Slicing the Pie: Quantifying the Aggregate and Distributional Effects of Trade

Simon Galle$^1$  Andrés Rodríguez-Clare$^2$  Moises Yi$^3$

$^1$BI Norwegian Business School

$^2$University of California, Berkeley

$^3$U.S. Census Bureau

August, 2017
Motivation

- Gravity models → quantify aggregate welfare effects of trade
- Empirical research → large distributional effects of trade
- This paper: bridge two literatures and quantify aggregate and distributional effects of trade
Gravity and Welfare

- Armington, Eaton and Kortum, Krugman, Melitz-Pareto are all *gravity models*.

- For gravity models:
  - Trade openness + trade elasticity $\rightarrow$ gains from trade
  - Trade data + trade elasticity $\rightarrow$ counterfactual analysis

- Gains from trade:
  - 2-8% for USA (Costinot and Rodriguez-Clare)
  - 5-36% for CR (Alfaro)

- Caliendo, Feenstra, Romalis and Taylor (2017) (next two slides)
Figure 13: Welfare effects from tariff changes, world, detail, 1990–2010 change
Figure 14: Welfare effects from actual 2010 tariffs to Free Trade - Percent
The China Syndrome

- Autor, Dorn and Hanson’s paper in the AER 2013
- 1096 Google Scholar citations
- Almost daily mention in major newspapers and magazines
- Focus on *local labor markets*... commuting zones
- Major finding: decline in wages and employment for CZs most exposed to competition from ↑ US imports from China
- Other findings: ↑ federal transfers, ↓ marriage, ↑ suicide and drug overdose, electoral polarization... and Trump
What about welfare?

- Empirical methodology can only identify relative effects...
- But ↑ imports also imply gains via lower prices... not captured
- So absolute effects? Are groups better or worse off?
- Specific factors + intra-industry trade: ↓ in relative wage for workers in import competing industries, but may still gain
- Need general equilibrium model... back to gravity
Gravity + Roy-Frechet

- Standard multi-sector gravity: workers are perfectly mobile
- Other extreme: workers are stuck in their sector
- Roy-Frechet: parameter $\kappa \in [1, \infty]$ determines where we are
- High $\kappa \rightarrow$ small distributive effects
Estimation

- Key challenge: estimate $\kappa$
- Our approach: use China shock for estimation
- Combine empirical and theoretical elements:
  1. Empirical: higher exposure to China shock $\rightarrow$ ↓ in manufacturing employment
  2. Theoretical: ↓ manufacturing employment $\rightarrow$ ↓ relative income depending on $\kappa$
Table 2: Estimation of $\kappa$

<table>
<thead>
<tr>
<th>Definition of $\pi_{gs}$</th>
<th>(1) Workers</th>
<th>(2) Hours</th>
<th>(3) Earnings</th>
</tr>
</thead>
<tbody>
<tr>
<td>$\ln \hat{\pi}_{gNM}$</td>
<td>-0.466</td>
<td>-0.494</td>
<td>-0.512</td>
</tr>
<tr>
<td></td>
<td>(0.161)</td>
<td>(0.166)</td>
<td>(0.181)</td>
</tr>
<tr>
<td>Implied $\kappa$</td>
<td>2.147</td>
<td>2.024</td>
<td>1.952</td>
</tr>
<tr>
<td></td>
<td>(0.743)</td>
<td>(0.682)</td>
<td>(0.689)</td>
</tr>
<tr>
<td>First-stage F-Statistic</td>
<td>23.19</td>
<td>20.43</td>
<td>9.902</td>
</tr>
<tr>
<td>Observations</td>
<td>1444</td>
<td>1444</td>
<td>1444</td>
</tr>
</tbody>
</table>
Table 3: The Welfare Effects of the China Shock on the US

<table>
<thead>
<tr>
<th>$\kappa$</th>
<th>$\hat{W}_{US}$</th>
<th>Mean</th>
<th>CV</th>
<th>Min.</th>
<th>Max.</th>
<th>$\prod_s \hat{\lambda}_s^{-\beta_s/\theta_s}$</th>
</tr>
</thead>
<tbody>
<tr>
<td>$\rightarrow 1$</td>
<td>0.29</td>
<td>0.38</td>
<td>0.87</td>
<td>-2.24</td>
<td>2.56</td>
<td>0.20</td>
</tr>
<tr>
<td>2</td>
<td>0.25</td>
<td>0.32</td>
<td>0.56</td>
<td>-1.64</td>
<td>1.34</td>
<td>0.20</td>
</tr>
<tr>
<td>4</td>
<td>0.23</td>
<td>0.28</td>
<td>0.36</td>
<td>-1.01</td>
<td>0.76</td>
<td>0.21</td>
</tr>
<tr>
<td>$\rightarrow \infty$</td>
<td>0.24</td>
<td>0.24</td>
<td>0.00</td>
<td>0.24</td>
<td>0.24</td>
<td>0.24</td>
</tr>
</tbody>
</table>
**Figure**: Geographical distribution of the welfare gains from the rise of China

**Figure**: Low-educated workers
Figure: Inequality-Adjusted welfare-effects from the China shock
Figure: Initial group-level income and our Bartik measure of import competition
Table 5: Aggregate and Group-level Gains from Trade

<table>
<thead>
<tr>
<th>$\kappa$</th>
<th>$\hat{W}_{US}$</th>
<th>Mean</th>
<th>CV</th>
<th>Min.</th>
<th>Max.</th>
<th>$\prod_s \hat{\lambda}_s^{-\beta_s/\theta_s}$</th>
</tr>
</thead>
<tbody>
<tr>
<td>$\rightarrow 1$</td>
<td>1.60</td>
<td>1.80</td>
<td>0.59</td>
<td>-7.86</td>
<td>3.36</td>
<td>1.45</td>
</tr>
<tr>
<td>2</td>
<td>1.52</td>
<td>1.63</td>
<td>0.33</td>
<td>-3.19</td>
<td>2.41</td>
<td>1.45</td>
</tr>
<tr>
<td>4</td>
<td>1.48</td>
<td>1.54</td>
<td>0.18</td>
<td>-0.87</td>
<td>1.93</td>
<td>1.45</td>
</tr>
<tr>
<td>$\rightarrow \infty$</td>
<td>1.45</td>
<td>1.45</td>
<td>0.00</td>
<td>1.45</td>
<td>1.45</td>
<td>1.45</td>
</tr>
</tbody>
</table>
Figure 5: Inequality-adjusted Gains from Trade
Figure 6: Group-level Import Competition and Income