IMPROVING THE THEORY AND PRACTICE OF BENEFIT-COST ANALYSIS

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Presentation Abstracts

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Contents

Session 1: Thursday, March 15, 2018, 9:00 – 10:30am

➢ A-1: Methods for BCA in Low- and Middle-Income Countries

Chair: Lisa A. Robinson, Harvard Center for Risk Analysis and Center for Health Decision Science

Over the past year, several researchers and practitioners have been working to develop guidance on conducting benefit-cost analysis of health and development policies in low- and middle-income countries. In this session, we will provide an overview of the project and present our recommendations on key methodological topics. Our main goal is to solicit feedback from the audience, to aid in shaping the ultimate recommendations. We will focus on methods for valuing mortality risk reductions, valuing nonfatal health risk reductions, and estimating economy-wide effects. The overall goals of this project are to increase the comparability of benefit-cost analyses, improve their quality, and expand their use, encouraging completion of high-quality, transparent, and consistent evaluations that address the needs of decision-makers and other stakeholders. The project is funded by the Bill and Melinda Gates Foundation; more information is available here: https://sites.sph.harvard.edu/bcaguidelines/

Additional presenters:
James K. Hammitt, Harvard Center for Risk Analysis and Center for Health Decision Science
James E. Neumann, Industrial Economics, Incorporated

➢ B-1: The Distribution of the Benefits and Costs of Regulation

Chair: Cary Coglianese, University of Pennsylvania Law School

Discussant: Jennifer Baxter, Industrial Economics, Inc.
The aggregate level of benefits and costs of federal regulation have been widely analyzed, especially in advance of the promulgation of new rules. We know much less about the incidence of regulation's benefits and costs. This panel assesses what is known about the distribution of the impacts of in several major areas of federal regulation in the United States: environmental, energy, workplace safety, and automobile safety and fuel economy. The papers give particular emphasis to which segments of society benefit and which bear more of the costs, offering insight not only about the way that regulation may contribute to or ameliorate inequality in society but also providing more general methodological and theoretical lessons about the analysis of the incidence of the benefits and costs of regulation.

Presentations:

Auto Regulation: Is It Regressive?; *John Graham, Indiana University*

The Distribution of Costs and Benefits from Regulation by the U.S. Occupational Safety and Health Administration; *John Mendeloff, University of Pittsburgh*

Distributional Impacts of Environmental Regulation; *Lori Bennear, Duke University*

Electricity Restructuring and the Distribution of its Effects; *David Spence, University of Texas*

➢ C-1: The Value of Recreational Uses of Natural Resource and Public Lands

Chair: Trudy Ann Cameron, University of Oregon

Discussant: Patrick Lloyd-Smith, University of Saskatchewan

This session showcases four current empirical approaches to valuing recreational uses of natural resources and public lands. The management of non-market environmental public goods represents a persistent challenge for benefit-cost analysis. These authors explore camping, recreational fishing, forest recreation, and bird-watching. More specifically, these four papers explore (1) the demand for camping opportunities on federal lands using campsite reservation data from the Recreation Information Database, with an initial application to California; (2) the prospects for improved management of recreational fisheries using the Gulf of Mexico red snapper fishery to assess the losses from recreational open access based on a pilot version of a catch share program; (3) the demand for recreational access to Forest Service wilderness areas based three rounds of data now available from the Forest Service National Visitor Use Monitoring Program; and (4) the demand for recreational birding opportunities based on information from Cornell's eBird citizen science program in combination with a separate special-purpose survey of eBird members. The datasets used in each of the studies are new, or they are being newly analyzed by economists with the goal of quantifying recreational benefits to support decisions by policy-makers about how to allocate access to these resources across competing uses. Each of these papers, to different degrees, contends with interesting state-of-the-art challenges in the empirical modeling of non-market demands for environmental public goods, such as heterogeneity in preferences, congestion and intertemporal substitution, and they all add to the inventory of value estimates needed for welfare-maximizing management of public lands and open-access natural resources.

Presentations:

Determinants of Demand for Campsites: A Random-Utility Site Choice Model Using the Recreation Information Database for California; *William P. Wheeler, University of Oregon, Department of Economics*

The Welfare Consequences of Escaping Recreation Derbies: Evidence from Surveys of Headboat Anglers; *Vic Adamowicz, University of Georgia*

Estimating Recreation Access Value to National Forest Wilderness; *Craig Landry, University of Georgia*

The Recreational Value of Birding Opportunities: Supplementing eBird Citizen Science Data with Auxiliary Survey Data; *Sonja Kolstoe, Salisbury University*

➢ D-1: The Implications of Behavioral Economics and Theory for BCA

Chair: David Weimer, University of Wisconsin

Discussant: Kyle Rozema, University of Chicago

Presentations:

Behavioral Economics in BCA: Measuring Unrecognized Benefits; *Tim Brennan, University of Maryland, Baltimore County*

In doing benefit cost analysis, the crucial difference between the traditional neoclassical economic approach and the still relatively new behavioral economic (BE) approach is how benefits are measured. One difference, following from the BE endowment effect, is that â€œwillingness to acceptâ€• (WTA) may significantly exceed â€œwillingness to payâ€• (WTP), and that the former rather than the latter should be applied in policy evaluation. A second difference, and the focus of this submission, is that BE finds a variety of biases affecting choices that create a wedge between revealed preference and actual preference. The difference is not between WTA and WTP, but that data based upon consumer choices produces a revealed WTP that differs from the actual benefits that a properly unbiased and cognitively skilled consumer would recognize and be willing to pay for. Under a BE approach to BCA, the difference between the traditional revealed WTP measure and this â€œbut for cognitive limitationsâ€ WTP should be included. We can call this â€œunrecognized benefit\,â€• abbreviate as UB, sometimes called â€œprivate benefitâ€• . The question I investigate is whether and how UB might be measured following a policy intervention, where consumer valuation data remain based upon revealed WTP and not cognitive limitation-free WTP. I explore this through a simple example involving energy efficiency standards for air conditioners. Suppose there are two kinds of air conditioners on the market, high efficiency and low efficiency. To make the example interesting, I assume that UB is greater than the difference in price between a high efficiency and low efficiency air conditioner. An energy efficiency regulation takes the low efficiency air conditioners off the market. One who had been planning to buy a low efficiency unit purchases either a high efficiency unit or no air conditioner. Under the traditional approach, the regulation imposes costs on those who had been planning to buy a low efficiency unit, because they revealed a preference for doing so over the high efficiency unit or nothing. But for an external benefit, such as reduced emissions, the policy would fail a BCA. However, recognizing UB could tilt the scale on both sides. Those who switch to a high efficiency unit obtain UB and thus are really better off. Moroever, some who switch to purchasing no unit at all may be better off, as the regulation prevents them from mistakenly buying a wasteful low efficiency unit. The objective is not to criticize the application of UB, but to understand how the policy evaluator can incorporated it into a BCA using the differences between pre-regulation and post-regulation demand curves. We hope to understand what

assumptions she may need to do so, particularly for example to conclude that UB exactly equals the difference between the value of reduced energy expenditures and the added cost of the high efficiency unit.

What's In, What's Out? Towards a Rigorous Definition of the Boundaries of BCA; *Daniel Acland, University of California, Berkeley*

Methodological advances have expanded the range of policy impacts for which willingness to pay can be observed or elicited. Contingent valuation, in particular, has the potential to allow for monetizing, and then including in benefit cost analysis, almost any impact that could result from a policy. In order to preserve the validity of BCA as an analytical tool, a clear definition is needed of the boundary between impacts that should be included in BCA and those that should not. Previous authors have suggested that anything for which willingness to pay can be elicited should be included in BCA. I offer an alternative definition of the boundary based on what I call the "usefulness" criterion. I argue that the set of impacts that should be included are those for which willingness to pay provides information that is useful to decision makers, and I hypothesize that this set will contain only those impacts that can be characterized as productive resources and the goods and services that are produced by them. My hypothesize is based on the observation that WTP hides the reasons that individuals value an impact, and the weights they place on those reasons, so that the only impacts for which WTP will be seen as useful will be those for which a broad consensus of society feels the reasons an impact is valued, and the weights on those reasons, should be of no concern to public decision makers. In other words, only those impacts for which we feel it is appropriate to apply consumer sovereignty, which I believe contains only productive resources and the goods and services they produce. I test this hypothesis by conducting contingent valuation on a set of policy impacts that includes some that clearly satisfy my definition and others that I believe do not, and presenting the contingent valuation results to decision makers in interviews to determine those for which they consider WTP to be a useful measure.

WTP or WTA, Another Method for Determining the Appropriate Measure of the Value of a Reference Dependent Change; *Jack Knetsch, Simon Fraser University*

A large and growing body of empirical evidence continues to indicate that people value many changes in terms of a neutral reference state, which may, or may not be the status quo. In such cases of reference dependent valuations positive changes may be taken by people either as gains or as reductions of losses. (Analogous implications hold for negative changes, but only positive ones are discussed here.) As the monetary value of gains are most accurately measured by the Willingness-to-Pay measure (WTP), and the monetary value of both losses and reductions of losses are most accurately assessed by the Willingness-to-Accept measure (WTA), and as the differences in assessments due to the choice of measure are, in practice, likely to be large, it is important that the appropriate measure is used in particular cases. While analysts' intuitions may lead to correct choices in more obvious cases -- such as the clearing of a roadway being taken as a reduction of a loss, rather than a gain from a reference of blocked traffic -- there remains virtually no more objective means to determine the most appropriate

choice of measure for a wider array of cases on which agreement might be reached. One suggestion, that remains relevant, is based on the characteristics of reference dependent valuations that losses are valued more than gains, and that reductions of losses are valued similarly to commensurate losses This allows the matching of judgments of the importance of the change at issue with either that of a gain or a loss to determine the most appropriate measure. The new method being proposed here is based on another characteristic of reference dependent valuations -- that people typically choose certain outcomes when dealing with gains and risky outcomes when dealing with changes in the losses. This is commonly demonstrated in the classroom or seminar by asking people if they prefer a certain, say, $80 or an 80 percent chance of $100 and 20 percent nothing, followed by a question with a minus sign preceding the same numbers -- the preferences invariably reverse with typically about 80 or 90 percent choosing certainty for the gain and 70 to 90 percent the risky choice for the loss. To the extent people follow the same pattern of preferences for certainty in the gains and risk in the losses, this could then provide a reasonably dependable and objective means o determine if people regard a positive change as a gain, with the WTP measure being then appropriate, or a reduction of a loss, for which WTA is the better choice. This method also eliminates the need for people to provide monetary or nonmonetary assessments of the changes, as this requires only a showing of preference for either certainty or risk associated with whatever change is at issue. Initial tests have confirmed that people prefer risky outcomes for reductions in loss as well as for losses - a very encouraging finding.

Incorporating Citizen Preferences in Willingness to Pay Values; *Susan Chilton*, Newcastle University; Morgan Beeson, Hugh Metcalf, Jytte Seested Nielsen*

Altruism - and the associated problem of double counting - is one of the most trenchant problems in non-market valuation studies (1,2). So far, no elicitation mechanism has been found to be demonstrably immune from it. It is problematic for BCA since theory suggests that inefficiencies can arise in valuations when certain social preferences, namely pure altruism, enter willingness-to-pay (WTP) values. These social preferences can generate both inflate or deflate values for project appraisal. This paper develops a novel methodology for eliciting 'citizen' preferences in a valuation exercise and shows the responses that are not affected by the problems associated with purely altruistic preferences. Citizen preferences are induced by invoking a Veil of Ignorance (3,4) (VoI) on respondents so that purely altruistic concerns become cancelled out in individual-level valuations. The implication of this for a BCA is that pure altruism would be filtered from valuations, but not paternalistic or distributional concerns. The core research question requires us to establish how a VoI affects WTP when social preferences exist in respondents' utility functions. Thus, a laboratory experiment was conducted to isolate this effect to judge the potential of the mechanism as a tool for regulating problems created by pure altruism. In general, purely altruistic preferences are expected to manifest as symmetric shifts towards the group optimal away from the private optimal, whilst distributional preferences are expected to cause a shift in the direction of the optimal of those who have garnered sympathy. The VoI employs a level of uncertainty over individuals' position within the societal distribution as they choose a level of provision of a public good. The addition of the VoI results in individuals seeking a level of public good provision that represents an optimum based on their

social and risk preferences. This leads to an interesting result in which self-interested and purely altruistic optimals become equivalent so that purely altruistic preferences are indistinguishable from selfish preferences whilst distributional preferences are still apparent. To test this hypothesis, the Random Price Voting Mechanism (5) is used to efficiently elicit WTP values for a laboratory public good. A four treatment design tests for within sample differences in WTP values between groups that are either homogenous or heterogeneous in their endowments and induced private values. Treatments 1 and 2 gather WTP for individuals in front of the veil, whilst Treatments 3 and 4 utilise the same scenarios behind the veil. Individuals are placed in groups with either symmetrically (T1 & T3) or asymmetrically (T2 & T4) distributed endowments and values. The difference between WTP values from the heterogeneous and homogenous groups measures social preferences. Results show that purely altruistic preferences are present in the baseline treatments (no VoI) since we observe statistically significant shifts towards the efficient group provision in heterogeneous groups. When the VoI is present WTP statistically equates to the self-interested baseline. This suggests that the citizen frame, elicited with the VoI mechanism, is capturing social preferences. A strong case can therefore be made for its use in in future valuation studies. (1)-(5) References

➢ E-1: How Many Roads? (and Other Infrastructure)

Chair: Kevin Simmons, Austin College

Discussant: Chad Shirley, Congressional Budget Office

Presentations:

Quantifying Wider Economic Benefits of Agglomeration within Transport BCA: Existing Evidence and Future Directions; *Daniel Graham, Imperial College of London*

Benefit Cost Analysis (BCA) is the most important component of ex-ante project appraisal for transport schemes in the UK. It has a well established theoretical and empirical basis and it provides a familiar and well understood approach that is routinely used by Civil Servants, transport professionals, and academics. It has been recognised for some time that the core consumer surplus based calculations of conventional BCA capture only a sub-set of the potential benefits of transport schemes. Recent work on Wider Economic Benefits (WEBs) has extended the scope of BCA to incorporate additional impacts arising from externalities and from forms of imperfect competition, again based on clearly set out theoretical and empirical evidence. This paper provides an overview of the theory and quantification of WEBs in transport BCA, focusing in particular on the role of transport induced agglomeration effects. It describe how agglomeration externalities can be modelled and included within a standard BCA framework to assess the wider productivity benefits of infrastructure investments. Examples from around the world are used to illustrate the potential significance of WEBs of agglomeration in CBA calculations. Finally, the paper discuss limitation of the existing approach, particularly in relation to econometric modelling, and suggests future areas for research.

How Much Should the U.S. Invest in Highways? Challenges in Benefit-Cost Analysis Using the Highway Economic Requirements; *David Luskin, Federal Highway Administration, Office of Investment & Economics*

The Federal Highway Administration has developed the HERS model for assessing the nation's need for investment in highways, and presents the assessments in the biennial Conditions and Performance Reports to Congress. The model employs a combination of engineering standards and benefit-cost analysis to estimate over a 20-year horizon the amount of investment needed to achieve user-specified targets, such as maintaining average congestion delay or pavement roughness at the base year level, or, alternatively, implementing all highway improvements that would be cost-beneficial. Among the many challenges for the model's benefit-cost analysis are the treatment of induced demand, the handling of database limitations, the valuation of travel time and reliability improvements, optimization of investment timing under budget constraints, and the valuation of traveler comfort benefits from improved pavement condition. This presentation will discuss the challenges and the planned and potential research solutions. Included will be a discussion of current research that uses HERS in conjunction with a computable general equilibrium model to estimate the impacts of additional investment in highways. The CGE model measures the overall welfare change in terms of real household consumption, which suggests the use of a social discount rate different from the 7 percent that OMB requires for BCA of investment projects. Implications for the choice of discount rate in HERS, which is based on the OMB guidance, will be explored.

The Use of Retrospective Cost-Benefit Analysis to Assess the Long-Term Effects of Major Infrastructure Projects; *Chiara Pancotti, CSIL - Centre for Industrial Studies*

The presentation draws from a recent retrospective evaluation carried out for the European Commission aimed at assessing the long term effects produced by a sample of ten major infrastructures in the transport sectors and interpreting the key determinants of the observed performance. More specifically, this evaluation study required to evaluate projects in operation from at least 5 years, placing - de-facto - the assessment in an intermediate viewpoint in comparison to the whole projects' time horizon. Among others, the study offered a unique opportunity to apply cost-benefit analysis (CBA) adopting a long-run perspective, which extends into both the past and the future, and requires a mix of retrospective and prospective analysis. This presentation revolves around the potential of ex-post CBA to assess long term impacts of major infrastructure projects and discusses some methodological implications related to its use. CBA is a standard methodology for project selection, but it can be also useful after project implementation and closure to measure the actual net effects of the executed project. In principle ex-post CBA shall be performed as an ex-ante but using historical rather than forecasted data. However, far from being as straightforward as apparently it would look like, performing an ex post CBA â”€ which is not a mere updating of the ex-ante analysis with actual values â”€ raises a number of interesting methodological issues. The first implication of the interim perspective of the study is that while the most significant share of effects expected to be observed ex-post will be those also reflected in the ex-ante CBA, the ex-post CBA can be a little bit more ambitious in terms of effects to be accounted for as the risk of optimism bias is

mitigated by the possibility to rely on observed data. Actually, the perspective an ex-ante CBA, where prudence is fundamental to avoid optimism bias, is different form the ex-post one, where there is much more certainty and knowledge on what actually happened and is observed. Also, the fact that the CBA is carried out during the lifetime of the projects leads to a hybrid typology of CBA, sharing the features of both an ex-ante CBA and a pure retrospective CBA. This, in turn, involves that the CBA â”€ which is always undertaken from 'today' perspective â”€ is both backward-looking, i.e. uses past evidence on the project performance until today, and forward-looking, i.e. forecasts future developments of the project form today onwards. The intermediate perspective poses some challenges to the treatment of key elements of the CBA, for example, the choice of an appropriate reference scenario, the definition of the relevant project 'boundaries', as well as the choice of the key parameters such as the social discount rate or the conversion factors. Taking stock of the experience gained with the mentioned study, the presentation illustrates some technical solutions to deal with retrospective CBA. In particular, it will focus on the definition of the proper unit of analysis, the choice of the counterfactual and the choice of the discount rates.

The Role of BCA for the German Federal Transport Infrastructure Plan (FTIP); *Christopher Walther, PVT Planung Transport Verkehr AG*

Short abstract In 2016 the revision of the German Federal Transport Infrastructure Plan 2030 (FTIP 2030) was completed. The contribution describes briefly the overall FTIP process, explains the role of BCA for project selection and highlights major methodological changes. The impacts of new indicators are demonstrated with the help of an artificial project and a simplified network model. The presentation aims at motivating a scientific exchange between the US and Germany. Abstract The Federal Government is â€“ referring to the basic law - responsible for construction and preservation of transport infrastructure. Key regulation element is the Federal Transport Infrastructure Plan (FTIP). It is usually in effect for 10 to 15 years and states, which requirements for maintenance, expansion and new construction investments exist. German budget law postulates that appropriate profitability analyses must be conducted for financially effective measures. For project assessment, four modules including BCA, environmental aspects, ac-cessibility of regions and urban development must be executed. The presentation will focus on the BCA module and introduce the different benefit components like travel time savings etc. which are integrated in BCA. Special emphasis will be put on the â€œnewâ€• indicators â€œreliabilityâ€□ and â€œimplicit benefit differenceâ€□, which make the main difference between the methodology of FTIP 2003 and FTIP 2016 (named FTIP 2030). The underlying understanding of non-reliability can be the missing ability of a road link to provide a defined level of service for given â€œstandardâ€• traffic situations. The alternative interpretation of non-reliability is the deviation of the realised travel time from the expected travel time. The contribution will explain the different approaches for different transport carriers. Beside this, the fact that reliability is mainly a KPI for the whole route from origin to destination has far-reaching consequences for transport modelling and project assessment. BCA approaches are based on the concept of welfare change. On international level, this concept is put into practice by measuring changes in the consumer's and producer's surplus due to new or modified transport infrastructure. German FTIP measures welfare changes by changes in

resource consumption. Therefore, benefits of new or expanded transport infra-structure are measured by changes in operational and maintenance costs, clean air, travel times and others, generating the problem that so called induced traffic reduces the benefits of a project by additional operational costs etc. The concept of the â€œimplicit benefit differenceâ€• bridges the gap between national and international standard and avoids the complete rear-rangement of the German procedure. After the theoretical explanation of these indicators, the presentation will assess a fictional infrastructure project exemplarily based on the FTIP 2030 approach and will compare these results with the previous methodology leaving out the mentioned indicators. The presentation concludes with a description of the prioritization process applied to identify the most efficient projects: 1. Determination of the necessary financial means for maintenance and replacement 2. Distribution of the remaining financial means to the transport carriers: road, railways and inland waterways 3. Project urgency classification within the different transport carriers, weighting the results of the four modules.

➢ G-1: Clean Power Plan and Global Climate Change

Chair: Elizabeth Kopits, U.S. Environmental Protection Agency

Presentations:

Estimating Co-Pollutant Benefits from the Clean Power Plan: An Empirical Approach;
Daniel Simon, Indiana University
In October 2017, the EPA proposed to repeal the Clean Power Plan (CPP), President Obama's signature climate policy. While the primary goal of most climate policies is to reduce GHG emissions (e.g., CO2), these policies can also provide substantial health benefits by improving air quality. For example, the EPA originally projected that the CPP would reduce emissions of harmful co-pollutants, such as sulfur dioxide (SO2) and nitrogen oxide (NOx), with health benefits that were roughly as large, and perhaps more than twice as large as the climate change benefits of reducing CO2 emissions (EPA 2015). In the proposal to repeal the CPP, the EPA reports that there is substantial uncertainty in estimating the benefits of co-pollutant reductions in areas with low levels of air pollution. However, the EPA does not provide estimates of the uncertainty of their projections (i.e., they do not report confidence intervals). They only report some rough sensitivity analysis. Specifically, the impact analysis for the proposal to repeal the CPP includes a scenario in which the benefits from reducing co-pollutant emissions in areas with air quality levels exceeding the National Ambient Air Quality Standards threshold are zero. Critically, under this scenario, the proposal to repeal the CPP has positive net benefits (the CPP has negative net benefits). In this paper, we use data from the Emissions and Generation Resource Integrated Database to estimate the co-pollutant emissions reductions that would result from the CPP. Our empirical approach allows us to directly assess the uncertainty associated with our estimated reductions in co-pollutant emissions. We examine the impact of the two key abatement choices (electricity output and heat rate) on emissions of the two primary co-pollutants, SO2 and NOx. We use these elasticities to calculate the implied co-pollutant reductions under the CPP, assuming power plants comply as projected by the EPA. Our point estimates of the total reductions in SO2 and

NOx in 2030 are very similar to the EPA's projections (within 6%). We estimate that compliance with the CPP would yield a reduction of 285,000 tons of NOx and 263,000 tons of SO2. And, while the EPA does not provide confidence intervals around its projections, we find that SO2 reductions could be as large as 483,000 tons or as small as 44,000 tons. Similarly, when we look at the health impacts, we find very large confidence intervals for SO2 emissions reductions. In seven out of ten cases, we find that our confidence interval includes the higher EPA projected health benefit from SO2 reduction, in eight out of 10 cases the confidence interval includes zero, and in five of the ten cases the confidence interval includes both the EPA's higher projection of health benefits and zero benefits. This large range of values highlights the importance of incorporating uncertainty into our cost-benefit analysis. â€ƒ Bibliography EPA. 2015a. 'Regulatory Impact Analysis for the Clean Power Plan Final Rule.'

Incorporating Uncertainty into Climate Change Adaptation Measures; *David Ryder*, ICF; Will Cooper*, ICF; Beth Rodehorst, ICF; Justin Lennon, WSP; Chris Dorney, WSP; Robert Kafalenos, Federal Highway Administration; Robert Hyman, Federal Highway Administration*
Benefit-cost analyses are an important tool for transportation design practitioners when determining climate change resilient asset design alternatives. It is important for planners to factor in future weather conditions to mitigate excessive future expenditures. This is especially true when considering natural disasters and potentially hidden costs that may overlooked. This study presents an application of a benefit-cost analysis that uses a scenario approach, as well as Monte Carlo, to evaluate the cost-effectiveness of several alternative designs for a culvert on US 34 in Colorado. Drier climate projections for Northern Colorado are expected to increase incidence of wildfire, which results in additional sediment discharges. The inherent uncertainty in climate, wildfire, and precipitation projectionsâ€”and related confounding effectsâ€”present an analytical challenge when evaluating design alternatives. The analysis incorporates the lifecycle costs of design alternatives, including traffic loss-of-function values during construction; discharge-damage functions for burn and no-burn conditions; eight wildfire scenarios; climate simulations; and precipitation forecasts. Accounting for the Keetch-Byram Drought Index, which assesses conditions conducive to wildfire, and accounts for fuel, soil moisture, and weather conditions, the research team is able to evaluate the cost-effectiveness of the three design alternatives. Our methodology represents an approach that can be used to support decision making regarding climate change adaptation alternatives under compounded uncertainty. In addition, this methodology can be used to determine which adaptation design alternative is the most consistently resilient across the range of climate change and disaster event scenarios.

A Tale of Two Regulatory Impact Analysis: The Clean Power Plan Under the Obama and Trump Administration; *Alison Cassady, Center for American Progress*

Session 2: Thursday, March 15, 2018, 10:45 – 12:15pm

- A-2: An International Comparison of Social Discounting for Infrastructure and Regulation: Theory and Practice

Chair: Maureen Cropper, University of Maryland and Resources for the Future

Discussant: Glenn Jenkins, Queens University

The discounting practices of national and state governments, multi-lateral organizations, and regional economic groups vary across the type of entity, geographic domains and, in some cases, the type of program being considered. In the US, OMB guidelines recommend a base discount rate of 7% for investment analyses but recommend both 3% and 7% for regulatory analyses. The most recent guidance from the EC recommends a lower discount rate (3%) for investment projects in more developed EU member states and 5% for lagging-behind countries. Moreover, for environmental regulations or analyses that span multiple generations, such as climate change or ozone depleting substances, discount rates below 3% are sometimes used. A number of economists have suggested that discount rates should decline over time for intergenerational analyses, and the UK and France have adopted a declining discount rate in the long term. To what extent are these geographical and other differences justified using theoretical reasoning and to what extent do they reflect social policy or mores or practical considerations? Is there a 'right' or central number to use for discounting? How and according to what parameters should this discount rate change? Join our international set of presenters and panelists to explore these issues.

Presentations:

Two is Better Than One: Social Discounting Rates and EU Regional Policy; *Massimo Florio, University of Milan*

A Discount Rate for the Economic Analysis of Projects at the World Bank; *Aart Kraay, World Bank*

Efficient Discount System: The Risk and Time Dimensions; *Christian Gollier, Toulouse School of Economics*

➢ B-2: Federal Regulatory BCA in Practice

Chair: Caroline Cecot, Antonin Scalia Law School

Presentations:

Benefit-Cost Analysis and Independent Regulatory Commissions: Regulatory Analysis at the CPSC in the CPSIA Era; *Deborah Aiken, U.S. Department of Transportation*

In this study, I examine the regulatory analysis practices of the Consumer Product Safety Commission, an independent regulatory agency. I explore how the agency responded when its statutory obligations to conduct benefit cost analysis (BCA) were relaxed under the Consumer Product Safety Improvement Act (CPSIA) of 2008. When given discretion under the CPSIA, the agency abandoned the practice despite significant institutional experience in conducting regulatory BCA and a history of using BCA as a key input to decision making. While the

decision to forego regulatory BCA may have been quite rational given the requirements and constraints posed by the CPSIA, this decision reflects a fundamental change in the agency's regulatory approach. In contrast to the typical rule CPSC historically supported with BCA findings, many of the CPSIA rules impose significant economic burdens yet yield negligible benefits. The CPSC would have been unlikely to have pursued the CPSIA rulemakings on its own accord because it could not have made the necessary BCA findings.

Benefit-Cost Analysis at the Food and Drug Administration: A History; *Rachel Lange, U.S. Food and Drug Administration*

Since the 1980s, the Economics Staff at the Food and Drug Administration has performed benefit-cost analysis in fulfillment of the requirements of various Executive Orders, including 12991, 12866, and â€“ most recently â€“ 13771. During this time, the FDA's Economics Staff has analyzed the economic and public health effects of a wide variety of regulations, from the nutrition facts panel promulgated under the Nutrition Labeling and Education Act of 1990, to regulations under the Public Health Security and Bioterrorism Preparedness and Response Act of 2001, to regulations forthcoming under the 21st Century Cures Act of 1016. Using data from the Federal Register, we are able to examine, for the first time, the succession of estimated benefits and costs for over 170 regulatory impact analyses, representing every significant FDA final rule published since 1994. This body of benefit-cost analyses represents a history, not only of evolving methods used in benefit-cost analysis, but also of changing Administrations and regulatory actions taken by the modern Food and Drug Administration. This historical record shows how regulatory policy, the economics of regulations, and the role of benefit-cost analysis have evolved since the regulatory review era began for FDA. This record allows us to understand the contribution of economics to the regulatory process, the growing role of regulation in public health policy, and the increasing analytical rigor of benefit-cost analysis. These lessons will help prepare us for the new challenges of 21st Century, such as the role of FDA in the regulation of addictive substances, the more effective use of regulation in areas such as food safety, and encouraging innovation.

Estimating the Benefits and Costs of Data Privacy Regulation: Comparing Regulation of BIAS by the FTC and FCC; *Joseph Cordes, The George Washington University*

A New Methodology for Conducting Product Support Business Case Analysis (BCA); *Frank Camm, RAND Corporation*

Department of Defense (DoD) product support business case analyses (BCAs) compare alternative courses of action (COAs) for sustaining weapon systems and recommend ways to improve on current sustainment practice. This document explains how to apply standard Office of Management and Budget and DoD guidance on project evaluation to product support BCAs in a way that allows senior DoD decisionmakers to use net present value (NPV) as the dominant figure of merit for comparing COAs. It identifies a primary performance attribute and estimates the cost of ensuring that every COA meets a target level of performance for this attribute. This begins a process of estimating the annual cash flows for each COA relative to a baseline COA.

The approach then elicits from subject matter experts (1) what sources of risk might delay or thwart each COA's efforts to achieve target performance and(2) how each source of risk affects each COA's efforts. It allows these efforts to differ across potential future states. Each future state yields a different set of annual cash flows based on (1) the cash flows associated with trouble-free implementation, including transition and implementation costs and savings, and (2)the effects of sources of risk that degrade implementation. The approach ultimately states the findings of a BCA in terms of dollar values of NPVs for COAs-figures that senior decisionmakers understand intuitively, because they use them routinely in decisions about defense resource management.

➢ C-2: How Regulators Can Learn from Crisis

Chair: Jonathan Wiener, Duke University

Panelists:
Edward Balleisen, Duke University
Joe Aldy, Harvard University
Lori Bennear, Duke University

➢ E-2: Advances in Transportation Policy BCA

Chair: David Luskin, U.S. Department of Transportation

Discussant: Daniel Graham, Imperial College

Benefit Cost Analysis (BCA) is the most important component of ex-ante project appraisal for transport schemes in the UK. It has a well established theoretical and empirical basis and it provides a familiar and well understood approach that is routinely used by Civil Servants, transport professionals, and academics. It has been recognised for some time that the core consumer surplus based calculations of conventional BCA capture only a sub-set of the potential benefits of transport schemes. Recent work on Wider Economic Benefits (WEBs) has extended the scope of BCA to incorporate additional impacts arising from externalities and from forms of imperfect competition, again based on clearly set out theoretical and empirical evidence. This paper provides an overview of the theory and quantification of WEBs in transport BCA, focusing in particular on the role of transport induced agglomeration effects. It describe how agglomeration externalities can be modelled and included within a standard BCA framework to assess the wider productivity benefits of infrastructure investments. Examples from around the world are used to illustrate the potential significance of WEBs of agglomeration in CBA calculations. Finally, the paper discuss limitation of the existing approach, particularly in relation to econometric modelling, and suggests future areas for research.

Presentations:

How Society Benefits from Optimal Vehicle Routing Pattern for Poulty Meat Distribution Network; *Amir Chizari, University of Tehran*

Sustainable transportation has become a central issue for scholars around the world. Tehran is one of the world's most populous cities. In Tehran, about 140 meat grocery stores are skater in all part of Tehran which under the management of Tehran Municipality Management of Fruit and Vegetables Organization (TMMFVO). All poultry meat distribution is deliver to these meat grocery locations from two central markets, Bahman and Piroozi Squares, which located in Tehran. This study investigated the transportation structure to provide an optimal model for the daily distribution of poultry meat in Tehran. Finally, transportation costs of the existing circumstances will be compare to the optimal routing pattern. This study sets out to design an optimal routing system for poultry meat using 2014 data. In this work, we used a Mixed Integer Linear Programming model (MILP) given that the majority of routing templates follow this model. In the present study, we applied a Fleet Size and Mix Vehicle Routing Problem (FSMVRP) with an unlimited number of each type of vehicle. Comparisons has been drawn among the three days in terms of transportation cost and cost of reducing of poultry meat for consumers. The results indicate that using optimal transportation model might contribute to reduce costs for driver and Tehran Municipality Management of Fruit and Vegetables Organization for three days are 29.6, 27.9 and 32.6 percent respectively. In addition, the cost of each kilogram of poultry met for consumer will reduce by 20 percent, as a whole the society will benefit from optimal vehicle routing pattern for poultry meat.

Examining Maritime Casualties from Vessel Grounds Using Zero-Inflated and Zero-Truncated Models; *Jerome Kerby, U.S. Coast Guard; Fatima Zouhair, FedWriters*

The growth in global shipping has increased the number of vessels on waterways around the world and maritime safety, as a result, has become increasingly important. However, according to Lloyd's List Casualty Survey, the number of maritime accidents has decreased over the past 30 years by 18 percent. Nevertheless, despite improvements in global shipping safety, accidents, occurring from incidents such as groundings and collisions, in addition to many other factors, periodically occur. The U.S. Coast Guard (USCG) is responsible for promulgating regulations that prevent and mitigate maritime accidents. Because of loss of life, property damage, and adverse environmental effects these incidents are critical to decision makers and policy makers alike. This objective of this study is to develop a model to assess the loss of human life and injuries by establishing a relationship between injuries and fatalities, and vessel groundings. Often times, data contain an excessive number of zero outcomes. For this statistical analysis and to handle this problem, we will use a zero-inflated distribution for fatalities. We will use a zero-truncated model for the response variable, injuries, where the values cannot be zero. We will also compare the results of these models to other competitive techniques. Lastly, we will examine the marginal effects to determine the contribution of the explanatory variables on grounding fatalities and injuries. We obtained accident data from the Coast Guard's Marine for Safety and Law Enforcement (MISLE) database. We will use marine casualty data between 1991 and 2016 for vessel accidents that occurred in U.S. waterways and within the Exclusive Economic Zone (EEZ).

The Economics of All Door Boarding on Buses; *Pierre Vilain, Steer Davis Gleave; Tabitha Decker, transitCenter*

Most transit operators in the United States require bus riders to enter uniquely through the front door of the vehicle. For example, in New York City most bus riders enter through the front door only, but several express bus routes (the Select Bus Service) have off-bus ticketing and access through all doors. There is a widespread interest in a wider implementation of all door boarding for buses, not just in New York City but nationally and internationally as well. An assessment of all door boarding on New York's Select Bus Service suggests that the efficiency gains from allowing passengers to enter through all doors is significant. Implementation of all door boarding in locations such as San Francisco and Oslo, and a pilot program in Montreal similarly suggest efficiency gains could be considerable. Is it truly the case that moving to all door boarding really is a clear efficiency gain for a transit operator? Are the benefits in terms of travel time savings and operating cost reductions greater than the costs of converting to such a system? The current presentation reports on a recent cost-benefit analysis of a hypothetical system-wide implementation of all door boarding in New York City. The exercise involved a considerable amount of data gathering and generation to permit an accurate assessment of benefits. The approach involved a fairly extensive survey exercise to observe the differences in passenger boarding rates in front door boarding compared to those in all door boarding contexts. The data and analysis are structured to generate an accurate â€œtreatmentâ€• effect to isolate precisely the impact of all door boarding. Our work in this area is a contribution to an area of enquiry where research has been limited. The data analysis yields a rigorous model that estimates the net benefits of all door boarding under varying conditions of crowding. The models are used to estimate the total travel time savings to buses and passengers that would accrue. While we find that there are significant benefits to be gained from an all door boarding policy, we consider the costs of implementation as well. We report on the net benefits using a comprehensive cost-benefit analysis. Our analysis includes key parameters that reflect local conditions where the all door boarding would take place, including local values of time for bus passengers in New York City.

➢ F-2: Addressing Health Costs in BCA

Chair: Richard Williams

Presentations:

A Reference Case for Global Health Costing; *Carol Levin*, University of Washington; Sedona Sweeney; James G. Kahn; Gabriela Gomez; Lori Bollinger; Elliot Marseille; Ben Herzel; Willyanne DeCormier Plosky; Lucy Cunnama; Edina Sinanovic; Sergio Bautista, GHCC Technical Advisory Group, GHCC Stakeholder Group; Kate Harris*

Estimates of the costs of global health interventions are required for the analysis of efficiency in service delivery, economic evaluations, priority setting and the formulation of resource

requirements at both the country and international levels. Currently, costs are estimated using a wide range of approaches, often combining research methods for data collection with routinely collected data. There are a wide variety of guidelines available to analysts, both on costing for specific purposes (such as economic evaluations) and for specific global health interventions or disease areas. Yet, there is no commonly agreed-upon guidance on principles, methods, and reporting standards for cost estimates across different global health areas. The lack of consistency in both estimation methods and the reporting of costs for health interventions have long been recognised. Of particular concern is the impact that this can have on the variability of economic evaluation results, which should be comparable across interventions. This presentation introduces the work by the Global Health Costing Consortium to develop a reference case for global health costing. We developed a Reference Case with the goal to improve the relevance, use and quality of cost estimates for global health. The reference case approach has its origins in the field of economic evaluation. The first US Panel on Cost-Effectiveness in Health and Medicine ('US Panel') proposed the use of a reference case 'to improve comparability of cost-effectiveness analysis designed to inform decision-making while allowing analysts the flexibility to design studies that answer issues specific to a particular problem or industry'. This concept has since been applied by the International Decision Support Initiative (iDSi) to economic evaluations in global health and has been recently extended by the second US Panel. In line with the Reference Case on Economic Evaluation, the technical content of the Reference Case content provides costing principles, methodological specifications and reporting standards according to a range of 'costing purposes', including economic evaluation, financial planning, efficiency analyses and budget impact assessment. For each of these purposes principles are defined that provide a set of rules that are sufficiently broad to gain consensus and apply in multiple settings. These are followed by a set of methodological specifications providing a non-exhaustive set of options that enable the analyst to adhere to the principles. The Reference Case is a guide that helps ensure that the process of cost estimation is transparent and clear, so that those using cost data can interpret the findings properly and assess their quality (accuracy, precision, generalizability and consistency). The reference case aims to provide a framework for analysts to ensure they fully consider how their methods may influence the quality of their estimates.

Cost Estimation for Rift Valley Fever from 2007 to 2010; *Mohammed Mansour, Central Veterinary Research Laboratory*

Rift Valley fever (RVF) is transboundary zoonotic disease. Mosquito is the principle vector of RVF. It affects most prominently small ruminants, sheep and goats, and cattle, camels and human can get infected. It occurs following up average heavy rainfalls which render abundance of mosquito vector, and it often occurs every 10 to 15 years associated with ElNio phenomenon. RVF is influenza like illness with fever and muscle ache and back pain, in severe form, it involves retinitis, opthalmitis, encephalitis and hepatic and hemorrhagic form; in addition, it is characterized by storm of abortion in pregnant humans and animals, stillbirth and high mortality rates in young animals. This paper is an endeavor to estimate cost for RVF in Sudan from 2007 to 2010. A financial model has been derived by using Palisade financial model. The model parameters were set to estimate cost for RVF outbreak. Average cost for controlling RVF was

estimated by US $ 74607069.29, Probability of meeting base case value was 0.00%, total budget required for 95.0% confidence was US $ 78,726,457 and Contingency was US$192,700 with 95.0% confidence. This model has significant influence on socioeconomic life of affected communities and potential sequel on national income as well. Key words: Rift Valley fever, cost estimates, financial model, Sudan

Moving from Global Burden of Disease Estimates to Policy Analysis: The Case of Foodborne Disease; *Sandra Hoffman, U.S. Department of Agriculture*

Recently the World Health Organization, Foodborne Disease Burden Epidemiology Reference Group estimated that 31 foodborne diseases (FBDs) resulted in over 600 million illnesses and 420,000 deaths worldwide in 2010. Knowing the relative importance different foods play as exposure routes for key hazards is critical to preventing illness. This presentation will do two things. First, it will present the results of recent research attributing the burden of foodborne disease around the world to specific food exposures. Second, we will present current research exploring ways in which these estimates can be used to build a stronger foundation for analysis of food safety and global health policy around the world. We use a structured expert elicitation to develop globally comparable estimates of the proportion of specific FBDs attributable to specific food exposure routes for 11 major FBDs diseases in each of 14 world subregions. In this research we use Cooke's Classical Model to elicit and aggregate judgments of 73 international experts. Judgments were elicited from each expert individually and aggregated using both equal and performance weights. These are the first such globally comparable estimates and the first such estimates for most regions of the world. While we find substantial uncertainty around central tendency estimates, we believe these estimates provide the best currently available basis on which to link FBDs and specific foods in many parts of the world, providing guidance for policy actions to control FBDs. The WHO's effort to develop estimates of the global burden of disease and attribute them to food exposure routes has been a major global research undertaking and provides a basis for improved food safety policy analysis around the world. Additional work is needed to fully exploit the potential benefits of this effort in improving national and global health policy. We two extensions of this work. In the first, we explore the use of benefits transfer of VSL estimates to provide estimates of the economic burden of deaths from foodborne illnesses at a regional and global level. In the second, we explore the potential of using global burden of disease modeling in conjunction with regionally specific and globally comparable estimates of food demand to simulate how patterns of foodborne illness might change as food demand responds to changes in income and prices.

The Choice Between Iron and Folic Acid (IFA) and Multiple Micro-Nutrients (MMS) as Alternative Maternal Supplement; *Bahman Kashi, Queens University*

Background - As part of antenatal care, the WHO recommends a daily dose of elemental iron and folic acid (IFA). However developing countries have expressed interest in transitioning from IFA alone to multiple micronutrient supplements (MMS) as a way to concurrently target other nutritional deficiencies. In Pakistan, MMS is not part of the Pakistan Essential Medicine List, and there is little guidance regarding whether to initiate a transition. This study conducts a marginal

cost-effectiveness analysis to compare IFA and MMS for a cohort of women and their infants, in Pakistan. Methods - Nine heath outcomes were selected to compare the effectiveness of IFA and MMS: maternal anaemia, preterm deliveries, small-for-gestational-age (SGA) infants, low birth weight (LBW) infants, stunting, maternal mortality, stillbirths, neonatal mortality, and infant mortality. Effectiveness was measured using disability-adjusted life years (DALYs). Costs comprised patient and program costs, assuming 95% geographical coverage. A deterministic model was built to estimate the averted DALYs for each health outcome. Subsequently, a probabilistic analysis was conducted on the deterministic model using Monte Carlo simulations. The marginal cost-effectiveness of MMS compared to IFA was calculated using the marginal benefits, reported for 100,000 participants. Sensitivity analyses were conducted on the discount rate at 0% and at 5%. Results - The deterministic analysis estimated MMS averts 17,108 more DALYs than IFA, per 100,000 participants. The probabilistic analysis demonstrated MMS averts more DALYs than IFA with 87% certainty. The estimated cost-effectiveness of IFA alone is 46.76 USD (2016) per DALY averted, and the estimated cost-effectiveness of MMS alone is 32.75 USD (2016). The marginal cost-effectiveness of MMS compared to IFA would therefore be 7.14 USD (2016) per DALY averted. This is below the WHO cost-effectiveness threshold (less than 3 times GDP/capita). The sensitivity analysis found that modeling the discount rate at 0% and 5% did not change the expected DALYs averted. Neonatal mortality, stillbirths, and infant mortality were the most sensitive inputs.

➢ G-2: Applications of BCA for Air Pollution

Chair: Kelly Maguire, U.S. Environmental Protection Agency

Presentations:

Spatial Variability and Uncertainty in Air Quality Social Costs and the Implications for Policy; *Elisabeth Gilmore, Clark University*

Information on the benefits of pollution abatement is useful both for policy design and policy evaluation. Multiple models now exist that can produce benefit estimates for air pollution with differences in these estimates reflecting underlying uncertainty in air quality models. This paper employs marginal ($/ton) benefits developed by three different models â€“ Air Pollution Emission Experiments and Policy analysis (APEEP/AP2), Estimating Air pollution Social Impacts Using Regression (EASIUR), and the Intervention Model for Air Pollution (InMAP) â€“ to examine the robustness of the benefits estimates as well as to identify opportunities to improve the efficiency of extant regulations. We find that despite differences in the representation for the air quality chemistry in each model, the national level average benefits per ton are similar in magnitude. Further, the rank ordering of benefits per ton across pollutants is the same across models. Each model also predicts large variability in the benefits across the US with population density being a major driver of these spatial differences. However, these models predict significantly different degrees of cross-sectional variance in the marginal benefits across pollutants. From the perspective of policy design, the primary implication is that there is a different distribution of benefits from emission reductions across source locations. The analysis

concludes with an exploration of the projected benefits from a standardized set of emission scenarios to show how model choice affects levels and the distribution of benefits.

Characterization of Epidemiological Concentration-Response Functions in U.S. EPA's BenMAP Software; *R. Jeffrey Lewis, ExxonMobil Biomedical Sciences, Inc.; Ashish Jachak, ExxonMobil Biomedical Sciences*

Problem statement: The United States Environmental Protection Agency's (US EPA) Benefits Mapping and Analysis Program (BenMAP) is widely used in benefit-cost analysis. BenMAP calculates the number and economic value of air pollution-related deaths and illnesses and includes a number of concentration-response functions (CRF), population files, and health and economic data needed to quantify these impacts. The computer program uses health impact functions to relate changes in air pollution concentrations to changes in health outcomes. These health impact functions are based on data from four sources: the population, baseline incidence rates, pollutant concentrations, and CRFs identified from the epidemiological literature (CRFs relate a unit change in air pollutant concentration to a change in health endpoint incidence). Method: This presentation will evaluate and describe characteristics of CRFs obtained from the epidemiological literature and populated by default into BenMAP. Specifically, the literature supporting CRFs in BenMAP for pollutants (either ozone or PM2.5) will be evaluated and characterized with regards to study quality, strengths, and limitations. Our review will also address other features of available CRFs in BenMAP such as range of potential sensitive subpopulations and health endpoints covered, and an assessment of the four types of functions (linear, log-linear, logistical, and Cox proportional hazards) applied to the studies. Assessing and characterizing the quality of the literature underlying the CRFs included in BenMAP, will help address some key questions that regulators and the scientific community are often faced with, such as 1) what is the quality of the epidemiological data that support the CRFs, 2) what are the data gaps that need to be addressed, and 3) which CRFs may require additional bolstering of supporting data, etc.

Valuing Health Risk Reductions from Air Quality Improvement: Evidence from a New Discrete Choice Experiment in China; *Yana Jin, Peking University*

In recent years, China is implementing large scale policies to improve air quality and protect human health. Therefore, it is important to understand the current Chinese citizens' demand for public provision of health risk reductions. Prior valuation results in China are scarce, and most are based on contingent valuation surveys more than 10 years ago. In this study, we used data from a representative survey of 1000 Beijing citizens in 2016 to provide new welfare measures for mortality and morbidity risk reductions from air quality improvement in China. We designed a discrete choice experiment focusing on three major illnesses associated with air pollution: ischemic heart disease (IHD), stroke and chronic obstructive pulmonary disease (COPD). We incorporated recent epidemiological evidences applicable for China where the pollution level is high. Thus, we developed realistic scenarios of risk reductions from air quality improvement in China. Willingness to pay (WTP) estimates obtained from different model specifications (conditional logit, mixed logit and latent class) are similar. Overall, for mortality and morbidity

risk reductions similar to our research setting, value of statistical life is $300,000 ($220,000-$500,000) and value of statistical illness is $60,000 ($40,000-$90,000) in 2016 US dollars. We found evidences for significant preference heterogeneity: about 60% respondents behaved as predicted by expected utility theory (rational), that they care about policy cost, how quickly the policy can bring benefits, and by how much mortality and morbidity risks can be reduced. Another 10% respondents only trade-off between morbidity risk reductions and costs. The rest 30% respondents neglected the size of the risk reduction and payed limited attention to the time needed before policy becomes effective. More rational choices were related with longer time spent on survey, better air quality on the survey date, clearer understanding of risk visual aid, agreement to choose as if in reality, higher subjective attributable risk level, more risk knowledge, belief in causality between air pollution and health risks, larger house property ownership and no ownership of new-wind system at home. No significant differences were found in WTP for risk reductions among the three illnesses.

How Attainment of Air Quality Standards in Southern California Improves Public Health and Reduces Health Risk Inequality; *Anthony Oliver, South Coast Air Quality Management District; Elaine Shen, South Coast Air Quality Management District*

The South Coast Air Basin (SCAB) is residence to over 17 million people in Southern California and a region with some of the most polluted air in the nation. The 2016 Air Quality Management Plan (AQMP) outlines the air quality control measures necessary for SCAB to attain the National Ambient Air Quality Standards for both ozone and particulate matter (PM2.5) within the next 15 years. Population exposure to these pollutants is causally linked to increases in mortality rates, illnesses, and other morbidity incidence. By improving air quality, various health risks will be significantly diminished across the population. However, the distribution of health risk reductions will vary spatially within the region due to the local topography, location of emission sources, pollutant dispersion patterns, atmospheric processes, and differentials in local residents' vulnerability and susceptibility to pollution exposure. This study used an integrated method to both quantify the public health benefits and the changes in health risk distributions related to the implementation of the 2016 AQMP. The analysis quantified the public health benefits using the Environmental Benefits Mapping and Analysis Program - Community Edition (BenMAP-CE) with local data, including air quality scenarios specifically generated for the 2016 AQMP, local demographic and health incidence data, and concentration-response functions estimated from studies using data specific to the Los Angeles area to quantify health impacts (Jerrett et al. 2005; Krewski et al. 2009; Jerrett et al. 2013; Bell, Dominici, and Samet 2005). The analysis also extended the methodological framework of Fann et al. (2011) by integrating an environmental justice (EJ) screening tool into the distributional analysis. The results were then combined to estimate changes in the measures of relative and absolute health risk inequality for the region overall and both within and between EJ and non-EJ communities as a result of implementing the 2016 AQMP. It was estimated that, as a result of implementing the 2016 AQMP, an average of 1,600 premature deaths would be avoided per year. Numerous other non-fatal health conditions were also estimated to be avoided annually, including about 2,500 asthma-related emergency department visits, about 700 hospital admissions related to asthma, cardiovascular, or respiratory conditions, and more than 200,000 person-days of work and

school absences. Due to these lowered mortality and morbidity risks, an estimated $173 billion worth of public health benefits are expected to accrue in the four-county region, cumulatively from 2017 to 2031. Inequality in mortality-related risk was found to decrease overall and decrease between EJ and non-EJ communities with implementation of the 2016 AQMP.

Session 3: Thursday, March 15, 2018, 2:00pm - 3:30pm

➢ A-3: New Developments in Regulatory BCA

Chair: Lisa Robinson, Harvard University, Center for Health Decision Science and Center for Risk Analysis

Trump Administration initiatives pose several challenges for the U.S. regulatory development process and for the conduct of regulatory analysis. While many of these challenges were also faced by past administrations, others are new as a result of the substantially increased focus on deregulation. In this roundtable, a group of experts will discuss related issues, such as anticipating the need for retrospective evaluation when designing new regulations, conducting and using the results of retrospective analyses, and improving prospective analyses of regulatory and deregulatory actions. This session builds on a September 2017 discussion hosted by the Society for Benefit-Cost Analysis, the George Washington University Regulatory Studies Center, and the Administrative Conference of the United States, which can be viewed here: https://benefitcostanalysis.org/symposium-new-developments-regulatory-benefit-cost-analysis. In a related panel, “Experience Conducting BCA to Comply with New Regulatory Directives,” Federal regulatory agency staff will be providing their perspectives on these issues.

Panelists:
Joe Aldy, Harvard Kennedy School
Jennifer Baxter, Industrial Economics, Incorporated
Reeve Bull, Administrative Conference of the United States
Cary Coglianese, University of Pennsylvania School of Law
Jonathan Wiener, Duke University

➢ C-3: Recreation, Resources, and Local Economies

Chair: Trudy Ann Cameron, University of Oregon

The first paper in this session will report upon recent analysis of the accumulating data for 2014, 2015 and 2016, from the National Visitor Use Monitoring Program of the U.S. Forest Service. This program is designed to assess visitation, activity participation, demographics, visit duration, measures of satisfaction, and expenditures related to visits to National Forests and Grasslands. This research offers a window on how these public lands contribute to jobs and incomes in the surrounding area. This session also contributes research that has bearing on the national debate about the proper scope of National Monuments, in light of the distributional consequences that stem from their restrictions on resource exploitation and the tradeoffs between jobs in extractive industries and jobs in tourism. The specific application examines the

regional impact of Utah's Grand Staircase-Escalante National Monument as a first example. We will also hear about a strategy to measure willingness to pay, in North Carolina, to protect forest resources from a deadly invasive species, focusing on the Great Smoky Mountain National Park, Pisgah National Forest, and Nantahala National Forest. This study utilizes a survey of households and also explores a number of methodological issues relating to the design and analysis of stated preference surveys.

Presentations:

Issues Affecting Recreational Values of national Forests; *Don English, U.S. Forest Service*

Neither Boon nor Bane: The Economic effects of a Landscape-Scale National Monument; *Paul Jakus, Utah State University*

Valuing Hemlock Woody Adelgid Control in Public Forests: Scope Effects in Stated Preference Data with Attribute Non-Attendance; *Chris Giguere, Appalachian State University*

➢ D-3: Time Keeping in BCA

Chair: Joe Devlin, Environment and Climate Change

Discussant: Charles Griffiths, U.S. Environmental Protection Agency

Presentations:

Institutional Economics and the Cost of Capital; *Rick Geddes*, Cornell University; Joshua Goldman*

Debate regarding the public- versus private-sector's cost of capital is ongoing since at least the mid-1960s. Arrow and Lind's seminal contribution concluded that the social cost of public-sector capital is lower because project risk is more efficiently spread across numerous taxpayers than across relatively concentrated private investors. That issue has gained renewed vigor due to increasing use of public-private partnerships (PPPs) to finance investment in large infrastructure projects. The debate has been largely devoid of institutional considerations, however. Legal structures such as limited liability and transferability of ownership shares have evolved over time to help manage the cost of private-sector risk bearing, but are either weak or unavailable to taxpayers in their role as a public project's residual risk bearers. Differences in institutional and legal arrangements surrounding taxpayer- versus private-investor risk bearing, and their likely impact on the cost of capital have yet to be systematically considered. We analyze the roles of limited liability and transferability of ownership shares, and their effects on the relative social cost of capital. Our analysis of the arrangements surrounding public -versus private-sector risk bearing suggests that a reassessment of Arrow and Lind's conclusions is warranted.

A Framework for Describing and Evaluating Timeframes for Benefit-Cost Analysis; *Joe Devlin, Environment and Climate Change*

Guidance on benefit-cost analysis typically offers some advice on choosing an appropriate analytical timeframe, but it may not always be clear what this means. In practice, analytical timeframes may not be long enough to completely capture all incremental impacts of a given regulatory proposal, particularly when the timing of these impacts exceeds the duration of our forecasts. Does this matter? This presentation will present a framework for describing analytical timeframes in terms of regulatory actions and consequences. Using this framework we can evaluate the completeness of any given benefit-cost analysis, consider the degree of sufficiency of incomplete timeframes, and better understand the comparability of analyses. Perhaps most importantly, this framework can help to clarify how the choice of timeframe affects the results of the analysis, which should be of interest to decision-makers. Examples of benefit-cost analysis timeframes and applications of the framework will be presented based on published Regulatory Impact Analysis Statements completed by Environment and Climate Change Canada.

Why Discount Nature Differently?; *Arjan Ruijs*, PBL Netherlands Environmental Assessment Agency; Mark Koetse; Gusta Renes; Aart de Zeeuw*

In the literature, there is no consensus on how to discount the long term effects of e.g. climate change or declining levels of biodiversity or ecosystem services. We investigate the decision of the Dutch government to apply in their cost-benefit analyses a 1% lower discount rate for effects on ecosystem services than for other effects, except for ecosystem services that are easily substitutable. In this paper, we investigate which ecosystem services should be discounted similar to normal consumption goods, for which ecosystem services a lower discount rate is justifiable, and which reduction is appropriate. For this, following BaumgÃ¤rtner et al. (2015; Env.&Res.Econ.), we derive the Ramsey-rule for a utility function with both consumption of regular goods and of ecosystem goods and services as arguments. According to this rule, the discount rate depends on the difference of the growth rates of both types of goods and the substitutability between regular goods and ecosystem services in the utility function. We investigate on what grounds the different elements of nature should be discounted differently; is it because nature becomes relatively more scarce or because it is difficult to substitute it for other goods. On the basis of empirical evidence for the Netherlands on trends in the production of ecosystem services and an international review of substitution elasticities, we estimate an appropriate discount rate for nature. Finally, we provide practical and easily applicable policy advice on the discount rates for nature that can be used by cost-benefit practitioners.

➢ E-3: Issues in the BCA of Electricital Power Reforms

Chair: R. Jeffrey Lewis, ExxonMobil Biomedical Sciences, Inc.

Discussant: Tim Brennan, University of Maryland, Baltimore County

Presentations:

Parametric and Non-Parametric Models to Estimate Households and Businesses' Willingness to Pay for Reliable Electricity; *Glenn P. Jenkins, Queens University*

Access to reliable electricity for increasing the living standards of households and quality service of businesses is crucial in developing countries. However, Nepal suffers from the worst electricity shortages in South Asia, and only half of the demand for electricity can be met by the nation's grid. This results in load shedding of up to 18 hours a day during the dry winter months, when hydropower generation is low. This research examines the applicability of parametric and nonparametric models to estimate households and businesses' willingness to pay (WTP) for improved reliable electricity services in Nepal by using the cheap talk contingent valuation (CV) data from 1800 households and 590 businesses. The parametric models used is logit model, while the Turnbull estimator and the KristrÃ¶m mean estimation approach were used for the nonparametric estimation. It is interesting to note that the both households and businesses are willing to pay more to get from a 50% reduction in outages to a complete elimination of outages than they are willing to pay to get from their current situation to a 50% reduction in the incidence of electricity outages. The marginal willingness to pay does not decrease as the quality of the service improves. This differential in the estimates of the WTP for these two options is even more pronounced in the case of businesses than for households. This is to be expected because the disruption and coping costs for businesses will not be alleviated to a significant degree by a partial improvement in the electricity service they receive. The major benefit received by businesses is when they have a continuously reliable supply of electricity that they can count on in planning their business activities. These findings have important implications for an investment strategy improving the reliability of electricity service in Nepal. On the benefit side of the cost-benefit analysis, the marginal benefits are likely to be increasing over the range of improvements until full reliability is achieved.

Application of Benefit-Cost Methods for the Evaluation of the Solar PV Net Energy Metering Values in Different Jurisdictions; *Scott Bloomberg*, NERA Economic Consulting; Derya Eryilmaz, NERA Economic Consulting*

The declining cost of residential solar PV (along with financial incentives) has led to significant increases in residential solar PV installations in states across the U.S. Although residential solar PV can provide environment and economic benefits to solar net energy metering (NEM) customers, the significant increases in residential solar PV have led states to re-evaluate how these customer-generators are compensated. While solar PV NEM customers generate some of their own electricity, they still are connected to the grid, and therefore, still putting demands on the power distribution system. In addition, current NEM policy in most states allows residential solar PV NEM customers to be paid the full retail rate for their generation, raising justified concern that such rates over compensate NEM customers, thus shifting costs on to non-NEM customers. This â€œcross-subsidyâ€• effect can be important in many regulatory settings, but this equity issue extends beyond the focus of the benefit-cost analysis. The key question facing regulators and stakeholders is, â€œWhat is the proper electricity rate that solar PV NEM customers should receive for their generation? And, how can regulators/utilities determine that

matches the value that residential solar PV provides?â€• In this presentation, we will evaluate the various the benefit-cost approaches that are now being used to determine the appropriate value of solar PV NEM customer. Many analyses to date have been focused in areas with either a favorable location for solar PV (e.g., Arizona) and/or heightened social interest in cleaner electricity (e.g., California). In fact, the net economic value of solar is mostly driven by the regional differences and our research demonstrates that simple off-the-shelf approaches may not accurately quantify the benefits and costs of solar PV NEM. This research compares and contrasts the benefit-cost analysis for two different types of jurisdictions as a case study to demonstrate the differences in net benefits of solar: 1) high cost electricity/high solar PV penetration, and 2) low cost electricity/low solar PV penetration. The presentation will also highlight the importance of accounting for the synergies between solar and rapidly-developing technologies, such as electricity storage and advanced inverter technologies (and standards) in order to accurately calculate the benefits and costs of solar in different jurisdictions. As these technologies become more prevalent, the economics of renewable integration and the methods to calculate the net benefits are constantly evolving. This study has an objective to address this issue. The analysis will highlight how the benefit-cost analysis will provide potentially very different values depending on the characteristics of region being analyzed. The analysis will also demonstrate that the analyst must keep an open mind since some variables that may be benefits in one region could turn out to be costs in another.

Cost Benefit Analysis of Power Sector Reform in Haiti; *Bahman Kashi, Queens University; Juan Belt*, Center for Strategic and International Studies (CSIS); Nicolas Allien; Jay Mackinnon*

This paper argues that to improve the power sector in Haiti, which now constitutes a critical constraint to economic growth, it would be necessary to carry out a significant regulatory and utility governance reform; without these reforms, any physical investment program would be ineffective and unsustainable. Haiti has the most underdeveloped and inefficient power sector in the Americas. Numerous past attempts to reform it have failed due to lack of political will. In this paper, we consider a multi-phase program of reform and assess its feasibility. In the first phase, the Government of Haiti (GOH) carries the corporatization of units of ElectricitÃ© d'HaÃ¯ti (EDH); establishes cost-reflective tariffs; and introduces management contracts, leases, and concessions, and privatizes EDH units as appropriate. If the first phase succeeds we propose proceeding to later phases that would support EDH. Costs have been estimated based on a similar program implemented in Afghanistan by the United States Agency for International Development (USAID). Our estimation of economic benefits is based on a projected reduction in technical losses, valued at the retail price of electricity for average consumers; net gains in consumer surplus resulting from servicing high value customers are excluded from the model due to lack of reliable data to support a quantitative estimate. Furthermore, the analysis is conducted based on a 50% chance of success for the reform. At these conservative measures of costs and benefits, the project is found to be economically and financially viable (Economic IRR: 15%, Economic NPV: 11 Million 2017 USD, Financial IRR: 28%, Financial NPV: 78 Million 2017 USD).

➢ F-3: BCA of Safety: Cops, Guns, and Maritime Accidents

Chair: Glenn Blomquist, University of Kentucky

Discussant: Mark Dickie, University of Central Florida

Presentations:

Good Cop, Bad Cop: An Analysis of Chicago Civilian Allegations of Police Misconduct;
Kyle Rozema, University of Chicago Law School; Max Schanzenbach*

Police officers are tasked with a very complicated undertaking: they must make arrests and prevent crimes without violating the rights of civilians, under subjective standards such as â€œreasonable forceâ€□ and â€œprobable cause.â€□ Many of their decisions are imbued with a great deal of discretion, which gives rise to opportunities for abuse of power. Those who supervise police officers also confront a complicated undertaking: they must prevent police officer misconduct, while still giving police officers the incentives and flexibility to fight crime. Detection of police officer misconduct by supervisors is difficult because it is costly to monitor police interactions with civilians. To facilitate detection of police misconduct, most large police departments have an administrative process through which civilians can bring allegations of police misconduct. There is little empirical evidence on the viability of civilian allegations to predict police misconduct. Police officer organizations and some criminal justice scholars have questioned the use of civilian allegations, arguing that the rate at which officers receive civilian allegations largely reflects officer productivity (Worden et al., 2012; Lersch, 2002). This article assesses the potential for civilian allegations to predict police officer misconduct using recently released data on over 50,000 civilian allegations of police officer misconduct in Chicago. We use empirical Bayes estimation to construct a â€œshrunkenâ€• measure of officer-level civilian allegations that (1) controls for officer assignment and officer characteristics, and (2) accounts for the reliability of the allegations by shrinking noisier estimates toward zero. This approach has been utilized in other settings, including the teacher value-added literature (e.g., Kane and Staiger, 2008; Chetty et al., 2014, 2015; Bacher-Hicks, et al., 2014). We then test the power of shrunken civilian allegations to predict serious misconduct as measured by civil rights litigation. Because of attorney incentives stemming from contingency fee arrangements and the legal obstacles to civil rights litigation, civil rights litigation filters for the most serious incidents of officer misconduct. We find a strong non-linear relationship between shrunken allegations and future civil rights litigation. For the officers in the bottom 80 percent of shrunken allegations, shrunken allegations are unrelated to litigation. The relationship between shrunken allegations and litigation spikes for worst 5% of officers and, when we consider damages, spikes further for the worst 1% of officers. This non-linear relationship suggests that intervention efforts could be fruitfully concentrated among a relatively small group of officers. Moreover, it suggests that officers with a moderate number of risk-adjusted allegations are at no greater risk of committing serious misconduct than officers who receive no allegations. In a final analysis, we present evidence on the policy debate regarding the requirement that civilians swear an affidavit as part of the investigation process. An affidavit is a sworn statement and those swearing are warned of

the consequences of perjury. Roughly 55% of allegations are dismissed for failure to swear an affidavit. We find that allegations lacking an affidavit have the same predictive power as affidavit-based allegations. These findings raise concerns about the value of affidavit requirements.

Benefits and Costs of Confiscating Firearms from Prohibited Persons in California; *Chris Mai, Vera Institute*

Gun violence continues to be a problem that vexes policymakers at all levels of government. One policy idea that has been tested by both the federal and state governments as a strategy to reduce gun violence is to ensure that certain people, such as those with felony convictions and those with domestic violence misdemeanor convictions, are unable to purchase guns. Federal law ensures that a set of â€œprohibitedâ€• persons are unable to purchase a firearm through a licensed dealer, and several states expand on these laws. But California is the only state that has created an enforcement regimeâ€”the Armed and Prohibited Persons System (APPS)â€”to remove firearms from people who purchased them legally but became prohibited from firearm ownership at a later date. Enforcing APPS involves both investigation of state databases to confirm that an individual is both â€œarmedâ€ and â€œprohibitedâ€ and visits to APPS homes to retrieve unlawful firearms. This research will investigate the full range of costs and benefits resulting from APPS. The most obvious potential benefit is a reduction in gun violence by removing firearms from people who are legally prohibited from ownership and who may be at higher risk to commit violence against themselves or others. The evaluation will track the extent to which the intervention reduces gun violence, including gun suicides, in the neighborhoods in which it is implemented, compared to a control group of neighborhoods. The costs include the expense to pay for these enforcement efforts, including personnel costs and travel costs to perform the visits. But there is also an array of intangible costs as well. One potential cost of the intervention is that APPS households may experience harm, such as fear, intimation, or stigma from multiple police officers visiting their home and potentially entering to conduct a search. APPS individuals and households also face a cost from losing access to their firearms, although such access is illegal. This session will present data from a range of sources including the budgetary cost of APPS, extant literature on the cost of gun violence, and research on the impact of police visits to create an original breakeven analysis. Costs and benefits will be monetized, though in practice the monetary valuations of some impacts, such as the police visits, will be speculative. This intervention is unique to California and the evaluation is the first of its kind to investigate the potential reduction in violence and costs of this new type of policy.

Using Near Miss Data to Characterize Baseline Risk in Maritime Regulatory Cost-Benefit Analysis; *Kimberly Wilson, U.S. Coast Guard; Ali Gungor, U.S. Coast Guard; Jeffrey Horn, U.S. Coast Guard*

To estimate and quantify the benefits of its regulations the U.S. Coast Guard currently relies upon historic maritime incident data, which provides information on incidents involving injuries, fatalities, property damage, and damage to the environment. However, currently Coast Guard

benefit analyses do not capture the entire span of risks, including a class of small failures (or near miss incidents) in everyday maritime operations that are unremarked, unreported, and ultimately unexamined. Capturing near miss data highlights unsafe work practices, safety rule violations, unsafe work practices, and potential issues with an entity or corporate safety culture. In addition, near misses are often harbingers of low-probability high-consequence disasters. A better understanding of near misses may shed light on how to avert a catastrophic event, and may also allow the Coast Guard to better capture the baseline risk associated with certain activities in our regulatory analyses. Capturing this baseline risk is becoming increasing important in Coast Guard benefit analyses, as many regulations or policies seek to prevent or mitigate damage from worst case events that may or may not have occurred. The proposed presentation will provide an overview of Coast Guard's work developing a methodology to incorporate near misses into our regulatory analyses. The presentation will provide a summary of how near misses are addressed in a regulatory context, how the Coast Guard addressed issues such defining a near miss and lack of data, and a summary of the approaches currently being developed by the Coast Guard.

➢ G-3: Valuing Health for Applications in BCA

Chair: Sue Hamann, National Institute of Health

Discussant: Elizabeth Quinn, U.S. Food and Drug Administration

Presentations:

Valuing Non-Fatal health Risks: Theory and Empirical Evidence; *Daniel Herrera Araujo*, Paris School of Economics; James K. Hammitt; Christoph Rheinberger.*

We propose a novel approach to estimating the monetary value of a change in health risk. We start from a general utility function for health, longevity, and wealth and derive theoretically valid lower and upper bounds on the willingness-to-pay for a quality-adjusted life year (QALY). The upper bound matches exactly the value per QALY derived by Hammitt (2013) under the assumption that preferences for health and longevity are consistent with any health-adjusted life year measure. This value is likely to change with current health, wealth, and longevity. We empirically assess the theoretical upper bound derived from the model drawing on a rich stated-preference data set from France. We find an upper bound on the value per QALY gain of approximately euros 90,000, but the value depends on the individual's endowment of health, wealth, and remaining life expectancy.

Health Insurance Price Externalities; *Daniel Wilmoth, U.S. Small Business Administration*

Analyses of economic efficiency often focus on interactions outside of the market, such as the negative externalities created by pollution. However, interactions between consumers through prices can also affect efficiency. Health insurers often pay prices that are linked to those paid

by other purchasers. For example, Medicaid typically receives a rebate of 23.1 percent of the average manufacturer price for brand name prescription drugs. Linked pricing can affect economic efficiency by changing the prices paid by other purchasers. The insured are insensitive to prices, and healthcare providers with market power can increase the linked prices paid for the insured by changing prices in the remaining market. The effects of those changes on deadweight loss can be estimated using basic economic theory and values like quantity, price, and profit margin. A method of estimating effects on deadweight loss is illustrated using the Medicaid price linkage for brand name prescription drugs.

A BCA of Hearing Aids to Reduce the Symptoms of Dementia; *Robert J. Brent, Fordham University*

Research Question: Dementia is a term used to describe various symptoms of cognitive decline, involving memory, language and thinking that are severe enough to affect daily activities. Global costs of dementia were US$ 818 billion in 2015. Given the prevalence and costs of this disease, it is important that interventions for dementia be identified and evaluated using benefit-cost analysis (BCA) to assess whether they are socially worthwhile. We test to see whether hearing aids reduce dementia symptoms and, if so, estimate whether they are socially worthwhile. The Analysis: In this study we carry out a BCA of hearing aids as a method for reducing the symptoms of dementia. The benefits of hearing aids are obtained by estimating the direct and indirect effects (working through dementia symptoms reductions) of hearing aids on utility and valuing this by the price of a life year attached to the number of life years that an individual has remaining in a particular health state. We provide a novel method for deriving the price of a life year from the value of a statistical life literature. There are two estimation equations: one for estimating the effect of hearing aids on dementia symptoms and a second one for estimating the effect of hearing aids and dementia on utility. We use the Clinical Dementia Rating (CDR) Scale to measure dementia severity and the Geriatric Depression Scale (GDS) to measure utility. The Data and Estimation Our data comes from the National Alzheimer Coordinating Center (NACC) panel of 118,00 patient visits, made up of an average of 3.2 visits over 13 years for over 30,000 participants at 32 US Alzheimer's Disease Centers over the period September 2005 and May 2017. We use a fixed effects model for estimation that controls for time invariant individual variables and test this against a random effects estimator. Main Findings. Hearing aids reduce the symptoms of dementia by about one point (on a scale of 1 to 18). Our methods produce a price of a QALY of $442,000. As hearing aids directly and indirectly increase the utility of a life year by 0.02, the benefits of a hearing aid are $8,840 in 2001 prices. With the cost of a hearing aid being around $3,000, including follow up and maintenance, the conclusion is that hearing aids have a benefit-cost ratio close to 3 and therefore are socially worthwhile and should be covered by Medicare.

Public Safety Under Imperfect Taxation; *Yuting Yang*, Toulouse School of Economics; Nicolas Treich, Toulouse School of Economics*

In this paper, we examine theoretically the effect of tax system imperfections on the optimal level of public safety. We compare three exogenous tax systems, namely first-best, uniform and

income tax. Moreover, we consider several sources of imperfections, namely individuals' heterogeneity in wealth and in risk exposure, and labor supply distortion. We show that the effect of imperfect taxation critically depends on the source of imperfection as well as on the utility and on survival probability functions. Hence, imperfect taxation cannot generically justify more or less public safety. There is thus no fundamental reason to always adjust downwards the value of statistical life (VSL) because of imperfect taxation, nor to assume a marginal cost of public funds systematically greater than one for the benefit-cost analysis of public safety projects.

Session 4: Thursday, March 15, 2018, 3:45pm - 5:15pm

➢ A-4: Teaching BCA

Chair: Scott Farrow, University of Maryland, Baltimore County

This round table begins with a summary of each panel member's short teaching module in the edited volume titled "Teaching Benefit-Cost Analysis". In addition, panel members are encouraged to address higher level issues in teaching BCA such as: what are the core elements we want undergraduates to know or be able to do? What about graduate students? What are the hardest topics to teach? Should we be only pro-BCA or have sections on critiques or where violation of assumptions causes BCA to break-down? Is there a role for international examples and contexts in any given institutional setting? Questions will also be taken from the audience.

Panelists:
Susan Dudley, The George Washington University
David Weimer, University of Wisconsin, Madison
Stuart Shapiro, Rutgers University
Arnold Harberger, UCLA
Chiara Pancotti, Center for Industrial Studies (CSIL)

➢ B-4: Retrospective Costs and Benefits of Food Safety Regulations

Chair: Aliya Sassi, U.S. Food and Drug Administration

Discussant: Elizabeth Ashley, OIRA/OMB

Recent developments in regulatory benefit-cost analysis reaffirm the need for retrospective analyses of existing rules and regulations. This panel provides a sampling of how United States regulatory agencies and scholars conduct retrospective analyses of costs and benefits of food safety and nutrition regulations. The aim is to discuss in detail the existing approaches, challenges faced, and methods used to overcome these challenges. In four presentations we 1) provide a retrospective review of the U.S. Food and Drug Administration's (FDA's) 2003 trans fat regulation and explore the factors that may have influenced producers to choose to

reformulate their food products rather than relabel them as containing unhealthy ingredients; 2) re-examine the benefits of the United States Department of Agriculture's (USDA's) proposed and final rules aimed at reducing the incidence of Listeria monocytogenes in ready-to-eat meat and poultry products; 3) re-examine many aspects of the original regulatory impact analysis of the USDA's final Listeria monocytogenes rule and affirm that the rule has been cost-effective without imposing a disproportionate cost burden on small and very small establishments; and 4) retrospectively review the FDA's Prior Notice regulations for imported foods and discuss the impacts those new food security measures had on the food importation process and society.

Presentations:

Consumer and Producer Responses to the 2003 Trans Fat Labeling Regulation: A Retrospective View; *Amber Jessup, U.S. Department of Health and Human Services (HHS/ASPE)*

Retrospective Benefit-Cost Analysis of the Regulation on "Control of Listeria monocytogenes in Ready-to-Eat Meat and Poultry Products; *Flora Tsui, U.S. Department of Agriculture, Food Safety and Inspection Service*

Retrospective Analysis of the United States Food and Drug Administration's Prior Notice Regulations for Imported Foods; *Aliya Sassi, U.S. Food and Drug Administration*

➢ C-4: Hedonic Price Studies and BCA

Chair: Dennis Guignet, U.S. Environmental Protection Agency

Discussant: Ben Witherell, New Jersey Department of Environmental Protection

Presentations:

A Practical Guide to the Use of Hedonic Studies in Benefit-Cost Analysis; Alastair McFarlane, U.S. Department of Housing and Urban Development; *Michael Hollar, U.S. Department of Housing and Urban Development*

(1) The authors attempt to provide some guidelines concerning adapting hedonic estimates to benefit-cost analysis. (2) We review best practices and warn against common mistakes. (3) The research provides needed assistance in interpreting measures of willingness-to-pay taken from the real estate market. (4) We find that the ease in adapting results from other studies depends to a large extent on information concerning the cost of a regulatory action.

The Impact of Air Pollution and Noise on Property Prices Over Time; *Henrik Andersson*, Toulouse School of Economics; Peter MolnÃ¡r, Department of Public Health and Community Medicine, University of Gothenburg, Sweden; Jan-Erik SwÃ¤rdh, Department of Transport*

Economics, VTI, Sweden; Mikael Ã–gren, Sahlgrenska University Hospital, University of Gothenburg, Sweden

Revealed preference (RP) methods are preferred by many economists to stated preference methods to value non-market goods, since the former involves actual decision compared to the hypothetical decisions with the latter approach. However, one issue when using market data is that many of the variables may be correlated and/or confounded. This means that it may either be difficult, or even impossible, to examine how different non-market attributes influence individual's behavior, and hence they cannot be monetized with RP methods with good precision. In this study we examine the effect on property prices from air pollution and road noise using the hedonic regression technique (HP). There already exist a relatively large literature of HP studies on air pollution and transportation noise. One concern in these studies is that the estimated effect on the property prices from the environmental attribute, e.g. air pollution, also captures the effect from other attributes, e.g. noise (i.e. omitted variable bias). Hence, the concern is that the market data in the case of a high correlation between the air pollution and noise levels is not suitable for eliciting individuals' willingness to pay (WTP) for these attributes. The aim of this study is to examine the potential magnitude of this potential bias by running hedonic regression models on data from Gothenburg, Sweden. We have access to a very rich data set, that not only spans over a relatively large area, but also over a long time-period. The objectives are to estimate the effect on the property price from air pollution, in our case NOx, and road, and to estimate the effect if one of them is left out of the regression. Hence, we will obtain an empirical estimate of the potential size of the omitted variable bias in studies only examining the effect from one of the attributes. Our preliminary findings suggest that whereas the level of road noise has a statistically significant negative effect on the property price, we do not find such an effect from the level of air pollution. Regarding the size of the omitted variable bias our preliminary findings suggest that it is non-negligible, but relative small to other uncertainties in estimating HP models. The findings of the study is both of high research and policy relevance.

Property Values and Water Quality: A Nationwide Meta-Analysis and the Implications for Benefit-Transfer; *Dennis Guignet*, U.S. Environmental Protection Agency; Matthew Heberling; Michael Papenfus; Olivia Griot, Ben Holland*

There is a well-established literature examining how water quality impacts home values, dating back over five decades. Despite this, hedonic property value studies have yet to be used in regulatory analyses of regional and nationwide water quality regulations enacted by the US Environmental Protection Agency. Heterogeneity in local housing markets, the types of waterbodies examined, and the water quality metrics used, are key reasons why the results of these local studies have not been applied to broader policies. Our objective is to synthesize this vast literature, and estimate unit values and value-transfer functions that can be used to assess broader water quality policies. We identify 38 studies in the published and grey literature that examine how home values vary with water quality. Our study is the first meta-analysis to aggregate this literature and systematically calculate comparable within- and cross-study elasticity estimates by accounting for differences in functional forms, assumed price-distance

gradients, and baseline conditions. We convert the primary study coefficient estimates to common elasticity and semi-elasticity measures for both waterfront and near-waterfront homes, and then use Monte Carlo simulations to estimate the corresponding standard errors. Each study can yield numerous meta-observations due to multiple study areas, water quality metrics, and model specifications. Our preliminary meta-dataset contains n=686 unique observations, and for 524 of these observations sufficient information was reported to calculate the corresponding elasticity and semi-elasticity estimates. We find considerable heterogeneity in the meta-dataset in terms of the water quality metrics utilized, the type of waterbody studied, and the region of the US. The majority of estimated elasticities are with respect to water clarity (n=261). Among these studies, preliminary analysis suggests a mean price elasticity with respect to a one-percent increase in secchi depth of 0.12% (median of 0.04%), with a range from -0.65% to 1.72%. Other common metrics that are examined include dissolved oxygen, fecal coliform, E. coli, pH, chlorophyll, nitrogen, phosphorous, and total suspended solids. We find that the majority of estimates correspond to freshwater lakes (291), followed by estuaries (280), rivers (86) and small rivers and streams (29). Finally, we find reasonable spatial coverage, with studies covering 20 different states. The one exception, however, is the western US, where there are only four studies (providing just 75 meta-observations). A key contribution of this study is in highlighting key gaps in the literature regarding the types of waterbodies and regions covered, and the gap between the water quality metrics used by economists versus those currently examined by water quality modelers. We have just completed construction of the meta-dataset, and the next steps are to bin the meta-observations according to common water quality metrics, and estimate meta-analytic Random Effect Size (RES) means, RES meta-regressions, and Random Effects Panel models. We will then statistically test the appropriateness of pooling estimates from different regions and types of waterbodies, and discuss the implications for benefit-transfer.

➢ D-4: Applications of BCA Methods to Social Policies

Chair: Daniel Acland, University of California-Berkeley

Discussant: Lynn Karoly, RAND Corporation

Presentations:

Conducting an Individual-Level Benefit-Cost Analysis of Family Self Sufficiency Programs; *David Long, Princeton Policy Associates*

I completed a benefit-cost analysis of a three-arm random control trial of FSS programs in New York City for MDRC earlier this year. I am giving a paper on the analysis next month at APPAM, where my focus will be on the substantive results of the analysisâ€”that is, the policy implications for HUD and local housing authorities operating FSS programs (the chair of the session is from HUD and the other papers address FSS programs). I propose to prepare a methodology-focused paper for SBCA. In this analysis, pertinent outcomes were monetized for individual sample members (2 treatment groups, 1 low-service control group) before they were

used in impact estimation equations. Thus, costs, benefits, and net present value results in this study (from participant, government, and society perspectives) were all regression-adjusted impact estimates. This allowed significance tests to be conducted, confidence intervals to be calculated, and a subgroup analysis to be conducted.

Does the Revocation of the Deferred Action for Childhood Arrivals (DACA) Survive an Accurate Cost and Benefit; *Carolina Arlota, The University of Oklahoma, College of Law*

In September 05 th, 2017, Attorney General Jeff Sessions announced the rescission of the Deferred Action for Childhood Arrivals program â€“ DACA, hereinafter. DACA was created in 2012, and has been evaluated as an overall success. Its revocation has been criticized by members of both political parties. This article argues that the Administration's revocation does not pass the test of cost and benefit analysis (CBA) based on three accounts. First, from an administrative standpoint, the Executive determination is illegal under the Administrative Procedure Act of 1946. According to this Act, before creating, modifying, or repealing substantive rules, agencies must start a procedure known as â€œnotice and comment.â€• This procedure determines that agencies shall provide at least thirty days notice of its planned action and hear comments by affected/interested parties. The rationale is to assure that the agency's action is not arbitrary nor capricious. To the extent that neither notice or comment occurred, DACA's rescission will potentially increase litigation arising merely of procedural (and totally avoidable) claims. Importantly, until today, the Department of Homeland and Security was not capable of showing the benefits of its rescinding action. Therefore, this research discusses the costs of the current presidential immigration policy in light of this missing evidence and the violation of transparency requirements which have been obeyed previously by all administrations. Second, this article contends that DACA's revocation is inefficient if considered in substantive terms, because the children who were brought to the U.S. (and assuming they fulfilled the requirements of the program) no longer will be authorized to pursue an education â€“ high school and university included. Work and travel authorizations will be non existent once the two-years conditional approval expires. Consequently, instead of participating in the economy, paying taxes and tuition, and contributing to social programs, such individuals will become marginalized of a significant part of the economy today and, arguably, in the upcoming decades. In this scenario, DACA's revocation is likely to provide greater incentives for strategic behavior, such as marriage by convenience with U.S. citizens, for instance. The rescission has already escalated litigation between the federal government and the so-called â€œsanctuary citiesâ€□ and â€œsafe heavenâ€□ states. Third, the analysis of the beneficiaries of DACA, who were brought to the U.S. in such an early age, is addressed under a CBA theoretical approach. Hence, this research contends that CBA shall not be blind-folded to moral considerations. In light of the three accounts above, the analysis presented in this article is unique, and focused on a current controversial topic. This framework contributes to the literature on CBA, because it addresses a contemporary example of a public policy enacted without cost considerations. It also advances a trending topic on CBA, namely, the inclusion of moral dimensions to costs considerations. The article concludes that DACA's revocation does not survive an accurate cost and benefit analysis.

What Works to Increase Student Attendance Around the World? Recent Results from Comparative Cost-Effectiveness Analysis; *Samantha Carter*, J-PAL Global; Radhika Bhula*

The Abdul Latif Jameel Poverty Action Lab (J-PAL) recently released a major review of 58 randomized evaluations that tested programs designed to increase school enrollment and attendance, including a cost-effectiveness analysis comparing sixteen different programs in nine countries. This presentation will highlight the results from this recent publication, focusing specifically on the results of the cost-effectiveness analysis. The most cost-effective programs to improve student enrollment and attendance included in the analysis were those that addressed health problems and reduced the distance to school by creating low-cost schools in areas where few schools existed. On average, reducing the cost of school and providing other incentives were not as cost-effective as other approaches. Around the world, education is correlated with a range of positive outcomes including higher incomes, better health, and more active participation in politics and civil society. Encouragingly, there has been a dramatic rise in the number of children enrolled in school in recent decades, with 91 percent of primary school age children enrolled in school in 2015. Despite these gains, however, pockets of low enrollment remain. As of 2015, 61 million children of primary school age were out of school, along with an additional 202 million adolescents of secondary school age. In addition, millions of children who are enrolled in school do not attend regularly; in India, for instance, 29 percent of enrolled students were absent during unannounced visits to schools in 2016. Evidence from a substantial body of randomized evaluations suggests that the investments that parents and students make in education is sensitive to the costs and perceived benefits of schooling. And, while this literature suggests that certain approaches may be effective at increasing schooling, policymakers seeking to improve student attendance face resource constraints. The Abdul Latif Jameel Poverty Action Lab (J-PAL), a network of more than 140 affiliated professors who conduct randomized evaluations to test and improve the effectiveness of programs and policies aimed at reducing poverty, carries out comparative cost-effectiveness analyses to inform policy decisions. Comparative cost-effectiveness analysis can highlight the types of programs that tend to be most cost-effective, and can therefore serve as a useful starting point in the decision-making process.

➢ E-4: Investing in Infrastructure

Chair: Frits Bos, CPB Netherlands Bureau for Economic Policy Analysis

Discussant: Rick Geddes, Cornell University

Presentations:

A Web-Based Land Use Benefit Cost Optimization Tool; *Ken Acks, The Cost Benefit Gr, LLC, Env Valuation & Cost Benefit News*

Currently, zoning and political power dictate land uses and density. This often results in suboptimal outcomes. Negative effects possibly include high housing costs arising from

reduced supply and burdensome expenses, lower mobility, inequality, delays, inferior resilience to natural disasters, sprawl, pollution, and unjust dispersion of negative externalities. Zoning regulations can play a major role in where and how we live and work, and in the strength of economies. They can determine the size of our homes, what they look like, and where they can be located. Current land use regulations often are too static and difficult to change - many industrial and agricultural parcels are better suited to be improved with more dense residential structures, but can only be developed to their â€œhighest and best useâ€• with great difficulty. Most parcels within a particular zone may be well suited to the restriction placed upon uses in a zone, but some parcels may not be and thus remain vacant or used suboptimally. Zoning maps often force the same restrictions upon a large number of contiguous parcels with differing comparative advantages. Liberals, notably Jason Furman (2015), Orzag and Furman (2015) and Joseph Stiglitz (2015) and conservatives, including the Cato Institute, David Brooks (2017) and Edward Glaeser (2002, 2006 ...) alike have criticized these regulations. This paper will discuss the magnitudes of the welfare costs generated by flaws in current land use regulations, and then present a web-based model designed to begin providing superior alternatives by utilizing the tools of benefit-cost analysis. Advances in BCA and a plethora of new geo-locational data sources facilitated model development. The model compares the benefits and costs of eight alternative uses in four medium density urban/suburban locations. Four 60,000 square foot (SF) sites with 30,000 SF building footprints are analyzed for development with (1) 24 2-story 2,500 SF single family homes, (2) 20 3-story 4,500 SF 2-family homes, (3) a 10-story 250 unit apartment building containing 300,000 SF, (4) a 1-story neighborhood retail shopping center containing 30,000 SF, (5) 10-story 300,000 SF office building (6) a 10-story 300,000 SF mixed-use retail/office/apartment building, (7) a 1-story industrial building containing 30,000 SF and (8) a 50,000 SF park with several recreational options. Benefits are represented by estimated rents, revenues, consumer surpluses and shadow benefits generated. Costs include construction and other development costs and negative externalities. Benefits and costs are affected by neighboring uses and the proposed project. Environmental impacts of land use include habitat loss, reduction in biodiversity, flooding and reduced water quality from proliferation of impervious surfaces, air pollution from increased driving, and congestion. Health effects arising from increased driving attendant to sprawl include respiratory diseases and cancers, traffic fatalities, and obesity which increases disease risks. The algorithm maximizes the total value derived from a parcel, which primarily accrues to the owners and users (renters) (private value), but also is a function of how it influences surrounding parcels (social value). We find existing processes often don't maximize value.

An Application of the Delphi Method to Benefit-Cost Analysis in Côte d'Ivoire; *Timothy Breithbarth, Green Climate Fund; Djan Fanny, CNPC; Mamadou Yoda, CNPC, Government of Côte d'Ivoire; Alban Ahoure*

In the field of international development, economists are often asked to estimate the benefits and costs of projects with limited data due to time, resource or capacity constraints. As a result, economists routinely search for low-cost methods of collecting or approximating data to inform their benefit-cost analysis. This presentation describes the Delphi Method used to obtain a consensus opinion on the economic value of government-owned land from a diverse group of

experts in CÃ´te d'Ivoire. During the development of the Cote d'Ivoire Compact with MCC, the Government of CÃ´te d'Ivoire proposed a bridge crossing the BiÃ©try bay in Abidjan. After an initial analysis deemed the traffic would be too low to justify the cost, an alternative of partially filling the lagoon to create land to support a road and additional lands for economic activities in the port area. The benefit-cost model needed estimates of the market value of this land, as rental rates for similar land was regulated by the Port of Abidjan. Due to a lack of time and available data, economists designed a workshop using the Delphi Method to obtain an estimate of land value from a group of experts. Through a three-hour workshop, experts were able to generate three increasingly precise and informed estimates of the land value per square meter, which could then be fed into the benefit-cost model. This experience showed the importance of timing, careful selection of participants, the brevity of questionnaires and the precise wording of questions to obtain a quality estimate from experts. Given its low cost, this method could be replicated in similar developing country contexts where data is scarce and time or resources are limited.

Cost-Benefit Analysis and EU Cohesion Policy: Economic versus Financial Returns in Investment Project Appraisal; *Massimo Florio, University of Milan; Valentina Morretta, UniversitÃ degli Studi di Milano, Department of Economics, Management and Quantitative Methods; Witold Willak, European Commission, DG Regional and Urban Policy*

This paper investigates the role of Cost-Benefit Analysis (CBA) upon the evaluation of major infrastructure projects, in the context of the European Union Cohesion Policy. After presenting an overview of the changing landscape of the Cohesion Policy and the consequent development of the CBA practice over the last years, we use a dataset of around 1,000 major projects appraised during the period 2007-13, representing almost â‚¬180 billion of investment, and we study the expected difference between their Economic Rate of Return (ERR) and Financial Rate of Return (FRR). Such difference is a distinctive feature of the current CBA approach adopted by the European Commission and mainly depends on the use of shadow prices and the inclusion of externalities on the estimation of ERR, whilst FRR is based on market prices. Hence, we ask two simple questions: to what extent CBA leads to different expected returns compared with the financial analysis on a portfolio of major projects? What are the most important drivers of the difference between financial and economic analysis? We find that, on average, FRR is slightly negative (-2.9%), while ERR is positive (16.2%). The existing positive relation between ERR and FRR suggests that proposed projects are expected to be beneficial for the society and while they are not attractive for private investors, on average, they do not produce too large financial losses. Moreover, the analysis shows that the difference between ERR and FRR is wider in some sectors and we discuss possible interpretations of these findings.

➢ G-4: New Vehicles, Regulations, and Subsidies

Chair: Kerry Krutilla, Indiana University, Bloomington

Discussant: Ann Wolverton, U.S. Environmental Protection Agency

Presentations:

Consumer Satisfaction with New Vehicles Subject to Greenhouse Gas and Fuel Economy Standards; *Hsing-Hsiang Huang*, Oak Ridge Institute for Science and Technology; Gloria Helfand, U.S. Environmental Protection Agency; Kevin Bolon, U.S. Environmental Protection Agency*

A variety of fuel-saving technologies have been implemented in light-duty vehicles since 2012 under the U.S. Environmental Protection Agency's and Department of Transportation's light-duty vehicle greenhouse gas emissions and fuel economy standards. Questions have arisen whether these new technologies create unforeseen problems -- hidden costs -- that have not been included in the net benefit calculations. We examine hidden costs associated with a vehicle's operational characteristics such as acceleration, handling, ride comfort, noise, and vibration; consumers' responses to these attributes are not easy to measure. To overcome the empirical challenge, a few recent studies used data coded from online professional auto reviews to explore potential hidden costs, and found little correlation of hidden costs with the technologies. However, there may be a gap of assessment of operational characteristics between professional auto reviewers and vehicle consumers. This study aims to fill this gap by using vehicle consumer satisfaction survey data gathered from 2014 to 2016 by Strategic Vision. In addition to a rich set of household characteristics, this survey provides consumers' overall experience with the purchased vehicle and assessment on a number of operational characteristics. Preliminary results indicate that, for each survey year, consumers' experiences with new vehicles are good; less than 3% of either passenger car or light-truck consumers gave an overall unsatisfactory review. For most of the operational characteristics, the unsatisfactory rates are also less than 3%; the unsatisfactory rates noise and vibration are higher but below 9%. Moreover, regression results suggest that more fuel-efficient vehicles are associated with lower probability of getting unsatisfactory ratings of operational characteristics, conditional on engine cylinders, brands, segments, and household characteristics. Additional work will explore the relationships between specific fuel-saving technologies and operational characteristics.

Power and Fuel Economy Tradeoffs, and Implications for Benefits and Costs of Vehicle Greenhouse Gas Regulations; *Gloria Helfand*, U.S. Environmental Protection Agency; Andrew Moskalik, Jeff Alson*

As federal requirements for vehicle greenhouse gas (GHG) emissions and fuel economy (FE) have grown more stringent, concerns have been raised about possible opportunity costs of the standards. Some research argues that improvements in FE come at the expense of vehicle performance. If so, then losses in performance may be an opportunity cost of the standards. There are at least two counters to this hypothesis. First, the standards appear to have increased innovation and adoption of new technologies in the auto industry. If regulation caused innovation that can improve power, FE or both, then standards may also be responsible for a performance benefit for consumers that would not have happened in their absence. Second, the opportunity cost argument raises the question of the relationship between fuel economy and

performance. Previous analyses, based on regressions of the relationship between power, fuel economy, and weight for vehicles produced, may not address some key concerns. First, vehicles produced do not provide a random sample of all possible technological relationships; estimates based on a non-random sample may be biased. Next, results are sensitive to measures used for power. Third, measures of innovation are sensitive to specification. Thus, tradeoff measures from these analyses may not accurately reflect underlying technological relationships. This paper provides evidence from an engineering simulation model of the changing relationship between power and fuel economy, and assesses its implications for benefit-cost analysis. We examine the tradeoffs for vehicles representing model years 1980, 2008, and 2016, and a simulated advanced technology. For newer powertrains, for constant fuel consumption, vehicles can have different acceleration rates; fuel consumption appears unaffected by power. These results come from powertrain innovations. If these innovations are attributable to regulations, then there may be ancillary benefits, rather than solely opportunity costs, to be considered in regulatory analysis.

Network Externality and Subsidy Structure in Two-Sided Markets: Evidence from Electric Vehicle Incentives; *Katalin Springel, Resources for the Future*

In an effort to combat global warming and reduce emissions, governments across the world are implementing increasingly diverse incentives to expand the proportion of electric vehicles (EVs) on the roads. Many of these policies provide financial support to lower the high upfront costs consumers face and build up the infrastructure of charging stations. There is little guidance theoretically and empirically on which governmental efforts work best to advance electric vehicle sales. My paper empirically investigates the impact different incentives have on electric vehicle adoption using a two-sided market framework. The electric vehicle market is inherently two-sided, with one side being the electric vehicle drivers, and the other side being battery charging stations and between them are the platforms, the car manufacturers. Particularly, the focus is on whether it is preferable to subsidize consumers by lowering the high upfront costs associated with EV purchases, or charging stations, by lowering their sunk entry costs with a one-time subsidy. To motivate my research question, I began by developing a stylistic two-sided market model to show that subsidies to the different sides of the EV market are non-neutral, in the sense that one dollar spent on subsidy given to the charging side has a different economic impact as the same amount spent on subsidy given to consumers purchasing EVs. This result is driven by a key feature of two-sided markets, namely the positive network externalities between the two sides of the market. This clearly shows that if we really want to learn where to give subsidies to achieve the policy goal of increased EV sales we need to empirically estimate the impact of price subsidies versus station subsidies using a two-sided market framework. In my analysis, I use new large-scale vehicle registry data from Norway to empirically estimate the impact different subsidies have on electric vehicle adoption where network externalities are present. I present descriptive evidence to show that electric vehicle purchases are positively related to both consumer price and charging station subsidies. I estimate a structural model of consumer vehicle choice and charging station entry, which incorporates flexible substitution patterns and allows me to analyze out-of-sample predictions of electric vehicle sales. In particular, the counterfactuals compare the impact of direct purchasing price subsidies to the

impact of charging station subsidies. I find that between 2010 and 2015 every 100 million Norwegian kroner spent on station subsidies alone resulted in 835 additional electric vehicle purchases compared to a counterfactual in which there are no subsidies on either side of the market. The same amount spent on price subsidies led to only an additional 387 electric vehicles being sold compared to a simulated scenario where there are no EV incentives. However, the relation inverts with increased spending, as the impact of station subsidies on electric vehicle purchases tapers off faster.

Session 5: Friday, March 16, 2018, 9:00am - 10:30am

➢ A-5: Experience Conducting BCA to Comply with New Regulatory Directives

Chair: Matt Wiener, Administrative Conference of the United States

This Roundtable will extend the discussion initially hosted by Society for Benefit-Cost Analysis, the George Washington University Regulatory Studies Center and the Administrative Conference of the United States in September 2017 at the George Washington University. The panel senior government economists will share their experiences with analysis relevant to new regulatory directives.

Panelists:

Nan Shellabarger, Federal Aviation Administration
Deborah Aiken, U.S. Department of Transportation
Amber Jessup, U.S. Department of Health and Humas Services (HHS/ASPE)
Clark Nardinelli, U.S. Food and Drug Administration
Linda Abbott, U.S. Department of Agriculture
Doug Scheffler, U.S. Coast Guard

➢ B-5: Utility of SBREFA Panels in Benefit-Cost Regulatory Analysis

Chair: Michael McManus, SBA Office of Advocacy

Formal pre-rule input from small businesses has been a part of the regulatory process for the Environmental Protection Agency (EPA) and Occupational Safety and Health Administration (OSHA) since the enactment of the Small Business Regulatory Enforcement Fairness Act (SBREFA) in 1996, and for the Consumer Financial Protection Bureau (CFPB) since the passage of the Dodd-Frank Wall Street Reform and Consumer Protection Act in 2010. This avenue for early input from small businesses has driven improvements in regulatory analysis and the cost effectiveness of federal rules. This SBCA panel will begin with a brief presentation on the role of benefit-cost analysis in SBREFA panels. It will focus on panels that had significant cost/benefit information, and review the input received from the small entities and its effect on decision-making. A second presentation will address a case-study of a 2015 EPA SBREFA panel that resulted in meaningful input from small businesses. This case study involves the

development of EPA's proposal on Emission Standards for New and Modified Sources in the Oil and Natural Gas Sector (EPA regulation OOOOa). This SBREFA panel included detailed cost and benefit information which greatly influenced the resulting proposal. Subsequently, economists from the agencies required to perform SBREFA panels (EPA, CFPB and OSHA) and economists from SBA Advocacy and OIRA will discuss their experience with these panels, how they affect regulatory analysis, and inform the regulatory development decision-making process. Panel member presenters: Kevin Bromberg, Office of Advocacy and Patrick Delehanty, Office of Advocacy â€“ Overview of SBREFA panel process, and Oil & Gas Panel case study Tentative panel members for moderated discussion: Panelists will likely include economists and senior staff from SBA Advocacy (confirmed), the Office of Information and Regulatory Affairs (invited), the Environmental Protection Agency (invited), the Consumer Financial Protection Bureau (invited), and the Occupational Safety and Health Administration (invited).

Panelists:
Kevin Bromberg, SBA Office of Advocacy
Bob Burt, Occupational Safety and Health Administration
Christine Kymn, OMB Office of Information and Regulatory Affairs

➢ C-5: Ecosystems

Chair: : Bahman Kashi, Queens University

Discussant: Steve Newbold, U.S. Environmental Protection Agency

Presentations:

Valuation and Management of Mudflats in the Yellow River Delta, China; *Duncan Knowler*, Simon Fraser University; Tao Ya Gui, Simon Fraser University CANADA; Xiyong Hou, Yantai Institute for Coastal Zone Research (Chinese Academy of Sciences, Yantai CHINA); Xiubo Yu, Institute for Geographical Science and Natural Resources Research (Chinese Academy of Sciences, Beijing CHINA); Xiaowei Li, Yantai Institute for Coastal Zone Research (Chinese Academy of Sciences, Yantai CHINA)*

Mudflats are found in sheltered intertidal areas in which wave action is relatively low and sediment loads are high. They typically have low species diversity but support large populations of individual species. Mudflats provide feeding and resting areas for important populations of migratory birds and act as a nursery for various fish species. Not only are mudflats and related ecosystems important for biological communities, they also provide important services to humans, such as supporting populations of commercially important species (e.g. clams), providing aesthetic values and opportunities for bird watching, and serve as protective coastal defenses against extreme weather events. China's Huang He (Yellow River) is a case in point: it is the most sediment-filled river on the planet, as evidenced by its large delta (2000 km2) and extensive mudflats. However, water and sediment flows to the delta declined dramatically from

the 1970s onwards, due to reduced rainfall and explosive urban and agricultural demand for water upstream. During the 1990s, the river frequently ran dry well before reaching the delta, damaging wetlands and worsening water pollution. Subsequently, flow regulation in 2002 improved the situation. Our paper assesses how these environmental changes may have affected the presence and values of ecosystem services associated with the Yellow River delta's mudflats and associated ecosystems. We take a spatial and dynamic approach that allows us to capture the areal and temporal dimensions of environmental change in the Yellow River delta in response to flow regulation. We combined these techniques with 'spatially explicit value transfer', wherein spatial land type data at differing points in time are combined with estimates of value per unit area, to produce a valuation grid across the landscape and time. To accomplish this, we used regional spatial data to generate digitized datasets of natural land types (e.g. estuarine waters, coastal lagoons, beaches and mudflats, etc.); these were produced for four points in time from 2000 to 2015. Then we used analysis from four detailed valuation studies to map ecosystem services onto these individual land types. Finally, we relied on two methods to develop benefit transfer estimates of ecosystem service values, including a novel meta-regression procedure that used 44 valuation studies of ecosystem service values for the Yellow and Yangtze River wetlands. Observations of deteriorating conditions in the Yellow River delta due to volatility in the river`s flow prior to 2002 led us to anticipate that conditions would improve over our study period. However, our preliminary results indicate that natural land types in the Yellow River delta fluctuated in area over the 15 year period since flow regulation was instituted in the Yellow River, rather than displaying a sustained trend. Nonetheless, there was a noticeable increase in water cover and reduction in land cover with flow regulation. Preliminary estimates of total ecosystem service value for the mudflats follow a similar pattern over time but generally fall within the vicinity of RMB 1 billion (about USD 200 million) per year.

How to Account for the Impact on Nature in CBAs? Four Case Studies from the Netherlands; *Frits Bos, CPB Netherlands Bureau for Economic Policy Analysis, Arjan Ruijs, PBL Netherlands Environmental Assessment Agency*

This paper discusses how the impact of policy measures on nature can be incorporated in cost-benefit analysis. This is illustrated by four case studies from the Netherlands. A major problem with incorporating the impact on nature is proper valuation. Different valuation principles can be used, like valuation via surveys, revealed preference and costs of compensation and prevention. However, in CBA practice an even greater challenge is how to quantify the size and quality of the impact on nature and to assess to what extent they matter for human welfare. In the Netherlands, biodiversity points are used to measure the impact on biodiversity. Another issue is how to devise policy alternatives that comply with nature protection regulations and are cost-effective. The four case studies are CBA on renovating the IJssellake enclosure dam, CBA on raising the water level in the IJssel lake, CBA on 600 â€œMore room for Riverâ€• projects and the CBA on water quality in the Volkerak-Zoom lake.

Delegation of NPDES Authority to the State of Alaska; *William Wheeler, U.S. Environmental Protection Agency*

All Federal environmental statutes envision the use of federalism, with a balance between a central authority (the U.S. EPA) and states, with states having the option to have more control if they so desire. Although there is a considerable theoretical literature on the economics of environmental federalism, this literature gives ambiguous predictions, and there are very few empirical studies supporting the theoretical literature. Meanwhile, EPA's most recent strategic plan lists â€œcooperative federalismâ€• as one of the Agency's three Strategic Goals; describing a rebalancing of â€œthe power between Washington and the statesâ€• making the lack of empirical evidence regarding the effects of federalism even more salient. In this paper, I consider the delegation of authority to run the National Pollution Discharge Elimination System (NPDES) program under the Clean Water Act (CWA) to the State of Alaska. The NPDES program regulates the discharge of pollution from point sources into the waters of the United States. Alaska is the most recent state to obtain delegated authority, only receiving delegation to run the NPDES program in 2008. Also, unique among NPDES delegations, the delegation was phased, so that permitting authority for groups of sectors of dischargers was transferred in four stages, although EPA retained authority for some facilities. I examine the performance of facilities before and after responsibility for their sector was transferred to Alaska using both event study and difference-in-differences frameworks. Performance of the facility is measures as effluent levels normalized to the permit limit, a common approach in the literature. I restrict the sample to monthly average concentration measurements to best represent long-term facility performance and focus the analysis on specific pollutants. Studying the state of Alaska is useful for several reasons. As the most recent state to receive NPDES delegation, there is better data available than for any other delegated state. Also, the unique phasing of the transfer of Alaskan NPDES facilities enables a more credible research design than if all permits were transferred at once, with the facilities staying under EPA jurisdiction serving as a control group. Across the specifications I consider, I find that the delegation of NPDES authority to Alaska had no statistical discernible effect on facility performance. I consider different samples and estimation techniques, with no change in the results. This indicates that facilities did not change their behavior post-delegation. It should be noted that the delegation process took several years and substantial capacity-building on the part of Alaska, and more abrupt delegations may have different outcomes.

Water Pollution and Health Impacts in China: The Role of Environmental Performance Reviews of Government Officials; *Jinhua Zhao*, Michigan State University; Liguo Lin; Wei Sun*

Water pollution is one of the major environmental challenges facing China. Surface water is the major source of drinking water but over 50% of the nation's major water bodies are deemed not suitable for drinking. Among the major health hazards of water pollution is digestive cancer. Gastro-Intestinal cancer ranks as the number two cause of death after lung cancer in China. In response to water pollution, the Chinese government started to include water quality and water pollution abatement targets in its annual performance review of its provincial governors, over and above the typical GDP based measures. This type of â€œwater quality performance reviewâ€• (WQPR) was first implemented on a trial basis during 2005 - 2007 for the Huai River Basin, where performance reviews started to include water pollution reduction targets at 25

â€œmonitoring stationsâ€• at provincial boundaries. WQPR was expanded to 157 monitor stations in 9 major watersheds during 2008 â€“ 2010, and to 428 monitor stations in 10 major watersheds during 2011-2015. In this paper, we study whether including explicit water quality targets in the otherwise GDP centered performance review of provincial officials has improved water quality and reduced digestive cancer mortality in China. We take advantage of the gradual expansion of WQPR over time and space, and in the number of water quality attributes covered, and employ difference-in-difference methods to estimate the effects of WQPR. We link water quality data from two national networks of monitoring stations with cancer mortality data from the national Disease Surveillance Points (DSPs), and match these data sets with the WQPR regions. Specifically, the water quality data are drawn from 492 locally controlled river monitoring stations during 2004 â€“ 2010, supplemented by data from 132 automatic water quality monitoring stations under the control of the central government during 2004 â€“ 2012. The mortality data are from 126 DSPs that are matched with water quality monitoring stations, covering 31 provinces during 2004 â€“ 2012. These data are matched with annual rainfall data and data on social economic characteristics such as GDP and household access to tap water. We find that WQPR significantly improved water quality, and its impact is higher for the attributes covered by WQPR, along provincial boundaries, and when the provincial officials have more promotion opportunities. Specifically, WQPR on average reduced chemical oxygen demand (COD) by 7% and ammonia by 9% across stations and years. The percentages are increased to 10% and 13% respectively if the provincial governors are younger than 65 years old, i.e., if they can still be promoted in the Chinese bureaucratic system. Further, the percentages are raised to 15% and 10% respectively for stations along provincial boundaries. We also find that WQPR on average reduced digestive cancer death rates by 6% each year, and the impacts accumulate over time, so that by year seven, WQPR reduced the death rates by 17%.

➢ E-5: Disastrous BCA

Chair: Mark Dickie, University of Central Florida

Discussant: Kenneth Acks, Cost-Benefit Group, LLC

Presentations:

Economic Analysis for Disaster Risk Management Strategies in Developing Countries;
David Corderi Novoa, University of Navarra; Tsuneki Hori; Carlos Avelar; Carmen Acosta*

Governments in developing countries need to evaluate the economic tradeoffs of alternative disaster risk management (DRM) strategies in a context of limited availability of funds. Typical options to be considered in a DRM strategy include investing in risk reduction, retaining risk or transferring it through financial instruments. Previous studies have performed benefit-cost analysis (BCA) of each option in isolation, failing to account for tradeoffs and interactions among them. In this paper we develop an integrated assessment approach to evaluate DRM options and prioritize strategies according to economic principles at the country level. Combining

probabilistic risk assessments, engineering and cost-benefit analysis with optimization techniques, we evaluate different options and their interactions over a multi-year planning horizon. Our model incorporates the estimated costs and benefits of measures into a mixed integer linear program to explore the desirability of alternative DRM strategies for a set of future scenarios. The model analyzes the optimal combination of options and ultimately the appropriate allocation of national public funds within a planning horizon. We present the results of the model application in Peru. Investment in disaster risk reduction is desirable to a certain level where damage from most high-frequency and low damage disaster events is reduced at a reasonable cost. Retention and transferring of risk are also part of an optimal DRM strategy and their economic desirability depends, among other factors, on the amount of investment in risk reduction and the structure of risk in the country.

Benefit/Cost Analysis Enhanced Building Codes for States Prone to Windstorms; *Kevin Simmons*, Austin College; Adam Smith National Centers for Environmental Information; Paul Kovacs Institute for Catastrophic Loss Reduction*

After Hurricane Andrew, the state of Florida adopted the nation's strongest statewide building code relying on wind engineering principles. The wisdom of this policy was realized when multiple hurricanes struck the state in 2004/2005 and more recently by Hurricane Irma in 2017. Research using paid insured losses in Florida show reduced losses from wind up to 72% providing a benefit to cost ratio up to $6 dollars in reduced loss for each $1 in additional construction cost. (Simmons et al, forthcoming) The hurricanes of 2017 and recent tornado outbreaks remind policymakers that the threat from windstorms is not limited to Florida. But no other state has followed Florida's lead in adopting codes that provide resilient housing in states vulnerable to wind storms. The purpose of this presentation is to use the tools of Benefit/Cost analysis to identify states which might benefit from a statewide building code similar to Florida. We use insurance loss data to estimate the Average Annual Loss from windstorms for each state vulnerable to either hurricanes or tornadoes. Then using the incremental construction cost of the Florida Building Code (FBC) and an estimate of reduced losses from a forthcoming study of the FBC (Simmons et al, forthcoming) we provide benefit/cost estimates for each state, which are then ranked by states from highest to lowest benefit to cost ratio. Results show that of the 20 states considered, 15 have positive benefit/cost ratios. The top 5 include tornado prone states Oklahoma and Missouri plus Alabama, Louisiana and Mississippi which experience both hurricanes and tornadoes. In a political climate that views increased regulation with suspicion, benefit/cost analysis is an essential tool to identify whether a policy that increases cost is justified. Our results identify the states where resilient construction practices bring the greatest benefit. With this tool, advocates of enhanced building codes are able to make a strong case for adoption beyond Florida. References Simmons, Kevin M., Czajkowski, Jeffrey, Done, James (2017) â€œEconomic Effectiveness of Implementing a Statewide Building Code: The Case of Floridaâ€• , Land Economics, forthcoming. Note: Hurricanes Harvey, Irma and Maria have brought media attention to the results of this forthcoming paper. The authors have forthcoming summaries of the work in Regulatory Review, a publication of the University of Pennsylvania Law School and Risk Management Review, a publication of the Wharton Risk Center. Additionally, the results were featured in Journalist's Resource, a publication of the Harvard

Kennedy School found here: https://journalistsresource.org/studies/society/housing/building-codes-pay-disaster-prone-regions and a recent Wall Street Journal article found here: https://www.wsj.com/articles/one-early-lesson-from-irma-hurricane-building-codes-work-1505559600.

Benefit-Cost Analysis of Acquisition of Properties Subject to a Non-Recurring Hazard (Landslides); *Kaveh Zomorodi, Dewberry*

Traditional Benefit-Cost Analysis (BCA) of mitigation projects employs a fixed range of hazard frequency-damages. The expected average annual damage is assumed to remain constant in the future for the duration of the mitigation project useful life. However, for hazards such as landslides, the expected level of damage is usually limited to two possibilities; zero damage or total loss. If landslide hits a property, it will probably cause a total loss and an abrupt termination of the expected annual losses and elimination of the hazard mechanism. Thus, the traditional BCA based on recurring damages is not directly applicable to non-recurring damages that amount to a â€œone-time-lossâ€• . This paper presents a new approach to BCA for acquisition of properties subject to non-recurring total loss damage. The problem is categorized as a success-failure scenario formulated such that the total expected number of failures during the project life does not exceed one and the total damage over the analysis period does not exceed the total loss. The solution method involves an equivalent annual probability of landslide which is estimated for two cases. Case one applies when the probability of a catastrophic landslide event within the next few years is given from geotechnical studies or other sources. Case two applies when progressive erosion due to one or more flooding events of given frequency could trigger the total loss of a property. The benefit-cost ratio of property acquisition for each case is obtained in a separate spreadsheet that implements the proposed solution. In this paper, the theoretical approach and assumptions are laid out and the proposed solution is explained through example problems. Additionally, for Case one simplified solutions in tabular, graphical and equation formats are included. The simplified solutions can aid in checking the cost-effectiveness of a mitigation project without resorting to the complete solution spreadsheet.

➢ F-5: Job and Vehicle Safety

Chair: Kip Viscusi, Vanderbilt University

Presentations:

Evaluating the Risk in Military Combat Employment; *Thomas Kniesner*, Claremont Graduate University; Laura Armey; John Leeth; Ryan Sullivan*

Our research examines the effect of combat deployments in Iraq and Afghanistan on fatalities. We use restricted data from the Defense Manpower Data Center (DMDC) and Social Security Administration (SSA) to construct a panel of all U.S. Active Duty Service members having served at some point during the years 2001-2012. In terms of breaking down casualty rates by personnel types, our results show that casualties disproportionately happen at higher rates

among (1) young white males, (2) enlisted personnel, (3) less educated personnel, and (4) those in combat job types. Our preferred estimates indicate that overall U.S. military personnel who deploy in a year to Iraq or Afghanistan incur a 0.048 percent increase in the probability of death in comparison to non-deployed military personnel who remain stateside. Preliminary estimates suggest a compensating wage differential equal to $500 to $800 per month would be economically appropriate in comparison to the current status quo of $225 per month in danger pay and additional tax benefits provided to U.S. military personnel deployed into combat zones. Furthermore, the compensating differential value may need to be adjusted by service branch or job type.

Assessing the Risk of Maritime Accidents; *Paul Large, U.S. Coast Guard; Fatima Zouhair, FedWriters*

As part of the rulemaking process, Federal Agencies need to identify, quantify, and where possible monetize the benefits of proposed regulations. This need becomes especially salient when the proposed regulation is intended to prevent or mitigate the impacts of accidents in an industry where this distribution is heavily skewed right. The maritime industry encounters risks of low probability and high consequence which are often difficult to model. The U.S. Coast Guard (USCG) is responsible for promulgating regulations that prevent or mitigate maritime accidents. Because the possible impacts from a these events can be significant, these accidents may be of particular interest to policymakers. The goal of the analysis is to predict the risks of worst-case accidents, identify return levels and return periods using extreme value theory along with its competitive models. Knowledge of the risk assessment is essential for policymakers to help design regulations that manage risk by mitigating Black Swan events and promote safety. This analysis is based on USCG commercial vessel accident data from 2007-2016 and models the risk curve for resulting fatalities and injuries. The USCG accident data contains information related to marine investigations reportable under 46 C.F.R. 4.03. The data reflect information collected by USCG personnel concerning vessel accidents throughout the United States and its territories.

Benefits of OSHA's On-Site Consultation Program: An Economic Analysis; *Jessica Stone, U.S. Department of Labor, Occupational Safety and Health Administration; Charles McCormick, U.S. Department of Labor, Occupational Safety and health Administration*

OSHA's On-Site Consultation (OSC) program has been around since the early days of OSHA but, apart from individual success stories, there has been no effort to quantified the benefits of the program. The OSC program provides free, confidential occupational safety and health advice to small and medium-sized businesses. Consultations are requested by employers and the consultant conducts a wall-to-wall inspection to identify hazards and assesses the strength of the employer's safety and health program. Based on the function of the consultation program, and using available literature, we estimated the reduction in workplace injuries that result from the OSC program and quantified the benefits to workers, the workers' compensation system, and employers. We examined three possible approaches to estimating the reduction in injuries including assuming that an OSC visit is similar to a one-year safety and health program,

that it is an exercise in hazard identification and abatement, and that it is similar to an OSHA enforcement inspection. Safety and health programs are a systematic method that employers can adopt to help them proactively find and fix workplace hazards. These programs align well with the OSC program and there has been some research conducted on the effects of workplace safety and health programs. Based on the existing data, we estimated that an OSC visit would lead to a 25% reduction in the injury rate in the following year. Based on the expected injury rate and the number of workers employed at firms that received consultation services, we estimated that the OSC program would prevent about 9,500. Using the value of a statistical injury, the cost of a workers' compensation injury, and indirect costs to employers of 110% of the workers' comp cost, using this method we estimated that the OSC program produces societal benefits of about $1.2 billion annually with $634 million in benefits to workers, $289 million in benefits to the workers' comp system, and $318 million in benefits to employers. We felt the this approach was the most defensible but examined other approaches for comparison. Approaching OSC visits like an exercise in finding and fixing hazards and using data on the ratio of hazards abated to injuries prevented from the Maine 200 program, we estimated that the OSC program yielded societal benefits of about $1.4 billion annually. The link between the number of hazards abated and the number of injuries prevented is not well established, among other issues, making this result less defensible. We also examined the question assuming that an OSC visit is like an OSHA enforcement inspection which studies have shown lead to about a 10% reduction in injuries in the following year. Using this method we estimated that the OSC program has benefits of about $500 million annually. However, OSC visits and OSHA inspections are not particularly comparable making this approach questionable. While our best estimate of the benefits of the OSC program is $1.2 billion annually, all approached yielded significantly positive benefits and demonstrate the value of the OSC program.

Do Behavioral Responses Offset the Impacts of Safety Policies? Estimates Exploiting Changes in Perceived Vehicle Safety; *Damien Sheehan-Connor, Wesleyan University*

An important consideration when evaluating policies to improve automotive safety is the behavioral response of drivers to the new policy environment. The underlying theory suggesting that consumer responses will â€œoffsetâ€• some or all of the potential benefits of automotive safety regulation was developed by Peltzman in the 1970s. This offset hypothesis has been difficult to test empirically due to selection issues. If safer cars are driven in a less safe manner, this could be due to a behavioral offset, but it could also be due to an adverse selection of risky drivers choosing to buy safer vehicles. An ideal test of the offset hypothesis would investigate whether the same drivers change their driving habits as a function of the safety of the vehicle they are driving, but the required data are not readily available. This research contributes to the empirical literature by testing whether drivers change their driving behavior in response to a perceived change in vehicle safety. Two sources of potential changes in perceived safety are exploited. First, the Insurance Institute for Highway Safety (IIHS) performs crash tests on vehicles and publicizes its ratings. The ratings are sometimes retrospectively applied to earlier model years of the same vehicle that are structurally comparable to the tested vehicle. The ratings were thus unavailable at the time of vehicle purchase, but become available after

purchase and may change the vehicle owners' perception of the safety of the vehicle. The second source of changes in perceived safety exploits the negative publicity accompanying safety-related automobile recalls and widely publicized safety problems attributed to particular makes and models. This negative publicity could cause existing vehicle owners to perceive their cars as less safe. Preliminary results suggest no change in accident propensity or severity in response to changes in perceived vehicle safety, contradicting Peltzman's offset hypothesis.

➢ G-5: Retrospective Analysis of Environmental Regulation: Cost and Productivity Effects

Chair: Ann Wolverton, U.S. Environmental Protection Agency

Discussants: Sofie Miller, The George Washington University; Art Fraas, Resources for the Future

Retrospective analysis is a valuable but sometimes underutilized tool for understanding the effects of regulation. The three papers in this panel examine the effects of environmental regulation retrospectively in order to evaluate the extent to which what actually occurred matches ex ante expectations of methods and costs of compliance and/or to uncover potentially unintended consequences.

Presentations:

Retrospective Evaluation of the Cost Associated with the 2004 Automobile and Light-Duty Truck Surfaces Coating NESHAP; *Ann Wolverton, U.S. Environmental Protection Agency*

Retrospective Evaluation of the Costs Associated with the 2004 Automobile and Light-Duty Truck Surface Coating NESHAP Ann Wolverton (presenter), Ann E. Ferris and Nathalie Simon (co-authors) The extent to which ex-ante estimates of the costs of regulation differ from ex-post estimates is an empirical question of considerable interest to policymakers, regulated entities, and the public. This paper examines evidence on the actual costs of compliance with the 2004 Automobile and Light-Duty Truck Surface Coating NESHAP and then compares these estimates to the EPAâ€™s ex-ante cost estimates to identify key drivers of any differences. This regulation is particularly interesting from a cost perspective because at the time of promulgation the EPA considered it to be economically significant (and it was therefore accompanied by an extensive cost analysis), under stood who was likely to be regulated under the NESHAP, and had identified several available technologies that could be used to reduce HAP emissions. Data on ex-post costs are gathered from a subset of the industry via survey and follow-up interview. We find that the EPA overestimated the cost of compliance for these plants and that overestimation was driven primarily by use of estimation methods that did not account for regulatory flexibilities such as the ability to utilize any effective HAPs control method. Thus, we find that differences between ex ante and ex post cost estimates for our sample of facilities are primarily driven by differences in the method of compliance rather than differences in the per-unit cost associated with a given compliance approach. In particular, the EPA expected

facilities to install pollution abatement control technologies in their paint shops to reduce emissions of hazardous air pollutants, but instead these plants complied by reformulating their coatings.

Ex Ante Costs vs. Ex Post Costs of the Large Municipal Waste Combustor Role; *Carl Pasurka, U.S. Environmental Agency*

Ex Ante Costs vs. Ex Post Costs of the Large Municipal Waste Combustor Rule Carl Pasurka (presenter), Cynthia Morgan (co-author) This paper compares EPAâ€™s ex ante cost estimates of the 1995 municipal waste combustor (MWC) rule to ex post cost estimates. Several changes between when the economic analysis was written (in 1994) and the compliance deadline (in 2000) complicate a comparison of aggregate ex ante and ex post costs. In particular, the aggregate cost estimates in the ex-ante analysis assumed a substantially larger number of MWC plants would be subject to the rule than existed in 2000. As a result, we decided to compare ex ante and ex post costs of individual MWC plants operating in 2000. Because the EPA relied on a set of model plants in its ex ante analysis, we first assigned a plant to a specific model plant to generate plant-specific ex ante cost data. Our plant level ex post cost estimates come from the U.S. Department of Energy EIA-767 annual survey of pollution abatement expenditures by steam-electric power plants and an occasional survey of municipal waste combustors compiled by Government Advisory Associates. Our preliminary results show 35 of the 60 existing MWCs incurred no additional costs related to the rule for reducing SO2 and PM emissions. For the 10 MWCs that installed both flue gas de-sulfurization (FGD) and FGP systems and reported the costs of these systems, the ex ante capital costs are higher than the ex post costs for 6 plants and lower for 4 plants. For the 32 plants that installed systems for mercury (Hg) and/or nitrous oxide (NOx) abatement and also reported the costs, we find that the ex post costs of NOx control systems are typically lower than the ex ante cost estimates, while the ex post costs of Hg control systems tend to be higher than the ex ante cost estimates.

Does Environmental Regulation Affect Productivity? Evidence from China's Textile Printing and Dyeing Industry; *Ron Shadbegian, U.S. Environmental Protection Agency*

Does environmental regulation affect productivity? Evidence from Chinaâ€™s textile printing and dyeing industry Ron Shadbegian (presenter), Mengdi Liu and Bing Zhang (co-authors) Conventional wisdom is that environmental regulations raise production costs of firms, which weakens competitiveness in international markets. On the other hand, Porter argues that more stringent regulations improve productivity by causing firms to become more efficient and enhance â€˜greenâ€™ innovation (PH). Despite some anecdotal evidence supporting the PH, empirical studies largely focused on the United States and western Europe find that more stringent regulation reduces productivity. Unlike developed countries, China, the worldâ€™s second largest economy is just starting to address numerous severe environmental concerns while trying to sustain its rapid economic development. In this paper, we estimate the causal effect of a new, more stringent, wastewater discharge standard, directed at textile, printing, and dyeing firms (TPD) in China on total factor productivity (TFP). Given the potential endogeneity of

environmental regulations, we use a difference-in-differences estimator with firm fixed effects. We find evidence that firms in the treatment group installed just over 18% more wastewater facilities than firms in the control group during the policy period. Furthermore, we find that the more stringent requirements in Lake Tai region significantly reduced TFP in TPD firms by approximately 5% relative to the control group, which is contrary to the strong version of the PH that environmental policy may lead to higher overall productivity of firms. More specifically, our results indicate that the more stringent wastewater discharge standard has negative effects on productivity in domestically-owned private firms, but little or no impact on public or foreign-owned firms.

Session 6: Friday, March 16, 2018, 10:45 – 12:15pm

- A-6: PLENARY Regulatory Impact Analysis: The Experience of OIRA Administrators

Moderator: Don Kenkel, Cornell University

Administrators:
Sally Katzen (1993-1997)
John Graham (2001-2006)
Susan Dudley (2007-2009)
Howard Shelanski (2013-2017)

Session 7: Friday, March 16, 2018, 2:00 – 3:30pm

- A-7: Mortality Risk Reductions: New Developments

Chair: Kelly Maguire, U.S. Environmental Protection Agency

Mortality risk reductions comprise a large portion of the benefits associated with environmental policy. As such, estimating the monetary value associated with these risk reductions is important and can have a large influence on the outcome of a formal benefit-cost analysis. This panel includes four paper on new developments in this line of research.

Presentations:

Disambiguating the "Value of Statistical Life"; *Nathalie Simon, U.S. Environmental Protection Agency*

Estimating Changes in the Fatality Risk Premium; *Chris Dockins, U.S. Environmental Protection Agency*

Expanding the Domain of the Value of a Statistical Life; *W. Kip Viscusi, Vanderbilt University*

This paper proposes that there be an expansion in the use of the value of a statistical life (VSL) in setting regulatory sanctions and for valuing product safety in corporate risk analyses. Federal agencies currently use estimates of the VSL primarily in regulatory impact analyses to monetize the mortality risk reduction benefits of government policies. However, no government agency uses the VSL to set regulatory sanctions. This paper reviews the current levels of sanctions that several government agencies impose for regulatory violations involving fatalities. These sanctions are often several orders of magnitude below the VSL. Although the sanctions often could be greater than their current levels, agencies generally do not have sufficient discretion to raise these sanctions to the level of the VSL in order to provide efficient levels of safety incentives. In this paper, I review the statutory restrictions on penalty levels and indicate how the statutory language should be revised to permit use of the VSL in setting regulatory sanctions. Adoption of this approach would foster more responsible corporate benefit-cost analyses. Past corporate risk analysis practices have focused on valuing expected costs of mortality risks by the direct financial costs that companies will incur after the deaths, which have largely been limited to the value of damages awards in wrongful death cases. Setting the regulatory penalties based on the VSL would align corporate risk decisions with the same kinds of benefit-cost practices as are used in government agencies. The paper illustrates the application of corporate use of the VSL in a benefit-cost analysis using the GM ignition switch failure as the case study and finds that estimated benefits of addressing the defect greatly exceed the associated costs. Unlike government agencies, corporations face the threat of punitive damages that in practice may be triggered by analyses that place an explicit value on mortality risks. The paper proposes expanded legal protections for corporate benefit-cost analyses, expanding on the themes of my book, Pricing Lives: Guideposts for a Safer Society (Princeton University Press, 2018).
Valuing Reductions in Fatal Risks to Children; William Raich, Industrial Economics, Inc.

Valuing Mortality Risk in China: Comparing Stated-Preference Estimates from 2005 and 2016; *James K. Hammitt, Harvard University*

➢ B-7: Regulatory Benefit-Cost Analysis for Emerging Technologies

Chair: Susan Dudley, The George Washington University

Nascent innovations-such as drones, automated vehicles, and blockchain-hold great potential but pose analytical challenges for regulators. Foreseeing future technological developments, much less anticipating their potential benefits and costs, is a demanding undertaking. This panel addresses those challenges by considering how regulatory approaches can be tailored to fit uncertain parameters and limited data, with a focus on the regulation of drones and automated vehicles.

Presentations:

Applying Benefit-Cost Analysis to Regulation of Emerging Technologies; *Sofie Miller, The George Washington University*

Different regulatory frameworks can foster or hamper innovation. In the arena of emerging technologies, such as drones, driverless cars, and blockchain, the regulatory frameworks that agencies choose may determine which regulatory benefitsâ€"and which costsâ€"are relevant to consider. This paper provides explores regulatory approaches in the face of limited data and uncertainty posed by new technologies, and provides analytical tools for assessing the benefits and costs of regulating new markets.

Analytical Challenges in Constructing Regulatory Framework for Automated Vehicles; *Heidi King, National Highway Traffic Safety Administration*

Designing Regulation with Rapid Technological Change: The Case of Drones; *Timothy Brennan, University of Maryland, Baltimore County*

Regulation is challenging in the best of circumstancesâ€"when the regulator has reliable information about stable technologies. Rapid technological change multiplies these challenges. Technological change can outpace the ability of regulators to gather information on benefits and costs, solicit public comment, issue new rules, and deal with inevitable challenges. Before one cycle is complete, the process has to start over. At the most extreme, regulators may be asked to regulate before they know what the technology that they oversee will be. Requirements to regulate use of drones, put the FAA in just that kind of bind. For example, current rules require that drones be operated within sight of the operator, ruling out many potentially beneficial remote sensing, monitoring, and measurement applications. Still, the drone example suggests that regulators may have some options. Rather than attempt to define in advance which uses for drones pass a benefit cost test ex ante, it could issue penalties ex post when a drone uses causes harm, for example, if a delivery drone drops a package on someoneâ€™s head. The regulator (or a court) could set the penalty equal to the harm, and the drone operator or user can then decide if the benefits of that use of a drone are worth the risk. If a regulator knows everything, it could choose which technologies are going to be beneficial on net, and which are not. An important principle is to design regulations to minimize the amount of information that needs to go to the regulator. Because information is scarce at the outset of new technologies, states could different regulatory arrangements from which all might learn. It is also important not to let stakeholders negotiate a solution, because the stakeholders with the wherewithal to be invited to participate may not include the public at large.

One Year of Equity Crowdfunding: An Analysis of Initial Market Developments and Capital Rising Trends; *Lindsay Abate, U.S. Small Business Administration, Office of Advocacy*

On May 16, 2016, the U.S. Securities and Exchange Commissionâ€™s new equity crowdfunding rule, Regulation Crowdfunding, went into effect, enabling small businesses to raise up to $1,070,000 annually through internet-based crowdfunding campaigns. This paper analyzes all crowdfunding filings made pursuant to the new regulation during the first year of activity (May 16, 2016 through May 16, 2017). It highlights key attributes of the firms that have attempted to raise capital through this financing method, including firm location, legal structure, age, employment, and gender. This analysis also describes trends among the online

intermediaries responsible for hosting crowdfunding campaigns, as well as transactional characteristics, such as the type of securities offered and the amount of capital sought and raised. The paper concludes with a discussion of policy implications for small businesses seeking capital through innovative financing methods and potential considerations for future regulatory activity in this space.

➢ C-7: Forest Pests

Chair: Chris Moore, U.S. Environmental Protection Agency

Discussant: John Whitehead, Appalachian State University

Presentations:

Using Machine Learning Tools to Optimize Biosecurity Inspections: A Case Study of the Asian Gypsy Moth in Australia; *Paul Mwebaze, Commonwealth Scientific and Ind Research Org (CSIRO); Dean Paini, CSIRO, Australia; Petra Kuhnert, CSIRO, Australia*

The spread of invasive species continues to provide significant challenges to those government biosecurity agencies charged with protecting a country's borders. In an increasingly connected world, these invasive species are potentially able to spread further and more rapidly. Human mediated pathways such as ships are the most obvious ways in which invasive species can be spread. Direct routes from one port to another are currently monitored, but indirect pathways, in which a ship picks up an invasive species and then travels to a number of different locations before arriving at the final destination, present more challenging scenarios. For the Australian Government Department of Agriculture, one particular concern is for ships arriving into Australia carrying viable eggs of the Asian gypsy moth (Lymantria dispar). Using classification models, we develop a predictive tool that will analyse the pathways for incoming ships and determine the likelihood the ship could be carrying AGM egg masses. This tool has potential to deliver significant benefits to the Department of Agriculture and the wider shipping industry. In this paper, we present preliminary results and discuss the implications, and further work required.

An Application of Benefit-Cost Analysis in Forestry: The Economic Impact of Pest Disease in Uruguay; *Virginia Morales Olmos*, University of the Republic; Julia Ansuberro; Mariana Pintos; Guillermo PÃ©rez*

The forest sector in Uruguay has rapidly developed since the early 1990s under a Forestry Law designed to increase the area and develop a sector. The main species planted have been eucalyptus and pine. One of the most valuable species planted was Eucalyptus globulus, which is very suitable for cellulose production. This species only grows in selected parts of the world due to adaptation issues. In Uruguay was the most planted species. In 2007, the foliar pathogen Teratosphaeria nubilosa was accidentally introduced in Uruguay and had an impact on young E. globulus plantations. The impact on the tree growth was not known. Furthermore, the economic

impact of the disease for the producers and for the economy was unknown. One of the expected consequences of the introduction of this pest was the reduction of the planted area with the species. The objective of this project was to estimate the economic impact of T. nubilosa in the Uruguayan economy. It was carried out by a multidisciplinary group of the University of the Republic (UDELAR) and funded by the Agricultural National Research Institute (INIA). The benefit-cost method was used to estimate the economic impact at two different levels: the producer and the Uruguayan economy. This is a unique research because despite the importance of the forest sector in the Uruguayan economy, nobody had estimated the economic impact of a pest or disease on the plantations using this approach. The estimates relied on primary and secondary information. Three main groups of data were collected from secondary sources: forest areas, exports and forest producers' data. In order to collect primary information, interviews were conducted among E. globulus producers, companies and informants in the forest sector. Shadow prices were obtained from the Planning and Programming Office of the Government. Preliminary results have been already presented. In this presentation a discussion on the application of the method to estimate the impact of a forest pest is presented. Some challenges and opportunities were identified during the research. The decision making process of the E. globulus producers seems to differ from the other producers in the sector, then decision of replacing the species might result from a combination of economic results and other factors.

Cost-Effective Targeting of Live Plant Import Exclusion for Preventing Forest Pest Establishment; *Rebecca Epanchin-Niell*, Resources for the Future; Andrew Liebhold, U.S. Forest Service; Mike Springborn, U.C. Davis*

While globalization and international trade provide many benefits, trends of increasing international movement of goods and people also drive increasing environmental risks and damages, including ecological and economic impacts from invasive species introductions. International trade inadvertently facilitates diverse invasion pathways including â€œhitchhikersâ€• on traded products. Trade in live plants is a particularly important invasion pathway for introduction of pathogens and pests of agricultural and natural resources worldwide, and has been the source of substantial damage to agriculture and ecosystems worldwide. Nonetheless, imported live plants provide value to domestic horticultural producers, as well as consumers, by providing low cost plant material. Favorable climate and labor costs overseas enables lower cost inputs to the domestic horticultural industry, which typically imports plants as seedlings or cuttings that are subsequently prepared for sale by domestic growers and distributers. Prohibitions on live plant imports have been proposed as a strategy for reducing agricultural and ecosystem risks from pest introductions. Here we develop an approach for evaluating the costs and benefits of live plant imports to inform exclusion policies (i.e. importation bans) for plant genera that may pose pest introduction risks. We estimate welfare benefits from trade in specific groups of live plants, and compare these to estimates of expected costs from pest introduction via those imports. We compare expected costs and benefits for a range of plant genera that have been imported into the US in recent years and identify categories of plants for which risks may outweigh the benefits, and vice versa. In particular, we consider how damages may vary across plant genera, dependent on their relatedness to US

genera, recognizing that pests introduced on more related plants are more likely to find suitable hosts in the US. We illustrate our approach with the case of forest pest introduction risk from woody plant imports and use heterogeneity in the relatedness of imported taxa to US trees as a means for differentiating risk across commodities. Recognizing the great uncertainty in both welfare benefit and cost estimates, we use Monte Carlo analysis to assess the robustness of model predictions. We show how heterogeneity in risks and benefits across commodities make a uniform exclusion policies inefficient. While, the data for estimating costs and benefits are less complete than would be ideal for this analysis, our application provides analysis that illustrates the methodological approach, identifies key data gaps, and provides support that exclusion policies targeted at more closely related genera are more likely to be cost-efficient.

➢ D-7: Innovations in BCA

Chair: Robert J. Brent, Fordham University

Presentations:

Measuring Costs and Benefits of Privacy Controls: Conceptual Issues and Empirical Estimates; *Daniel Perez, The George Washington University*

Social Rate of Return Evaluation of DHS University Investments; *Scott Farrow, University of Maryland, Baltimore County*

The Department of Homeland Security has invested close to half a billion dollars in University research. The funding sought ways transition academic tools to inform and improve operations at DHS components such as the Coast Guard, FEMA, Customs and Border Patrol, Transportation Security Administration and so on. DHS seeks to answer the question, what has been the social and DHS return on investment? A number of case studies have been implemented and more are in progress to answer this question using either a benefit-cost or a cost-effectiveness methodology. DHS is also seeking generalizable insight into frequent categories of analysis, such as the benefits of improved detection. This paper presents methodological issues encountered and a few resolutions of those issues.

Benefits and Costs of Emerging Nutrition Devices; *Richard Williams, Self-Employed*
This paper is a theoretical introduction to a new public policy problem. A long history of largely failed attempts at getting people to change their diets through labeling and information campaigns by government is about to radically change. It's not as through the private sector has been very successful as most diets have only short run successes. The problems are generally that there is far too much information, that is too complex and often contradictory. What's more, general dietary recommendations may not work for all individuals. However, with the advent of big data, better ways to monitor and track what is eaten and internet of things devices, a new generation of easy to follow, individualized recommendations for eating at home and away is almost upon us. Because these devices will give eating recommendations that will have consequences for disease and obesity, there are serious choices that must be made as to

how to regulate them. Each intervention, all the way from pre-market approval down to mandated information release, will have benefits and costs. Economists need to begin now to examine the legal and regulatory options to ensure that we capture the full benefits of a vibrant, competitive market to produce better health outcomes while ensuring that those who shortcut or ignore sound science, do not end up misleading consumers.

➢ F-7: Valuing Education and School Policies

Chair: Samantha Carter, J-PAL Global

Presenters:

A WSIPP Approach to Valuing Higher Education; *Michael Hirsch*, Washington State Institute for Public Policy; Danielle Fumia; Catherine Nicolai; Mia Nafziger; Chasya Hoagland*
WSIPP has expanded its benefit-cost model to produce estimates for programs designed to increase higher educational attainment. Doing so required WSIPP to develop new approaches in its practical application of meta-analysis to benefit-cost modeling in valuing both enrollment and graduation for Associate and Bachelor degree programs. The Washington State Institute for Public Policy is a leader in the practical application of benefit-cost analysis for government program interventions. WSIPP works to conduct benefit-analysis of behalf of the legislature, monetizing the benefits and costs of programs and policy options across a variety of policy areas. With funding from the Pew-MacArthur Results First Initiative, WSIPP has expanded its benefit-cost analysis framework into higher education. The WSIPP benefit-cost model currently includes efforts to model the life course of an individual after receiving a program. WSIPP's benefit-cost model uses the same framework to value changes in criminal behavior, child abuse and neglect, substance use, and high school graduation among other outcomes. Meta-analysis is used to estimate the expected magnitude of a per-person effect of a program. WSIPP's monetary values of outcomes are created by relying existing literature as well as primary data analysis when applicable. The per-person effect on outcomes is monetized within the consistent framework, allowing WSIPP to compare the benefits and costs of programs within and across policy areas. WSIPP has implemented a method for to value the lifetime earnings gains from higher education. The modeling accounts for different paths and endpoints in the higher education process including enrollment, transfer, and graduation. This approach allows WSIPP to value enrollment and graduation outcomes measured at different points in time. WSIPP combines information from state and national sources to estimate the number of individuals reaching each level of educational attainment and forecasts the lifetime earnings gains for those populations, accounting for time spent outside of the labor force, death, and other factors. The higher education methodology also takes into account the expense of attending college.

The Economic Implications of Later School Start Times in the U.S.; *Marco Hafner*, RAND Europe CIC; Martin Stepanek; Wendy M. Troxel*

Numerous studies have shown that later school start times (SST) are associated with positive student outcomes, including improvements in academic performance, mental and physical

health, and public safety. While the benefits of later SST are very well documented in the literature, in practice there is opposition against delaying SST. A major argument against later SST is the claim that delaying SST will result in significant additional costs for schools due to changes in bussing strategies. However, to date, there has only been one published study that has quantified the potential economic benefits of later SST in relation to potential costs. The current study investigates the economic implications of later school start times by examining a policy experiment and its subsequent state-wide economic effects of a state-wide universal shift in school start times to 8.30 am. Using a novel macroeconomic modeling approach, the study estimates changes in the economic performance of 47 U.S. states following a delayed school start time, which includes the benefits of higher academic performance of students and reduced car crash rates. The benefit-cost projections of this study suggest that delaying school start times is a cost-effective, population-level strategy which could have a significant impact on public health and the U.S. economy, with an estimated annual economic gain of $ 9 billion. From a policy perspective, these findings are crucial as they demonstrate that significant economic gains resulting from the delay in SST accrue over a relatively short period of time following the adoption of the policy shift.

Cost Analysis of a Mindfulness-Based Professional Development Program for Teachers;
Sebrina Doyle, Penn State University; Damira Rasheed; Joshua Brown; Damon Jones; Patricia Jennings*

This study examines the cost of three implementations of the Cultivating Awareness and Resilience in Education (CARE) for Teachers professional development program during a randomized control trial targeting a diverse sample of public elementary school teachers in New York City. CARE has shown significant positive impacts on teachers' health and wellbeing and on the quality of classroom interactions that support student learning, specifically teachers' emotional support (teacher sensitivity and positive emotional climate) and time for learning (productivity). Although there is a substantial literature on the psychological and physical benefits of mindfulness-based interventions (MBIs), there is little understanding of the costs of implementing such programs. Detailed budget information collected during the randomized control trial was used to identify the cost of resources associated with program implementation. Costs related to program facilitation, ancillary costs associated with providing the training, and opportunity costs associated with teachers' program participation were identified; facilities and administrative indirect costs were also accounted for. Costs associated with research activities were excluded. The largest expense category was opportunity costs which accounted for 40.5% of the total cost. This was closely followed by the program-required costs related to coordination, facilitation, and supplies for the program at 31.8%. Finally, ancillary costs related to facilitator travel, room rental, and food for the trainings encompassed 11% of the total cost. The average cost per teacher across all three implementations was $1,217. Program-required costs were lower in all future cost projections when compared to actual program delivery costs. If only considering program-required and indirect costs, the price per teacher drops to $414 when providing the program to a group of 45 teachers. When the highest level of all ancillary and opportunity costs are included, the expected cost per teacher is higher than the actual cost per teacher in the study implementations, $1,850 per teacher for 25 teachers and $1,741 for 45

teachers. During the study implementations, there were no costs for space for most trainings, and we were able to capitalize on one district contracted professional development day. If a site were able to do the same, the cost per teacher would drop to $1,424 (n=25) and $1,355 (n=45). The cost for the CARE for Teachers program is similar to those reported for other MBIs. CARE for Teachers has been demonstrated as an effective program that positively impacts teachers and their students. In this time of scarce funding in education, it is fiscally responsible to use programs that are proven to produce results. The price of this MBI is the price of funding a professional development program with evidence of effectiveness. While homegrown programs may cost less, they do not come with the benefit of years of rigorous research demonstrating positive results. This is the first research to report on the full cost of providing an evidence-based MBI to teachers in a public education setting. These results can help inform future CARE for Teachers program implementations, provide a model for reporting on costs for other MBIs, and provide a basis for future cost-effectiveness analyses.

Are All Homeowners Willing to Pay for Better Schools? A Finite Mixture Model; *Okmyung Bin*, East Carolina University; Jee W. Hwang College of Business Administration, Northern New Mexico College; Chun Kuang, Department of Economics, East Carolina University*

School quality indicators such as student test scores have been shown to be capitalized into the value of local homes. The presence of households with different preferences for education implies that the implicit price of improvements in school quality might vary even within a region. In this paper, we employ a finite mixture model (FMM) to capture unobserved heterogeneity in household preferences. Using school quality and residential property sales data from Pitt County, North Carolina, we find evidence of two subpopulations of houses, where the prices for one group are virtually invariant to school quality. Consistent with recent research by Davis et al. (2017), these results indicate that heterogeneous valuation of educational quality by households with different socio-economic backgrounds should be taken into consideration when devising policies targeted at the local level.

Session 8: Friday, March 16, 2018, 3:45 – 5:15pm

➢ A-8: Soda Taxes: Benefits, Costs, and Distributional Issues

Chair: Clark Nardinelli, U.S. Food and Drug Administration

Discussant: Elizabeth Botkins, U.S. Food and Drug Administration

Presenters:

Regressive Sin Taxes, with an Application to the Optimal Soda Tax; *Benjamin Lockwood, University of Pennsylvania*

How Well Targeted are Soda Taxes?; *Rachel Griffith, Institute for Fiscal Studies (IFS)*

The Pass-Through of the Tax on SSBs in Boulder, CO; *David Frisvold, University of Iowa*

➢ B-8: Costs and De-Regulation

Chair: Randall Lutter, University of Virginia

Discussant: Brian Mannix, The George Washington University

Presenters:

Deregulatory Cost-Benefit Analysis; *Caroline Cecot, Antonin Scalia Law School, George Mason University*

Cost-benefit analysis ('CBA') was once considered a tool for implementing conservative regulatory policies in part because benefits-which could justify increasing the stringency of regulations-were difficult to monetize. As advancements have been made in monetization, CBA has shed some of its conservative associations and its framework is gaining acceptance as an essential part of reasoned agency decisionmaking. This Article argues that when CBA is deployed thoughtfully, the analysis-a limit on irrational government action-is as much a limit on deregulation as a limit on regulation. This stabilizing effect of CBA across presidential administrations stems from the additional difficulties in recalculating and explaining costs and benefits to support the new policy. In fact, CBA constraints might prove most effective in preserving some of the Obama Administration's regulations, at least those supported by well-conducted CBAs, from the regulatory rollbacks envisioned by the Trump Administration. The Article discusses three implications of the stabilizing influence of CBA in an age of analysis. First, agencies will face incentives to conduct more analysis because regulations unsupported by CBA-or those supported by incomplete or underdeveloped CBA-will be easier to adjust in light of policy preferences. In particular, agencies will (1) justify regulation on CBA when possible; (2) conduct more complete CBA; and (3) rely less on unquantified benefits to justify rulemaking. Second, because a regulation's stringency depends on the value of costs and benefits, stakeholders will face incentives to promote research into these valuations. Third, as CBA becomes known as a constraint on deregulation as well as regulation, agencies will face pressures to engage in retrospective review. The Article also considers the desirability of such a stabilizing influence given concerns about democracy and accountability, agency bias toward rulemaking, and use of alternative methods of deregulation, such as nonenforcement of agency regulations. Overall, the Article contends that, by encouraging rational decisionmaking and only evidence-based changes in regulatory policy, CBA promotes predictability and plays a desirable stabilizing role in regulatory policy across presidential administrations.

Understanding Regulatory Burden from Business' Perspective; *Stuart Shapiro, Rutgers University; Debra Borie-Holtz, Rutgers University*

Much of the literature on the cost of regulations is either theoretical based on traditional microeconomics or large scale statistical studies (with the exception of some literature in the law

and society tradition â€“ and that focuses mostly on the motivations for compliance or exceeding compliance). This literature has led to political rhetoric that either fatalizes the negative effects of regulation (â€œjob-killing regulationsâ€•) or minimizes it. In this paper we take a closer look at how businesses actually experience and perceive regulatory burden. We do this via two methods. We conducted a survey of more than 250 manufacturing businesses in the U.S. Midwest, asking them both about the burden of regulation, and about their attitudes toward government regulation of the economy. Manufacturing in the Midwest has been at the center of much of the debates about regulation and about the US economy. The Midwest also played a crucial role in the 2016 election where regulation was a central issue. We also did eight in depth interviews of such businesses going into much more detail about how they respond to regulation and how it affects their business decisions. These interviews were intended to add context to the survey and to the broader debate on regulatory impact. They were conducted with businesses of varying sizes and in various industries. Our results are still preliminary but we can say that businesses generally have a much more nuanced attitude about regulation than the rhetoric of the regulatory debate would indicate. Some predictions of theory are borne out; regulation serves as a disincentive for expansion in some cases, and incumbent firms that are complying with regulations generally do not see it as much of a burden. Firm size is a key variable in determining regulatory response. Other findings are more surprising. There is a complex interplay between perception and actual burden with each reinforcing the other. At the same time the perceived burden of regulation does not always match up with the amount of time or money firms spend on compliance. We will present the preliminary results of the survey and interviews in this paper.

Estimating the Impact of Regulatory Costs on Small Businesses Using Five Key Financial Health Indicators; *Ann Czerwonka*, Industrial Economics, Inc.; Jennifer Baxter IEc; Arturo Rios, U.S. Coast Guard*

Pursuant to the Regulatory Flexibility Act (RFA), as amended by the Small Business Regulatory Enforcement Fairness Act (SBREFA), as well as other relevant executive orders, Federal agencies are required to consider the impacts of their regulations on small entities, including small businesses. Specifically, agencies are required to consider whether small businesses have been disproportionately burdened by regulatory costs relative to their larger counterparts. Current methods used by most agencies for such evaluations rely on simple comparisons of direct compliance costs to business revenues or profits. These methods are not effective at capturing other potential impacts, however, such as increased incidences of technical insolvency and/or business closures that may result from regulatory burdens. To address this gap, we developed a model that relies on readily-available financial data for businesses of varying sizes in specific industries (defined by NAICS codes) and applies widely-used and respected metrics of entity-specific financial health. By entering anticipated compliance costs, analysts can calculate the changes in metrics that assess a company's financial structure, performance and solvency, including its debt-to-equity ratio, current ratio, times-interest-earned ratio, Beaver's ratio, and Altman's Z-score. Resulting metrics with the regulatory costs are compared to baseline and average target values (the latter of which can be tailored for each industry and size class) as an indicator of the degree to which the compliance requirements will

increase a typical company's financial vulnerability and likelihood of bankruptcy. The model builds on existing tools currently employed by regulatory agencies to assess the affordability of financial penalties for non-compliance with existing regulations, and represents a more sophisticated approach to considering the impacts of regulations on small businesses.

➢ D-8: Theoretical Considerations in BCA and Regulatory Analysis

Chair: Daniel Wilmoth, U.S. Small Business Administration

Presenters:

Meta-BCA: Optimizing the Level of Effort for Benefit-Cost Analysis; *Stephen Newbold*, U.S. Environmental Protection Agency; Charles Griffiths; Elizabeth Kopits*

A benefit-cost analysis should be made as simple as possible, but not simpler. This aphorism can be put into practice by starting a benefit-cost analysis using readily available data, simplified models, and default assumptions and then adding complicationsâ€”collecting more data, estimating more regressions, employing more sophisticated simulation models, and the likeâ€”only if those complications are worth the cost. This staged approach follows directly from applying the logic of benefit-cost analysis to the conduct of benefit-cost analysis itself, so we call this approach â€œmeta benefit-cost analysisâ€• (meta-BCA). In this paper we argue that routine application of meta-BCA could reduce the cost of regulatory analyses, increase the overall social net benefits of federal regulations, or both. To illustrate the advantages of this approach we develop a stylized analytical model of the optimal level of effort to apply to a benefit-cost analysis conditional on the prior distribution of net benefits and the marginal cost function for increased precision. We then use this model to estimate the potential increase in net social benefits from government regulations if the complexity of BCAs were routinely optimized compared to a benchmark case where a common level of effort is applied to all analyses. With the theoretical concepts in place, the next challenge is to translate the principles into practice. To begin this translation, the second half of the paper presents an artificial case study to illustrate how the approach could work in a more realistic setting. Our case study is framed as a generic version of a proposed environmental regulation that would set emission standards for a possibly toxic compound. Although highly stylized, its main features are designed to resemble the kinds of uncertain elements that appear in many real-world benefit-cost analyses conducted by economists in state and federal regulatory agencies on a regular basis. Our case study comprises three elements: 1) an exposure-response model, 2) estimated marginal willingness-to-pay for reducing the associated health risks, and 3) an estimated abatement cost curve. We first conduct a preliminary, or â€œstage-0,â€• benefit-cost analysis. This stage also involves using prior probability distributions that describe the uncertainty associated with each of the three case study elements to generate a prior distribution over the expected net social benefits of the proposed rule. Next, we examine the conditions under which additional information would be worth the cost of collecting it in a more detailed â€œstage-1â€• analysis for each uncertain element. We also discuss how our proposed approach relates to determinations of â€œeconomically significantâ€• regulations

made by the Office of Management and Budget, and to break-even analysis, which is often used to supplement benefit-cost analyses when one or more potentially important categories of benefits cannot be reliably monetized.

A Taxonomy for Improved Regulatory Evaluation; *Kerry Krutilla, Indiana University, Bloomington; Keith Belton; John Graham; David Good*

A number of regulatory reform proposals have been made to improve ex ante Regulatory Impact Analysis (RIA), and to encourage retrospective review. The Regulatory Accountability Act (RAA), a bipartisan legislative proposal, would require agencies to perform a judicially enforceable cost-benefit test for proposed regulatory actions, hold mandatory public hearings on regulatory proposals expected to have billion-dollar impacts, and comply with information-quality requirements for scientific, technical, and economic evidence. The RAA would also require that an agency incorporate a plan for retrospective review when new significant rules are proposed. The Trump administration has also taken a number of administrative actions that will increase retrospective regulatory evaluation and encourage the replacement of under-performing regulations. The diversity of regulatory scales and structures pose evaluation challenges, and may influence the ultimate success of current proposals to improve regulatory assessment. This research explores whether a taxonomy of evaluation-relevant characteristics can be identified to help support regulatory reform. To illustrate the kinds of issues this research is concerned with, some regulations impose large capital costs on an entire industry (e.g., Mercury and Air Toxic Standards, the Clean Power Plan), and such costs will quickly become sunk after the regulation is promulgated. Because the operational cost savings of repealing this kind of regulation are relatively low, the emphasis should be on high quality ex ante analysis that provides sufficient prior screening. In such cases, the purpose of ex post review would be to review the accuracy of the ex ante analysis in order to improve future evaluations. Regulations that do not impose high capital costs would be better candidates for retrospective review motivated for regulatory rollback. Examples include behavioral requirements or work practice standards (e.g., hours of service rules for truckers or track-side workplace standards to improve railroad safety) or certifications and procedural requirements (e.g., pilot training requirements). However, these kinds of regulations differ in the level of information available. Traffic safety regulations rely on large crash data bases; in contrast, the â€œincident dataâ€• for episodic airline crashes or pipeline accidents do not contain many observations. This reality raises questions both about how to conduct the uncertainty analysis ex ante, and how to evaluate such regulations ex post. For example, are the absence of airline fatalities since 2009 a reflection of FAA regulation, market-oriented actions the industry itself took, both, or neither? This study will clarify and identify key structural differences that should matter for regulatory evaluation, and make recommendations for tailoring evaluations for different regulatory contexts. The study will be based on a review of the accumulating literature on retrospective review, and a survey of RIAs of 25 lifesaving regulations issued by the EPA and DOT from 2011 through 2016. Owing to its scope and granular focus, the study will add information to the current literature on regulatory evaluation methods and practices, and provide policy-relevant insight to support the implementation of regulatory reform initiatives.

Better Rules of the Game: Introducing New Global Indicators on Regulatory Governance; *Joseph Lemoine*, Global Indicators Group; Melissa Johns*

Our paper presents a new database of indicators measuring the extent to which rulemaking processes are transparent and participatory across 185 countries: the Global Indicators of Regulatory Governance. The data look at how citizen engagement happens in practice, including when and how governments open the policy-making process to public input. The data also capture the use of ex ante assessments to determine the possible cost of compliance with a proposed new regulation, the likely administrative burden of enforcing the regulation, and its potential environmental and social impacts. The data show that citizens have more opportunities to participate directly in the rulemaking process in developed economies than in developing ones. Differences are also apparent among regions: rulemaking processes are significantly less transparent and inclusive in Sub-Saharan Africa, the Middle East and North Africa, and South Asia on average than in Organisation for Economic Co-operation and Development high-income countries, Europe and Central Asia, and East Asia and the Pacific. In addition, ex ante impact assessments are much more common among higher-income economies than among lower-income ones. And greater citizen engagement in rulemaking is associated with higher-quality regulation, stronger democratic regimes, and less corrupt institutions. The Global Indicators of Regulatory Governance grew out of an increasing recognition of the importance of transparency and accountability in government actions. Following the 2017 data collection effort, the indicators now cover: (i) transparency of rulemaking, (ii) public consultation in rulemaking, (iii) impact assessment, (iv) accessing laws and regulations, (v) reviewing laws and regulations (ex-post reviews) and (vi) challenging regulations. The team also maintains a global database containing documents related to regulatory impact assessment (RIA) issued by or for national governments, or publications studying RIA as it is applied by governments worldwide. We will also publish an in-depth study on RIA practices using the dataset: â€œGlobal Indicators of Regulatory Governance: Worldwide Practices of Regulatory Impact Assessmentsâ€• (expected second half of October 2017).

➢ E-8: Food and Agricultural BCA

Chair: Sandra Hoffmann, U.S. Department of Agriculture

Presenters:

Economic Impacts Associated with Direct Marketing Initiatives by U.S. Farmers: A Quantile Decomposition of Sales; *Timothy Park, U.S. Department of Agriculture*

An emerging agricultural marketing issue is the promotion of direct marketing initiatives that are designed to expand producer margins. Initiatives at the U.S. Department of Agriculture have advocated for expanded direct marketing efforts. Major food retailers promote direct sales by farmers, claiming that local foods give farmers, ranchers, growers and producers maximum return on their investment. We develop a model of direct marketing initiatives by farmers and assess the unconditional impact of direct marketing on farm sales while also uncovering the

heterogeneous effects that occur across the distribution of farm sales. Data from the Agricultural Resource Management Survey (from 2008 to 2013) are used to measure sales differences between farmers participating in direct marketing compared to those do not use this marketing option. One innovation is to assess the impact of information accessed through the Internet on farm sales. We distinguish between internet use for farm-related news and information (weather, farm, agricultural markets) and internet activity devoted to farm-related commerce (purchases, sales, banking, and on-line record accounting). We use an unconditional quantile regression (UQR) approach to measure the full impact of participation in direct marketing on farmer sales at specific quantiles in the sales distribution. We apply a method to decompose sales differences across the complete sales distribution for these two types of farmers (direct marketers and those not participating). There are two broad factors that contribute to differentials across the sales distribution. First, the composition effect accounts for differences in the characteristics of the two groups, such as education, experience, or farm structure, and input choices. The composition component uncovers how these characteristics influence differences in the quantiles of the marginal sales distribution. A second component (the structure effect) is based on differences in the estimated coefficients of the sales model for farmers and accounts for differences in the marginal impact of the explanatory variables on sales. The decomposition reveals how much of the sales differential associated with direct marketing efforts is driven by differences in farm experience or farm structure. The structure component is informative about how much of the unexplained gap is related to diï¬€ering returns to education or farming experience. The factors that are identified that can assist marketing experts and extension professionals in guiding farmers who are considering initiating or expanding direct marketing activities.

A Dynamic Systems Assessment of Benefits and Costs of Policies to Regulate Antimicrobial Use in U.S. Animal Agriculture; *Guillaume Lhermie*, Cornell University; Don Kenkel*, Cornell University; Loren Tauer, Dyson School of Applied Economics and Management, Cornell SC Johnson College of Business; Charles Nicholson, Dyson School of Applied Economics and Management, Cornell SC Johnson College of Business; Yrjo Grohn, Department of Population Medicine and Diagnostic Sciences, College of Veterinary Medicine, Cornell University*

Antimicrobials are used in humans and animals to cure bacterial infectious diseases. However, antimicrobial use (AMU) leads unavoidably to the selection of resistant bacteria, constituting a negative externality: antimicrobial resistance (AMR) compromises the efficacy of future antimicrobial treatments, and generates high additional public health costs. More specifically in animal production, AMU prevents or limits the damages associated with the occurrence of diseases on farms. Therefore, antimicrobials can be viewed as inputs into the production functions for livestock products. The potential transfer of resistant bacteria selected after on-farm AMU throughout the production process, via direct contact, the food chain, or the environment, constitutes a threat to public health. Given this threat, some governments implement policies to decrease AMU in conventional farming systems (e.g., the European and USA ban of use of subtherapeutic doses that promote growth and improve feed efficiency). Policies that decrease AMU in farming impose opportunity costs on society because they

reduce the current economic efficiency of the production of livestock-based food commodities. In general market equilibrium, the efficiency loss reduces farm profits and/or increases food prices. AMU policies create societal benefits because they slow development of AMR and maintain the future efficacy of antimicrobials to treat diseases in animals and humans. Thus, one policy tradeoff is between the costs of reduced current farming efficiency and the benefits of improved future farming efficiency and improved public health. We conduct a benefit-cost analysis to compare the opportunity costs of AMU policies to the value of the public health improvements, based on of the value of a statistical life and its extensions to value morbidity reductions. Given the potential differences in short- and long-term outcomes for multiple stakeholders interacting in a complex system, a dynamic assessment of the benefits and costs of AMU policies on farmers, retailers, animal and human health workers, and citizens is challenging yet highly relevant. We develop a systems simulation model that represents the dynamics of AMU in U.S. animal production (poultry, pigs, cattle), the relationship between AMU and AMR, and the impacts of three public policies designed to mitigate AMR. These policies include 1) prohibition of AMU, 2) a tax on AMU and 3) an exogenously-imposed reduction in AMU of 50%, and are compared to a status quo Baseline scenario. We evaluate the dynamics of benefits and costs associated with the three policies over a ten-year period, using various discount rates, also undertaking sensitivity analyses for the price of antimicrobials.

A Comparison of Regulatory Impacts on Corn Farming Between the United States and European Union; *Zhoudan Xie*, The George Washington University Regulatory Studies Center; Daniel R. PÃ©rez; Aryamala Prasad*

Wide variations in regulatory systems and approaches in the United States (U.S.) and European Union (EU) make it difficult to compare the impact of regulation between the two jurisdictions. Such variations are prominent in regulation affecting the agriculture sector. This study focuses on corn farming to estimate the economic impactsâ€”both costs and benefitsâ€”of major environmental and food safety regulations on corn production in the U.S. and EU. Although this study is primarily concerned with U.S. federal and EU-level regulations, two EU member statesâ€”France and Spainâ€”are selected as case studies to illustrate the differences in translation and implementation of EU-level regulations at the country level. Using a â€œtypical farmâ€• approach as defined in the study, we demonstrate relative differences in regulatory burden for corn farmers among the U.S., France and Spain. We begin by identifying and discussing regulations affecting corn farming in four categories: genetically modified (GM) crops, pesticides, fertilizers, and agri-environmental practices. We then proceed to quantify the incremental private costs and benefits for corn farmers resulting from the operational requirements associated with each regulation in each country, including a sensitivity analysis. We find that French and Spanish corn farmers face much higher regulatory burden than the U.S. corn farmers, primarily due to significantly higher regulatory costs associated with GM crop and pesticide regulations in the EU.

Socio-Economics of Cassava Production in East Africa; *Paul Mwebaze*, Commonwealth Scientific and Ind. Research Org (CSIRO); Sarina MacFadyen, CSIRO, Australia; Paul De Barro, CSIRO, Australia; Christopher Omongo, National Crops Resources Research Institute,*

Kampala, Uganda; Anton Bua, National Crops Resources Research Institute, Kampala, Uganda; Andrew Kalyebi, National Crops Resources Research Institute, Kampala, Uganda; Fred Tairo, Mikocheni Agricultural Research Institute, Dar es Salaam, Tanzania; Donald Kachigamba, Department of Agricultural Research Services, Bvumbe, Malawi

Cassava is the second most important food crop in Africa after maize. It is a major staple crop for more than 200 million people in East and Central Africa, most of them living in poverty in rural areas. However, its production is undermined by several factors, particularly the problem of emerging pests and diseases. We conducted a comprehensive socio-economic study covering Uganda, Tanzania and Malawi to determine the status of cassava production with the following specific objectives: (1) What is the present status of cassava production and productivity? (2) What is the current adoption rate of improved cassava production technologies in the study countries? (3) What is the economic impact of the cassava white-fly on smallholder farmers? The primary data for this study was collected from cassava farmers-using a pre-tested survey questionnaire that was orally administered to individual farmers. A total of 1200 respondents were selected and interviewed using a multi-stage random sampling technique. We employ cost-benefit analysis and a stochastic frontier production model to analyse costs, returns and productivity of smallholder cassava producers. Here we present results and discuss the implications. Key words: Cassava, smallholders, disease, income, food security.

Pollinator Valuation Measures and Policy Analytics; *Peyton Ferrier*, U.S. Department of Agriculture; Randal R. Rucker, Montana State University; Walter N. Thurman, North Carolina State University*

Concern for the consequences of the loss of pollinators on the agricultural economy continues to influence debate regarding agricultural policy, pesticide regulation, and land conservation. Valuation studies from the ecology literature often ascribe large dollar values to the contribution of pollinators to the agricultural economy (Bauer & Wing, 2010; Gallai, Salles, Settele, & VaissiÃ¨re, 2009; Morse & Calderone, 2000; Robinson, Nowogrodzki, & Morse, 1989). These estimates assign a value to the pollination services provided by honey bees and other insects by measuring the value of farm output lost if all pollinators were absent, and farmers made no offsetting adjustment to farm operations. Some studies have tried to reconcile these â€œall-or-nothingâ€• studies with the more common economic concepts of producer and consumer welfare (Melhim, Daly, & Weersink, 2016; Winfree, Gross, & Kremen, 2011) and to adapt them to applied policy analysis (Gallai & Salles, 2016). Although farms rely on wild or unpaid pollinators, markets for pollination services (i.e., honey bee colony rentals) have been well-organized since at least the 1940s (Burgett, Daberkow, & Rucker, 2010; Cheung, 1973; Olmstead & Wooten, 1987; Rucker & Thurman, 2010). Cheung (1973) and Rucker, Thurman, and Burgett (2012) show how pollination service fee prices, after being adjusted for the value of honey co-products, reveal both the beekeeper's marginal cost of providing pollination services and the farm's marginal valuation of pollination services as an input. Despite the potential for ecosystem disturbances to affect pollination service supply, fluctuations in pollination service fees allow the market to adjust supplies to changing requirements of farms. We assess whether commonly cited valuations of pollinators can be resolved with welfare economic principles and

show that cited pollination valuation methods, by failing to explicitly model farm production, do not allow acknowledge farms' abilities to substitute other inputs for insect-provided pollination services, plant crop varieties that are less dependent on pollination services, or save costs following early-season realization that yields are low. Valuations measures often fail to distinguish the average and marginal values of inputs in calculations (Winfree et al., 2011 and Muth and Thurman, 1995). In some instances (e.g. Calderone 2012), the value of crops produced with seed requiring pollination are double counted in the valuation measures. In addition to these methodological concerns, we show that widespread concerns regarding the impending scarcity of pollination services is not reflected in current data. Specifically, we use new USDA data from the Cost of Pollination Survey and Colony Loss Survey to show that in recent years the number of U.S. bee colonies has been rising and that for most crops, pollination service costs have been relatively stable and small relative to total costs.

- G-8: “Economic Feasibility” Under the Safe Drinking Water Act: An Unexpected Opportunity for Regulatory Reform

Chair: Richard Belzer, Regulatory Checkbook

The Safe Drinking Water Act of 1974 directed USEPA (and indirectly, the states) to establish standards for drinking water contaminants that are â€œeconomically and technologically feasible.â€• Congress delegated to the Agency the legislative authority to define these terms. Engineering has held sway over the definition of â€œtechnological feasibility,â€• but economics has played a negligible role in defining â€œeconomic feasibility.â€• The Agency's definition relies on the principle of â€œaffordability,â€• which it has defined as 2.5% of median household income. In May 2016, California promulgated a drinking water standard for hexavalent chromium without making any reasoned determination that it was economically feasible, as California law required. Estimated household-level costs for small water systems exceeded $6,000 per year, an amount that a California Superior Court judge ruled was â€œon its face, â€¦ economically unfeasible for many people.â€• The court vacated the drinking water rule in May 2017, directing the state to revisit the matter and re-propose a new regulation that was economically feasible. The state chose not to appeal the court's ruling and expects to complete this task in 18-24 months. This case provides an opportunity to reconsider first principles. Is â€œaffordabilityâ€ an appropriate metric for defining â€œeconomic feasibilityâ€• ? What is the proper role of economics, and particularly, benefit-cost analysis? This panel consists of three presentations: (1) a historical tour of how USEPA defined economic feasibility in the 1970s and developed its â€œaffordabilityâ€• principle; (2) a description of the difficulties that water systems have had (and continue to have) complying with the â€œaffordabilityâ€• principle; and (3) a proposal for a new definition of â€œeconomic feasibility:â€• grounded in economics. A discussant will review these presentations and provide his own, independent insight.

Discussant: W. Kip Viscusi, Vanderbilt University

Presenters:

Redefining 'Economic Feasibility' Using Economics: A Reform Proposal That Would Improve Both Efficency and Equity; *Richard Belzer, Regulatory Checkbook*

Creation of EPA's Small Entity Affordability Criterion: A Study of Ignorance Compounded by Bad Economics; *David Schnare, Torcastle Law, LLC*

Practical Problems with U.S. EPA's Affordability Guidance; *Tracy Mehan, American Waterworks Association*