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#### DOCTORAL STUDIES

expected 2021

#### PhD. Economics

Washington State University

Dissertation: "Essays in Water and Resource Economics"

#### Committee

Professor Michael Brady
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Professor Jonathan Yoder
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Professor Joseph Cook
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#### **Fields**

Environmental and Natural Resource Economics, International Economics

#### RESEARCH PAPERS

#### Climate and irrigated agriculture: Evidence from cash rents (Job Market Paper)

Irrigated agriculture is affected by local climate impacts on profits and by non-local effects on water supplies stored as snowpack. We estimate the impact of a 1°C increase in temperature on irrigated agriculture. We focus on the rental price of irrigated cropland (cash rents), which reflects profit expectations given climate conditions and allows for a Ricardian analysis that accounts for adaptation strategies by producers. In addition, cash rents are reported separately for irrigated acres, are less subject to non-farm factors, and reflect actual market transactions. Increasing temperatures positively affect production up to a point at which higher temperatures have increasingly negative effects. We parameterize temperature as time spent in each one-degree temperature bin and use a penalized regression to estimate this threshold point for per acre irrigated cash rents and water use. To estimate climate impacts, we employ a spatial model to account for spatial correlation and reduce the effects of unobserved variables. Holding water supplies fixed, a 1°C increase in temperature would lead to an increase in per acre water use of nine percent and a decrease in per acre rent of eight percent in the high temperature counties of Arizona and southern California, leading to a 15 percent decline in total value. Less hot counties in other western states would experience a five percent increase in water use and a four percent increase in the rental price of irrigated cropland, leading to a 1.5 percent decline in total value.

#### On the frontier of water rights: Forfeiture then and now

Forfeiture of water is an important limitation on water rights in the western United States, where the right to water is allocated according to the priority date of the claim. We develop a theoretical model of forfeiture and water property rights in which the maintenance of the right requires applying water, and illustrate how forfeiture reduced information costs and enhanced water right security in the context of the settling of the U.S. western frontier. However, in a modern context these benefits are less important and the effects of forfeiture are increasingly driven by its effect on nonproductive water applications and increased transaction costs. However, forfeiture cannot be dismissed without decreasing the security of more junior water rights. This is a classic case of institutional path dependence in which a now suboptimal policy cannot be changed without significant costs. We evaluate two possible policy changes: (1) increasing the forfeiture period, and (2) reducing the burden of proof by introducing a statute of limitations on use requirements. Our model suggests that these policies reduce the negative aspects of forfeiture while minimally increasing risk to water rights holders.

### • Property rights and the relationship between conflict and drought

The effect of drought on small scale sub-national conflict is uncertain. While estimating the causal effect of drought on small scale conflict is important, understanding the mechanisms that drive that relationship can help societies manage their water resources and mitigate risk of conflict. We use a spatially-gridded measure of drought and data on conflict occurrences in Sub-Saharan Africa and Central America to examine two specific questions. Given the sparsity of conflict occurrences, what can we really say about the effect of drought? And do water property rights play a mediating role in that relationship? In our primary analysis, we employ a random effects model specified to allow for property right variation at the country level while also estimating the "within" effect of drought on small scale conflict. Preliminary results suggest that while a two-way fixed-effects model shows that drought has a small effect on the likelihood of conflict, this effect disappears when accounting for the rarity of events and eliminating nonsensical comparisons between groups by using a stacked model. Major changes in water property rights legislation do little to reduce the likelihood of conflict where it does occur.

#### PRIOR EDUCATION

2005 • M.S. in Applied Mathematics

University of Massachusetts - Amherst

2002 • B.A. in Economics

2019

2019

2019

Hampshire College

#### PUBLICATIONS

rnassqs: An R package to access agricultural data via the USDA National Agricultural Statistics Service (USDA-NASS) 'Quick Stats' API

Journal of Open Source Software, 4(43), 1880. DOI: https://doi.org/10.21105/joss.01880

The Long-Term Effects of Moving to Opportunity on Adult Health and Economic Self-Sufficiency. Coauthors: Lisa Sanbonmatsu and others.

Cityscape 14(2), 109-36.

rnassgs: Access the NASS QuickStats API

R package. https://CRAN.R-project.org/package=rnassqs, doi: 10.5281/zenodo.2662520

vcovConley: Conley spatially-adjusted standard srrors

R package. https://github.com/potterzot/vcovConley

		· ropensci/rnoaa: R interface to many NOAA data APIs
		· ghgvcr: Ecosystem Climate Regulation Services Calculator
		CONFERENCE PAPERS AND PRESENTATIONS
2020	•	"Reproducible geoprocessing of agricultural, climate, and land use data at scale with R"
		The Workshop in Environmental Economics and Data Science (TWEEDS), Online
2020	•	"Climate and irrigated agriculture: Evidence from cash rents"
		Online Seminar Workshop in Environment, Energy, and Transportation (OSWEET), Online
2020	•	"Do property rights institutions mitigate drought-induced conflict?"
		Agricultural and Applied Economics Association Annual Meeting, Online
2020	•	"Limitations on water rights in the West: The economic logic of forfeiture"
		Western Agricultural Economics Association Annual Meeting, Online
2019	•	"On the frontier of water rights: Beneficial use and relinquishment in settling the Columbia River Basin"
		Universities Council on Water Resources Annual Meeting, Snowbird, UT
2018	•	"Climate impacts on agricultural productivity in the fruitful rim"
		Northwest Climate Conference, Boise, ID
2018		"Using climate analogues to obtain a causal estimate of the impact of climate on agricultural productivity"
		Agricultural and Applied Economics Association Annual Meeting, Washington, D.C.
		SELECTED PROFESSIONAL TALKS
2020	•	"Using data.table for fast processing of large datasets"
		R Working Group, Washington State University
2019		"On the frontier of water rights: Beneficial use and relinquishment in the wild west and now"  Environmental Economics Lunch, Washington State University
2018		"A bayesian model of crop choice using STAN."
	Ĭ	R Working Group, Washington State University
2018	•	"Can crop switching mitigate the effect of climate on agricultural productivity in the fruitful rim?"
		School of Economic Sciences Seminar, Washington State University
2018	•	"Hierarchical regression modeling with STAN"
		R Working Group, Washington State University
2017	•	"Causal bayesian estimates of minimum wage impacts"
		R Working Group, Washington University
2017		"A matching approach to estimating the impact of climate on agricultural productivity"

R Working Group, Washington State University

• Contributions to other software:

## TEACHING EXPERIENCE

Fall 2018

Instructor, Fundamentals of Microeconomics

211 students, rated 4.2 out of 5

2020 | 2018 Instructor, Software and Data Carpentry Workshops

- · Maine Medical Center, Portland, ME, April 2019
- · Southwest Indian Polytechnical Institute, Albuquerque, NM, September 2019
- · Washington State University, Pullman, WA. February 2018, October 2018, April 2019, October 2019, April 2020, October 2020

## RELEVANT EXPERIENCE

present | 2018 Research Assistant, Water for Agriculture

Washington State University

· Professors Jonathan Yoder and Joseph Cook

2018 | 2017 Research Assistant, Farmer Participation in Conservation Programs

Washington State University

· Professors Hayley Chouinard, Michael Brady, Phillip Wandschneider

2017 | 2016 Research Assistant, Center for Sustaining Agriculture and Natural Resources

Washington State University

2015 | Research Assistant, Measure to Manage

Washington State University

2012

2012

Research Assistant, Moving to Opportunity Project

National Bureau of Economic Research

2011 | 2008 Business Development Volunteer, Guinea and Niger

United States Peace Corps

2008 | 2006 Research Scientist, Bureau of Business and Economic Research

University of New Mexico

## PROFESSIONAL ACTIVITIES

2019

President, School of Economic Sciences Graduate Student Association

Washington State University

2018

Vice-President, School of Economic Sciences Graduate Student Association

Washington State University

## • Referee Services

- · Journal of Open Source Software (JOSS), 2019
  - · Agricultural and Applied Economics Association submitted abstracts, 2017, 2018

# AWARDS

2017

2018 • Student Scholarship, StanCon 2018

• Tesfaye Girma Deboch Graduate Fellowship, Washington State University