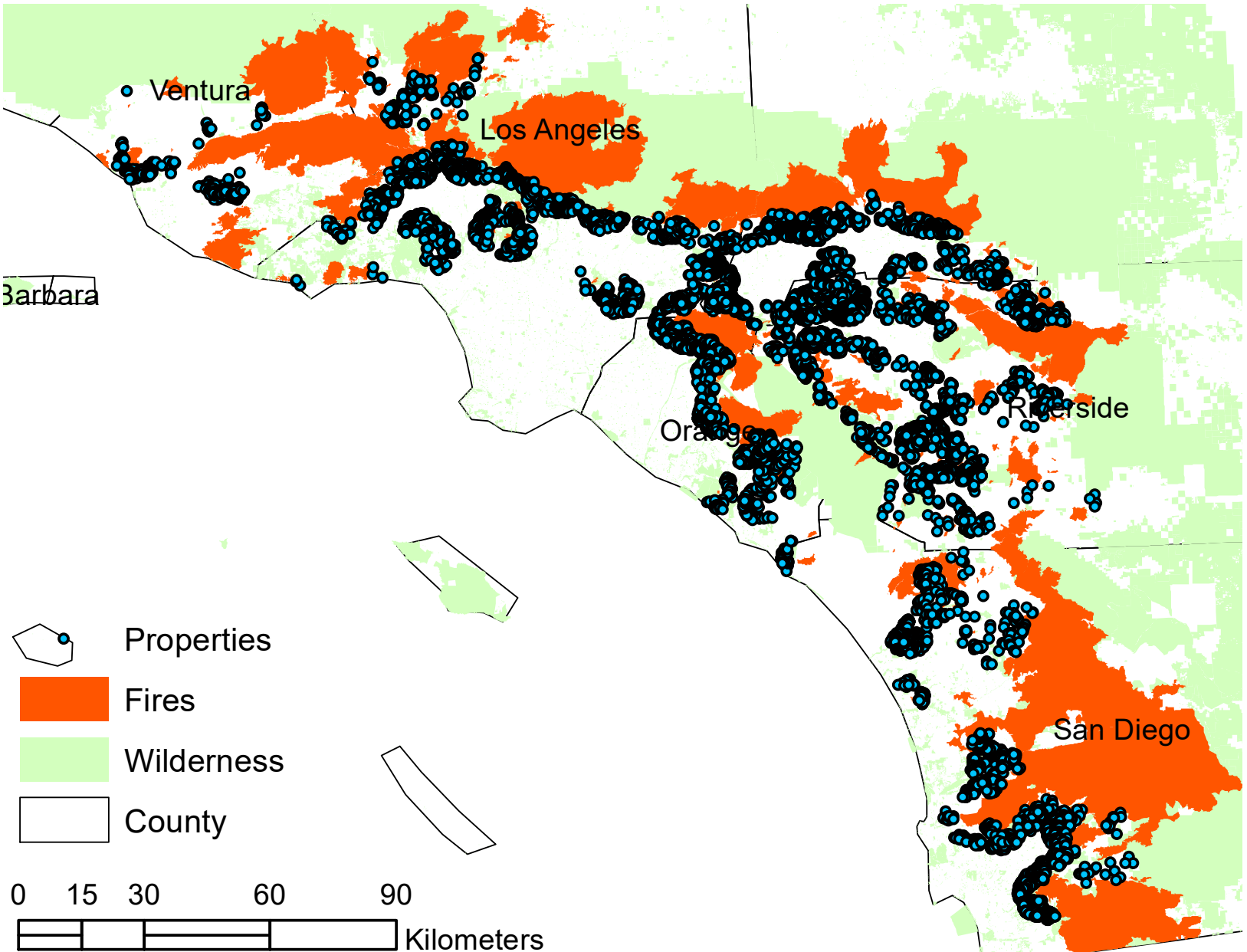
Placebo test with 'treatments' on the risk zone both pre and post new designation

	Sample restrictions around the risk zone			
	0-500m		500m-1km	
	(1)	(2)	(3)	(4)
ΔRiskZone×PostRezoning	0.0139	0.0119	-0.0687	-0.0464
	(0.0416)	(0.0514)	(0.0555)	(0.0724)
Quadratic county trends	Yes		Yes	
Year×Quarter	Yes		Yes	
County×Year×Quarter		Yes		Yes
N	3792	3792	3030	3030
R^2_{adj}	0.793	0.805	0.869	0.879

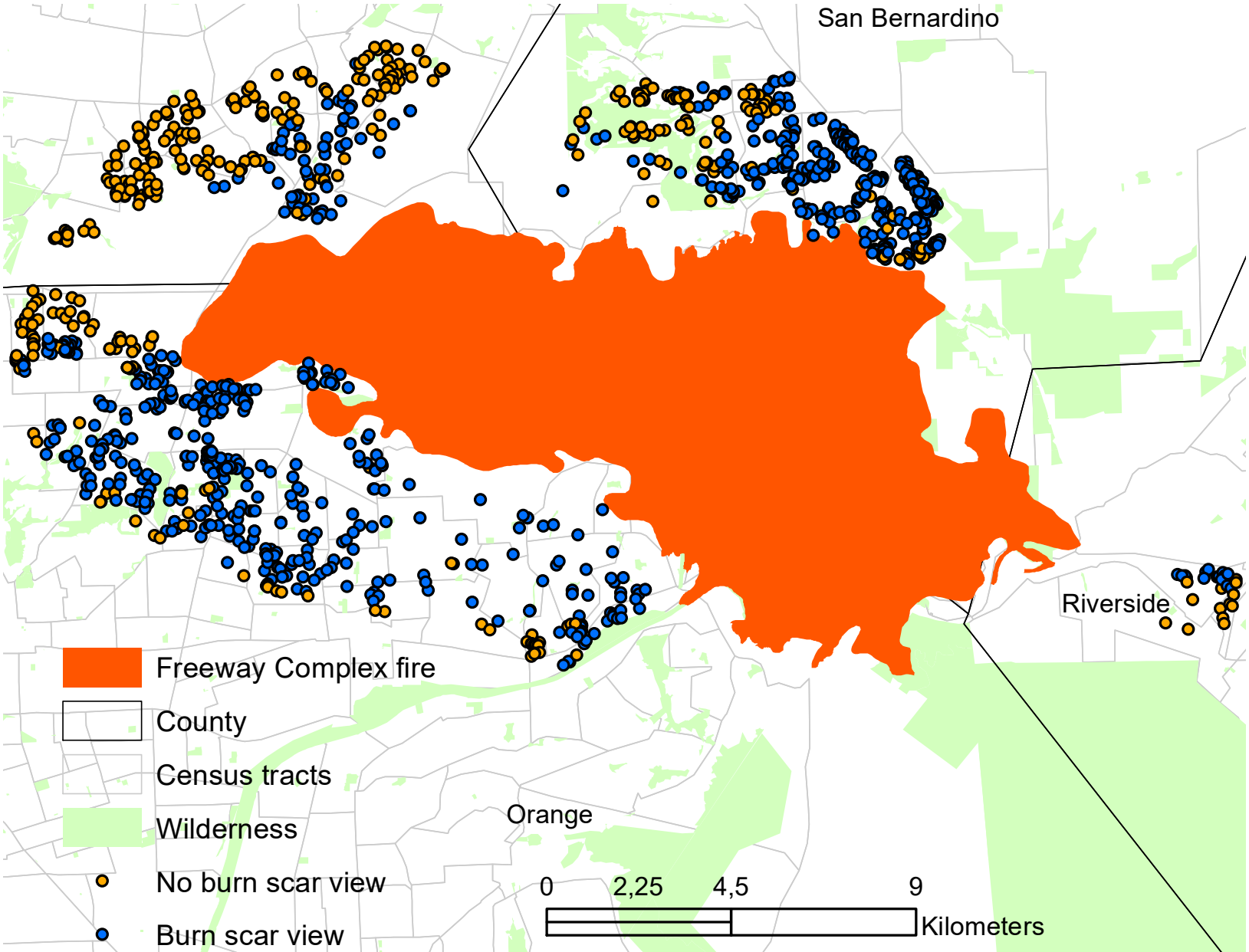
Note: Each specification includes Property fixed effects. Robust clustered standard errors at the census-tract level in parentheses. * p<0.1, ** p<0.05, *** p<0.01

Effect of exposure to natural disaster damages on salience

Wildfire perimeters with homes selling within 4km and 2 years post-fire (2000-2015)



Example of homes with (treatment) and without burn scar view (control) – Freeway Complex Fire



Empirical model of exposure to natural disaster damages on home prices

- Sample definitions: repeat sales & selling within 4km of burn scar and 2 years post-fire
- Identifying assumption: price change differentials across treatments and controls due to changes in risk perceptions and visual disamenity

$$\ln p_{it} = \sum_j (\beta_j View_{jit} + \gamma_j View_{jit} \times Large_{jit}) + \lambda_i + \mu_{it} + \epsilon_{it}$$

Burn scar view estimates for the 0-2km and 3-4km bins

	0-2km bin		3-4km bin	
	(1)	(2)	(3)	(4)
$View_1$	-0.0419***	-0.0504***	-0.0194**	-0.0323***
	(0.0145)	(0.0131)	(0.0085)	(0.0079)
$View_2$	-0.0203	-0.0216	-0.0167**	-0.0259***
	(0.0145)	(0.0132)	(0.0075)	(0.0069)
$View_1 \times Large_1$	0.0066	0.0070	-0.0084	-0.0083
	(0.0184)	(0.0174)	(0.0141)	(0.0140)
$View_2 \times Large_2$	0.0023	-0.0090	0.0098	0.0043
	(0.0177)	(0.0162)	(0.0138)	(0.0124)
Quadratic county trends	Yes		Yes	
Year×Quarter	Yes		Yes	
County×Year×Quarter		Yes		Yes
N	10573	10573	24770	24770
R^2_{adj}	0.843	0.862	0.868	0.880

Note: Each specification includes Property fixed effects. Robust standard errors clustered at the census-tract level in parentheses. * p<0.1, ** p<0.05, *** p<0.01

Conclusions

- Evidence suggests households' risk perception responds to risk salience
  1. New risk zone designation has persistent effect on home prices
  2. Temporary effect of visual cues of natural disaster damages
- Risk salience can bias households' risk perceptions
- Policy interventions may help convey risk information