Eugene TAN Perk Han

Columbia University
School of International and Public Affairs
420 W 118th Street, New York NY
United States of America

Phone: +1 (631) 746-5004
Email: eugene.tan@columbia.edu
GitHub: www.github.com/taneugene

Research Statement

I am an applied microeconomist specializing in the study of energy, technology, and firms, primarily in developing countries. My research utilizes tools from industrial organization, spatial analysis, big data, and network economics. I am interested in understanding consumer and firm behavior, and designing public policies that take these factors into account. My current research focuses on policies for electricity access in Sub-Saharan Africa, the impact of carbon taxes on supply chains and fossil fuel producers, and methods for estimating a firm's internal production network.

Research in Progress

Balancing Climate and Industrial Objectives when Pricing Dirty Upstream Goods

Private Enterprise Development in Low-Income Countries
3rd Special ERG Call on Climate Change Research Funding (22000GBP)

Most upstream goods are dirty, and most industrial emissions are upstream. A Pigouvian logic would tax dirty goods to internalize their negative externalities, whereas industrial economists have advocated for subsidies on upstream goods to fix accumulated quantity distortions in vertically integrated supply chains. Should we subsidize or tax dirty upstream goods? While 'direct' abatement and leakage occur through the adoption of green or abatement technologies and relocation, respectively, the 'indirect' effects of carbon pricing depend on the microeconomic responses of buyers exposed to regulated suppliers. Buyers can choose to substitute towards green suppliers (indirect abatement), source from foreign suppliers (indirect leakage), pass through costs down their supply chain, or exit. Pass-through and exit propagate the regulatory costs downstream, creating the same choice for downstream producers. If indirect abatement is minimal and pass-through dominates, carbon pricing may function as a de-facto negative industrial policy. Using novel production network data, I analyze the effects of EU-ETS price shocks on buyer substitution and cost pass-through. The behavior of buyers in a production network tends to raise the social costs and reduce the social benefits of regulation. In a second-best world, climate policy should be designed with market imperfections in mind.

Connection Policy Design for Electricity Access

with Gabriel Gonzalez Sutil, Vijay Modi, and Joel Mugyenyi
International Growth Center Travel Grant (3000USD)

Sub-Saharan utilities and governments have employed policies to promote electricity access that differ from those of utilities elsewhere. First, instead of a flat-rate connection charge based on connection sizes, Sub-Saharan utilities have used distance-based connection charges based on a marginal cost logic. We show that distance-based connection charges create strategic incentives for electricity adoption, even with just two households. The first to connect pays more to extend the grid, while the second mover benefits from a lower cost after expansion. This positive externality slows the adoption of electricity but also induces a cross-subsidy from the richer first mover to the poorer second mover. The network is also more efficiently allocated over space in equilibrium. Second, we observe that credit is unusually often paid through consumption tariffs rather than fixed installments. We argue that it affects prices, and it induces substitution from electricity. Even as repayment is decreased, this can counterintuitively increase utility profits, as most Sub-Saharan utilities have consumption tariffs below marginal cost. By reducing enforcement costs, it also allows the utility to give more generous credit. Finally, governments can choose to delineate areas for on-grid and off-grid electricity spatially. This diffuses the spatial extent of electricity coverage that off-grid Private companies and the public utility can provide together at the cost of consumer choice within an area. We use a case study of Rwanda to examine

these tradeoffs in connection with policies that address all three. We find that distance-based connection charges are responsible for at least 40% of the rural electricity Access in Rwanda, and credit policies were responsible for a .7x increase in electricity access since 2017.

The Impact of Carbon Taxes on the Value of Fossil Fuel Resources
with William Nordhaus

The present study analyzes the impact of carbon pricing, along with other policies, on the value of fossil fuel resources, CO2 emissions, and economic welfare. It employs a model based on the Hotelling analysis of resource values and calibrates this approach to data on fossil resources, costs, demands, and CO2 emissions. Total fossil-fuel resource rents are estimated to be $17 trillion (2015 US$) without carbon pricing. Fossil fuel rents decline in aggregate due to pricing, but aggregate revenues only start to decline above 50$/tCO2s. The value of fossil fuel assets is non-monotonic and heterogeneous. Some low-emissions fossil fuel producers initially benefit from carbon taxation if substitution toward them outweighs substitution away from them. The study also shows that other policies, such as those involving subsidies for renewable energy, are very inefficient and poor substitutes for carbon pricing.

Embedded Carbon and Production Networks

Can we measure embedded emissions without direct firm disclosure? Firm disclosure of scope 3 emissions is difficult because firms typically know only a small fraction of the emissions of their indirect suppliers, because suppliers see their suppliers and technologies as part of their comparative advantage. We develop an algorithm to estimate an intra-facility production from firm inputs and outputs based on graphical matching to technology databases, drawing from an old literature on technology-based models of the firm. We estimate life-cycle emissions from production network data, and show implications for embedded carbon based policies.

Publications

Brandt, A. R., Y. Sun, S. Bharadwaj, D. Livingston, **E. Tan,** and D. Gordon (2015). Energy return on investment for forty global oilfields using a detailed engineering-based model of oil production. *PloS ONE*, 10(12).

Gordon, D., **E.P.H. Tan**, and J. Feldman (2016). Changing Oils, Changing Management. *Journal of Industrial Ecology*, 20(4), 673-675.

Livingston, D. and **E. Tan,** (2015) Shale's True Contribution to the Oil Market. *Carnegie Papers (not peer-reviewed).*

Gordon, D., **E. Tan,** and K. Garner (2015) The Abundance of Oils in the Water Stressed Rockies. *Carnegie Papers (not peer-reviewed).*

Education

Columbia University, School of International and Public Affairs

Doctoral Candidate

Sustainable Development PhD

References:

Scott Barrett sb3118@columbia.edu

Eric Verhoogen eric.verhoogen@columbia.edu

Daniel Björkegren dan.bjork@columbia.edu

Master of Philosophy

Master of Arts

Yale University, School of Forestry and Environmental Studies

Master of Environmental Science

Environmental and Natural Resource Economics

Colorado College
Bachelor of Arts
Environmental Science with Chemistry

London School of Economics and Political Science
General Course (Study Abroad)

Conference Presentations

2024:
SusDever (Columbia SIPA)

2023:
Northeast Workshop on Energy Policy and Environmental Economics (Cornell)
AERE@Eastern Economic Association

2022:
Heartland Environmental and Resource Economics Workshop (UIUC)

Teaching

Columbia University
Instructor
Economics of Energy (Spring 2023)
Extraordinary Teaching Award, SIPA Energy and Environment Concentration

Teaching Assistant
Climate Change Politics and Diplomacy (Barrett, Fall 2023)
Economics of Energy (Druckenmiller, Spring 2022)
Intermediate Microeconomics (Musatti, Spring 2021)
Empirical Analysis of Energy Markets (Mercadal, Fall 2020)

Yale University
Teaching Fellow
Ordinary and Partial Differential Equations with Applications (Benett, Fall 2018).
Ordinary and Partial Differential Equations (Rolf, Fall 2017).

Colorado College Environmental Program
Teaching Assistant
Air: Atmospheric Chemistry and Physics (Drossman and Whitten, Spring 2014).
Energy: Energetics and Thermodynamics (Whitten Fall, 2013).

Employment

World Bank, Global Facility for Disaster Reduction and Recovery (Jan-August 2019)
Data Science and Economics Short-Term Consultant

- Building tools to assess climate change resilience using Living Standards Measurement Study (LSMS) data, contributing to the Unbreakable report.

Center for Applied Data Science (April 2016 – May 2018)
Lead Instructor, Enterprise Data Science
- Led and taught three 42-day courses for Business Intelligence teams within enterprises across Asia; each covered about 2 semesters of content.

Carnegie Endowment for International Peace (August 2014 – August 2015)
Junior Fellow, Energy and Climate Program.
- Provided research assistance for David Livingston and Deborah Gordon
- Compiled and of the Oil-Climate Index

Non-Research Honors

Fellowships

Junior Fellowship, Carnegie Endowment for International Peace (2014-2015)
Perdana Fellowship, Government of Malaysia (2013)

Scholarships

Davis UWC Scholarship, Davis UWC Scholars Program (2010-2014)

Funding

President's Special Projects Fund, Colorado College, 2012
Selig International Study Fund, Colorado College, 2012

Service and Leadership

Lead Organizer, SusDever at Columbia SIPA, 2024.
Organization Committee, Interdisciplinary PhD Workshop in Sustainable Development, Columbia SIPA, 2023.
PhD Student Committee, Columbia University 2021-2022.
Producer, Carnegie International Nuclear Policy Conference, Carnegie Endowment for International Peace 2015.
Interim Chairman, United World College Malaysian Alumni Association 2014-2015.
Board Member, United World College Malaysian Alumni Association 2014-2015.
Student Representative, Colorado College Committee on Instruction, 2013-2014.
Student Representative, Colorado College Committee on Library Renovation, 2013-2014.
Special Officer to the Minister of Energy, Green Technology, and Water, Malaysia 2013.
Government Transformation Programme Intern, Urban Public Transport National Key Result Area, Office of the Prime Minister, Malaysia 2012.

Computational Skills

Programming Languages: Python, JavaScript, Spark
Other Computational Languages: GAMS, SQL
Geospatial: GeoPandas, GDAL/OGR, Google Earth Engine.
Statistical: Stata, R.
Writing: LaTeX