

Session: “Theoretical Advances in Climate Change Economics”

Chair: Christian Traeger (University of Oslo) christian.traeger@econ.uio.no

JEL Codes (Primary): Q5, D8

JEL Codes (Secondary): D80, F42, Q54

	<u>Presenter</u>	<u>Discussant</u>	<u>Paper Title</u>
1	Lisa Rennels (UC Berkeley) lrennels@berkeley.edu	Terrance Iverson (Colorado State University) Terry.Iverson@colostate.edu	Considering Robustness to Deep Uncertainties Drives More Rapid Emissions Reductions
2	Christopher Costello (UC Santa Barbara) costello@bren.ucsb.edu	Renato Molina (University of Miami) renato.molina@miami.edu	Dynamic Climate Adaptation
3	Christian Traeger (University of Oslo) christian.traeger@econ.uio.no	David Kelly (University of Miami) dkelly@bus.miami.edu	Structure, Shocks, and Speed: Learning’s Impact on Optimal Climate Policy
4	Terrance Iverson (Colorado State University) Terry.Iverson@colostate.edu	Larry Karp (UC Berkeley) karp@berkeley.edu	Tiered Climate Clubs: Global Abatement Without Global Agreement

Considering Robustness to Deep Uncertainties Drives More Rapid Emissions Reductions

Presenter: Lisa Rennels, Energy and Resources Group; University of California, Berkeley, CA, USA; lrennels@berkeley.edu

Discussant: Terrance Iverson, Colorado State University; Terry.Iverson@colostate.edu

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Abstract:

Evaluating the economic impacts of climate change is crucial to inform climate policy. One typical approach to assessing mitigation policy options uses integrated climate-economy models to analyze tradeoffs between the costs of reducing greenhouse gas emissions and the benefits of avoiding climate damages. The deep uncertainty characterizing these models poses challenges for policymakers. We address this challenge using a robust decision-making framework to evaluate mitigation policy. We show that a shift from a decision framework that maximizes expected outcomes to one that is averse to regret supports precaution in the face of uncertainty and faster emissions cuts than currently implemented. Uncertainties about socioeconomic trajectories and the magnitude and functional form of climate damages create asymmetric consequences from delayed or weak mitigation policy.

JEL codes: D81

Dynamic Climate Adaptation

Presenter: Christopher Costello, UC Santa Barbara; costello@bren.ucsb.edu

Discussant: Renato Molina, University of Miami; renato.molina@miami.edu

Authors:

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Sam Collie, Natural Capital Consulting; samuel.brinton.collie@gmail.com

Abstract:

Managing natural resources like fisheries, forests, and ecosystems requires making decisions that have dynamic consequences. Climate change, defined as a shift in the distribution of weather experienced over time, is unequivocally dynamic and affects natural resource dynamics as it unfolds. How, then, should rational agents adapt to climate change in a dynamic setting? We provide a constructive theory that formalizes the role of adaptation, and its value, in dynamic decision environments. We show that policy functions derived to be optimal in dynamic settings without climate change are remarkably robust to climate change, so further adapting to climate change delivers only modest benefits. We illustrate this theory with a global dataset of fisheries where we find that perfect adaptation to climate change increases the value of fisheries only marginally (typically <1%) relative to optimized management without climate change. This surprising result arises despite the fact that climate change is having substantial impacts on fisheries productivity.

JEL codes: D83, Q54

Structure, Shocks, and Speed: Learning's Impact on Optimal Climate Policy

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Authors:

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Abstract:

We investigate the impact of learning on the formation of optimal economic policy, with a particular emphasis on climate policy. Dynamic economic models dealing with uncertainty inherently rely on assumptions about how agents anticipate and adapt to new information. We find that seemingly similar 'no learning' approaches can result in widely divergent risk premiums applied to policy decisions. Specifically, our study focuses on the uncertain factor of climate sensitivity - the degree to which our planet's temperature responds to the accumulation of greenhouse gases over medium to long-term periods. We carefully distinguish three components of uncertainty: natural temperature variability, measurement error, and subjective uncertainty governing unknown model parameters. Even though learning reduces uncertainty over time, our analysis using a version of Nordhaus' Dynamic Integrated Model of Climate and the Economy (DICE) framework reveals a paradox: accelerated Bayesian learning can, in fact, increase the risk premium on the optimal carbon tax. We provide an analytic formula for optimal carbon pricing under anticipated Bayesian learning, and we offer an in-depth discussion of the mechanisms through which uncertainty and learning interplay to influence policy formulation. We illustrate how the speed of information acquisition affects policy risk premiums through different channels. Our findings are quantified within a DICE-based recursive stochastic dynamic programming model, providing insights that challenge traditional notions of learning and policy-making in the context of environmental economics.

JEL codes: D80, D83, Q54

Tiered Climate Clubs: Global Abatement Without Global Agreement

Presenter: Terrance Iverson, Colorado State University; Terry.Iverson@colostate.edu

Discussant: Larry Karp, UC Berkeley, karp@berkeley.edu

Author: Terrance Iverson, Colorado State University; Terry.Iverson@colostate.edu

Abstract:

The paper proposes a novel policy structure with the potential to effectively reduce global carbon emissions without the need for broad multilateral cooperation. It extends Nordhaus's (2015) climate club by adding a second tier. Countries in the second-tier price carbon at a fixed fraction (the "match rate") of the average carbon price adopted within the first tier, or face tariffs. Tier-one countries abate more since doing so induces matching abatement elsewhere. The analytical section derives closed-form expressions for the optimal carbon price and global abatement. It shows how a TCC navigates the major challenges that arise when carbon abatement is adopted by less than the Grand Coalition. The quantitative section studies coalition stability in a quantitative model that resembles C-DICE, the coalition-formation model used in Nordhaus (2015). The unique stable coalition consists of the US, EU, and UK. It optimally sets the first-tier carbon price near the global Social Cost of Carbon, achieving global abatement just over half the efficient level. The agreement could be strengthened to achieve the efficient level of global abatement if the US-EU-UK coalition could increase the match rate to 67 percent.

JEL codes: F42, Q27

Session: “Climate change impact, adaptation, and resilience in the developing world”

Chair: Xinde Ji (University of Florida) xjil@ufl.edu

JEL Codes (Primary): I2, J1, Q2

JEL Codes (Secondary): I25, J16, Q23

	<u>Presenter</u>	<u>Discussant</u>	<u>Paper Title</u>
1	A. Patrick Behrer (World Bank) abehrer@worldbank.org	Kelton Minor (Columbia University, km3876@columbia.edu)	High Temperature and Learning Outcomes: Evidence from Ethiopia
2	Valeria Mueller (Arizona State University) vmuelle1@asu.edu	Aparna Howlander (Chatham University, A.Howlander@chatham.edu)	Social Assistance and Adaptation to Flooding in Bangladesh
3	Eric Zou (University of Michigan) ericzou@umich.edu	Victoria Xie (Santa Clara University, wxie@scu.edu)	Microclimate Risks and Urban Businesses
4	James Ji (University of Florida) xjil@ufl.edu	Valerie Mueller (Arizona State University, vmuelle1@asu.edu)	Climate Change, Intimate Partner Violence, and the Moderating Effects of Climate Resilience Initiatives

High Temperature and Learning Outcomes: Evidence from Ethiopia

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Abstract:

We use data from 2003-2019 for 2.47 million test takers of a national high-stakes university entrance exam in Ethiopia to study the impacts of temperature on learning outcomes. We find that high temperatures during the school year leading up to the exam reduce test scores, controlling for temperatures when the exam is taken. Our results suggest that the scores of female students are less impacted by higher temperatures compared to their male counterparts. Additionally, we find that the scores of students from schools located in hotter regions are less impacted by higher temperatures compared to their counterparts from cooler regions. Our evidence indicates that the adverse effects of temperature are driven by impacts from within-classroom temperatures, rather than from indirect impacts on agriculture.

JEL codes: I25, Q54

Social Assistance and Adaptation to Flooding in Bangladesh

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Abstract:

Bangladesh faces increasingly severe environmental risks due to climate change, with women and girls disproportionately affected. Within Bangladesh, there is growing interest in the potential of social assistance programs (such as those providing cash or in-kind transfers, often with complementary trainings or other activities) to build climate resilience among women and girls. Social assistance programs target large numbers of poor and vulnerable households – which are hardest hit by climate hazards – and are well-established in Bangladesh. Many also name women as primary transfer recipients or include other components targeting women, thus having potential to be gender-responsive. However, little rigorous evidence exists globally on the role of social assistance programs in promoting women’s and girls’ climate resilience, with even less specific to Bangladesh. We contribute to addressing this evidence gap by bringing together union-level remote sensing data with longitudinal household survey data from a randomized trial of a social assistance program in Bangladesh. The social assistance program, the Transfer Modality Research Initiative (TMRI), provided monthly cash or food transfers, with or without intensive nutrition behavior change communication to mothers of young children in poor rural households. TMRI was implemented from 2012-2014 as two cluster-randomized controlled trials, in the Northwest (Rangpur) and in the Southern coast (Barisal and Khulna). TMRI treatment and control households were interviewed at baseline, midline, and endline rounds (2012, 2013, 2014), as well as 4 years post program (2018). We first construct measures of union-level exposure to flood hazards for all TMRI households in each of these rounds. We then use the randomized design of TMRI to assess the role that receiving social assistance played in protecting household-level and gender-disaggregated outcomes in the short- and longer-term in the context of this exposure, as well as the extent to which it promoted specific gendered coping and adaptive behaviors.

JEL codes: J16, O15, Q54

Microclimate Risks and Urban Businesses

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Abstract:

A heat wave pans out differently across areas within a city. This paper documents these microclimate variations, estimates the damage function on city businesses, and studies mitigation strategies. We: (1) leverage high-resolution satellite data to document sub-city temperature variations during a hot day; (2) use geo-located revenue and consumer traffic data from over 150,000 restaurants and other eatery service establishments in a mega city of China to estimate the damage function of these microclimate shocks on business outcomes; and (3) present new evidence that urban green spaces around businesses mitigate the microclimate shocks they experience. Our research highlights location microclimate management as an important part of business strategies in the face of rising climate risks.

JEL codes: Q23, Q54, R12

Climate Change, Intimate Partner Violence, and the Moderating Effects of Climate Resilience Initiatives

Authors list (name, affiliation, email):

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Abstract:

This paper investigates the impact of climate change on women's agency in Bangladesh. Utilizing a novel dataset linking meteorological data with information on women's agency from the Bangladesh Demographic and Health Survey, and controlling for a variety of weather indicators in flexible specifications, we find that dry shocks increase tolerance for intimate partner violence among poorest women in agriculture-dependent communities, thus amplifying existing socio-environmental vulnerabilities. Climate resilience projects funded by the Bangladesh Climate Change Trust (BCCT) moderate the negative impacts of dry shocks on intimate partner violence, indicating an important role for initiatives that appear to have positive externalities in terms of ameliorating the harmful consequences of climate change on women. Our findings offer insights into the complex environmental and social dynamics that shape gendered climate change effects, and highlight the role of policy interventions in fostering resilience and women's wellbeing.

JEL codes: J16, O15, Q54

Session Title: The Energy Transition, Electricity Prices, and Consumer Behavior

JEL classification (primary): L94

JEL classification (secondary): Q42

Chair: Karen Palmer, Resources for the Future, palmer@rff.org

Papers:

Unintended Consequences of Time-Of-Use Rates: EV Charging and Distribution Network Constraints

Presenter: David Brown, University of Alberta, dpbrown@ualberta.ca

Discussant: Casey Wichman, Georgia Institute of Technology, wichman@gatech.edu

How does declining US electricity demand affect electricity prices? Implications for the distributional effects of energy efficiency, rooftop solar and other demand side policies

Presenter: Joshua Linn, University of Maryland, linn@umd.edu

Discussant: Jesse Buchsbaum, Resources for the Future, jbuchsbaum@rff.org (after 8/16/2024)
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Variable Pricing Accelerates Decarbonization of the Electricity Sector: Implications from a High-Resolution Model of the Continental United States

Presenter: Ethan Hartley, University of Hawaii Manoa, ehartley@hawaii.edu

Discussant: Lucas Davis, University of California Berkeley, ldavis@haas.berkeley.edu

Good Rates Sunshine: The Causal Impact of Time-of-Use Rates on Residential PV Adoption

Presenter: Jenya Kahn-Lang, Resources for the Future, jkahn-lang@rff.org

Discussant: Katrina Jessoe, University of California Davis, kkjessoe@ucdavis.edu

Unintended Consequences of Time-Of-Use Rates: EV Charging and Distribution Network Constraints

Megan Bailey, University of Calgary

*David Brown, University of Alberta

Erica Myers, University of Calgary

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Frank Wolak, Stanford University

We implement a field experiment to assess the effect of time-of-use (TOU) pricing and managed charging to shift the timing of electric vehicle (EV) charging and reduce strain on the electric distribution grid. We randomly assign EVs into 10-vehicle “virtual transformer” groups that face randomized, daily transformer constraints. We find that while TOU rates do deliver, as intended, a shift in electricity consumption to off-peak periods—a useful outcome for the energy system—they also result in the unintentional coordination of electricity consumption for EV charging in the cheaper evening TOU off-peak hours. This unintended coordination aspect of TOU pricing increases the frequency of virtual distribution transformer constraint violations compared to our control group. In contrast, centrally managed charging of EVs reduces the frequency of virtual transformer constraint violations. Further, we find that EV owners rarely opted out of managed charging, only overriding managed charging in approximately 1% of charge sessions. These results highlight the potential for automation to facilitate electrification of the transportation sector with lower distribution grid upgrade costs than expected.

How does declining US electricity demand affect electricity prices? Implications for the distributional effects of energy efficiency, rooftop solar and other demand side policies

Jing Liang, University of Maryland at College Park

*Joshua Linn, University of Maryland at College Park

Lucy Qiu, University of Maryland at College Park

In the United States, local, state, and federal policies promote energy efficiency and rooftop solar photovoltaic (PV) systems, aiming to decrease electricity demand and reduce stress on the electricity grid as well as local air pollution and greenhouse gas emissions. While advocates proclaim these policies to be highly cost effective, opponents caution against a death spiral. Electricity transmission and distribution services constitute natural monopolies, and their average costs decrease with the quantity of electricity supplied. By reducing electricity demand, rooftop solar or energy efficiency policies increase average costs of supplying transmission and distribution, which could increase retail electricity prices. Higher prices would further stimulate PV and energy efficiency adoption, reducing electricity demand and potentially driving retailers out of business. While claims of death spirals may be overblown, invoking them does highlight the real possibility that demand-side climate policies may be regressive. High-income households tend to benefit directly from PV subsidies and efficiency standards and programs. Because the income elasticity of consumption is less than one, higher electricity prices disproportionately disadvantage lower-income households. Consequently, these policies may be regressive, even those that target benefits to low-income households. This paper evaluates whether PV subsidies, home appliance energy efficiency standards, and other energy efficiency policies have increased electricity prices and household bills. We quantify the distributional implications of those price changes across income and other demographic groups. We combine econometric analysis with a more structural approach based on an electricity generator dispatch model to estimate the short run elasticity of electricity supply to the price of electricity. Based on these estimates, we simulate demand reduction caused by subsidizing solar PV or energy efficiency and quantify the welfare changes across income and other demographic groups caused by the resulting changes in electricity prices.

Variable Pricing Accelerates Decarbonization of the Electricity Sector: Implications from a High-Resolution Model of the Continental United States

*Ethan Hartley, University of Hawaii at Manoa
Michael Roberts, University of Hawaii at Manoa

Real-time pricing (RTP) sets the price of electricity equal to its marginal cost over a short period, typically one hour. Alternatively, time-of-use pricing (TOU) sets prices by time of day, ideally varying according to the typical marginal cost in each block. Since network monopolies govern electricity at the retail level, prices are regulated and rarely time-varying. Usually, retail prices far exceed marginal costs to help recover capital and operations costs. Sometimes, retail prices can be far less than marginal cost, particularly when demand approaches the system's capacity and scarcity rents become large. Economists have long advocated for variable prices that come as close as feasible to marginal cost. While nominal gains in conventional power systems are modest, variable retail pricing also alleviates market power in wholesale markets, which can be substantial. Variable pricing is also becoming more valuable with intermittent solar and wind growth. For the island of Oahu, the benefits of RTP are 6-12 times greater in a decarbonized system compared to a conventional one, depending on demand and cost assumptions. In this paper, we evaluate the benefits of RTP and TOU nationally using a high-resolution implementation of Switch, open-source software that simultaneously resolves investment, hourly chronological operations, and demand across 26 regions, including crucial weather links. We use this model to project the effects of the Inflation Reduction Act on the decarbonization pathway and how much RTP and TOU would shift that path. We also quantify the social benefits from both emissions reductions and consumer benefits. Without RTP or TOU, projected emissions reductions align with recent studies. The model projects a considerably faster decarbonization pathway with RTP that meets or exceeds ambitious decarbonization goals while generating significant additional consumer benefits. Gains from TOU are substantial but far less than RTP.

Good Rates Sunshine: The Causal Impact of Time-of-Use Rates on Residential PV Adoption

*Jenya Kahn-Lang, Stanford University
Karen Palmer, Resources for the Future
Peter Cappers, ABT Associates

There has been increasing regulatory support for time-of-use (TOU) electricity rate designs, and simulation studies suggest that residential photovoltaic (PV) adoption could be highly sensitive to switching to TOU rates. At the same time, research suggests that most residential consumers are inattentive to their electricity rate choices and the rate designs they face. There is little ex-post empirical evidence on how TOU rates impact PV adoption in practice and whether residential customers consider rate design when deciding whether to invest in PV. This paper fills this gap by empirically estimating the causal impacts of optional and mandatory time-of-use rates on residential PV adoption. Our findings provide important insights for regulators and utilities about the tradeoffs between efficient short-run and long-run electricity pricing and the role of alternative policies for incentivizing greenhouse gas-mitigating technologies.

Session: “Water and Water Policy”

Chair: Sheila Olmstead (UT Austin)

JEL Codes (Primary): Q2, Q5

JEL Codes (Secondary): Q25, Q15, Q53, Q58

	<u>Presenter</u>	<u>Discussant (confirmed)</u>	<u>Paper Title</u>
1	Matt Woerman (Colorado State University) matt.woerman@colostate.edu	Katrina Jessoe (UC Davis) kkjessoe@ucdavis.edu	Benefits of Surface Irrigation Project for Groundwater Conservation in India
2	Jinge Li (Yale) jinge.li@yale.edu	David Keiser (UMass-Amherst) dkeiser@umass.edu	Green Ocean: Nutrient Pollution and Transboundary Dynamics in East Asia
3	Laura Alcocer Quinones (UC Davis) lalcocer@ucdavis.edu	Wes Austin (US EPA) Austin.Wes@epa.gov	The Quality of Water Quality Regulation: Assessing the Impact of PFAS Water Regulation in California
4	Praharsh Patel (Penn State University) pmp5456@psu.edu	Sheila Olmstead (UT Austin) sheila.olmstead@austin.utexas.edu	Behavioral responses to two-part tariffs: Evidence from the introduction of volumetric water pricing

Benefits of Surface Irrigation Project for Groundwater Conservation in India

Authors: Prashikdivya Gajbhiye, University of Massachusetts - Amherst; Nilesh Shinde, University of Massachusetts Amherst; and Matt Woerman, Colorado State University

Abstract:

India's groundwater aquifers are being critically overdrafted, largely because 60% of agricultural water demand is supplied by groundwater. To reverse this unsustainable aquifer use, India has invested billions of dollars in large canal irrigation systems. These canals provide surface water that both serves as a substitute for groundwater and provides water to recharge aquifers. Recent studies have explored local agricultural and economic consequences of such projects, yet the extent to which these investments improve groundwater aquifer levels remains unclear. To address this gap, we use a geographic regression discontinuity design (RDD) to study the effects of India's multi-billion-dollar Narmada Main Canal (NMC) project in Gujarat. Because of the hydrogeologic features of this gravity-fed canal, surface water is accessible only on one side of the canal. As a result, our estimation strategy effectively compares units on the side of the canal with surface water to the nearly identical units on the other side that lack this resource. We use observed groundwater levels, village-level data, and highly-granular satellite imagery to estimate the effects of this large canal irrigation project on a wide range of outcomes. We estimate the canal surface water causes aquifer levels to rise by 14.56 meters—55% of baseline aquifer levels—indicating the irrigation canal project is effective at reversing the overuse of important groundwater resources. We further find that surface water access reduces the costs of constructing groundwater wells and other water structures, saving each village roughly \$14,000 over the years 2007 to 2014, which corresponds to a total savings of at least \$44 million during this period. Looking at agricultural outcomes, we find that this surface water access causes a 10% increase in irrigated area, a 12% decrease in the planting of drought-resistant crops, and a 12% increase in the planting of high-value cash crops.

JEL codes: Q15, Q25

Potential Discussants

- Shweta Bhogale (JPAL and UCSD): sbhogale@povertyactionlab.org
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Green Ocean: Nutrient Pollution and Transboundary Dynamics in East Asia

Authors: Xinming Du, National University of Singapore; and Jinge Li, Yale University

Abstract:

Incorporating natural capital into welfare assessments is gaining visibility among economists and policymakers. This paper provides a framework to estimate one aspect of natural capital: the value of ocean. We study the causes, consequences, and transboundary dynamics of ocean nutrient pollution. To do so, we combine granular data on ocean color, chemical characteristics, surface current speed and direction, with fertilizer usage, fishery yield, and human health in China, South Korea, and Japan.

Our findings reveal a direct link between inland fertilizer usage and coastal nutrient pollution in China: A one-million-ton increase in fertilizer application at the province-year level corresponds to a 0.16 percentage point rise in downstream inland water pollution and a 0.8 percentage point increase in coastal ocean chlorophyll-a levels.

Examining the transboundary impact, we construct an ocean current flow matrix at the province-province-month level between Chinese coastal provinces and the receiving countries for over twenty years and uncover significant nutrient pollution inflows from China to South Korea and Japan. Specifically, a 1% increase in China's coastal pollution leads to a 0.34% increase in South Korea's coastal pollution and a 0.05% increase in Japan's coastal pollution after three months.

Integrating transboundary estimates with outcomes in South Korea, our analysis reveals ocean pollution from China damages fishery yields and increases mortality rates in South Korea. Instrumented by China's imported pollution, a 1% increase in Korea's surrounding ocean chlorophyll-a concentration reduces fish catch by 0.24% and increases the total number of deaths by 0.006%. This implies an annual loss of \$4.6 million in Korea's fishery revenue and approximately 1,200 additional human deaths due to China's national fertilizer use.

From the policy perspective, our findings underscore the importance of efficient fertilizer use and sustainable agriculture practices. The transboundary nature of ocean pollution calls for international cooperation.

JEL codes: Q53

Potential discussants:

- David A. Keiser (UMassAmherst, dkeiser@umass.edu)
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- Namrata Kala (MIT, kala@mit.edu)
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The Quality of Water Quality Regulation: Assessing the Impact of PFAS Water Regulation in California

Authors: Laura Alcocer Quinones, University of California, Davis

Abstract:

Certain unregulated and harmful contaminants have become prevalent in the United States' drinking water systems. These are known as PFAS (Per- and Polyfluoroalkyl Substances), a family of man-made chemicals primarily used in production processes. Appropriately nicknamed "Forever Chemicals", these substances are difficult and costly to remove. While these chemicals remain federally unregulated under the Safe Drinking Water Act, states like California regulate them. The goal of this paper is to evaluate the impact of the reduction of Notification Levels for Perfluorooctanoic acid (PFOA) and Perfluorooctanesulfonic acid (PFOS) in California in 2019. Anecdotally, this low-cost policy led to improvements in water quality. A key challenge of this analysis is the wide prevalence of partial censoring in PFAS reporting. I first show that applying standard approaches, such as difference-in-differences or changes-in-changes, ignoring this partial censoring, would lead to biased estimates of the causal impact of the regulation. To overcome this bias, I use a parametric approximation to recover the cumulative distribution function (CDF) under partial censoring focusing on the PFAS context in California. I implement a changes-in-changes approach using the recovered distribution of PFAS concentration to estimate the impact of tightening standards for the regulated pollutants on water quality. Using PFAS concentration data at the source-test level from the California Department of Drinking Water and the EPA, paired with socioeconomic and demographic characteristics, weather data, and other variables, I quantify the effect of this policy on water quality. This paper provides evidence on how different regulatory instruments can curb our exposure to pollution. Furthermore, the methods implemented will allow for policy evaluation under partial censoring of data in a variety of contexts.

JEL codes: Q50, Q53, Q58

Behavioral responses to two-part tariffs: Evidence from the introduction of volumetric water pricing

Authors: Praharsh M. Patel (Corresponding Author), PhD Candidate (Energy, Environmental, and Food Economics), Pennsylvania State University. Daniel A. Brent, Associate Professor, Pennsylvania State University. Casey Wichman, Associate Professor, Georgia Institute of Technology

Abstract:

Climate change, population growth, and competing demands for scarce water are straining water resources globally. With growing urbanization, urban utilities face challenges as they struggle to meet growing water demand, update outdated infrastructure, and balance strained water resources on top of pushing the conservation agenda. Economists advocate using price signals to encourage water conservation (Olmstead, REEP 2010); however, there are often political constraints and challenges to using prices for conservation. Furthermore, an ongoing debate persists regarding whether consumers respond to marginal or average prices when facing nonlinear tariffs. Understanding consumers' responses to prices is important for estimating demand and setting rates to encourage conservation. This paper exploits a wide-scale policy that installs water meters and switches consumers from flat rates to volumetric rates. In 2004, California passed Assembly Bill 2572 to require all urban water suppliers to meter and charge customers for the water they use by 2025. This generates a large and salient increase in the marginal cost of water and provides quasi-experimental data to understand if consumers respond to the price mechanism. This setup allows us to address two primary research questions: 1) how do consumers respond to the introduction of volumetric water rates? and 2) what can we learn about consumer behavior based on heterogeneous responses? The results show heterogeneity among the consumers. The consumers seeing a reduction in total bills after switching to volumetric pricing, and the low-consumption households increase their consumption. On the contrary, the high-water consuming households reduce their consumption. These results are consistent with consumers using heuristics to respond to complicated rate schedules, also termed as "schmeduling" (Liebman and Zeckhauser, 2004), instead of optimizing concerning the correct marginal incentives. This leads to understanding that the changes in marginal incentives may have a limited impact on conservation without large changes in total bills, which is politically challenging.

JEL codes: L95, Q25, Q58, Q52

Potential discussants:

- Kristina Jessoe, Associate Professor, University of California Davis kjessoe@ucdavis.edu
- Koichiro Ito, Associate Professor, Harris School of Public Policy at University of Chicago ito@uchicago.edu

Session Title: Energy Markets and the Environment

JEL classification (primary): Q4

JEL classification (secondary): Q2, Q3

Chair: Ken Gillingham, Yale University, kenneth.gillingham@yale.edu

Papers:

Money and Power: How Economies of Scope in Financing Shape the Green Energy Transition

Presenter: Joshua Blonz, Federal Reserve Board of Governors, Joshua.blonz@frb.gov

Discussant: Nora Pankratz, University of Toronto, nora.pankratz@gmail.com

Drought and Investment in Electricity Markets

Presenter: Lena Harris, University of Rochester, h.harris@rochester.edu

Discussant: Cuicui Chen, SUNY Albany, cchen27@albany.edu

Quantifying Commitment Failure in Oil and Gas Auctions

Presenter: Eric Lewis, Texas A&M University, ericlewis@tamu.edu

Discussant: David Brown, University of Alberta, dpbrown@ualberta.ca

You Don't Know? Pump It Up: Consumer Beliefs and Gasoline Price Uncertainty

Presenter: James Archsmith, University of Maryland, College Park, archsmi@umd.edu

Discussant: Ken Gillingham, Yale University, kenneth.gillingham@yale.edu

Money and Power: How Economies of Scope in Financing Shape the Green Energy Transition

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Many firms with extensive fossil fuel electricity generation capacity also account for a large share of investment in both nonfossil generation capacity and transmission and distribution (T&D) infrastructure. In this paper, we argue that financial frictions can endogenously generate these economies of scope and study the role of financial markets in driving structural changes in electricity markets. We use the Federal Reserve's Y-14Q regulatory filing data to first show that firms with fossil generation capacity have access to valuable collateral and stable cash flows provided by their fossil generation assets, which allows them to obtain more generous terms on loans for both fossil and non-fossil projects. We then examine how the financing and operations of energy producers change in response to an increase in the cost of fossil generation. We use the rollout and enforcement of the 2011 Mercury Air Toxics Standard (MATS), which required scrubbers to be installed on all coal fired power plants by April 2016. Our identification strategy compares loan outcomes for otherwise-similar generation firms with heterogeneous exposure to MATS based on pre-existing installation of coal scrubbers. We manually match the loan-level Y-14Q data to EIA Form 860 data on power plant characteristics to determine firm-level exposure to the regulation. Preliminary evidence shows that firms exposed to MATS became more likely to default on their fossil loans but did not adjust their fossil operations. Instead, they responded primarily by scaling down their nonfossil activities. These results suggest that regulations specifically targeting fossil fuel generation can have unintended consequences for other kinds of energy investments.

Drought and Investment in Electricity Markets

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Climate change potentially poses a risk to electricity generation by making drought both more frequent and more severe, since thermal generation (i.e. coal, natural gas, etc.) accounts for almost 50% of total water use in the US (LLNL, 2011). However, the full impact of changing drought conditions on electricity markets is unclear since while drought may adversely impact short run generation, it may also spur investment in less water intensive generation technologies mitigating the short run shock. This paper examines the equilibrium effects on electricity markets from changing drought conditions by exploring both channels. Using monthly power plant level data for Texas since 2001, I first present empirical evidence on both the short and long run relationship between drought and electricity market outcomes. I show that in the short run worse drought conditions shift generation away from high water use technologies leading to an increase in the wholesale market price. A novel finding is that the magnitude of these changes depends both on the share of the market impacted by drought and the merit order of the affected plants relative to the marginal producing plant. I then present new correlational evidence that worse drought conditions are also associated with a shift in investment away from high water use technologies. I then use the empirical evidence to develop a structural model of production and investment in electricity markets that includes drought shocks. I use the model to run counterfactual experiments to understand the potential risks to electricity markets from changing drought conditions and to what extent endogenous investment mitigates these risks. The findings of this paper are directly relevant for ensuring energy reliability in the face of a changing climate, but also help inform policies regarding power plant siting and investment in alternative generating technologies.

Quantifying Commitment Failure in Oil and Gas Auctions

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A seller who receives no initial offers for a good may lower the price of the good in hope of attracting future sales. Knowing this, potential buyers may be incentivized to initially withhold offers, hoping to receive the good at a lower price in the future. We quantify the impact of the failure to commit to a price within the setting of US federal onshore oil and gas lease auctions where government policy set a reserve price but then made leases available first-come first-serve at a lower price in the event of no bid meeting the reserve price. This practice, known as "noncompetitive leasing", had a significant effect on lease outcomes as 27% of onshore federal leases awarded from 2003-2019 were sold noncompetitively. To measure the impact of noncompetitive leasing policy, we compile data on federal onshore oil and gas lease auctions from Nevada, Montana and the Dakotas between December 2016 and September 2020. Consistent with theory, our reduced-form descriptive evidence shows that high expected productivity parcels were the most likely to be sold via auction, medium productivity parcels were the most likely to be sold non-competitively, and low expected productivity parcels the most likely to remain unsold. We then estimate a structural model where participants choose whether to bid in the auction, submit a noncompetitive offer, or do nothing. We use our estimates to compute counterfactuals for government revenue in the case where the non-competitive system is eliminated and the reserve price was binding. Preliminary estimates show that eliminating noncompetitive leasing would lead to positive but small increases to government revenue. We also examine how parameter estimates of auctions are biased if commitment failure is ignored.

You Don't Know? Pump It Up: Consumer Beliefs and Gasoline Price Uncertainty

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Simon Levin, University of Maryland at College Park

Consumers (partly) account for future operating costs when purchasing durable goods but in many contexts future costs are uncertain. This is particularly relevant in automobile purchases where fuel costs comprise a large share of the total cost of vehicle ownership. Since Anderson et al 2011, the prevailing sentiment amongst energy economists is that typical consumers have expectations of future prices that are identical to current prices. An established literature has documented the relationship between variation in fuel prices over time and automobile purchase behavior. However, there is also substantial variation in uncertainty over future fuel prices and little empirical investigation of its impact on consumers' behavior. In this paper we examine consumer responses to uncertainty over future fuel prices in their decision to purchase new automobiles. We compute forward-looking market expectations of future uncertainty applying methods from Real Options Theory to futures and options contract prices for gasoline and oil. Using comprehensive data on the sales and registrations of new vehicles in the United States since 2005, we estimate the impact of forward-looking uncertainty of vehicle purchase decisions in a discrete choice model of vehicle demand. We find when uncertainty over future fuel prices increases, consumers have a higher willingness-to-pay for fuel economy, consistent with consumers valuing fuel economy as a hedge against future fuel price uncertainty. Failing to account for future uncertainty leads to estimates that understate consumers' true willingness-to-pay for fuel efficiency. However, even when accounting for future uncertainty the full valuation is still below the full present value fuel cost savings. These results demonstrate uncertainty over the future energy costs may impact consumers' current durable good purchase behavior. This highlights the role geopolitical or energy policy uncertainty, e.g., future climate change regulation, may play in demand for energy-consuming durables.

Session: “Environment, Pollution, and Human Health”

Chair: Nicholas Sanders (Cornell) njsanders@cornell.edu

JEL Codes (Primary): I1, Q5, J1

JEL Codes (Secondary): I18, Q53, L93, J13

	<u>Presenter</u>	<u>Discussant (confirmed)</u>	<u>Paper Title</u>
1	Xinming Du (National University of Singapore) xd2197@columbia.edu	Jongeun Park (Ohio State) park.3070@osu.edu	Airlines, Pollution, and Fertility
2	Yuhang Pan (Peking University) yhpan.econ@gmail.com	Eric Zou (U Michigan) ericzou@umich.edu	Prenatal Air Pollution Exposure and Early-Childhood Cognition: The Role of Micronutrient Powder Intervention
3	Shivani Chowdhry (UT Dallas) shivani.chowdhry@utdallas.edu	Matt Woerman (Colorado State) matt.woerman@colostate.edu	Effects of Household Air Pollution on Mental Health: Evidence from India
4	Jiee Zhong (Miami University) zhongj8@miamioh.edu	Nicholas Sanders (Cornell) njsanders@cornell.edu	Lead in the Air: Unraveling the Long-Term Impacts of Lead Exposure

Airlines, Pollution, and Fertility

Authors: Xinming Du, National University of Singapore; and Charles Taylor, Harvard Kennedy School

Abstract:

This paper introduces a new instrument for air pollution derived from the global airline network. Pollution is persistently elevated beneath overhead flight routes along gradients otherwise uncorrelated with pollution. We combine this cross-sectional variation with the launch of new flight routes to estimate the impacts of pollution on health across the world. We establish several findings. First, PM_{2.5} has adverse impacts on infant health via lower birth weights, including in 44 developing countries where data is scarce. Second, we leverage the fact that propeller planes still use leaded fuel to show that 1ng/m³ ambient lead reduces fertility rate by 0.15%. Third, we generalize this in relation to the historical phase-out of leaded fuel in vehicles, which our analysis suggests added over 2 million people per year to the global population---making it among the most material public health interventions. This paper demonstrates a large but little-known negative externality of the aviation industry. We provide this global gridded airline data product for use in future research.

JEL codes: I15, J13, L93

Prenatal Air Pollution Exposure and Early-Childhood Cognition: The Role of Micronutrient Powder Intervention

Authors: Yuhang Pan, Peking University

Abstract:

Prenatal exposure to air pollution can have life-long disadvantages in wealth and health. This paper investigates how prenatal air pollution exposure impedes cognitive development in early childhood and experimentally explores the mitigation effect of a micronutrient powder (MNP) intervention in China. Our experiment involves approximately two thousands infants in 11 Chinese counties. We conduct the randomization at village level and distribute MNP packets to children in the villages which are assigned as the treatment group. In addition to the baseline and endline surveys, we conducted follow-up surveys every six months. In each round of survey, we collected information on families and tested children's cognitive ability. The entire experiment period lasted two years. To implement this research, we obtained the in-utero pollution exposure level experienced by each child based their place of birth and birth certificate. This paper has three primary findings. First, we find that exposure to PM_{2.5} during pregnancy negatively impacts postnatal cognitive development, measured by either mental development index (MDI) or psychomotor development index (PDI). Pollution exposure during the second trimester is examined to have larger compared to pollution exposure during other trimesters. Second, in our experiment, children randomly assigned to receive postnatal MNP interventions exhibit a reduced susceptibility to the adverse effects of pollution. Specifically, the MNP intervention offsets approximately two-thirds of the impairment in mental development caused by air pollution exposure, although it does not mitigate the impact on psychomotor development. Third, we found that more frequent and earlier interventions were more effective in helping . We also document a correlation between the intake of nutritional packets and the parents' education level and the child's initial cognitive ability status. Overall, our findings suggest that adaptive nutrition policies in developing regions may compensate for the early childhood cognitive damages already caused by pollutant exposure.

JEL codes: I10, J13, Q50, Q53

Effects of Household Air Pollution on Mental Health: Evidence from India

Authors: Shivani Chowdhry, University of Texas at Dallas

Abstract:

Air pollution exposure is one of the most prominent causes of environmentally induced inflammation and oxidative stress, both of which are linked to the genesis of mental illnesses in epidemiological studies. While most studies studying the costs associated with air pollution have focused on physical health costs of ambient air pollution, very few studies have explored the link between household air pollution caused due to burning of solid fuels for cooking in developing countries and its effects on mental health outcomes of those exposed to it. Using an instrumental variables framework and a nationally representative longitudinal survey dataset of adults over age 50 and a smaller cohort over age 18, this study investigates the causal relationship between household air pollution exposure and the increased risk of depression and anxiety symptoms in individuals. It shows that after taking into account the endogeneity in solid fuel use in the model, the use of solid fuels is associated with increased odds for depression and anxiety among older adults in India. This study adds to the evolving literature on the effects of household and ambient air pollution on overall human psychological well-being and mental health outcomes such as anxiety and depression. It will likely have important policy implications for designing clean air policies in cities and rural areas of low- and middle-income countries in addition to policies targeting higher adoption of clean fuels in households.

JEL codes: C23

Lead in the Air: Unraveling the Long-Term Impacts of Lead Exposure

Authors: Thao Duong, Texas A&M University; and Jiee Zhong, Miami University

Abstract:

This paper analyzes the long-term effects of low-level lead exposure during early childhood from Kindergarten through grade three on educational achievement and earnings. Utilizing the unexpected decline in lead emissions following the reduced operation of piston-engine aircraft after the 9/11 attacks as a natural experiment, combined with detailed individual-level administrative data from Texas ERC, we employ both difference-in-differences and instrumental variable techniques to identify the causal impact of lead exposure on various student outcomes. Our findings reveal that even minimal increases in lead exposure, measured in micrograms per cubic meter, are associated with significantly decreased probabilities of high school graduation and post-secondary enrollment in public universities or community colleges. Moreover, we observe that lead exposure adversely affects children by diminishing earnings when they enter the labor market.

JEL codes: I00, Q56

Session Title: “Environmental Justice”

JEL Codes (Primary): D6, Q5

JEL Codes (Secondary): D63, Q53, Q54, Q58

Chair: Becka Brolinson, becka.brolinson@fhfa.gov

Papers:

Powering Down and Moving On? Energy Transition, Gentrification, and Local Impacts

Presenter: Jancy Ling Liu, Georgia Tech, jancyll@gatech.edu

Discussant: Spencer Banzhaf, NC State, hsbanzh2@ncsu.edu

The Effects of Political Alignment on Nuisance Facilities in the U.S.

Presenter: Hui Zhou, University of Rhode Island, hui.zhou@uri.edu

Discussant: Becka Brolinson, Federal Housing Finance Agency, becka.brolinson@fhfa.gov

Political Representation and Environmental Conservation: Evaluating the Impact of Caste-Based Leadership on Forest Cover in Rural India

Presenter: Onupurba Das, University of Massachusetts Amherst, odas@umass.edu

Discussant: James Ji, University of Florida, xji1@ufl.edu

Sacrifice for the Greater Good? Welfare and Distributional Impacts of Flood Detention Basins in China

Presenter: Yuxiao Hu, London School of Economics, y.hu28@lse.ac.uk

Discussant: Shaoda Wang, University of Chicago, shaoda@uchicago.edu

Powering Down and Moving On? Energy Transition, Gentrification, and Local Impacts

*Jancy Ling Liu

This study investigates the effects of fossil fuel power plant closures on local migration. I leverage variation in fuel prices and plant age that results in plausibly exogenous power plant retirements. The retirement results in a ‘stagnation effect’ where both in-migration and out-migration decreases, a pattern not consistent with a typical gentrification result of increased in and out migration. My analysis shows that the stagnation effect is more pronounced in lower-income and predominantly Black communities, raising environmental justice concerns. These findings underscore the complex interplay between the environmental advantages and local economic challenges associated with phasing out fossil fuel infrastructure.

JEL Codes: D63, Q40

The Effects of Political Alignment on Nuisance Facilities in the U.S.

Matthew Gordon, Paris School of Economics

Shan Zhang, Old Dominion University

*Hui Zhou, University of Rhode Island

Over the last three decades, the U.S. has experienced significant changes in the landscape of nuisance facilities, reflecting broader shifts in environmental policy and pollution management. This paper examines the waste industry to explore the evolution of waste processing in the country. Despite a decline in the number of waste facilities, the total volume of waste processed has consistently risen, highlighting a trend toward fewer but larger facilities. This trend is evidenced by the expanding average capacity of existing facilities, with 700 more closures than openings, and new facilities typically boasting over double the size of those closed. This consolidation suggests a shift towards larger waste processing centers, prompting an investigation into the drivers behind this trend. In addition to factors such as race, income, and population density, we analyze a novel factor: political alignment. The granting of landfill permits by state and local governments serves as a critical point for this analysis, using political discrepancies between county and state levels as a proxy for political alignment, to uncover its role in the strategic siting and expansion of waste facilities. Utilizing comprehensive datasets spanning from 1994 to 2021, including annual processing capacity, voting data from presidential elections, and demographic data at the county level, we employ a two-way fixed effects model to explore correlations between waste and political and demographic factors. Our findings indicate that more waste is directed to counties with higher percentages of Black or Hispanic populations and to politically unaligned counties. Politically aligned counties tend to receive less waste, with stronger correlations in counties that are more active in voting. Additionally, using a regression discontinuity design, we find that political alignment significantly reduces the amount of waste received. These results highlight how political factors dynamically shape the landscape of waste facilities in the U.S.

JEL Codes: D63, Q53

Political Representation and Environmental Conservation: Evaluating the Impact of Caste-Based Leadership on Forest Cover in Rural India

*Onupurba Das, University of Massachusetts Amherst

Forests globally support over 1.6 billion people, including 300 to 350 million who are highly dependent on these ecosystems and reside near them. Despite the critical role forests play in biodiversity and human livelihood, deforestation and environmental degradation remain pressing issues, particularly affecting the world's poorest communities. This study investigates whether the presence of marginalized communities in local political office impacts local resource management in a developing country context. My study is based in rural India, where vulnerabilities due to deforestation are exacerbated by the oppressive caste system, that has persisted through centuries, making the protection of these ecosystems not just an environmental issue but a crucial aspect of social justice. I leverage the 1992 legislative change made in India, which mandated political quotas for Dalits (Scheduled Castes) and Adivasis (Scheduled Tribes) within village self-governing institutions (Gram Panchayats, or GPs). These changes aimed at empowering historically discriminated against communities, rapidly altered the dynamics in these governing bodies. Using a unique dataset from Karnataka, which includes GP election reservation data, NASA's vegetation continuous fields from 1982 to 2016, and census data from 1991 to 2011, our research leverages this legislative shift as a natural experiment. This enables us to isolate the effects of caste-based leadership on forest conservation. Employing a difference-in-differences model with political-division and temporal fixed effects, we analyze variations in forest conservation outcomes under SC/ST leadership. Preliminary findings indicate generally poorer forest cover under SC/ST-led GPs, suggesting complex interactions between caste leadership and forest conservation. I am investigating the underlying mechanisms such as socio-economic factors, historical resource access, and institutional capabilities, which have resulted in this outcome. Further, I explore how the intersection of caste and gender in leadership roles influences these outcomes, with a particular focus on the impacts of female leaders from these communities on forest conservation.

JEL Codes: D63, D72, Q23

Sacrifice for the Greater Good? Welfare and Distributional Impacts of Flood Detention Basins in China

*Yuxiao Hu, London School of Economics

This paper studies the distributional and welfare impact of a unique large-scale natural disaster management policy in China, the Flood Detention Basin (FDB) policy. Since 2000, 96 pre-designated FDB counties have been deliberately inundated for more than 100 times to protect a broader region. Our study addresses two aspects of this policy: (i) the economic costs on FDB counties; and (ii) the net welfare gain brought to the whole economy. Using a difference-in-differences approach, we find that the policy results in an annual loss of approximately US\$10billion in real GDP for FDB counties. Our partial equilibrium model emphasizes the 'firm response effect,' indicating that firms are hesitant to enter and invest in FDB counties due to increased risk. Consistent with model implications, we find that firm entry decreases by around 20% if a county gets selected into the FDB list. Using detailed firm-level financial and location data, our spatial regression discontinuity analysis reveals an approximate 20% reduction in fixed asset investment in FDB counties compared to neighboring non-FDB counties. In a spatial general equilibrium setting, we construct a counterfactual scenario without FDB policy to assess the welfare implication of this policy. We find that the policy leads to an annual net increase in output of around US\$10billion in Huai River Basin.

JEL Codes: Q54, Q58, R13, R38

Session Title: Methodological Advances in Environmental Economics

JEL classification (primary): Q5

JEL classification (secondary): C1

Chair: Catherine Kling, Cornell University, ckling@cornell.edu

Papers:

Causality and Resilience

Presenter: Paul Ferraro, Johns Hopkins University, pferraro@jhu.edu

Discussant: Patrick Baylis, University of British Columbia, patrick.baylis@ubc.ca

Learning, Catastrophic Risk and Ambiguity in the Climate Change Era

Presenter: Frances Moore, UC Davis, fmoore@ucdavis.edu

Discussant: Brigitte Roth Tran, Federal Reserve Bank of San Francisco, Brigitte.RothTran@sf.frb.org

Difference-in-Differences with endogenous externalities: model and application to climate econometrics

Presenter: Sandy Dall'erba, University of Illinois Urbana-Champaign, dallerba@illinois.edu

Discussant: Pierre Mérel, University of California, Davis, merel@primal.ucdavis.edu

Valuing Policy Characteristics and New Products using a Simple Linear Program

Presenter: Spencer Banzhaf, North Carolina State University, spencer_banzhaf@ncsu.edu

Discussant: Catherine Kling, Cornell University, ckling@cornell.edu

Causality and Resilience

*Paul Ferraro, Johns Hopkins University, pferraro@jhu.edu

Hundreds of empirical studies report on the factors that increase resilience to negative shocks in coupled human-nature systems. Yet, in a set of 500 empirical studies that investigate resilience to climate shocks, I find that most studies fail to clearly define their target causal effects (estimands) or explain how their design identifies these effects. In the studies that specify the target causal effect, many use an empirical design in which the effect is not identified. Thus, the empirical literature on resilience to climate shocks is largely uninterpretable. In this study, I start with the idealized experiment: a factorial experiment in which shocks and attributes that improve resilience to the shock are randomized across units from a target population (“units” like households or watersheds). For logistical and ethical reasons, we cannot run such an experiment. However, the idealized experimental design implies that resilience scholars who use observational designs, like experimentalists who use factorial designs, can estimate multiple causal effects, some of which are more policy and scientifically relevant than others. I define these causal effects, describe their utility in terms of common scientific and policy questions, describe how identification and estimation of each causal effect requires a different observational design, and assess the climate resilience literature in light of these findings. Without this information, scientists will struggle to develop appropriate empirical designs for investigating resilience and will find it challenging to evaluate the quality of published empirical studies on resilience. I conclude by describing a set of best practices for empirical studies of resilience in a range of literatures, including climate science, economics, ecology, cognitive science (brain resilience), political science, and sociology.

Learning, Catastrophic Risk and Ambiguity in the Climate Change Era

*Frances Moore, UC Davis, fmoore@ucdavis.edu

Climate--the probability distribution over weather--is not directly observable. Instead it must be estimated, typically using the historical weather record. The assumption that the climate is stationary and that therefore the set of historic observations is representative of today has been central to both engineering and financial methods for weather risk management. Anthropogenic climate change undermines this assumption, rendering past weather observations potentially uninformative of the current distribution of weather risks. This reduces the information available to actors and increases uncertainty in the estimated climate distribution. Using a motivating case-study of extreme rainfall related flood damages in New York City, this paper develops a Bayesian learning model, applied to a long record of daily rainfall intensity, and shows how relaxing the stationarity assumption increases variance in the posterior climate distribution. This uncertainty can interact with a steeply non-linear damage function (derived from claims under the National Flood Insurance Program) to greatly increase the mean and variance of the loss distribution. I show how the added uncertainty simply from relaxing the stationarity assumption, with no change in historic weather data or the damage function, could ripple through insurance markets in the form of higher and more volatile premiums and higher reinsurance costs, with limited potential for diversification within the insurance sector. These effects are consistent with observed changes in the U.S. property insurance market in recent years.

Difference-in-Differences with endogenous externalities: model and application to climate econometrics

*Sandy Dall'erba, University of Illinois Urbana-Champaign, dallerba@illinois.edu

Andre Chagas, University of Sao Paulo

Yilan Xu, University of Illinois Urbana-Champaign

William Ridley, University of Illinois Urbana-Champaign

Recent literature has highlighted the importance of incorporating spatial dependence within the difference-in-differences DID framework. It occurs when the treatments are spatially correlated and/or the individuals' responses to the treatment are prone to spatial autocorrelation. Spatially autocorrelated treatments do not violate the stable unit treatment value assumption (SUTVA). However, spatially autocorrelated responses violate the SUTVA, leading to potentially biased and inconsistent DID estimates of treatment effects when spillovers are disregarded. In this paper, we extend SDID by considering the case where regions are connected in an economic network that is prone to changes in response to the treatment. We name it the instrumental variable network difference-in-difference process, or IV-NDID for short. This framework accounts for endogeneity of the network to the treatment in a first-stage regression while the role of the treatment on the treated areas and on any member of the network is measured in the second stage. As such, our approach differs from other contributions in which the network is endogenous but is time-invariant. We apply this approach to the impact of drought (the treatment) on the global wheat trade first and, second, on wheat production and area planted. Our results indicate that local wheat production and area planted react negatively to a local drought but positively to a drought in destination places. As such, failing to account for the transmission of the treatment effect through the trade network, as well as the adjustment of the trade network itself in response to the treatment, leads to underestimates of the impact of drought on agriculture. Additional research in this area aims at enlarging the applications of IV-NDID to other network structures such as peer-effects, supply-chains and migration flows.

Valuing Policy Characteristics and New Products using a Simple Linear Program

*Spencer Banzhaf, North Carolina State University, spencer_banzhaf@ncsu.edu

The Random Utility Model (RUM) is a workhorse model for valuing new products or changes in public goods. But RUMs have been faulted along two lines. First, for including idiosyncratic errors that imply unreasonably high values for new alternatives and unrealistic substitution patterns. Second, for involving strong restrictions on functional forms for utility. This paper shows how, starting with a RUM framework, one can nonparametrically set-identify the answers to policy questions using only the Generalized Axiom of Revealed Preference (GARP). When GARP is satisfied, the approach set identifies a pure characteristics model. When GARP is violated, the approach recasts the RUM errors as departures from GARP, to be minimized using a minimum-distance criterion. This perspective provides another avenue for nonparametric identification of discrete choice models. The paper illustrates the approach by estimating bounds on the values of ecological improvements in the Southern Appalachian Mountains using survey data.

Session Title: “Political Economy of the Environment”

JEL Codes (Primary): D7, Q5

JEL Codes (Secondary): D72, D73, Q56, Q58

Chair: Victoria Xie, Santa Clara University, wxie@scu.edu

Papers:

Environmental Enforcement during Legislative Vacancies: Insights from Clean Air Act Inspections

Presenter: Jongeun Park, The Ohio State University, park.3070@osu.edu

Discussant: Zach Raff, USDA Economic Research Service, Zachary.Raff@usda.gov

Economic Analysis of Government Incentives to Provide Environmental Goods: The Case of the US National Park Service

Presenter: Sara Sutherland, University of California, Davis, sasutherland@ucdavis.edu

Discussant: Nilesh Shinde, University of Massachusetts Amherst, nshinde@umass.edu

The Political Economics of Corporate Environmentalism: Climate Disclosures in the Age of ESG Reporting

Presenter: Lily Hsueh, Arizona State University, lily.hsueh@asu.edu

Discussant: Thomas Lyon, University of Michigan, tplyon@umich.edu

Greenness and Democracy

Presenter: Edward Barbier, Colorado State University, edward.barbier@colostate.edu

Discussant: Victoria Xie, Santa Clara University, wxie@scu.edu

Environmental Enforcement during Legislative Vacancies: Insights from Clean Air Act Inspections

*Jongeun Park, The Ohio State University

Abdoul Sam, The Ohio State University

The Clean Air Act (CAA) is often perceived as hindering economic development in favor of environmental protection and public health. Congressional representatives—politicians who might be interested in local economic and environmental concerns—may seek to align the CAA enforcement with their political preferences to satisfy their constituents. We explore how bureaucratic regulators respond to the temporary absence of political pressure from local legislators when they conduct the CAA inspections for electricity-generating power plants. To establish a causal impact of political pressure on the CAA inspections, we exploit the occurrence of vacant seats in the House of Representatives resulting from resignations or deaths. These legislative vacancies create a temporary absence of political power until the seat is filled by the next representative through general or special elections. During the vacancies, the bureaucratic regulators may adjust enforcement levels based on their own preferences, independently of political pressure. Our research contributes to the understanding of how individual congressional members influence local enforcement behavior. We introduce a legislative vacancy as an indicator of a temporary absence of political pressure and explore how local bureaucrats respond to legislative vacancies. We construct a monthly electricity-generating power-plant level panel dataset in the United States between 2001 and 2021. We find that legislative vacancies from Republican representatives significantly increase the probability of CAA inspections on power plants by 33% compared to Democratic vacancies, implying that the bureaucratic regulators might reduce their inspections due to incumbent Republican representatives. The vacancies from Republican members who served on committees addressing budget, rules, and the environment have stronger effects on inspections, while we find no evidence of the effects from non-members of such committees. Additionally, we suggest the effects of Republican vacancies are strengthened in Republican governorship and non-attainment areas.

JEL codes: D72, D73, Q59

Economic Analysis of Government Incentives to Provide Environmental Goods: The Case of the US National Park Service

*Sara Sutherland, University of California, Davis
Eric Edwards, University of California, Davis

How and when governmental agencies choose to preserve and protect land to provide for natural habitat, wilderness, and environmental and cultural amenities is not well understood. Policymakers and agency officials respond to various incentives including those related to political considerations, budgets, and intrinsic motivation. In this paper we examine the U.S. National Park Service (NPS) to understand how political considerations, the incentive to increase agency size, agency identity, and changes in consumer demand affect the provision of public goods. A key challenge in this type of empirical work is the nature of governmental agency budgets, which are modified incrementally, have large categories of expenditures linked together, and occur infrequently. The NPS offers a unique empirical setting, providing annual line-item budgets, area, employment, and visitation statistics for each of its 419 park units, which allows us to assemble a 100-year panel of NPS budgets from archives and Congressional testimony. We provide two stages of analysis. First, matching park location data to socioeconomic, demographic data, we demonstrate how NPS added units, especially National Historic Sites and National Recreation Areas, near population centers to secure popular support. Second, we show that budget allocations are not responsive to visitation but do increase for parks overlapping Congressional Districts with committee members responsible for appropriating funds to the NPS. These results demonstrate that park budgets are allocated to grow the agency, maintain popular and congressional support, and protect the image/identity of the service.

JEL Codes: Q24, Q59, D73

The Political Economics of Corporate Environmentalism: Climate Disclosures in the Age of ESG Reporting

*Lily Hsueh, Arizona State University

Increasingly, countries and subnational jurisdictions—from the United Kingdom and New Zealand to India, to Hong Kong, and recently to California—require firms that operate in their jurisdictions to disclose carbon emissions and climate-related risks. The plethora of climate disclosure mandates worldwide signal that policymakers and investors alike perceive climate disclosures as driving actions that protect the environment. Some firms while not others have emerged as supporters for climate disclosure mandates and other government policies that incentivize decarbonization. How does corporate governance interact with the political economy to drive firms' climate (non-)disclosures? Under what firm-level managerial and organizational and external political economy conditions influence firm behavior and reduce carbon emissions? Unlike the extant literature, this paper situates firms in a political economic framework whereby firms are key players in a nested structure of climate change governance with interactions between bottom-up and top-down agents, incentives, and institutions involving corporate, regulatory, and global governance. Empirically, this research examines the causal effects of Fortune Global 500 and S&P 500 index firms' corporate climate disclosures to the CDP (formerly the Carbon Disclosure Project) between 2011 and 2020. Findings from quasi-experiments and discrete-continuous econometric modeling show that senior- and executive-level managers form governing coalitions inside the firm to delineate and mobilize support for corporate environmentalism. When regulatory pressure is high and the marginal cost of self-regulation is low, there is a hastening of efforts led by managers to signal firms' ability to internalize externalities, earn regulatory goodwill, and avoid costly liabilities. Managers shape, translate, and disseminate global best practices that could someday become market norms or rule of law. The more stringent existing or impending regulation is, the greater the effort is devoted to and the more likely firms engage in costly climate action that leads to environmental performance (i.e., reduced carbon emissions and/or carbon emissions intensity). By contrast, in the absence of credible regulation, the more likely that firms will engage in greenwashing behavior. This paper contributes a nuanced theory of corporate environmental behavior that integrates corporate governance with regulatory and global governance and bridges dominant economic and political science explanations. Empirical testing of the proposed theoretical framework offers policy implications for a politically feasible design of climate disclosure programs that features both carrots and sticks and is greenwashing-resistant.

JEL Codes: D21, D22, F53, Q58

Greenness and Democracy

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Green transition policies are not always supported by governments. For one, capabilities and costs of implementing green policies differ considerably between rich and poor countries. Countries with greater civil liberties, political rights and freedoms also appear to favor policies that foster decarbonization compared to more autocratic nations. This raises an important research question: Are democracies more likely to green their economies, and is this effect impacted by the level of per capita income? This question is first explored through an electoral decision model, which shows that whether a democracy proceeds with green transition policies will depend on the share of the public supporting adoption. This outcome may also be influenced by a country's level of per capita income. This suggests as a hypothesis that the association of electoral democracy with green policies and outcomes is conditioned on the per capita income of an economy. To test this hypothesis, the paper employs a panel analysis of five-year intervals from 1995-2020 for 172 countries. Various indicators of green policy adoption are regressed on cumulative democratic experience, (ln) per capita income, the two variables interacted, and a set of macroeconomic controls. The dependent variables employed include the green share of stimulus and recovery spending, the stringency of climate actions and policies, green export share, renewable share of electricity, carbon emissions per capita and carbon intensity. Cumulative electoral democratic experience up to time t is based on the V-Dem dataset variable $v2x_polyarchy$ and Polity2 as an alternative. The conditioning variable is (ln) per capita income (PWT 10.1). In nearly all regressions, the coefficients of cumulative democratic experience and the interaction term are significant, the marginal effect of democratic experience on green policy adoption is positive, and the marginal effect increases with per capita income. Overall, it is difficult to reject the null hypothesis.

JEL Codes: Q01, Q56, Q58