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Undergraduate Studies:
BA, Philosophy, Politics and Economics (PPE), Oxford University, First Class, 2010

Graduate Studies:
Harvard University, 2013 to present
Ph.D. Candidate in Political Economy and Government
Thesis Title: "*Essays on Empirical Banking and Misallocation*"
Expected Completion Date: June 2018

Oxford University, Nuffield College, 2010-2012
M.Phil. Economics, Distinction

References:

Professor Jeremy Stein
Department of Economics, Harvard University
617-495-6455, jeremy_stein@harvard.edu

Professor Gita Gopinath
Department of Economics, Harvard University
617-495-8161, gopinath@harvard.edu

Professor Adi Sunderam
Harvard Business School
617-495-6644, asunderam@hbs.edu

Professor Matteo Maggiori
Department of Economics, Harvard University
617-496-2614, maggiori@fas.harvard.edu

Teaching and Research Fields:
Primary fields: Financial Economics, Corporate Finance
Secondary field: Macroeconomics

Teaching Experience:

Spring, 2017	Corporate Finance and Banking (2nd year PhD class), Harvard, teaching fellow for Professors Sam Hanson and Adi Sunderam.
Spring, 2016	Corporate Finance and Banking (2nd year PhD class), Harvard, teaching fellow for Professors David Scharfstein and Jeremy Stein.

Spring, 2016	International Finance (2^{nd} year PhD class), Harvard, teaching fellow for Professor Gita Gopinath.
Fall, 2016	Empirical Macroeconomics (2^{nd} year PhD class), Harvard, teaching fellow for Professor Gabriel Chodorow-Reich.

Research Experience and Other Employment:

2015 to present	Bank of Portugal, Visiting Researcher
2012	International Monetary Fund, Intern

Honors, Scholarships, and Fellowships:

2017	Lamfalussy Fellowship, European Central Bank
2017	Research Grant, Institute for Quantitative Social Science
2016,'17	Harvard University Certificate of Distinction in Teaching
2016	Macro Financial Modeling Fellowship, Becker Friedman Institute
2015	Research Grant, Lab for Economic Applications and Policy
2015	GSAS Summer Predissertation Fellowship, Harvard
2015	Research Grant, Hirtle Callaghan Fund
2014	PhD Fellowship, German National Merit Foundation
2013	ERP Fellowship, German Federal Ministry of Economics and Technology

Research Papers:

"*When Losses Turn into Loans: The Cost of Undercapitalized Banks*" (Job Market Paper)
(with Luisa Farinha and Francisca Rebelo), 2017

We provide evidence that banks hit with a negative shock to capital adequacy inefficiently reallocate credit and that this credit reallocation contributes to the misallocation of capital. A regulatory intervention by the European Banking Authority in 2011 provides a natural experiment that unexpectedly increased capital requirements for a subset of banks. Using administrative data from the Bank of Portugal, we show that exposed banks cut back on credit for all but a subset of financially distressed firms for which banks had been underreporting incurred loan losses. We argue that the credit allocation to these underreported firms is consistent with two perverse lending incentives. First, banks roll over loans to distressed firms with underreported losses to avoid realizing a large loss in case of firm insolvency. Second, undercapitalized banks gamble for the resurrection of distressed borrowers and underreport losses to avoid regulatory scrutiny of risky loans. We develop a method to back out the underreporting of loan losses using detailed loan-level data. We then show that the credit reallocation affects firm-level investment and employment. A partial equilibrium estimate suggests that the credit reallocation accounts for close to 20% of the decline in productivity in this period.

"*What Did 1 Trillion Euros Buy Us? Evidence on the Real Effects of Quantitative Easing in Europe*"
(with Luisa Farinha and Gil Nogueira), 2017

This paper studies the transmission channels of the European Central Bank's (ECB) asset purchase programs via the banking sector using proprietary data from the Bank of Portugal. Banks that hold larger amounts of assets eligible for ECB purchase prior to announcement of the programs realize trading profits from selling these assets following the announcement. Banks use most of these gains to increase their cash holdings. We find a moderate positive effect on loan approval rates for new corporate borrowers, which is stronger for riskier borrowers. There is no evidence that banks offer lower interest rates or provide additional loans to existing customers. We investigate two additional channels. The ECB's purchase of covered bonds, a popular funding instrument for banks, does not spur the origination of covered bonds. Similarly, the ECB's purchase of asset-backed securities (ABS) does not lead banks with pre-existing issuance technology to issue more ABS nor to originate more loans that are ABS-eligible. Our results suggest that the pass-through of asset purchase programs to lending conditions may occur through channels other than bank balance sheets.

"*Debt or Demand: Which Holds Investment Back? Evidence from an Investment Tax Credit*"
(with Luisa Farinha and Francisca Rebelo), 2017

We study how debt frictions and demand affect corporate investment using administrative data from a large temporary investment tax credit in Portugal. We obtain exogenous variation in demand for exporting firms from product-destination-level changes in foreign demand. We proxy debt frictions by an index of different debt-earnings ratios. We find that debt has a strong, non-linear effect on the likelihood that a firm invests in response to the tax credit. Firms in the lower two quartiles of the debt-earnings index have roughly equal predicted take-up probabilities. For firms in the third quartile predicted take-up drops by 50% while firms in the worst debt-earnings quartile have a predicted take-up rate close to zero. We also find important interactions between debt and demand. For firms in the lowest debt-earnings quartile, demand has a highly significant positive effect with a 10% increase in predicted demand leading to a 9 p.p. higher take-up probability. In contrast, for firms in the worst debt-earnings quartile, demand ceases to have a significant impact on take-up. OLS attenuates the effects of demand by a factor of three. These results highlight the limit of panel regressions that only allow for a linear effect of debt on investment, do not instrument for demand, and do not allow for an interaction between demand and debt.

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Personal Information: Date of birth: April 3, 1987; Citizenship: U.S.A.

Undergraduate and Prior Studies:
B.A. Economics and Mathematics, Columbia University, *summa cum laude*, 2009
M.A. Statistics, Columbia University, 2012

Graduate Studies:
Harvard University, 2012 to present
Ph.D. Candidate in Business Economics
Thesis Title: Essays in Banking and Corporate Finance
Expected Completion Date: June 2018

References:

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Professor Victoria Ivashina
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Professor Adi Sunderam
Harvard Business School, Baker Library
617-495-6644, asunderam@hbs.edu

Teaching and Research Fields:
Primary fields: Corporate Finance, Financial Intermediation

Secondary fields: Consumer Finance

Teaching Experience:
Spring 2015, 2016 — Econ 970, “Economics of Risk and Uncertainty,” Harvard University
Main Instructor (designed and taught sophomore tutorial)

Other Employment:
2009-2012 — Federal Reserve Bank of New York, Research Associate, Assistant Economist, and Economist Level C

Honors, Scholarships, and Fellowships:

2012-2018	Graduate School of Arts and Sciences Fellowship, Harvard University
2015, 2016	Certificate of Distinction in Teaching

Research Papers:

"Bank Consolidation and Financial Inclusion: The Adverse Effects of Bank Mergers on Depositors" (**Job Market Paper**)

I document that large banks tend to have higher fees and higher minimum required balances on deposit accounts relative to small banks. As a result, bank consolidation makes it relatively more expensive for low-income households to maintain bank accounts. Using a difference-in-differences methodology to estimate a causal impact, I show that following acquisitions of small banks by large banks, deposit account fees and minimum required balances increase, and deposit outflow is almost 2% per year higher, relative to acquisitions by other small banks. The effect of consolidation on deposit outflow is stronger in areas with a higher proportion of low-income households. Areas in which large banks acquired small banks subsequently experience faster growth in non-bank financial services such as check cashing facilities, consistent with some of the outflow corresponding to depositors who leave the banking system altogether. Moreover, households in areas affected by bank consolidation are more likely to experience evictions after personal financial shocks, in line with these households facing difficulty in accumulating emergency savings without bank accounts.

"Large Banks and Small Firm Lending" (with Victoria Ivashina and Ryan D. Taliaferro)

We show that following the financial crisis, there was a large and persistent shift in the composition of small firm lenders. In 2007 and 2008, large banks impacted by the real estate shock contracted their credit to small firms, even in unaffected counties. However, healthy banks—those not exposed to the real estate price shock—expanded their operations and even entered new banking markets, capturing a large part of the market share in both loans and deposits. The market share gain of healthy banks relative to exposed banks was a standard deviation above the long-run historical market share growth, and comparable to the effects of branch banking deregulation in the US. Despite this offsetting expansion by healthy banks, the net effect of the contraction in credit was negative, with lower aggregate credit and deposit growth and lower entrepreneurial activity through 2015.

Research Papers in Progress:

"Competition, Risk, and Organizational Form: Lessons from Credit Unions and Small Banks"

Publications:

Bord, V.M. and J.A.C. Santos. (2015) Does securitization of corporate loans lead to riskier lending? Journal of Money, Credit, and Banking. 47(2-3), 415-444.

Bord, V.M. and J.A.C. Santos. (2014). Bank liquidity and the cost of liquidity to corporations. Journal of Money, Credit, and Banking. 46(1), 13-45.

Bord, V.M. and J.A.C. Santos. (2012). Banks' originate to distribute model and the rise of shadow banking. Federal Reserve Bank of New York Economic Policy Review. July 2012: 1-14.

Invited Presentations:

2017	Eastern Finance Association Annual Meeting
2015	European Finance Association Annual Meeting

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Undergraduate Studies:
Diploma in Economics and Mathematics, Financial University, Moscow, Highest Honors, 2009

Graduate Studies:

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Expected Completion Date: June 2018

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Professor Robert Gibbons
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New Economic School, 2010-2012
M.A. in Economics, Summa Cum Laude

Teaching and Research Fields:

Primary Field: International Trade

Secondary Fields: Organizational Economics, Microeconometrics

Teaching Experience (all teaching fellow unless noted)

Spring 2017	Intermediate Microeconomics, Harvard University, Prof. Marc Melitz
2014-2016	International Trade (Ph.D.), Harvard University, Prof. Elhanan Helpman
Spring 2016	Managing the Modern Organization (MBA), MIT Sloan School of Management, Prof. Robert Gibbons
2015-2016	Contracts and Organizations (Ph.D.), Harvard University, Profs. Oliver Hart, Philippe Aghion, and Richard Holden
Summer 2015	What Causes What in the World (microeconometrics for high school students), Summer School in Contemporary Mathematics, Dubna, Russia, lecturer
2013-2015	Microeconomics (Ph.D.), Harvard University, Prof. Edward Glaeser
2011-12	Econometrics, Topics in Econometrics, Empirical Industrial Organization, Macroeconomics (graduate), New Economic School

Research Experience and Other Employment:

2013-2015	Harvard University, Research Assistant to Prof. Oliver Hart
2014-2015	Harvard University, Research Assistant to Prof. Elhanan Helpman

Honors, Scholarships, and Fellowships:

2017	Pellegrini Summer International Economics Research Grant
2016	Harvard Distinction in Teaching Award
2015	Harvard Lab for Economic Applications and Policy Grant
2012-2014	UniCredit and Universities US PhD Scholarship
2012	Don Patinkin's Prize, New Economic School

Professional Activities

Referee for the *Quarterly Journal of Economics*, *Journal of Public Economics*, *Journal of Comparative Economics*

Job Market Paper:

"The Distributional Effects of Trade: Theory and Evidence from the United States"
(with Xavier Jaravel)

Are the gains from trade unequally distributed in society? This paper presents new evidence on the distributional effects of trade on education groups in the U.S. through both consumer prices (expenditure channel) and wages (earnings channel). Our analysis, guided by a simple quantitative trade model, leverages linked datasets that cover the entire U.S. economy and include detailed spending data on consumer packaged goods and automobiles. First, we show that the share of spending on imports is similar across education groups, leading to a neutral expenditure channel. This finding stems from offsetting forces: college graduates spend more on services, which are largely non-traded, but their spending on goods is biased towards industries and brands with higher import content. Second, on the earnings side, we find that college graduates work in industries that (1) are less exposed to import competition, (2) export more, (3) are more income-elastic, and (4) use fewer imported inputs. The first three forces cause trade liberalizations to favor college graduates; the fourth has the opposite effect. Finally, we combine and quantify the expenditure and earnings channels using the model. A 10% reduction of all import and export barriers generates a modest increase in inequality between education groups, primarily due to the earnings channel. Welfare gains are 18% higher for college graduates, whose real income increases by 2.03% compared to 1.69% for individuals without a college degree. Reductions of import barriers with China have qualitatively similar implications.

Additional Research Papers:

"Intra-Firm Linkages in Multi-Segment Firms: Evidence from the Japanese Manufacturing Sector"
(with Toshihiro Okubo, RIETI working paper)

Are diversified firms mere collections of independent assets, or is there anything that glues different businesses together? We explore this question by looking at segment-level growth of multi-segment (i.e., producing in several

6-digit industries at the same time) manufacturing firms in Japan. We find substantial co-movement between such segments and show that it can be driven by plant-wide but not firm-wide shocks. Our findings suggest that inputs that are shared firm-wide, such as brand and organizational routines, are not too important for production.

"Revisiting Event Study Designs" (with Xavier Jaravel, working paper)
A broad empirical literature uses "event study" research designs for treatment effect estimation, a setting in which all units in the panel receive treatment but at random times. We make four novel points about identification and estimation of causal effects in this setting and show their practical relevance. First, we show that in the presence of unit and time fixed effects, it is impossible to identify the linear component of the path of pre-trends and dynamic treatment effects. Second, we propose graphical and statistical tests for pre-trends. Third, we consider commonly-used "static" regressions, with a treatment dummy instead of a full set of leads and lags around the treatment event, and we show that OLS does not recover a reasonable weighted average of the treatment effects: long-run effects are weighted negatively, and we introduce different estimators robust to this issue. Fourth, we show that equivalent problems of under-identification and negative weighting arise in difference-in-differences settings when the control group is allowed to be on a different time trend or in the presence of unit-specific time trends. We show the practical relevance of these issues in a series of examples from the existing literature. We focus on the estimation of the marginal propensity to consume out of tax rebates: according to our preferred specification, the marginal propensity to consume is much lower than the main estimates in the literature.

"Consistency and Inference in Bartik Research Designs" (with Xavier Jaravel, working paper)
A growing number of empirical studies use identification strategies similar the one proposed by Bartik (1991), where a demand shock in a geographic location is constructed by combining the local composition of industries in the pre-period with national growth rates of industries. We provide a set of conditions on randomness of industry growth rates that ensure consistency of Bartik estimators in the many-location many-industry asymptotic. We highlight the importance of clustering standard errors to account for the correlation of residuals in locations with similar industrial composition and provide a computationally efficient quasi-maximum likelihood estimator.

"Bounding the Population Shares Affected by Treatments" (working paper)
The fraction of a population that is affected by a treatment (the "responders") may be as important to identify as the average magnitude of the treatment effect. I show that if the distributions of potential outcomes with and without treatment are identified, then the total variation distance between them serves as the sharp lower bound on the share of responders. It can be computed for randomized control trials, instrumental variables, and other empirical designs. I demonstrate the usefulness of the approach in three examples of economic interest, related to behavioral biases in retirement savings, electoral fraud, and student cheating.

Updated: October 30, 2017

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Undergraduate Studies:
A.B., Economics and Mathematics, Harvard University, *summa cum laude*, 2010

Graduate Studies:
Harvard University, 2012 to present
Ph.D. Candidate in Economics
Thesis Title: "*Essays on Financial Economics*"
Expected Completion Date: May 2018

References:

Professor Jeremy C. Stein
Harvard University, Economics Department
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Professor Andrei Shleifer
Harvard University, Economics Department
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Professor Samuel G. Hanson
Harvard Business School
(617) 495-6137, shanson@hbs.edu

Professor David S. Scharfstein
Harvard Business School
(617) 496-5067, dscharfstein@hbs.edu

Teaching and Research Fields:
Primary fields: Financial Economics, Corporate Finance, Entrepreneurship and Innovation

Secondary fields: Macroeconomics

Research Papers:
"Seeing is Believing: The Impact of Local Economic Conditions on Firm Expectations, Employment and Investment" (**Job Market Paper**)
I show that managers overweight observations of local economic conditions at firm headquarters (HQ) when forming their macroeconomic expectations. This implies that HQ local economic conditions have an excessive impact on firm investment and employment growth. Using an empirical strategy identifying the impact of local economic conditions at HQ on employment outside the HQ, I find that a 1 percentage point (p.p.) higher local unemployment rate at HQ leads to 2 p.p. lower employment growth at non-HQ establishments. I consider a number of alternative explanations such as internal capital markets reallocation or local financing, and rule these out using placebo tests and by testing the key implications

of the explanations. Then, I present evidence that HQ local conditions are overweighted in managers' expectations. Worse HQ local conditions lead to more pessimistic sales forecasts and more negative macroeconomic sentiment. These findings, along with results from tests comparing firms with different sensitivities to the macroeconomic cycle, support the notion that local economic conditions bias managers' macroeconomic expectations. Finally, I show that this bias can explain differences in county economic outcomes and may lead to significant investment misallocation.

"The Decline of Big-Bank Lending to Small Business: Dynamic Impacts on Local Credit and Labor Markets" (with Samuel Hanson and Jeremy Stein)
Small business lending by the four largest U.S. banks fell sharply relative to other banks beginning in 2008 and remained depressed through 2014. We explore the consequences of this credit supply shock, with a particular focus on the resulting dynamic adjustment process. Using a difference-in-difference approach that compares counties where the Top 4 banks had a higher initial market share to counties where they had a smaller share, we find that the aggregate flow of small business credit fell and interest rates rose from 2006 to 2010 in high Top 4 counties. Economic activity also contracted in these affected counties: fewer businesses expanded employment, the unemployment rate rose, and wages fell. Moreover, the employment effects were concentrated in industries that are most reliant on external finance, such as manufacturing. Next, we explore how high Top 4 counties adjusted to this shock from 2010 to 2014. While the flow of small business credit has slowly recovered in affected counties—as smaller banks, non-bank finance companies, and online lenders have filled the void left by the Top 4 banks—loan interest rates remain elevated, suggesting that credit conditions are still tighter in these areas. Moreover, although the unemployment rate returns to normal by 2014 in high Top 4 counties, the effects on wages persist, suggesting that more expensive credit may have led small businesses to become less capital intensive.

"Management Ownership and Investment in the Business Cycle"
Does risk aversion amplify business cycle downturns? I study the risk exposure of CEOs and its effect on firm investment in times of high macroeconomic uncertainty. Exploiting exogenous variation in CEO equity ownership, I show that firms with larger CEO stakes decrease investment significantly more in periods of high uncertainty. I consider whether better shareholder alignment explains this finding, but do not find evidence supporting this explanation. Firms with high institutional ownership do not cut investment more in times of high uncertainty. In addition, firms with high CEO stakes decrease risk-taking in times of high uncertainty, and experience lower stock returns subsequent to periods of high uncertainty. These results are consistent with the management risk aversion explanation, and suggest that large inside ownership stakes can pose costs to outside shareholders in times of high uncertainty.

Research Papers in Progress:
"Local Economic Conditions Overweighting Among Households and in U.S. Monetary Policy"
"The Impact of Expectations on Long-Run Innovation: Evidence from Stock Market Dislocations" (with Josh Feng)

Teaching Experience:

Fall 2014, Fall 2015	Capital Markets (Economics 1723), Harvard University, Teaching Fellow for Professor John Y. Campbell, Derek C. Bok Certificate of Distinction

Honors, Scholarships, and Fellowships:

2017	Best Finance Ph.D. Award, 14th Annual Corporate Finance Conference at Olin Business School
2016	American Finance Association (AFA) Travel Grant
2015	Hirtle Callaghan Prize
2012-2015	National Science Foundation Graduate Research Fellowship
2009	Phi Beta Kappa (Junior 24)

Research Experience and Other Employment:

2010 to 2012 The Boston Consulting Group, Associate

Professional Activities:

Referee for the *Quarterly Journal of Economics*, *Review of Financial Studies*

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Undergraduate Studies:
B.S. Economics, Massachusetts Institute of Technology, Phi Beta Kappa, 2009-2012

Graduate Studies:
Harvard University, 2012 to present
Ph.D. Candidate in Business Economics
Thesis Title: "*Essays on Monetary Policy with Informational Frictions*"
Expected Completion Date: June 2018

References:

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Professor Xavier Gabaix
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Teaching and Research Fields:
Primary fields: Macroeconomics, Monetary Economics

Secondary fields: Macro-finance, Information Economics

Research Papers:
"Perceptions of Competence: Monetary Policy and the Reputational Accelerator" (Job Market Paper)

Central banks are often concerned about their reputation for competence. This paper addresses why, developing a new macroeconomic model in which perceptions of a central bank's competence affect monetary policy's ability to stabilize aggregate outcomes. The central bank receives imperfect signals on the state of the economy, with the precision of its signals private information to the central bank. A reputation for competence is formed rationally by agents in equilibrium through the observation of aggregate outcomes. High reputation improves equilibrium outcomes for the central bank, through a coordination and confidence channel that alleviates informational externalities generated by the dispersion of information in the economy. The endogenous formation of perceptions amplifies the effects of monetary errors; favorable monetary outcomes endogenously lead to more favorable outcomes in the future, and vice-versa, an effect I call the *reputational accelerator*. The model also exhibits excess output volatility, and endogenously generates large downside tail events, particularly after long periods of stability. Such central bank 'Minsky moments' arise from the decoupling of equilibrium responses to signals from their true informative content. Breaking this sharp link also generates a time-varying inefficiency wedge between the equilibrium and efficient responses to public signals, adding to the theory of dispersed information. Using individual level private forecast, I find empirical support for the model, showing that FOMC announcements act as focal points for expectations, with this effect stronger when public forecasts by the FOMC were more accurate in the recent past.

"Monetary Policy Reversal Aversion"

Many central banks appear to avoid interest rate reversals, but there are few theories formally explaining why. One potential reason is that reversals affect a central bank's reputation; reversing course may lead to the public lowering its assessment of the central bank's competence. I develop a model in which a central bank cares about its reputation for competence, and attempts to strategically develop this reputation. The resulting reversal aversion leads to two potential welfare costs and policy distortions, relative to a world without reputational concerns. A central bank may not correct an interest rate movement even if it realizes ex-post that the previous decision was likely the wrong one, and additionally the fear of a reversal itself may cause the central bank to proceed with caution in order to avoid a potential reversal, thus causing the central bank to move too late. I provide cross-country empirical evidence showing that reversal aversion may have additional explanatory power for the widespread interest-rate inertia observed by central banks around the world, in addition to the well-studied explanation of gradualism (the desire to smooth interest rates over a long period of time).

Research in Progress:

"Sovereign Risk and Bank Runs: A Macroeconomic Analysis"

"Social Value of Public Information with Unobservable Precision"

Teaching Experience:

Spring 2016	Econ 970, "Monetary Policy: Theory and Practice," Harvard University Main Instructor (designed and taught sophomore tutorial)

Research Experience and Other Employment:

Summer 2013	Harvard Law School, Research Assistant to Professor Louis Kaplow
Summer 2011-Fall 2012	Harvard University, Research Assistant to Professor Efraim Benmelech

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Undergraduate Studies:
BA, Economics and Mathematics, University of Pennsylvania, magna cum laude, 2011

Graduate Studies:
Harvard University, 2011 to present
Ph.D. Candidate in Political Economy and Government
Thesis Title: "Essays on the Macroeconomics of Labor Markets"
Expected Completion Date: June 2018

References:

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Professor Lawrence Katz
Harvard University
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Professor James Stock
Harvard University
james_stock@harvard.edu

Teaching and Research Fields:
Primary fields: Macroeconomics, Labor economics
Secondary fields: Public economics

Research Papers:
"*The Rise of In-and-Outs: Declining Labor Force Participation of Prime Age Men*" (Job Market Paper)
This paper shows that much of the decline in labor force participation of U.S. prime age men comes from "in-and-outs" – whom I define as men that temporarily leave the labor force. Individuals moving in and out of the labor force have been an understudied margin of labor supply and account for roughly one third of the decline in participation between 1977 and 2015. Most in-and-outs take an occasional short break in between jobs, but are otherwise continuously attached to the labor force. In-and-outs are also qualitatively different from long-term non-participants. Half of the rise of in-and-outs has come from married or cohabiting men and I show that this rise can be explained by a wealth effect from their partners' growing earnings, using variation in the growth of female wages across demographic groups. In addition, I find that changes in household structure can account much of the rest of the rise of in-and-outs. To capture both effects in a unified framework, I construct and estimate a dynamic model of labor supply and household formation. The model estimates imply that labor supply factors are responsible for nearly the entire rise of in-and-outs, while changes in labor demand have contributed little.

"*The Limited Macroeconomic Effects of Unemployment Benefit Extensions"* (with Gabriel Chodorow-Reich and Loukas Karabarbounis, Revise and Resubmit from *The Quarterly Journal of Economics*)

"*The Effects of Fuel Prices, Regulations, and Other Factors on U.S. Coal Production, 2008-2016"* (with Todd Gerarden and James H. Stock)

Publications:

Coglianese, J., Davis, L. W., Kilian, L., and Stock, J. H. (2017). Anticipation, Tax Avoidance, and the Price Elasticity of Gasoline Demand. *Journal of Applied Econometrics*.

Teaching Experience:

Fall 2014, '15	Intro. to Econometrics, Harvard, teaching fellow for Professor James Stock
Spring, 2017	Intro. to Econometrics, Harvard, teaching fellow for Dr. Gregory Bruich

Research Experience and Other Employment:

2013-2014	Council of Economic Advisers, Staff Economist

Honors, Scholarships, and Fellowships:

2016-2017	Doctoral Grant, Washington Center for Equitable Growth
2014, '15, '17	Certificate of Distinction in Teaching, Harvard University
2011-2013	Political Economy and Government Fellowship

Professional Activities

Presentations:	Society of Labor Economics Annual Meeting (2016)
Refereeing:	Quarterly Journal of Economics, American Economic Journal: Economic Policy, Journal of Applied Econometrics

Other Writings:

Braun, S., Coglianese, J., Furman, J., Stevenson, B., and Stock, J. (2014). Understanding the decline in the labour force participation rate in the United States. VOX.

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Undergraduate Studies:
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Graduate Studies:
Harvard University, 2013 to present
Ph.D. Candidate in Economics
Thesis Title: "*Essays on Globalization*"
Expected Completion Date: June 2018

M.A. in Economic Theory, ITAM, Highest Honors, 2012-2013

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Teaching and Research Fields:
Primary field: International Trade
Secondary fields: International Macroeconomics, Computational Economics

Teaching Experience:

2016-2017	Economic Theory (1st year PhD class), Harvard University, Teaching Fellow for Prof. Kenneth Rogoff.
2016	The Future of Globalization: Issues, Actors, and Decisions (Masters), Harvard University, Teaching Fellow for Profs. Lawrence Summers and Robert Lawrence.
2015	Religion and the Rise of Capitalism (Undergraduate), Teaching Fellow for Prof. Benjamin Friedman.
2013	Intermediate Microeconomics (Undergraduate), ITAM, Lecturer.

Professional Activities

Presentations: 2017: NBER Summer Institute (ITI), SAET Faro, Imports and Global Value Chains Conference (Nottingham), 1st Catalan Economic Society Conference (Barcelona), Harvard International Economics Lunch and Workshop, ITAM
2016 and before: SED Toulouse, Harvard International Economics and Economic History Lunches

Referee: Quarterly Journal of Economics, Journal of Development Economics, Journal of Urban Economics, Economics Letters, Review of International Economics

Honors, Scholarships, and Fellowships:

2017	Harvard Graduate Student Council Summer Fellowship, Harvard Summer Travel Fellowship, Banco de México Summer Internship
2016	Harvard Summer Travel Fellowship
2015	Danielian/Kuznets Travel and Research Grant
2013 to present	CONACYT/Fundación México en Harvard/Harvard Graduate Fellowship

Publications:

"Globalization, Inequality and Welfare", ***Journal of International Economics**,* 2017, 108: 387-412, with Pol Antràs and Oleg Itskhoki.

Research Papers:

"Disentangling Global Value Chains" (**Job Market Paper**).

I present a global value chain (GVC) framework in which intermediate input suppliers produce specialized inputs that are only compatible with specific downstream uses. Using Mexican firm-level import-export data, I confirm the prevalence of specialized inputs by showing that the manufacturing firms that export to the U.S. utilize relatively more U.S. inputs than those that export to other destinations. I then use the new GVC framework to obtain GVC estimates that reflect the heterogeneity in the use of inputs observed in the data. This reveals that 27% of the $118bn of Mexican final good exports to the U.S. is U.S. value-added returning home. In contrast, the current GVC framework assumes that all products within a given industry utilize the same intermediate inputs and this yields a U.S. share of only 17%. This discrepancy has serious implications for the ongoing renegotiation of NAFTA as it suggests that the potential costs of supply chain disruption are being understated. Lastly, I show how to compute these counterfactuals with an extension of the influential sufficient statistics approach to specialized inputs models and highlight important areas of future data collection.

"On the Geography of Global Value Chains", NBER Working Paper #23456, with Pol Antràs.
Revise and Resubmit, ***Econometrica***.

This paper develops a multi-stage general-equilibrium model of global value chains (GVCs) and studies the specialization of countries within GVCs in a world with barriers to international trade. With costly trade, the optimal location of production of a given stage in a GVC is not only a function of the marginal cost at which that stage can be produced in a given country, but is also shaped by the proximity of that location to the precedent and the subsequent desired locations of production. We show that, other things equal, it is optimal to locate relatively downstream stages of production in relatively central locations. We also develop and estimate a tractable, quantifiable version of our model that illustrates how changes in trade costs affect the extent to which various countries participate in domestic, regional or global value chains, and traces the real income consequences of these changes.

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Graduate Studies:
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Ph.D. Candidate in Business Economics
Thesis Title: *"Essays on Information in Financial Markets"*
Expected Completion Date: May 2018

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Professor Christopher Malloy
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Teaching and Research Fields:
Primary fields: Asset Pricing, Behavioral Finance
Secondary fields: Contract Theory, Corporate Finance

Teaching Experience:

Summer 2017	Summer School on Textual Data in Finance, graduate-level training course for European Union H2010 initiative BigDataFinance
Spring 2016	Undergraduate "Information in Financial Markets," Harvard University, sophomore tutorial, designed and taught *Teaching award: Certificate of Excellence and Distinction in Teaching*
Spring 2015	Undergraduate "Behavioral Finance," Harvard University, sophomore tutorial, designed and taught *Teaching award: Certificate of Excellence and Distinction in Teaching*
Summer 2014	III School in Machine Learning and Knowledge Discovery in Databases, University of São Paulo, graduate-level lecture on big data in finance
Spring 2013, 2014	Undergraduate "Behavioral Economics and Applications in Markets," Harvard University, sophomore tutorial, designed and taught *Teaching award: Certificate of Excellence and Distinction in Teaching*

Research Experience and Other Employment:

2016 Trendrating S.A., Research Consultant
Advising research efforts on estimating the performance effects of overlaying Trendrating's momentum signals on top of mutual fund portfolios.

2015 Bloomberg Media, Research Consultant
Estimating financial impact of creative advertising.

2010-2012 Goldman Sachs, Investment Management Division, Senior Analyst
Managing equity, fixed income, currency, and credit portfolios. Research on sector-specific signals, statistical arbitrage strategies, regime-switching models.

Professional Activities & Invited Presentations:

Keynotes: Financial Data Science Association (2016); 2nd workshop on Web and Data Science for News Publishing, WWW Conference (2015)

Presentations: AFA Annual Meeting (2018, scheduled); Hillcrest Asset Management (2017, scheduled); Cubist Systematic (2017); PanAgora Asset Management (2017); EFA Annual Meeting (2017); SITE Workshop on Experimental Economics (2017); Fidelity Investments (2017); WFA Annual Meeting (2017); Institut Jozef Stefan (2017); Trans-Atlantic Doctoral Conference (2017, 2015, 2014); AEA Annual Meeting (2017); State Street Global Advisers (2016); World Finance Conference (2016); Bloomberg, L.P. (2014); Fundação Getúlio Vargas (2014); Teradata Corporation (2014); 8th Nordic Conference on Behavioral and Experimental Economics (2013)

Referee: *American Economic Review; Quarterly Journal of Economics*

Honors and Awards:

2017 European Finance Association, Best Ph.D. Paper Award
Paper: "Front Page News: The Effect of News Positioning on Financial Markets"

2017 PanAgora Asset Management Dr. Richard A. Crowell Memorial Prize, Finalist
Paper: "Trading on Talent: Human Capital and Firm Performance"

2017 WFA Cubist Systematic Strategies PhD Candidate Award for Outstanding Research
Paper: "Front Page News: The Effect of News Positioning on Financial Markets"

2016 Hillcrest Behavioral Finance Award, Finalist
Paper: "Front Page News: The Effect of News Positioning on Financial Markets"

2016 World Finance Conference, Top 3 Best Paper Award
Paper: "News Consumption: From Information to Returns"

Grants:

2017 Pershing Square Venture Fund for Research on the Foundations of Human Behavior
Project: "Front Page News: The Effect of News Positioning on Financial Markets"

2017 Hillcrest Asset Management Research Grant
Project: "Front Page News: The Effect of News Positioning on Financial Markets"

2015 Russell Sage Foundation Small Research Grant
Project: "Asymmetric Naïveté: Beliefs about Self-Control"

2015 Pershing Square Venture Fund for Research on the Foundations of Human Behavior
Project: "Asymmetric Naïveté: Beliefs about Self-Control"

2015 Lab for Economic Applications and Policy Grant
Project: "Asymmetric Naïveté: Beliefs about Self-Control"

Business Publications:

"How to Tell If Machine Learning Can Solve Your Business Problem." Harvard Business Review, 11/25/2016

"Research: How Investors' Reading Habits Influence Stock Prices." Harvard Business Review, 09/02/2016

Research Papers:

"Front Page News: The Effect of News Positioning on Financial Markets" (Job Market Paper)

Abstract: This paper estimates the effect of presentation of information on financial markets, using quasi-random variation in prominent "front page" positioning of news on the Bloomberg terminal. The front page and non-front page articles are indistinguishable by either algorithmic analysis or by the target audience of active finance professionals. Front page positioning induces 280% higher trading volumes and 180% larger price changes within the first ten minutes after publication. Front page articles also see a stronger price drift from these initial reactions for the next 30-45 minutes. Subsequently, non-front page information begins to catch up, but the incorporation of non-front page information is substantially more gradual. As a result, the initial effects of positioning persist for days after the news. The effects induced by positioning are even stronger than the differences between articles of varying editorial importance.

"Disagreement after News: Gradual Information Diffusion or Differences of Opinion?"

Abstract: This paper explores the long-standing empirical fact of increased trading volume around news releases through the lens of canonical models of gradual information diffusion and differences of opinion. I use a unique dataset of clicks on news by key finance professionals to distinguish between trading among investors who see the news at different times and trading among investors who see the same news but disagree regarding its interpretation. Consistent with gradual information diffusion, dispersion in the timing of investors' attention is strongly predictive of daily volume around earnings announcements and volume within minutes of individual news articles. Furthermore, delayed attention is predictive of minute-level return continuation, daily-level post-earnings-announcement drift, and monthly-level return momentum. Differences of opinion, measured as heterogeneity in the investors clicking on the news, is generally weaker in explaining trading volume around news, but plays a larger role when the news is more textually ambiguous.

"*Trading on Talent: Human Capital and Firm Performance"* (with James Hodson)

Abstract: How does a firm's human capital impact financial performance? By directly observing the employment and education trajectories of a significant proportion of U.S. public company employees from 1990 to the present, we explore the relationship between performance and two aspects of human capital: turnover and skills. First, we find that firms with higher employee turnover experience significantly worse future returns. A long-short strategy based on employee turnover with a three-month lag generates an excess compounded annual return of 14.3%. Second, firms with a larger emphasis on sales-oriented skills show better subsequent performance, whereas firms with more focus on administrative skills underperform. The effects of skills are heterogeneous across industries, with a larger premium on web development in Information, a higher premium on insurance in Manufacturing, and no benefit from sales-oriented skills in Finance.

"Asymmetric Naïveté: Beliefs about Self-Control"

Abstract: Do individuals anticipate present bias in others? This paper jointly investigates beliefs about one's own and others' present bias in two settings. First, in a classroom survey, students systematically underestimate how late they will turn in an assignment, but hold significantly more accurate beliefs about their classmates. Second, in an online experiment, participants engaged in a real-effort task display little awareness of their own present bias, but anticipate present bias in others. Structurally, I estimate a present bias parameter β of 0.82. Participants perceive others' β to be 0.87, indicating substantial sophistication, contrasted with 1.03 for themselves, indicating full naïveté.

"Managerial Structure and Performance-Induced Trading." (with Saurin Patel and Sergei Sarkissian)

The literature finds that investors increase portfolio turnover following high returns, explaining it by either overconfidence or skilled trading. This paper develops a theoretical model and shows empirically that team-managed funds trade less after good performance than single-managed funds. The magnitude of this differential increases with team size. Moreover, the change from single- to team-management structure decreases overconfidence-induced trading. In spite of more trading, the next-period risk-adjusted returns of single-managed funds are no better than those of team-managed funds. These findings indicate that team management reduces overconfident trading. Alternative channels cannot explain the drop in excessive trading in team-managed funds.

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Thesis Title: Essays on Industrial Organization and Innovation
Expected Completion Date: May 2018

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Teaching and Research Fields:
Primary fields: Industrial Organization, Health Economics, Innovation and Entrepreneurship

Teaching fields: Public Economics, Econometrics, Behavioral Economics

Teaching Experience:

Fall 2016	Introduction to Econometrics (Econ 1123), teaching fellow for Prof. James Stock
Fall 2015	The Business and Politics of Health (EMR 20), Prof. David Cutler
Spring 2015	Behavioral Economics (Econ 980bb), Prof. Tomasz Strzalecki
	Graduate Industrial Organization II (Econ 2611), Prof. Pierre Dubois
Spring 2010	Optimization Methods (Applied Math 121), Prof. Yiling Chen

Professional Activities:

Invited Presentations	BU IP Technology and Policy Research Initiative.	2017
	NBER Productivity Seminar.	2017
	Hoover IP^2 Conference	2017
	NBER Summer Institute, Innovation Session	2016
	NBER Productivity Seminar	2015
	US Patent and Trademark Office, Visiting Speaker Series	2015
Referee	Quarterly Journal of Economics	
	Journal of Health Economics	

Honors, Scholarships, and Fellowships:

Spring 2015	NBER-IFS Value of Medical Research Fellowship
Fall 2014	Price Theory Scholar at the Becker Friedman Institute, University of Chicago
Spring 2013	*Econometric Games* Team Member (Harvard University)

Research Papers:

"*History-Dependent Demand and Intermediaries: Explaining Prescription Drug Pricing Dynamics*" (Job Market Paper)

Using a novel quasi-experimental approach, I find evidence of inertia and history-dependent generic and incremental drug demand in several chronic drug markets. I then show that these patterns have significant effects on drug pricing, by embedding them in a model of industry pricing structure. In the model, drug manufacturers play a finite-period dynamic game by making take-it-or-leave-it net price offers to pharmacy benefit managers (PBMs), who leverage their ability to set formularies to maximize their own profits. Model estimates using novel net price data and subsequent counterfactuals show that the model's structure is key to explaining the salient features of equilibrium prices, and that inertia and intermediary aversion to excluding popular drugs help maintain price levels in the face of competitor and generic entry.

"*Crafting Intellectual Property Rights: Implications for Patent Assertion Entities, Litigation, and Innovation*" (w/ Xavier Jaravel)

(This paper will replace an earlier manuscript entitled "Who Feeds the Trolls? Patent Trolls and the Patent Examination Process.")

We show that much of the heterogeneity in patent outcomes results from the process of creation of patent rights and is independent of scientific determinants. Quasi-random allocation of patents to examiners generates causal variation in the way patent rights are crafted. A one standard deviation change in examiner effects leads stock market capitalization to increase by 3 million dollars, citations by 24%, and litigation by 64%. The much-debated activities of Patent Assertion Entities are largely explained by examiner effects: they disproportionately purchase and assert patents granted by "lenient" examiners, who craft patents that are more likely to be invalid.

"*Drug Quality Measures and Economic Research*" (white paper; w/ Luca Maini)

Prescription drug quality is an important variable in several strands of the health economics literature, including research on the value of medical R&D, the structure of the pharmaceutical markets, and the impact of innovation policy. In this paper, we provide a starting point for researchers interested in these topics by first summarizing the data, methodology, and literature surrounding the measurement of drug quality, and then highlighting areas of economic research that use quality measures. We conclude with a discussion of possible areas for future research.

Research Papers in Progress:

"*The Impact of Expectations on Long-Run Innovation: Evidence from Stock Market Dislocations*" (w/ Brian Chen)

"*Do Clinical Trial Outcomes Match Perceived Drug Quality?*" (w/ Luca Maini)

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Undergraduate Studies:
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Graduate Studies:
Harvard University, 2012 to Present
Ph.D. Candidate in Political Economy and Government, Economics Track
Thesis Title: Essays on Labor Demand
Expected Completion Date: June 2018

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Professor Edward Glaeser
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Professor Claudia Goldin
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Teaching and Research Fields:
Primary fields: Labor Economics, Public Finance

Secondary field: Urban Economics

Teaching Experience:

Spring 2015–2017	Graduate Public Finance II, Harvard Economics Department, Teaching Fellow for Professor Nathaniel Hendren
Fall 2014–2015	Economics of Work and Family, Harvard College, Teaching Fellow for Professor Claudia Goldin
Fall 2014	Quantitative Analysis and Empirical Methods, Harvard Kennedy School (M.P.P. course), Teaching Fellow for Professor Maya Sen

Research Experience and Other Employment:

September	Internal Revenue Service, Research, Applied Analytics, and Statistics (RAAS)

2017–Present	Division, Student Volunteer
September 2011–August 2012	Massachusetts Institute of Technology, Research Assistant to Professors David Autor and Parag Pathak
August 2009–July 2011	United States Congress, Joint Committee on Taxation, Research Assistant

Professional Activities

Referee Service: *Journal of Urban Economics, Quarterly Journal of Economics*
Conference Discussant: *NBER Summer Institute, Urban Economics Section* (2016)
Conference Presentations: Society of Labor Economists 2017 Meeting, "*Public Investment and the Spread of 'Good-Paying' Manufacturing Jobs: Evidence from World War II's Big Plants"*

Honors, Scholarships, and Fellowships:

2014–Present	Fellow, Multidisciplinary Program in Inequality and Social Policy, Harvard University
2016–2017	Harvard Lab for Economic Applications and Policy Grant (x3)
2014–2017	US Department of Transportation, University Transportation Centers Grant (with Edward Glaeser)
2014	Harvard Kennedy School Taubman Center Urban Dissertation Fellowship

Research Papers:

"*How Does Firm Performance Affect Wages? Evidence from Idiosyncratic Export Shocks*" (with Filipe Silverio, Banco de Portugal) Job Market Paper
In the canonical competitive labor market model, firms are wage-takers and idiosyncratic shocks to individual firms do not affect wages. However, when labor markets are frictional, wages may directly depend on firm-specific factors. We test how sensitive wages are to firm-level labor demand by estimating the incidence of idiosyncratic export demand shocks on the wages of incumbent workers in Portugal during the Great Recession (2008-2010). Using detailed export records, we construct measures of firm exposure to unanticipated shocks to the demands of different countries for specific products. The shocks predict changes in output and payroll at affected firms, but not at other similar firms. We combine the export demand measures with firm balance sheet data and matched longitudinal administrative employer-employee records to estimate the impact of idiosyncratic firm-level demand shocks on employee outcomes. We find that idiosyncratic shocks that decreased sales or value added by 10 percent caused wages to grow 1.5 percent less for incumbent workers who were employed by affected firms in 2007. Furthermore, we find that these pass-through effects are stronger in industries with higher durability of employment relationships and lower employee turnover rates. These results support a model in which barriers to replacing incumbent workers give rise to internal labor markets within the firm, exposing workers to their employers' idiosyncratic conditions.

"*Putting America to Work, Where? The Limits of Infrastructure Construction as a Locally Targeted Employment Policy"* (Revise and Resubmit, *Journal of Urban Economics*)
Is infrastructure construction an effective way to boost employment in distressed local labor markets? I use new geographically detailed data on highway construction funded by the American Recovery and Reinvestment Act to study the relationship between construction work and local employment growth. I show that the method for allocating funds across space facilitates a plausible selection-on-observables strategy. However, I find a precisely estimated zero effect of spending on road construction employment—or other employment—in the locale of the construction site. Reported data on vendors reveal this is because the majority of contractors—selected by competitive bidding—commute from

other local labor markets. I also find no robust effect in the locales of the contractors' offices, but argue that this source of variation does not capture an economically meaningful local demand shock. I conclude that infrastructure construction is not effective as a way to stimulate local labor markets in the short run so long as projects are allocated by competitive bidding.

"*Public Investment and the Spread of 'Good-Paying' Manufacturing Jobs: Evidence from World War II's Big Plants*"
This paper studies the long-run local labor market effects of the publicly financed construction of large manufacturing facilities during World War II. I focus on a subset of large, new plants on which the military was not able to incentivize private firms to stake any capital and that likely would not have been built if not for the war. I compare recipient counties to counties that were similar but for conditions engendered by the war. After establishing an absence of pre-trends across a number of outcomes, I show that recipient counties experienced a large post-reconversion boost in manufacturing employment and wages that persisted for several decades. I show how these effects impact broader labor market outcomes in the post-war period and discuss methods for distinguishing between causal mechanisms using plant-level data.

Research Paper in Progress
"Growth in Supply and Demand for Contingent Work: Evidence from Tax Returns" (with David Card, Lawrence Katz, and Dmitri Koustas)
Contingent work has grown rapidly in the U.S. in recent years, but the sources of this growth remain largely unknown. We use longitudinally linked tax data combining individual returns (1040s) and firm-issued information returns on both non-employment labor earnings (1099s) and employment earnings (W-2s) to study how individuals and households transition into and out of alternative work. We document pathways leading both individuals and firms into alternative work arrangements and examine whether tax policy may have contributed to these changes. We consider implications for how employment policy might best respond to this major change in the U.S. labor market.

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Undergraduate Studies:
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Honors thesis: "Downward Nominal Wage Rigidity: A Double-Density Model."

Graduate Studies:
Harvard University, 2012 to present
Ph.D. Candidate in Economics
Thesis Title: "Essays on Macroeconomics and Public Finance"
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Research References:

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Professor N. Gregory Mankiw
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Professor Edward Glaeser
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Teaching References:

Professor Robert Barro
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Fields:
Macroeconomics; public finance

Teaching Experience:

Fall 2014-2015	Economic Theory (Ph.D. core sequence) Teaching fellow for Professor Robert Barro
Spring 2015	Macroeconomic Theory (undergraduate intermediate, honors) Teaching fellow for Professors Philippe Aghion and Gabriel Chodorow-Reich
Spring 2016	Principles of Economics (macroeconomics) Teaching fellow for Professor N. Gregory Mankiw

Research Experience and Other Employment:

Summer 2013	NBER, Research Assistant to Professors John Beshears, James Choi, David Laibson, and Brigitte Madrian

Professional Activities:

Referee	*Quarterly Journal of Economics* (Fall 2015, Spring 2017) *Journal of Urban Economics* (Spring 2017)

Honors, Scholarships, and Fellowships:

2016-2017	Harvard Joint Center for Housing Studies: John R. Meyer Dissertation Fellowship
2017	Center for Retirement Research at Boston College: Dissertation Fellowship
2017-2018	Harvard GSAS: Dissertation Completion Fellowship
2011	*Phi Beta Kappa*, Junior 24

Research Papers:

"Optimal Taxation in Overlapping Generations Economies with Aggregate Risk" (Job Market Paper)
How should governments leverage available policy instruments to raise revenue and share aggregate risk across generations? I address this question by developing a framework for analyzing optimal taxation in economies with overlapping generations (OLG) and stochastic government spending and productivity. I derive two new, opposing considerations in addition to the classic desire to smooth distortions: First, such economies lack Ricardian equivalence. This encourages governments to run balanced budgets, since deficits drive up interest rates and therefore future tax distortions. Second, the social planner has a redistributive motive across generations and thus faces an equity/efficiency tradeoff. I consider applications to three policy problems: financing of wars, intergenerational sharing of productivity risk, and intergenerational redistribution of trend productivity growth. I find that optimal policy in the first application features partial tax smoothing, with substantially higher labor taxes when government spending is high, but also substantial autocovariance of the labor tax rate. I demonstrate in the latter two applications the optimality of a Social Security program with procyclical benefits; this program is larger if trend productivity growth is more rapid and the planner is more inequality-averse.

"The Effect of State Income Taxes on Home Values: Evidence from a Border Pair Study"
I estimate the elasticity of home prices with respect to the net-of-state-income-tax rate, using three variants of a border pair strategy. I find strongly suggestive evidence that this elasticity is positive and large. However, concerns include violation of the parallel trends assumption in many specifications, the fact that most observed tax changes are small, and others. These concerns illustrate methodological issues that can arise in classic quasi-experimental research designs. Calibrating a calculation of the marginal value of public funds for state income taxes to the elasticities suggested by this study shows that ignoring such general equilibrium effects of taxes can lead to large errors in the calculation.

Research in Progress:

"For Whom Is Housing a Good Investment? The Housing Cycle's Winners and Losers"

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Thesis Title: "Tests of Restrictions and Models in Macro-Finance"
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References:

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Professor James H. Stock
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Teaching and Research Fields:
Primary fields: Macroeconomics, Financial Economics
Secondary field: Time-Series Econometrics

Teaching Experience:

Spring 2016–17	*Economic Theory* (Ph.D. Macro), Harvard, TA for Prof. E. Farhi
Fall 2015	*Asset Pricing I* (Ph.D.), Harvard, TA for Prof. J. Campbell
Fall 2015	*The Psych. and Econ. of Beliefs* (Undergraduate), Harvard, TA for Prof. M. Rabin

Research Experience and Other Employment:

2014–15	Harvard University, Research Assistant for:
	Professors John Y. Campbell, Adi Sunderam, Luis Viceira
	Professor Gabriel Chodorow-Reich
	Professor Matthew Rabin
2011–13	Federal Reserve Bank of New York, Analyst, Open Market Trading Desk

Honors and Fellowships:

2015–17	Harvard Certificate of Distinction in Teaching (awarded three times)
2016	Harvard Graduate School of Arts and Sciences Research Merit Fellowship
2011	Penn Economics Lawrence R. Klein Prize for Best Undergraduate Thesis

Job Market Paper:

"*Restrictions on Asset-Price Movements Under Rational Expectations: Theory and Evidence*" (with Ned Augenblick)

How restrictive is the assumption of rational expectations in asset markets? We provide two contributions to address this question. First, we derive restrictions on the admissible variation in asset prices in a general class of rational-expectations equilibria. The challenge in this task is that asset prices reflect both beliefs and preferences. We gain traction by considering market-implied, or risk-neutral, probabilities of future outcomes, and we provide a mapping between the variation in these probabilities and the minimum curvature of utility — or, more generally, the slope of the stochastic discount factor — required to rationalize the marginal investor's beliefs. Second, we implement these bounds empirically using S&P 500 index options. We find that very high utility curvature is required to rationalize the behavior of risk-neutral beliefs, and in some cases, no stochastic discount factor in the class we consider is capable of rationalizing these beliefs. This provides evidence of overreaction to new information relative to the rational benchmark. We show further that this overreaction is strongest for beliefs over prices at distant horizons, and that our findings cannot be explained by factors specific to the option market.

Other Research Papers:

"*Measuring Trends in Markups: An Identification Result*"

Recent literature has suggested that increases in firms' market power, and associated markups in price over marginal cost, may be capable of partially explaining secular macroeconomic trends including the recent decline in labor's share of income. Testing these claims typically requires access to high-quality micro data and/or restrictive parametric assumptions for estimation. In this note, I show by means of a novel identification argument that one may instead conduct such estimation using time-series macro data and less-restrictive parametric assumptions than in previous literature. The key insight is that estimation of firms' first-order conditions for profit maximization will suffer from omitted variable bias in the presence of time variation in markups (or variation in any such optimization wedge) in a manner that allows for identification of that variation. Such a test is thus capable of providing an external validity check on the results from the related literature.

"*The Size–Power Tradeoff in HAR Inference*" (Submitted, with Daniel J. Lewis and James H. Stock)

Heteroskedasticity and autocorrelation-robust (HAR) inference in time series regression typically involves kernel estimation of the long-run variance. Conventional wisdom holds that, for a given kernel, the choice of truncation parameter trades off a test's null rejection rate and power, and that this tradeoff differs across kernels. We use higher-order expansions to provide a size–power frontier for kernel and orthogonal series tests using nonstandard "fixed-*b*" critical values. We also provide a frontier for the subset of these tests for which the fixed-*b* distribution is *t* or *F*. These frontiers are respectively achieved by the QS kernel and equal-weighted periodogram. The frontiers have simple closed-form expressions, which show that the price paid for restricting attention to tests with *t* and *F* critical values is small. The frontiers are derived for the multivariate location model that dominates the theoretical literature, but simulations suggest the qualitative findings extend to stochastic regressors.

<u>Research Papers in Progress:</u>
"***Factor-Augmenting Technical Growth and the Decline of the Labor Share***" (with Robert Z. Lawrence and James H. Stock)

"***A Note on Recentered Subsample HAR Tests with O(1/T) Estimator Bias***" (with Daniel J. Lewis and James H. Stock)

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Graduate Studies
Harvard University, 2012 to present
Ph.D. Candidate in Business Economics
Thesis Title: "Essays in Financial Economics and Corporate Innovation"
Expected Completion Date: May 2018

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Undergraduate Studies
Bachelor of Arts, Mathematics, Princeton University, with High Honors, 2009
Senior Thesis: "Optimal Dynamic Portfolio Choice in the Market with Arbitrage Opportunities"
Faculty Advisors: Professors Christopher Sims, Hyun Song Shin, Alexander d'Aspremont
Completion of Preliminary Course in Medicine, Seoul National University, 2005

Teaching and Research Fields
Primary Field: Corporate Finance, Pricing Theory
Secondary Field: Contract Theory, Macroeconomics

Teaching Experiences
The Economics of Discontinuous Change (Undergraduate) for Professor Richard Freeman, Spring 2017
Time Series (Ph.D. course) for Professor James Stock, Fall 2015
Capital Market (Undergraduate) for Professor John Campbell, Fall 2014
Capital Market (Undergraduate) for Professor John Campbell, Fall 2013

Other Academic Experiences
Organizer of Harvard University Finance Lunch Seminar, 2014–2016
Research Assistant for Professors John Campbell and Luis Viceira, 2013
Research Assistant for Professors Bo Becker and Luis Viceira, 2012

Honors, Scholarships, and Fellowships
Dissertation Completion Fellowship, Harvard University
Doctoral Fellowship, Harvard Business School
American Financial Association Travel Grant
Samsung Scholarship
Kwangjeong Scholarship
Research Promotion Grant, Korea Science and Engineering Foundation
Gold Medal, International Mathematical Olympiad

Other Experiences
United States Forces Korea, Interpreter for Garrison Commander (mandatory military service)
National Assembly of Korea, Policy Advisor
Korean Mathematical Society Mathematical Olympiad Summer Program, Lecturer

Working Papers
"Employment Protection, Financial Uncertainty, and Corporate Investment in Innovation" (Job Market Paper)

Abstract: This paper provides evidence of operating leverage channel through which employment protection changes corporate investment in innovation. Using the adoption of wrongful-discharge protections by the state courts across the U.S. states as an exogenous variation in downside labor adjustment cost, we show that corporate operating leverage, defined as sensitivity of operating profit to sales, increases after the adoption. Furthermore, we document that the court decision reduces R&D investment among the firms who are more subject to frictions in the financial market, and that R&D investment procyclicality becomes stronger. In contrast, the impact of the adoption on capital investment is insignificant regardless of the level of financial constraints. To establish a causal relationship between operating leverage and investment decisions, we construct an industry layoff elasticity measure as a proxy for the exposure to the shock, and compare the investment responses of the firms with different levels of exposure. Firms that are highly R&D intensive also actively change their capital structure by hoarding more liquidity and issuing more equities. A simple firm investment model with costly external finance and R&D liquidity constraint can generate predictions that are consistent with our empirical findings.

"Innovation Intensity and Asset Prices"

Abstract: In this paper, I explore the implications for asset prices of shocks that raise the intensity of innovation and generate new consumption products. In my model, the economy is driven by both economy-wide common productivity shock and stochastic arrival rate of innovation, and households value the diversity of products in the sprit of Romer (1990). Because households can enjoy more utility in the future from the variety of products by delaying their consumption when innovation intensity is high, more innovation is associated with higher marginal value of consumption. Therefore, firms who benefit from the higher innovation intensity, the growth firms, command low risk premia. Based on this observation, I propose an asset pricing model that can potentially explain the market and cross-sectional distribution of risk premia and is relatively free from the parametric assumptions. This model is consistent with the findings that value premium is mostly an intra-industry phenomenon, given that innovation intensity changes mostly at an industry level.

"Market News Decomposition and Cross-Sectional Variations in Stock Returns"

Abstract: One shortcoming of the conventional VAR estimation to decompose the stock returns into cash-flow news and discount rate news is that researchers can overestimate the variation of future dividend news as a source of the excess return volatility when their VAR specification understates the predictability of excess return. Instead of relying on return expectations to generate cash-flow news, I exploit the cross-sectional variations in the sensitivity of past individual stock returns to the market news to estimate market discount-rate and cash-flow news from the contemporaneous individual stock returns. I find that the contribution of cash-flow news to market excess return volatility is much smaller than previously estimated using the VAR models, while discount-rate news plays a similar role. By directly capturing the market responses to the news, my approach provides another tool to quantify the impact of monetary policy changes.

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Undergraduate Studies:
A.B., Economics, Princeton University, *summa cum laude*, Phi Beta Kappa, 2013

Graduate Studies:
Harvard University, 2013 to present
Ph.D. Candidate in Economics
Thesis Title: "*Essays in Time Series Econometrics*"
Expected Completion Date: May 2018

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Teaching and Research Fields:
Econometrics, Macroeconomics

Teaching Experience:

Spring, 2017	Ec 970: Sophomore Tutorial in Monetary Economics, Harvard University, *Bok Center Teaching Award*
Fall, 2016	Ec 970: Sophomore Tutorial in Monetary Economics, Harvard University, *Bok Center Teaching Award*
Spring, 2016	Ec 970: Sophomore Tutorial in Monetary Economics, Harvard University, *Bok Center Teaching Award*
Fall, 2015	Ec 1123: Introduction to Econometrics, Harvard University, Professor James Stock

Research Experience:

Summer 2016	Harvard University, Research Assistant to Professor Gabriel Chodorow-Reich
Summer 2011 & 2012	Princeton University, Research Assistant to Professor Hyun Song Shin
Summer 2011 & 2012	Princeton University, Research Assistant to Professor Daniela Campello

Professional Activities:

Invited Presentations: Haverford College, 2017
Referee Service: *Journal of Econometrics*
Organizational Service: Summer workshop in Time Series and Macroeconometrics (Harvard University), 2016 & 2017

Honors, Scholarships, and Fellowships:

2016-17	Bok Center Teaching Award recipient (three times)
2016	World Econometric Game Champion
2013-2015	Douglas Dillon Fellowship

Research Papers:

"Identifying Shocks via Time-varying Volatility"
(Job Market Paper)
Under specific parametric assumptions, an *n*-variable structural vector auto-regression (SVAR) can be identified (up to *n!* shock orderings) via heteroskedasticity of the structural shocks (Rigobon, 2003, Sentana & Fiorentini, 2001). I show that misspecification of the heteroskedasticity process can bias results derived from these identification schemes. I propose a different method that identifies the SVAR up to *n!* shock orderings using only moment equations implied by a stochastic process for the variance. Unlike previous work, this result requires only weak technical conditions. In particular, it requires neither parametric assumptions nor mutual independence of the shocks. I propose intuitive criteria to select among the orderings and show that this selection does not impact inference asymptotically. As an empirical exercise, I apply this method to Bernanke, Boivin, & Eliasz (2005) and reject their Cholesky assumptions on the structural shocks. However, I confirm their conclusion of monetary non-neutrality and offer several extensions.

"The Size-Power Tradeoff in HAR Inference" (submitted, with E. Lazarus & J. H. Stock)
Heteroskedasticity and autocorrelation-robust (HAR) inference in time series regression typically involves kernel estimation of the long-run variance. Conventional wisdom holds that, for a given kernel, the choice of truncation parameter trades off a test's null rejection rate and power, and that this tradeoff differs across kernels. We use higher-order expansions to provide a size-power frontier for kernel and orthogonal series tests using nonstandard "fixed-*b*" critical values. We also provide a frontier for the subset of these tests for which the fixed-*b* distribution is *t* or *F*. These frontiers are respectively achieved by the QS kernel and equal-weighted periodogram. The frontiers have simple closed-form expressions, which show that the price paid for restricting attention to tests with *t* and *F* critical values is small. The frontiers are derived for the multivariate location model that dominates the theoretical literature, but simulations suggest the qualitative findings extend to stochastic regressors.

"Robust Inference in Models Identified via Heteroskedasticity"
Simultaneous equations models identified via heteroskedasticity may be subject to weak identification concerns due to proportional changes in variance across series. Considering data from Nakamura & Steinsson (2017), I calibrate simulations to show the relevance of these concerns in practice. I propose conditions under which robust inference methods for a subset of the parameter vector are valid. In simulation, these methods avoid dramatic size-distortions present in strong-identification methods. While there is power loss relative to standard inference, they are less conservative than the previous alternative of projection methods. I propose two tests for weak identification. I offer a method for robust inference on IRFs for SVARs identified via heteroskedasticity. An empirical application to Nakamura & Steinsson (2017) shows that weak identification is a problem with daily policy shocks, but not higher-frequency shocks. This confirms the authors' suspicions, and shows the value of focusing empirical work on carefully constructed shock series.

Research Papers in Progress

"HAR Inference: Recommendations for Practice" (with E. Lazarus, J. H. Stock & M. W. Watson)

The classic papers by Newey and West (1987) and Andrews (1991) spurred a large body of work investigating methods for improved heteroskedasticity- and autocorrelation-robust (HAR) inference in time series regression. Empirical practice, however, has not kept up with these developments. The goal of this paper is to draw on these developments to make a recommendation for practitioners about how to compute standard errors in regression settings with heteroskedasticity and serial correlation. A general conclusion from this literature is that the large size distortions of conventional HAR tests can be greatly reduced by using longer time-domain truncation parameters and modified "fixed-*b*" asymptotic critical values. In general, fixed-*b* distributions are nonstandard, however a class of tests (using basis-function estimators of the long-run variance) has standard *t* and *F* fixed-*b* asymptotic distributions. We draw on recent theoretical results to organize extensive Monte Carlo experiments that reflect both the benchmark designs used in the literature and data-based designs using U.S. macroeconomic time series. Theory and Monte Carlo results suggest that little is lost by restricting attention to tests with fixed-*b* *t*- and *F*-distributions. We conclude with specific recommendations for kernel choice and bandwidth choice.

"Size of Recentered Subsample HAR Tests with *O(1/T)* Estimator Bias" (with E. Lazarus & J. H. Stock)

We consider the performance of Ibragimov & Mueller's (2010) subsample HAR tests in a prediction setting. In particular, we analyze multi-step prediction with a persistent regressor, whose innovations may be correlated with the regression errors. This aligns with the prediction of equity returns using dividend yields. We model the regressor's persistence as local-to-unity to capture the finite-sample bias of the subsample estimates in an asymptotic framework. This mirrors the bias results of Stambaugh (1999). We show that, asymptotically, the size of tests using the subsample HAR estimator approaches unity. We illustrate these properties in Monte Carlo simulations. These limitations are not shared by many orthogonal series estimators; in particular, an equal-weighted periodogram estimator of the long-run variance retains accurate size and approaches an optimal size-power frontier.

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Personal Information:
Date of birth: July 24th, 1990
Sex: Male
Marital Status: Single
Citizenship: United States

Undergraduate Studies:
S.B. in Mathematics (with Honors), A.B. in Economics (with Honors), A.B. in Statistics
University of Chicago, 2008-2012

Graduate Studies:
Harvard University, 2012 to present
Ph.D. Candidate in Economics
Thesis Title: Information and Learning in Mechanism Design
Expected Completion Date: May 2018

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Professor Jerry Green
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Professor Benjamin Golub
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Teaching and Research Fields:
Primary field: Microeconomic Theory
Secondary fields: Organizational Economics, Industrial Organization

Teaching Experience:

AY 2015/16, 2016/17	Econ 985TA/985TB, "Research In Economic Theory, Modeling, Industrial Organization and Econometrics" Senior Thesis Tutorial, Harvard University, section leader
Spring 2014	Econ 2052, "Game Theory I: Equilibrium Theory" (graduate game theory topics course), Harvard University, teaching fellow for Professor Drew Fudenberg

Research Experience and Other Employment:

Summer 2016	Research Assistant for Professor Benjamin Golub
Fall 2014-Summer 2015	Research Assistant for Professor Tomasz Strzalecki
Summer/Fall 2013	Affiliate, Program for Evolutionary Dynamics
Summer 2012	Research Assistant for Professor Xavier Gabaix

Professional Activities:

Department service:
Organizer: Games and Markets Lunch, AY 2015/16, 2016/17
Master of Ceremonies: Economics Department Holiday Party, December 2014

Referee:
Quarterly Journal of Economics, Journal of Economics and Management Strategy

Honors, Scholarships, and Fellowships:

AY 2017-2018	Dissertation Completion Fellowship, Harvard University
Fall 2016 and Spring 2017	Bok Center Award for Teaching (awarded two times)
Spring 2015	Institute for Humane Studies PhD Scholarship Award
Spring 2012	Paul R. Cohen Award (Top 5 record in mathematics among graduating seniors)
Spring 2012	David S. Hu Award (Departmental award for graduating seniors in economics)
Spring 2012	Phi Beta Kappa

Job Market Paper:

"***Informational Robustness in Intertemporal Pricing***" ***with Xiaosheng Mu***

Consumers may be unsure of their willingness-to-pay for a product if they are unfamiliar with some of its features or have never made a similar purchase before. How does this possibility influence optimal pricing? To answer this question, we introduce a dynamic pricing model where buyers have the ability to learn about their value for a product over time. A seller commits to a pricing strategy, while buyers arrive exogenously and decide when to make a one-time purchase. The seller does not know how each buyer learns about his value for the product, and seeks to maximize profits against the worst-case information arrival processes. With only a single quality level and no known informational externalities, a constant price path delivers the optimal profit, which is also the optimal profit in an environment where buyers cannot delay. We then demonstrate that introductory pricing can be beneficial when the seller knows information is conveyed across buyers, and that intertemporal incentives arise when there are gradations in quality.

Other Research Papers

"False Positives and Transparency in Scientific Research"

This paper develops a model of costly information acquisition, focusing on an application to scientific research. When research protocols are not fully transparent, scientists are incentivized to make their experiments more susceptible to false positives, even though they obtain higher surplus from more informative experiments. On the other hand, non-transparency can induce a scientist to undertake a costlier but more informative experiment if it also enables her to commit to acting scrupulously. Our analysis suggests, counterintuitively, that policies establishing greater transparency in scientific methodology might therefore ultimately lead to some scientists undertaking research that is worse for those interested in the results.

"Prototyping under Competition"

Allocations of contracts for new technology development are often done prior to the total resolution of uncertainty regarding ultimate viability. A common method of allocation involves prototyping—demonstrating some preliminary version of the project with the intention of bringing it to completion. This considers the value of competition in these settings, relating the results to challenges faced by policymakers. When agents share the same ordinal preferences over their projects as the principal (for instance, if surplus is ultimately divided according to Nash bargaining between the principal and selected agent), an optimal mechanism need not feature stochastic project choice when randomizations across agents are feasible. Such mechanisms may be suboptimal without the alignment of the principal's and agent's incentives. The resulting policy requires commitment whenever randomization is involved, despite the optimality of deterministic mechanisms in the single agent case.

Research in Progress

"Informed Principal with Evolving Private Information"

Procurers often require contracts to be written in the presence of evolving uncertainty on the procurer's side. Motivated by these applications, this paper adapts a sequential screening model to accommodate private information on the principal's (procurer's) side. Both the agent's cost and the principal's demand parameter are privately observed by each party, and the agent takes an action at time 1, which we interpret as investment. Results on information irrelevance are obtained in cases where the agent's type is uncorrelated across periods, and when the investment action does not influence the principal's type. Without these features, distortions arise as the principal must promise payments in order to prevent the agent from becoming a "victim of his own success."

"Contracting with Experiment Choice: Interpreting Failure"

This paper develops a model for contracting for experimentation that distinguishes the *match quality* between the principal and the agent and the project quality of a particular research activity. Match quality is symmetrically unknown but learned about over time, though project quality is privately observed by the agent. This paper shows how the optimal level of discretion depends on the uncertainty over match quality. Specifically, an incentive conflict arises when there is uncertainty about match quality, with the agent preferring to change projects in case failure causes the principal to become pessimistic too early.

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B.S.E. in Computer Science, University of Pennsylvania, *summa cum laude*, 2012
M.S.E in Computer Science, University of Pennsylvania, 2012

Graduate Studies:
Harvard University, 2013 to present
Ph.D. Candidate in Business Economics
Thesis Title: "Essays in Entrepreneurship and Financial Economics"
Expected Completion Date: June 2018

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Teaching and Research Fields:
Entrepreneurship, Behavioral Finance, Asset Pricing

Teaching Experience:

2015 Spring	Corporate Finance, Harvard University, TF for Prof. Matteo Maggiori
2014 Fall	Macroeconomics and Politics, Harvard University, TF for Profs. Robert Barro and Emmanuel Farhi
2014 Spring	Economics and Computation, Harvard University, TF for Prof. David Parkes
2012 Fall	Fixed Income Securities, University of Pennsylvania, TA for Prof. John Zhu
2012 Spring	Fixed Income Securities, University of Pennsylvania, TA for Prof. Nikolai Roussanov

Research Experience and Other Employment:

2014	NBER, Research Assistant for Profs. Matteo Maggiori, Xavier Gabaix and Emmanuel Farhi
2013	AQR Capital Management, Research Analyst, Global Stock Selection
2011-2012	University of Pennsylvania, Research Assistant for Prof. Nikolai Roussanov
2011 Summer	Morgan Stanley, Sales and Trading Summer Analyst, FX and Rates Exotics Desks

Professional Activities:

Referee: *Management Science*

Honors, Scholarships, and Fellowships:

2013-2018	Harvard Business School Doctoral Fellowship
2015	Princeton Initiative on Macro, Money and Finance
2015	Yale Summer Program in Behavioral Finance
2007	First-class Prize in Chinese Mathematical Olympiad
2006	First-class Prize in Chinese Physics Olympiad

Research Papers:

"The Other Gender Gap: Female Entrepreneurship after WWII" (Job Market Paper)

Abstract: I use World War II casualty rates as exogenous variation in a natural experiment to establish a causal relationship between the opportunity costs of marriage and female entrepreneurship. World War II casualties affected the marriage market for single women and access to capital for war widows. Using an instrumental variable strategy, I establish that women in U.S. counties with heavier casualties were more active in starting new businesses after the war ended, and the marginal rate of entrepreneurship was twice as high as the average rate. This difference persists to this day. I also find that single women were more likely to start new businesses than war widows. Evidence in favor of the marriage market channel suggests that reducing opportunity cost is more effective in encouraging women to start new businesses than merely providing financial subsidies.

"Talking Your Book: Evidence from Investment Pitches at Conferences"

Abstract: Using a novel dataset on investment conferences from 2008 to 2013, I show that hedge funds take advantage of the publicity of these conferences and strategically release their book information to drive market demand. Specifically, I find that hedge funds pitch stocks in their portfolios that have performed well in the past and they want to take profit in. However, these stocks still perform better than non-pitched stocks in the portfolio afterwards due to demand from mutual funds and other investors. They earn a cumulative abnormal return of 20% over 18 months before the pitch, and continue to outperform the benchmark by 7% over 9 months afterwards. However, half the post-conference abnormal return reverts after another 9 months. Moreover, I discover that other hedge funds crowd into the same stocks at a similar pace, suggesting that they either run correlated strategies or share information. Mutual funds, on the other hand, exhibit opposite behaviors, suggesting they have different specialization in security selection from hedge funds. Finally, I show how to predict investment pitches and build profitable trading strategies.

"Detecting Anomalies: The Relevance and Power of Asset Pricing Tests" with Malcolm Baker and Ryan Taliaferro

Abstract: The two standard approaches for identifying capital market anomalies are cross-sectional coefficient tests, in the spirit of Fama and MacBeth (1973), and time-series intercept tests, in the spirit of Jensen (1968). A new signal can pass the first test, which we label a "score anomaly," it can pass the second test as a "factor anomaly," or it can pass both. We demonstrate the relevance of each to a mean-variance optimizing investor facing simple transaction costs that are constant across stocks. For a risk-neutral investor facing transaction costs, only score anomalies are relevant. For a risk-averse investor facing no transaction costs, only factor anomalies are relevant. In the more general case of risk aversion and transaction costs, both tests matter. In extensions, we derive modified versions of the basic tests that net out anomaly execution costs for situations where the investor faces capital constraints, a multi-period portfolio choice problem, or transaction costs that vary across stocks. Next, we measure the econometric power of the two tests. Time-series factor tests have uniformly lower power than equivalent cross-sectional score tests, with the gap increasing in the in-sample Sharpe ratio of the incumbent factor model. New factor anomalies are successively harder to detect. There is a lower natural limit on the number of anomalies, after which new factors can no longer be verified. Meanwhile, for an investor facing transaction costs, where score anomalies are also applicable, there is a higher natural limit on the number of anomalies that can be statistically validated as relevant.

"Assessing Local Credit Rationing Through Peer-to-Peer Lending"

Abstract: This paper uses a novel dataset on online lending platforms to assess credit rationing by traditional banks. Without needing to operate physical branches, new online lending platforms underwrite consumer credit nationally and provide a new source of credit for households. Low quality borrowers in counties with bad banking access are more credit constrained and have higher propensity to borrow than those in counties with good banking access. To identify this heterogeneous treatment effect, I use high quality borrowers as a control group and conduct a difference-in-difference research design. I find that low quality borrowers borrow 8% more from these online lending platforms for one standard deviation decrease in the local banking access. This result provides evidence that traditional brick-and-mortal banks cannot provide adequate consumer credit to low quality borrowers at current cost structure. New online lending platforms fill the lending void for this underserved group

"Learning by Suing: Structural Estimates of Court Errors in Patent Litigation" with Alan Marco and Nicholas Pairolero

Abstract: This paper presents structural estimates of the probability of validity, and the probability of Type I and Type II errors by courts in patent litigation. Patents are modeled as uncertain property rights, and implications of the model are tested using stock market reactions to patent litigation decisions. While court errors are inherently unobservable, the estimation quantifies beliefs about patent validity and court errors in a Bayesian context by relying on observable win rates and stock market reactions. I estimate that the underlying beliefs about validity average from 0.55 to 0.70 for litigated patents. For a number of different specifications, I show that Type I errors (finding a valid patent invalid) occur with an estimated probability of 0.20 to 0.25. The range for Type II errors (finding an invalid patent valid) varies more broadly, from near zero probability to as high as 0.40. Additional implications of the model address patent value.

Research Papers in Progress

"Momentum, News and Retail Trading" with Enrichetta Ravina and Luis Viceira

Abstract: Using a novel dataset on 2.8 million retail accounts between 2010 and 2014, we find individual investors are consistently on the losing side of momentum due to their contrarian trading behavior. They not only tend to hold negative momentum stocks but also actively trade out of positive ones. We discover that portfolio-specific news, either company events or macroeconomic announcement, is the trigger of their trading: they sell on positive news and buy on negative news. Momentum stocks tend to have positive news and momentum return is twice as large in stocks with high retail trading than in average stocks. We further show that, despite the average negative momentum tilt, there is large cross-sectional dispersion in factor loadings and alphas. Large accounts that trade less frequently, suffer less from contrarian trading, and have higher alphas.

"Autocorrelation Neglect: Amazon Product Ratings and Stock Returns"

"How Do Risk-based Disclosures Affect Future Consumer Economic Behaviors?" with Mingzhu Tai and Rajesh Vijayaraghavan

Updated: October 2017

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Personal Information: Date of birth: July 1, 1992. Gender: Female.

Undergraduate Studies:
Harvard University, 2010--2014
B.A. in Applied Mathematics, *summa cum laude*

Graduate Studies:
Harvard University, 2014 to present
Ph.D. Candidate in Business Economics
Thesis Title: Empirical Analyses in Finance and Macroeconomics
Expected Completion: May 2018

References:

Professor Andrei Shleifer Littauer Center 208 617-495-5046, ashleifer@harvard.edu	Professor Edward Glaeser Littauer Center 315A 617-495-0575, eglaeser@harvard.edu
Professor Samuel Hanson Baker Library 361, Harvard Business School 617-495-6137, shanson@hbs.edu	Professor Alp Simsek E52-552, Massachusetts Institute of Technology 617-253-4836, asimsek@mit.edu

Teaching and Research Fields:
Primary field: Financial economics. Secondary fields: Macroeconomics. Behavioral economics.

Publications:
"Expectations and Investment," with Nicola Gennaioli and Andrei Shleifer. *NBER Macroeconomics Annual (2016)*, Martin Eichenbaum and Jonathan Parker (ed.), National Bureau of Economic Research.

"What is Different about Urbanization in Rich and Poor Countries? Cities in Brazil, China, India, and the United States," with Juan Pablo Chauvin, Edward Glaeser, and Kristina Tobio. *Journal of Urban Economics (2016).*

"A Real Estate Boom with Chinese Characteristics," with Wei Huang, Edward Glaeser, and Andrei Shleifer. *Journal of Economic Perspectives (2017).*

Research Papers:

"Low Interest Rates and Risk Taking: Evidence from Individual Investment Decisions," with Chen Lian and Carmen Wang. (Job Market Paper)

How do low interest rates affect investor behavior? We document that individuals "reach for yield," that is, have a greater appetite for risk taking when interest rates are low. Using a randomized investment experiment holding fixed risk premia and risks, we show that low interest rates lead to significantly higher allocations to risky assets, among MTurk subjects and HBS MBAs. This effect also displays non-linearity, and becomes increasingly pronounced as interest rates decrease below historical norms. Such behavior cannot be easily explained by conventional portfolio choice theory or by institutional frictions. We then propose and test explanations related to investor psychology, including reference dependence and salience. We also present complementary evidence using historical data on household investment decisions.

Replicated by the Netherlands Authority for the Financial Markets.

"Anatomy of Corporate Borrowing Constraints," with Chen Lian.

We investigate borrowing constraints of non-financial firms. We find that 20% of US non-financial corporate debt by value is collateralized by specific physical assets ("asset-based lending" in creditor parlance), while 80% is not tied to the liquidation value of physical assets, and is based predominantly on cash flows from firms' operations ("cash flow-based lending"). A standard form of borrowing constraint restricts a firm's total debt as a function of cash flows measured using operating earnings ("earnings-based borrowing constraints," or EBCs). The centrality of cash flows in corporate borrowing has several implications. First, cash flows in the form of operating earnings relax EBCs, and enable firms to both borrow and invest more. This mechanism also reveals a new channel of firms' investment sensitivity to cash flows, one that arises from cash flows' direct impact on borrowing constraints, rather than effects on internal funds. Second, as corporate borrowing overall does not rely heavily on physical assets such as real estate, firms could be less vulnerable to collateral damage from property price shocks. In the Great Recession, for example, property price declines did not significantly affect major US non-financial firms' borrowing and investment through collateral damage. Finally, results in the US contrast with those in Japan, where corporate borrowing historically emphasizes physical assets.

"Non-Financial Firms as Cross-Market Arbitrageurs." Revise and Resubmit, *Journal of Finance.*

I demonstrate that non-financial corporations act as cross-market arbitrageurs in their own securities. Firms use one type of security to replace another in response to shifts in relative valuations, inducing negatively-correlated financing flows in different markets. Net equity repurchases and net debt issuance both increase when the expected returns on debt are particularly low, or when the expected returns on equity are relatively high. Credit valuations affect equity financing as much as equity valuations do, and vice versa. Cross-market corporate arbitrage is most prevalent among large, unconstrained firms. It counteracts market segmentation and helps to account for aggregate financing patterns.

"New Experimental Evidence on Expectations Formation," with Augustin Landier and David Thesmar.

In this paper, we measure belief formation in an experimental setting where agents are incentivized to provide accurate forecasts of a random variable, drawn from a stable and simple statistical process. Using these data, we estimate an empirical model that builds on the recent literature on expectation dynamics: It nests rational expectations, but also allows for extrapolation and under-reaction. Our findings are threefold. First, the rational expectation hypothesis is strongly rejected in our setting, and we find little evidence or learning. Second, both extrapolation and underreaction patterns are statistically discernible in the data, but extrapolation quantitatively dominates. Third, our model coefficients are very robust to changes in experimental setting: They do not depend on process parameters, individual characteristics, or framing.

These large and stable deviations from rationality occur even though the forecasting exercise is simple and transparent.

"Bank CEO Optimism and the Financial Crisis."

I test theories of the financial crisis by studying how banks' pre-crisis investments connect to their CEOs' beliefs. Using different proxies for beliefs, I find banks with larger housing investments and worse crisis performance had CEOs who were more optimistic ex ante. Banks with the most optimistic CEOs experienced 20 percentage points higher real estate loan growth, and 15 percentage points lower crisis period stock returns. Bank decisions appear consistent with CEO beliefs. CEOs' optimism contributed to credit expansions and crisis losses. I do not find evidence that CEOs made housing investments due to agency frictions while aware of impending problems

In Progress:

"Expectations in Macroeconomics and Finance," with Pedro Bordalo, Nicola Gennaioli, and Andrei Shleifer.

"Aggregate Impact of Expectational Errors," with David Sraer and David Thesmar.

"Corporate Asset Holdings and Collateral Usage."

Teaching Experiences:

Spring 2016	The Financial System and the Central Bank, Teaching Fellow for Professor Jeremy Stein. *Recipient, Derek Bok Center Certificate of Distinction in Teaching*

Honors and Awards:

2016, 2017	WFA Cubist Systematic Strategies PhD Candidate Award for Outstanding Research
2014	Thomas T. Hoopes Prize
2013	Phi Beta Kappa (Junior 24)

Conference Presentations:

2018	Econometric Society North American Winter Meeting, AEA*
2017	NBER Behavioral Finance Fall Meeting*, NBER Summer Institute (Risks), WFA Annual Meeting, SFS Cavalcade, FMA Napa Conference, UBC Winter Finance Conference
2016	NBER Behavioral Finance Fall Meeting, Econometric Society European Winter Meeting*, WFA Annual Meeting, FMA Applied Finance Conference, FSU SunTrust Beach Conference
2015	Miami Behavioral Finance Conference, NBER Macro Annual*

*****presentation by coauthor

Professional Services:

Discussions

2017	NBER Summer Institute (Urban), FMA Annual Meeting
2016	FMA Annual Meeting
2015	NBER Summer Institute (Urban)

Referee

Quarterly Journal of Economics, Review of Financial Studies, Journal of Urban Economics, Management Science, Economic Journal.

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Undergraduate Studies:
B.A. in Economics, University of Chicago, *Honors*, 2011
B.S. in Mathematics, University of Chicago, 2011

Graduate Studies:
Harvard University, 2012 to present
Ph.D. Candidate in Economics
Thesis Title: *"Essays on the Economics of Pharmaceutical Markets"*
Expected Completion Date: May 2018

References:

Professor Ariel Pakes Harvard University apakes@fas.harvard.edu	Professor David Cutler Harvard University dcutler@fas.harvard.edu
Professor Robin Lee Harvard University robinlee@fas.harvard.edu	Professor Ernst Berndt MIT Sloan School of Management eberndt@mit.edu

Teaching and Research Fields:
Industrial Organization, Health Economics

Teaching Experience:

Spring 2016,17	*Policy Options in Health Economics* (undergraduate). Teaching fellow for Professor Ariel Pakes
Spring 2016,17	*Industrial Organization II* (graduate). Teaching fellow for Professors Robin Lee, Myrto Kalouptsidi
Fall 2014,15	*The Business and Politics of Health* (undergraduate). Teaching fellow for Professor David Cutler
Spring 2015	*Psychology and Economics* (undergraduate). Teaching fellow for Professors David Laibson and Tomasz Strzalecki

Research Experience and Other Employment:

2014-2015	Harvard University, Research Assistant for Professors Ariel Pakes, Katherine Ho, and Mark Shepard
2013	Harvard University, Research Assistant for Professor Kenneth Rogoff
2011-2012	National Bureau of Economics Research, Research Assistant for Professors David Laibson, Brigitte Madrian, James Choi, and John Beshears
2010-2011	University of Chicago, Research Assistant for Professor Derek Neal

Professional Activities

Referee Service	*Journal of Health Economics*
Invited Presentations	*EIEF Doctoral Workshop on Applied Microeconomics, June 2017* *Bates-White Life Sciences Symposium, May 2017* *Applications of Economics Workshop, University of Chicago, May 2017*

Honors, Scholarships, and Fellowships:

2016	Health Economics Dissertation Fellowship, Becker Friedman Institute
2016	NBER-IFS Pre-Doctoral Fellowship on the Value of Medical Research
2015	Harvard University Certificate of Distinction in Teaching

Publications:

Aitken, Murray, Ernst R. Berndt, David Cutler, Michael Kleinrock, and Luca Maini. "**Has The Era Of Slow Growth For Prescription Drug Spending Ended?**" *Health Affairs* 35, no. 9 (2016): 1595-1603.

Job Market Paper:

"Reference Pricing as a Deterrent to Entry: Evidence from the European Pharmaceutical Market" (with Fabio Pammolli)

This paper empirically and theoretically analyzes the impact of external reference pricing (ERP) on launch delays in the market for pharmaceutical products. Governments that implement ERP use prices in other countries as negotiation benchmarks in an effort to bring down the cost of prescription drugs. By doing so, they limit the ability of firms to price discriminate across countries, and create an incentive to withhold drugs from countries with lower willingness to pay. Using data on pharmaceutical sales in European countries from 2002 to 2012, we document the presence of widespread launch delays across Europe --- up to three years on average in Eastern Europe. To distinguish between strategic delays caused by ERP and delays that arise for other reasons, we develop a dynamic structural model of entry that allows for externalities in price, which we estimate using a novel moment inequality approach. We find that removing ERP would reduce delays in Eastern Europe by up to 14 months per drug. At the same time, ERP has a small impact on firm profits, so it would be theoretically possible to compensate firms for their profit loss in exchange for forgoing strategic delays.

Research Papers:

"Where Is the Good Stuff? Drug Quality Measures and Economic Research" (with Josh Feng)

Prescription drug quality is an important variable in several strands of the health economics literature, including research on the value of medical R&D, the structure of pharmaceutical markets, and the impact of innovation policy. In this paper, we provide a starting point for researchers interested in these topics by first summarizing the data, methodology, and literature surrounding the measurement of drug quality, and then highlighting areas of economic research that use quality measures. We conclude with a discussion of possible areas for future research.

Research Papers in Progress

"Do Clinical Trial Outcomes Match Perceived Drug Quality?" (with Josh Feng)

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Undergraduate Studies:
B.A., Quantitative Economics, Tufts University, *summa cum laude*, 2010
Visiting Student in Economics, Pembroke College, University of Oxford, 2008–2009

Graduate Studies:
Harvard University, 2013 to present
Ph.D. Candidate in Economics
Thesis Title: "Essays in Labor Market Inequality"
Expected Completion Date: May 2018

References:

Professor Edward Glaeser
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Professor Amanda Pallais
Littauer Center 234
apallais@fas.harvard.edu

Professor Claudia Goldin
Littauer Center 229
617-613-1200, cgoldin@harvard.edu

Fields:
Labor, Public Finance

Research Papers:
"Gender and Sibling Dynamics in the Intergenerational Transmission of Entrepreneurship" (Job Market Paper)
This project uses gender and sibling dynamics to explore the intergenerational transmission of entrepreneurship. I find that the transmission of self-employment from fathers to daughters is significantly reduced when there are sons in the family. I interpret this as evidence that the intergenerational transmission of entrepreneurship is driven at least in part by costly investments by parents, which can be crowded out by brothers. I investigate specific types of parental investments – transfers of money, businesses, and human capital – that potentially underlie this transmission and conclude that sons crowd out human capital acquisition by daughters. If all daughters of self-employed men experienced the "sisters-only" level of transmission, the overall gender gap in self-employment would be reduced by nearly 20 percent.

"Majors, Skills, and the Returns to College"
This project examines the role of occupation-specific skill accumulation and utilization in explaining differences in earnings by college major. I construct two novel indices for major specificity that are based on the mix of occupations in which graduates are employed. The measures are intended to proxy for the intensity of occupation-specific training in a major; high-ranking majors according to these measures include Nursing, Architecture, Accounting, and Education. Using the Baccalaureate & Beyond 1993/2003 study, I find that within broad fields, earnings of graduates with relatively specific majors are more sensitive to the relatedness of the graduate's occupation to his or her major. This suggests that there are real differences in the generalizability of college skill content across majors and points to the importance of studying the returns to not just the quantity but also the content of education.

Publications:

Mishkin, Elizabeth and John Straub. "The Redistributive Effects of British Subsidies to Higher Education." *Social Policy and Society* 13(3): 337–355, 2014.

Teaching Experience:

Spring 2016	Inequality in the Labor Market, Harvard College (Sophomore Tutorial Instructor)

Research Experience and Other Employment:

Summer 2014	Harvard University, Research Assistant to Professor Amanda Pallais
2010–2013	Cornerstone Research, Analyst/Senior Analyst
Spring 2010	Federal Reserve Bank of Boston, Research Intern

Professional Activities

2017–2018	President, Graduate Economics Association, Harvard University
2017	Entrepreneurship Research Boot Camp, National Bureau of Economic Research
2016	Panel moderator, Conference on Poverty and Inequality, Harvard Kennedy School

Honors, Scholarships, and Fellowships:

2017–2018	Kauffman Dissertation Fellowship
2017–2018	Dissertation Completion Fellowship, Harvard University
2016–2017	Weatherhead Initiative on Gender Inequality Fellowship, Harvard University
2015–2016	Inequality and Social Policy Doctoral Fellowship, Harvard Kennedy School
2013–2016	National Science Foundation Graduate Research Fellowship

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Education:

M.S., Statistics, Stanford University, 2011
B.A., Economics, Stanford University, *with distinction*, 2010

Graduate Studies:

Harvard University, 2012 to present
Ph.D. Candidate in Economics
Thesis Title: "Essays on the Political Economy of Development"
Expected Completion Date: June 2018

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Professor Richard Hornbeck
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Teaching and Research Fields:

Fields: Development Economics, Political Economy, Economic History

Research Papers:

"*Cooperative Property Rights and Agricultural Development: Evidence from Land Reform in El Salvador*" (Job Market Paper)

Abstract: In cooperative property rights systems workers jointly own and manage production, whereas in outside ownership systems, an owner contracts laborers. Despite a rich theoretical literature on how the organization of property rights affects production, there is little causal evidence on the productivity implications of cooperative property rights. During a land reform in El Salvador in 1980, properties owned by individuals with cumulative landholdings over 500 hectares were reorganized into cooperatives managed by the former *hacienda* workers. Properties belonging to individuals with less than 500 hectares remained as privately-owned *haciendas*. Using the discontinuous probability of a property being becoming a cooperative and regression discontinuity design, I present causal evidence on the effects of cooperative property rights relative to outside ownership on agricultural productivity and economic development. The reform cooperatives are (i) less likely to produce cash crops and more likely to produce staple crops; (ii) less productive when producing cash crops; but (iii) more productive when producing staple crops. Additionally, cooperatives have more equitable worker income distributions and higher incomes relative to *hacienda* workers. The results are consistent with an incomplete contracting model comparing cooperatives and *haciendas*.

"*Mistrust in Medicine: The Legacy of Colonial Medicine Campaigns in Central Africa*," (with Sara Lowes)
Abstract: We examine how historical experiences with modern medicine affect present day engagement with the health sector by examining the legacy of French colonial medical campaigns. Between 1921 and 1958, the French military organized medical campaigns to treat and prevent sleeping sickness. The military forced villagers to participate and used medications with harsh, sometimes fatal, side effects. We digitized over thirty years of French colonial records that document the locations of campaign visits and the intensity of treatment at a granular geographic level for five African countries. We examine how exposure to the historical campaigns affects trust in medicine -- measured by willingness to take a blood test for anemia or HIV. Using an IV strategy, we show a significant and positive effect of historical exposure to campaigns on refusal to consent to a blood test. We provide evidence that the mistrust generated by this experience is specific to the medical sector, rather than to institutions more generally. Finally, we examine the importance of these historical campaigns for present day health policy by demonstrating differential response to a universal measles campaign.

"*Blood Rubber*," (with Sara Lowes)
Abstract: We examine the legacy of one of the most extreme examples of colonial extraction, the Leopold II concession system of the Congo Free State (CFS). The CFS granted concessions to private companies that used violent tactics to collect rubber. Village chiefs were co-opted into supporting the rubber regime, and individuals were severely punished if they did not meet the rubber quotas. We use a regression discontinuity design along the well-defined boundaries of the ABIR and Anversoise concessions to show that greater exposure to the rubber concessions causes significantly worse education, wealth, and health outcomes. We then use survey and experimental data from a former concession boundary to examine channels. Consistent with the historical co-option of chiefs by the concessions, village chiefs within the former concessions are less likely to be elected and provide fewer public goods. However, individuals within the concessions are more trusting and have stronger sharing norms.

Research in Progress

"*Age Organization and Accountability: Evidence from the DRC*," (with Sara Lowes, Nathan Nunn, and James A. Robinson)

"*Land Redistribution and Incomplete Property Rights: Evidence from Land Lotteries in Puerto Rico*," (with Raissa Fabregas)

"*The Impacts of Currency Fluctuations on Ethiopian Firms*," (with Andualem Telaye Mengistu and Alexander Segura)

Publications:

"*King Leopold's Ghost: The Legacy of Labor Coercion in the DRC*," in *The Long Economic Shadow of History*. Eds. Stelios Michalopoulos and Elias Papaioannou, CEPR/VOXEU, 2017, (with Sara Lowes)

Teaching Experience:

Spring, 2017	Ec2392: Political Economy of Development, Harvard University, Teaching Fellow for Professor Nico Voigtlaender
Spring, 2016	Ec2392: Political Economy of Development, Harvard University, Teaching Fellow for Professor Melissa Dell
Fall, 2015	Ec2325: Comparative Historical Economic Development, Harvard University, Teaching Fellow for Professor Nathan Nunn
Fall, 2015	API201: Quantitative Analysis and Empirical Methods I, Harvard Kennedy School, Teaching Fellow for Professor Michael Callen
Spring, 2015	Ec1393: Poverty and Development, Harvard University, Teaching Fellow for Professor Nathan Nunn
Fall, 2014	Ec2325: Comparative Historical Economic Development, Harvard University, Teaching Fellow for Professors Nathan Nunn and James Robinson
Fall, 2014	API201: Quantitative Analysis and Empirical Methods I, Harvard Kennedy School, Teaching Fellow for Professor John Friedman
Fall, 2013	Ec2325: Comparative Historical Economic Development, Harvard University, Teaching Fellow for Professors Nathan Nunn and James Robinson

Professional Activities

Referee:
Explorations in Economic History, Journal of Comparative Economics, Journal of Development Economics, Quarterly Journal of Economics

Seminar and Conference Presentations:
"*Cooperative Property Rights and Agricultural Development: Evidence from Land Reform in El Salvador*": EHA Conference (San Jose, 2017)
"*Blood Rubber: The Effects of Labor Coercion on Institutions and Culture in the DRC*": Deep Rooted Factors in Comparative Development (Brown, 2017); WGAPE (World Bank, 2016); Conference Sur la Croissance Economique Inclusive en RDC (Kinshasa, January 2015); B-WGAPE (MIT, 2014); NEUDC (Boston University, 2014); Macro Lunch (Brown, 2014)

Honors, Scholarships, and Fellowships:

2017	Harvard Dissertation Completion Fellowship
2016	Cambridge University Press Dissertation Fellowship, Economic History Association
2016	J-PAL Governance Initiative, 2016. "*Age Organization and Accountability: Evidence from the DRC,*'" (with Sara Lowes, Nathan Nunn, and James A. Robinson)
2016	Weiss Family Program Fund Grant, 2016. "*Addressing Mistrust in Medicine in Central Africa,*" (with Sara Lowes)
2016	Warburg Fund Grant, 2016. "*Land Redistribution and Incomplete Property Rights: Evidence from Land Lotteries in Puerto Rico*," (with Raissa Fabregas)
2015	Certificate of Distinction in Teaching, Derek Bok Center for Teaching and Learning, Harvard University
2015	Institute for Quantitative Social Science Grant, "*Blood Rubber: The Effects of Labor Coercion on Development and Culture in the DRC*" (with Sara Lowes)
2015	Warburg Fund Grant, "*Blood Rubber: The Effects of Labor Coercion on Development and Culture in the DRC*" (with Sara Lowes)
2015	The History Project Research Grant, Center for History and Economics, Harvard University, "*Blood Rubber: The Effects of Labor Coercion on Development and Culture in the DRC*" (with Sara Lowes)
2015	Lab for Economic Applications and Policy Grant (LEAP) Research Grant, "*Blood Rubber: The Effects of Labor Coercion on Development and Culture in the DRC*"

	(with Sara Lowes)
2015	Private Enterprise Development in Low-Income Countries Grant, "*The Impacts of Currency Fluctuations on Ethiopian Firms*," (with Alex Segura)
2014	Foundations of Human Behavior Initiative Summer Research Grant, "*Blood Rubber: The Effects of Labor Coercion on Development and Culture in the DRC*" (with Sara Lowes)
2014	Graduate Research and Travel Grant, "*Cooperative Property Rights and Agricultural Development: Evidence from Land Reform in El Salvador*"
2013	Lab for Economic Applications and Policy Grant (LEAP) Research Grant, "*The Lasting Impacts of Colonial Medical Campaigns in Central Africa*" (with Sara Lowes)
2012-2013	Douglas Dillon Fellow, Harvard University

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Thesis Title: "Essays on the Economics of Information"
Expected Completion Date: June 2018

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Teaching and Research Fields:
Game Theory, Decision Theory, Behavioral Economics

Teaching Experience:

Spring, 2014	Ec 2052 Graduate Game Theory, teaching fellow for Professor Drew Fudenberg
Fall, 2016	Ec 2052 Topics in Game Theory, teaching fellow for Professor Michihiro Kandori
Fall, 2016	Ec 1011 Undergraduate Microeconomics, teaching fellow for Prof. Edward Glaeser
Spring, 2017	Ec 2010 Graduate Microeconomics, teaching fellow for Professor Oliver Hart

Research Experience and Other Employment:

Spring, 2015	Harvard University, research assistant for Professor Matthew Rabin
Fall, 2015	Harvard University, research assistant for Professor Tomasz Strzalecki

Honors, Scholarships, and Fellowships:

2013-2017	Weiss Family Program Fund for Research in Economics
2009, 2011	Winner of the William Lowell Putnam Mathematics Competition
2008	Gold Medal in 49th International Mathematical Olympiad

Publications:

"Log-concavity of a Mixture of Beta Distributions"
Statistics and Probability Letters, 99: 125-130, 2015

"Differentially Private and Incentive Compatible Recommendation System for the Adoption of Network Goods" (with Kevin He)
EC'14, Proceedings of the 15th ACM Conference on Economics and Computation, 2014

Job Market Paper:

"Dynamic Information Acquisition from Multiple Sources" with Annie Liang and Vasilis Syrgkanis
Decision-makers often aggregate information across many sources, each of which provides relevant information. We introduce a dynamic learning model where a decision-maker learns about unknown states by sequentially sampling from a finite set of Gaussian signals with arbitrary correlation. Such a setting describes sequential search between similar products, as well as reading news articles with correlated biases. We study the optimal sequence of information acquisitions. Assuming the final decision depends linearly on the states, we show that myopic signal acquisitions are nonetheless optimal at sufficiently late periods. For classes of correlation structures that we describe, the myopic rule is optimal from period 1. These results hold independently of the decision problem and its (endogenous or exogenous) timing. We apply these results to characterize dynamic information acquisition in games.

Other Research Papers:

"Overabundant Information and Learning Traps" with Annie Liang
We study a model of sequential learning, where agents choose what kind of information to acquire from a large, fixed set of Gaussian signals with arbitrary correlation. In each period, a short-lived agent acquires a signal from this set of sources to maximize an individual objective. All signal realizations are public. We study the community's asymptotic speed of learning, and characterize the set of sources observed in the long run. A simple property of the correlation structure guarantees that the community learns as fast as possible, and moreover that a "best" set of sources is eventually observed. When this property fails, the community may get stuck in an inefficient set of sources and learn (arbitrarily) slowly. There is a specific, diverse set of possible final outcomes, which we characterize.

"Informational Robustness in Intertemporal Pricing" with Jonathan Libgober
Consumers may be unsure of their willingness-to-pay for a product if they are unfamiliar with some of its features or have never made a similar purchase before. How does this possibility influence optimal pricing? To answer this question, we introduce a dynamic pricing model where buyers have the ability to learn about their value for a product over time. A seller commits to a pricing strategy, while buyers arrive exogenously and decide when to make a one-time purchase. The seller does not know how each buyer learns about his value for the product, and seeks to maximize profits against the worst-case information arrival processes. With only a single quality level and no known informational externalities, a constant price path delivers the optimal profit. We then demonstrate that introductory pricing can be beneficial when the seller knows information is conveyed across buyers, and that intertemporal incentives arise when there are gradations in quality.

"Keeping Your Story Straight: Truthtelling and Liespotting" with Johannes Hörner and Nicolas Vieille
An agent privately observes a Markov chain online and reports it to a designer. To what patterns in the

reported data should the designer pay attention? We show that, in general, keeping track of the empirical frequency of transition counts in the agent's reports is insufficient, despite the true state being Markovian. Nonetheless, we derive conditions under which any deviation that can be distinguished from truthtelling by checking the frequency of strings of an arbitrary (finite) size can be detected by "checking pairs." Further, we find that some undetectable deviations cannot be profitable, independent of the agent's preferences. Hence, we provide weaker sufficient conditions that ensure that the agent finds honesty to be the best strategy. We explore the implications of these results for the literature on (i) linking incentives, (ii) dynamic implementation, and (iii) repeated games and agency models.

"Paying for Attention: The Impact of Information Processing Costs on Bayesian Inference" with Scott D. Kominers and Alexander Peysakovich
Human information processing is often modeled as costless Bayesian inference. However, research in psychology shows that attention is a computationally costly and potentially limited resource. We study a Bayesian individual for whom computing posterior beliefs is costly. Such an agent faces a tradeoff between economizing on attention costs and having more accurate beliefs. We show that even small processing costs can lead to significant departures from the standard costless processing model. There exist situations where beliefs can cycle persistently and never converge. In addition, when updating is costly, agents are more sensitive to signals about rare events than to signals about common events. Thus, these individuals can permanently overestimate the likelihood of rare events (e.g., the probability of a plane crash). There is a commonly held assumption in economics that individuals will converge to correct beliefs/optimal behavior given sufficient experience. Our results contribute to a growing literature in psychology, neuroscience, and behavioral economics suggesting that this assumption is both theoretically and empirically fragile.

"Amendment Voting with Incomplete Preferences: A Revealed-Preference Approach to Robust Identification"
I study the outcome of the amendment voting procedure based on a potentially incomplete preference relation. A decision-maker evaluates candidates in a list and iteratively updates her choice by comparing the status quo to the next candidate. She favors the status quo when the two candidates are incomparable according to her underlying preference. Developing a revealed preference approach, I characterize all choice functions that can arise from such a procedure and discuss to what extent the underlying preference can be identified from observed choices.

Research Papers in Progress
"(Myopically) Searching for the Best"
I study optimal search with binary outcomes. A decision-maker sequentially acquires signals about a number of projects and has to choose one at the end of the horizon. Projects either succeed or fail, and they are ex-ante symmetric. I show that optimal information acquisition always focuses on the two projects whose current expected payoffs are highest. Thus, optimal search in this environment is quasi-myopic. I further characterize those signal distributions under which the completely myopic strategy of learning about the currently best project is optimal. I extend these results to a situation in which multiple projects are eventually chosen.

"Ranking of Experiments and Mutual Information Measure"
I characterize preferences over stochastic information structures/experiments. Relative to the previous literature, I provide a behavioral foundation for mutual information as a measure of information value. The key new axiom in my analysis is termed "independence of irrelevant priors" (IIP). It captures the decision heuristic that when comparing two experiments, the decision-maker may combine multiple states into one so long as neither experiment affects the relative probabilities of these states. I show that mutual information arises whenever the decision-maker treats states and signals anonymously and his preference satisfies IIP.

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Research and Teaching Fields:
Primary Field: Labor
Secondary Fields: Behavioral, Development, Personnel Economics

Job Market Paper:
"Interpreting Signals: Evidence from Doctor Referrals"

This paper provides evidence that a person's gender influences the way others interpret information about his or her ability and documents the implications for gender inequality in labor markets. Using data on primary care physicians' (PCPs) referrals to surgeons, I find that PCPs view patient outcomes differently depending on the performing surgeon's gender. PCPs become more pessimistic about a female surgeon's ability than a male's after a patient death, indicated by a sharper drop in referrals to the female surgeon. However, PCPs become more optimistic about a male surgeon's ability after a good patient outcome, indicated by a larger increase in the number of referrals the male surgeon receives. PCPs also change their behavior toward other female surgeons after a bad experience with one female surgeon, becoming less likely to refer to new women in the same specialty. There are no such spillovers to other men after a bad experience with one male surgeon. Consistent with learning models, PCPs' reactions to events are strongest when they have just begun to refer to a surgeon. However, the empirical patterns are consistent with Bayesian learning only if PCPs do not have rational expectations about the true distribution of surgeon ability.

Working Papers:

"Gender Differences in Recognition for Group Work"

Does gender influence how credit for group work is allocated when individual contributions are not perfectly observed? Using data from academic economists' CVs, I test whether coauthored and solo-authored publications matter differently for tenure for men and women. Because coauthors are listed alphabetically in economics, coauthored papers do not provide specific information about each contributor's skills or ability. Solo-authored papers, on the other hand, provide a relatively clear signal of ability. I find that men are tenured at roughly the same rate regardless of whether they coauthor or solo-author. Women, however, become less likely to receive tenure the more they coauthor. The result is most pronounced for women coauthoring with men and less pronounced among women who coauthor with other women. I contrast economics with sociology, a discipline in which coauthors are listed in order of contribution, and find that when contributions are made clear, men and women receive equal credit for coauthored papers.

"Confidence Men? Evidence on Gender and Confidence from Top Economics" (with Guo Xu)

Does a confidence gap exist between men and women who made it to the top of their careers? Using data from a select group of economists working in top U.S. universities, we find that women are still less confident than men along two margins. First, when asked about their level of agreement on survey questions about the economy, women are less likely to give "extreme" answers in which they strongly agree or disagree. Second, women are less confident in the accuracy of their answer. The results persist after controlling for the year the PhD was granted, the PhD awarding institution, the current institution, and the number of solo and co-authored publications up to the point of tenure. We provide suggestive evidence that the confidence gap is driven by women being less confident (or men being overconfident) when asked questions that are outside their field of expertise.

Research Papers in Progress:

"Categorical Thinking: Police Officers' Reactions to Shootings"
"Coordination and Sexual Assault Reporting" (with Laura Derksen)

Publications:

"Rainfall and Conflict: A Cautionary Tale," *Journal of Development Economics*, Vol. 115, July 2015: 62-72.

There is evidence that, in some contexts, income shocks cause conflict. The literature demonstrating this relationship uses rainfall shocks to instrument for income shocks, arguing that in agriculturally-dependent regions, negative rain shocks lower income which incites violence. This identification strategy relies on the assumption that rainfall shocks affect conflict only through their impacts on income. This paper evaluates this exclusion restriction in the context of religious conflict in India. Using data on dam construction, I identify districts that are downstream from irrigation dams and show that income in these areas is much less sensitive to rainfall fluctuations. However, rain shocks remain equally strong predictors of riot incidence in these districts. I explore other channels through which rainfall might affect conflict.

"Recognition for Group Work: Gender Differences in Academia," *American Economic Review: Papers & Proceedings,* 2017, Vol. 107(5): 141-145.

Teaching Experience

Spring 2015	Race in America (undergraduate), Harvard University, Prof. Roland Fryer

Research Experience and Other Employment:

2011 - 2012	Harvard University, Research Assistant to Professors Raj Chetty, John Friedman, and Joshua Goodman
2011	Researcher at Innovations for Poverty Action

Honors, Scholarships, and Fellowships:

2017	Harvard Dissertation Completion Fellowship
2017	Washington Center for Equitable Growth Doctoral Award
2016	Weatherhead Initiative on Gender Inequality Graduate Fellowship
2016	University of Toronto Rotman Institute for Gender and the Economy Research Grant (with Laura Derksen)
2014 – 2017	Social Sciences & Humanities Research Council of Canada Graduate Fellowship
2014 – 2016	Harvard Kennedy School Inequality and Social Policy Fellowship
2015	Harvard Lab for Economic Applications and Policy Grant (x2)
2014 – 2015	PODER Fellowship, London School of Economics
2014	Harvard South Asia Institute Graduate Student Research Grant
2012	Rotary International Ambassadorial Scholarship
2012	Rita Ricardo-Campbell Fellowship in Economics, Harvard

Conferences and Invited Presentations:

2017: Wharton School of the University of Pennsylvania, Washington Center for Equitable Growth, Early Career Behavioral Economics Conference (CMU), Brown University, Harvard Kennedy School Women and Public Policy Program, Carnegie Mellon University, University of Lausanne, WZB-Berlin, RESTAT Conference on Publishing

2016: AEA Meetings (Chicago), Early Career Economics Conference (Bonn), Harvard Business School Gender Initiative

2015: AEA Meetings (San Francisco), Society of Labor Economics

2014: NEUDC (Harvard Kennedy School)

2012: NEUDC (Yale)

Referee Service:

AEJ: Applied Economics, Economic Development and Cultural Change, Journal of Development Economics, Journal of Human Resources, Journal of Urban Economics, Oxford Bulletin of Economics and Statistics, Oxford Development Studies, Quarterly Journal of Economics, Review of Economics and Statistics, Review of Economic Studies

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Undergraduate Studies

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Professional School Studies

J.D., Yale Law School, 2014

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Research and Teaching Fields

Research Fields: Health, Labor
Teaching Fields: Econometrics, Microeconomics

Job Market Paper

"Provider Response to Higher Cost Sharing and its Effect on Patient Outcomes"
(with Bastian Ravesteijn)
This paper investigates whether providers, in response to lower demand for their services, alter how they treat patients and if so how that affects patient outcomes. We examine all specialist mental health care providers in the Netherlands, which had a financial incentive under the reimbursement system to treat patients for longer after a national cost sharing reform. The reform raised the out-of-pocket price for mental health care for adults but not for youths, so we use the fraction of adults treated by the provider before the reform as an instrument for the change in duration of patient treatment after the reform. We show providers that treated a greater fraction of adults before the reform treated patients for longer after the reform. After controlling for provider-specific effects, we use two-stage least squares to estimate the impact of longer treatment durations on patient health and socioeconomic outcomes.

Working Paper

"The Impact of Cost Sharing for Mental Health Care on Health Care Use and Employment"
(with Bastian Ravesteijn)
This paper investigates whether less generous insurance coverage for mental health care lowers economic productivity. We evaluate a health insurance reform in the Netherlands that led to exogenous variation in patient cost sharing for mental health care. We use administrative data on the mental health care claims records of all residents of the Netherlands that we link to administrative data on labor market outcomes at the individual level. Our results indicate that the potential reduction in moral hazard under less generous insurance came at the expense of reductions in employment for certain identifiable subpopulations. Therefore, a well-targeted Pigouvian subsidy in the form of a lower out-of-pocket price for mental health care can be welfare-improving.

Publication

Ravesteijn B, Schachar EB, Beekman ATF, Janssen RTJM, Jeurissen PPT. Association of Cost Sharing With Mental Health Care Use, Involuntary Commitment, and Acute Care. *JAMA Psychiatry*. 2017;74(9):1-9.
This paper examines the association of higher patient cost sharing with mental health care use and downstream effects, such as the use of involuntary commitment and acute mental health care. In the Netherlands, the number of regular mental health care records opened for adults decreased abruptly and persistently by 13.4% when cost sharing was increased in 2012. Simultaneously, daily record openings increased for involuntary commitment by 96.8% and for acute mental health care by 25.1%. Overall, the cost-sharing reform was associated with estimated savings of €13.4 million. However, for adults with psychotic disorder or bipolar disorder, the additional costs of involuntary commitment and acute mental health care exceeded savings by €25.5 million.

Teaching Experience

Fall 2015	Econ 1010a (undergraduate), Harvard University, Lecturer Maxim Boycko
Fall 2014	Econ 1010a (undergraduate), Harvard University, Senior Lecturer Jeff Miron
Spring 2014	Econ 2140 (graduate), Harvard University, Professor Alberto Abadie
Fall 2010	Econ 115a (undergraduate), Yale University, Professor Steven Berry

Research Experience and Other Employment

2012-present	Harvard University, Resident Tutor, Lowell House
2010	Yale Law School, Research Assistant for Professor Christine Jolls
2007	Institute for Financial Management and Research, Research Assistant

Honors, Scholarships, and Fellowships

2017	Harvard Dissertation Completion Fellowship
2017	Pershing Square Venture Fund for Research on Foundations of Human Behavior
2016	Warburg Prize
2016	Lab for Economic Applications and Policy Research Grant
2016	Economics Travel and Research Award (x2)
2014	Bok Center Certificate of Distinction in Teaching
2011	National Science Foundation Graduate Research Fellowship
2007	Ronald Meltzer/Cornelia Awdziewicz Economic Award
2007	Phi Beta Kappa

Conferences and Presentations

2017	AEA Annual Meeting (Chicago), Harvard University Labor Economics Workshop (Cambridge)

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Fields: Financial Economics, International Macroeconomics

Research Papers:

"*Monetary Spillovers in Financial Markets: Policymakers and Premia*" (Job Market Paper)

As global markets become more interlinked, there is growing concern about the Federal Reserve's effects internationally. I examine the channels through which Fed monetary policy spills over into foreign developed financial markets. I establish a new fact on the asymmetric reactions of currencies and foreign bonds to Fed announcements, and show that it provides evidence against two leading channels of spillovers. Using high-frequency returns, I show that when the Fed tightens: (i) the dollar appreciates by more against high-rate currencies (e.g. the Australian dollar) than against low-rate currencies (e.g. the yen), and (ii) high-rate long-maturity bond yields rise more than low-rate long-maturity bond yields. The asymmetries across currency and bond markets provide evidence against theories in which foreign central banks react to the Fed or foreign risk premia shift in complete markets. Currency markets predict that when the Fed tightens, central banks tighten most or stochastic discount factors rise most in *low-rate* countries. By contrast, bond markets predict that central banks tighten most or stochastic discount factors rise most in *high-rate* countries. I further argue against these theories, by using evidence from foreign term structures and by showing unusual restrictions generated in models of complete markets. Only shifts in foreign risk premia under incomplete markets are consistent with these patterns, and I document the conditions such models must match. My results suggest that spillovers do not diminish the independence of central banks, but rather illustrate the importance of frictions in global markets.

Research Papers in Progress

"*Foreign-Currency Lenders of Last Resort*"

When a financial system is financed in foreign-currency short-term liabilities, monetary authorities can only mitigate liquidity crises with foreign-currency reserves or swap lines. I use a Bayesian dynamic linear model to estimate the (unreported) currency compositions of eighty central banks' reserves, and find the portfolios reflect the currency compositions of their financial systems' short-term liabilities.

"*Entertainment versus Information in Public Stock Recommendations*"

"Intraweek Patterns of Carry Trade Premia"

"Surcharges and Discounts for Dollar Invoicing" (using restricted Bureau of Labor Statistics microdata)

Teaching Experience:

2013 – 2016 (Fall)	Economics 1545: International Finance and Macro Policy, Harvard University, teaching fellow for Professor Kenneth Rogoff
2011, 2014 (Spring)	Statistics 123: Applied Quantitative Finance, Harvard University, teaching fellow for Professor Stephen Blyth
2013 – 2016 (Spring)	Economics 1420: American Economic Policy, Harvard University, head teaching fellow for Professor Martin Feldstein

Research Experience and Other Employment:

2016	Visiting Researcher, Bank of Canada
2015	Harvard University, Research Assistant for Professor Gita Gopinath
2013	University of Chicago, Data Science for Social Good, Fellow
2011 – 2012	D.E. Shaw, Equity Options Trader (traded volatility forecasts on individual stocks)

Honors, Scholarships, and Fellowships:

2012 – 2018	Harvard Graduate School of Arts and Sciences Fellowship
2015 – 2016	Rumsfeld Graduate Student Fellowship
2009 – 2016	Certificate of Distinction in Teaching (awarded ten times)
2015	Hirtle Callaghan Grant
2014	Pellegrini Research Grant for International Economics

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Undergraduate Studies:

BSc, Mathematics (TopMath), Technical University of Munich, with high distinction, 2010

Graduate Studies:

MASt, Mathematics (Part III of the Mathematical Tripos), University of Cambridge, with distinction, 2011
MPP, Public Policy, Harvard Kennedy School, 2013
AM, Economics, Harvard University, 2015

PhD Candidate, Economics, Harvard University, 2013 to present
Thesis Title: "Essays on the Econometrics of Machine Learning"
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Teaching and Research Fields:

Econometrics, Applied Microeconomics, Machine Learning, Behavioral Economics (teaching)

Teaching Experience:

2016	Economics 2140: Econometric Methods (PhD class in econometrics), Teaching fellow for Mikkel Plagborg-Møller, Harvard University
2014, 16	Economics 2150: Machine Learning in Econometrics (PhD class in econometrics), Teaching fellow for Sendhil Mullainathan, Harvard University
2012	Economics 2030: Psychology and Economics (PhD class in behavioral economics), Teaching fellow for David Laibson and Sendhil Mullainathan, Harvard University
2009/10	Discrete Mathematics (undergraduate class in mathematics), Teaching fellow for Anusch Taraz, Technical University of Munich

Research Experience:

2013	Research assistant to Alberto Abadie, Harvard Kennedy School
2012	Research assistant to David Laibson, Harvard University

Honors, Scholarships, and Fellowships:

2015–17	Machine Learning and Economics Fellowship, Harvard University
2012, 14, 16	Harvard University Certificate of Distinction in Teaching (awarded four times)
2011–13	McCloy Fellow, John F. Kennedy School of Government, Harvard University
2011	Bateman Scholar, Trinity Hall, University of Cambridge
2010–11	Kurt Hahn Scholar, University of Cambridge

Research Papers:

"Optimal Estimation when Researcher and Social Preferences are Misaligned" (Job Market Paper)

Econometric analysis typically focuses on the statistical properties of fixed estimators. In practice, however, researchers may have preferences over estimates and engage in specification searches. In this paper, I approach the analysis of experimental data as a mechanism-design problem. Specifically, I focus on covariate adjustments, which can increase precision, but open the door to bias when researchers search through specifications. First, I derive a justification for unbiasedness as a mini-max optimal requirement on estimation that aligns researchers' preferences with the minimization of the mean-squared error relative to the true treatment effect. Second, I provide a constructive characterization of all unbiased estimators as sample-splitting procedures. Third, I show that a researcher restricted to the class of unbiased estimators will solve a prediction problem. The duality between unbiased estimation and prediction across sample splits completely characterizes the class of admissible procedures, leaves space for exploratory data analysis, and offers an opportunity to leverage machine learning. As a practical implication, I describe flexible yet robust pre-analysis plans for randomized experiments that achieve efficiency without bias.

"Unbiased Shrinkage Estimation" (arXiv:1708.06436)

Shrinkage estimation usually reduces variance at the cost of bias. But when we care only about some parameters of a model, I show that we can reduce variance without incurring bias if we have additional information about the distribution of covariates. In a linear regression model with homoscedastic Normal noise, I consider shrinkage estimation of the nuisance parameters associated with control variables. For at least three control variables and exogenous treatment, I establish that the standard least-squares estimator is dominated with respect to squared-error loss in the treatment effect even among unbiased estimators and even when the target parameter is low-dimensional. I construct the dominating estimator by a variant of James–Stein shrinkage in a high-dimensional Normal-means problem. It can be interpreted as an invariant generalized Bayes estimator with an uninformative (improper) Jeffreys prior in the target parameter.

"Bias Reduction in Instrumental Variable Estimation through First-Stage Shrinkage" (arXiv:1708.06443)

The two-stage least-squares (2SLS) estimator is known to be biased when its first-stage fit is poor. I show that better first-stage prediction can alleviate this bias. In a two-stage linear regression model with Normal noise, I consider shrinkage in the estimation of the first-stage instrumental variable coefficients. For at least four instrumental variables and a single endogenous regressor, I establish that the standard 2SLS estimator is dominated with respect to bias. The dominating IV estimator applies James–Stein type shrinkage in a first-stage high-dimensional Normal-means problem followed by a control-function approach in the second stage. It preserves invariances of the structural instrumental variable equations.

"Robust Post-Matching Inference" (with Alberto Abadie)

Nearest-neighbor matching (Cochran, 1953; Rubin, 1973) is a popular nonparametric tool to create balance between treatment and control groups in observational studies. As a preprocessing step before regression analysis, matching reduces the dependence on parametric modeling assumptions (Ho et al., 2007). Moreover, matching followed by regression allows estimation of elaborate models that are useful to describe heterogeneity in treatment effects. In current empirical practice, the matching step is often ignored for the estimation of standard errors and confidence intervals. That is, to do inference, researchers proceed as if matching did not take place. We show that ignoring the matching first step produces valid standard errors if matching is done without replacement and if the regression model is correctly specified relative to the population regression function of the outcome variable on the treatment variable and all the covariates used for matching. However, standard errors that ignore the matching step are not valid if matching is conducted with replacement or, more crucially, if the second step regression model is misspecified. We show that two easily implementable alternatives, (i) clustering the standard errors at the level of the matches, or (ii) a nonparametric block bootstrap procedure, produce approximations to the distribution of the post-matching estimator that are robust to misspecification, provided that matching is done without replacement. These results allow robust inference for post-matching methods that use regression in the second step. A simulation study and an empirical example demonstrate the empirical relevance of our results.

"Machine Learning Tests for Effects on Multiple Outcomes" (with Jens Ludwig and Sendhil Mullainathan; arXiv:1707.01473)

A core challenge in the analysis of experimental data is that the impact of some intervention is often not entirely captured by a single, well-defined outcome. Instead there may be a large number of outcome variables that are potentially affected and of interest. We propose a data-driven approach rooted in machine learning to the problem of testing effects on such groups of outcome variables. It is based on two simple observations. First, the "false-positive" problem that a group of outcomes is similar to the concern of "over-fitting," which has been the focus of a large literature in statistics and computer science. We can thus leverage sample-splitting methods from the machine-learning playbook that are designed to control over-fitting to ensure that statistical models express generalizable insights about treatment effects. The second simple observation is that the question whether treatment affects a group of variables is equivalent to the question whether treatment is predictable from these variables better than some trivial benchmark (provided treatment is assigned randomly). This formulation allows us to leverage data-driven predictors from the machine-learning literature to flexibly mine for effects, rather than rely on more rigid approaches like multiple-testing corrections and pre-analysis plans. We formulate a specific methodology and present three kinds of results. First, our test is exactly sized for the null hypothesis of no effect. Second, a specific version is asymptotically equivalent to a benchmark joint Wald test in a linear regression. Third, this methodology can guide inference on where an intervention has effects. Finally, we argue that our approach can naturally deal with typical features of real-world experiments, and be adapted to baseline balance checks.

Publication:

"Machine Learning: An Applied Econometric Approach" (with Sendhil Mullainathan)
Journal of Economic Perspectives (Spring 2017)

Machines are increasingly doing "intelligent" things: Facebook recognizes faces in photos, Siri understands voices, and Google translates websites. The fundamental insight behind these breakthroughs is as much statistical as computational. Face recognition algorithms, for example, use a large dataset of photos labeled as having a face or not to estimate a function $f(x)$ that predicts the presence y of a face from pixels x. This similarity to econometrics raises questions: How do these new empirical tools fit with what we know? As empirical economists, how can we use them? We present a way of thinking about machine learning that clarifies its place in the econometric toolbox. Machine learning not only provides new tools, it solves a specific problem. Machine learning revolves around prediction on new sample points from the same distribution, while many economic applications revolve around parameter estimation and counterfactual prognosis. So applying machine learning to economics requires finding relevant prediction tasks.

Book:

"Machine Learning for Economics" (with Sendhil Mullainathan)
Princeton University Press (in preparation)

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Research and Teaching Fields:
Primary fields: Development Economics, Political Economy
Secondary fields: Economic History, Cultural Economics

Teaching Experience:

Fall 2015, 2017	*Cultural Economics* (undergraduate). Teaching fellow for Professor Alberto Alesina
Spring 2015, 2016	*Formal Models of Domestic Politics* (graduate). Teaching fellow for Professors Horacio Larreguy and Arthur Silve
Fall 2014, 2015	*Formal Political Theory* (graduate). Teaching fellow for Professors Horacio Larreguy and Arthur Silve

Honors and Fellowships:

2016	The Pershing Square Fund for Research on the Foundations of Human Behavior
2016	IQSS Graduate Research Grant
2015	Center for American Political Studies Graduate Seed Grant

Professional Activities:

Referee for:	*Quarterly Journal of Economics, Journal of the European Economic Association, Journal of Development Economics, Review of Economics and Statistics, Economic Journal, European Journal of Political Economy*
Invited Presentations:	2017: RIDGE-LACEA Political Economy Meeting, Rio de Janeiro; DEVPEC, Stanford; PACDEV, UC Riverside; NEUDC, Tufts University 2016: The Empirics and Methods in Economics Conference, Northwestern 2015: DEVPEC, Stanford 2014: NEUDC, Boston University; Brown University Macro Lunch

Job Market Paper:

"Patronage in the Allocation of Public Sector Jobs," with Emanuele Colonnelli and Mounu Prem

Abstract: This paper studies patronage - the use of public sector jobs to reward political supporters of the party in power - in Brazilian local governments. We use longitudinal data on the universe of Brazilian public sector employees over the 1997-2014 period, matched with information on more than 2,000,000 political supporters of Brazilian local parties. Using a regression discontinuity design that generates exogenous variation in individuals' connection to the party in power, we first document the presence of significant political favoritism in the allocation of jobs throughout the entire Brazilian public sector hierarchy: being a political supporter of the party in power increases the probability of having a public sector job by 10.5 percentage points (a 47% increase). Leveraging detailed information on supporters' and jobs' characteristics, we then show that patronage is the leading explanation behind this favoritism: jobs in the public sector are used as reward for political supporters. We find that patronage has significant real consequences for selection to public employment, as the amount of support provided to the party in power substitutes qualifications as determinant of hiring decisions. Finally, consistent with this negative impact on the quality of the selected public workers, we present evidence suggesting that patronage practices are associated with a worse provision of public services.

Publications:

"The Long-Term Effect of Demographic Shocks on the Evolution of Gender Norms. Evidence from the Trans-Atlantic Slave Trade" (Forthcoming*, Journal of the European Economic Association*)

Abstract: Can demographic shocks affect the long-run evolution of female labor force participation and gender norms? This paper traces current variation in women's participation in the labor force within Sub-Saharan Africa to the emergence of a female-biased sex ratio during the centuries of the transatlantic slave trade. This historical shock affected the division of labor along gender lines in the remaining African population, as women substituted for the missing men by taking up areas of work that were traditionally male tasks. By exploiting variation in the degree to which different ethnic groups were affected by the transatlantic slave trade, I show that women whose ancestors were more exposed to this shock are today more likely to be in the labor force, have lower levels of fertility, and are more likely to participate in household decisions. The marriage market and the cultural transmission of internal norms across generations represent important mechanisms explaining this long-run persistence.

"Intergenerational Mobility and Preferences for Redistribution," with Alberto Alesina and Stefanie Stantcheva (Forthcoming, *American Economic Review*)

Abstract: Using new cross-country survey and experimental data, we investigate how beliefs about intergenerational mobility affect preferences for redistribution in France, Italy, Sweden, the U.K., and the U.S.. Americans are more optimistic than Europeans about social mobility. Our randomized treatment shows pessimistic information about mobility and increases support for redistribution, mostly for "equality of opportunity" policies. We find a strong political polarization. Left-wing respondents are more pessimistic about mobility, their preferences for redistribution are correlated with their mobility perceptions, and they support more redistribution after seeing pessimistic information. None of these apply to right-wing respondents, possibly because they see the government as a "problem" and not as the "solution."

Research Papers in Progress:
"State-Owned Firms and Political Employment: Evidence from Brazil," with Emanuele Colonnelli

"What Drives Corporate Elites' Contribution Behavior? Evidence from Directors of U.S. Public Firms"

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Undergraduate Studies:
A.B., Mathematics-Economics, Brown University, *magna cum laude*, 2013

Graduate Studies:
Harvard University, 2013 to present
Ph.D. Candidate in Business Economics
Thesis Title: "*Essays on Economic Behavior and Design*"
Expected Completion Date: May 2018

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Professor Andrei Shleifer
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Teaching and Research Fields:
Primary fields: Labor Economics, Behavioral Economics

Secondary fields: Market Design, Public Economics

Teaching Experience:

Fall 2014 and 2015	Psychology and Economic Theory, Professor Matthew Rabin, Harvard University Econ 2035, Teaching Fellow [Rating: 4.7/5 (2014), 4.9/5 (2015)]
Spring 2013	Introduction to Econometrics, Professor Blaise Melly, Brown University Econ 1620, Teaching Assistant
Fall 2015	Guest Lecture, Market Design, Professor Scott Duke Kominers, Harvard University

Professional Activities:

Presentations
- University of California at San Diego, Rady School of Management, 2017
- The Hebrew University of Jerusalem, 2017
- Tel Aviv University, 2017
- Stanford Institute for Theoretical Economics: Psychology and Economics, 2017
- HCEO Conference on Market Design Perspectives on Inequality, University of Chicago, 2016
- 11th Workshop on Matching in Practice, Paris School of Economics, 2016
- INFORMS Annual Meeting, Philadelphia, 2015
- 11th World Congress of the Econometric Society, Montréal, 2015
- Third Conference on Auctions, Market Mechanisms and Their Applications, University of Chicago, 2015
- 16th ACM Conference on Economics and Computation, Portland, 2015

Referee Service *American Economic Review, Economics of Transition, Quarterly Journal of Economics*

Honors and Fellowships:

2016	Lynde and Harry Bradley Foundation Fellowship
2014 and 2015	Certificate of Distinction in Teaching, Bok Center, Harvard University

Job Market Paper:

"*Daily Labor Supply and Adaptive Reference Points*," with Linh T. Tô
(Revise and resubmit, *American Economic Review*)

Abstract: We document evidence of high-frequency reference-point adjustment in the field. Analyzing a dataset of all New York City cab fares in 2013 using non-parametric methods, we find reductions in cabdriver labor supply in response to higher accumulated daily earnings and stronger effects for more recent earnings. The income effect is inconsistent with the neoclassical model and the non-fungibility of daily income rejects models invoking daily income targets. To explain the evidence, we incorporate adaptive reference points into models of loss aversion and salience. While loss aversion tends to overstate the main quantitative features of the data, both models capture the qualitative features.

Research Papers:

"*The Public-Housing Allocation Problem: Theory and Evidence from Pittsburgh*"

Abstract: We present a model of public-housing allocation, in which objects that arrive stochastically over time must be matched with applicants on a waiting list. Our framework delivers a strategy-proof, ex-ante efficient and envy-free mechanism which allows applicants to trade off their preferences for different units and waiting times by choosing among a set of waiting lists. A counterfactual change from existing mechanisms, in which applicants receive offers after units become available and can refuse only a limited number of times, to the proposed mechanism improves welfare by a lower bound of $6,429 per applicant in a sample of Pittsburgh households.

Publications:

"The Design of Public-Housing Policies," in preparation for *More Equal by Design: Economic Design Responses to Inequality*, eds. Scott Duke Kominers and Alexander Teytelboym, Oxford University Press.

Abstract: Social programs are a central means for addressing inequality. This chapter proposes to view social programs through the lens of market design, focusing on the case of public-housing assistance. One of the goals of this chapter is to deliver lessons for housing policy that can be gleaned from market design. After presenting relevant features of the market for affordable housing, we highlight various dimensions of inequality. We explore design considerations that pertain to inequality among those who do receive assistance as well as inequality in terms of which households receive housing assistance. We describe recent research that attempts to address these issues and suggest directions where further research can make progress. The chapter aims to show more broadly that the market for public housing also exemplifies general lessons for market deign.

“Matching with Stochastic Arrival,” extended abstract in *Proceedings of the Sixteenth ACM Conference on Economics and Computation*, EC ’15, pp. 343–343, 2015.

Abstract: We study matching in a dynamic setting, with applications to the allocation of public housing. In our model, objects of different types that arrive stochastically over time must be allocated to agents in a queue. For the case that the objects share a common priority ordering over agents, we introduce a strategy-proof mechanism that satisfies certain fairness and efficiency properties. More generally, we show that the mechanism continues to satisfy these properties if and only if the priority relations satisfy an acyclicity condition. We then turn to an application of the framework by evaluating the procedures that are currently being used to allocate public housing.

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Undergraduate Studies:
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Graduate Studies:
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Ph.D. Candidate in Economics
Thesis Title: "*Essays in Health Economics*"
Expected Completion Date: June 2018

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Harvard Medical School
Health Care Policy Department
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Fields:
Primary Fields: Public Finance

Secondary fields: Health Economics, Econometrics

Job Market Paper:

"Quasi-experimental Evidence of Physician Effects"

Variation in health care utilization is large and exists both across geographic regions and across doctors in the same region. However, the literature is only just beginning to understand the drivers of such variation. Are doctors prescribing different care for the same types of patients or are patients different in ways unobservable to researchers? This paper estimates the share of variation in physician practice intensity that is due to doctor differences as opposed to patient differences. The quasi-experiment leverages changes in the referral network of primary care physicians resulting from specialist migrations and exits. Using Medicare claims data, I estimate that between 50% and 70% of variation is driven by doctor styles. I replicate the baseline results using an instrumental variables strategy, suggesting that identification is robust to the most-likely endogeneity threats. Higher or lower health care usage is not correlated with mortality or hospitalization rates, but higher initial utilization does lead to greater subsequent utilization. In contrast to past studies, I estimate the treatment effect of doctors, rather than the treatment effect of geographic regions. Since doctors are the key decision-makers in health care provision and since variation across doctors vastly exceeds variation across regions, understanding the causal effect of doctors is vital for understanding the sources of variation and for designing policies to reduce that variation.

Research in Progress

"The Incentive Effects of Medicare's Sustainable Growth Rate"

"Connecting Cost-Effectiveness Analysis and Medical Practice"

Teaching Experience:

Fall 2014, 2015, 2016	Introduction to Econometrics (undergraduate), Harvard University, teaching fellow for James Stock
Spring 2015	"Messing with Markets" (sophomore seminar in public finance), Harvard University, seminar leader

Derek Bok Certificate of Excellence in Teaching in all four semesters

Research Experience and Other Employment:

2011-2012	Stanford University, Research Assistant to Jay Bhattacharya • Coauthor of *Health Economics* by Bhattacharya, Hyde, and Tu
2009-2012	Facebook, Business Operations Associate

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EDUCATION

Harvard University — 2012-
Ph.D. Candidate, Political Economy and Government
Subfields: political economy, development economics.
Dissertation: "State building and political engagement: evidence from the D.R. Congo."
Committee: Horacio Larreguy, Nathan Nunn, Rohini Pande, James Robinson (chair).

Cambridge University — 2009-2010
One-year tripos, Political Theory (Pembroke College)

Harvard College — 2005-2009
B.A., Social Studies (Magna Cum Laude)

PUBLICATIONS

Lowes A, Nunn N, Robinson JA, and Weigel JL. 2017. "The Evolution of Culture and Institutions: Evidence from the Kuba Kingdom." ***Econometrica*** 85(4):1065-1091.

Lowes A, Nunn N, Robinson JA, and Weigel JL. 2015. "Understanding Ethnic Identity in Africa: Evidence from the Implicit Association Test (IAT)." ***American Economic Review: Papers and Proceedings*** 105(5):1-8.

Ivers LC, Teng J, Lascher J, Raymond M, Weigel JL, et al. 2013. "Use of Oral Cholera Vaccine in Haiti: A Rural Demonstration Project." ***American Journal of Tropical Medicine and Hygiene*** 89(4): 617-624.

Farmer P, Nutt CT, Wagner MW, Sekabaraga C, Nuthulaganti T, Weigel JL, et al. 2013. "Reduced Premature Mortality in Rwanda: Lessons from Success." ***British Medical Journal*** 346:f65.

WORKING PAPERS

Weigel JL. "Building State and Citizen: How Tax Collection in Congo Engenders Citizen Engagement with the State." (**Job Market Paper**)

Reid O and Weigel JL. "Citizen Participation in Corruption: Evidence from Roadway tolls in the D.R. Congo."

ONGOING PROJECTS

Weigel JL. "Paying Taxes to a Weak State: Quasi-Voluntary Compliance in Congo."

Balan P, Bergeron A, Tourek G, and Weigel JL. "The Origins of Tax Compliance and Government Accountability: Evidence from Congo."

Lowes S, Nunn N, Reid O, and Weigel JL. "Politics and Ethnic Salience: Evidence from Découpage in the D.R. Congo."

Weigel JL. "Information and Extortion: Empowering Citizens to Reduce Corruption."

Weigel JL. "In-Group Preferences and Pentecostalism in Africa: Experimental Evidence from the D.R. Congo."

OTHER PUBLICATIONS

Kerry V, Binagwaho A, Weigel JL, Farmer P. 2014. "From Aid to Accompaniment: Rules of the Road for Development Assistance." In *The Handbook of Global Health Policy*, ed. Yamey G. New York: Wiley-Blackwell.

Weigel JL et al. 2013. "Taking Stock of Foreign Aid", "Health For All? Competing Theories and Geopolitics", "The Unique Challenges of Mental Health and MDR-TB: Critical Perspectives on the Metrics of Disease." In *Reimagining Global Health: An Introduction*, ed. Farmer P, Kim JY, Kleinman A, Basilico M. Berkeley: University of California Press.

Ellner A, Pace C, Lee S, Weigel JL, Farmer P. 2013. "Embracing Complexity: Towards Platforms for Integrated Health and Social Service Delivery." In *Structural Approaches in Public Health*, eds. Sommer M and Parker R. London, UK: Routledge Press.

Weigel JL, Farmer P. 2012. "Cholera and the Road to Modernity: Lessons from One Latin American Epidemic for Another," *Americas Quarterly*

CONFERENCE PRESENTATIONS

Working Group on African Political Economy (WGAPE), University of California, Berkeley	2017
Northeast Workshop in Empirical Political Science (NEWEPS), Columbia University	2017
Cultural Evolution of Religion (CERC) Plenary Meeting, McGill University	2015

HONORS AND FELLOWSHIPS

Fulbright Scholarship, Democratic Republic of Congo	2016
Certificate of Distinction in Teaching, Bok Center for Teaching and Learning, Harvard	2015
Dame Ivy Compton-Burnett Prize, Pembroke College, Cambridge University	2010
William Shirley Scholarship, Harvard-Cambridge ("John Harvard") Scholarships	2009-2010
Ernst Kitzinger Prize, Lowell House, Harvard University	2009

GRANTS

Abdul Latif Jameel Poverty Action Lab (JPAL) Governance Initiative ($26,782) (with Pablo Balan, Augustin Bergeron, and Gabriel Tourek)	2017-
Evidence in Governance and Politics (EGAP) Metaketa II "Taxation" Initiative ($224,195) (with Pablo Balan, Augustin Bergeron, and Gabriel Tourek)	2017-
National Science Foundation Interdisciplinary Behavioral and Social Science Initiative ($55,000)	2016
Abdul Latif Jameel Poverty Action Lab (JPAL) Governance Initiative ($47,800) (with Otis Reid)	2016
Weiss Family Program Fund ($40,000)	2015-2016
Weatherhead Center for International Affairs, Harvard University ($14,500)	2014-2016
Committee on African Studies, Harvard University ($3,200)	2013

TEACHING

Government 20: Foundations of Comparative Politics 2014
Teaching Fellow with Professor Steve Levitsky

Government 1197: The Political Economy of Africa 2015
Head Teaching Fellow with Professors Robert Bates and James A. Robinson

ACADEMIC AFFILIATIONS AND SERVICE

Reviewer for: *Econometrica, Journal of Development Economics* 2016-

Affiliate, Evidence for Policy Design, Harvard Kennedy School 2017-

Research associate, Weatherhead Center for International Affairs, Harvard University 2015-

Affiliate, Institute for Quantitative Social Science, Harvard University 2015-

Coordinator, Harvard Political Economy Workshop 2014-2015

Board member, Harvard-Cambridge ("John Harvard") Scholarships 2014-

FIELD RESEARCH

Kananga, Democratic Republic of Congo Jan-Feb 2017
Kananga, Democratic Republic of Congo Jan-Oct 2016
Kananga, Democratic Republic of Congo Summer 2015
Kananga, Democratic Republic of Congo Summer 2014
Kananga, Democratic Republic of Congo Summer 2013

VOCATIONAL EXPERIENCE

Research Assistant for Professor Paul Farmer (Co-founder, Partners In Health) 2010-2012

SKILLS

Computing: Stata, R, ArcGIS, LaTeX, Python (basic)
Languages: French

REFERENCES

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Undergraduate Studies:
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Magna cum laude, Highest Honors in Economics and *Honors* in Mathematics

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Harvard University, 2012 to present
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Teaching and Research Fields:
Primary fields: International Trade, Urban Economics
Secondary fields: Development Economics, Financial Economics, Public Economics

Job Market Paper:
"Geographic Distribution of Firm Productivity and Production: A 'Market Access' Approach" (with Yuxiao Huang).

This paper studies the distribution of firm productivity and production in a network of geographic locations. Using firm-level data from China's manufacturing sector from 1998 to 2007, we document that, on average, firms' geographic locations explain approximately 14% of the productivity dispersion, yet the explanatory power of locations varies significantly across industries. These empirical patterns motivate us to develop two "market access" measures in a firm heterogeneity and trade framework to illustrate how changes in inter-location trade costs affect the selection of firms in each location and shape the distribution of firm productivity and production across locations. A decrease in a location's trade cost with other locations improves its (1) consumer market access (CMA), a measure of import competition that local firms face from rival firms elsewhere; (2) firm market access (FMA), a measure of the size of the export market for local firms. To distinguish between these two competing effects empirically, we use reduction in road travel time due to massive nationwide highway construction as a source of variation in trade costs between Chinese prefectures. Reduced-form evidence supports theoretical predictions that better CMA corresponds to higher local average productivity and smaller local firm output, while better FMA corresponds to lower average productivity and larger output. Counterfactual analysis suggests that, overall, the expansion of highway networks accounted for 24% the observed rise in aggregate productivity and 36% of the decline in productivity dispersion, but these effects differ substantially across industries and locations.

<u>Publications</u>:

"Agricultural Insurance and Economic Development" (with Shawn Cole), *Annual Review of Economics* (Sep. 2017) 9: 235–262.

This article provides a review of recent research on agricultural insurance (AI) in developing countries. Agricultural producers face a variety of significant risks; historically, only government-subsidized products have achieved widespread adoption. A recent contractual innovation, which links insurance payouts to realized weather rather than farmer indemnity, has spurred substantial research in the past decade. This review begins by describing the experience in developed economies and then turns to developing countries, covering the following topics: farmers' adoption of AI, how AI affects their decision to invest in risky assets, and the extent to which AI helps farmers smooth income and consumption. We conclude with suggestions for future research and practice related to AI in developing countries.

"Urban Productivity in the Developing World" (with Edward Glaeser), *Oxford Review of Economic Policy* (Jul. 2017) 33(3): 373-404.

Africa is urbanizing rapidly, and this creates both opportunities and challenges. Labour productivity appears to be much higher in developing-world cities than in rural areas, and historically urbanization is strongly correlated with economic growth. Education seems to be a strong complement to urbanization, and entrepreneurial human capital correlates strongly with urban success. Immigrants provide a natural source of entrepreneurship, both in the US and in Africa, which suggests that making African cities more livable can generate economic benefits by attracting talent. Reducing the negative externalities of urban life requires a combination of infrastructure, incentives, and institutions. Appropriate institutions can mean independent public authorities, public–private partnerships, and non-profit entities, depending on the setting.

"HIV Prevention and Risk Compensation" (with Christine Mattson and Nicholas Wilson), *Journal of Development Economics* (Jan. 2014) 106: 78-91.

Risk compensation has been called the "Achilles' heel" of HIV prevention policies (Cassell et al., 2006). This paper examines the behavioral response to male circumcision, a major HIV prevention policy currently being implemented throughout much of Sub-Saharan Africa. Contrary to the presumption of risk compensation, we find that the response due to the perceived reduction in HIV transmission appears to have been a reduction in risky sexual behavior. We suggest a mechanism for this finding: circumcision may reduce fatalism about acquiring HIV/AIDS and increase the salience of the tradeoff between engaging in additional risky behavior and avoiding acquiring HIV. We also find what appears to be a competing effect that does not operate through the circumcision recipient's belief about the reduction in the risk of acquiring HIV.

"The Limiting Spectral Measure for Ensembles of Symmetric Block Circulant Matrices" (with Murat Kologlu, Gene Kopp, Steven Miller, and Frederick Strauch), *Journal of Theoretical Probability* (Dec. 2013) 26:1020-1060.

Working Papers:

"Pension Fund Liabilities and Risk-Taking".

This paper analyzes the risk-taking incentives of U.S. pension funds and examines how such incentives shape their asset allocation. Defined-benefit pension funds facing asset-liability mismatch have competing incentives when choosing how much risk to carry with their portfolios. Both public and private funds may engage in risk management to avoid costly financial distress, yet they may also exhibit risk shifting behavior due to limited liability. This paper highlights how a major difference in accounting standards related to discount rate can encourage public funds to invest more in risky assets than their private counterparts when their funding status deteriorates. Consistent with this discount rate channel, empirical evidence suggests that, while risk management incentives dominate for private funds, public funds have much stronger incentives to shift risk.

Works in Progress:

"Price Limits and Paths: How Investors Respond to an IPO Reform" (with Xian Wang).

"Introducing Accountability: Evidence from a Randomized Field Trial in Vocational Schools in China" (with Prashant Loyalka and Zhaolei Shi).

"Information, Expectations, and Agricultural Investments: Evidence from a Field Experiment in India" (with Shawn Cole and Stefan Hunt).

Teaching Experience:

Teaching Fellow at Harvard College, since Sep. 2013.

Spring 2017	Intermediate Macroeconomics, by Prof. Chris Foote
Fall 2016	Capital Markets, by Prof. José L. Fillat
Fall 2014	Introduction to Econometrics, by Prof. James Stock
Spring 2014 & 2015	The Chinese Economy, by Prof. Richard Cooper
Fall 2013 & 2014	The Rise of Asia, by Prof. Dale Jorgenson

Research Experience:

Summer 2014	World Bank Development Economics Group, research assistant for Dr. Martin Kanz
Summer 2013	Harvard Economics Department, research assistant for Prof. Raj Chetty and Nathan Hendren
2011-12	Harvard Business School, research associate for Prof. Shawn Cole

Professional Activities:

Referee for *Journal of Development Economics, Journal of Urban Economics*

Scholarships and Fellowships:

2012-2018	Doctoral Fellowship & Douglas Dillion Fellowship, Harvard Graduate School of Arts and Sciences

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Prior Studies:
S.M., Technology and Policy, Massachusetts Institute of Technology, 2012
Bachelor, Environmental Engineering, Tsinghua University, 2010

Research Fields:
Industrial Organization, Environmental Economics

Teaching Experience:

Spring 2016-17	Fundamentals of Environmental Economics and Policy, teaching fellow for Professor Robert N. Stavins
Spring 2016	Game Theory and Strategic Decisions, teaching fellow for Pinar Dogan
Fall 2015	Analytic Frameworks for Policy, teaching fellow for Professor Richard Zeckhauser

	Quantitative Analysis and Empirical Methods, teaching fellow for Jonathan Borck
Spring 2015	Introduction to Applied Econometrics, teaching fellow for Professor Gary Chamberlain
Fall 2014	Microeconomic Theory I, teaching fellow for Professor Maciej Kotowski
Fall 2012	Energy Policy: Technology, Systems and Markets, teaching fellow for Henry Lee

Research Experience:

2015-16	Harvard Kennedy School, research assistant to Professor Joseph Aldy
Summer 2013	Resources for the Future, research intern to Rebecca Epanchin-Niell
2011-12	MIT Economics, research assistant to Professor Jerry Hausman
2010-12	MIT Joint Program on the Science and Policy of Global Change, research assistant to Sergey Paltsev

Seminar/Conference Presentations:

2016	INFORMS Annual Meeting, Environmental and Resource Economics Workshop at University of Colorado at Boulder, China Meeting of the Econometric Society, Association of Environmental and Resource Economists Annual Summer Conference, Public Choice Society Annual Meetings, Harvard Seminar on Environmental Economics and Policy

Honors, Scholarships, and Fellowships:

2017	Dissertation Completion Fellowship, Harvard Graduate School of Arts and Sciences
2016	Environment and Natural Resources Fellowship, Harvard Kennedy School
	Jeanne Humphrey Block Dissertation Award, Harvard Institute for Quantitative Social Science
	Grant for "Innovations in the Fashion Industry", Harvard Institute for Quantitative Social Science
2012-13	Graduate Student Fellowship, Harvard Graduate School of Arts and Sciences
2012	Technology and Policy Program Best Thesis Nominee, MIT

Research Papers:

"Slow Focus: Belief Evolution in the U.S. Acid Rain Program" (Job Market Paper)

Abstract: This paper quantifies the beliefs of electric utilities about the pollution permit price under the U.S. Acid Rain Program. This first large-scale cap-and-trade program exposed the heavily regulated electric utility industry to an unprecedented permit market. The program offers an ideal setting for studying how firms behave in a new environment. I estimate firms' beliefs about the permit price using a three-dimensional continuous-state dynamic model of allowance trades, coal quality, and pollution abatement investment. A maximum simulated likelihood estimator accounts for measurement errors in a state variable. New dynamic programming acceleration methods vastly reduce the computation burden. I find that firms initially underestimate the role of market fundamentals as a driver of permit prices. Smaller firms, and firms facing less competitive pressure, exhibit more biased beliefs. Over the years, firms' beliefs appear to converge toward the true stochastic process of permit prices. Improving beliefs and reducing price volatility have important implications for firm profits, total emissions and compliance costs. Dynamics with possibly biased beliefs can make cap-and-trade programs more efficient than taxes.

"Evaluating the Paris Agreement's Mitigation Pledges with Statistical Forecasting Models" (with Joseph Aldy and William Pizer)

Abstract: The 2015 Paris Agreement reflected an unprecedented breadth of participation in international climate policy, with some 185 countries comprising about 95% of global greenhouse gas emissions having submitted emission mitigation pledges subject to a new transparency and review mechanism. Assessing the environmental and economic impacts of these pledges will require economic and emission forecasts. We have developed forecasting tools, drawing from the economics and machine learning literatures, to produce country-specific emission forecasts to enable an assessment and comparison of expected mitigation effort by nearly every country participating in the Paris Agreement. We evaluate several specific models in the literature as well as employ a general forecasting model selection approach that searches over tens of thousands of models. In a general sense, we take each approach with a subset of our data, estimate a model, and then evaluate its out-of-sample performance with the balance of our data. Using the estimated "best" forecast models, we are assessing the expected emission abatement necessary to deliver on its pledge, comparing mitigation effort across countries, and investigating whether countries planning to reduce emissions from BAU forecasts tend to over-estimate their BAU emissions in their pledge.

"Brand Leadership, Competitive Pressure, and Social Marketing in the High-End Fashion Industry" (with Jorge Ale Chilet and Yu-San Lin)
Abstract: While the fashion industry has been mostly subject to qualitative research, we adopt a data-driven approach to studying high-end fashion brands' leadership, competitive pressure and social marketing. Applying text mining techniques to department store listings, expert runway reviews, and Instagram posts, we find that high-end fashion brands respond to competitive pressure by conducting persuasive advertising (e.g., posting about celebrity patronage and press mentions) more than informative advertising (e.g. posting about product characteristics) on social media. This effect is stronger for brands that tend to adopt others' designs than innovative brands. To explain these findings, we are developing a model of firm behavior based on the qualitative theories of fashion.

<u>Research Papers in Progress</u>:
"Partial Identification in Dynamic Games"
"Pledge and Agree: The Path to Cooperation" (with Antonio Alonso and Richard Zeckhauser)

<u>Publication:</u>
Chen, C., and R. J. Zeckhauser, "Collective Action in an Asymmetric World", forthcoming at *Journal of Public Economics*
Abstract: A central authority possessing tax and expenditure responsibilities can readily provide an efficient level of a public good. Absent a central authority, voluntary arrangements must replace coercive ones, and significant under-provision must be expected. International public goods are particularly challenging due to the substantial asymmetries among nations. Small-interest nations have strong incentives to ride cheaply. Our empirical results reveal cheap riding intentions in providing for climate change mitigation, a critical international public good. The evidence is provided by individual nations' Intended Nationally Determined Contributions voluntarily pledged for the Paris Climate Change Conference. We find that larger nations made much larger pledges in proportion to both their Gross National Incomes and their historical emissions. Implications for the Nordhaus Climate Club and carbon-tax proposals are discussed. To achieve Pareto optimality despite disparate cheap-riding incentives, we propose the Cheap-Riding Efficient equilibrium. That solution takes the Nash equilibrium as a base point, and then applies the principles of either the Nash Bargaining solution or the Lindahl equilibrium to proceed to the Pareto frontier.

<u>Other Publication:</u>
Chen, C., Epanchin-Niell, R. S. and Haight, R. G. (2017), "Optimal Inspection of Imports to Prevent Invasive Pest Introduction". *Risk Analysis*. doi:10.1111/risa.12880.

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Master of Public Policy, The University of Chicago, *with Honors*, 2012
Bachelor of Arts, Business-Economics, History, UCLA, *Magna cum Laude, Phi Beta Kappa*, 2007

Teaching and Research Fields:
Primary fields: Health Economics, Behavioral Economics
Secondary fields: Public Economics, Machine Learning, Applied Econometrics

Teaching Experience:

Spring 2015, 2016, 2017	Empirical Methods II (Econometrics for MPP students), Harvard Kennedy School, teaching fellow for Professor Daniel Shoag

Other Employment:

2015 - 2016	Harvard University Taubman Center, City of Boston Data Analytics Fellow
2011 - 2013	University of Chicago Crime Lab, Research Associate
2007 - 2010	Deloitte & Touche LLP, Senior Associate

Honors, Scholarships, and Fellowships:

2017 - 2018	Harvard GSAS Dissertation Completion Fellowship
2016 - 2017	Harvard Kennedy School Taubman Center Research Fellowship
2013 - 2015	Harvard GSAS Graduate Fellowship
2010 - 2012	Dean's Scholarship, University of Chicago Harris School (full tuition)

Job Market Paper:

"Behaving Discretely: Heuristic Thinking in the Emergency Department"

Abstract: This paper explores the use of heuristics among highly-trained physicians diagnosing heart disease in the emergency department, a common task with life-or-death consequences. Using data from a large private-payer claims database, I find compelling evidence of heuristic thinking in this setting: patients arriving in the emergency department just after their 40th birthday are roughly 10% more likely to be tested for and 20% more likely to be diagnosed with ischemic heart disease (IHD) than patients arriving just before this date, despite the fact that the incidence of heart disease increases smoothly with age. Moreover, I show that this shock to diagnostic intensity has meaningful implications for patient health, as it reduces the number of missed IHD diagnoses among patients arriving in the emergency department just after their 40th birthday, thereby preventing future heart attacks. I then develop a model that ties this behavior to an existing literature on representativeness heuristics, and discuss the implications of this class of heuristics for diagnostic decision making.

Research Papers in Progress:

"Worth the Price of Admission? Evidence from Emergency Department Admissions"

Abstract: Emergency department (ED) physicians are responsible for ~50% of all hospital admissions and are therefore important gatekeepers for expensive, high-intensity inpatient care. Many have pointed out the large variation in admission rates across EDs within the US, much of which cannot be explained by patient characteristics. Far fewer studies have been conducted on physician-level variation in admission rates within a given ED, which is also substantial. Much of this variation is likely due to how each physician operates within the "gray areas" of medicine, but there is little literature on the value of these marginal hospital admissions from the ED, despite the high costs associated with inpatient treatment. Using data from a large Boston-area hospital, I find that even after controlling for relevant patient characteristics, attending physicians with above-average admission rates are ~20% more likely to admit a patient than attending physicians with a below-average admission rate. I then use this variation in the physicians' admission rates in order to recover estimates of costs and benefits associated with marginal inpatient care, and explore the extent to which physicians' characteristics predict their propensity to admit patients.

"Fight the Power [Calculation]: Incorporating Compliance Prediction into RCT Design"

Abstract: In this paper, I propose a new methodological framework for selecting participants for randomized control trials (RCT) with imperfect compliance. It is known that the statistical power of an experiment increases in the compliance rate among participants. Therefore, selecting participants with above-average likelihoods of compliance can provide an experiment with more power, or the same level of power with fewer participants. I demonstrate how data from prior experiments (or quasi-experiments) can allow researchers to systematically predict potential participants' likelihood of compliance, using either regression models or machine learning algorithms. I then discuss the potential benefits and drawbacks of incorporating compliance prediction into RCT design, and describe the scenarios in which this method is likely to be most beneficial. Using publicly available data from the Oregon Health Insurance Experiment, I empirically demonstrate the feasibility of these methods.

Applied Policy Experience:

For the 2015-2016 academic year, I was awarded a fellowship by the Harvard Kennedy School's Taubman Center for State and Local Government to work for the City of Boston's Citywide Analytics Team to provide technical and research expertise to a number of the city's priorities. During this time, my efforts were primarily focused on developing a prototype machine learning algorithm to predict future opioid overdoses using both structured and unstructured text data obtained from the city's emergency medical services department.

Other:

Programming: R, Stata, Python
Languages: English (native), Spanish (basic)
Citizenship: USA

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M.Sc., Economics for Development, University of Oxford, 2009

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Teaching and Research Fields:
Primary: Development Economics
Secondary: Labor Economics, Economics of Education

Teaching Experience:

Fall 2015/2016	Harvard Kennedy School, Economic Development: Theory and Evidence (PED101), Teaching Fellow for Profs. R. Pande, D. Rodrik and A. Khwaja
Spring 2015	Harvard Kennedy School, Empirical Methods II (API 202), Teaching Fellow for Prof. R. Hanna
Fall 2015	Harvard Kennedy School, Second Year Policy Analysis (PED 250), Teaching Fellow for Profs. R. Hanna, M. Walton and E. Levy Yeyati

Research Experience and Other Employment:

2011-2012	Jameel Poverty Action Lab (J-PAL), University of Cape Town, Research Manager
2010-2011	Innovations for Poverty Action Kenya (IPA-K), Research Coordinator
2009-2010	Jameel Poverty Action Lab (J-PAL), Universidad Catolica de Chile, Research Associate

Professional Activities:

Referee Service: *The Economic Journal, Economics of Transition,*
The Review of Economics and Statistics

Affiliations: Harvard University Institute for Quantitative Social Science (IQSS)
Precision Agriculture for Development (PAD)
Evidence for Policy Design (EPOD) – PhD Affiliate

Grants and Fellowships:

2016-2017	Christopher and Silvana Pascucci Graduate Student Dissertation Fellowship
2013-2017	Consejo Nacional de Ciencia y Tecnologia (CONACYT) Scholarship
2015, 2017	IQSS Research Grants (with E. Montero) $5,000
2016	Agriculture Technology Adoption Initiative (with M. Kremer) $49,977
2014	Anonymous Donor (with M. Kremer, F. Schilbach and J. Robinson) $195,048
2014	3ie Grant (with M. Kremer, F. Schilbach and J. Robinson) $443,698

Job Market Paper:

"A Better School but a Worse Position? The Effects of Marginal School Admissions in Mexico City"

This paper examines some unintended consequences of attending better schools. Students in Mexico City are assigned to middle school through a centralized allocation process that relies on the results of a placement exam. The morning shift in double-shift schools is often oversubscribed, leading to the stratification of school-shifts by test score results. I use a regression discontinuity design to study how, for students at the margin of admission, attending a better school affects their academic performance, psychology and subsequent academic choices. Students who have the opportunity to attend a better school experience improvements in language scores as measured through standardized tests, but have a lower GPA and are less likely to obtain their middle school certificate. In line with the hypothesis that relative position within a school matters, I find that those students who barely placed in the more selective schools score lower in self-reported measures of perseverance and time management and that their aspirations and subsequent school choices are more likely to shift away from academic options. These findings highlight the potential trade-offs between a better school environment and a worse placement in the ability distribution.

Working Papers:

"Broadcasting Human Capital? The Labor Market Effects of Mexico's Telesecundarias"

Every year over 1.3 million children in rural Mexico attend telesecundarias, middle schools with classes transmitted through satellite television. Telesecundarias operate like conventional schools but replace the need for on-site specialized teachers with televised content. While highly criticized, we know very little about the effectiveness of this model of distance learning. This paper estimates the educational and labor market outcomes of adolescents living in areas with no middle schools who were exposed to a telesecundaria expansion policy in 1994. I obtain causal estimates by exploiting geographical differences in the intensity of school openings and differences in cohort exposure induced by the timing of the policy. The estimates suggest that an additional telesecundaria per 1,000 adolescents led to an average increase of 0.22 years of education and a 9% increase in monthly earnings, arising from both an increase in individuals' labor supply and a higher wage.

"The Effectiveness of Public Agricultural Extension: Evidence from Two Approaches in Kenya" (with M. Kremer, F. Schilbach and J. Robinson)
Agricultural extension is one of the main policy instruments used by governments to disseminate and increase the adoption of modern agricultural technologies among farmers. This paper provides experimental evidence on the effects of two extension models as implemented by a Kenyan public agency: farmer field days and SMS-based extension. We find little effects of the SMS-based intervention on farmer knowledge and input adoption. The farmer field days increased knowledge and changed beliefs about input profitability but this only translated into modest increases in adoption of inputs. We find no consistent evidence of heterogeneous treatment effects based on gender, income or education. Using simple cost and revenue estimates, we conclude that these interventions, as implemented, were not cost-effective at increasing the use of agricultural technologies in the short term.

Research in Progress:

"Netflix for Agriculture" (with M. Kremer, F. Schilbach and J. Robinson)
New technologies allow to collect and disseminate much more localized agricultural information to farmers. A social planner would invest in knowledge generation if the sum of the benefits to all agents exceeds the cost. However, decentralized markets may not yield the socially optimal outcome, due to the non-rivalry of knowledge and other distortions in information markets. We discuss implications for the types of institutions that might be appropriate in these contexts and the potential for mobile-phone based agricultural extension to provide personalized information tailored to farm and farmer characteristics. In particular, we discuss the possibility of a "Netflix for Agriculture" in which farmers would provide information on their experiences with different inputs and practices, knowing that the system would make better recommendations for them, and in turn, improve the performance of the system in offering recommendations to others.

"Improving Input Targeting Through Localized ICT-Extension: Evidence from Kenya" (with M. Kremer and G. Zane)
Many agricultural extension services in developing countries continue to provide blanket recommendations to farmers despite large heterogeneity in local agronomic needs. More fine-tuned agricultural management could increase input profitability and limit environmental impacts. Mobile phone extension has the potential to reach farmers at scale at a low-cost, while also providing them with personalized information. We conduct a randomized control trial of a phone-based extension program with a sample of 6,000 smallholder Kenyan farmers recruited through input shops. We construct predictive maps using soil data and provide farmers with area-specific information about soil acidity and use of agricultural lime, an input used to increase soil pH. Using survey data and administrative records collected from the redemption of discount coupons distributed to farmers in treatment and control arms, we find that the intervention increased the probability of following the local recommendations by 3-7 percentage points (corresponding to a 10%-23% increase). We find that the program was effective at increasing the use of agricultural lime in high-acidity areas and reducing it in non-acidic areas.

"Land Redistribution and Incomplete Property Rights: Evidence from Puerto Rico" (with E. Montero)
Starting in the 1940s the government of Puerto Rico redistributed land to landless peasants through a series of public lotteries. However, like many other land reforms in Latin America, property rights over these plots were incomplete and new occupants were severely restricted on how they could employ them. The extent to which the benefits from receiving land were negated by these frictions is an open question. We estimate the long-term effects of this reform on longevity and migration by linking lottery archival records to data from the US Social Security death master file. In ongoing work, we plan to link this to a newly constructed dataset that will contain information on individuals' education levels, occupation, marital status, retirement age and cause and place of death.

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Teaching and Research Fields:
Environmental Economics, Industrial Organization

Teaching Experience:

Spring 2015	Environmental Economics and Policy, Head Teaching Fellow for Prof. Robert Stavins
2013-2015	Math Camp (Ph.D.), Harvard Kennedy School of Government, Instructor

Research Experience and Other Employment:

2012-2015	Harvard Kennedy School, Research Assistant to Joseph Aldy and Robert Stavins
2010-2012	Resources for the Future, Research Assistant
2010	White House Office of Science and Technology Policy, Intern
2007	Zion National Park, Wildland Firefighter

Honors, Scholarships, and Fellowships:

2016-2017	Harvard Joseph Crump Fellowship
2014-2016	U.S. Environmental Protection Agency (EPA) STAR Fellowship
2013	Harvard Vicki Norberg-Bohm Fellowship
2009	Harry S. Truman Scholarship

Professional Activities:

Referee Service: *AEJ: Economic Policy, Journal of Environmental Economics and Management, Environmental and Resource Economics, The Energy Journal*

Coordinator: Harvard Environmental Economics Lunch (2014-2016)

Publications:

Gerarden, Todd, Richard G. Newell, and Robert N. Stavins. "Assessing the Energy-Efficiency Gap." *Forthcoming, Journal of Economic Literature* 55(4). NBER version: nber.org/papers/w20904

Walls, Margaret, Todd Gerarden, Karen Palmer, and Xian Fang Bak. 2017. "Is Energy Efficiency Capitalized into Home Prices? Evidence from Three U.S. Cities." *Journal of Environmental Economics and Management* 82: 104–24.

Gerarden, Todd, Richard G. Newell, and Robert N. Stavins. 2015. "Deconstructing the Energy-Efficiency Gap: Conceptual Frameworks and Evidence." *American Economic Review: Papers & Proceedings* 105 (5): 183–86.

Palmer, Karen L., Margaret Walls, Hal Gordon, and Todd Gerarden. 2013. "Assessing the Energy-Efficiency Information Gap: Results from a Survey of Home Energy Auditors." *Energy Efficiency* 6 (2): 271–92.

Muehlenbachs, Lucija, Mark Cohen, and Todd Gerarden. 2013. "The Impact of Water Depth on Safety and Environmental Performance in Offshore Oil and Gas Production." *Energy Policy* 55: 699–705.

Job Market Paper:

"Demanding Innovation: The Impact of Consumer Subsidies on Solar Panel Production Costs"

Abstract: Can subsidies to consumers spur firms to innovate? I study the impacts of consumer subsidies in the global market for solar panels. I estimate a dynamic structural model of competition in which solar panel manufacturers invest to lower their costs, taking into account the impact of government subsidies on demand. The model produces two key insights. First, static economic methods can generate biased estimates of the effects of government policy. Before accounting for induced innovation, subsidies increased global solar adoption 49 percent over the period 2010-2015, leading to over $15 billion in external environmental benefits. These static estimates understate the subsidies' true impacts: accounting for induced innovation increases the external benefits by at least 22 percent. Second, decentralized government intervention in a global market is inefficient. A subsidy in one country increases solar adoption elsewhere because it increases investment in innovation by international firms. This spillover underscores the need for international coordination to address climate change.

Additional Research Papers:

"Federal Coal Program Reform, the Clean Power Plan, and the Interaction of Upstream and Downstream Climate Policies" (with W. Spencer Reeder and James H. Stock), *Revise and Resubmit, American Economic Journal: Economic Policy*. NBER version: nber.org/papers/w22214

Abstract: Can supply-side environmental policies that limit the extraction of fossil fuels reduce CO_2 emissions? We study interactions between a specific supply-side policy – a carbon surcharge on federal coal royalties – and regulation of emissions from the power sector under the Clean Air Act. Using a detailed dynamic model of the power sector, we estimate that, absent new downstream regulation, a royalty surcharge equal to the Social Cost of Carbon would generate three-quarters of the emissions reductions projected for the Clean Power Plan (CPP), with an average abatement cost roughly equal to the Social Cost of Carbon. With the CPP in place, the royalty surcharge reduces emissions by reducing leakage and causing the CPP to be non-binding in some scenarios.

"Capital versus Output Subsidies: Implications of Alternative Incentives for Wind Energy" (with Joseph E. Aldy and Richard L. Sweeney)

Abstract: This paper examines the choice between using capital subsidies and using output subsidies to promote socially desirable production. We exploit a natural experiment in which wind farm developers were unexpectedly given the opportunity to choose between an investment subsidy and an output subsidy to estimate the differential impact of these subsidy margins on plant productivity. Using instrumental variable and matching estimators, we find that wind farms choosing the capital subsidy produced 11 to 12 percent less electricity per unit of capacity than wind farms selecting the output subsidy, and that this effect is driven by subsidy incentives rather than selection. We then use these estimates to evaluate the public economics of this policy shift, finding that the introduction of capital subsidies caused the Federal government to spend 18 percent more per unit of output from wind farms than they would have paid under an output subsidy. We also discuss the potential for increased entry and longer-run distortions.

Work in Progress:

"The Environmental Impacts of Solar Trade Disputes"

Abstract: I study the impacts of recent trade actions against Chinese solar manufacturers on the global market for solar panels and on the environment. I first use the synthetic control method to document that trade restrictions imposed by the European Union and the United States increased equilibrium prices in those markets relative to other geographic markets. I then estimate a structural model of solar panel demand and supply to quantify the impacts of these higher prices on solar adoption. This approach allows me to account for the possibility of cross-market spillovers that would bias reduced-form approaches. Finally, I estimate the "missed" environmental benefits due to reduced solar adoption using existing estimates of the external damages from conventional electricity generation. In ongoing work, I analyze the impact of trade restrictions on solar industry employment in the European Union and in the United States.

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MSc. in Development Studies, London School of Economics, *with Distinction,* December 2009

Graduate Studies:

Harvard University, 2012 to present
Ph.D. Candidate in Public Policy
Thesis Title: "*Essays on Governance and Development*"
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Professor Rema Hanna
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Research and Teaching Fields:

Primary Field: Development Economics
Secondary Fields: Political Economy, Public Policy, Gender

Job Market Paper:

"Perils of the Paperwork: The Impact of Information and Application Assistance on Welfare Program Take-Up in India"

Only one-third of eligible women are enrolled in an unconditional cash transfer program offered to poor widows and divorcées in Delhi. Why are women leaving money on the table in the face of substantial income and food insecurity? Low take-up could reflect information constraints and/or transaction costs associated with application ordeals. I conduct a field experiment with over 1,200 pension-eligible women in which I provide some women with information about the program and others with information plus varying degrees of mediation to assist with application procedures. I find that information alone only raises application rates among literate women. On the other hand, basic mediation at the stage of filling out the application form leads to a 41% increase in application rates and brings more illiterate and politically disconnected women into the applicant pool. Intensive mediation, which includes assistance engaging with political authorities, leads to a 70% increase in application rates and is especially important for boosting applications by less autonomous women. These findings highlight the distributive implications of ordeals built into application processes when eligible citizens face multiple vulnerabilities and have limited access to application support. Simpler and streamlined enrollment procedures, along with formal, non-discriminatory mediation provided directly by the bureaucracy may facilitate more widespread and inclusive take-up.

Research Paper(s) in Progress

"Can We Text Bad Politicians Out of Office? Experimental Evidence from an Indian Election" (with Siddarth George and Yusuf Neggers)

Adverse selection into politics is commonplace in the developing world. In India, nearly 1/3 of major party candidates have criminal charges and 15% have violent charges like murder, rape, and kidnapping. Existing work argues that deep-seated structural factors like clientelism explain the prevalence of criminals in Indian politics. In this project, we study whether light-touch, mobile-based information interventions can materially affect criminal candidates' electoral outcomes. We collaborated with 3 Indian telecom companies to run a large-scale field experiment involving over 1 million voters around the state assembly elections of Uttar Pradesh. Polling station areas within a single constituency were randomly selected to receive voice calls and text messages containing information about the criminal charges of candidates. We find that receiving a voice call and text message informing voters about candidates' criminal charges reduced the vote share of criminal candidates by 6.5pp. In treated polling station areas, candidates with murder charges receive 20pp less votes, while candidates with no criminal charges receive 13pp more votes. The effects are largest when the information message is accompanied by a public signal telling voters that many others have received the message, suggesting that voter coordination is one channel through which the effect operates.

"Claiming Cash: The Impact of Engaging the Welfare State and Receiving Cash Transfers on Women's Empowerment and Well-Being in India"

Women in India are less likely than men to make claims, or demands, regarding their rights and entitlements from the government. In addition, especially vulnerable women can be left out of welfare programs due to the design of application procedures. Given this reality, there is limited evidence on how engaging with the state and receiving cash transfers impacts women who at status quo are less likely to partake in these activities without intervention. In this paper, I use the context of the widow pension scheme in Delhi to ask whether experimental variation in attempting to apply for this cash transfer effects women's perception of the state and causes them to update on their ability and desire to apply for other government programs in the future. In addition, I measure whether receiving this cash transfer improves the personal well-being of beneficiaries in terms of food security, physical and mental health, quality of life, and decision-making power in the household. These findings can contribute to our understanding of how to empower vulnerable citizens to interact with the welfare state and highlight the implications of receiving an unconditional cash transfer from the government on mitigating challenges associated with poverty, especially among women who are often left out of such programs.

Work in Progress

"Leveraging Technology and Entrepreneurship to Increase Take-Up of Government Programs in India" (with Jennifer Bussell, Rema Hanna, Ben Olken)

Low take-up of government programs continues to be a challenge in many countries, including India. It has been shown that citizens can fail to enroll in social programs due to information constraints and inability to navigate complex application procedures without assistance. Many formal and informal intermediaries have emerged in India to facilitate access to the state, but they do not often cater to all citizens equally. In this project, we partner with a social enterprise in India called Haqdarshak in order to measure the impact of a private alternative to existing mediation services on the magnitude and composition of citizens who enroll in social programs. Haqdarshak has developed a mobile app that screens citizens for government programs, informs them of which programs they are eligible for, and helps them apply for these programs. A community facilitator, or Haqdarshak, is sent into rural communities to administer this app for a fee. In this project, we will offer Haqdarshak services to 10,000 households in rural Rajasthan and randomize prices charged as well as the gender of Haqdarshaks to better understand citizen demand for mediation and how this demand reflects personal characteristics of both the citizen and the intermediary.

"Does Mommy Know Best? The Impact of Maternity Cash Transfers on Newborn Health in Delhi" (with Jan Cooper, Jessica Leight, Simone Schaner)

Developing countries are increasingly using conditional cash transfers as a vehicle to improve maternal and child health. While these programs have been shown to have positive results, less is known about how to optimize the design of such programs to have the largest impact possible given limited government budgets. In partnership with the Government of Delhi, we plan to administer a maternity cash transfer to poor families and vary the timing and conditionality of the transfer as well as the whether the transfer is given to fathers or mothers. We will then measure the impact of these variations in transfer design on newborn health outcomes. This will help elucidate the mechanisms through which cash transfers can improve child health as well as contribute to our understanding of household bargaining power and financial decision-making among poor women in this context.

Teaching Experience:

Spring, 2016	EC 970: Governance, Corruption and Development, Harvard University, Instructor
Spring, 2015	EC 970: Governance, Corruption and Development, Harvard University, Instructor
Fall, 2014	SW 50: Political Corruption, Harvard University, TF for Prof. Alt and Prof. Ziblatt

Research Experience:

2015	Research Editor, Gender Action Portal, Women and Public Policy Program
2011-2012	Research Associate, Jameel Poverty Action Lab (J-PAL) South Asia
2010-2011	Research Assistant, Plan USA International, Washington D.C.
2010	Summer Researcher, UNICEF India
2010	Research Intern, Center for Economic Policy Research, Washington D.C.

Honors and Fellowships:

2017	Harvard Dissertation Completion Fellowship
2017	Summer Research Fellow, Mathematica Policy Research
2016	Harvard University Bok Center Distinction in Teaching Award
2015-2016	Graduate Student Associate, Harvard South Asia Institute
2014-2018	Graduate Affiliate, Harvard Institute for Quantitative Social Sciences
2014-2016	Director of Events and Operations, Harvard India Students Group
2012-2014	Graduate Fellowship, Harvard Graduate School of Arts and Science

Research Grants

2017	Cash Transfers for Child Health (CaTCH) Research Grant, $28,905 (co-PI)
2017	Watson Collaborative Research Grant, $5,000 (co-PI)
2016	Development Impact Lab Innovate Grant, $55,000 (co-PI)
2015	J-PAL Governance Initiative Grant, $50,000
2015	Weiss Family Program Fund Grant, $37,000
2015	Institute for Quantitative Social Science Graduate Research Grant, $3,000
2015	J-PAL Governance Initiative Grant, $48,505 (co-PI)
2015	South Asia Institute Graduate Student Associate Research Stipend, $3,000
2014	South Asia Institute Winter Grant for Exploratory Research, $2,000
2014	J-PAL Governance Initiative Research and Travel Grant, $5,000
2013; 2014	Weiss Family Program Fund Exploratory Research Grant ($2,425, $1,658)

Other Publications:

2011	"WASH and Women: A Situation Analysis of Living and Working Conditions in the Tea Gardens of Dibrugarh District, Assam." Publication. New Delhi: UNICEF. (with Rachel Amiya, Nasreen Habib, and Ellen Whitesides)
2010	"Reconciliation and Representation: The Share of the Population Represented by the Democratic Majority." Publication. Washington D.C: Center for Economic and Policy Research.
2010	"The High Budgetary Cost of Incarceration." Publication. Washington D.C: Center for Economic and Policy Research, 2010. (with John Schmitt and Kris Warner)