

ARE VINEYARD BUYERS WARMING UP TO COOLER LOCATIONS? VALUING CLIMATE ADAPTABILITY

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OWRI - Grape Day 04/03/2018

Agenda

- Research questions & motivation
- Modeling considerations
 - ▣ Belief effects
- Data
- Hedonic analysis
- Results

[illegible]

Media coverage - Wine & Climate

Berger on Wine: Climate change may shift vineyard planting



Pinot noir grapes are removed at a vineyard near Forestville, where BURGESS / The Press Democrat)

December 12, 2017

A decade ago I wrote an April Fool's Day wine column about an optimistic winemaker in Sweden who had planted cabernet sauvignon, anticipating that climate change would put him ahead of the curve.

At the time, the idea was considered radical; Sweden was too cool to grow wine grapes. Not anymore.

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New Wine Industry Symposium Focused on Long-Term Winegrowing Strategies in Face of Climate Change Set for June 7, 2018

THE BUDAPEST TIMES



Budapest, Budapest Hungary
Current Temp: 8° C (46° F)

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VINCE
WINE IS ALL AROUND
Budapest Wine Show 2018



VÁRKERT
BAZÁR

5-6-7 APRIL 2018

📅 12 March 2018 - 10:03 AM

English bursting French bubble

Climate change brings sparkling wine revolution for England



French champagne houses are buying land in England as more and more awards are taken by high-quality English sparkling wine. The tendency is increasing rapidly: in 2015 there were 46 gold medalist products, then just two years later England could be proud of their world champ bubbly Blanc de Blancs.

Motivation

- Climate, by definition, lengthy time scale
- Uncertainty permeates future climate states
- Daily exposure to the notion that change is coming through media coverage
 - ▣ How much stock is put into these reports?
- When would the market begin to reflect future state information?

Research Questions

- Does a future forecast affect vineyard value?
 - ▣ Spoiler: Does not seem to matter
- Does the media influence vineyard value?
 - ▣ Spoiler: Yes, our belief effect is highly influential on properties that can “grow” into a warming climate

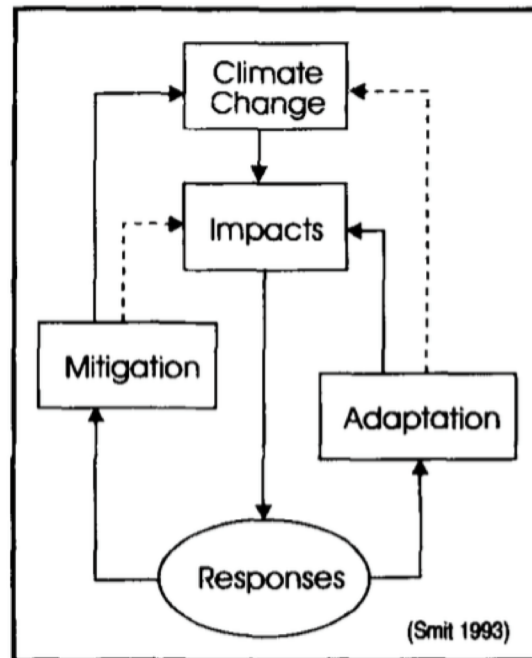


Relevant Literature

□ Adaptation Framework

▣ Climate Change Adaptation Framework

- John Smithers & Barry Smit, 1997 Global Environmental Change, “Human adaptation to climactic variability and change”



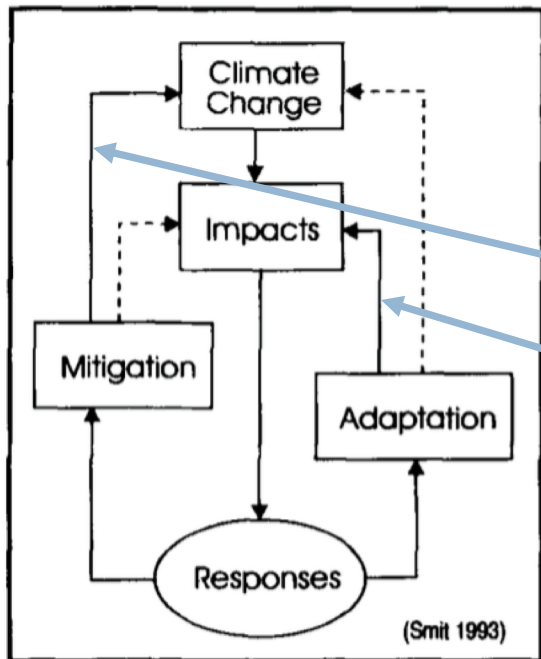
Relevant Literature

□ Adaptation Framework

▣ Influence of Climate

- Solomon Hsiang, 2016 Annual Review of Resource Economics, “Climate Econometrics”
 - Defines the way in which climate effects may be decomposed into direct effects and belief effects

Relevant Literature



- Belief Effect
- Direct Effect

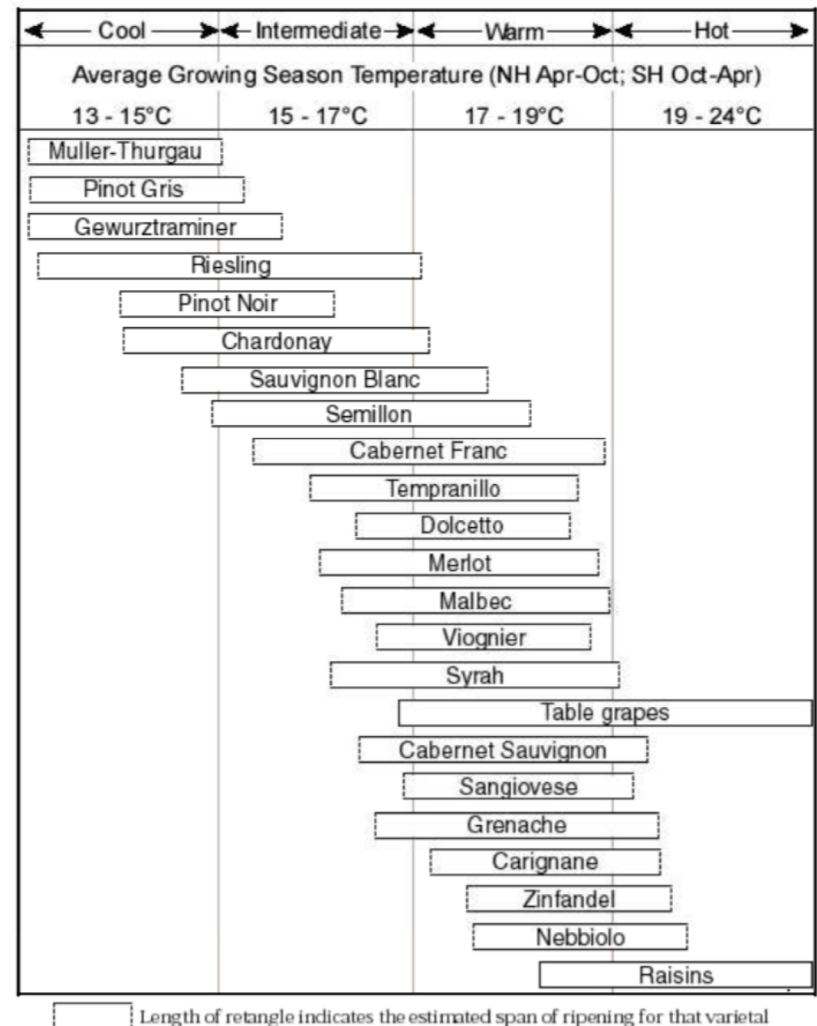
Relevant Literature

□ Vineyards Specifics

▣ Temperature matters

- Greg Jones, 2007
working paper, “Climate Change: Observations, projections, and general implications for viticulture and wine production”

Grapevine Climate/Maturity Groupings

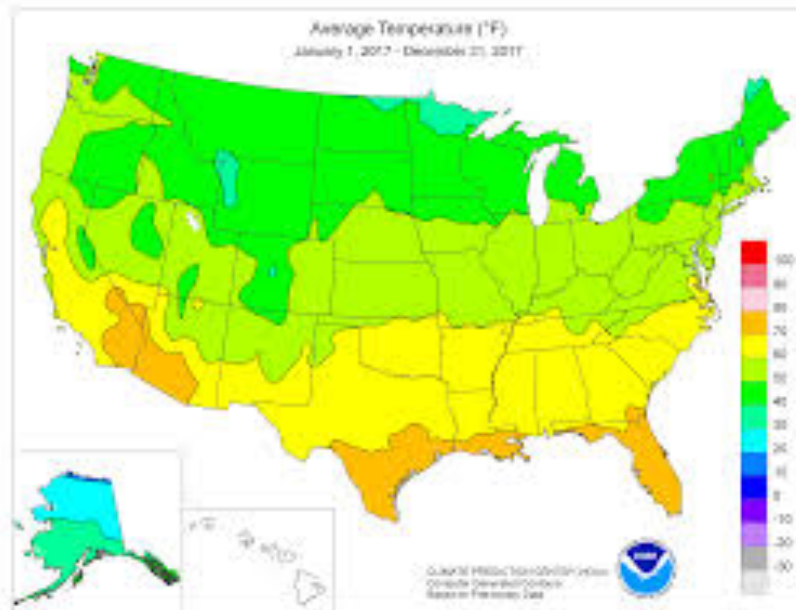


Relevant Literature

□ Vineyards Specifics

▣ “Poleward” shifts

- Mozell & Thach, 2014 Wine Economics & Policy, “The impact of climate changes on the global wine industry: Challenges & Solutions”



Relevant Literature

□ Vineyards Specifics

▣ “Poleward” shifts

- Moriondo et al, 2013
Climactic Change,
“Projected shifts in wine
regions in response to
climate change”

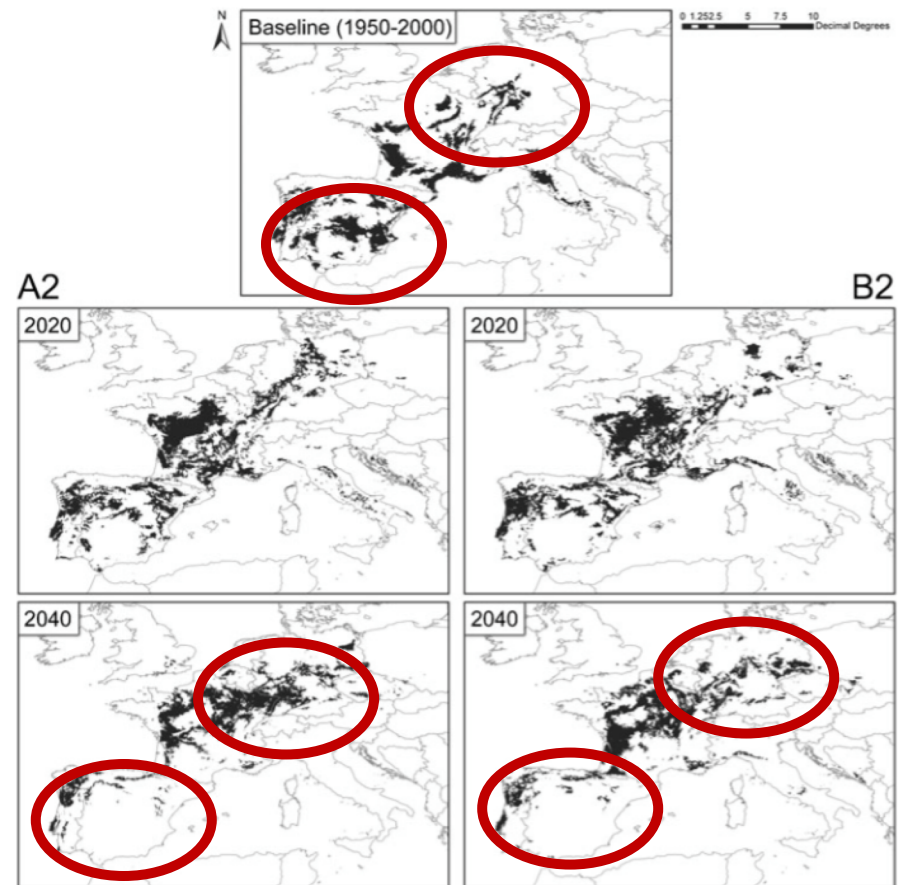


Fig. 2 Predicted grapevine cultivated area for the baseline (1950–2000) and the future time slices 2020 and 2050 in A2 and B2 scenarios

Relevant Literature

- AVA Designation & Other Controls
 - Gokeckus & Finnegan, 2017 Journal of Wine Economics, “Price Effects of Establishing a New Sub-AVA within Oregon’s Willamette Valley AVA”
 - Cross et al, 2017 Journal of Wine Economics, “Terroir in the New World: Hedonic Estimation of Vineyard Sale Prices in California”
 - Cross et al, 2011 American Economic Review: Papers and Proceedings, “What is the value of Terroir?”

What is a belief effect?

- Solomon Hsiang in “Climate Econometrics” identifies the manner in which a belief effect may be impactful:
 - ▣ What does this say? If climate changes, then the effect on the price may be decomposed into two pieces:
 - $\text{Changes in Price} = \text{Direct Climate Effect} + \text{Indirect Belief Effect}$

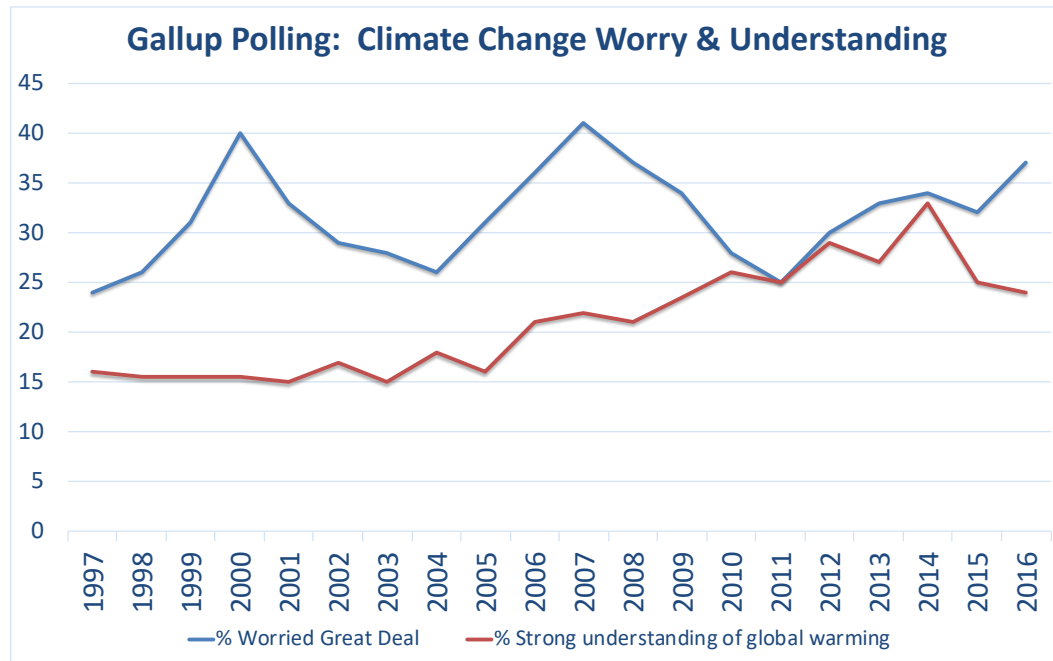
What is a belief effect?

- A belief effect is an indirect decision factor which may be strong enough to alter a choice, a value or an outcome
- Non-wine example:
 - ▣ Should I bring an umbrella today?
 - Direct Effect - Do I see it raining?
 - Belief Effect - Does a forecast tell me it's going to rain today?

Belief Effects and Vineyards?

- Why might this be plausible in vineyards?
 - ▣ Decision Duration: Vineyards last for decades upon decades
 - ▣ Price: Expensive
 - ▣ Grape sensitivity: Climate matters
 - ▣ Vineyard owners diverse and well informed

Does belief in climate change, change?



- Would belief effects be strong enough to impact vineyard values?
- Gallup Polls measuring climate change concerns show great variation between periods
 - ▣ Low ~ 20% to a high of around ~45%

Media Coverage

- Lower cost, more frequent measure?
 - ▣ News coverage/mentions of climate change
- Mechanism of media?
 - ▣ Does news inform beliefs
 - ▣ Does news follow beliefs
 - Either mechanism still would have a measurable effect on vineyard valuation



Data

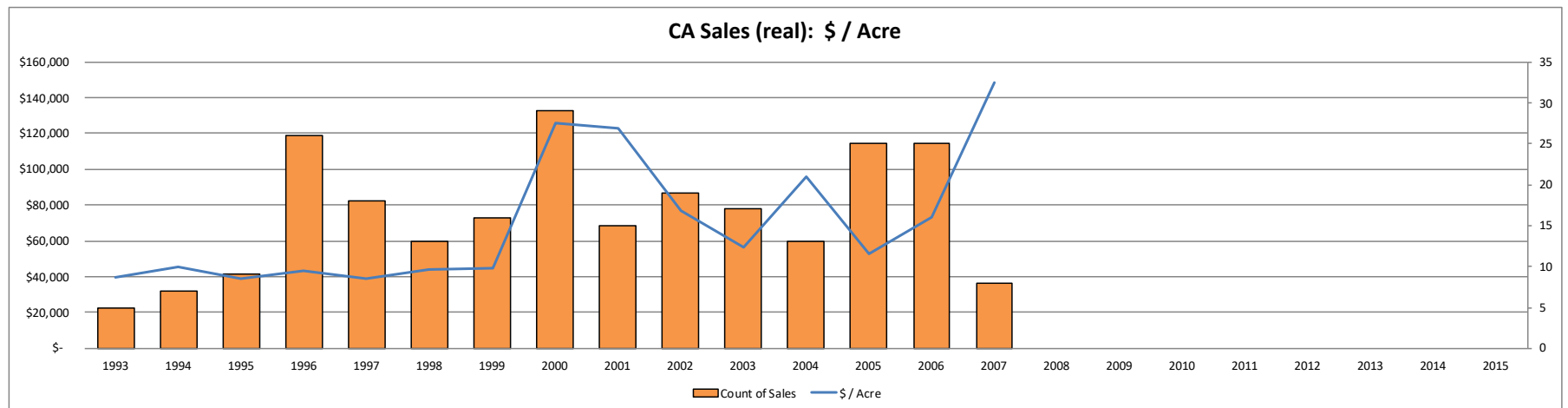
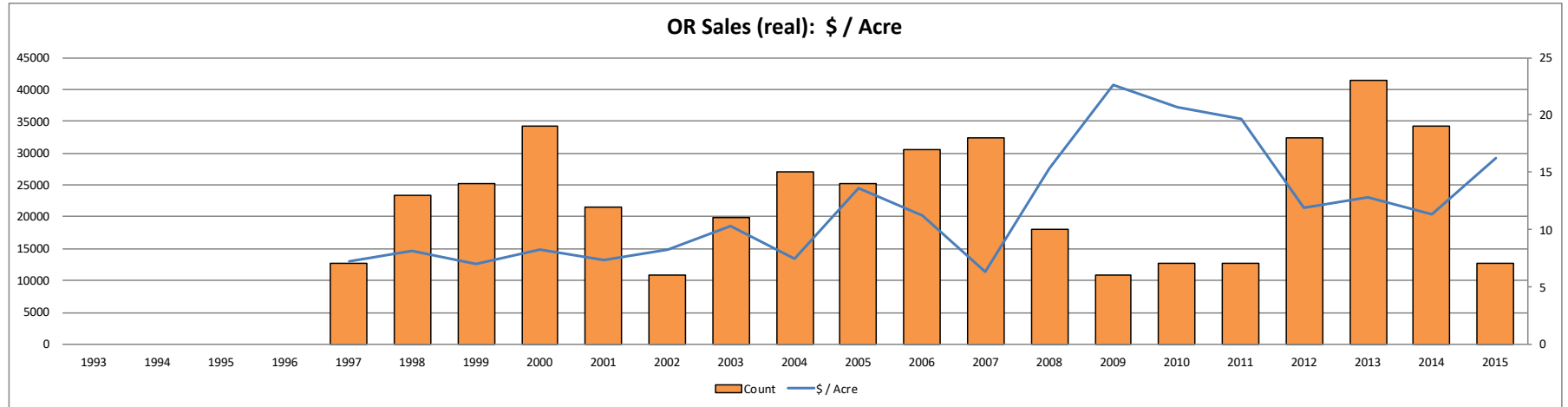
- Data set contains vineyard sales and information from OR and CA (1991 - 2015)
 - ▣ Vineyard Details:
 - Sales, "Cooler" sites
 - ▣ Geographic Characteristics:
 - Elevation grouping, slope grade, aspect, soil, climate controls
 - ▣ Forecast Information:
 - 2080 forecast by vineyard
 - ▣ Location Characteristics:
 - Distance to a major city
 - ▣ Polling/Media Coverage

Data - Summary Statistics

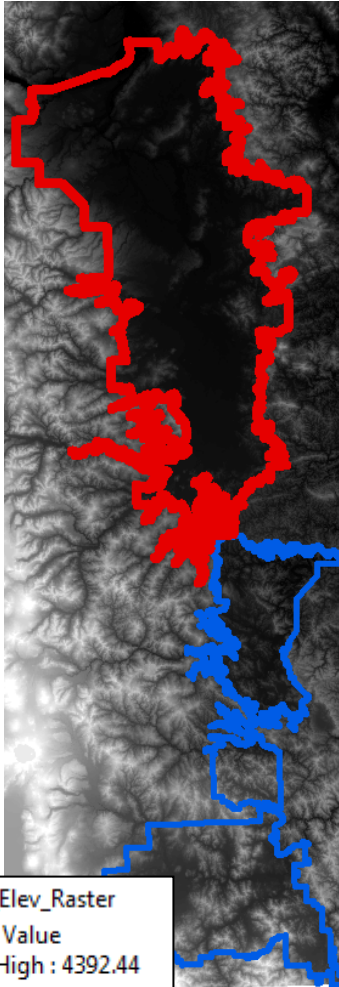
Averages by State

	<u>CALIFORNIA</u>	<u>OREGON</u>
Real Price per Acre	\$ 114,691	\$ 21,807
Total Acreage	68.3	83.2
September Minimum Temperature	10.7	9.7
September Precipitation Average	19.6	34.6
Media / News Count	744	1109
Gallup - Great or Fair Worry	61.6	59.6

Sales Data



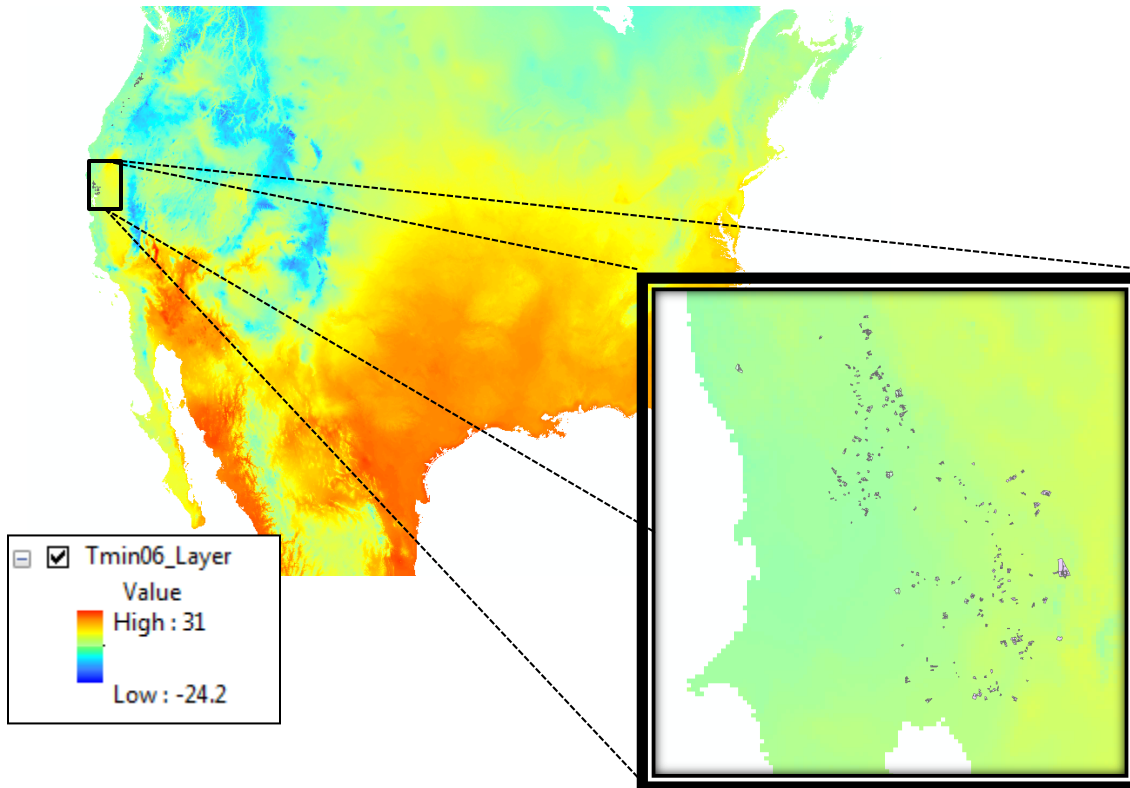
Geographical Data



	Elevation				Aspect									Temperature
	% 0-150	% 150-250	% 250-450	% 450 +	% W	% E	% S	% N	% Flat	% NW	% NE	% SE	% SW	Avg Jun Min
Southern Oregon	10%	17%	31%	42%	11%	8%	19%	14%	0%	12%	9%	12%	15%	8.49
Willamette Valley	66%	29%	4%	0%	10%	11%	22%	8%	0%	8%	9%	17%	14%	9.71
Applegate	0%	0%	75%	25%	11%	2%	26%	11%	0%	15%	3%	7%	25%	8.48
Chehalem	42%	43%	15%	0%	11%	10%	26%	5%	0%	7%	6%	17%	17%	9.96
Dundee Hills	51%	40%	9%	0%	12%	9%	21%	9%	0%	9%	6%	18%	17%	9.87
Elkton	66%	34%	0%	0%	31%	0%	4%	13%	0%	28%	0%	0%	26%	9.19
Eola Amity Hills	62%	35%	3%	0%	11%	11%	20%	10%	0%	10%	8%	17%	14%	9.51
McMinnville	47%	53%	0%	0%	7%	14%	25%	7%	0%	6%	8%	18%	14%	9.45
Ribbon Ridge	67%	33%	0%	0%	12%	9%	26%	4%	0%	9%	4%	17%	18%	10.08
Rogue Valley	0%	0%	42%	58%	12%	6%	16%	16%	0%	13%	9%	10%	17%	8.31
Umpqua Valley	38%	62%	0%	0%	8%	12%	26%	9%	0%	9%	7%	18%	11%	9.36
Yamhill Carlton	93%	7%	0%	0%	10%	10%	22%	10%	0%	9%	11%	16%	12%	9.83

Forecast Data

	<u>CA</u>			<u>OR</u>		
	Mean	Max	Min	Mean	Max	Min
June Minimum Temp	10.60	11.69	8.06	9.61	10.30	7.46
Forecasted Change (2080 Worst Case Scenario)	3.63	3.94	3.36	3.49	4.13	3.30



Analysis

- How can we model this data?

- ▣ *Hedonic analysis* - Breaks value apart by the pieces

- Example? Housing market

- You do not pay \$500,000 for a house, instead you pay for:

- The square footage

- The parcel acreage

- The neighborhood characteristics

- The quality of craftsmanship

Model Specification

□ Formally, we say a vineyard's value is a function of

▣ Direct Effects

- Vineyard attributes
- Geography & Location
- Climate
- Soil

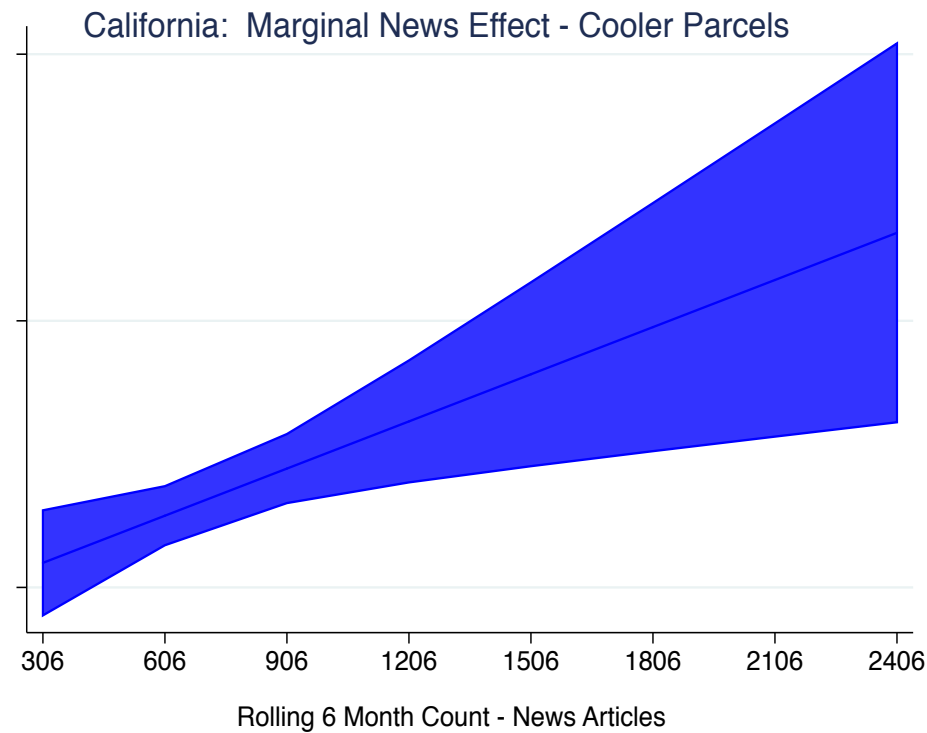
▣ Belief Effects

- Forecasts
- Climate perception



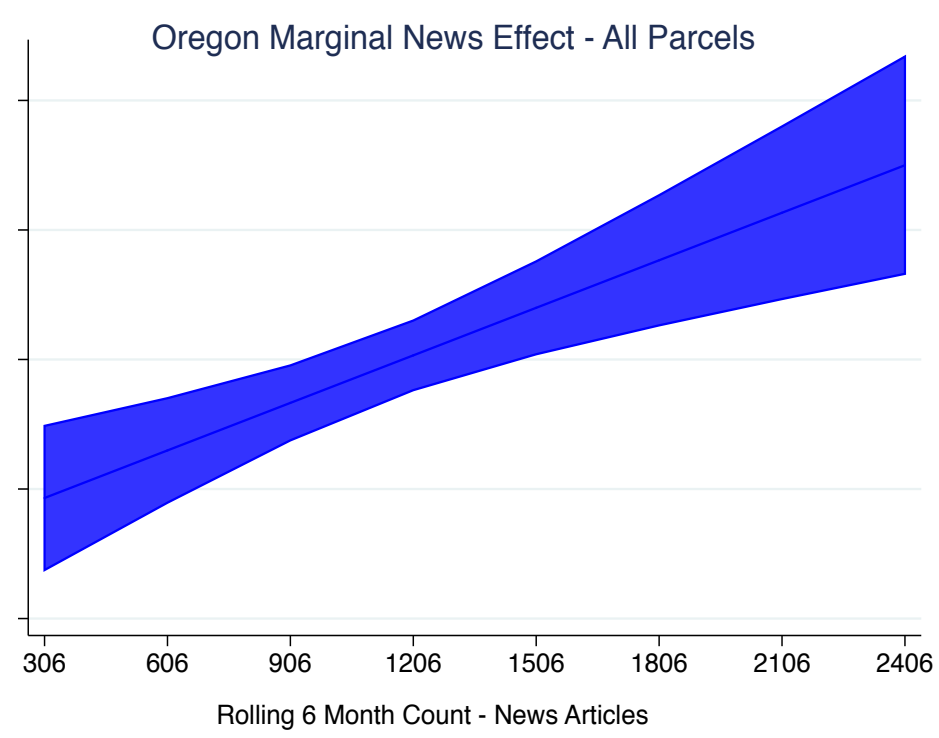
California Cooler Parcels

- Only "cooler" parcels command a premium
- Magnitude?
 - ▣ The effect of media may shift the total per-acre-price from \$109K to \$163K



Oregon Parcels

- ALL parcels command a premium
- Magnitude?
 - ▣ The effect of media may shift the total per-acre-price from \$18K to \$27K



Belief Effects

- Controlling for price changes as a function of time, belief effects (at the extremes):
 - ▣ Can shift price per acre nearly 45% for locations that are “cooler”
- Magnitude not at the extremes?
 - ▣ In Oregon, moving from 1,100 articles to 1,300 articles changes the per-acre real price from:
 - \$21,600 to \$22,683 (+\$1,083 or 5%)
 - \$5.41 per ARTICLE per ACRE price increase

Implications - Review

- Theoretical frameworks suggest people may partake in “anticipatory adaptation”
- Prior research posits a theoretical northward movement in vineyards as a climate haven
- We find premiums exist for cooler California locations and all of Oregon
 - ▣ Belief measures increase the premium suggesting adaptation may be occurring
 - ▣ Also suggesting Oregon may be a climate haven
- Media coverage may convey enough information to shift long-term investment patterns via anticipatory adaptation through a belief effect

Questions and Discussion

- Thank you