



Interdisciplinary Ph.D. Workshop on Sustainable Development

Session-by-session guide to the 2017 edition

DAY 1 -- Friday, April 21st

Session 1 – Disasters

Jayash Paudel (UMass Amherst) – “Natural Disasters and Human Capital Accumulation: The Case of Nepal’s Earthquake”, with Hanbyul Ryu

Abstract: Using the 1988 earthquake in Nepal as a natural experiment, we examine the long-term repercussions of a large exogenous physical shock on human capital accumulation. We employ the National Living Standards Survey (NLSS) data and exploit the quasi-random spatial and temporal nature of ground tremors to evaluate the long-term impact of earthquake on educational outcomes among affected children of rural Nepal. Results show that infants exposed to earthquake completed on average 0.6 years less schooling. Our findings further demonstrate that male infants born in earthquake-affected districts performed significantly better than the female counterparts, suggesting prospects of gender bias in an entirely patriarchal society. We also offer suggestive evidence that subsequent poverty trap and negative health shocks possibly influenced the long-term human capital accumulation of infants exposed to earthquake at an early age.

Denyse Dookie (Columbia University) – “Does Disaster Preparedness Matter? Evidence from the Caribbean”, with Dan Osgood

Abstract: Despite the severity of natural disasters, and the emphasis on disaster risk reduction strategies, there are few studies on whether preparedness matters. To test if preparedness matters, I focus on the annual proportion of population harmed by storms, varying the occurrence of heavy rainfall events on different days of the week. My assumption is that if there is less preparedness through reduced active awareness and communication by both local authorities and the general public on the weekend compared to during the work-week, then storms should have worse effects if they hit at the beginning of the week. Secondly, I consider the effect of preparedness in the macroeconomic context, by checking whether people affected by storms have consequences on national outcomes, and whether heavy rainfall events, specifically, are related to changes in economic output.

I find that disaster preparedness matters. Analysing panel data for 15 Caribbean countries over the period 1990-2010, I observe that heavy rainfall events on Mondays robustly affect more people compared to events on any other day of the week. Taking into account a typical 21-39 hour lead time between a storm forecast and storm approach, lower week-end government capacity and public awareness likely inhibits effective preparation, knowledge assimilation, coordination, communication and response ahead of storms on Mondays. I also find that in some models, people hurt by storms may have negative effects on annual GDP. In addition, I find a significant negative relationship between heavy rainfall and GDP growth, with heavy rainfall on Mondays having increased impacts on annual GDP in some specifications. Disaster preparedness, then, could have broader macroeconomic consequences.

This insight that preparedness matters could channel more attention to disaster preparedness and prevention strategies, assisting disaster policy.

Ashenafi Belayneh Ayenew (University of Copenhagen) – “Labor adaptation to extreme climate conditions”

Abstract: How do rural households adapt family labor to extreme climate conditions? To answer this question, I combined a panel survey on over 2900 small and medium-sized farm households from rural Mozambique with extreme climate conditions, drought and flood, calculated using high resolution precipitation and potential evapotranspiration data and causally estimated labor adaptation responses to extreme climate conditions. The results suggest significant labor adaptation during and following drought shocks, but not flood shocks. At the extensive margin, I find that drought shocks lead to a 4% points more engagement in salaried employment in agricultural and non-agricultural activities. In terms of medium term labor adaptation responses, I find that households adapt to last year’s drought shock by engaging 7% and 9% points more on wage employment in agricultural activities and self-employment in trade services, respectively. Two periods after experiencing drought shock, households significantly pull away from salaried employment in agricultural activities by 5% points, implying this activity is a temporary labor adaptation option to drought shocks, and engage 9% points more on establishing their own small and micro enterprises (SMEs). I empirically show that labor adaptation through wage employment in agricultural activities and self-employment in SMEs is exclusively undertaken locally, while non-agricultural activities involve migrating outside the village. Adapting through engaging in trade services is undertaken both locally and by migrating outside the village. Finally, I provide empirical evidence that it is better educated and labor rich households who are significantly adapting family labor to drought shocks.

Session 2 – *Wildlife & Illegal Activities*

Eyal Frank (Columbia University) – “The Right Information in the Wrong Hands: How Information Shocks on Species Extinction Risks Cause Wildlife Trade Spikes”

Abstract: Traders in illegal wildlife markets have incomplete information regarding the scarcity of different species. If poachers and collectors are targeting rare species, then information shocks on species’ rarity could adversely affect conservation efforts. In this paper I use monthly level data on extinction risk updates, for the period of 2002-2010, and match it with wildlife import data into the U.S. Using a non-parametric event study strategy I demonstrate that information shocks on the extinction risk of species lead to an increase in trade levels by 2.47 to 3.11 standard deviations, relative to the baseline period prior to the update. These results provide evidence that publicly revealing updates about the extinction risks of species can result in better coordination between supply and demand in wildlife trade markets. Therefore, monitoring and enforcement efforts could improve their effectiveness by increasing their focus on species that receive such information shocks.

Gabriel Englander (UC Berkeley) – “Conflict and elephant poaching”

Abstract: A large literature in economics studies the causes and consequences of armed, intergroup conflict. However, the effects of conflict on wildlife have mostly been examined by natural scientists through case studies. Do changes in conflict status—a new conflict beginning or an active conflict ending—affect elephant poaching? I find that conflict onset significantly increases poaching by about 22-36% relative to mean poaching levels, while conflict ending has a positive but only marginally significant effect. I use elephant site and year fixed effects, find similar estimates with country-by-year fixed effects, and include relevant subnational, time-varying control variables. I bound the bias from potential confounders, explore temporal dynamics and test for reverse causality, and check robustness to specification assumptions. This paper extends the economics literature on conflict into a new area, provides causal estimates to check previous findings by natural scientists, and offers evidence for policymakers and practitioners interested in reducing poaching of elephants and other high-value species.

Session 3 – *Climate Change*

James Doss-Gollin (Columbia University) – “Statistical-Dynamical Analysis of Climate Projections for Flood Infrastructure Design”, with David Farnham and Upmanu Lall

Abstract: Infrastructure for mitigation of climate extremes such as floods is traditionally designed for a specified level of risk protection such as the estimated 100-year flood event. However, the climate varies due to anthropogenic and natural factors, leading to non-stationarity in flood risk (Merz et al., 2014; Milly et al., 2008). Many of these variations have decadal time scales, meaning that short data sets may be particularly misleading in terms of future flood risk (Jain and Lall, 2001). Additionally, traditional design procedures effectively consider an infinite service life for the project, ignoring the actual risk of exceeding the T year event in a finite m year future period. We use a statistical-dynamical causal chain framework for using uncertain climate forecasts to estimate (a) the probability of getting one or more exceedances of a T -year event in a future m -year period; and (b) the uncertainty of estimating the fixed T year event from an n -year record, and its projection on to the future m year period. This approach is anchored through a case study of flooding in the Paraguay River region.

Léo Edel (École Polytechnique) – “Climatic change in the Arctic: towards a better characterization of snowfall”, with Chantal Claud and Christophe Genthon

Abstract: The main goals of the AC-AHC2 project is to study the atmospheric circulation and the hydrological cycle changes in the Arctic. This area has warmed twice as fast as the global average, and Arctic land precipitation has increased. This amplification is combined with an enhanced Greenland ice sheet melting and a rapid decrease of sea-ice coverage. This amplification is due to several positive feedbacks, e.g. the surface albedo associated with changes in snow cover and sea-ice. This latter increases the heat storage in the ocean, which in turn increases water vapor and cloud feedbacks, and then precipitation changes. Feedbacks still contain large uncertainties, with repercussions on many subjects as sea-level rise, freshwater availability, Arctic ocean exploitation, polar biodiversity, among others. These doubts rise essential questions on climate-decision making.

A better characterization of precipitation will help interpret ocean-atmospheric interactions and improve its modeling. This enhanced comprehension will help quantifying the global impact of Arctic amplification and the different strategies to reduce the risks of climate change. Only satellite observations can provide such a global climatology.

A climatology of Arctic precipitation was recently assembled using CloudSat satellite radar data. However, space – time coverage is partial and must be completed using other satellite data.

A first goal of the PhD will be thus to extend existing satellite precipitation retrieval methods using passive microwaves. To do so, the observations of the AMSU-B and MHS will be used because of their high sensitivity to hydrometeors allowed by the coverage high frequencies. These two instruments will fill the gaps of the CloudSat data thanks to their 2400 km swath, 16 km resolution and good temporal coverage due to the successive launches of a series of similar radiometers. Remote sensing of precipitation is based on the scattering of microwaves by precipitating clouds, which results in a cloud brightness temperature which is colder than its environment. The snowfall detection method will have to be assessed and compared to active microwave datasets, as well as model and reanalysis data. Then, the variability of snowfall across the Arctic will be investigated.

Ian Bolliger (UC Berkeley) – “Effect of model scale on the stationarity of snow depth estimates: Implications for water management in mountain basins”, with Noah P. Molotch, Alexei Pozdnoukhov and Margaret S. Torn

Abstract: One-sixth of the world’s population depends on snowmelt for their water supply. Efficient water use policies and reservoir operation in snowmelt-driven regions thus depend largely on accurate predictions of the magnitude and timing of melt. This is a function of the spatial distribution of snow water equivalent (SWE), a metric combining snow depth and density. To date, SWE estimates rely on sparse observations and their correlations to spring/summer streamflow. Such correlations assume a stationary climate, yet as climate change warms mountain regions, more winter precipitation will fall as rain instead of snow and snow will be confined to higher elevations. Therefore, future SWE distributions may not mirror previous patterns, necessitating a new approach to SWE estimation.

Terrain and vegetation features, which are relatively stationary across years and which contribute to variation in SWE, have the potential to drive model-based estimates of SWE distributions. With increasing resolution in elevation and land cover maps, we can drive higher-resolution SWE estimates, yet little is known of the effect of model scale on the consistency and predictive skill of terrain-based SWE models.

In this study, we apply multiple regression and regression tree approaches to a gridded snow depth time series from the Tuolumne River Basin from 2013-2016. The models are run at native 3m scale and at larger, resampled scales. Parameter estimates obtained at different time points are pooled, and parameter variance and out-of-sample predictive skill is compared across scales. Initial findings suggest the dominant, yet temporally inconsistent

influence of elevation and slope aspect at smaller scales. At medium scales, other features increase in importance, parameter estimates and tree structure become more stationary, and skill improves. At large scales, model skill declines.

The results of this study provide insight into optimal scale for terrain-based snow depth and SWE estimates. In snowmelt-driven rivers, information from terrain-snow modeling has the potential to dramatically improve the performance of forecast informed reservoir operations (FICO) and to help water policy and management strategies adapt to a changing climate.

Ingrid Dallmann (Université Paris Sud) – “Weather Shocks and International Trade”

Abstract: International trade data is the best available source for measuring economic activity at a low aggregation level that is comparable worldwide. I study the impact of weather shocks on economic activity using export data from BACI, worldwide and for the 1992-2014 period.

The empirical analysis is divided into three parts. First, I study the impact of weather shocks on exportation growth at a 2-digit product aggregation level and identified the products that are affected by temperature shocks. Second, I distinguish between the immediate and accumulated effects of temperature and precipitation shocks on exportation growth. Finally, I study the impact of weather shocks on the intensive and extensive margins of exports. I calculated the intensive and extensive margins for all the 5037 products in the 1-digit HS6 system, for the 698 products in the agricultural sector, and for the 2500 products sensitive to temperature shocks. Results show that there is a negative and significant effect of temperature shocks on export growth, and that there are both immediate and persistent effects. The effect of temperature shocks on the intensive and extensive margins are positive for the aggregate of all sectors and for the weather-sensitive sectors. All the statistically significant impacts occur only in poor countries.

Session 4 – *Public Policy*

Thomas Stoerk (Universitat Pompeu Fabra) – “Compliance, Efficiency, and Instrument Choice: Evidence from Air Pollution Control in China”

Abstract: This research evaluates China's main air pollution control policy. In 2005, China decided on a 10% SO₂ emissions reduction goal as part of the 11th Five-Year Plan (2006-2010). I study the effect of this policy on pollution outcomes, using both the official, misreporting-prone indicator and independent NASA SO₂ satellite data in a differences-in-differences strategy that exploits variation in target stringency at the province level. I find that results from the official and the satellite data differ initially when the Chinese government lacked the ability to effectively monitor SO₂ pollution. Ultimately, however, the policy worked and reduced air pollution by more than 10%. The regulated provincial governments react both through rhetorical compliance, measured by a unique dataset of quantified political statements, and through real compliance. Rhetorical compliance increases, especially before the government gained the ability to monitor SO₂ in 2008. Real compliance sets in through the shutdown of small, inefficient thermal units. Next, I compute detailed marginal abatement cost curves for SO₂ for each province in China, thus illustrating the large heterogeneity in abatement cost across provinces. I use those curves to construct the counterfactual cost-efficient allocation of SO₂ reduction targets across provinces. Using this benchmark, I find that the cost-efficient allocation would increase efficiency by 49% at the margin, by lowering marginal abatement cost from 658€/tSO₂ to 338€/tSO₂. This finding is robust to inclusion of a back-of-the-envelope measure for the marginal benefits of abatement. I conclude that a market-based allocation of SO₂ reduction targets would have doubled the efficiency of China's main air pollution control policy. Contrary to the US experience, I find that a mandate on scrubbers would reap most of those efficiency gains.

Betsy Priem (University of Chicago) – “Communication Strategies between Climate Scientists and Policy Actors”

Abstract: This research will explore the communication strategies employed by climate scientists and policy actors. Using a snowball sampling technique, I will conduct key informant interviews of prominent figures within the climate science and policy community to understand how and why communication occurs between these groups (if at all). Dimensions of communication include, but are not limited to: mode, initiation, frequency, efficiency, effectiveness, and individual conceptions of communication obligations. Preliminary data is not yet available for analysis.

Serena Cociolo (Institute for International Economic Studies) – “Community-Driven Development and Preferences for Participation: Experimental Evidence from Bangladesh”, with Jakob Svensson

Abstract: Participatory development projects often include building social capital and strengthening civil society as key objectives, and it is widely perceived by policy makers and practitioners that induced participation may sustain long term social development by promoting social cohesion and enhancing demand for democratic practices.

A large literature has emerged on the long term impact of CDD programs on social norms and institutions in beneficiaries communities. One fundamental challenge in this evaluation consists in the difficulties of observing and measuring social preferences. An increasing number of studies rely on lab-in-the-field experiments in order to test whether participatory development enhances participation, trust and social values in receiving communities. The existing evidence is mixed, calling for further researches on this topic, which has relevant policy implications on the potential long run impact of participatory governance.

I contribute to this debate by providing novel evidence on the impact of a Community-Driven Development (CDD) program on preferences for participatory decision-making. I designed a novel lab-in-the-field experiment in order to measure preferences for participatory decision-making in rural Bangladeshi communities.

I test whether the exposure to a CDD intervention increases the value that beneficiaries place on participatory decision-making. I evaluate several mechanisms in order to understand what are the driving forces of the main treatment effect. I estimate heterogeneous treatment effects in order to test whether the effect of the CDD program is larger among more marginalized and less empowered socio-economic groups. I explore whether the effect of receiving a CDD program on preferences for participatory decision-making is larger in communities where the implementation of the program is more successful and benefits from the intervention are more equally spread among households.

The data collection is currently ongoing, and it will be completed in March 2017. Preliminary results will be available in April 2017. The study is registered in the AEA RCT registry:

<https://www.socialscisearch.org/trials/1809/history/13261>

Raimundo Atal Chomali (Columbia University) – “A Market Based Recycling Subsidy”, with Rodrigo Harrison and José Antonio Carrasco

Abstract: When direct taxation on waste disposal is not a feasible option, a combination of a tax on production and a subsidy for recycling achieves efficient levels of waste disposal. We propose a new instrument: a tax on production and a market-based subsidy for recycling. In this market, recyclers can sell credits that can be used by firms to reduce their tax base. The credit's price acts as a subsidy for recycling and efficient levels of production, recycling and waste are achieved in equilibrium. Compared to other forms of tax and subsidies that have been discussed or implemented, this instrument gives flexibility to allow the separation of the production and recycling activities while at the same time lowers the financial burden on the government.

Session 5 – *Technological Change*

Paulo Savaget (University of Cambridge) – “Hacking sustainability - The development of a new concept”, with Martin Geissdoerfer and Steve Evans

Abstract: Sociotechnical progress plays an important but dubious role in sustainability discussions. The wide diffusion of unsustainable technological trajectories represents the most critical source of environmental jeopardy and widening inequalities. Yet, innovations are also the major sources of hope to find a way out from a potentially unwanted and disastrous future. Despite the open-ended nature of sustainability challenges, it seems clear that incremental changes happening within the prevailing sociotechnical regimes will not be enough. Changing sociotechnical systems should be at the very core of sustainability efforts.

Theories on innovation systems; sustainable innovations; system thinking and design; and sustainability transitions, to cite a few, emphasize that unsustainable characteristics of the prevailing sociotechnical systems are part of mutually-reinforcing dynamics, formed by the complex coevolution between technologies, industrial structures, policies, social behaviour, ecology, markets, civil society, and many other factors. By investigating the intensities, causalities and directionalities of these developments, they were capable of highlighting the existence of multiple

possibilities to influence sociotechnical systems. However, they do not shy away from the description of co-evolving features, as well as from rather consensual prescriptive statements, such as the importance of incorporating diversity, assessing expectations, or fostering coordinated action.

This article answers the following research question: what are the prevailing premises of theories covering sociotechnical system change for sustainability? This has been addressed through a comprehensive literature review with a sample of approximately 170 documents, combining the following methodological approaches: bibliometrics, snowballing, content analysis, and theoretical problematization. This allowed us to unravel the main assumptions, theoretical foundations, and boundaries grounding theoretical development, as well as to reveal prospects and challenges for future studies capable of empowering radical theoretical contributions in this area.

Margot Hovsepien (École Polytechnique) – “Technological complementarities and selection of green technological paths”

Abstract: In this paper we model investor decisions when choosing to fund research and development in either a polluting or a non polluting sector, in a dynamic framework with complementarities between agent's investment choices. We show that when complementarities are strong enough, the long run equilibrium may be indeterminate, meaning that it depends on agent's expectations. Furthermore, when complementarities are not only present at the private level but also at the social level, a pigouvian carbon tax may be inefficient in directing the economy toward the socially most desirable equilibrium. In such case we propose an alternative more efficient kind of policy.

Eugénie Dugoua (Columbia University) – “Science and Innovation at the Rescue of the Ozone Layer: Empirical Evidence on the Effects of International Agreements.”

Abstract:

Saleh Zakerinia (UC Davis) – “Climate Change Policy: Dynamics, Strategy, and Technological Change”, with C.-Y. Cynthia Lin Lawell and James E. Wilen

Abstract: Climate change is a “tragedy of the commons” problem since greenhouse gas emissions from any one country contribute to the total stock of global greenhouse gases in the earth’s atmosphere, which affects all countries. In the absence of a supranational institution that is endowed with the appropriate jurisdiction to enforce a global environmental target, each country sets its own climate policy based on its own interests and priorities. However, the monetary and political costs of these policies, the economic structure of different countries, and uncertainty in the future damages of climate change cause individual countries to postpone or free ride on other countries’ efforts to reduce greenhouse gas emissions.

In this research, we develop and estimate a structural econometric model of the dynamic game among countries making dynamic and strategic decisions regarding energy and environmental policy in the face of technological change. The structural econometric model enables us to answer the following main research questions:

1. How do economic factors, energy security concerns, and technological development impact the energy and environmental policy of different countries?
2. How do the energy and environmental policies of other countries affect a country’s energy and environmental policy?
3. How should environmental and energy policies be designed to increase the welfare of firms, individuals, countries, and society?

There are several advantages to using a dynamic structural econometric model. First, unlike reduced-form models, a dynamic structural model explicitly models the dynamics of countries’ environmental decisions. Moreover, a structural econometric model of a dynamic game can capture the strategic nature of countries’ environmental decisions as well. Second, a structural model enables us to estimate the impact of each state variable on the expected payoffs from environmental decisions; we therefore estimate parameters that have direct economic interpretations. Third, we can use the estimated parameters to simulate the effects of counterfactual scenarios and institutions on climate change policy, emissions, economic outcomes, and welfare.

Session 6 – Land Use

Tim Foreman (Columbia University) – “Dust Storm Impacts and Implications for Land Use Policy”

Abstract:

Mathias Iwanowsky (Stockholm University) – “Allocating property rights: Evidence from the Taylor Grazing Act”

Abstract: The Tragedy of the Commons predicts inefficient use of resources in the absence of defined property rights over common pool resources. One proposed solution is to centralize management of common pool resources. However, this practice fails when contracts are not enforceable, farmers cannot be excluded or quotas are set too high. Further, we have little to no empirical evidence on the consequences of changing property rights regimes for common pool resources. In this study, I use novel satellite imagery to evaluate the impact of the Taylor Grazing Act on land degradation, which restricted access to common pool resources in nine states, orthogonal to the interests of farmers.

Margaux Vinez (Paris School of Economics) – “Division of the Commons and Access to the Land on the Frontier: Lessons from the Colonial Legacy in the Democratic Republic of the Congo”

Abstract: What is the importance of colonial policies in shaping today's land tenure institutions and inequalities in access to land? This paper sheds light on this question by analyzing “*paysannat*”, a colonial intervention in the Belgian Congo attempting to push the evolution of the tenure system from communal toward private property rights. In the context of forced cultivation of cash crops, the Colony imposed the privatization of collectively owned land (forests or fallows) to individual farmers in some villages. Using spatial discontinuities of the implementation of *paysannat* and a unique combination of contemporary household survey data, geographic data, as well as historic data from both colonial records and contemporary oral history surveys, this paper shows that *paysannat* had a persistent impact on local land institutions through its impact on the privatization of collective land. We find that *paysannat* was successful in pushing toward the individualization of the commons, and that they had important distribution consequences between the clan groups.

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DAY 2 -- Saturday, April 22nd

Session 7 – Energy

Maryam Arbabzadeh (University of Michigan) – “Sustainability Assessment and Principles for Green Energy Storage Systems”, with Jeremiah Johnson, Shelie Miller and Gregory Keoleian

Abstract: Renewable energy development promises environmental improvements in the power sector. However, large-scale integration of variable renewables into the electrical grid poses critical challenges that may be overcome through energy storage deployment. New algorithms are required to design storage systems that will improve sustainability performance of the grid based on the renewable technology type, the existing generation mix, and electricity demand characteristics. My doctoral research seeks to develop integrative sustainability models and principles to guide development and deployment of storage technologies. I am applying life cycle assessment methods to evaluate environmental and economic sustainability performance of energy storage systems for both developed and developing economies.

Amanda Harker Steele (University of Georgia) – “*Gone with the Wind: The Unintended Consequences of Increasing the Capacity of Intermittent Renewable Resources Used for Electricity Generation*”, with Wesley Burnett

Abstract: Producing a steady supply of affordable, reliable electricity, while simultaneously using clean and safe available technology, is one of the most pressing issues of the current energy policy agenda in the United States. Over the past century, domestic electricity generation has been predominantly supplied by conventional fossil fuels such as coal and natural gas. Although these fossil fuels still dominate the market by accounting for 66% of overall electricity generated, variable energy resources (VERs) such as the wind and solar have steadily begun to saturate the market. The expansion of VERs has captured the attention of both foreign and domestic policy makers due to the environmental, health, and economic benefits associated with their development. Their ability to decrease CO₂ and other toxic greenhouse gas emissions, most commonly associated with traditional electricity production, is just one of the obstacles these resources help eliminate. However, the development of these resources is not without controversy. Electricity generation from VERs has been heavily scrutinized due to the unpredictable nature of the resources and lack of reliability they introduce into the system of production, transmission, and distribution of electricity. While most of the existing research surrounding VERs has been largely focused on the environmental and health benefits associated with their development little so far has been done to address the obvious operational challenges they pose for the electricity industry. In order to examine the unintended consequences of increasing the level of VERs generation into the power mix, this research analyzes utility level panel data filed via Form EIA-861 and Form EIA-923. Using a post-test only experimental framework, we test the hypothesis that increasing the amount of intermittent VERs generation will result in more disturbances on average at the utility level than conventional energy resources.

Susanna Berkouwer (UC Berkeley) – “Behavioral biases in household durables purchasing: Experimental evidence from charcoal and firewood access and usage”, with Joshua Dean

Abstract: We seek to understand how behavioral biases affect poor households’ decision making regarding the consumption and usage of a durable good with a high-cost energy input. While there is a substantial literature about how behavioral anomalies and failures of rationality—including self-control problems, incorrect beliefs, limited attention and flawed decision heuristics—contribute to the energy efficiency gap in the US (see for example Gillingham and Palmer (2014) for a review), very few of these behavioral theories relating to durables purchasing

and energy efficiency have been tested in a development setting. One might expect that since poorer consumers have more to lose from mistakes, they might be less susceptible to these biases. However, a large literature has looked at the psychology of decision-making among the poor, and finds that behavioral biases can be exacerbated by conditions associated with poverty such as increased stress or cognitive load (see Haushofer and Fehr (2014) for a review of the leading theories). This project will attempt to bridge these two literatures by examining how behavioral biases affecting durable purchase and energy savings might be exacerbated or attenuated in a developing setting.

Junfeng Zhang (Beihang University) – “Airline energy efficiency gap between China and America”, with Hong Fang, Mingshun Jia and Junjie Wu

Abstract: The development of Chinese and American airlines is evidence of the rise of the global aviation industry; this has also led to serious environmental concerns. This paper adopts a slacks-based measurement (SBM) model with undesirable outputs and the Malmquist-Luenberger (ML) productivity index to measure the energy efficiency and the productivity growth of American and Chinese airlines from 2011 to 2014. Then, factors influencing energy efficiency are explored using a Tobit model. Our results suggest that the average energy efficiency scores of American airlines are higher than those of Chinese airlines, and the energy efficiency gap between the two country’s airlines increased over the 2011-2014 period. Moreover, the productivity growth of Chinese and American airlines was underestimated if undesirable outputs were ignored. In addition, technical change was the main contributor to the productivity growth for Chinese airlines, while technical change and efficiency change together promoted the growth of TFP for American airlines. In addition, the fleet age of airlines in America was older than the fleet age of airlines in China, which is not conducive to the improvement of energy efficiency. Passengers per flight had a larger positive impact on the energy efficiency improvement of Chinese airlines, while haul distance and freight traffic had a positive impact on the energy efficiency improvement of American airlines. The average energy efficiency score of private airlines is higher than that of state-owned airlines.

Session 8 – Development

Midori Kaga (University of Ottawa) – “Can the Refugee Speak? Creating Space in Development-led Approaches for Refugee Agency and Voice”

Abstract: Globally, 16.1 million refugees under the United Nations High Commissioner for Refugees' (UNHCR) mandate are waiting for one of three durable solutions: repatriation, resettlement, or integration in a host country. In 2015, 86% of refugees were hosted in developing countries, most in cities, placing substantial strains on host communities and countries. Moreover, the average time refugees spend waiting for a durable solution is 20 years. Consequently, two-thirds of refugees are stuck in protracted refugee situations, unable to return home or establish a life in their country of asylum. This causes a loss of human potential, as refugees lack opportunities to build skills and assets that in the long-term will facilitate their settlement through one of the durable solutions. This can cause inter-generational chronic poverty for refugees, which has long-term consequences for the development and stability of entire countries.

Recent development-led refugee approaches aim to address these problems by building refugees’ capabilities, assets, and skills, expanding their economic opportunities and self reliance. However, we do not know how effectively these programs achieve their objectives. Further, it is unclear whether development-led approaches address known program gaps, namely: (a) recognizing refugees’ agency in forced displacement and refugee situations and (b) including refugees’ perspectives and needs in short/long-term planning.

Historical responses to refugee situations involve programs where refugees are always represented and spoken for, often for separate political reasons. Yet, recent refugee movements– from rural/camp to urban settings, onward movements to secondary countries of asylum, splitting of refugee households between locations– reveal refugees’ agency through their own search for solutions.

My research examines how current development-led approaches in Beirut (Lebanon) consider refugees’ agency, and how this impacts efforts to improve refugees’ livelihoods and well-being. Findings of my research will strengthen policies and programs implemented by UNHCR, NGOs and host governments, by demonstrating how including refugees as agents contributes to durable solutions, with potential applicability to other protracted refugee situations.

Hanna Mühlrad (University of Gothenburg) – “The Impact of Abortion Legalization on Fertility And Female Empowerment: New Evidence From Mexico”, with xxxxx

Abstract: We examine the effect of a large-scale, free, elective abortion program implemented in Mexico City in 2007. This reform resulted in a sharp increase in the request and use of early term elective abortions: approximately 90,000 abortions were administered by public health providers in the four years following the reform, versus only 62 in the five years preceding the reform. We document, firstly, that this localised reform resulted in a legislative backlash in 18 other Mexican states which constitutionally altered penal codes to increase sanctions on abortions. We take advantage of this dual policy environment to estimate the effect of progressive and regressive abortion reform on fertility and women's empowerment. Using administrative birth data we find that progressive abortion laws reduce rates of childbearing, particularly among young women. Additionally, the reform is found to increase women's role in household decision making—an empowerment result in line with economic theory and empirical results from a developed-country setting. We however find little evidence to suggest that the resulting regressive changes to penal codes have had an inverse result over the time-period studied. In turning to mechanisms, evidence from a panel of women suggests that results are directly driven by increased access to abortion, rather than changes in sexual behaviour, contraceptive use or contraceptive knowledge.

Ruinan Liu (Columbia University) – “How much is air pollution costing China? Evidence from Huai River”

Abstract: This paper's finding suggests that 1 microgram per cubic meter increase in PM2.5 leads to \$169 [95% CI: -321, -24] decrease in annual GDP per capita in China, measured in 2010 U.S. dollars, which translates into \$71 billion dollars loss in total annual GDP for all the major cities in Northern China. The identification was made based on China's Huai River policy, which arbitrarily increased the air pollution level in Northern China because it provides coal-powered winter heating to the cities on the north of Huai River but not to the cities on the south of the river. The results suggest that there are concretely measurable dollar to dollar trade-offs between pollution abatement and economic welfare, possibly through the channel of labor productivity impact, which has been largely ignored by policy makers so far.

Andrew Fang (University of Minnesota) – “Maximizing Health Co-Benefits of Climate Policy at the City-Scale: Case Study of Jiangsu Province”, with Raj Lal, Armistead Russell and Anu Ramaswami

Abstract: Previous work has highlighted the relationship between air quality and greenhouse gas (GHG) emissions but has struggled to incorporate air quality co-benefits into optimal GHG reduction scenarios due to the complexity involved in integrating carbon and health impacts across different spatial and temporal scales. Climate policy models that quantify the benefits of carbon mitigation have generally minimized costs instead of maximizing health benefits. Furthermore, most studies that have been successful in determining health implications of various GHG reduction strategies focus on a global or national scale, with few studies addressing the local air pollution co-benefits of carbon mitigation at the urban scale.

Chinese cities, in particular, are seeking to improve air quality by reducing PM2.5 concentrations, while also reducing GHG emissions. Utilizing a model that addresses carbon emissions and air pollution dispersion at the city-scale, this study explores the health benefits of air pollution and carbon mitigation policy to determine which policies are most effective at maximizing health benefits through reductions in PM2.5 related premature mortality. The model is uniquely effective in that it identifies in- and transboundary carbon and PM2.5 emissions from energy-related infrastructure activity while quantifying the health benefits of air quality improvement through air pollution dispersion modeling, allowing for the analysis of the health impacts of urban emission reduction policies.

A framework is developed to explore interactions between carbon and PM2.5 emissions, concentration, and health in cities in the Jiangsu Province in China. Policies targeting fossil fuel use reductions, air pollution control, and the combination of the two are modeled to determine which combinations of policy maximize health benefits while minimizing costs. In order to address potential impacts on local air quality, interventions are distinguished between urban and regional actions and by sector (residential, commercial, industrial, transportation). Policies are evaluated for cost effectiveness based on number of premature deaths avoided, cost per life saved, and net social benefit.

Session 9 – *Industrial Organization*

Yuan Chen (UC Davis) – “Modeling Supply and Demand in the Chinese Automobile Industry”, with: C.-Y. Cynthia Lin Lawell, Erich J. Muehlegger, Yunshi Wang and James E. Wilen

Abstract: China is experiencing rapid economic growth and, along with it, rapid growth in vehicle ownership. The rapid growth in vehicle ownership and vehicle usage is linked to increasing global warming, emissions, air pollution, and other problems. We analyze the supply and demand for automobiles in China, and the effects of government policy on the supply and demand for alternative vehicles. To do so, we develop and estimate a structural econometric model of a mixed oligopolistic differentiated products market that allows different consumers to vary in how much they like different car characteristics on the demand side and that allows state-owned automobile companies to have different objectives than private automobile companies on the supply side. We apply our model to a comprehensive data set on the sales, prices, and characteristics of the majority of vehicle makes and models in China, including electric vehicles, hybrid vehicles, and alternative-fueled vehicles. The parameters we estimate enable us to better understand what factors affect the demand and cost of vehicles in China, and how consumers in China trade off various vehicle characteristics (such as fuel efficiency, whether the vehicle is an electric vehicle, etc.) with each other and with price. We will use the model to simulate the demand and cost for new vehicles, and also the effects of various government policies on demand and cost.

Our research is significant for industry, government, society, academia, and NGOs. Our model of the demand and cost in the Chinese automobile market will be significant for industry, particularly car manufacturers interested in better targeting cars, including alternative vehicles, for the Chinese market. Our estimates of the factors that affect demand and supply in the Chinese automobile market is significant for policy-makers interested in developing incentive policies to increase market penetration of alternative vehicles with potential environmental and climate benefits.

Khaled Kheiravar (UC Davis) – “Modeling the Dynamic Game Among Oil and Gas Producers”, with C.-Y. Cynthia Lin Lawell, James B. Bushnell, Amy Myers Jaffe and Erich J. Muehlegger

Abstract: In this paper, we develop and estimate a structural econometric model of the dynamic game among petroleum-producing firms. We use the structural econometric model to analyze the effects of government policies, changing geopolitical landscapes, and new technologies on the petroleum industry.

Our research will enable us to better understand how government policies, such as a carbon tax and production quotas; changing geopolitical landscapes, such as the privatization of state-owned oil companies, changes in OPEC policy, and increased costs of mergers; and disruptive technologies, such as shale oil and gas, and new batteries for electric vehicles, impact future business models, the competition of fuels, and the composition of future energy demand. Our research will enable us to analyze how industry will respond to regulatory and/or societal demands for reduced greenhouse gas emissions and improved environmental quality. Our model will also enable us to examine how the oil industry might transition to more sustainable fuels. A better understanding of the oil and gas industry, and of how government policies, changing geopolitical landscapes, and new technologies affect the petroleum industry will enable us to better understand what is required for early alternative fuel transitions to succeed. Our modeling outcomes can be used to help inform decision-making and policy design.

The results of our research will be of interest to academics, policy-makers, entrepreneurs, and business practitioners, including oil companies, alike. This model will also help petroleum firms better respond to government policies, and will help policymakers better design sustainable energy policies.

Xueting Wang (Columbia University) – “Electricity market response to wind power: Evidence from Texas ERCOT”

Abstract:

Session 10 – *Food Security*

Anaïs Goburdhun (École Polytechnique) – “Spatial Correlation among Maize Markets in Tanzania: a Risk Analysis”

Abstract: This paper models the correlation between maize markets across Tanzania in order to evaluate the benefit of pooling the risk to design a risk sharing mechanism such as a revenue insurance at the national level at an affordable cost. To this end, we employ a Copula-GARCH model on prices, and we add a meteorological component to evaluate the impact of rainfall on local prices. Our results show that the correlation is weak enough to expect the insurance premium to be much lower by pooling the risk rather than implementing several regional insurances. Given the differences in terms of climatic conditions and production levels across Tanzania, pooling only two regions from two different areas can be efficient to diversify the risk and decrease the premium price.

Ehsan Najafi (City College of New York) – TBA

Abstract:

Drew Gower (Princeton University) – “Forecasting the impact of climate change on community water project growth and household food security in Laikipia, Kenya”, with Kelly Caylor

Abstract: Community water projects (CWPs) in the Laikipia region of Central Kenya distribute river water for irrigation to smallholder farmers who otherwise lack access to municipal systems or private water sources. Participating farmers are better able to withstand climatic conditions commonly found in drylands, including high potential evapotranspiration combined with low and variable rainfall. To provide these benefits, however, CWPs must be able to deliver water in sufficient quantities and with sufficient regularity to all farmers in the network. Factors such as variable river flow, aging infrastructure and increasing membership pose challenges to the CWP management in fulfilling this task.

During the dry season, river levels typically decline, reducing water available for CWPs and increasing the importance of intake position within the catchment. CWPs with intakes in upstream areas have first access to river water, making downstream farmers dependent on upstream consumption. Such conditions have pushed CWPs to jointly regulate their water consumption by setting withdrawal limits and coordinating withdrawal schedules with one another. Regulations also ensure that river water is not completely consumed by CWPs, allowing some flow to exit the catchment for human or environmental reasons.

This paper uses a simple numerical model to calculate the environmental and food-security impacts of multiple CWP along the same section of river. In the model, the CWPs provide water to a variable number of farmers in exchange for membership fees while farmers must grow sufficient crops to feed themselves and pay fees. The model shows that, under conditions similar to those in Laikipia, CWPs can consistently provide adequate benefits to its members with specific regulations in place. Otherwise, the economic benefits of CWP membership will gradually fall below the cost of membership, thus leading to a tragedy of the commons type scenario. This result may help in developing recommendations as to how CWP can be managed in similar areas.

Session 11 – *Health*

Ying Chen (London School of Economics) – “Cholera in Times of Floods. Weather shocks and health impacts in Dar es Salaam.”, with Nathalie Picarelli and Pascal Jaupart

Abstract: Despite a large economics literature that has looked at weather shocks on health issues, there is limited evidence on the health impacts of extreme weather events such as heavy rains and flooding within urban areas. This paper addresses this gap by estimating the effect of precipitation, flooding and relatedly infrastructure (such as drains, water wells and sewage provision) on the incidence of cholera within Dar es Salaam. The city is Tanzania’s largest city and one of the fastest growing cities in sub-Saharan Africa. Today more than 70% of its population lives in informal areas, and urban infrastructure is insufficient. Cholera is endemic to Tanzania and both flood episodes and heavy rains have been linked to past outbreaks in Dar es Salaam. This paper uses cholera cases at the ward level, infrastructure data from recently updated Open Street Map sources, satellite precipitation data and flooding projections to estimate a panel fixed-effects model at the ward and week levels for the period 2015-2016.

Preliminary findings suggest a 10% increase in precipitation increases cholera cases by 4.5% in a given week and ward. Flood events increase cholera incidence by almost 0.69 cases per week in a given ward.

Jaehyun Jung (Columbia University) – “Weather Shocks and Sex-selective Abortion: Evidence from Rural Vietnam”

Abstract: Negative weather shocks have various detrimental impacts on credit-constrained rural households in developing countries. Coupled with son preference, it could lead to excess female infant mortality in the short run and also worse adult female outcomes in the long run. With widely available sex-selection technologies, parents now can make simultaneous decisions on quantity and sex of child, by substituting away from postnatal discriminations against female infants. In this project, I investigate a household’s decisions on fertility and a child’s gender by exploiting exogenous variations in rainfall across years within a detailed geographic unit in rural Vietnam. Those decisions can be directly observed by using rare household-level datasets on prenatal sex determinations and abortions. I preliminarily find 46% increase in the abortion rate after negative rainfall shocks, and it is mostly due to mothers who already have at least one son in previous births. There is no change in the aggregate-level sex ratio at birth, but sonless mothers are less likely to give birth to a boy after negative rainfall shocks. I am currently examining how income and the opportunity cost of parental time change after rainfall shocks, which are two underlying mechanisms to explain these results.

Session 12 – *Agriculture*

Tamma Carleton (UC Berkeley) – “Subsidizing drawdown: Distortions to agricultural markets and the use of global freshwater resources”

Abstract: Global demands on freshwater resources are rising as populations continue to grow, diets shift, and anthropogenic climate change lowers aquifer recharge rates while redistributing supply. Many policy challenges affecting water usage, such as ensuring stable food supply despite falling water tables, inherently cross national borders. However, partly due to data constraints, most research on water resource management is local in nature. In this prospectus, I use a novel, globally-comprehensive, satellite-based measure of total water storage to ask how the policies that currently shape agriculture, society’s most water-demanding enterprise, affect freshwater resources. I find that distortions that raise domestic agricultural producer prices significantly damage local water availability, particularly for water-intensive crops and in the locations most suitable for those crops. I show that the effects of these political levers are comparable in magnitude to other hypothesized drivers of water loss, such as climate and total economic activity, as measured by night lights. I motivate these reduced-form estimates with a theoretical framework that accounts for spatial heterogeneity in agricultural production, generating testable hypotheses that link directly to the data.

Anil Bhattarai (University of Toronto) – “Seeing Like a Farmer: A Methodology for Exploring the Emergence, Spread, and Challenges of Ecological Farming in the Global South”

Abstract: Using Indonesia Family Life Survey (IFLS) waves 4 and 5, we study the causal effects of education on patience. We use INPRES primary school construction program between 1973/4 and 1978, one of the biggest school construction programs till date, to instrument for completed years of schooling. The local average treatment effect of the program is around 14 percent point increase in time preference of women for every extra year of completed formal school grade. The impact of education on time preference of males is statistically insignificant. We check the robustness of our findings using household fixed effect (FE), and individual FE specifications and find consistent results. The magnitudes for the FE specifications, however, are much smaller, in the range of 1-2 percent point increase in patience for every extra year of completed school. Our analysis suggest that cognition, as measured by Raven’s test scores, income earned and risk aversion are the plausible channels through which education affects patience. Education seems to make people more patient by making them more cognitively active, richer and risk averse.

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