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HARVARD UNIVERSITY

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Undergraduate and Master's Studies:

B.A. in History, Yale University, 2012
Magna Cum Laude, Phi Beta Kappa

M.Phil. in Economic History, University of Cambridge, 2013
With Distinction

Graduate Studies:

Harvard University, 2016 to present
Ph.D. Candidate in Political Economy and Government (Economics Track)
Thesis Title: "Essays in Environmental Economics"
Expected Completion Date: May 2022

References:

Professor James Stock
Harvard University
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Professor Edward Glaeser
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Professor of the Practice Joseph Aldy
Harvard Kennedy School
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Teaching Reference:

Senior Lecturer Henry Lee
Harvard Kennedy School
Phone: 617-495-1350
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Teaching and Research Fields:

Primary fields: Environmental Economics, Industrial Organization

Secondary fields: Public Economics

Teaching Experience:

Fall 2018, 2019	The Energy-Climate Challenge, Harvard Kennedy School Teaching Fellow for Professor John Holdren and Senior Lecturer Henry Lee
Spring 2019	The Economics of Cities, Harvard College Teaching Fellow for Professor Edward Glaeser and Lecturer Denise DiPasquale

Research Experience and Other Employment:

2020	Impact Fellow, Prime Coalition
2017-2018	Research Assistant to Joseph Aldy, Harvard Kennedy School
2016	Research Assistant to Christopher Knittel, MIT Sloan School of Management
2015	Research Assistant to Robert Pindyck, MIT Sloan School of Management
2014-2016	Associate, Industrial Economics, Inc.
2013	Research Assistant to Sheilagh Ogilvie, Faculty of Economics, University of Cambridge

Honors, Scholarships, and Fellowships:

2020-2022	NBER Pre-Doctoral Fellowship in Energy Economics
2019-2020	Joseph Crump Fellowship
2019	Lab for Economic Applications and Policy Research Grant (with Frank Pinter)
2018	Vicky Norberg-Bohm Fellowship
2018, 2019	Distinction in Student Teaching, Harvard Kennedy School
2016-2022	Pre-Doctoral Fellow, Harvard Environmental Economics Program
2012-2013	Gates Cambridge Scholarship

Professional Activities:

Presentations (including upcoming):

2022	NBER Workshop on Economics of Innovation in the Energy Sector
2021	Association of Environmental and Resource Economists Summer Conference; European Association of Environmental and Resource Economists Summer Conference – egg timer; Empirical Methods in Environmental Economics Summer Workshop
2020	Harvard University Environmental Economics Seminar; European Association of Environmental and Resource Economists Summer Conference; NBER Environment and Energy Program Spring Meeting; University of California, Berkeley, Advanced Workshop in Climate Economics; Allied Social Science Associations Annual Meeting, Paper Session on Carbon Tax Policy
2019	Harvard Kennedy School Energy Policy Seminar; Northeast Workshop on Energy Policy and Environmental Economics – egg timer; Association of Environmental and Resource Economists Summer Conference

Refereeing: *Quarterly Journal of Economics, Journal of Urban Economics, Climate Policy*

Job Market Paper:

"Technology Transitions and the Timing of Environmental Policy: Evidence from Efficient Lighting"

How does supporting early clean technologies affect the long-run transition away from dirty technologies? Early policy action generates immediate environmental benefits from increased adoption of available efficient products, but may result in intertemporal substitution away from later efficient

products with greater potential for reducing externalities. I examine how standards and subsidies supporting early advancements in lighting efficiency (halogens, CFLs) impacted the adoption of later products with higher efficiency (LEDs). I estimate a model of residential lighting demand, using structural methods derived from dynamic models to capture how the market size and distribution of consumer heterogeneity depended endogenously on the history of past purchases. Counterfactual simulations suggest that delaying the implementation of standards from 2012 to 2018 would result in 36 percent greater LED sales over this period, while delaying the phase-out of CFL subsidies from 2012 to 2018 would result in 20 percent fewer LEDs sold. However, across a range of specifications, I find that environmental benefits from early policy action outweigh the environmental cost of reduced LEDs adoption; the overall environmental externality is minimized when standards are implemented in 2012 and CFL subsidies are phased-out in 2014. Sensitivity analyses around alternative technology lifetimes, externalities, and innovation responses identify conditions under which early policy intervention would be counterproductive.

Publications:

"The Cost-Effectiveness Implications of Carbon Price Certainty" (with Joseph Aldy)
AEA Papers and Proceedings, 110 (2020): 113-18.

While a firm knows the carbon price with certainty under a tax, it must form an expectation about future allowance prices to identify its cost-effective abatement investment under a cap-and-trade program. We illustrate graphically how errors in forming this expectation increase the costs of irreversible pollution abatement investment under cap-and-trade relative to a tax. We describe empirical "cost-effectiveness anomalies" in allowance markets that may be attributed to cap-and-trade's inherent uncertainty. We model investment under simulated US carbon tax and cap-and-trade policies and find that allowance price uncertainty can increase resource costs 20 percent for a given quantity of emission abatement.

Research Papers:

"The Welfare Implications of Carbon Price Certainty" (with Joseph Aldy)
Revisions requested at *Journal of the Association of Environmental and Resource Economists*

Experiences in real-world pollution markets suggest that firms make persistent errors in forecasting allowance and credit prices that inform their investment decisions. The residual uncertainty characterizing allowance and credit trading means that pollution markets may fail to deliver cost-effective abatement. This contrasts with price-based policies under which firms make investments that equate marginal abatement cost to an emission tax. We show how the additional cost of forecast errors under quantity-based programs can be incorporated into a standard Weitzman-style prices versus quantity framework. We distinguish between individual firms' uncertainty over competitors' private information and systemic uncertainty over future cost shocks. We show that a welfare-maximizing regulator would favor price instruments in response to the prospect of firm-specific forecast errors under quantity instruments, ceteris paribus, and the relative net benefit of price instruments increases with the variance of the forecast errors. Given strong regulatory revealed preference for quantity-based instruments, we also discuss the role of policy design, such as incorporating price collars, in mitigating the cost-inefficiencies of price forecast errors.

"Regulatory Mandates and Electric Vehicle Product Variety" (with Frank Pinter – his job market paper)

Should policies to encourage new types of products operate on the supply side of the market, using regulations and mandates, or the demand side, using consumer incentives? We study an important supply-side policy in the early electric vehicle industry: the zero-emission vehicle mandate in California and nine other states. Focusing on the 2009-17 period, we examine the interaction between two channels that may cause supply-side and demand-side policies to differ: imperfect competition with differentiated products and endogenous product entry. After showing that firms internalized most of the social benefit of entry under the mandate, we evaluate a counterfactual policy that replaces the mandate with a

demand-side subsidy and tax regime. Holding fixed the regulator's stated target (electric vehicle sales in regulated states), the demand-side policy generates a wider gap between private entry incentives and social welfare, decreasing product variety. Consumer surplus and variable profit are both lower under the demand-side policy, but producers gain by avoiding entry costs.

Community Engagement:

2019-2020	Co-Organizer, Environmental Economics Graduate Research Workshop (Harvard Economics Department & Harvard Kennedy School)
2018-2019	Chair, Professional Development Committee, Graduate Economics Association (Harvard Economics Department)
2017-2019	Peer Mentor (Harvard Economics Department)
2017-2018	Participant, Graduate Consortium on Energy and Environment (Harvard University)
2014-2021	Volunteer Mentor & Tutor for High School Students (Minds Matter Boston & Enroot Cambridge)

Skills:

Data: Stata, Matlab, R, Python
Languages: English (native), French (proficient), Spanish (basic)

Last Updated: October 21, 2021