MAKE GREAT MONEY,
CHANGE THE WORLD
(FOR THE BETTER)

David Hummels
Distinguished Professor of Economics
Dr. Samuel R. Allen Dean
Krannert School of Management
Purdue University
PhDs In Management And Economics

• Research questions with societal impact

• Why you should consider these degrees

• The market for new PhDs
Research questions with societal impact
Dr. Gebisa Ejeta
2009 World Food Prize Laureate

Announcing the
2017 World Food Prize
LAUREATE

Dr. Akinwumi Adesina
NIGERIA

2017 Laureate
How long does it take to go from Here to get to Here?
Why *you* should consider these degrees

- Research methods require sophistication in mathematics, statistics, computation
Doing research in Mgmt and Econ

• Analytical modeling...characterizing the behavior of firms and consumers in mathematical terms and then solving systems of equations to predict complex behavior and interactions

• Empirical research...collecting, organizing data; experimental design; applying advanced statistical techniques to test model predictions, provide causal identification
Common PhD Core Content

Basics/Minimum Requirements
• Linear algebra
• Calculus and differential equations
• Basic probability theory/statistical analysis

Topics from Mathematical Analysis that you will see in the core courses
• Real analysis, Functional analysis

Other Math/Stat topics in the core courses
• Optimization theory, Convex analysis
• Dynamic programming, stochastic processes
• Game theory
• Econometric modeling
• Programming (data handling, estimators, and computational modeling)
Two huge changes to workforce: automation, offshoring
Offshoring and Labor Markets

• Does offshoring help or hurt workers?

• Substitution effect v. productivity effect
  – Offshoring replaces some kinds of labor, but it also makes the firm more productive, expands sales

• Identifying these effects is confounded
  – The biggest, most productive firms are most likely to be engaged in trade
The Wage Effects of Offshoring: Evidence from Danish Worker-Firm Data

David Hummels, Purdue University
Rasmus Jorgensen, University of Copenhagen
Jakob Munch, University of Copenhagen
Chong Xiang, Purdue University
How do I answer this question?

• Theory: a mathematical model of firm decision making
  – Firms and consumers solve a problem of constrained optimization
    • Firms: “produce locally or buy foreign inputs”
    • Consumers: “which firms should I buy from”
    • Action!! a shock to the system changes these choices
  – Firms are heterogeneous and make different choices depending on their productivity
    • Need to understand analytically tractable distributions and how to manipulate them
    • Tell a story! Simple correlations are misleading...more productive firms are bigger and offshore production more
Experimental design

Universe of Danish firms 1995-2006

Imports and Exports, origin x product

Universe of Danish workers

Programming: link datasets...workers to firms, and firms to their sales and trade behavior

Action! Find exogenous (external to the firm) shocks to the trading environment that change firms decisions

What are the exogenous shocks? Changes in world demand and supply for products sold (or purchased) by the firm
Table 3: Firm-level Effects of Trade

<table>
<thead>
<tr>
<th>Dependent Variables</th>
<th>OLS</th>
<th>Firm FE</th>
<th>Firm FE, Predicted Offshoring</th>
<th>Firm FE Predicted Offshoring &amp; Exports</th>
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</thead>
<tbody>
<tr>
<td>Offshorer dummy</td>
<td>(1)</td>
<td>(2)</td>
<td>(3)</td>
<td>(4)</td>
</tr>
<tr>
<td>log employment</td>
<td>0.681***</td>
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<tr>
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<tr>
<td>log (capital per worker)</td>
<td>0.161*</td>
<td>0.008</td>
<td>0.245***</td>
<td>0.119***</td>
</tr>
<tr>
<td>log(wage bill per worker)</td>
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<td>0.014***</td>
<td>0.224***</td>
<td>0.131***</td>
</tr>
<tr>
<td>log material inputs</td>
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Simple statistical techniques: Correlate firm characteristics (left hand column) on trade

Big firms are more productive, they offshore more, they have more employment
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Advanced statistical techniques (fixed effect instrumental variables)

Isolate exogenous shocks...reasons firms change trade decisions that are unrelated to firm productivity... offshoring lowers employment and exporting raises employment
A rise in exports increases wages for all kinds of workers; offshoring raises wages for college educated workers but reduces it for all others.

Table 5: Worker-Level Wage Regressions

<table>
<thead>
<tr>
<th>Dependent variable:</th>
<th>Log hourly wage</th>
<th></th>
<th>FE-IV</th>
<th></th>
</tr>
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<td></td>
<td>(1)</td>
<td>(2)</td>
<td>(3)</td>
<td>(4)</td>
</tr>
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<td>Log offshoring</td>
<td>-0.0025**</td>
<td>-0.0014</td>
<td>-0.0222**</td>
<td>-0.0228***</td>
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<tr>
<td></td>
<td>[-2.43]</td>
<td>[-1.41]</td>
<td>[-2.56]</td>
<td>[-3.70]</td>
</tr>
<tr>
<td>Log offshoring x high skilled</td>
<td>0.0060***</td>
<td>0.0061***</td>
<td>0.0510***</td>
<td>0.0523***</td>
</tr>
<tr>
<td></td>
<td>[5.59]</td>
<td>[5.57]</td>
<td>[7.71]</td>
<td>[7.78]</td>
</tr>
<tr>
<td>Log exports</td>
<td>0.0044**</td>
<td>0.0060***</td>
<td>0.0493***</td>
<td>0.0531***</td>
</tr>
<tr>
<td></td>
<td>[2.02]</td>
<td>[2.82]</td>
<td>[4.48]</td>
<td>[7.63]</td>
</tr>
<tr>
<td>Log exports x high skilled</td>
<td>-0.0005</td>
<td>0.0000</td>
<td>0.0008</td>
<td>0.0019</td>
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<tr>
<td></td>
<td>[-0.25]</td>
<td>[0.02]</td>
<td>[0.08]</td>
<td>[0.18]</td>
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The previous results assume you keep your job.

What happens to people who are displaced? Large, persistent decreases in labor income.

Workers displaced due to offshoring suffer much more than those displaced for other reasons.
So, that’s one paper

• Constrained optimization with a detour through manipulation of complex distributions

• Experimental design: in a complicated world, how do I isolate one effect from another

• Programming: collecting, cleaning, joining data; coding statistical estimation techniques

• Advanced econometrics: using state of the art estimators to achieve experimental design

• Data visualization...tell a story in simple graphs
Why *you* should consider these degrees

- Research methods require sophistication in mathematics, statistics, computation

- Business schools cannot deliver on their mission without a more diverse workforce.
The market for new PhDs
2017 PHD PLACEMENT

Response Rate: 63% 74% 69%

Business & Econ degrees much more likely to find immediate academic employment

Mathematics and statistics  Economics  Business

United States  Abroad
Starting salaries average almost 50% higher in Business disciplines, 100% higher in Accounting and Finance.

This does not include summer salary – which adds another 20-25% and is typically included in contracts.
THANK YOU

Questions?