

TRANSPORTATION AND PUBLIC UTILITIES GROUP

SESSIONS AT 2023 ALLIED SOCIAL SCIENCES ASSOCIATIONS MEETINGS

January 6-8, 2023

New Orleans, Louisiana

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| Check event locations in ASSA 2023 App in case of any room changes |
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Corresponding / presenting author in **bold**.

UTILITIES SESSION 1: DISTRIBUTIONAL EFFECTS AND REGULATION IN PUBLIC UTILITIES

Presiding: Jonathan E. Hughes (University of Colorado at Boulder)

Friday, January 6, 2023, 10:15pm-12:15pm (CST), New Orleans Marriott, 555 Canal Street, Bacchus Room (Fourth Floor)

1. **The Distributional Benefits of Emission Reductions from Renewable Energy**
Daniel T. Kaffine (University of Colorado, Boulder) and Nicole J. Mundt (California Independent System Operator)

Discussant: Justin Kirkpatrick (Michigan State University)

Abstract: Renewable electricity generation has dramatically expanded in the last decade, with important consequences for local emissions reductions and air quality. In this paper, we estimate the distributional benefits from reductions in local emissions due to wind and solar generation using hourly data from California electricity markets. We find that while the benefits of emissions reductions are roughly evenly shared across poverty rates and racial composition, there is a substantial disparity between high and low population areas - generation and emissions from rural power plants are an order of magnitude more responsive to renewables compared to more urban power plants. We show transmission and proximity to renewable capacity play key roles in determining the pattern of fossil fuel plant responses. While the environmental justice outcomes of market-oriented policies such as carbon pricing have recently come under scrutiny, these results provide insight into the lesser-known distributional implications of emission reductions from policies such as renewable electricity standards.

2. **Restructuring the Rate Base**
Steve Cicala (Tufts University)

Discussant: Akshaya Jha (Carnegie Mellon University)

Abstract: This paper evaluates the impact of power plant divestiture on the restructured utilities whose operations became narrowed in scope following electricity market liberalization. These utilities' transmission and distribution (T&D) lines of business remained subject to cost-of service regulation after their generation assets were sold off. I use a matched-difference-indifferences design based on proximate, similarly sized utilities

not subject to restructuring reforms as a control group. Using an annual panel of U.S. utilities' capital stocks from 1993- 2009, I find that T&D utilities responded to restructuring by increasing regulated capital stocks downstream of the market reforms. The average utility held \$0.45B (9.5%) in excess T&D capital 9 years after divestiture. This finding suggests a mechanism through which consumers failed to benefit from the cost reductions achieved through deregulation.

3. **Shock Avoidance: Experimental Evidence on High Bill Alerts and Energy Consumption**

Grant Jacobsen (Oregon State University) and James Stewart (The Cadmus Group)

Discussant: James Alleman (University of Colorado, Boulder)

Abstract: Spurred by a variety of regulatory requirements, energy utilities implement many types of programs to help customers conserve energy and reduce their bills. Most programs are designed without consideration of whether they help consumers avoid large unexpected bills, although such shocks may be particularly harmful to consumer welfare. Using a field experiment, we evaluate a high bill alert program that alerts customers to unusually high usage patterns, with the goal of helping customers avoid large bill shocks. We find that the alert program reduced mean consumption by about 0.5%. Quantile regression estimates indicate that the effects were small and insignificant at the bottom of the usage distribution and larger and significant at the top of the usage distribution, showing the program was effective at allowing households to experience fewer large expenditure shocks. This result holds both when we measure usage nominally or when we scale it to a relative measure based on each household's pre-program usage levels. The findings underscore the benefits of moving beyond analyses of average effects in program evaluation in the energy settings. More nuanced evaluations of the manner which energy savings are achieved is likely to become increasingly important as the energy system transitions toward a greater share of renewables and increased supply of electricity to electric vehicles.

4. **Pass-Through of Water Pollution Regulation: Evidence from Sewer Utility Bills and Wisconsin's Phosphorus Rule**

Zach Raff (University of Wisconsin Stout) and Andrew Meyer (Marquette University)

Discussant: Jonathan E. Hughes (University of Colorado, Boulder)

Abstract: Wisconsin's "phosphorus rule", which created the most stringent water quality standards for phosphorous in the country, imposes substantial compliance costs on point sources that discharge to waterbodies with poor ambient quality. As part of the rule, Wisconsin also implemented a water pollution offset trading program that allows affected point sources to comply at lower cost than through traditional treatment technology upgrades. In this paper, we estimate the pass-through of Wisconsin's phosphorus rule, providing the first empirical estimates of pass-through from a water pollution regulation. In our analysis, we examine how compliance with the rule affects real billing rates at sewer utilities in Wisconsin. We find that compliance with the phosphorous rule increases the average real sewer utility bill in our sample by 8-11%. As a second contribution, we examine the implementation of Wisconsin's water pollution offset trading program and how it differentially impacts pass-through in this setting. A descriptive analysis of the

program suggests that point sources that comply with the phosphorus rule through water pollution offset trading, rather than treatment technology upgrade, save \$17.5 million per year in aggregate. Importantly, the pass-through of the phosphorus rule reflects these cost savings. Empirical results show that real sewer utility rates increase by 14.6% for utilities that comply with the phosphorus rule with a treatment technology upgrade, while these same bills increase only 6.4% for utilities that comply with the rule through water pollution offset trading. Our results suggest that pass-through of the phosphorus rule is between 72% and 88% for affected sewer utilities.

UTILITIES SESSION 2: INCENTIVES FOR EFFICIENT HOUSEHOLD ELECTRICITY AND WATER CONSUMPTION

Presiding: Frank Wolak (Stanford University)

Friday, January 6, 2023, 2:30pm-4:30pm (CST), New Orleans Marriott, 555 Canal Street, Bacchus Room (Fourth Floor)

1. Incentivising Within-Day Shifting of Household Electricity Use

Anke Leroux (Monash University), **Gordon Leslie** (Monash University) and Michael Ward (Monash University)

Discussant: Frank Wolak (Stanford University)

Abstract: Australia's boom in rooftop solar panels is creating value opportunities for electricity users to shift more consumption to the sunny daytime and away from times when the sun has set. However, what will it take to engage households with so-called "solar sponge" tariffs to meaningfully shift their timing of energy use, and can it be demonstrated to electricity providers that such tariffs are worthwhile? This paper reports findings from a field experiment that evaluates how consumers respond to within-day load-shifting programs that vary by incentive design (encouraging more daytime use versus encouraging less evening use) and by incentive frequency (daily versus ad hoc). Further, we evaluate the impacts of the actions on energy procurement costs and net program costs to examine if an economic surplus is generated by these programs. Finally, our setting allows users to directly monitor their usage and their accumulation of rewards in real-time via a phone app, motivating our study design that allows for tests of theories comparing the extent that daily versus ad hoc events create routines or deplete attention stocks. We are currently 2 weeks into a 8-12 week randomized control trial of 6000 users, giving early indications that incentives to use more energy in the daytime encourage load shifting, with these groups using between 5-20% more energy in the day and 5-20% less energy in the evening when compared with the control group.

2. **Central Control Versus Pricing: An Electricity Demand Response Experiment**
Megan R. Bailey (University of Calgary), David P. Brown (University of Alberta), Blake Shaffer (University of Calgary) and Frank Wolak (Stanford University)
Discussant: Robert Metcalfe (University of Southern California)

Abstract: Contemporary economic thought has all but forgotten the debate on the merits of centrally planned vs. market economies, emphasizing the welfare-maximizing potential of markets. Intervention by public bodies is reserved to correct market failures. We, however, suspect a potentially advantageous role for central planning in one critical market: the market for electricity, during peak demand. During peak electricity demand, pre-existing information gaps about the true price of electricity as well as consumers' cognitive, behavioral, and technological barriers to responding to real-time pricing is exacerbated by the time-sensitive nature of skyrocketing electricity prices. Yet, the inability of the market to match supply to demand during these periods can result in electricity grid failure. We hypothesize that utility control of electricity demand during peak times could reduce demand more than improvements to peak pricing and prevent large welfare loss from blackouts. In partnership with a Canadian electric utility, we run a large-scale experiment in which we offer residential customers smart home electricity management equipment in combination with either a peak load pricing program or a "centralized control" program that enables the utility to directly alter customers' thermostats, hot water heater, and/or electric vehicle charger electricity usage. Our objectives are to evaluate: (1) the relative take-up rates and characteristics of consumers that accept offers for each treatment based on the nature of the offer, take-up incentives and customer demographic characteristics; (2) the average treatment effect on the treated in terms of (a) electricity demand reduced during peak load hours and (b) the reliability of the amount of electricity demand reduced; and (3) intent-to-treat estimates for each offer as a program. Initial results suggest that that customers who've conceded electricity usage control to the utility are outperforming other groups in reducing demand during peak periods.

3. **On the Inefficiency of Urban Water Pricing**
Casey J. Wichman (Georgia Institute of Technology)
Discussant: Sheila Olmstead (University of Texas at Austin)

Abstract: In this paper, I revisit classic theory on two-part pricing for municipal water supply and measure empirically the extent to which current pricing practices deviate from efficient pricing. Using a decade of annual rate information for more than 800 utilities in Georgia and North Carolina matched with municipal finance data on revenues and costs, I explore (a) the utility-wide implications of marginal price and rate structure changes and (b) the degree to which (historical) water scarcity is internalized into current rates. The results will highlight how water utilities can set prices to maintain revenue stability and adapt to changes in climate and population.

4. **Information, Incentives, and Goal-Setting in Water Usage: Evidence from a Large-Scale Field Experiment**

David P. Byrne (University of Melbourne) and Lorenz Goette (National University of Singapore and University of Bonn)

Discussant: Hunt Allcott (Microsoft)

Abstract: This paper reports findings from a large-scale field experiment that examines how real-time personalized feedback, high-frequency nudges, and goal-setting affects household water consumption. Our experiment was launched in March 2022, involving 950 households, lasting for 12 weeks. In each trial week, households have water-savings targets and incentives for reaching their targets. We use a 2x2 within-subject design that varies non-monetary incentives for achieving goals, monetary incentives for achieving goals easy goals, hard goals to examine how economic incentives affect households' ability to attain exogenously-set water usage goals. To implement the experiment, we partnered with a water utility in Melbourne that rolled out state-of-the-art smart water meters that record consumption data at the 5-minute level and a digital platform that visualizes these data and provides information and incentives through an app. In addition, throughout the trial, we vary the timing of mid-week personalized nudges to examine how the proximity of feedback to water-savings behaviors (e.g., shorter showers) influences the efficacy of the trial. Five weeks into the trial, our field experiment has generated substantial water conservation effects. We obtain a stable and statistically significant Intention-to-Treat effect of 6% water reductions and a Local Average Treatment Effect of 11%. In addition, we have drafted a structural model of individual behavior that we intend to have estimated by the AEA to derive the optimal program design for maximizing water conservation in an environment with real-time personalized feedback, nudges, and goals.

TPUG: ANNUAL BUSINESS MEETING AND RECEPTION

Presiding: Ian Savage (Northwestern University), TPUG President, 2022

Friday, January 6, 2023, 6:00pm-7:30pm (CST), New Orleans Marriott, 555 Canal Street, Riverview II Room (41st Floor)

1. President's Report
2. Treasurer's Report
3. Election of 2023 Officers
4. Best PhD Dissertation Award
5. Distinguished Member Award
6. Socializing, networking and having a good time

Cash bar and light appetizers

TRANSPORTATION SESSION 1: TRANSPORTATION ECONOMICS

Presiding: Ian Savage (Northwestern University)

Saturday, January 7, 2023, 12:30pm-2:15pm (CST), New Orleans Marriott, 555 Canal Street, Balcony I Room (Fourth Floor)

1. **The Effect of Adopting the Next Generation Air Transportation System on Air Travel Performance**

Y. Christy Zhou (Clemson University) and Ziyang Chu (Boston Consulting Group)

Discussant: James H. Peoples, Jr. (University of Wisconsin, Milwaukee)

Abstract: The U.S. Federal Aviation Administration is implementing a large-scale multi-year modernization plan called the Next Generation Air Transportation System (NextGen) to improve air transportation efficiency. To assess the efficacy of these infrastructure investments, we estimate how NextGen projects have affected air travel time and delays from 2014 to 2017. We build the empirical design guided by the event study results. We find sizable time savings from adopting NextGen and this effect is much more pronounced for flights on the right-tail of the air travel performance in the event of unexpected shocks such as poor weather and prior delays. However, NextGen benefits are less for flights pre-distorted by congestion and market power. Our estimates imply if all NextGen airports had been fully treated in 2014, the flights depart from treated airports would experience 15.5 minutes overall time saving in 2017 compared to the counterfactual if NextGen airports were never treated. Our most conservative calculation suggests a per-flight benefits at \$1.7k (with 68% from passenger time saving and the rest from crew cost savings and fuel saving). This amounts to \$4.1 billion of private benefits for flights that departed from NextGen airports in our sample in 2017 alone. We also calculate less conservative private benefits.

2. **The Nature of Noise Complainers and the Noise Pollution Discount on Minneapolis Homes: An IV Approach**

Felix Friedt (Macalester College), Jeffrey Cohen (University of Connecticut) and Zefan Qian (Macalester College)

Discussant: Monica Hartmann (St. Thomas University)

Abstract: Aircraft noise pollution adversely affects physical and mental health. Previous research quantified these problematic health effects through the losses that are capitalized into home values and relied heavily on noise contour plots to identify these house price discounts. Contour plots offer geographically limited insights on aircraft noise pollution and do not capture property value decreases beyond the contour boundaries. In this study, we overcome this limitation by leveraging a large dataset of noise complaints surrounding the Minneapolis-St. Paul International Airport from 2010 through 2017. First, we uncover the nature of noise complainers by mapping observed noise complaints against neighborhood socioeconomic and demographic characteristics. Second, we estimate the noise pollution effect on home values via an instrumental variables approach that isolates the noise complaint information on noise pollution from potentially confounding socioeconomic and demographic characteristics of the complainer.

3. **Accessibility in a Global Sample of Cities**
Victor Couture (University of British Columbia), **Prottoy Akbar** (Aalto University), **Gilles Duranton** (University of Pennsylvania) and **Adam Storeygard** (Tufts University)
Discussant: Patrick S. McCarthy (Georgia Institute of Technology)

Abstract: This paper investigates the relationship between city size and accessibility to jobs and amenities. Starting from standard consumer theory, we derive an index of accessibility that aggregates inverse travel times to various destination types. We compute our accessibility index by combining two novel datasets, on proximity to establishments and travel speed, for over 1,300 large cities on five continents. We find that accessibility to most destination types improves as city size increases, in both rich and poor countries. Larger cities' higher density implies closer proximity to establishments, and this outweighs the lower travel speed resulting from urban crowding. We document wide heterogeneity around these average patterns. There are destination types, transportation modes, areas of cities, and countries in which the negative impact of urban crowding on mobility cancels out the gains from closer proximity to establishments. In these contexts, the gains from larger and denser cities appear limited.

4. **How Should Ports Share the Risk of Natural Disasters?**
Ryo Itoh (Tohoku University) and **Anming Zhang** (University of British Columbia)
Discussant: Steven Craig (University of Houston)

Abstract: This study theoretically examines disaster adaptation investments undertaken by two neighboring competitive ports that may suffer either local disasters that affect one port but not the other, or a concurrent disaster that affect both ports simultaneously. In the event of a local disaster, some shippers reduce their losses by shifting to the unaffected port. As the proportion of local disasters relative to all disasters increases, the lower is the socially optimal amount of disaster mitigation investment that an individual port should make. However, the benefits from substituting one port for another accrue to the shippers' consumer surplus and not to the profit of the port, so it does not affect disaster-mitigation investments by private port authorities as they maximize their profits. Such ignorance of the risk sharing benefits by the private port authorities is likely to lead to underinvestment in disaster adaptation facilities when the likelihood of concurrent disasters is greater. Further, comparison of various forms of privatized operators shows that more competitive forms that induce higher investment levels are more likely to be superior in terms of social welfare when concurrent disasters are more likely.

TRANSPORTATION SESSION 2: URBAN TRANSPORTATION ECONOMICS

Presiding: Ian Savage (Northwestern University)

Saturday, January 7, 2023, 2:30pm-4:30pm (CST), New Orleans Marriott, 555 Canal Street, Balcony I Room (Fourth Floor)

1. **Uber versus Trains? Worldwide Evidence from Transit Expansions**

Jonathan Hall (University of Toronto), Marco Gonzalez-Navarro (University of California, Berkeley), Harrison Wheeler (University of California, Berkeley) and Rik Williams (Uber Technologies, Inc.)

Discussant: Max Gillman (University of Missouri-St. Louis)

Abstract: There is a contentious debate on whether ride-hailing complements or substitutes public transportation. We address this question using novel data and an innovative identification strategy. Our identification strategy relies on exogenous variation in local transit availability caused by rail expansions. Using proprietary, anonymized trip data from Uber for 35 countries, we use a dynamic difference-in-differences strategy to estimate how transit expansions affect local Uber ridership in 100 m distance bands centered on the new train station. Our estimates compare Uber ridership within a distance band before and after a train station opens relative to the next further out distance band. Total effects are obtained by aggregating relative effects at all further distance bands. We find that a new rail station opening increases Uber ridership within 100 m of the station by 60%, and that this effect decays to zero for distances beyond 300 m. This sharp test implies Uber and rail transit are complements.

2. **Unintended Effects of Tax Hikes: from Ridership to Congestion**

Bryan Weber (College of Staten Island – CUNY), Paolo Cappellari (College of Staten Island – CUNY) and Ali Moghtaderi (George Washington University)

Discussant: Kenneth Button (George Mason University)

Abstract: This paper examines the effects of a \$2.75 congestion tax on ride-share and taxi usage in New York City. We use a difference-in-differences method to evaluate both the change in rides and the coinciding decline in pickups. We find a significant decline in rides originating from the taxed area and estimate the price elasticity of rides in this area, and the deadweight loss of the policy. We also measure a significant decline in collisions during this period and a reduction in injuries, suggesting that the policy has effects outside of the ride-share market that partially counteract this deadweight loss.

3. **Inequitable Inefficiency: A Case Study of Rail Transit Fare Policies**

Zakhary Mallett (Cornell University)

Discussant: James Nolan (University of Saskatchewan)

Abstract: Research on transit fare equity traditionally measures equity based on the fare per mile consumed by riders. This overlooks the cost sharing nature of transit; as more riders consume a service, the average cost per rider is less. Using an average cost per rider metric to assign trip costs and fare revenue to estimate cost recovery through fares, I estimate the spatial and temporal variability of cost recovery across two rail systems BART

(San Francisco) and MARTA (Atlanta). Findings show that cost recovery patterns are spatially monocentric, and that the weekday peak period recovers more of its costs through fares than other time periods. Some ideas on why these findings appear divergent to past research are offered.

4. How New Card Acquisition Fee Affects Transit Card Purchase and Use Patterns: Evidence from Washington D.C.

Meiping Sun (Fordham University) and **Jing Wang** (Columbia University)

Discussant: Shih-Hsien Chuang (Northwest Missouri State University)

Abstract: Transit authorities in many cities have introduced automated fare media by expanding fare payment to electronic, magnetic-stripe contact cards and more recently to smartcards. Most transit smart cards come with a refundable or non-refundable one-time acquisition fee to cover the card costs and ensure uninterrupted transit service in case the rider inadvertently has a negative balance. Most empirical studies on the demand elasticity of rides analyze fare increases. The effect of the ubiquitous new transit card fee is not clear. In October 2013, the Washington Metropolitan Area Transit Authority (WMATA) system reduced the one-time non-refundable acquisition fee from \$5 to \$2. Using a causal inference approach, a difference-in-difference model, I examine the demand elasticity of “SmarTrip” card purchases and the demand elasticity of rides.