October 25, 2019

Dear Recruiting Chair:

We are pleased to provide the curriculum vitae and research statements/dissertation abstracts of the Penn Economics Ph.D. students who seek employment in this year's job market. Also find below the table, a summary indicating fields of interest and advisors' names.

Full dissertation abstracts and research papers will be supplied directly from the candidates as they apply for positions. Each candidate is also responsible for having confidential letters of recommendation sent upon request.

We encourage you to contact the faculty members who are most familiar with the students’ work (each vita contains a list of faculty references). Also, please feel free to contact either of the placement officers.

If you or a member of your institution will be in the Philadelphia area and would like to meet with some of our students, Gina Conway, our Graduate Group Coordinator, would be pleased to arrange such interviews. She can be reached by phone 215-898-5691 or email at gnc@sas.upenn.edu.

If we can help in any way regarding the placement of this year's University of Pennsylvania students, please call or e-mail us.

Sincerely,

Guillermo Ordonez  
Graduate Placement Officer  
ordonez@econ.upenn.edu  
(215) 898-6880

David Dillenberger  
Graduate Placement Officer  
ddill@sas.upenn.edu  
(215) 898-1503
SUMMARY LISTING OF DOCTORAL STUDENTS SEEKING EMPLOYMENT, 2019/2020

<table>
<thead>
<tr>
<th>Candidate Name</th>
<th>Research Interest</th>
<th>Job Market Paper</th>
<th>Faculty Advisor, Email</th>
</tr>
</thead>
<tbody>
<tr>
<td>Harun Alp</td>
<td>Macroeconomics, Firm Dynamics, Economic Growth, Innovation, Entrepreneurship</td>
<td>Incorporation, Selection and Firm Dynamics: A Quantitative Exploration</td>
<td>Ufuk Akcigit <a href="mailto:uakcigit@uchicago.edu">uakcigit@uchicago.edu</a></td>
</tr>
<tr>
<td>Samedh Ambokar</td>
<td>Macroeconomics, Mortgage Markets, Monetary Economics</td>
<td>Mortgage Search Heterogeneity, Refinancing Decisions and Monetary Policy Transmission to Consumption</td>
<td>Harold L. Cole <a href="mailto:colehl@sas.upenn.edu">colehl@sas.upenn.edu</a></td>
</tr>
<tr>
<td>Mallick Hossain</td>
<td>Applied Microeconomics, Public Economics, Industrial Organization, Health Economics</td>
<td>Less is More Expensive: Bulk Buying and Inequality</td>
<td>Katja Seim <a href="mailto:katja.seim@yale.edu">katja.seim@yale.edu</a></td>
</tr>
<tr>
<td>Ming Li</td>
<td>Empirical Microeconomics, Political Economy, Chinese Economy, Empirical IO</td>
<td>Information and Corruption: Evidence from China’s Land Auctions</td>
<td>Hanming Fang <a href="mailto:hanming.fang@econ.upenn.edu">hanming.fang@econ.upenn.edu</a></td>
</tr>
<tr>
<td>Minshen Li</td>
<td>Empirical IO, Applied Microeconomics, Marketing</td>
<td>Why Do Consumers Care About Loyalty Points?</td>
<td>Aviv Nevo <a href="mailto:anevo@upenn.edu">anevo@upenn.edu</a></td>
</tr>
<tr>
<td>Andre Victor Luduvic</td>
<td>Macroeconomics, Public Finance, Labor Economics</td>
<td>The Macroeconomic Effects of Universal Basic Income Programs</td>
<td>Dirk Krueger <a href="mailto:dkruger@econ.upenn.edu">dkruger@econ.upenn.edu</a></td>
</tr>
<tr>
<td>Paolo Martellini</td>
<td>Macroeconomics, Labor Economics, Urban Economics</td>
<td>The City-Size Wage Premium: Origins and Aggregate Implications</td>
<td>Guido Menzio <a href="mailto:gm1310@nyu.edu">gm1310@nyu.edu</a></td>
</tr>
<tr>
<td>Stefano Pietrosanti</td>
<td>Banking, Empirical Corporate Finance, and Macroeconomics</td>
<td>The impact of bank regulation on the cost of credit: Evidence from a discontinuity in capital requirements</td>
<td>Guillermo Ordonez <a href="mailto:ordonez@econ.upenn.edu">ordonez@econ.upenn.edu</a>, Michael Roberts <a href="mailto:mrobert@wharton.upenn.edu">mrobert@wharton.upenn.edu</a></td>
</tr>
<tr>
<td>Kian Samaee</td>
<td>Empirical IO, Corporate Finance, Real Estate, Banking</td>
<td>Semiparametric Panel Model and Group Heterogeneity with Application to the Production Function</td>
<td>Guillermo Ordonez <a href="mailto:ordonez@econ.upenn.edu">ordonez@econ.upenn.edu</a>, Aviv Nevo <a href="mailto:anevo@upenn.edu">anevo@upenn.edu</a></td>
</tr>
<tr>
<td>Peng Shao</td>
<td>Econometrics, Industrial Organization</td>
<td>Series Estimator and Group Heterogeneity, with an Application to Production Function</td>
<td>Xu Cheng <a href="mailto:xucheng@econ.upenn.edu">xucheng@econ.upenn.edu</a>, Frank Schorfheide <a href="mailto:schorf@econ.upenn.edu">schorf@econ.upenn.edu</a></td>
</tr>
<tr>
<td>Le Xu</td>
<td>Macroeconomics, Business Fluctuations, Network Economics</td>
<td>Supply Chain Management Cost, Production Networks, and Aggregate Fluctuations</td>
<td>Jesus Fernandez-Villaverde <a href="mailto:jesusfv@econ.upenn.edu">jesusfv@econ.upenn.edu</a></td>
</tr>
</tbody>
</table>
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215-898-1875

Placement Director: David Dillenberger  
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Graduate Student Coordinator: Gina Conway  
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215-898-5691

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Philadelphia, PA 19104
Phone number: 215-450-3177

**Personal Information:** Male, Turkey (F-1 Visa)

**Undergraduate Studies:**
B.S. in Economics, Middle East Technical University, Turkey, 2007

**Masters Level Work:**
M.S. in Economics, Middle East Technical University, Turkey, 2009

**Graduate Studies:**
University of Pennsylvania, 2012 to present
Thesis Title: “Essays on Firm Dynamics, Innovation and Growth”
Expected Completion Date: May 2020

**Thesis Committee and References:**

- **Professor Ufuk Akcigit** (Advisor)  
  Department of Economics  
  University of Chicago  
  1126 E. 59th Street  
  Chicago, IL, 60637  
  Phone: 773-702-0433  
  Email: uakcigit@uchicago.edu

- **Professor Dirk Krueger**  
  Department of Economics  
  University of Pennsylvania  
  133 South 36th Street, Room 520  
  Philadelphia, PA, 19104  
  Phone: 215-573-1424  
  Email: dkrueger@econ.upenn.edu

- **Professor Michael Peters**  
  Department of Economics  
  Yale University  
  28 Hillhouse Avenue  
  New Haven, CT, 06511  
  Phone: 203-436-8475  
  Email: mpeters@yale.edu

**Research Fields:**
Teaching Experience:

Spring 2018  Introduction to Microeconomics, Instructor
Fall 2017   Law and Economics, Teaching Assistant for Prof. Camilo Garcia-Jimeno.
Fall 2017   Foundations of Market Economics, Teaching Assistant for Prof. Jesus Fernandez-Villaverde
Summer 2016  Introduction to Microeconomics, Instructor
Spring 2014, 2015  Econometrics II (Graduate), Recitation Instructor for Prof. F.X. Diebold.
Fall 2013, 2014  Introduction to Microeconomics, Recitation Instructor for Prof. Rebecca Stein

Research Experience and Other Employment:

2015 - 2017 Research Assistant for Professor Ufuk Akcigit
2006 - 2012 Researcher, Research Department, Central Bank of Turkey

Professional Activities:


Honors, Scholarships, and Fellowships:

2012-2013 H.C. Haney Fellow, University of Pennsylvania
2013 Lawrence Robbins Prize, University of Pennsylvania
2012-2017 Graduate Fellowship, University of Pennsylvania

Publications:

(with Daron Acemoglu, Ufuk Akcigit, Nicholas Bloom, and William Kerr)

Research Papers:

“Incorporation, Selection and Firm Dynamics: A Quantitative Exploration” (Job Market Paper)

This paper studies how incorporation, which provides limited liability to firm owners, affects firm dynamics and macroeconomy. I document that incorporated firms perform better than unincorporated firms: they have higher employment upon entry, grow faster, and exit less often conditional on their size and age. I propose an endogenous growth model of firm dynamics with endogenous entry and exit, where firms spend resources to improve their productivity and choose whether to incorporate or not. Incorporation provides liability protection which ensures that firm value is bounded from below, at the expense of set-up and maintaining cost. An important model feature is that firms have heterogeneous (high and low) types which differ in their capacity to improve productivity. This heterogeneity allows for the possibility of selection as high-type firms, who have higher growth potential, benefit more from incorporation. I estimate the model by using firm-level data, specifically exploiting the heterogeneity in exit rates by age conditional on size to identify firm types in growth potential and therefore selection. The estimation results suggest that accounting for firm heterogeneity in growth potential is quantitatively important in explaining the observed better performance of incorporated firms. Upon entry, 90% (15%) of the incorporated (unincorporated) firms are high-types, which are estimated twice as efficient as low-types in improving their productivity. This underlines a significant selection effect which is more pronounced among incumbents as the exit rate of high-type firms is lower. In a counterfactual economy
where the incorporation decision is randomized within firm types, the productivity growth decreases from 3% to 2.2% and the difference in the average size of incorporated and unincorporated firms decreases by 32%. I find significant welfare gains from subsidizing incorporated firms and large welfare losses from removing incorporation choice. These welfare results are largely driven by the change in the degree of selection, i.e. the change in the composition of firm types.

(with Daron Acemoglu, Ufuk Akcigit, Nicholas Bloom, and William Kerr)

We build a model of firm-level innovation, productivity growth and reallocation featuring endogenous entry and exit. A new and central economic force is the selection between high- and low-type firms, which differ in terms of their innovative capacity. We estimate the parameters of the model using US Census micro data on firm-level output, R&D and patenting. The model provides a good fit to the dynamics of firm entry and exit, output and R&D. Taxing the continued operation of incumbents can lead to sizable gains (of the order of 1.4% improvement in welfare) by encouraging exit of less productive firms and freeing up skilled labor to be used for R&D by high-type incumbents. Subsidies to the R&D of incumbents do not achieve this objective because they encourage the survival and expansion of low-type firms.

“Lack of Selection and Limits to Delegation: Firm Dynamics in Developing Countries”, R&R American Economic Review. (with Ufuk Akcigit, and Michael Peters)

Managerial delegation is essential for firm growth. While firms in poor countries often shun outside managers and instead recruit among family members, the pattern is quite the opposite for firms in rich countries. In this paper, we ask whether these differences in managerial delegation have important aggregate effects. We construct a model of firm growth where entrepreneurs have fixed-time endowments to run their daily operations. As firms grow larger, the need to delegate decision-making authority increases. Firms in poor countries might therefore decide to remain small if delegating managerial tasks is difficult. We calibrate the model to firm-level data from the U.S. and India. We show that the model is quantitatively consistent with the experimental micro evidence on managerial efficiency and firm growth reported in Bloom et al. (2013). Our quantitative analysis shows that the low efficiency of delegation in India can account for 5% of productivity and 15% of income differences between the U.S. and India in steady state. We also show that such inefficient delegation possibilities reduce the size of Indian firms, but would cause substantially more harm for U.S. firms. This is because there are important complementarities between the ease of delegation and other factors affecting firm growth.

“Technology Adoption and the Latin American TFP Gap”
(with Ufuk Akcigit, Maya Eden, and Ha Nguyen)

We develop a novel methodology to study the dynamics of technology adoption across countries. We identify changes in “technology” as changes in the productivity of the frontier country that have a lagged effect on the productivity of the adopting country. We illustrate our methodology by studying the adoption process between Latin America and the Caribbean (LAC) countries and the US. Our analysis suggests an 8 year adoption lag, after which technologies are fully or nearly-fully adopted; this estimate implies that technology can account for a productivity gap of 4-10% (provided that there is full adoption in the long-run), and a TFP growth differential between 0-0.5%. We illustrate that our estimates are consistent both with the timing of the IT revolution, and with cross-country patent citation data. Finally, we provide a simple theory about the potential determinants of the measured adoption lags which highlights a possible link between the static wedges and technology adoption decisions.
Research Papers in Progress:
- Entry through Spinoffs, Competition and Growth
- Patents, Trade Secrets and Technology Diffusion

Other Research (Prior to PhD):
- “Monetary Policy and Output Gap: Mind the Composition” (with Fethi Ogunc, Cagri Sarikaya), CBT Research Notes in Economics 2013
- “Stylized Facts for Business Cycles in Turkey” (with Soner Başkaya, Mustafa Kılınç, Canan Yüksel), Working Papers 2012, Central Bank of Turkey
- “Measuring market based monetary policy expectations in Turkey” (with Refet Gurkaynak, Hakan Kara, Gursu Keles, Musa Orak), İktisat Isletme ve Finans 2010, 25 (295)
- “Transmission of Monetary Policy in Turkey: The Effects of Monetary Policy on Financial Markets” (with Zelal Aktas, Refet Gurkaynak, Mehtap Kesriyeli, Musa Orak), İktisat Isletme ve Finans 2009, 24 (278)

Languages: English (fluent), Turkish (native).
Computational Skills: Matlab, Julia, C++, R, Python, Stata.
Incorporation, Selection and Firm Dynamics: A Quantitative Exploration (Job Market Paper)

This paper studies how incorporation, which provides limited liability to firm owners, affects firm dynamics and macroeconomy. I document that incorporated firms perform better than unincorporated firms: they have higher employment upon entry, grow faster, and exit less often conditional on their size and age. I propose an endogenous growth model of firm dynamics with endogenous entry and exit, where firms spend resources to improve their productivity and choose whether to incorporate or not. Incorporation provides liability protection which ensures that firm value is bounded from below, at the expense of set-up and maintaining cost. An important model feature is that firms have heterogeneous (high and low) types which differ in their capacity to improve productivity. This heterogeneity allows for the possibility of selection as high-type firms, who have higher growth potential, benefit more from incorporation. I estimate the model by using firm-level data, specifically exploiting the heterogeneity in exit rates by age conditional on size to identify firm types in growth potential and therefore selection. The estimation results suggest that accounting for firm heterogeneity in growth potential is quantitatively important in explaining the observed better performance of incorporated firms. Upon entry, 90% (15%) of the incorporated (unincorporated) firms are high-types, which are estimated twice as efficient as low-types in improving their productivity. This underlines a significant selection effect which is more pronounced among incumbents as the exit rate of high-type firms is lower. In a counterfactual economy where the incorporation decision is randomized within firm types, the productivity growth decreases from 3% to 2.2% and the difference in the average size of incorporated and unincorporated firms decreases by 32%. I find significant welfare gains from subsidizing incorporated firms and large welfare losses from removing incorporation choice. These welfare results are largely driven by the change in the degree of selection, i.e. the change in the composition of firm types.

Innovation, Reallocation and Growth (with Daron Acemoglu, Ufuk Akcigit, Nicholas Bloom, and William Kerr)

We build a model of firm-level innovation, productivity growth and reallocation featuring endogenous entry and exit. A new and central economic force is the selection between high- and low-type firms, which differ in terms of their innovative capacity. We estimate the parameters of the model using US Census micro data on firm-level output, R&D and patenting. The model provides a good fit to the dynamics of firm entry and exit, output and R&D. Taxing the continued operation of incumbents can lead to sizable gains (of the order of 1.4% improvement in welfare) by encouraging exit of less productive firms and freeing up skilled labor.
to be used for R&D by high-type incumbents. Subsidies to the R&D of incumbents do not achieve this objective because they encourage the survival and expansion of low-type firms.

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Managerial delegation is essential for firm growth. While firms in poor countries often shun outside managers and instead recruit among family members, the pattern is quite the opposite for firms in rich countries. In this paper, we ask whether these differences in managerial delegation have important aggregate effects. We construct a model of firm growth where entrepreneurs have fixed-time endowments to run their daily operations. As firms grow larger, the need to delegate decision-making authority increases. Firms in poor countries might therefore decide to remain small if delegating managerial tasks is difficult. We calibrate the model to firm-level data from the U.S. and India. We show that the model is quantitatively consistent with the experimental micro evidence on managerial efficiency and firm growth reported in Bloom et al. (2013). Our quantitative analysis shows that the low efficiency of delegation in India can account for 5% of productivity and 15% of income differences between the U.S. and India in steady state. We also show that such inefficient delegation possibilities reduce the size of Indian firms, but would cause substantially more harm for U.S. firms. This is because there are important complementarities between the ease of delegation and other factors affecting firm growth.

**Technology Adoption and the Latin American TFP Gap (with Ufuk Akcigit, Maya Eden, and Ha Nguyen)**

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UNIVERSITY OF PENNSYLVANIA

Placement Director: Guillermo Ordonez  
Placement Director: David Dillenberger
Graduate Student Coordinator: Gina Conway

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Personal Information
Date of Birth: March 19th, 1987
Sex: Male
Citizenship: India
Visa: F-1 (Eligible for 24-month OPT extension)

Undergraduate Studies
B.Tech., Computer Science and Engineering, Indian Institute of Technology, Bombay, 2010

Masters Level Work
M.A., Economics, University of Pennsylvania, 2019
M.B.A., Indian Institute of Management, Ahmedabad, 2014
M.Tech., Computer Science and Engineering, Indian Institute of Technology, Bombay, 2010

Graduate Studies
University of Pennsylvania, 2014 to present
Thesis Title: “Essays in Mortgage Markets”
Expected Completion Date: May 2020

Thesis Committee and References:
Harold Cole (Advisor)  
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**Research Fields**

Primary fields: Macroeconomics, Monetary Economics

Secondary fields: Empirical Industrial Organization, Political Economy, Public Finance

**Teaching Fields**

Graduate Level: Macroeconomics

Undergraduate Level: Macroeconomics, Microeconomics, Monetary Economics, Public Finance

**Teaching Experience**

<table>
<thead>
<tr>
<th>Year</th>
<th>Course</th>
<th>Institution</th>
<th>Role</th>
</tr>
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<tbody>
<tr>
<td>2018 Fall</td>
<td>Introduction to Microeconomics and Macroeconomics</td>
<td>University of Pennsylvania</td>
<td>Head Teaching Assistant for Prof. Gizem Saka</td>
</tr>
<tr>
<td>2018 Spring</td>
<td>Fiscal and Monetary Policy</td>
<td>University of Pennsylvania</td>
<td>Teaching Assistant for Prof. Harold Cole</td>
</tr>
<tr>
<td>2017 Fall</td>
<td>Introduction to Microeconomics and Macroeconomics</td>
<td>University of Pennsylvania</td>
<td>Teaching Assistant for Prof. Gizem Saka</td>
</tr>
<tr>
<td>2017 Spring</td>
<td>Macroeconomic Theory I, Graduate</td>
<td>University of Pennsylvania</td>
<td>Teaching Assistant for Prof. Jose-Victor Rios-Rull</td>
</tr>
<tr>
<td>2016 Fall</td>
<td>Introduction to Microeconomics and Macroeconomics</td>
<td>University of Pennsylvania</td>
<td>Teaching Assistant for Prof. Gizem Saka and Prof. Anne Duchene</td>
</tr>
<tr>
<td>2016 Spring</td>
<td>Macroeconomic Theory I, Graduate</td>
<td>University of Pennsylvania</td>
<td>Teaching Assistant for Prof. Dirk Krueger</td>
</tr>
<tr>
<td>2015 Fall</td>
<td>Introduction to Microeconomics and Macroeconomics</td>
<td>University of Pennsylvania</td>
<td>Teaching Assistant for Prof. Gizem Saka and Prof. Anne Duchene</td>
</tr>
<tr>
<td>2010 Spring</td>
<td>Cryptography and Network Security</td>
<td>Indian Institute of Technology, Bombay</td>
<td>Teaching Assistant for Prof. Bernard Menezes</td>
</tr>
<tr>
<td>2009 Fall</td>
<td>Network Security, Graduate</td>
<td>Indian Institute of Technology, Bombay</td>
<td>Teaching Assistant for Prof. Bernard Menezes</td>
</tr>
</tbody>
</table>

**Research Experience and Other Employment**

<table>
<thead>
<tr>
<th>Year</th>
<th>Position/Internship</th>
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<tbody>
<tr>
<td>2019</td>
<td>AQR Capital Management, PhD Research Intern</td>
</tr>
<tr>
<td>2018</td>
<td>University of Pennsylvania, Research Assistant for Prof. Harold Cole</td>
</tr>
<tr>
<td>2018</td>
<td>University of Pennsylvania, Research Assistant for Prof. Dirk Krueger</td>
</tr>
<tr>
<td>2014</td>
<td>Goldman Sachs, Quantitative Strategist</td>
</tr>
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<td>2010-2012</td>
<td>Oracle, Member Technical Staff</td>
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**Professional Activities**

<table>
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<tr>
<th>Year</th>
<th>Activities</th>
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<tbody>
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<td>2015-2019</td>
<td>Seminars at University of Pennsylvania</td>
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**Honors, Scholarships, and Fellowships**

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<th>Year</th>
<th>Scholarship/Fellowship</th>
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<td>2014-2019</td>
<td>University Fellowship, University of Pennsylvania</td>
</tr>
</tbody>
</table>

**Publication**

Research Papers

“Mortgage Search Heterogeneity, Refinancing Decisions and Monetary Policy Transmission to Consumption” (Job Market Paper) (with Kian Samaee)

In the US, half of all mortgage refinance consider one lender at origination. This paper investigates how heterogeneity in mortgage search affects monetary policy transmission to consumption at the aggregate as well as distributional level via its effect on refinancing decisions, the distribution of home equity and of mortgage rates. We build a general equilibrium model of the mortgage market with two types of mortgage refinance: they get either one quote or two quotes. A lender infers the expected search behavior from the relative mass of the two types at any observable current rate and home equity. If the refinance is more likely to get one quote, then lenders have more market power. As a result, they offer higher rates to both types, reducing the likelihood that they refinance. So, even a borrower with high current rate may decide not to refinance as she is offered high rates because of being inferred as more likely to get one quote. In steady state, those who get two quotes get lower rates sooner and hence accumulate more home equity. As such, in response to a 25 basis point expansionary monetary shock, the percentage increase in consumption of those who get two quotes is 1.47 times that of those who get one quote. In two counterfactual economies, one with more mortgage search intensity, an explicit goal of the CFPB, and the other with no search behavior inference, percentage increase in borrower consumption in response to the same shock is about 1.5 times that in the benchmark model. Thus, removing search inference is as important as increasing mortgage search to improve monetary policy transmission to consumption.

“Inaction, Search Costs and Market Power in the US Mortgage Market” (with Kian Samaee)

Many US mortgage borrowers do not refinance despite seemingly having financial incentives to do so. We explore the role of search costs in explaining this inaction, focusing on the 2009-2015 period when mortgage rates significantly declined. We estimate a (dynamic) discrete choice model of refinancing and search decisions using a proprietary panel data set, which includes detailed information on mortgage contracts, borrower creditworthiness, and search intensity (number of mortgage inquiries), and the sequence of refinancing decisions. We find that search costs significantly inhibit refinancing through two channels: While larger search costs directly increase the cost of refinancing, they also indirectly increase loan originators’ market power and raise the offered mortgage rates. We find that the indirect market power effect dominates. We apply our model to study an alternative market design, in which loan originators post interest rates based on credit qualities to a centralized market, and borrowers can lock in posted rates by choosing to refinance. We conclude, a centralized market for mortgage origination can significantly improve refinancing activity by eliminating market power, even if there will be no change in refinancing costs.

“Effect of Coalition Governments on Public Investment”

Based on a panel data of 80 countries, I find that during an election cycle, public investment is a concave function of months to election. Also, the post-election increase in public investment is smaller if the share of the coalition partners in the government is higher and that a government perceived to be corrupt does less public investment. I write a model of coalition governments where parties in government divert a fraction of the imperfectly observed public investment for private benefit and the smaller party in government can call an early election hoping to become the bigger party post-election. This model adds endogenous early elections to models of political competition. Coalition governments invest less to signal honesty and thus avoid an early election. Strong governments invest less as election approaches to signal honesty whereas weak governments invest more as election approaches as the incentive of smaller party to call an early election reduces as the scheduled election is nearer; thus public investment is concave during an election cycle. For optimal growth-inducing public investment, winner-takes-all systems are better than proportional systems to reduce these distortions.

Computational Skills: Python, Matlab, Stata, R, C++, Java, SQL, C

Languages: English (Fluent), Hindi (Native), Marathi (Native)
Research Statement

My research primarily seeks to understand how heterogeneity in agents observed at the microlevel affects their interaction with market participants, the macro economy and macroeconomic policy. In particular, my job market paper studies how the enormous heterogeneity in mortgage search observed in data impacts the interaction between mortgage borrowers and lenders, the macro economy and monetary policy via refinancing decisions. In a related paper, we (my co-author and I) find the sources of lack of refinancing in the US by estimating the search cost distribution of mortgage borrowers and mortgage approval rates.

Mortgage Search Heterogeneity, Refinancing Decisions and Monetary Policy Transmission to Consumption (Job Market Paper):

Mortgage refinancing is a vital channel of monetary policy transmission to consumption in US. A national survey finds that 52% mortgage refiners consider only one lender. This lack of mortgage search hampers the transmission to consumption. It leads to higher offer rates not only due to refiner’s own search behavior but also due to their likely search behavior as inferred by a lender based on their current mortgage. A worse current contract signals a history of aversion to search and thus the lender offers the borrower a worse new contract. The Consumer Financial Protection Bureau aims to increase the mortgage search intensity but the issue of search behavior inference is not mentioned anywhere. We find that removing search behavior inference is as important as increasing mortgage search for better monetary policy transmission to consumption.

In order to understand how lack of search affects the refinancing decisions and outcomes of borrowers, we build a general equilibrium model with heterogeneity in mortgage search behavior that is consistent with our findings in data. Search behavior inference and the search behavior itself result in higher offer rates, more frequent refinancing, smaller home equity and
thus a smaller consumption response to monetary policy shock for those who search less. Compared to the baseline economy, consumption response increases significantly by a similar magnitude in each of the two counterfactual economies with more mortgage search and with no search behavior inference. Thus, while policies for increasing mortgage search are important, it is also important to remove the ability of lenders to infer a refinancer’s search behavior to improve monetary policy transmission to consumption.

**Inaction, Search Costs and Market Power in the US Mortgage Market:**

Many US mortgage borrowers do not refinance despite having financial incentives to do so. Their refinancing activity is determined by a combination of their own search cost as well as their credit quality which determines mortgage approval by lenders. We find that policies designed to encourage refinancing activity by removing credit quality from lender approval decisions would not be effective because of the high search cost of borrowers. These search costs are estimated in a dynamic discrete choice model of refinancing and search decisions using a proprietary panel data set. Higher search costs not only increase the direct cost of refinancing but also increase the lender’s market power, leading to higher offered mortgage rates. We find that this indirect market power effect dominates. Thus, policies designed to reduce the search cost of borrowers would also lead to more competitive offer rates and thus be more effective in encouraging refinancing activity.

An area of future research is to understand the underlying sources of the enormous heterogeneity in mortgage search observed in data and studied in my job market paper; and whether the resulting mechanism leads to amplification effects at the aggregate and at the distributional level. For example, if a low income refinancer is less likely to search for her mortgage and thus end up with a worse contract, it would amplify the consumption and saving inequality borne purely out of income inequality.
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Research Papers:

Less is More Expensive: Bulk Buying and Inequality (JOB MARKET PAPER)

High-income households buy in bulk more often than low-income households, especially for storable, non-food items. If low-income households bought in bulk as often as high-income households, they would lower their grocery expenditures by five percent. This paper examines the drivers of consumer heterogeneity in bulk buying behavior. I focus on three factors: cognitive costs, store access, and storage costs. Data I collected on state-level price regulations shows that the mandated display of per-unit prices, which reduces cognitive costs, increases a household's bulk buying by four to nine percent. Using data on warehouse club entry, I show that warehouse club entry increases bulk buying only for middle- and high-income households. For storage costs, I find that bulk buying increases when house size increases and that smaller products have smaller gaps in bulk buying between high- and low-income households. I then estimate a discrete choice model of toilet paper purchases to quantify how the bulk buying gap changes when regulations and storage costs are changed. Counterfactual simulations show that equalizing storage costs across all households shrinks the gap by 27%. Mandating the display of unit prices, which has only been adopted by nine states, would achieve a similar effect and reduce the bulk buying gap between the highest and lowest income households by 27%. As a result of these policies, households buy larger quantities and pay lower unit prices, with the lowest-income households achieving a six percent savings.

Research in Progress:

Going Off-Script: Physician License Suspension and Primary Care Access for Medicaid Recipients with Emma Boswell Dean and Daniel Kaliski
This paper analyzes how Medicaid patients respond to changes in primary care access and how changes to access affect their health outcomes. Using a novel dataset of medical license suspensions that we construct based on public records combined with Medicaid claims data, we explore how Medicaid patients respond to the sudden unavailability of their primary care physician. Using a differences-in-differences framework, we estimate how patient outcomes and behavior are different between patients whose physicians are suspended versus those that are not. We focus on whether patients continue care with other physicians, whether they visit emergency rooms in place of primary care, and whether they continue taking prescribed medications. We find that physicians that accept Medicaid patients are more likely to be disciplined for delivering sub-standard care, but may still provide valuable treatment to patients and prevent overuse of emergency department resources. These findings help policymakers better understand the trade-offs between access to care and the quality of clinical care patients receive.

**Made from Scratch: SNAP and Lottery Sales** with Jason Sockin

On average, lotteries offer a negative return on investment, yet many billions of dollars are spent playing them. Using administrative records from Pennsylvania, we construct a new dataset of store-level lottery ticket sales and individual stores’ eligibility to accept SNAP benefits. Using this data, we document that SNAP-eligible stores account for over 70% of lottery sales, while making up only 45% of outlets that sell lottery tickets. Furthermore, we find evidence that county-level lottery sales are positively correlated with disbursement of government transfer programs. Specifically, we find that a ten percent increase in county-level SNAP transfer payments is associated with a one percent increase in lottery sales. During the 2018–2019 federal government shutdown, SNAP benefits were disbursed unexpectedly early, with households receiving two months of benefits in January and no benefits in February. We use the change in lottery ticket sales during this disruption to estimate a household’s elasticity of consumption of lottery tickets with respect to SNAP benefits.
Dissertation Abstract

This dissertation examines how local economic environments affect the decisions of low-income households and ultimately their economic and physical well-being. The first two chapters focus on a household’s decisions in a basic grocery store setting. The first chapter analyzes the factors discouraging low-income households from buying in bulk and realizing valuable savings from quantity discounts. The second chapter examines whether low-income households are more likely to play the lottery as a result of where they shop for groceries. These two chapters examine why low-income households may spend more than necessary as a result of their local retail environment. The final chapter turns to the physical well-being of low-income households. They have limited access to primary care and I examine how their health outcomes are affected when access becomes even more limited. Together this dissertation explores how even small changes to the economic environment of low-income households can affect their decisions and well-being.

Chapter 1: Less is More Expensive: Bulk Buying and Inequality (Job Market Paper)

Low-income households pay more for a wide range of goods and services, including check cashing, durable purchases, and even basic grocery purchases. Grocery purchases (including housekeeping supplies) are a basic necessity and occupy a large share of a household's discretionary budget (total expenditures excluding fixed monthly expenses like rent, utilities, and transportation). In 2017, households in the lowest income quintile devoted 30% of their discretionary spending to grocery purchases. Because these items make up such a large share of their spending, any savings are especially valuable. Households often use sales, coupons, and generic brands to reduce their expenditures. Quantity discounts are another way for households to reduce their expenditures, but our understanding of how common these discounts are and who uses them is limited.

This paper presents a new finding that low-income households are less likely to take advantage of quantity discounts than high-income households. Using Nielsen data, I document that low-income households are 30% less likely to buy non-food grocery items in bulk compared to high-income households, even after controlling for household size, age, and other characteristics. I estimate that low-income households would reduce their annual grocery expenditures by five percent if they bought in bulk at the same rate as high-income households, generating an aggregate savings of $2.7 billion.

I explore the reasons for the lower bulk buying rates among low-income households. I consider three distinct factors: cognitive costs of computing per-unit prices of different-sized packages, access to stores that sell bulk packages, and storage or transportation costs. To evaluate the effects of cognitive costs, I exploit the fact that some US states mandate the display of per-unit prices as a consumer protection measure while other states do not. Using a new dataset of state per-unit pricing mandates that I constructed, I show that mandated per-unit pricing is associated with four to nine percent more bulk buying. To control for endogeneity in which states adopt such regulations, I examine the bulk buying behavior of the same households before and after the entry of warehouse club stores. Middle- and high-income households increase their bulk buying by five to ten percent in response to warehouse club entry, while low-income households do not change their bulk buying. However, differences in bulk buying behavior exist even within the same stores, so access to warehouse clubs may amplify differences due to other factors, such as storage and transportation costs.
To assess the importance of storage and transportation costs, I examine the differences in bulk buying relative to the size of a household's home and relative to the physical size of the product being purchased. I find that households living in single-family homes buy in bulk more than those living in apartments. To control for endogeneity in housing choice, I look at how bulk buying changes within a household when it moves between an apartment and a single-family home. I find that when a household lives in a single-family home, their bulk buying is three to four percent higher than when they live in an apartment. Furthermore, differences in bulk buying are larger for bulkier product categories, like paper products, relative to less bulky categories like plastic wrap.

Finally, to estimate the separate contribution of each of these factors to overall differences in bulk buying between high- and low-income households, I estimate a discrete-choice model on a case study of consumer toilet paper purchases. Household choose a product based on price, quantity, quality, and package size, which serves as a proxy for storage costs. I allow state-level unit pricing mandates to affect a household’s price responsiveness. I then use the model to predict how consumer choices change under two counterfactual scenarios: mandating the posting of per-unit prices and reducing storage and transportation costs. I estimate that the differences in bulk buying between high- and low-income households would fall by 27% if unit prices were universally posted. Setting the storage costs of low-income households equal to the storage costs of high-income households would reduce the difference by an additional 27%. Given that only nine states mandate the display of per-unit prices, policymakers in other states may want to adopt existing regulations to increase bulk buying to help households capture savings from quantity discounts.

Chapter 2: Made from Scratch: SNAP and Lottery Sales (with Jason Sockin)

On average, lotteries offer a negative return on investment, yet many billions of dollars are spent playing them. Using administrative records from Pennsylvania, we construct a new dataset of store-level lottery ticket sales and individual stores’ eligibility to accept SNAP benefits. Using this data, we document that SNAP-eligible stores account for over 70% of lottery sales, while making up only 45% of outlets that sell lottery tickets. Furthermore, we find evidence that county-level lottery sales are positively correlated with disbursement of government transfer programs. Specifically, we find that a ten percent increase in county-level SNAP transfer payments is associated with a one percent increase in lottery sales. During the 2018–2019 federal government shutdown, SNAP benefits were disbursed unexpectedly early, with households receiving two months of benefits in January and no benefits in February. We use the change in lottery ticket sales during this disruption to estimate a household’s elasticity of consumption of lottery tickets with respect to SNAP benefits.

Chapter 3: Going Off-Script: Physician License Suspensions and Primary Care Access for Medicaid Recipients (with Emma Dean and Daniel Kaliski)

This paper analyzes how Medicaid patients respond to changes in primary care access and how changes to access affect their health outcomes. Using a novel dataset of medical license suspensions that we construct based on public records combined with Medicaid claims data, we explore how Medicaid patients respond to the sudden unavailability of their primary care physician. Using a differences-in-differences framework, we estimate how patient outcomes and behavior are different between patients whose physicians are suspended versus those that are not. We focus on whether patients continue care with other physicians, whether they visit emergency rooms in place of primary care, and whether they continue taking prescribed medications. We find that physicians that accept Medicaid patients are more likely to be disciplined for delivering sub-standard care, but may still provide valuable treatment to patients and prevent overuse of emergency department resources. These findings help policymakers better understand the trade-offs between access to care and the quality of clinical care patients receive.
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Fall, 2018  Applied Data Analysis and Causality for Business and Public Policy for Professor Santosh Anagol
Spring, 2018  China: Institution and the Economics, Teaching Assistant for Professor Hanming Fang and Professor Yue Hou
Fall, 2017  International Trade, Teaching Assistant for Professor Iourii Manovskii
“Information and Corruption: Evidence from China’s Land Auctions” (Job Market Paper)
Aimed at combating corruption, China launched a massive land reform in early 2000s, and it requires local governments to sell all land through public auctions. However, local governments still have discretion to choose the auction format for each piece of land and hold private information about land’s value. This leaves significant room for corruption. I examine how the effect of sellers’ private information on auction outcomes differs in two-stage auction and English auction, and how this difference affects local governments’ incentive in choosing auction formats. I develop a theoretical model endogenizing local governments’ choice of auction format. I show that two-stage auction is more prone to corruption than English auction when information is asymmetric, and land with lower value faces harder constraint for corruption. Consequently, local governments tend to use two-stage auction on low-value land to maximize personal benefit and to use English auction on high-value land to maximize public benefit. Using a detailed data set covering all land transactions in China between 2007 and 2017, I then structurally estimate a common value auction model with bidders asymmetric in information as well as private costs. My results show that land sold by two-stage auction on average has a value lower than that of English auction by CNY 343/m2, explaining 43% of the observed price difference between these two auction formats (selection effect), and the remaining 57% is explained by the different bidding equilibrium of these two auction formats (corruption effect). Moreover, the politically connected bidders have a significant information advantage over the unconnected ones, which allows them to bid higher and win more often. My analysis, however, also finds that politically connected bidders have higher private costs, and this suggests a big efficiency loss. Finally, I also evaluate the impacts of several alternative land market designs. The counter-factual results suggest that using English auction only and increasing public information disclosure can both significantly reduce corruption and increase land revenues as well as social welfare.

“Greasing the Wheels of Economy: Corruption or Anti-corruption?” with Xi Lu
This paper tests the “greasing-the-wheels” hypothesis in the context of China’s residential land market. Using the date from the China’s anti-corruption campaign, we show that removing corruption from China’s monopoly land market causes a drop in the land transaction volume. Moreover, not removing any form of corruption will lead to the drop. What really matters is only removing the corruption that can help real estate developers circumvent red tape and reduce trade costs. Our findings support the “greasing-the-wheels” hypothesis: when an economy remains a low outcome for some pre-existing distortions, corruption could be a good thing in the sense of a “second-best world”.
Publications:
(with Fan Fan, Ran Tao, and Dali Yang)
Abstract: China has adopted a transfer-based fiscal decentralization scheme since the mid-1990s. In the 1994 tax sharing reform, the central government significantly raised its share of government revenue vis-à-vis local governments by taking most of the newly created value-added tax on manufacturing. One aim for the adoption of the transfer-based fiscal scheme was to channel more funds to less developed regions and rural areas, and to alleviate growing interregional inequality and urban–rural income disparity. In 2002 and 2003 the Chinese central government further grabbed 50% and 60%, respectively, of the income taxes previously assigned only to local governments while providing more fiscal transfers to the country’s poor regions and the countryside. Utilizing the 2002–2003 change in China’s central–local tax sharing regime as an exogenous policy shock, we employ a Simulated Instrumental Variable approach to causally evaluate the effects of the policy shock on growth, interregional inequality and urban–rural disparity. We find the lower local tax share dis-incentivized local governments and led to lower growth. Although higher central transfers helped to reduce interregional inequalities in per capita GDP and per capita income, the equalizing effects were only present for urban incomes. We argue that transfer-based decentralization without bottom-up accountability was detrimental to economic growth and had limited impact on income redistribution.

"Bringing Politics Back in Charitable Giving: Evidence from Donations after China’s Sichuan Earthquake", Nonprofit and Voluntary Sector Quarterly (forthcoming): 0899764019868848
(with Fubing Su and Ran Tao)
Abstract: Do non-Westerners donate differently? Drawing on a unique survey after the 2008 Sichuan earthquake, this article reports some empirical findings about Chinese donation behavior. Our empirical analysis confirms the importance of various socioeconomic factors in charitable giving. What distinguishes the Chinese case from other societies is the role of politics. Political attitudes affect how people donate: Less trustful individuals and less dependent communities do not embrace state-centered charity enthusiastically. Our research expands the spatial coverage of the charity study that is dominated by experiences and practices from European and North American countries. To generate hypotheses about political attitudes, we develop a simple political model of charity. Placing politicians’ survival motivation at the center opens up new inquiries that are underexplored by current literature. It also inspires further research into comparative institutional designs of charity across national boundaries.

(with Ran Tao and Fubing Su)
Abstract: China launched a massive poverty alleviation program in the 1990s that focused on 592 poverty counties. By injecting earmarked transfers with clear spending mandates, the central government hoped for major investments in productive capacities in the poverty counties so they could develop sustainably. Comparing fiscal data of county governments through a regression discontinuity approach, we show that the opposite was true. Poverty county officials failed to make extra investments in production-oriented areas while diversion of central transfers for administrative consumption was rampant. This paper develops a better empirical strategy to challenge some earlier findings. Theoretically, China has adopted an interesting fiscal system of revenue centralization and spending decentralization. Our analysis indicates how autocratical control at the center and clientelist politics at the local level have shaped these changes. It sheds some light on the theoretical literature on fiscal transfer and decentralization.

(with Guangzhong Cao, Yan Ma, and Ran Tao)
Abstract: Drawing on a survey of migrants in 12 cities across four major urbanizing areas in China, this paper analyses rural migrants’ intention for permanent urban settlement. We focus on one sizeable but often overlooked group of rural migrants, that is, the self-employed. Our hypothesis is that the self-employed migrants tend to have stronger intention for permanent urban settlement since they are usually more ingrained in urban economy and society. The empirical evidence supports our hypothesis. Moreover, the social and economic choices made by the self-employed migrants are consistent with their expressed intentions: they are more likely to migrate with spouses and to live with their family members, more likely to have a plan for house purchase in cities; they are also more integrated into urban society in terms of learning local dialects and making friends with local permanent residents.

(with Ran Tao, Xi Lu, and Dali Yang)

Abstract: Using an instrumental variable approach, we analyze survey data to untangle the relationship between social and political trust in contemporary China. We find strong evidence that political trust enhances social trust in China and the results are robust to a range of measures, including the generalized social trust question, as well as three contextualized trust questions. We also shed light on the impact of economic modernization on social trust. Our findings contribute to the general literature on trust and provide a better understanding of the complicated relationship between political trust and social trust. They also offer insight into the dynamics of trust production and reproduction in China and thus into China’s socio-political development.

(with Fubing Su, Ran Tao and Xi Lu)

Abstract: To explain China's dramatic economic growth, researchers have proposed a “tournament thesis.” According to this thesis, the central government's ability to set growth targets has played a crucial role in growth since political promotion is largely based on local economic growth. We use provincial officials' career mobility data to test this thesis. For both time periods (1979–1995 and 1979–2002), economic performance, measured in annual, average and relative terms, did not affect these officials' career advancement. We then sketch an alternative analytical framework to explain Chinese local officials' strong urge for developmentalism and, finally, draw policy implications from this explanatory framework.
Dissertation Abstract

Chapter 1: Information and Corruption: Evidence from China’s Land Auctions (Job Market Paper)

Land plays an important role in China’s economic system. Not only does the state own the land and only the government can decide its usage and lease it to developers, but also revenues from land sale constitute an important source of local fiscal income. Despite the financial significance of land, corruption is a major problem in its utilization. In this paper, I study the mechanism of corruption in China’s land auctions. I develop a model in which local governments, as the auctioneer, hold private information about the land value, and can sell the information to the politically connected bidders in exchange for personal benefit. To estimate the model, I combine four different data sources on China’s land market.

Land auctions involve both private and common value components. Unlike most auctions, revenue from land development is usually realized after several years and depends crucially on local governments’ development and infrastructure investment in the surrounding area. However, at the time of the auction, local governments’ plan for the following years is their private information that is unknown to the bidders. This leaves significant room for corruption. Some politically connected bidders can approach local officials and buy such information by paying bribes, while unconnected bidders do not have this opportunity. This leads to potential asymmetric information on common value in the auctions. In the English auction, bidders observe the bidding sequence as well as the identity of the bidder of each bid. In contrast, in the first stage of a two-stage auction, bidders observe neither other bidders’ identities nor their bids, which gives better informed bidders more room to make profit from their private information about land value. Consequently, connected bidders are willing to pay higher bribes for information in two-stage auctions, which makes two-stage auction more prone to corruption.

My analysis first provides reduced-form evidence on the asymmetries between bidders. I find that politically connected bidders bid significantly higher and make more profit than unconnected bidders. Moreover, I find that local governments use the two-stage auction, which has lower price on average, much more frequently than the English auction. This is partially due to local governments’ selection of the two-stage auction for low-quality land and the English auction for high-quality land.

In light of these empirical patterns, I develop a theoretical model with an anti-corruption central government, a corrupt local government, a politically connected bidder who can approach the local government and buy information by paying a bribe, and other unconnected bidders who do not have such an opportunity. I show with a common value auction model that the two-stage auction is more prone to corruption than the English auction when bidders’ information on the common value is asymmetric. Moreover, land with lower value yields lower information rent for the connected bidder, thus having a harder constraint for corruption. Consequently, local governments tend to
use the two-stage auction for low-value land to maximize personal benefit and the English auction on high-value land to maximize public benefit.

I then structurally estimate a common value auction model with bidders having asymmetric information as well as private costs. I show that land sold by the two-stage auction has, on average, a value lower than that in the English auction by CNY 343/m², explaining 43% of the observed price difference between the two auction formats (selection effect), and the remaining 57% is explained by the different bidding equilibrium of the two auction formats (corruption effect). Moreover, politically connected bidders have a significant information advantage over unconnected bidders, which allows the former to bid higher and win more often. My analysis, however, also finds that politically connected bidders have higher private costs, suggesting a great efficiency loss, since land is not developed by the most cost-efficient firm.

Finally, I also evaluate the impacts of several alternative land market designs. The counterfactual analysis suggests that using the English auction only and increasing public information disclosure can significantly reduce corruption as well as increase land revenue and social welfare.

My paper contributes to four strands of the literature. First, it contributes to studies of China’s land market by providing a complete overview of corruption in the market using a big data set covering all transactions in the past 10 years, and I am also able to characterize the mechanism of corruption with a structural model. Second, it contributes to the empirical studies of common value auction with asymmetric bidder by developing a structural estimation approach when only observing winning bids, and moreover, by comparing different auction formats with a structural model. Third, it contributes to the literature of political favoritism in auctions by providing additional empirical evidence, and moreover, a structural model that formalizes the mechanisms by which governments’ private information gives rise to corruption. Finally, this paper is closely related to a small but growing literature investigating the effects of information disclosure on corruption. Previous studies mostly focus on cross-country evidence on the impact of information disclosure on corruption. I contribute to this vein of literature by providing micro-level evidence on how information disclosure can reduce corruption.

Chapter 2: Greasing the Wheels of Economy: Corruption or Anti-corruption? (with Xi Lu)

This paper tests the “greasing-the-wheels” hypothesis in the context of China’s residential land market. We show that China’s anti-corruption campaign, aimed at removing corruption in China’s monopoly land market, caused a decrease in land transaction volumes. Furthermore, not removing any form of corruption would also lead to a similar decrease. It is only necessary to remove corruption that enables real estate developers to circumvent red tape and reduce trading costs. Our findings support the “greasing-the-wheels” hypothesis: when an economy has a low outcome owing to some preexisting distortions, corruption could be a positive factor in that it offers a “second-best world”.

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- Fall 2018: Introduction to Microeconomics, University of Pennsylvania, Course Instructor
- Summer 2017, 2018: Introduction to Microeconomics (Online), University of Pennsylvania, Course Instructor
- Spring 2019: Intermediate Microeconomics, University of Pennsylvania, Teaching Assistant for Prof. Rohit Lamba
- Fall 2017, Spring 2019: Introduction to Microeconomics, University of Pennsylvania, Head Teaching Assistant for Prof. Anne Duchene
- Winter 2018: Demand, Supply, and the Social Good (Coursera), University of Pennsylvania, Teaching Assistant for Prof. Rebecca Stein
- Spring 2016, 2017: Introduction to Microeconomics, University of Pennsylvania, Head Teaching Assistant for Prof. Rebecca Stein
- Fall 2015, 2016: Introduction to Microeconomics, University of Pennsylvania, Head Teaching Assistant for Prof. Anne Duchene

Research Experience and Other Employment:

- Fall 2017: Wharton Customer Analytics Initiative (WCAI) Accelerator Challenge
  - Collaborated with analytics team members (Wharton MBAs and Undergraduate students) in identifying a case study of business problems faced by a partner company (Madison Reed) and delivering data-driven business solutions within a timeline of six weeks.
  - Forecasted customer churning and computed RLVs and CLVs through fitting and cross validating the “Buy Till You Die” (Pareto/NBD) model using R. Summarized the computed CLVs based on customer characteristics (including demographics) to detect clusters of valuable customers. Used computed CLVs to rank effectiveness of different customer enrollment options (email, flyers, and phone calls). Provided suggestions on what option the company should invest in the future.
  - Communicated the results with stakeholders. Presented the project at WCAI Accelerator Challenge Summit.

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  2018: UPenn Applied Micro Lunch
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- Referee:
  2016: Princeton EconCon
  2017: Yale YES (Young Economist Symposium)

Research Papers:

Why Do Consumers Care About Loyalty Points? (Job Market Paper)

Abstract: I separately identify two mechanisms that jointly explain why consumers would care about loyalty points in the “Collect X Points, Get A Reward” type of frequency reward loyalty programs. One is an economic mechanism that incentivizes consumers through the value of the resulting price discounts: Consumers endogenously choose the timing and amount of reward redemption, and forward-looking consumers with rational expectations would get incentivized by the potential realized value of redemption. The other is a psychological mechanism that incentivizes consumers through the
satisfaction from goal achievement: Consumers pursue extrinsic reward thresholds as goals and receive satisfaction upon goal achievement regardless of redemption decisions. Using the detailed records of credit card transactions, reward (voucher) generation, and cardholder redemption from a European credit card loyalty program, I develop and estimate a structural model of credit card spending that incorporates the two mechanisms. Using the model estimates and through counterfactual experiments, I find that the program increases credit card spending by 5.87%, but the majority of such increase (88.66%) is driven by the psychological mechanism. Given the relative effectiveness of the two mechanisms, I show through counterfactual experiments that increasing points per dollar spent (points issuance ratios) would increase profits for the credit card company, while increasing the voucher face value would decrease profits. To generate win–win outcomes where profits and consumer welfare both increase, it is necessary to increase both points issuance ratios and the voucher face value.

Initial Biases, Product Loyalty, and Profit-Maximizing Strategies for New Products

Abstract: I disentangle consumer learning and switching costs in the consumer-packaged-goods (CPG) markets, the typical two types of sources of dynamics in CPG markets. I focus on recovering the heterogeneity structure underlying consumers’ initial biases and product loyalty (the negative of switching costs). Given the structure, I revisit the conventional design of the promotion strategies for new products: introductory price discounts and free samples. The “invest-harvest” design can increase profits if consumers are initially pessimistic and have positive switching costs (i.e., are loyal to last purchased products). If consumers are initially optimistic or have negative switching costs (i.e., are variety-seeking), “harvesting” right away by increasing the introductory prices is more profitable. I develop and structurally estimate a demand model that incorporates learning and switching costs using the Nielsen consumer panel data from Boston Greek Yogurt market between the years 2012 and 2013, when numerous new products were introduced. The estimation results reveal significant heterogeneity in initial biases and switching costs. Given the model estimates, I conduct a case study on “Chobani Flip” by computing the profit-maximizing introductory price adjustment and deciding whether to send out free samples.

Software/Programming/Computational Skills:
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Certificate:
IBM Data Science Professional Certificate (Courses Completed: Open Source tools for Data Science, Data Science Methodology, Python for Data Science and AI, Databases and SQL for Data Science, Data Analysis with Python, Data Visualization with Python, Machine Learning with Python, Applied Data Science Capstone Project)
Essays on Consumer Choice Dynamics and Their Implications on Firm Strategies

Minshen Li

My dissertation has two chapters: In chapter One, also my job market paper, “Why Would Consumers Care About Loyalty Points?,” I distinguish between an economic and a psychological source of credit card spending incentive driven by a credit card loyalty (rewards) program. In Chapter Two, “Initial Biases, Product Loyalty, and Profit-Maximizing Strategies for New Products,” I disentangle consumer learning and switching costs in the consumer-packaged-goods markets with active new product introduction, for example, the Greek Yogurt market. In both chapters, I apply analytics tools to document nonstructural evidence for the presence of multiple sources of consumer choice dynamics: in Chapter One, I document the presence of an economic mechanism and a psychological mechanism; in Chapter Two, there are consumer learning and switching costs. Then I structurally estimate the models to quantify the key underlying primitives. Using the model estimates, I conduct counterfactual experiments, providing insight into the managerial implications of the presence and the magnitude of each type of choice dynamics. In Chapter One, I explore how credit card companies could better design the credit card rewards program to achieve win-win outcomes, where profits and cardholder welfare both would increase; in Chapter Two, I explore how retailing business should modify their introductory pricing and free sampling strategies to maximize long-run profits for new products.

Chapter One. Why Do Consumers Care About Loyalty Programs? (Job Market Paper)

In this paper, I separately identify an economic and a psychological source of incentive that jointly drives customers to increase credit card spending in the context of a European credit card rewards program. The program rewards customers with loyalty points when they spend with the credit card and on a monthly basis, the loyalty points are converted into gift vouchers redeemable at approximately 10% of the national retailers. Like the typical frequency reward loyalty programs, the program under study takes the “Get $X Voucher for Each Y Points” linear reward structure, which embeds two main features: First, to earn Y points (i.e., to pass the reward threshold), customers need to spend a long way; second, the face value of the reward (the value of X) is mediocre or even trivial. While customers in this program need to spend $500 - $2500 to get a $5 gift voucher, 40% of customers never redeemed the vouchers they earned. The financial incentive appears weak but customers indeed accelerate spending as they approach the reward thresholds even though points will never devalue or expire.

I find that customers' puzzling passion for earning loyalty points can be attributed to two reasons: One is the financial value of price discounts that result from redeeming vouchers, which he terms as the economic mechanism. Second is a psychological value people attach to reaching goals, which he terms as the psychological mechanism. Taking advantage of the detailed records in credit card transaction, loyalty points accumulation, vouchers generation, and vouchers redemption, I detect the presence of each mechanism, sort out the two mechanisms, and quantify the contribution of each mechanism to credit card spending increase through a combination of exploratory data analyses, structural estimation, and counterfactual experiments. I find that the seemingly financially unattractive loyalty program indeed increases credit card spending by 5.87% and 88.66% of such increase is driven by the psychological mechanism.

Given the relatively effective psychological mechanism and the relatively ineffective economic mechanism, I further show through counterfactual experiments that increasing points earned per dollar spent (points issuance ratios)
would increase profits for the credit card company by mainly leveraging the psychological mechanism while increasing the voucher face value would cause profit loss due to ineffective economic mechanism. Meanwhile, as firms attempt to increase profits by inducing consumers to increase credit card spending, consumers may be worse off due to higher interest and late fees as well as the inactive voucher redemption behavior. I find that increasing both points issuance ratios and voucher face value would be a necessary condition for generating the win-win outcomes where profits increase without worsening consumer welfare. My structural estimation result suggests that a key reason why the economic mechanism is ineffective is due to the presence of a large redemption cost. Such redemption cost can be interpreted as the overall inconvenience customers experience as they redeem the paper vouchers in select stores. The redemption cost causes low redemption rates among customers and thus little added incentive to increase credit card spending as a result of the economic mechanism. By eliminating such redemption cost, the economic mechanism signifies dramatically and I find that increasing voucher face value alone would generate the win-win outcome.

Chapter Two. Initial Biases, Product Loyalty, and Profit-Maximizing Strategies for New Products

I disentangle consumer learning and switching costs in the consumer-packaged-goods markets. In particular, I focus on the heterogeneity structure underlying consumers’ initial biases and switching costs. The initial biases measure the deviation of consumers’ initial perception about the quality of the new product relative to its true quality. Consumers are initially optimistic if the initial bias is positive and are initially pessimistic otherwise. The switching costs correspond to consumers’ loyalty to the products they purchased in their previous shopping trip. Consumers are loyal if switching costs are positive and are variety-seeking if otherwise.

By allowing for a flexible structure of learning and switching costs, this paper revisits the conventional design of the promotion strategies for new products. The conventional idea is the “invest-harvest” design – introductory price discounts and free samples, to help eliminate negative biases and lock in purchases for the new products if consumers are initially pessimistic or are loyal. On the other hand, if consumers are initially optimistic or are variety-seeking, introductory price discounts and free samples backfire because they speed up the elimination of the positive bias and cause switching away from the new products. In this case, “harvesting” right away by increasing introductory prices should be the way to go. Ultimately, the optimal design depends on the heterogeneity underlying consumers’ initial biases and loyalty (the negative of switching costs).

The empirical part of the study uses consumer scanner data from one of the largest Greek yogurt markets in the United States, the Boston market, between the years 2012 and 2013, when numerous new products were introduced to the market. The nonstructural evidence is twofold. First, there is the systematic temporal change in the market-level demand for specific brands given temporally robust prices. Second, there is the temporally robust difference between the repeated purchasing probability and the marginal purchasing probability, which can only be rationalized by the presence of nonzero switching costs. Then, I structurally estimate a demand model that incorporates learning and switching costs, using MCMC Bayesian estimation methods. The estimation results reveal significant heterogeneity in initial biases and switching costs. Given the model estimates, I conduct a case study on “Chobani Flip” by computing the profit-maximizing introductory price adjustment and deciding whether to send out free samples.

This paper enriches documentation on consumer choice dynamics in the consumer package goods markets, and, importantly, it challenges the conventional view about new product promotion. For example, Osborne (2011) and Sridhar et al. (2012) suggest that introductory price discounts enhance profits for new products. Halbheer et al. (2014) suggest that free samples can enhance profits. This paper suggests that neither has to be true: depending on the heterogeneous structure underlying initial biases and switching costs, firms could gain from charging an initially high price and could lose from giving out free samples.
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Masters Level Work:
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M.Sc., Economics, Fundação Getúlio Vargas (EPGE-FGV/RJ), 2014

Graduate Studies:
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Thesis Title: “Essays in Macroeconomics with Heterogeneity”
Expected Completion Date: May 2020

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Research Fields:

Macroeconomics, Public Finance, Labor Economics

Teaching Experience:

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<th>Course</th>
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<td>Spring 2016</td>
<td>Introduction to Microeconomics</td>
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<td>Rebecca Stein</td>
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<td>Fall 2015</td>
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<td>Fall, Spring</td>
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<tr>
<td>Fall 2009</td>
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<td>Spring 2008</td>
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</tr>
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Research Experience and Other Employment:

- 2016 to present: Federal Reserve Bank of Philadelphia, Graduate Research Analyst
- 2018: University of Pennsylvania, Research Assistant for Prof. Juan Pablo Atal
- 2016: University of Pennsylvania, Research Assistant for Prof. Iourii Manovski
- 2011: Universidade de Brasília, Research Assistant for Prof. Mauro Boianovsky
- 2009: Central Bank of Brazil, Research Department Intern

Professional Activities:

- Presentations
  - 2020: Temple University (scheduled)
  - 2019: ESEM (Manchester), NASMES (Seattle), Midwest Macro (Athens), FRB Philadelphia, University of Pennsylvania
  - 2018: LACEA (Guayaquil), Bonn Summer School of Macroeconomics of Inequality, University of Pennsylvania
  - 2017: LACEA (Buenos Aires), EPGE-FGV/RJ (Rio de Janeiro), University of Pennsylvania
  - 2016: University of Pennsylvania

Honors, Scholarships, and Fellowships:

- 2017-2019: GAPSA Research Travel Grant, University of Pennsylvania
- 2017-2019: SAS Dean’s Travel Subvention, University of Pennsylvania
- 2018: Fels Policy Research Initiative Seminar Series Honorarium
- 2018: SASgov Travel Grant, University of Pennsylvania
- 2014-2019: University Fellowship, University of Pennsylvania
- 2012-2013: CAPES Fellowship for Master’s Program in Economics
Publications:


Research Papers:

“The Macroeconomic Effects of Universal Basic Income Programs” (Job Market Paper)

What are the consequences of a nationwide reform of a transfer system based on means-testing towards one of unconditional transfers? I answer this question by constructing a quantitative model to assess the general equilibrium effects of substituting the current U.S. income security system with a Universal Basic Income (UBI) policy and measure its impact on inequality, the budget trade-off, and welfare. To do so, I develop an overlapping generations model with idiosyncratic income risk that incorporates intensive and extensive margins of labor supply, on-the-job learning, and child-bearing costs. The tax-transfer system closely mimics the U.S. design. I calibrate the model to the U.S. economy and conduct counterfactual analyses that implement reforms towards a UBI, taking into account the transitional dynamics. I find that an expenditure-neutral reform induces households to work more hours through a substitution effect, but the income effect increases their non-participation. A UBI of US$ 1,000 monthly requires a substantial increase in the tax rate of consumption used to clear the government budget and leads to an overall decrease of the macroeconomic aggregates. In both cases, the economy is more equal in terms of disposable income and consumption, with significant redistribution towards the bottom. The UBI economy constitutes a welfare loss if expenditure-neutral but results in gains when generous. The welfare effects in the latter are positive at the bottom of the income distribution and negative at the top, which stems from the redistribution of consumption and leisure and thus enables the construction of a political majority to vote in favor of the UBI reform.

“Unemployment Insurance Design in an Economy with Informal Markets” (with Gustavo Souza)

Emerging and developing countries have, on average 50% of their employment in informal markets, generating a key aspect to be taken into account on the UI design: beneficiaries can simultaneously work on side jobs during their unemployment spell. At the same time, workers face a trade-off when considering the search for jobs in the informal sector, as the UI eligibility tenure is only attained via enrollment in formal jobs. This paper develops a heterogeneous agents model with sectoral choice and history-dependent UI benefits built on stylized facts of the Brazilian economy in order to quantitatively evaluate the welfare effects of the UI program design. We study a program characterized by three variables: a replacement ratio, a limit on how many months the worker can receive benefits, and a tenure requirement on past formal jobs. In a preliminary numerical analysis, we find that a decrease in the replacement ratio reduces the wage in the informal sector, an increase in the number of monthly payments augments enrollment in the program, and an increase in the requirement induces workers to move from the formal to the informal sector.

“Adjustment Costs, Financial Constraints, and the Persistence of Misallocation in China” (with Gustavo Camilo)

Using firm-level data in the years 2000-2013 on all Chinese publicly traded manufacturing firms divided among private, state-owned and privatized enterprises, we document the presence of misallocation in the Chinese economy, as measured by TFPR dispersion. We then develop a dynamic investment model with physical and financial frictions where firms make their financing decisions in the presence of operating, equity issuance, adjustment and financing costs where the latter are captured by a collateral constraint that allows lenders to discriminate among firms according to their ownership. Using the firm-level data, we estimate the structural parameters of the model, which can generate TFP losses relative to the efficient allocation of 59% and dispersion in TFPR that closely matches the data. We explore a counterfactual analysis comparing the levels
of aggregate productivity to the efficient level when adjustment costs are removed and find that 35% of the misallocation generated by the model in the baseline economy disappears without the presence of such costs. Finally, we observe that adjustment costs and a tight financing restriction interact to amplify misallocation losses by spreading firms' size distribution.

**Research Papers in Progress**

“The Aggregate Effects of Cash Transfers on Earnings Risk: Evidence from Millions of Brazilian Workers” (with Tomás Rodríguez Martínez)

“The Rise of Dual-Earner Families and Male-Based Recessions” (with Ayse Imrohoroglu and Martín López-Daneri)

**Languages:** Portuguese (Native), English (Fluent), German (Advanced), Spanish (Basic)

**Computational Skills:** Fortran, Matlab, Stata, Julia, R.
My research interests lie in the intersection between macroeconomics, public finance, and labor economics. In particular, the focus of my work is on the interplay between heterogeneity at the micro-level and the macroeconomy. A common question that my papers address is how the design of public insurance policies entails distributional consequences that have impacts on macroeconomic aggregates, inequality, and welfare. My methodological approach is to bring the “Micro” to the “Macro” building heterogeneous agents models that are consistent with the inequality observed in the data. Using these models, I then study the distributional sources of macro outcomes and the trade-offs involved in policy implementation, along with its normative consequences. My work also explores how the mapping between heterogeneity and the macroeconomy uniquely manifests itself in emerging economies. Below, I describe my papers in more detail.

In my job market paper, “The Macroeconomic Effects of Universal Basic Income Programs”, I assess the general equilibrium effects of substituting the current U.S. income security system with a Universal Basic Income (UBI) policy and measure its impact on inequality, the budget trade-off, and welfare. To do so, I develop an overlapping generations model with idiosyncratic income risk that incorporates intensive and extensive margins of labor supply, on-the-job learning, and child-bearing costs. The tax-transfer system closely mimics the U.S. design. I calibrate the model to the U.S. economy and conduct counterfactual analyses that implement reforms towards a UBI, taking into account the transitional dynamics. I find that an expenditure-neutral reform induces households to work more hours through a substitution effect, but the income effect increases their non-participation. A UBI of US$ 1,000 monthly requires a substantial increase in the tax rate of consumption used to clear the government budget and leads to an overall decrease of the macroeconomic aggregates. In both cases, the economy is more equal in terms of disposable income and consumption, with significant redistribution towards the bottom. The UBI economy constitutes a welfare loss if expenditure-neutral but results in gains when generous. The welfare effects in the latter are positive at the bottom of the income distribution and negative at the top, which stems from the redistribution of consumption and leisure and thus enables the construction of a political majority to vote in favor of the UBI reform.

In the paper “Unemployment Insurance Design in an Economy with Informal Markets” (joint with Gustavo Souza) we develop a heterogeneous agents model with sectoral choice and history-dependent unemployment insurance (UI) benefits built on stylized facts of the
Brazilian economy in order to quantitatively evaluate the welfare effects of the UI program design. Emerging countries like Brazil have, on average, 50% of their employment in informal markets, where beneficiaries can simultaneously work on side jobs during their unemployment spell. At the same time, workers face a trade-off when considering the search for jobs in the informal sector, as UI eligibility tenure is only attained via enrollment in formal jobs. In the model, we study a program characterized by three variables: a replacement ratio, a limit on how many months the worker can receive benefits, and a tenure requirement on past formal jobs. In preliminary results, we find that a decrease in the replacement ratio reduces the wage in the informal sector, an increase in the number of monthly payments augments enrollment in the program, and an increase in the requirement induces workers to move from the formal to the informal sector.

In “Adjustment Costs, Financial Constraints, and the Persistence of Misallocation in China” (joint with Gustavo Camilo), we use firm-level data in the years 2000-2013 on all Chinese publicly traded manufacturing firms to document the presence of misallocation in the Chinese economy, as measured by TFPR dispersion. We then develop a dynamic investment model with physical and financial frictions where firms make financing decisions in the presence of operating, equity issuance, adjustment, and borrowing costs where the latter is captured by a collateral constraint that allows lenders to discriminate among firms according to their ownership. We estimate the structural parameters of the model, which generates TFP losses relative to the efficient allocation of 59% and dispersion in TFPR, closely matching the data. We explore a counterfactual analysis comparing the levels of aggregate productivity to the efficient level when adjustment costs are removed and find that 35% of the misallocation generated by the model in the baseline economy disappears without the presence of such costs. We also observe that adjustment costs and a tight financing restriction interact to amplify misallocation losses by spreading firms’ size distribution.

Finally, in my future work, I plan to deepen the scope of my research on two main fronts: the use of rich microdata and heterogeneity at the household level. I tackle this objective in two projects described briefly in the sequence, which focus on the role of heterogeneity in periods of economic hardship. In “The Aggregate Effects of Cash Transfers on Earnings Risk: Evidence from Millions of Brazilian Workers” (joint with Tomás Martínez), we make use of administrative datasets to estimate the contribution of the main Brazilian cash transfers program to the earnings risk structure of workers and their performance during the recent crisis. In “The Rise of Dual-Earner Families and Male-Based Recessions” (joint with Ayse Imrohoroglu and Martín López-Daneri), we explore how the secular change in the breadwinner structure of U.S. households - from single- to dual-earners - has contributed to the labor supply response of female and male workers during the Great Recession.
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M.Sc., Economics, University of Pisa, 2014
Diploma, Economics, Scuola Superiore Sant’Anna, Pisa, 2016

Graduate Studies:
University of Pennsylvania, 2014 to present.
Thesis Title: “Essays on Labor Markets and Cities”
Expected Completion Date: May 2020

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Macroeconomics, Labor Economics, Urban Economics

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Spring 2019: Markets with Frictions, New York University, Teaching Assistant for Prof. Guido Menzio
Fall 2018: Public Finance, University of Pennsylvania, Teaching Assistant for Dr. Margaux Luflade
Fall 2018: Game Theory, University of Pennsylvania, Teaching Assistant for Dr. Annie Liang
Fall 2017: Public Finance, University of Pennsylvania, Teaching Assistant for Prof. Hanming Fang
Fall 2017: Urban Fiscal Policy, University of Pennsylvania, Teaching Assistant for Prof. Holger Sieg
Fall 2015: Introduction to Micro and Macro, University of Pennsylvania, Teaching Assistant for Dr. Gizem Saka

Research Experience and Other Employment:

Fall 2016: Research Analyst, Federal Reserve Bank of Minneapolis

Professional Activities

Presentations: 2019: NBER EF&G (San Francisco), EIEF (Rome)
2018: NBER Summer Institute, Minnesota Macro (Minneapolis), Philadelphia Fed, EIEF (Rome)

Honors, Scholarships, and Fellowships:

2019-2020: SAS Dissertation Completion Fellowship, University of Pennsylvania
2015-2019: University Fellowship, University of Pennsylvania
2014-2015: Ando-Modigliani Scholarship, Bank of Italy
2010-2014: Full Residential Scholarship, Scuola Superiore Sant’Anna

Research Papers:

“The City-Size Wage Premium: Origins and Aggregate Implications” (JOB MARKET PAPER)

Why do workers earn higher wages in larger cities, and why does the city-size wage premium increase over the life cycle? What are the aggregate implications of spatial wage differentials? To answer these questions, I introduce the first dynamic equilibrium model of knowledge diffusion and labor market frictions in cities. I estimate the model by matching aggregate differences between small and large US cities. I then validate it by testing its ability to replicate micro evidence on selection into, and the return to, migration. I find that higher firm-worker match quality has a level effect of about a third of the average wage premium, while the contribution of knowledge diffusion increases over the life cycle, up to forty percent after twenty years of labor market experience. The residual wage premium is accounted for by life-cycle sorting on observable education
and unobservable human capital. I use my framework to study the consequences of relaxing housing regulations in large cities. A hypothetical scenario in which local productivity was invariant to the relocation of workers across cities would overestimate the magnitude of equilibrium income gains by a factor of 2.5. This finding highlights the macroeconomic implications of understanding the nature of spatial wage differentials. Last, I show that, due to the dynamic nature of knowledge spillovers, and heterogeneity in learning ability, the optimal spatial allocation displays less dispersion in city size, but stronger educational sorting than the laissez-faire equilibrium.

“Declining Search Frictions, Unemployment, and Growth” (with Guido Menzio), R&R at Journal of Political Economy

The Diamond-Mortensen-Pissarides theory argues that unemployment and vacancies emerge because of search frictions in the labor market. Yet, over the last century, US unemployment and vacancy rates show no trend, even though search efficiency in the labor market must have improved thanks to the diffusion of telephones, computers and the Internet. We resolve this puzzle using a search model where firm-worker matches are inspection goods. We show that if the distribution of idiosyncratic productivity for new matches is Pareto, then unemployment, vacancy, job-finding and job-loss rates remain constant while the efficiency of search grows over time. Improvements in search technology show up in productivity growth. A corollary of our theory is that population growth does not affect unemployment and vacancy rates even under non-constant returns to scale in the search process. We develop and implement a strategy to measure the growth rate of the search technology, the returns to scale of the search process, and their contribution to productivity growth.

“Revisiting the Hypothesis of High Discounts and High Unemployment” (with Guido Menzio and Ludo Visschers)

We revisit the hypothesis that labor market fluctuations are driven by shocks to the discount rate. Using a model in which the UE and the EU rates are endogenous, we show that an increase in the discount rate leads to a decline in both the UE and the EU rates. In the data, though, the UE and EU rates move against each other at business cycle frequency. Using a lifecycle model with human capital accumulation on the job, we show that an increase in the discount rate does indeed lead to a decline in the aggregate UE rate and to an increase in the aggregate EU rate. However, the decline in the UE rate is larger for younger workers than for older workers and the EU rate increases only for younger workers. In the data, fluctuations in the UE and EU rates at the business cycle frequency are nearly identical across age groups.

Research Papers in Progress

“Sorting, Commuting Cost, and School Choice” (with Francesco Agostinelli and Margaux Luflade)

Languages: Italian (Native), English (Fluent)

Computational Skills: Julia, Matlab, Stata.
My research interests are in macro, labor, and urban economics, with a particular focus on studying the contribution of labor market frictions and human capital accumulation to life-cycle earnings and economic growth. A defining feature of my research is understanding the spatial differences in labor market characteristics and learning opportunities, and how the dynamics of local labor markets can affect macroeconomic outcomes.

My job market paper, ‘The City-Size Wage Premium: Origins and Aggregate Implications’, speaks to this passion. I propose a model in which local interactions between economic agents are the main source of spatial wage differentials. I build on the idea that knowledge diffusion is greatly facilitated by geographic proximity, and that the benefits are not uniformly distributed across workers. At the same time, large labor markets allow for the creation of better matches between workers and firms. As a result, large and productive (but expensive) cities co-exist with small, less productive (but cheaper) locations. Importantly, productivity differences between cities in the model are equilibrium outcomes—which allows me to study the aggregate implications of spatial policies, accounting for their impact on city size and composition. In a counterfactual exercise, I find that relaxing housing regulations in large cities would deliver noticeably shallower income gains compared with a world governed by exogenous differences in city productivities. In my paper, I highlight how small cities decline due to worker relocation toward large cities. While I assume that productivity is embodied in both mobile workers and immobile jobs, more research is needed to understand how the flow of technology, goods, and people contributes to the geographical redistribution of productivity growth. At a micro level, I am interested in asking how portable human capital is across occupations and firms within a city. At a macro level, I plan to study the contribution of knowledge diffusion through international migration and trade to global economic growth.

In ‘Declining Search Frictions, Unemployment, and Growth’, Guido Menzio and I build a model that is able to reconcile the decline in search frictions, due to advancements in information and transportation technology, with the striking stability of the US unemployment rate over the last century. We find that a decline in search frictions boosts economic growth by improving the allocation of workers to jobs. Our main contribution is developing a theoretical framework that can be analytically solved, and in which the effect of changes in search technology on endogenous outcomes can be easily mapped into

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the data. Building on this paper, I would like to continue investigating the interaction between the functioning of labor markets and economic growth. The historical evolution of search technologies is just one possible dimension of heterogeneity in the process that governs the combination of productive inputs. Even in the present time, there is vast cross-sectional heterogeneity in labor market institutions, both in developed and developing economies. The study of labor market frictions could contribute to unpacking some of the sources of cross-country income differences that are commonly bundled into total factor productivity.

Search frictions have also been employed to account for the business-cycle dynamics of labor market flows. In ‘Revisiting the Hypothesis of High Discounts and High Unemployment’, Guido Menzio, Ludo Visschers and I explore the implications of discount rate shock-driven business cycles for the behavior of both job finding and job destruction rates. The previous literature has highlighted how hiring a worker is an investment decision, and, as such, its value is negatively affected by an increase in discount rates. We augment the existing theory by including endogenous job separations in a model in which matches are experience goods, which are destroyed if they turn out to be particularly unproductive. In this context, we show that separations are also a form of investment—into the search of a better potential match. Hence, discount rate shocks counterfactually reduce the job destruction rate in recessions. Adding human capital accumulation through learning-by-doing helps recover the empirical cyclicality of aggregate labor market variables, but it generates cross-sectional patterns of separations that significantly differ from those observed in the data. Our paper calls for further research into the role played by labor market frictions in the propagation of aggregate shocks. It also highlights how labor market variables can be used to discipline different theories of aggregate fluctuations.

Last, in ‘Sorting, Commuting Cost, and School Choice’, a project that I recently started with Francesco Agostinelli and Margaux Luflade, we zoom in on even finer geographic dimensions of local interactions, namely neighborhoods and school zones. Using variations in the assignment of base schools to neighborhoods, and in the provision of school transportation, we explore the extent to which residential sorting and city structure constrain access to better schools for children from low-income families. In this paper, we treat a child’s human capital as the result of the interaction between individual ability and school composition. The goal of the project is to understand the distributional consequences of local education policies, like changes in the school choice set associated to a given neighborhood, or the provision of free transportation to currently inaccessible parts of the city. We plan to measure how the policy outcomes are affected by the equilibrium response of school quality, and local house prices. This paper extends existing structural urban frameworks, which mainly focus on commuting to work, to another markedly local decision, i.e. schools. In my future work, I intend to continue exploring how local interactions contribute to human capital formation and income inequality in multiple contexts and life-cycle stages.
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M.A in Economics (Laurea Magistrale), Università di Torino, cum laude and printing dignity, 2014
Master in Economics, Collegio Carlo Alberto Allievi Honors Program, with distinction, 2014

Graduate Studies:
University of Pennsylvania, 2014 to present
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Fall 2018  Macro-Modeling, University of Pennsylvania,  
Teaching Assistant for Prof. Guillermo Ordóñez

Spring 2016  Intermediate Microeconomics, University of Pennsylvania,  
Teaching Assistant for Prof. Kenneth Burdett

Fall 2015  Intermediate Microeconomics, University of Pennsylvania,  
Teaching Assistant for Prof. Rakesh Vohra

Research Experience and Other Employment:

July 2018,  Fall 2019  University of Pennsylvania  
Research Assistant for Prof. Marc Flandreau, Howard Marks Chair of Economic History

Summer 2016,  January 2017,  Summer 2019  Financial Stability Directorate, Banca d’Italia  
Research Intern

Spring 2019  Federal Reserve Bank of Philadelphia  
Research Analyst

Professional Activities:


Honors, Scholarships, and Fellowships:

2016-2018  Bonaldo Stringher Scholarship, Banca d’Italia

2015  Gold Medal for Best Thesis in Economics, University of Turin

2011-2014  Allievi Program Fellowship, Collegio Carlo Alberto

Job Market Paper:

“The impact of bank regulation on the cost of credit: Evidence from a discontinuity in capital requirements”  
with Emilia Bonaccorsi di Patti and Mirko Moscatelli


Abstract: We study the effect of a change in minimum capital requirements on the cost of credit. We exploit a 23.81 per cent discount on the risk weights applied in 2014 to loans to small and medium enterprises, whose exposure is below a threshold (Small and Medium Enterprises Supporting Factor, SME-SF). Employing a regression discontinuity design and matched bank-firm data from the Italian Credit Register, we estimate that the discount causes a reduction in the interest rate paid by eligible borrowers of approximately 19 basis points, which implies a pass-through to the cost of credit of approximately 9.5 basis points per percentage point change in the minimum capital requirement. We also find that the estimate of the effect is larger, between 12.5 and 15.5 basis points per percentage point change, for borrowers that have multiple bank relationships. We interpret this result as evidence that the pass-through of the cost of capital regulation to borrowers depends on the extent to which banks can exercise monopoly on them.
Work in Progress:

“Bank specialization and the design of loan contracts” with Marco Giometti


Abstract: Using data on syndicated lending in the US, we show that bank specialization in servicing specific industrial sectors is common and persistent even in a market for large corporate loans. This contrasts naive interpretations of seminal works in banking theory, and adds to the growing empirical evidence from smaller credit markets. Using Dealscan's detailed information on credit contracts, we then show that the typical loan made by a specialized syndicate leader has looser covenants and lower price. This, with respect to a loan arranged by the same leader, at the same time, to a firm out of its area of specialization. We interpret this result in light of the information theory of covenants, suggesting it supports comparative advantage explanations of banks' specialization.

“Justifying the Glass-Steagall Act: Underwriter competition and risk taking in the 1920s” with Marc Flandreau

Abstract: The Glass-Steagall Act of 1933 forced commercial banks out of security underwriting. Past empirical work has questioned Glass-Steagall on the grounds that there is no evidence that commercial banks acted any more recklessly than investment banks before the 1929 crisis. We return to this question using new and detailed data on the underwriting of government securities. We suggest that banking competition combined with different supervisory regimes for certain commercial banks resulted in perverse incentives for investment banks to lower lending standards. Commercial banks that were both State chartered and FED members enjoyed laxer regulation and the FED liquidity backstop insurance. We show evidence that these banks engaged in riskier lending and put pressure on lending standards at large. In our novel reading of Glass-Steagall, the exclusion of commercial banks from underwriting does make sense, as part of a comprehensive package of reforms meant to remedy regulatory spillovers, and level conditions for all banks within each market.

“Entrepreneurial selection and quality of enforcement: Theory and evidence from court district borders”


Abstract: Using Bruegel data on European exporters (EFIGE) and World Bank Doing Business Survey data on court efficiency, I document two well known anomalies about the Italian economy. First, the prevalence of over 65 years old managers and entrepreneurs; second, the slowness of civil and commercial trials. Furthermore, I document how only for Italian firms, old management comes with higher probability of being granted credit. I thus introduce a static general equilibrium model of firm allocation explaining how incumbent advantage, caused by difficulty in accessing credit for new managers, can sustain firm misallocation. I use this model to argue in which cases the presence of such frictions in access to funding can justify subsidies to young managers/entrepreneurs. Finally, I investigate the causal relationships between firm allocation, credit access and the quality of courts using the variation in enforcement quality at Italian court districts’ borders.

Languages: Italian (native), English (fluent)

Computational skills: Stata, R, Python, Matlab, ArcGIS
Research Statement

Stefano Pietrosanti

My research covers topics in banking, empirical corporate finance, and macroeconomics. It analyzes how credit market structure interacts with institutional features and regulation to shape access to credit and, eventually, real outcomes. Theory-guided empirical analysis plays a key role in all of my projects.

My job market paper, “The impact of bank regulation on the cost of credit: Evidence from a discontinuity in capital requirements”, joint with Emilia Bonaccorsi di Patti and Mirko Moscatelli at the Bank of Italy, provides novel estimates of the cost of capital regulation and highlights how competition between lenders may be important for the pass-through of this cost to firms. To do this, we take advantage of a 2 percent capital requirements discount on SMEs’ credit relationships smaller than 1.5 million euros (the Small and Medium Enterprises Supporting Factor, SME-SF). We exploit the SME-SF assignment threshold to quantify the average impact of the policy on lending rates through a Regression Discontinuity Design, which provides clean source of variation independent of major shocks to the macroeconomy. The results show that a 1 percent decrease in capital requirements decreases loan rates by approximately 9.5 basis points.

We then show that the pass-through of the discount increases by about 4.5 basis points if we include firm fixed effects. In this case, identification comes from firms that have both eligible and non-eligible credit lines in the neighborhood of the SME-SF assignment threshold. We argue that the observed increase is consistent with the greater bargaining power that firms with multiple credit relationships have vis-a-vis firms with only one credit relationship. Indeed, if banks do not lower the rate on the lines eligible for the capital requirements discount, these firms would be indifferent between using their eligible and non-eligible credit lines, and can thus credibly walk away.

This suggests that competition between lenders matters for the pass-through of capital regulation, thus connecting research on bank regulation (e.g. Jiménez et al., 2017) with research on monopoly power in the context of credit relationships (e.g. Santos and Winton, 2019). The findings are consistent with recent evidence regarding the pass-through of monetary policy (e.g. Agarwal et al., 2015), and draw attention to how banks’ monopoly power can act as a limit on the effectiveness of countercyclical changes in capital requirements, as the ones envisioned by standard macro-prudential policy.

In “Bank specialization and the design of loan contracts”, joint with Marco Giometti, we investigate the specialization choices of lenders in the US syndicated loan market. Using Dealscan data on syndicated lending, matched with firm (Chava and Roberts, 2008) and bank holding company (Schwert, 2018) information, we document that there is sizable evidence of bank specialization in lending to specific industrial sectors, even in a credit market with large and sophisticated borrowers. We then exploit the detailed information about loan contracts to understand what drives banks specialization. Looking at the data from the perspective of information theory of covenants (Garleanu and Zwiebel, 2008), we analyze how bank specialization affects observed contract strictness, i.e. the ex-ante probability of violating such covenants.

The information theory of covenants suggests that contract strictness is a good measure of information distance between borrowers and lenders. As long as it is true that an information advantage drives banks’ specialization choice, we would expect banks that are specialized in a given sector to write overall laxer contracts when lending to firms in that sector. To identify such pattern in the data, we would ideally need random assignment of banks to
firms; but in fact the matching between banks and firms is not random. We mitigate this concern by focusing on variation that is both within firm and within bank-time. Our findings show a robust pattern of laxer contracts between specialized banks and firms in the bank’s industry of specialization. Moreover, we find that such contracts display significantly lower drawn spreads than similar contracts written to firms out of the bank’s industry of specialization. Such evidence would be at odds with alternative explanations of lax covenants, such as attempts by banks to collect high interests from risky loans they have no comparative information advantage about. These findings cannot be fully explained by hypotheses based on relationship lending, nor on geographic proximity between borrowers and banks.

This new evidence from contract terms provides support to explanations of bank specialization based on information advantage, and it is in line with the work by Paravisini et al. (2015). This conclusion is of economic significance as banks’ information advantage towards specific industries helps explain patterns of imperfect substitutability of credit from different sources, as documented by Paravisini et al. (2014), and highlights the importance of the role of banks as monitors and screeners of projects.

In the paper “Justifying the Glass-Stegall Act: Underwriter competition and risk taking in the 1920s”, joint with Marc Flandreau, we revisit the debate on the Glass-Stegall Act, which, in 1933, forced commercial banks out of securities underwriting (Kroszner and Rajan, 1994). We return to this question using new and detailed data on underwriting of government securities in the New York Stock Exchange during the twenties. We suggest that banking competition combined with different supervisory regimes for certain commercial banks resulted in perverse incentives for investment banks to lower lending standards. Commercial banks that were both State chartered and FED members enjoyed at the same time laxer regulation and the FED liquidity backstop insurance. We show evidence that these banks engaged in riskier lending and put pressure on lending standards at large, particularly for investment banks operating in the government bond underwriting business.

These findings suggest that regulating commercial banks out of underwriting activity could be justified, particularly in light of the implementation in the thirties of the Federal Deposit Insurance, which would have compounded with the already existing liquidity insurance provided by the FED Membership of some banks.

Finally, I am currently working on “Entrepreneurial selection and the quality of enforcement: Evidence from court district borders”. In this project, I study the link between the quality of contracts enforcement, access to funding, and the selection of less than optimal entrepreneurs and managers. First, using survey data on European manufacturers across continental Europe (EFIGE dataset) and World Bank’s “Doing Business” survey on the time necessary to solve commercial suits, I show further evidence that in Italy two anomalies coexist. First, over-65-years-old CEOs/entrepreneurs are extremely more common in Italy than in the rest of Europe; second, it takes almost double the time to solve a commercial case in Italy than it takes, for example, in Spain. Moreover, I document how only in Italy it is the case that old CEOs come with a significantly higher likelihood of being granted credit, which could be related to lower enforcement quality, which is likely to make soft relationships between CEOs and banks more important for credit allocation.

Using a simple general equilibrium model of a market for firm ownership, akin to the one introduced in Caselli and Gennaioli (2005), I argue that disparities in access to financing between incumbents and new managers-entrepreneurs can cause inefficiencies in firm allocation. As an incumbent’s advantage would slow down the rate at which new human capital is incorporated in firms, this would depress wages, which in turn would exert a price externality that would provide incumbent firm-owners with less incentives to step down.
To understand whether weak contract enforcement determines firm allocation and real outcomes by making soft credit relationships more valuable and thus advantaging incumbents, I am planning to access data about the setup of new limited liability ventures. I will then use the variation in enforcement quality between municipalities at the borders of different Italian court districts to investigate the drivers of firm location and funding choices, and how these vary with entrepreneurs’ characteristics.

Research cited


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Research Fields:

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Teaching Experience:

**Ph.D.**
- Spring 2016: Econometrics, Department of Economics, University of Pennsylvania, TA for Francis X. Diebold

**MBA**
- Fall 2014: Corporate Finance, The Wharton School, University of Pennsylvania, TA for Michael Roberts and Jules H. van Binsbergen
- Spring 2014: Corporate Finance, McCombs School of Business, University of Texas-Austin, TA for Michael Sadler

**Undergraduate**
- Fall 2015: Intermediate Macroeconomics, Department of Economics, University of Pennsylvania, TA for Dirk Krueger
- Spring 2015: Corporate Finance, The Wharton School, University of Pennsylvania, TA for Jeffrey F. Jaffe

Research Experience and Other Employment:

- 2016 to present: Federal Reserve Bank of Philadelphia, Graduate Research Intern
- 2014-2016: Wharton Business School, Research Assistant for Nikolai Roussanov
- 2010-2012: Central Bank of Iran, Research Analyst

Honors, Scholarships, and Fellowships:

- 2018: Hiram C. Haney Fellowship Award (Best Third-Year Research Paper at UPenn)
- 2016: Princeton Initiative Travel Grant
- 2016: Macro Finance Society 8th Workshop, Travel Grant
- 2014: HAND Foundation Scholarship
- 2008: Gold Medalist, National Economics Olympiad, Iran
- 2008: Ranked 1st (among nearly 10,000 candidates), National Masters Degree Entrance Examination in Economics, Iran

Research Papers:

**Job Market Paper:**

“Inaction, Search Costs, and Market Power in the US Mortgage Market” (with Sumedh Ambokar)

Many US mortgage borrowers do not refinance despite seemingly having financial incentives to do so. We explore the role of search costs in explaining this inaction, focusing on the 2009-2015 period when mortgage rates significantly declined. We estimate a (dynamic) discrete choice model of refinancing and search decisions using a proprietary panel data set, which includes detailed information on mortgage contracts, borrower creditworthiness and search intensity (number of mortgage inquiries), and the sequence of refinancing decisions. We find that search costs significantly inhibit refinancing through two channels: While larger search costs directly increase the cost of refinancing, they also indirectly increase loan originators’ market power and raise the offered mortgage rates. We find that the indirect market power effect dominates. We apply our model
to study an alternative market design, in which loan originators post interest rates based on credit qualities to a centralized market, and borrowers can lock in posted rates by choosing to refinance. We conclude, a centralized market for mortgage origination can significantly improve refinancing activity by eliminating market power, even if there will be no change in refinancing costs.

“Mortgage Search Heterogeneity, Refinancing Decisions and Monetary Policy Transmission to Consumption” (with Sumedh Ambokar)
In the US, half of all mortgage borrowers consider one lender at origination. This paper investigates how heterogeneity in mortgage search affects refinancing decisions, the distribution of home equity and mortgage rates. These affect the consumption response to a monetary policy shock at the aggregate as well as distributional level. We build a general equilibrium model of the mortgage market with two types of mortgage borrowers: they get either one quote or two quotes at refinancing. A lender infers the expected search behavior from the relative mass of the two types at any observable current rate and home equity. If the refinancer is more likely to get one quote, then lenders have more market power. As a result, they offer higher rates to both types, reducing the likelihood that they refinance. So, even a borrower with high current rate may decide not to refinance as she is offered high rates because of being inferred as more likely to get one quote. In steady state, those who get two quotes get lower rates sooner and hence accumulate more home equity. As such, in response to a 25 basis points expansionary monetary shock, the percentage increase in consumption of those who get two quotes is 1.47 times that of those who get one quote. In a counterfactual economy with more mortgage search intensity, an explicit goal of the CFPB, percentage increase in borrower consumption in response to the same shock is 1.52 times that in the benchmark model. Thus, more mortgage search results in significantly higher consumption response to expansionary monetary policy.

“Liquidity Management, Banks vs. Shadow Banks” (2018)
How does the banking sector respond to a change in discount window rate while shadow banking coexists with a regulated banking sector? This paper studies a dynamic equilibrium model in which banks and shadow banks provide illiquid loans by issuing short-term bonds. Banks have access to the discount window to manage the liquidity risk while regulated by the liquidity requirement. Shadow banks face the same risk, but they can only manage the liquidity shock by investing enough in the safe assets. Changing the discount window rate changes the relative advantage of banks compared to shadow banks, in terms of having access to the discount window. Depending on the size of the shadow banking system, effectiveness of the role of federal reserve in changing the overnight rates may be dampened as shadow banks and banks can become interchangeable.

Languages: Farsi (Native), English

Computational Skills: R, Python, Matlab, Stata.
Research Statement

Kian Samaee

Department of Economics, University of Pennsylvania

My main research agenda contributes to exploring inaction and its sources in consumers’ financial decision-making and understanding its impacts on market power and efficiency in the financial markets. Inaction is a common feature of households’ financial decisions. Households are typically inactive in responding to financial incentives, even after a long time that they have first arisen. Many sources are studied to explain this inaction: search costs, switching costs, and inattention are among the most well-known ones.

My work lies at the intersection of Industrial Organization (IO) and Finance. In IO, imperfect competition is the workhorse models, in which the typical source of market power is product differentiation. In Finance, workhorse models are competitive models, and inaction is crucial evidence in most financial markets. The IO-Finance literature seeks to bring standard imperfect competition models from IO to study the efficiencies in financial markets, in which inaction is the primary source of market power. The critical questions in this literature are: How do sources of inaction can be separately quantified? How do they should be incorporated in standard demand estimation models? Do these demand models give different estimates for market power? How do firms respond to these frictions? Does inaction derive market power for firms? Does this market power necessarily inefficient? What contributes more to the market power of financial firms: consumer inaction or product differentiation? Furthermore, what are the optimal contracts or market designs to remove inefficiencies coming from households’ inaction?

In my job market paper, “Inaction, Search Costs and Market Power in the US Mortgage Market” (with Sumedh Ambokar), we explore several questions mentioned above in the context of fixed-rate mortgage refinance market. Many US mortgage borrowers do not refinance despite seemingly having financial incentives to do so. We explore the role of search costs in explaining this inaction, focusing on the 2009-2015 period when mortgage rates significantly declined. We find that search costs significantly inhibit refinancing through two channels. While larger search costs directly increase the cost of refinancing, they also indirectly increase loan originators’ market power and raise the offered mortgage rates. We find that the indirect market power effect dominates. We apply our model to study
an alternative market design, in which loan originators post interest rates based on credit qualities to a centralized market, and borrowers can lock in posted rates by choosing to refinance. We conclude, a centralized market for mortgage origination can significantly improve refinancing activity by eliminating market power, even if there will be no change in refinancing costs.

Inaction may also derive inefficiencies at the aggregate level, specifically in the context of the mortgage market. Housing wealth makes up almost two-thirds of the median households’ total wealth in the US, and mortgages are the largest household liability. Mortgage refinancing is an essential channel for monetary policy transmission. Mortgage borrowers typically are more liquidity constrained than lenders. Thus, refinancing to lower rates can boost aggregate consumption through redistribution of wealth from low MPC savers to high MPC borrowers. In this regard, the lack of refinancing can be socially inefficient. In “Mortgage Search Heterogeneity, Refinancing Decisions and Monetary Policy Transmission to Consumption” (with Sumedh Ambokar), we quantitatively explore the effect of inactivity of mortgage borrowers due to search friction on effectiveness of refinancing channel of monetary policy.

Another research agenda that my studies seek to advance is exploring the effect of shadow banking on market structure and efficiency while they coexist with a regulated banking sector. Shadow banks are active and have significant market shares in the banking sector in the US. They had 50% of the residential mortgage origination market share in 2015. They also had 45% of the total market share in issuing deposit-like financial instruments in 2012. In my paper, “Liquidity Management, Banks vs. Shadow Banks”, I ask how effective is the policy of changing discount window rate on changing the loan interest rates in the economy while shadow banking competes with the regulated banking sector. Banks have access to the discount window to manage the liquidity risk while regulated by the liquidity requirement. Shadow banks face the same risk, but they can only manage the liquidity shock by investing enough in safe assets. I quantitatively find that, depending on the size of the shadow banking system, the effectiveness of changing the loan interest rates by manipulating the discount window rate may be dampened as shadow banks and banks can become interchangeable.
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Teaching and Research Fields:
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- Secondary fields: Industrial Organization

Teaching Experience:
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- 2019: Econometrics (Undergraduate), University of Pennsylvania, Teaching Assistant for Professor Francis X. Diebold
- Fall 2017-
- 2018: Econometrics (Undergraduate), University of Pennsylvania, Teaching Assistant for Professor Francis X. Diebold
Spring 2017  Econometrics (Undergraduate), University of Pennsylvania, Teaching Assistant for Professor Xu Cheng
Spring 2016  Introduction to Macroeconomics (Undergraduate), University of Pennsylvania, Teaching Assistant for Dr. Luca Bossi
Fall 2015-2016  Econometrics I (Graduate), University of Pennsylvania, Teaching Assistant for Professor Frank Schorfheide and Professor Xu Cheng

Professional Activities:
Presentations: UPenn Econometrics Lunch, UPenn Econometric Seminar

Research Experience and Other Employment:
Summer 2016  University of Pennsylvania, Research Assistant for Professor Xu Cheng
Summer 2015  University of Pennsylvania, Research Assistant for Professor Pinar Yildirim

Honors, Scholarships, and Fellowships:
2019-2020  Maloof Family Award Dissertation Fellowship in Economics, University of Pennsylvania
2015  Certificate of Distinctive Performance in the Preliminary Examination in Econometrics, University of Pennsylvania
2014-2019  University Fellowship, University of Pennsylvania
2011-2012  School of Economics prize for one of the best Dissertations, University of Edinburgh
2010-2011  Dean’s List, Washington University St Louis (Exchange Year)
2009-2011  Lanfine Bursary (awarded two consecutive years), University of Edinburgh
2008-2009  Morgan Stanley Prize for academic achievements in Economics, University of Edinburgh

Research Papers:
“Semiparametric Panel Model and Group Heterogeneity with Application to Production Function” (Job Market Paper)

This paper studies a semiparametric partially linear panel model with time-varying group level effects. As a critical feature, the group memberships are unobserved but time-invariant. The linear coefficients’ estimator is shown asymptotically normal for inference. For application, the paper also considers a two-step problem; the objective (second-step) parameter is identified by moments, conditional on the partially linear model’s potentially infinite-dimensional parameters. Then the paper provides a consistent second-step estimator with its required asymptotic analysis. The two analyses generically connect to the control function problem under the presence of time-varying heterogeneity for panel models. With the two-step solution, the economic application generalises the proxy variable method, designed for the simultaneity problem with estimating the firm’s production function, by allowing correlation in firms’ productivity. Monte Carlo simulation shows that the new production function estimator performs well when the firm’s surprise productivity fluctuation is comparably small. For empirical application, I consider four Chilean manufacturing sectors from 1987 to 1996. Without accounting for correlated productivity, I find productivity effects on output growth and its dispersion as understated.
“Clustering for Multidimensional Heterogeneity with Application to Production Function” (With Xu Cheng and Frank Schorfheide)

This paper provides a new multi-clustering approach for multi-dimensional unobserved heterogeneity in panel data methods. Each unit is assigned with cluster memberships in differing features. For example, two firms can share their capital output elasticity but differ in labour output elasticity and mean productivity level. The memberships are unknown and classified simultaneously. In contrast, the existing approach ignores that firms can share some but not all features. Our multi-clustering approach provide significant improvements when these multiple unobserved features have a sparse interaction, i.e., only a small number of firms share all features. We estimate the multi-clustering memberships and the unknown cluster-specific and common parameters in a nonlinear GMM problem. Furthermore, we provide the first classification consistency result in a nonlinear GMM setup. We re-evaluate the “rise of mark-up” in Loecker and Eeckhout (2017) by replacing their sector-specific production function with a cluster-based one. We find that the upward trajectory persists, but the magnitude is less pronounced after accounting for multi-dimensional heterogeneity.

“Matching to Produce Information” (With Ashwin Kambhampati and Carlos Segura-Rodriguez)

We study the efficiency of decentralized team formation inside research organizations through the lens of a one-sided matching model with non-cooperative after match information production. In our model, inefficient sorting arises from two sources. First, moral hazard within teams may cause workers to join less productive teams in which they exert relatively less effort. Second, even if productive teams form, such teams may reduce average productivity across all teams. We identify management interventions that restore efficiency.

**Computation Skills:**
Matlab, R (primary), and Stata, Parallel Computing

**Languages:**
English (Native), Chinese Mandarin (Native)
Dissertation Abstract

My dissertation studies regression on panel data and its application to production function estimation and policy analysis. The goal is to offer flexible and parsimonious modeling of unobserved heterogeneity through clustering techniques, by utilising machine learning methods for estimation, and develop asymptotic theories for estimation and inference in the large $N$ and large $T$ framework. The first chapter studies a semiparametric panel model with unobserved group heterogeneity and an unknown function estimated by the sieve method. With the main example, the unknown function addresses the simultaneity issue in production function estimation. Furthermore, the second chapter proposes the modeling of multi-dimensional heterogeneity by assigning panel units with multiple cluster memberships in a nonlinear generalized method of moments problem. This new econometric method is applied to estimate production functions for a panel of US firms, and the estimates are used to document a rise in mark-ups.

Chapter 1: Semiparametric Panel Model and Group Heterogeneity with Application to Production Function. (Job Market Paper)

This chapter studies a semiparametric partially linear panel model - consisting of a linear model, a nonparametric function, and time-varying group-level effects. The partially linear model is a workhorse in many econometric applications. Here, I expand this workhorse’s toolkit by introducing unobserved group heterogeneity.

Abstracting the reality down to a parsimonious but useful model is a tenet of economic research. In this vein, modeling heterogeneity as group-wise is part of the tradition. For example, modeling heterogeneity at the regional or the household level provides convenient and useful approximation about the economic agent - though reality’s atomic heterogeneity level is much more nuanced. Here, as a critical feature, the group memberships are unobserved but time-invariant.

The chapter provides economic examples where modeling heterogeneity is relevant in the partially linear setting. For a simple example, consider measuring the linear effect of inequality’s growth on income per capita growth for a panel of countries. However, the level of inequality can induce a separate nonlinear effect on income growth, and the econometrician treats this effect as nonparametric. Moreover, the economic and legal institutions (unobserved heterogeneity) theoretically play notable roles in effecting both inequality and income growth. Conventional economic wisdom suggests economic systems can be partitioned into institutional groups varying across the market-orientated versus central-planning spectrum. However, the econometrician may find classifying countries into groups by a data-driven approach as more objective than based on his prior knowledge.

The paper proposes to classify the group memberships by K-mean clustering and estimate the nonparametric component by series approximation. I provide an estimator for the linear coefficients, the nonparametric function, the group memberships, and the time-varying group-level effects. The paper focuses on two forms of application. In the first, the main economic interest is on the linear coefficients, and the paper provides the asymptotic theory for the linear coefficients’ inference. Furthermore, the group memberships, the group effects, and the nonparametric function estimators are uniformly consistent. Hence, the estimators...
also help in analysing the groups. In the second, the paper considers a two-step problem; conditional on the partially linear model’s parameters, a set of moments identifies the objective (second-step) parameter. I provide a consistent second-step estimator based on the partially linear model’s estimators.

With the two-step solution, the main economic application develops a method to estimate the firm’s production function. Production function estimation has a simultaneity problem; the firm’s productivity, unobserved to the econometrician, determines both the firm’s output and inputs. On this issue, I decompose productivity into two separate components: the first as firm-specific and the second as correlated among similar firms. For empirical application, I consider four Chilean manufacturing sectors from 1987 to 1996. The period covers the Chilean economic boom after implementing Pinochet’s economic reforms. Nonparametric estimation handles the firm-specific productivity, and group-level effects model the correlated productivity. As an interpretation, the group structure partitions firms according to the low to high productivity spectrum. Without accounting for correlated productivity, I find the model to understate both productivity effects on output growth and productivity’s dispersion. Furthermore, the more productive group of firms tends to use more inputs.

The paper provides classification results in the presence of nonparametric estimation, extending related classification results in Bonhomme and Manresa (2015). It also introduces an example of applying both classification and nonparametric estimation to solve a conditional moments problem in the generic two-step problem, as covered by Chen, Linton, and Keilegom (2003). Finally, the paper contributes to the production function literature by generalising the extensively used proxy variable method, to allow correlation in firms’ productivity.

Chapter 2: Clustering for Multidimensional Heterogeneity with Application to Production Function. (with Xu Cheng and Frank Schorfheide)

This chapter provides a new multi-clustering approach for multi-dimensional unobserved heterogeneity in panel data models. The key idea of the proposed methods is to assign multiple cluster memberships to each unit and allow units in one cluster to be the same in one dimension but differ in other dimensions. The memberships are unknown and classified simultaneously. Take the production function, for example. Firms differ in productivity as well as in labor output elasticity and capital output elasticity. With the proposed multi-clustering method, a firm’s labor output elasticity is estimated using all firms that share the same labor output elasticity, regardless of their productivity and capital output elasticity. In contrast, the existing approach ignores that firms can share some but not all features. Our multi-clustering approach provides significant improvements when these multiple unobserved features have a sparse interaction, i.e., only a small number of firms share all features.

We estimate the multi-clustering memberships and the unknown cluster-specific and common parameters together in a nonlinear GMM problem. Furthermore, we provide the first classification consistency results in a nonlinear GMM setup, extending related classification results in Bonhomme and Manresa (2015) and Su, Shi, and Phillips (2016). We re-evaluate the ”rise of mark-up” in Loecker and Eeckhout (2017) by replacing their homogeneous production function with the proposed one. We found that the upward trajectory persists, but the magnitude is less pronounced once data-driven multi-dimensional heterogeneity is allowed in the specification.
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 Thesis Title: “Essays on Production Networks”
 Expected Completion Date: May 2020

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Research Fields:
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Teaching Experience:

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<td>Summer 2017,</td>
<td>ECON-102 Intermediate Macroeconomics</td>
<td>University of Pennsylvania, Philadelphia, USA</td>
<td>Instructor</td>
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<tr>
<td>Fall 2015, Spring</td>
<td>ECON-001 Introduction to Microeconomics</td>
<td>University of Pennsylvania, Philadelphia, USA</td>
<td>Recitation Instructor for Prof. Rebecca Stein</td>
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Research Experience and Other Employment:

2018 to present  Federal Reserve Bank of Philadelphia, Philadelphia, USA  Graduate Research Analyst

2018 Summer  International Monetary Fund, Washington, DC, USA  Fund Internship Program

Professional Activities

Presentations  2019: Federal Reserve Bank of Philadelphia, GCER Biennial Alumni Conference (Georgetown University), Asian Meeting of the Econometrics Society (Xiamen University), Biennial Conference of China Development Studies (Shanghai Jiao Tong University)  2016-2019: University of Pennsylvania

Honors, Scholarships, and Fellowships:

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<td>2019</td>
<td>GAPSA Research Travel Grant</td>
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<tr>
<td>2014-2019</td>
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Publications:

Research Papers:

“Supply Chain Management Cost, Production Networks, and Aggregate Fluctuations” (Job Market Paper)

Over the business cycle, firms adjust not only their sales and input expenditures but also the number of suppliers from which they source from. I incorporate this extensive margin into a multi-industry real business cycle model. Using a dataset of supply chain relationships among US firms, I first document that increases in the number of suppliers are correlated with increases in sales, intermediate input expenditures, total factor productivities, and costs of managing suppliers. Based on these facts, I develop a model in which firms trade off the productivity benefit (return to variety) of accessing more varieties with the (fixed) cost of managing these varieties. The extensive margin adjustment introduces a return to scale into production and amplifies industry productivity shocks: In my estimated model, the effect of industry productivity shocks on GDP fluctuations is one-third larger than in a (conventional) model where the extensive margin is absent.

“Land Price, Export Shocks, and Investment in China: A Tale of Two Sectors”

I construct the quarterly commercial land price series using land transaction data in China and document a negative correlation between real land price and aggregate investment. In the US, instead, this correlation is positive. With sectoral productivity processes estimated, an RBC model with an industrial and a service sector is used to explain the negative correlation. A positive export (industrial goods) price shock increases the demand for tradable industrial goods and attracts capital and labor from the non-tradable service sector, by which only land is used. Aggregate investment rises because the industrial sector is more capital intensive. Land price, on the other hand, falls as the return to land decreases.

Research Papers in Progress

“Industry Heterogeneity, Production Networks, and Monetary Policy” (with Zhesheng Qiu and Jianhong Xin)

“Machine Learning and Financial Crises Forecasting” (with Antonio Chan-Lau, IMF, Silvia Iorgova, IMF, and Kevin Wiseman, IMF)

Computational Skills: Matlab, Python, Stata, R.
My research focuses on the propagation of both micro and macro shocks in production networks and how they shape aggregate outcomes. In our economy, heterogeneous producers source intermediate inputs from each other. Understanding the structure of the supply chain, the effects of various heterogeneity, and how they interact with each other is important for academics on the propagation of shocks and the origins of the aggregate fluctuations. It is also crucial for policymakers to design policies to prepare for and recover from adverse economic conditions. My current research studies industry productivity and monetary shocks and relies on a growing stock of micro-level datasets, among which are the Input-Output Tables, industry-level datasets, and firm-level supply chain datasets. These datasets allow me to study various mechanisms, of which I quantify the aggregate effects using general equilibrium models.

My job market paper, "Supply Chain Management Cost, Production Networks, and Aggregate Fluctuations," studies the propagation and amplification of industry productivity shocks in production networks and the implication on aggregate output volatility. Over the business cycle, firms adjust not only their sales and input expenditures but also the number of suppliers from which they source from. I incorporate this extensive margin into a multi-industry real business cycle model. Using a dataset of supply chain relationships among US firms, I first document that increases in the number of suppliers are correlated with increases in sales, intermediate input expenditures, costs of managing suppliers, and total factor productivities. Based on these facts, I develop a model in which firms trade off the productivity benefit (return to variety) of accessing more varieties with the (fixed) cost of managing these varieties. The extensive margin adjustment introduces a return to scale into production and amplifies industry productivity shocks: In my estimated model, the effect of industry productivity shocks on GDP fluctuations is one-third larger than in a (conventional) model where the extensive margin is absent. Moreover, I find that the supply chain structure matters for the amplification effect of extensive margin adjustments, and in a different way how it matters for the propagation of industry productivity shocks without the extensive margin.

For a long time, macroeconomists have been searching for the origins of aggregate fluctuations, including the fundamental shocks and mechanisms that propagate and amplify the shocks. My paper provides an amplification mechanism of industry productivity shocks to account for a larger share of the aggregate fluctuations.
My co-authored paper “Industry Heterogeneity, Production Networks, and Monetary Policy” with Zhesheng Qiu and Jianhong Xin, on the other hand, studies the propagation of monetary shocks in production networks and its implication on inflation. Using the local projection method, we document heterogeneous industry-level price impulse responses to monetary shocks. To explain the documented evidence, we build a New Keynesian model with production networks, allowing for heterogeneous industry price and wage rigidities, and non-constant return to scale. To quantify the role of each feature in the propagation of monetary policy shocks and in shaping industry-level inflations, we estimate the key parameters equation-by-equation. Then we simulate the model and decompose the impulse responses into the contribution of each feature. Our work is fundamental to the understanding of how monetary policy influences aggregate inflation.

The above two papers reveal my primary research approach, which is documenting important facts using micro or macro data and studying their aggregate implications. Using a similar approach, my paper “Land Price, Export Shocks, and Investment in China: A Tale of Two Sectors” relies on the land transaction data in China, which I scrapped online. Using this dataset, I construct the quarterly commercial land price series and document a negative correlation between real land price and aggregate investment. In the US, instead, this correlation is positive. Then I explain the negative correlation in China using a two-sector real business cycle.

In my co-authored paper “Machine Learning and Financial Crises Forecasting” with Antonio Chan-Lau, Silvia Iorgova, and Kevin Wiseman from the International monetary fund (IMF), we apply the state-of-the-art machine learning techniques to a comprehensive cross-country panel dataset of all types of macro, financial, fiscal, external, and institutional indicators to forecast financial crises. By comparing the results of various models, we find the model which best balances the out-of-sample forecasting performance and the interpretability of forecasts to guide internal decisions at the IMF.

In a nutshell, my work generally uses micro and macro datasets to document important mechanisms and quantify their aggregate effects using general equilibrium models. Production networks and business cycles are my particular research interests.