Weather, Wine and Prices

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WEATHER AND CULT WINE PRICES

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Introduction & Motivation

- Since the late 19th century, the planet's average surface temperature has increased 2°F (NASA, 2022).
- According to World Food Programme, it is estimated an additional 189 million people could face hunger if average global temperature rises by 2°C from pre-industrial levels.
- Cult wines are luxury wines that have high quality, limited quantity, restricted availability, and high prices.
- Research Questions:
  - How is weather variability associated with cult wines prices?
  - Does climate impact price differences between primary and secondary markets for cult wines?

Methodology

We implement two-way fixed effects (FE) model. It controls for unobservable firm and year fixed effects. We employ robust standard errors to account for possible heteroskedasticity and serial correlation.

- For price and weather:

$$\log(Market\ Price_{ijt}) = \alpha + \beta * f(weather_{ij(t-k)}) + \delta * X_{ijt} + \mu_i + \lambda_t + \varepsilon_{ijt}$$

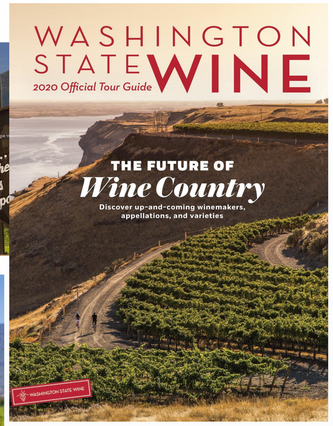
- For price gap and weather:

$$\log(Price\ Gap_{ijt}) = \alpha + \beta * g(weather_{ij(t-k)}) + \delta * X_{ijt} + \mu_i + \lambda_t + \varepsilon_{ijt}$$

$$Price\ Gap\ =\ Market\ Price\ -\ Release\ Price$$

where *i* is a wine maker; *j* is a type of wine produced by the wine maker *i*; *t* is the year when wine is released for sale; *(t–k)* represents vintage; *X* is a vector of other explanatory variables; μ_i and λ_t are firm and time effect, respectively; ε_{ijt} is an error term. We also consider different functional forms *f* for weather variables, including linear and nonlinear. Ultimately, our coefficient of interest is β.

Each equation is estimated twice: one using Ashenfelter's (2008) design and the other using Ramirez's (2008) design for weather variables. The main difference between these two designs is the way how the weather variables are split into sub-periods.

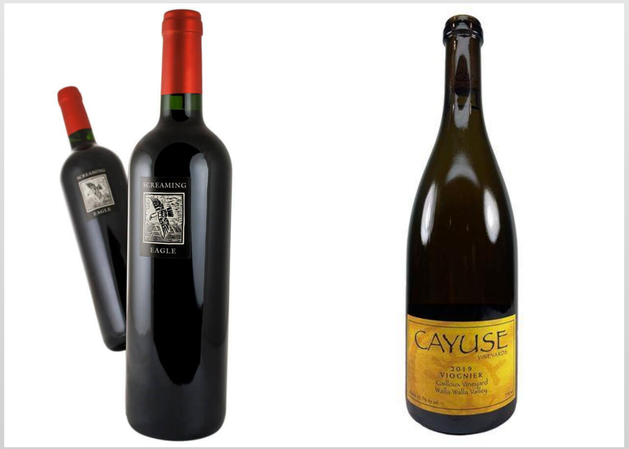


Discussion of the Results

- Our regression results indicate an increase in temperature is associated with an increase in wine prices and the price gap.
  - This is especially evident during early growing season and harvest period (April and May) and the harvest period (August and September).
- We find very little statistical evidence to support the price of cult wine being affected by the changes in precipitation.
- Wine is an interesting product because both the wine maker's reputation and the region's reputation affect prices, and the effect of past quality has a greater impact than current quality. The best wine regions could change, but reputations will likely change more slowly. The cult wine makers considered in this analysis have built their reputations into major assets.

Data

- Period: 2016-2020.
- 14 winemakers:
  - 8 from Napa (CA)
  - 4 from Sonoma (CA)
  - 2 from Walla Walla (WA/OR).
- All winemakers require a membership to be able to purchase wines directly from them.
- Sources: Wine-Searcher, Wine Spectator, and National Centers for Environmental Information.



Empirical Results

	Dependent Variable: *log(Price Gap)*							
	(1)	(2)	(3)	(4)	(5)	(6)	(7)	(8)
Avg. temp. in early growing season period (APR/MAY)	0.1129***	0.0849***			0.1185***	0.0849***	0.1291***	0.1348***
Avg. temp. in late growing period (JUN/JUL)	-0.0035	0.0084			0.0162	0.0391	0.0321	0.0427
Avg. temp. in harvest period (AUG/SEP)	0.0747**	0.0529**			0.0661*	0.0533	0.0792**	0.0614*
Avg. rain in winter period (JAN/FEB)			0.0044	-0.0038	-0.0004	-0.0163*	-0.0057	-0.0227**
Avg. rain in early growing season period (APR/MAY)			-0.1539**	-0.0442	-0.0903	0.0637	-0.0647	0.0067
Avg. rain in late growing period (JUN/JUL)			-0.0283	0.2446*	0.3441	0.3087	0.3972	0.4510**
Avg. rain in harvest period (AUG/SEP)			-0.7238**	-0.3965**	0.1657	-0.2776*	0.2342	0.4476*
Company Age							0.2493**	0.1406***
Napa Region							3.7367***	3.1563***
Sonoma Region							2.2440***	1.9235***
Constant	-6.8697**	-4.6043*	5.5442***	5.0117***	-8.1573**	-6.7362**	-22.269***	-18.385***
Firm fixed effect	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes
Year fixed effect	Yes	No	Yes	No	Yes	No	Yes	No
Observations	231	231	231	231	231	231	231	231
Adjusted R^2	0.7242	0.7177	0.7047	0.7011	0.7228	0.7208	0.7264	0.7296
F Statistic	29.7566***	37.5463***	25.9498***	32.7359***	24.9900***	30.6875***	24.4835***	30.5487***
Note:	Robust standard errors in parenthesis. *p<0.1; **p<0.05; ***p<0.01							

Reference

- Ashenfelter, O. (2008). Estimation of a hedonic price equation for Bordeaux wine: does quality matter? Economic Journal, 107, 390-402.
- Ramirez, C. D. 2008. Wine quality, wine prices, and the weather: Is Napa "different"? Journal of Wine Economics, 3(2), 114-131.