Who’s Getting Globalized? The Size and Nature of Intranational Trade Costs

David Atkin\textsuperscript{1}  Dave Donaldson\textsuperscript{2}

\textsuperscript{1}Yale
\textsuperscript{2}MIT
Who’s Getting Globalized?

- Massive reductions in barriers to international trade (tariffs, shipping costs, logistics, etc) in past decades.
  - But if intra-national trade costs are large, the impact may be minimal for consumers in remote locations.
  - This may be especially true in developing countries (poor roads, barriers to entry, etc).
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  • This may be especially true in developing countries (poor roads, barriers to entry, etc).

• Question: How large are intra-national trade costs in developing countries?
  
  • Lots of anecdotes but scarce evidence.
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  - Lots of anecdotes but scarce evidence.

- Key idea here: differences in prices over space can reveal trade costs. But one has to be careful.
Estimating Trade Costs from Spatial Price Gaps: 3 Challenges

1. Spatial price gaps may reflect differences in product characteristics (eg quality):
   - We use newly collected CPI micro-data on extremely narrowly defined brand name consumer products (akin to barcodes)

2. Spatial price gaps are only rarely informative about the level (rather than the range) of trade costs:
   - We obtain the source location for each product in our sample and only use source-destination pairs

3. Spatial price gaps may reflect both trade costs and differences in intermediaries' mark-ups across locations:
   - We use sufficient statistic (price pass-through) to uncover the true marginal costs of distance
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Spatial price gaps are only rarely informative about the level (rather than range) of trade costs:

![Graph showing spatial price gaps for Ethiopia and Nigeria.](image)

- **Ethiopia**:
  - 15 products, 103 towns, 106 months (2001–2010)
  - Costs in 2001 US$ vs. distance from source location to destination market (minutes, log scale)
  - 95% confidence intervals shown
  - Locally weighted polynomial (Epanechnikov kernel, bandwidth=0.5)
  - Semiparametric and includes product-time fixed effects (Baltagi and Li, 2002)

- **Nigeria**:
  - 17 products, 36 towns, 111 months (2001–2010)
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Spatial price gaps reflect both trade costs and spatial differences in intermediaries’ mark-ups:

- **Ethiopia**
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Implication: 2 Effects of Remoteness on Social Surplus

1. We find extremely high marginal costs of distance (\(7-15\times\) larger than CAN-US trucking from Hummels 2001).
   - \(\Rightarrow\) Less social surplus from trade available to remote consumers/intermediaries
Implication: 2 Effects of Remoteness on Social Surplus

1. We find extremely high marginal costs of distance (7-15X larger than CAN-US trucking from Hummels 2001).
   - $\implies$ Less social surplus from trade available to remote consumers/intermediaries

2. We also find that remote markets are less competitive.
   - $\implies$ Whatever social surplus from trade exists in remote locations sees smaller shares accruing to consumers (relative to intermediaries and deadweight loss)
   - Pass-through (again) provides a sufficient statistic for calculating these shares without need for (difficult) markup/elasticity of substitution estimation
Intermediary Profits over Consumer Surplus

Ethiopia: All Goods

Nigeria: All Goods

Distance from source location to destination market (minutes, log scale)

95% confidence intervals shown. Locally weighted polynomial (Epanechnikov kernel, bandwidth=0.5).
Outline of Talk

Introduction

Data

How large are intranational trade costs?

Implication: Who is capturing the gains from globalization?

Concluding Remarks
Outline of Talk

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New Data: 2 Requirements

1. Retail price of identical products at many locations in space, observed at high frequency for a long duration.

2. Source location (factory location or port of entry) of each of these goods (in each country, for each time period).
Dataset 1: CPI micro-data from set of developing countries

- Sample for today:
  - Ethiopia (2001-2010): 15 products, 103 towns
  - Nigeria (2001-2010): 17 products, 36 towns
  - Products are those for which an exact product (with brand name) is identified.

- Ongoing data collection/cleaning for:
  - India (1985-2010): 100 products, 650 villages.

- Additional hope for:
  - Zambia, Bangladesh, Rwanda, Senegal, Pakistan, Indonesia, Mozambique, Uganda, Ghana, Guinea-Bissau, Mexico and [Your Country Here?].
Dataset 2: Source Locations

- Conducted telephone surveys with the firms that produce (or distribute) each product.
  - e.g. Titus Sardines (125g Tin), Rothmans Cigarettes (20 Pack), Harar Beer (330cc), Zahra Detergent (50g).

- For domestically-produced goods, ask producers: where is product made each year.

- For imported goods, ask distributors and retailers: what is country of origin and port of entry.
  - Corroborate port with trade statistics.
Empirical Proxy for Distance

- Distance metric $x_{odt}$ is the log total travel time between locations calculated using Google maps.
- Assumes that traders are taking optimal routes so as to minimize travel time.

<table>
<thead>
<tr>
<th>Road Quality</th>
<th>Minutes/Mile (Ethiopia)</th>
<th>Minutes/Mile (Nigeria)</th>
</tr>
</thead>
<tbody>
<tr>
<td>National highway</td>
<td>1.2</td>
<td>1.2</td>
</tr>
<tr>
<td>Secondary road</td>
<td>1.4</td>
<td>1.4</td>
</tr>
<tr>
<td>Tertiary road</td>
<td>1.9</td>
<td>2.4</td>
</tr>
</tbody>
</table>

- Results robust to using road or great circle distance.
Distribution of Population by Source-Destination Distance

Ethiopia: All Goods

Nigeria: All Goods

Distance from source location to destination market (minutes, log scale)

Destination market population (mid sample period)
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How large are intranational trade costs? 3 Steps

1. Importance of knowing the source location.
   • Without this, spatial price gaps not informative about trade costs.

2. Estimates of ‘pass-through’, denoted by $\rho$, for each location and product:
   • Perfect competition requires $\rho = 1$. Deviations from this imply imperfect competition.
   • We find, consistently, that $\rho < 1$. And more so in remote locations.

3. Use estimates of $\rho$ to correct for varying mark-ups over space
Step 1: Importance of Knowing the Source Location

- We compare:
  - ‘trading pairs’: origin-destination \((o, d)\) pairs for which goods are definitely being traded; theory:
    \[ P^k_{dt} - P^k_{ot} = \tau(X^k_{odt}) \]
  - ‘all pairs’: any pair of locations \((i, j)\) which may or may not be trading; theory:
    \[ P^k_{it} - P^k_{jt} = \tau(X^k_{oit}) - \tau(X^k_{ojt}) \leq \tau(X^k_{ijt}) \]
Step 1: Importance of Knowing the Source Location

![Graphs showing costs (2001 US$) vs. distance from source location to destination market for Ethiopia and Nigeria.](image)

Ethiopia: All Goods
Nigeria: All Goods

Costs (2001 US$)
Distance from source location to destination market (minutes, log scale)

95% confidence intervals shown. Locally weighted polynomial (Epanechnikov kernel, bandwidth=0.5). All plots are semiparametric and include product–time fixed effects (Baltagi and Li, 2002).
Step 2: Estimating Pass-Through

- **What is ‘pass-through’?**
  - Extent to which price charged by a producer changes when his marginal costs change.
Step 2: Estimating Pass-Through

Why is pass-through useful here?

- If $\rho = 1$, then prices are changing one-for-one with marginal costs.
  - This implies that mark-ups are not changing with marginal costs.
  - That is, the way price gaps vary over distance measures how marginal costs vary over distance.

- If $\rho < 1$, then prices are changing less than one-for-one with marginal costs.
  - This implies that mark-ups are falling as marginal costs rise.
  - That is, the way price gaps vary over distance understates how marginal costs vary over distance.
Step 2: Estimating Pass-Through

- **How do we estimate pass-through?**
  - We estimate how price shocks at the source location affect (ie ‘pass through into’) prices at destination locations.
  - We do this separately for each destination location and for each product.
Step 2: Estimating Pass-Through

Ethiopia: All Goods

Nigeria: All Goods

95% confidence intervals shown. Locally weighted polynomial (Epanechnikov kernel, bandwidth=0.5).
Step 3: How large are intranational trade costs?

- Once we know pass-through for each location and product, it is straightforward to ‘correct’ spatial price gaps for varying mark-ups over space.
  - NB: if $\rho = 1$ then this correction does nothing.

- We also use our demand system to control for possibility that the level of competition is lower in more remote locations
  - That is, the way price gaps vary over distance overstates how marginal costs vary over distance since mark-ups higher in remote locations.
Step 3: How large are intranational trade costs?

95% confidence intervals shown. Locally weighted polynomial (Epanechnikov kernel, bandwidth=0.5). All plots are semiparametric and include product–time fixed effects. Adjusted gaps control for market power.
Step 3: How large are intranational trade costs?

<table>
<thead>
<tr>
<th></th>
<th>Ethiopia (Trading Pairs)</th>
<th>Nigeria (Trading Pairs)</th>
</tr>
</thead>
<tbody>
<tr>
<td></td>
<td>Price Gap</td>
<td>Adjusted Gap</td>
</tr>
<tr>
<td>Log distance to source (minutes)</td>
<td>0.0289***</td>
<td>0.0411***</td>
</tr>
<tr>
<td></td>
<td>(0.00147)</td>
<td>(0.00246)</td>
</tr>
<tr>
<td>Time-Product FE</td>
<td>Yes</td>
<td>Yes</td>
</tr>
<tr>
<td>Time-Product (\times \frac{1-\rho_{kd}^k}{\rho_{od}^k})</td>
<td>No</td>
<td>Yes</td>
</tr>
<tr>
<td>Destination (\times \frac{1-\rho_{eq}^k}{\rho_{od}^k})</td>
<td>No</td>
<td>Yes</td>
</tr>
<tr>
<td>Observations</td>
<td>100762</td>
<td>100762</td>
</tr>
<tr>
<td>R-squared</td>
<td>0.258</td>
<td>0.933</td>
</tr>
</tbody>
</table>

Notes: Standard errors clustered at the time-product level. * significant at 10 percent level, ** at 5 percent and *** at 1 percent.

- Additional cost to reach the most remote locations (20 hours away, 97-99th percentile) compared to the least remote locations (1 hour away, 2nd percentile):
  - 12 US cents (30% of mean \(P_o\)) in Ethiopia, 17 cents in Nigeria (14% of mean \(P_o\)).
Step 3: How large are intranational trade costs?

- Rough comparison to international trade costs:
  - Use these estimates to calculate additional ad valorem cost to reach locations 3 log units further away:

<table>
<thead>
<tr>
<th>Mode of Transport</th>
<th>Implied Δad-valorem transport cost for Δ ln(distance) of 3 units (by mode of transport for cargo of mean kg/$)</th>
</tr>
</thead>
<tbody>
<tr>
<td>US Imports (Truck from CAN)</td>
<td>2.0 percent</td>
</tr>
<tr>
<td>US Imports (Rail from CAN)</td>
<td>2.7 percent</td>
</tr>
<tr>
<td>US Imports (Ocean)</td>
<td>4.9 percent</td>
</tr>
<tr>
<td>US Imports (Air)</td>
<td>14.6 percent</td>
</tr>
</tbody>
</table>

- Compare to: **30 percent** in Ethiopia, **14 percent** in Nigeria.
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Implication: Who is capturing the gains from globalization?

Concluding Remarks
Who is capturing the gains from globalization? Shares of surplus

• Though experiment: suppose the port price of an import falls by 20% due to “globalization”.

• Two effects of remoteness:

1. High marginal cost of distance $\implies$ remote locations see smaller increases in the *quantity* of surplus available to consumers/intermediaries.

2. Markups vary across space $\implies$ whatever surplus is generated, remote locations see different *shares* of this surplus accruing to consumers (compared to intermediaries and deadweight loss).
Who is capturing the gains from globalization? Shares of surplus

- How to measure the distribution of surplus?

- Turns out that (under conditions that we lay out in the paper) pass-through is all one needs to know.

- Pass-through can also be used to estimate measures of (relative) ‘competitiveness’ in each market.
  - Intuitively, all else equal, if pass-through is close to one then competitiveness must be high.
Who is capturing the gains from globalization? Competitiveness Index

95% confidence intervals shown. Locally weighted polynomial (Epanechnikov kernel, bandwidth=0.5).
Who is capturing the gains from globalization? Distribution of Surplus

Ethiopia: All Goods

Nigeria: All Goods

Relative ratio of intermediary profits to consumer surplus

Distance from source location to destination market (minutes, log scale)

95% confidence intervals shown. Locally weighted polynomial (Epanechnikov kernel, bandwidth=0.5).
Who is capturing the gains from globalization?

<table>
<thead>
<tr>
<th></th>
<th>Ethiopia</th>
<th>Nigeria</th>
</tr>
</thead>
<tbody>
<tr>
<td>Relative Competitiveness</td>
<td></td>
<td></td>
</tr>
<tr>
<td>Index of Intermediaries</td>
<td></td>
<td></td>
</tr>
<tr>
<td>(All Locations)</td>
<td></td>
<td></td>
</tr>
<tr>
<td>Log distance to capital</td>
<td>-0.230**</td>
<td>-0.707***</td>
</tr>
<tr>
<td>(minutes)</td>
<td>(0.106)</td>
<td>(0.169)</td>
</tr>
<tr>
<td>Log distance to source</td>
<td>0.284***</td>
<td>0.336***</td>
</tr>
<tr>
<td>(minutes)</td>
<td>(0.060)</td>
<td>(0.116)</td>
</tr>
<tr>
<td>Constant</td>
<td>3.459***</td>
<td>8.004***</td>
</tr>
<tr>
<td></td>
<td>(0.621)</td>
<td>(1.012)</td>
</tr>
<tr>
<td>Intermediary Profits/</td>
<td>0.161</td>
<td>-0.0103</td>
</tr>
<tr>
<td>Consumer’s Surplus</td>
<td></td>
<td></td>
</tr>
<tr>
<td>(All Good-Location Pairs)</td>
<td></td>
<td></td>
</tr>
<tr>
<td>Observations</td>
<td>100</td>
<td>36</td>
</tr>
<tr>
<td>R-squared</td>
<td>0.027</td>
<td>0.150</td>
</tr>
</tbody>
</table>

Notes: Robust standard errors in parentheses. * significant at 10 percent level, ** at 5 percent and *** at 1 percent.

- Ratio of intermediary/consumer surplus in the least remote locations (1 hour away) compared to the most remote locations (20 hours away):
  - Between 40%-64% higher in Ethiopia, 40%-74% in Nigeria.
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• How large are intra-national trade costs in developing countries?
  • The marginal costs of distance in our sample appear to be very high. (Approximately 7-15X larger than CAN-US trucking.)
  • Appear to be under-estimated by standard spatial price gap methods
    • MC of distance approximately double when only use source-destination pairs
    • MC of distance approximately double again when spatial variation in mark-ups accounted for by using sufficient statistic (pass-through) approach

• 2 Implications for costs of remoteness:
  1. Trade generates less social surplus for consumers/intermediaries in remote locations
  2. Additionally, consumers in remote locations capture a smaller share of whatever surplus is generated