The Economic Impacts of Wildfires on Agricultural Land Markets

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  - Pacific states account for the highest acreage burned
  - The average yearly acres burned in the US increased by 125% in the 2000–2016 period compared to 1983–1999 (NIFC, 2024)

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  - Pacific states account for the highest acreage burned
  - The average yearly acres burned in the US increased by 125% in the 2000–2016 period compared to 1983–1999 (NIFC, 2024)
- The impacts on agricultural land prices have received less attention than other land uses (Huang and Skidmore, 2024; Wang and Lewis, 2024)

Research Question

- How do wildfires affect agricultural land prices?
  - Examine how fire-risk perceptions, measured by proximity to wildfire, affect observed parcel-level agricultural land prices
  - Estimate the effects for nearby fires using a difference-in-differences (DD) research design

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- Preview of what we find
  - Wildfires have led to a reduction of land values in Oregon
  - The magnitude of the reduction was 25 to 40%
  - Oregon agricultural properties sold lately following a wildfire had an average decline of $700-1,120/acre

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- Agricultural land values reflect both land productivity and expectations of future land production potential (Plantinga et al., 2002)
- Our general working hypothesis is that agricultural land prices should decrease in response to recent nearby wildfires

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- Other administrative boundary are taking from Oregon's Authoritative Geospatial Repository (OAGR)

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- Construct a fire-specific dataset so that the fire level serves as the unit of the treatment and the primary source of variation

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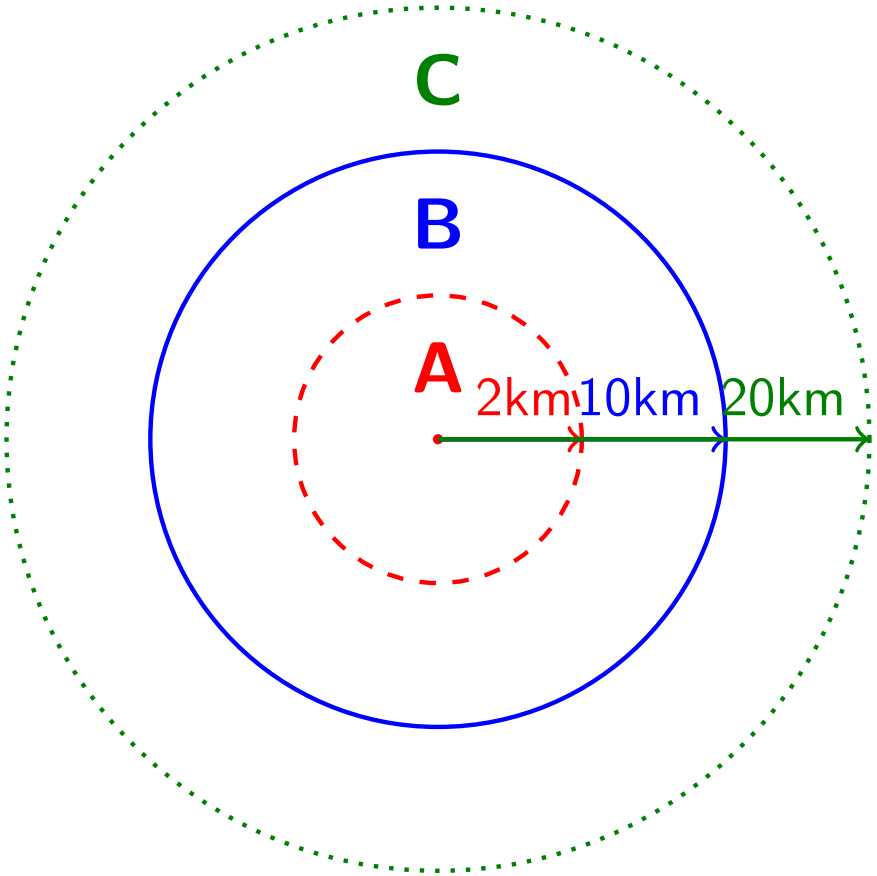
  - Ensure that we have pre-/post and treatment-/control parcels within the 2km treatment bandwidth for each fire ID
  - Leaving a total of 3,866 observations with 494 unique fires between 2000 and 2023 for the final analysis

Spatial Thresholds



A – Treatment zone (within 2km)
B – Control for 10km buffer

Wildfire impact zones illustrating 2km treatment and 10km buffer

Empirical Model Specification

- Using a pooled cross sectional data, the DD model will be specified as follows:

$$ln(Y_i) = \beta_1 Treat_{j(i)} + \beta_2 Post_i + \beta_3 Treat_{j(i)} \times Post_i + \phi' \mathbf{X_i} + \mu_{j(i)} + \gamma_{t(i)} + \varepsilon_i$$

$$Treat_j(i) = \begin{cases} 1 \text{ if parcels within the treatment area} \\ 0 \text{ otherwise} \end{cases}$$

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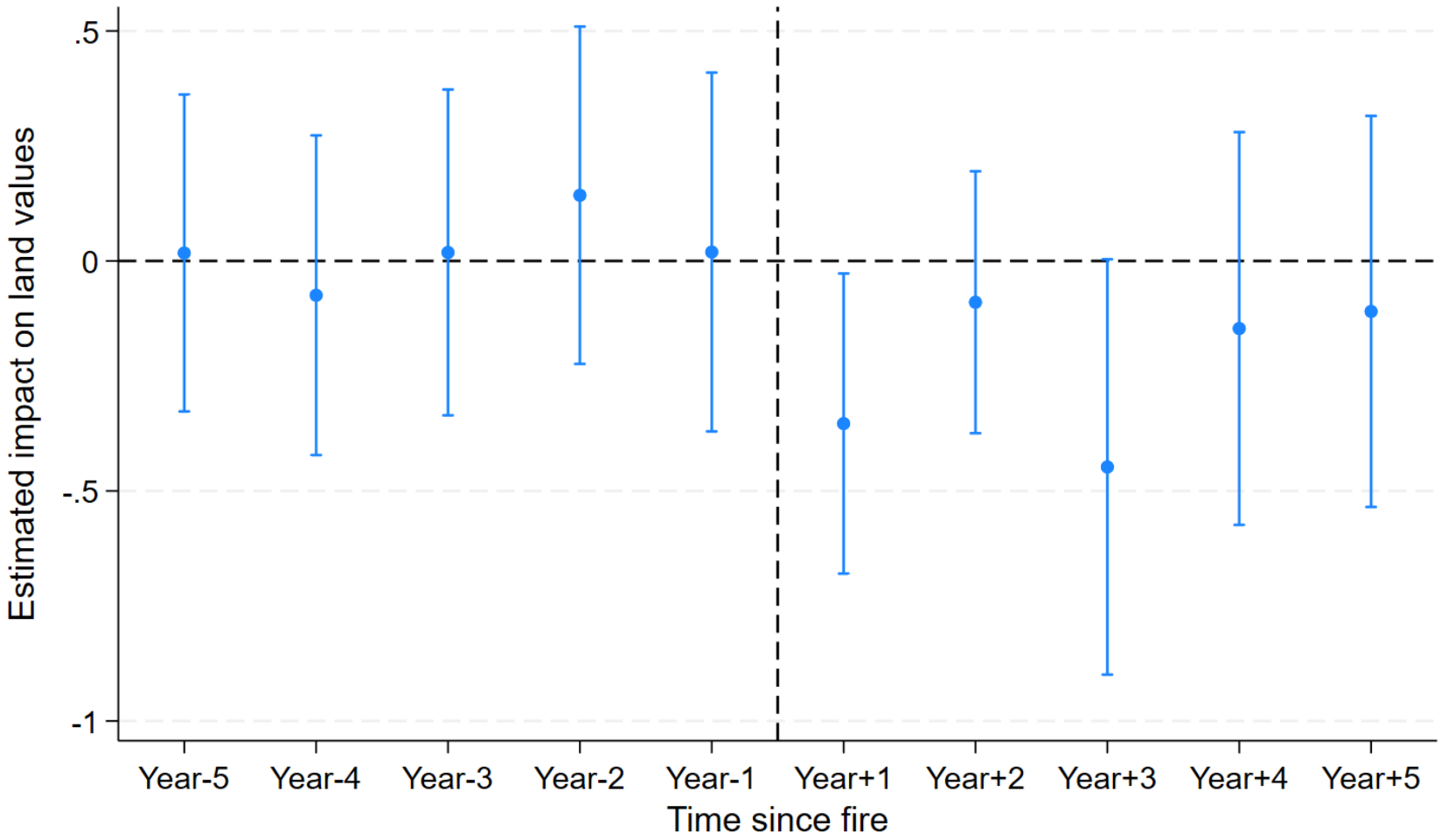
- Y_i is the land price per acre, β_3 is the treatment effect, $\mathbf{X_i}$ is the covariates (soil class, topographic and climate variables), $\mu_{j(i)}$ and $\gamma_{t(i)}$ are the fire and sales year fixed-effects, and ε_i is the error term

How wildfires affect the value of agricultural land

	(1)	(2)	(3)	(4)	(5)
		All Parcels		**CDL restriction**	
Treatment effect	-0.247***	-0.398**	-0.282***	-0.296***	-0.254***
	(0.092)	(0.157)	(0.105)	(0.107)	(0.089)
Observations	3,866	3,866	3,866	3,619	2,985
R-squared	0.395	0.512	0.645	0.651	0.671
Year FE	Yes	Yes	Yes	Yes	Yes
Fire FE	Yes	Yes	Yes	Yes	Yes
Reg. Weights	No	Yes	Yes	Yes	Yes
Controls	No	No	Yes	Yes	Yes
Adjusted R-squared	0.378	0.498	0.634	0.640	0.658

Notes: CDL restrictions place at least a 25% overlap with sales data for all ag parcels (4) and only pastureland or cropland (5)

Event Study Analysis



Impact of Wildfires on Land Values Over Time, 95% CI

Heterogeneity by fire size

	(1)	(2)	(3)	(4)
Treatment effect × size	-0.402**	-0.533*	-0.437***	-0.534*
	(0.157)	(0.279)	(0.154)	(0.273)
Observations	3,336	3,336	3,336	3,336
R-squared	0.649	0.663	0.650	0.663
Year FE	Yes	Yes	Yes	Yes
Fire FE	Yes	Yes	Yes	Yes
Reg. Weights	No	Yes	No	Yes
Controls	Yes	Yes	Yes	Yes
Adjusted R-squared	0.636	0.651	0.637	0.651

Notes: Columns 1 and 2 include a fire size dummy, with thresholds of 17,678 (50th percentile), while Columns 3 and 4 use 20,000 acres (above the 50th percentile), respectively

How wildfires affect the value of agricultural land

	(1)	(2)	(3)	(4)
	CDL restriction		**Zoning restriction**	
Treatment effect	-0.383***	-0.349***	-0.403**	-0.453***
	(0.137)	(0.111)	(0.157)	(0.147)
Observations	3,113	2,553	2,160	2,439
R-squared	0.669	0.682	0.727	0.713
Year FE	Yes	Yes	Yes	Yes
Fire FE	Yes	Yes	Yes	Yes
Reg. Weights	Yes	Yes	Yes	Yes
Controls	Yes	Yes	Yes	Yes
Adjusted R-squared	0.656	0.667	0.712	0.698

Notes: Restrict the sample to parcels sold five years before and three years after the fire, and impose the CDL and Zoning restrictions

Conclusion

- We find that changes in fire specific risk led to a 25-40% reduction in farmland value (decline of $700-1,120/acre), from the main specification
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Conclusion

- We find that changes in fire specific risk led to a 25-40% reduction in farmland value (decline of $700-1,120/acre), from the main specification
  - The empirical findings for Oregon indicate that the price of nearby land declines after wildfire occurrence
- There have been a few empirical estimations of how wildfires affect agricultural land market in Oregon as well as the western US
- Highlight the importance of measuring the economic costs of recent catastrophic wildfires in Oregon, as reflected in land prices

Questions or Feedback

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Appendix

Descriptive statistics of main variables used in the analysis

Variable	Obs.	Unweighted Mean	Weighted Mean	Min	Max
Farmland price ($/acre)	3,866	9,742	2,801	100.5	59,830
Post fire	3,866	0.516	0.508	0	1
2km fire bandwidth	3,866	0.180	0.234	0	1
% LCC 1-2	3,866	10.29	5.240	0	100
% LCC 3-4	3,866	41.74	33.04	0	100.0
% LCC 5-6	3,866	29.76	27.73	0	100
Precipitation (mm)	3,866	182.1	147.2	64.19	612.6
Temperature (°C)	3,866	15.96	15.69	10.23	18.85
Slope (degrees)	3,866	7.219	9.203	0.00137	37.57
Elevation (m)	3,864	635.0	767.9	27.39	1,949
Distance to City (km)	3,866	8.806	12.76	0.0421	85.30
Distance to road (km)	3,866	4.104	5.059	0.00643	31.88
Fire size dummy	3,866	0.499	0.518	0	1
Sale acres	3,866	155.9	–	10	7,538

Notes:All parcels within 10km and sold fives years before and after fire. Sufficient obs. for pre/post and treatment/control

Appendix (Cont'd)

Descriptive statistics of main variables used in the analysis

Variable	Within 20km			Within 10km		
	Obs.	Mean	SD	Obs.	Mean	SD
Farmland price ($/acre)	31,566	2,377	4,840	8,921	2,057	4,227
Post fire	31,566	0.468	0.499	8,921	0.457	0.498
2km fire bandwidth	31,566	0.0420	0.201	8,921	0.132	0.338
% LCC 1-2	31,566	3.605	13.51	8,921	3.431	12.54
% LCC 3-4	31,566	30.82	34.27	8,921	29.82	33.68
% LCC 5-6	31,566	31.51	36.55	8,921	28.84	35.63
Precipitation (mm)	31,566	145.6	68.96	8,921	144.4	68.68
Temperature (°C)	31,566	15.25	1.687	8,921	15.37	1.675
Slope (degrees)	31,566	8.552	6.754	8,921	9.119	6.604
Elevation (m)	31,531	890.3	371.7	8,911	864.2	366.1
Distance to City (km)	31,566	16.61	15.13	8,921	16.46	13.50
Distance to road (km)	31,566	6.041	6.108	8,921	6.089	5.862
Fire size dummy	31,566	0.247	0.432	8,921	0.271	0.445