Gravity without Apology: The Science of Elasticities, Distance, and Trade

Céline Carrère
Geneva and CEPR

Monika Mrázová
Geneva and CEPR

J. Peter Neary
Oxford, CEPR and CESifo

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Introduction: Gravity and International Trade

- Gravity: The value of trade declines with distance
- One of the great successes of modern economics
- Gravity in trade is both *fact* and *theory*
- Though this is not widely known by economists outside trade
- And “anti-gravity” continues to have popular appeal
Gravity in the News

Financial Times

Treasury’s grim forecasts spark fury from Tory Brexit rebels

Osborne seeks to demolish economic case for Out • Gove to launch stinging response

George Osborne’s attempt to conquer the economic battlefield on Brexit with the greatest of ease has been met with a sharp rebuff from the Treasury.

The three scenarios published by the Treasury to show how a Brexit would affect the UK economy have been labeled "unrealistic" and "risky" by proponents of staying in the European Union.

The Treasury has published three scenarios to show how a Brexit could affect the UK economy: a "best case" scenario, a "worst case" scenario, and a "baseline" scenario.

The best case scenario shows that the UK economy would grow by 0.5% per year, while the worst case scenario shows that the economy would shrink by 2.5% per year.

The baseline scenario is the most likely outcome, with the economy growing by 1.0% per year.

The scenarios are based on a range of assumptions, including the impact of a Brexit on trade, investment, and consumer confidence.

The Treasury has also published a report on the potential impact of a Brexit on the UK economy, which is available online.

The report includes a series of charts and graphs to illustrate the potential impacts of a Brexit on the UK economy.
“Today, we stand on the verge of an unprecedented ability to liberate global trade for the benefit of our whole planet with technological advances dissolving away the barriers of time and distance. It is potentially the beginning of what I might call ‘post geography trading world’ where we are much less restricted in having to find partners who are physically close to us.”

– Liam Fox, UK Minister for International Trade, Sept. 2016
This Lecture

- Review the evidence for gravity
- Introduce some simple ways of understanding CES gravity
- Note some problems with CES
- Sketch some alternatives
- Background: Brexit ...
“I don’t think we’ll be poorer out [of the EU], but if you told me my family would have to eat grass I’d still have voted to leave.”

Introduction

What they told us ...

We send the EU £350 million a week
let’s fund our NHS instead

Let’s take back control
What they didn’t tell us ...
“I don’t think we’ll be poorer out, but if you told me my family would have to eat grass I’d still have voted to leave.”
“I don’t think we’ll be poorer out, but if you told me my family would have to eat grass I’d still have voted to leave.”
Many studies of the trade effects of Brexit

Predominantly using the gravity model
- Dhingra et al. (2017), Sampson (2017)
- Mayer, Vicard, and Zignago (2019)

I ignore work on other economic aspects of Brexit
- Davies and Studnicka (2018): Stock-market response
- Alabrese, Becker, Fetzer, and Novy (2019): Determinants of voting
- O’Rourke (2019): Historical context
Professional consensus: Three Iron Laws of the Economics of Brexit

- Focusing on trade in goods ...
- ... ignoring transitional problems ...
- ... and macro policy responses

1. The only good Brexit is a dead Brexit
2. The harder the Brexit the higher the economic costs
3. Even a hard Brexit will not have “very” large costs
   - 2% of GDP if soft, 6+\% of GDP if hard
   - Compare: UK spent 7.26\% of GDP on NHS in 2016/17


Outline

1. Gravity as Fact
2. Gravity as Theory
3. Gravity Anomalies
4. Subconvex Gravity
5. Conclusion
The Gravity Equation: A Universal Tendency

- Overwhelming professional consensus that distance matters for trade
  - Head and Mayer (2014): review of 159 papers
    - Average preferred estimate of distance elasticity: −1.1
    - S.D. 0.41; median −1.14
- Not just geographical distance matters:
  - Common language, legal system, colonial origins, FTA membership, etc.
- Results below for distance elasticity of 2017 UK exports in line with the literature:
  - −0.752 (0.098): OLS, simple regression, \( n = 181 \)
  - −1.441 (0.029): OLS, full controls, \( n = 23,251 \)
  - −0.977 (0.021): PPML, full controls, \( n = 42,230 \)
Gravity: Not Just for Trade in Goods

- Distance also matters (though less so on average) for:
  - Services trade: Kimura and Lee (2006)
  - FDI: Kleinert and Toubal (2010), Keller and Yeaple (2013)
  - Equities: Portes and Rey (2005)
  - eBay: Lendle, Olarreaga, Schropp, and Vézina (2016)
  - Google: Cowgill and Dorobantu (2012)

- And the distance coefficient for goods trade has not fallen over time
  - “The Mystery of the Missing Globalization”!
  - But: Not a mystery
  - Distance is relative
Data Sources, etc.

- **Survey:**
  - Head and Mayer (2014)

- **Data:** CEPII

- **UK trade policy:** UK Trade Policy Observatory
  - [http://blogs.sussex.ac.uk/uktpo/](http://blogs.sussex.ac.uk/uktpo/)

- **EU trade agreements**
UK Exports and Importer GDP, 2017

- Slope: 1.06
- $R^2$: 0.826
UK Exports/Importer GDP and Distance, 2017

- Slope: -0.75
- R²: 0.246
Gravity Weighted by Exports, UK, 2017

slope = -0.75
R² = 0.246
Trade Agreements, UK, 2017

Gravity as Fact

CMN (Geneva and Oxford) Gravity without Apology RES: April 15, 2019 22 / 80
Trade Agreements and ex-Colonies, UK, 2017
Outline

1. Gravity as Fact

2. Gravity as Theory
   - Structural Gravity
   - Comparative Statics for Structural Gravity
   - An Application: Brexit

3. Gravity Anomalies

4. Subconvex Gravity

5. Conclusion
“[I] have explained the phenomena of the heavens and of our sea by the power of gravity, but have not yet assigned the cause of this power.”

– Isaac Newton (1713)

“The intent of this paper is to provide a theoretical explanation for the gravity equation applied to commodities.”

– Jim Anderson (1979)
A variety of different supply sides, all with CES preferences

The gravity equation has been shown to be consistent with:

- Armington (1969) model of pure exchange
- Models of monopolistic competition such as Krugman (1980)
  - Bergstrand (1985) and Helpman (1987)
- Heterogeneous-firms model of Melitz (2003)
  - Chaney (2008)
- Multi-country Ricardian model
  - Eaton and Kortum (2002)
- Synthesis: Arkolakis, Costinot, and Rodríguez-Clare (2012)

All yield the same “structural gravity” model

Here: I focus on the simplest Armington-based version
Start with CES Demands

- $n$ countries, each endowed with a unique good
- Common CES preferences: Each country consumes all goods:

$$x_{jk} = \beta_j \left( \frac{p_{jk}}{P_k} \right)^{-\sigma} E_k \Rightarrow V_{jk} = \beta_j \left( \frac{p_{jk}}{P_k} \right)^{1-\sigma} E_k$$

- $V_{jk} = p_{jk} x_{jk}$: Value of exports from $j$ to $k$
- $\beta_j$: Taste parameter for country $j$ good
- $p_{jk}$: Delivered price of $j$’s export in $k$
  - $p_{jk} = p_j t_{jk}$: Equals home price times an “iceberg” trade cost
- $P_k$: Importer price index:

$$P_k = \left( \sum_h \beta_h p_{hk}^{1-\sigma} \right)^{\frac{1}{1-\sigma}}$$

- $\sigma$: Elasticity of substitution
- $E_k$: Country $k$’s expenditure on all goods
Total sales by country $j$ sum to GDP in equilibrium:

$$\sum_k V_{jk} = Y_j$$

Substitute into this from CES demands:

$$Y_j = \sum_k V_{jk} = (\beta_j p_j)^{1-\sigma} \sum_k \left( \frac{t_{jk}}{P_k} \right)^{1-\sigma} E_k$$

Use this to eliminate $(\beta_j p_j)^{1-\sigma}$ from $V_{jk}$ and $P_k$.
Structural Gravity

- Structural gravity:

\[ V_{jk} = \left( \frac{t_{jk}}{\prod_j P_k} \right)^{1-\sigma} \frac{Y_j E_k}{Y_W} \]  

(1)

(2):

- Frictionless trade: \( Y_W \) is world income

(1):

- Trade costs relative to outward and inward “multilateral resistance”:

\[ (\Pi_j)^{1-\sigma} = \sum_h \left( \frac{t_{jh}}{P_h} \right)^{1-\sigma} \frac{E_h}{Y_W} \]

\[ (P_k)^{1-\sigma} = \sum_h \left( \frac{t_{hk}}{\Pi_h} \right)^{1-\sigma} \frac{Y_h}{Y_W} \]

- \( \Pi_j \): Index of outward trade costs
- \( P_k \): In equilibrium, price index is also an index of inward trade costs
- Dual to one another
Uses of Structural Gravity

- **Estimation**
  - Usually in log-linear form with importer and exporter fixed effects:
  \[
  \log V_{jk} = F_j + F_k + \beta \log t_{jk} + u_{jk}, \quad t_{jk} = \delta_{jk} \exp(\gamma' D_{jk})
  \]

- **Simulation**
  - Policy analysis, e.g. Brexit

- **Theoretical Analysis**
  - Not possible in levels
  - What about comparative statics for local changes?
Comparative Statics for Structural Gravity

- Allen, Arkolakis, and Takahashi (2019)
- Eaton, Kortum, and Sotelo (2013)
- Baqae and Farhi (2017)
- Jones (1965)
- Diewurt and Woodland (1977), Jones and Scheinkman (1977)
Comparative Statics:

Define GDP and expenditure shares:

\[
\lambda_{jk} = \frac{V_{jk}}{Y_j} \quad \theta_{jk} = \frac{V_{jk}}{E_k}
\]

Express changes in terms of these:

\[
\hat{x} \equiv d \log x
\]

\[
Y_j = \sum_k V_{jk} \quad \Rightarrow \quad \hat{Y}_j = \sum_k \lambda_{jk} \hat{V}_{jk}
\]

\[
P_k = \left( \sum_h p_{hk}^{1-\sigma} \right)^{\frac{1}{1-\sigma}} \quad \Rightarrow \quad \hat{P}_k = \sum_j \theta_{jk} \hat{P}_{jk}
\]
Gravity at the Margin

- Demands at the margin:

\[ \hat{x}_{jk} = -\sigma \hat{p}_{jk} + (\sigma - 1) \hat{P}_k + \hat{E}_k \]

- Own and cross-price derivatives:

\[ \frac{\partial \log x_{jk}}{\partial \log p_{jk}} = -\{\sigma(1 - \theta_{jk}) + \theta_{jk}\} \quad \frac{\partial \log x_{jk}}{\partial \log p_{jh}} \bigg|_{h \neq j} = (\sigma - 1)\theta_{jh} \]

- Gross substitutes: 

\[ -\frac{\partial \log x_{jk}}{\partial \log p_{jk}} > \frac{\partial \log x_{jk}}{\partial \log p_{jh}} > 0 \]

- Add:

  - Trade costs: 

\[ p_{jk} = p_j t_{jk} \quad \Rightarrow \quad \hat{p}_{jk} = \hat{p}_j + \hat{t}_{jk} \]

  - Balanced trade:

\[ E_j = \kappa_j Y_j \quad \Rightarrow \quad \hat{E}_j = \hat{Y}_j \]

  - Supply side:

\[ \begin{cases} Y_j = p_j Q_j \\ w_j = p_j \end{cases} \quad \Rightarrow \quad \hat{Y}_j = \hat{w}_j = \hat{p}_j \]
Specialize to 3 countries: $A$, $B$, and $E$

- $A$ and $E$ large
- Take $p_A$ as numéraire
- Equilibrium: Market-clearing conditions for outputs of $B$ and $E$...
- ... determine equilibrium wages: $w_B = p_B$ and $w_E = p_E$
Illustrate equilibrium in \( \{p_E, p_B\} \), i.e., \( \{w_E, w_B\} \) space
Initial equilibrium at $S$.

Goods-market-equilibrium locus for good $B$?
Goods-market-equilibrium locus for good $B$:

- Higher $w_B$, i.e. $p_B$, leads to excess supply, lower to excess demand
Goods-Market Equilibrium

- Goods-market-equilibrium locus for good $B$:
  - Higher $w_B$, i.e. $p_B$, leads to excess supply, lower to excess demand
  - Conversely for $w_E$, though effect is weaker
    - Gross substitutes in each market, and so in all
Goods-market-equilibrium locus for good $B$:

- Higher $w_B$, i.e. $p_B$, leads to excess supply, lower to excess demand
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- Uniformly higher $w_B$ and $w_E$ leads to excess supply
Goods-market-equilibrium locus for good $B$:

- Higher $w_B$, i.e. $p_B$, leads to excess supply, lower to excess demand
- Conversely for $w_E$, though effect is weaker
  - Gross substitutes in each market, and so in all
- Uniformly higher $w_B$ and $w_E$ leads to excess supply
- So market-clearing locus is upward-sloping as shown
Similarly for good $E$

- Close to vertical if $B$ is small
Goods-Market Equilibrium

- Intersection of the two determines equilibrium wages \( w_B \) and \( w_E \)
**Trade Cost Scenarios**

- Decompose trade costs:
  \[ t_{jk} = \delta_{jk} \tau_{jk} \]
  \[ \delta_{jk} : \text{“natural”} \]
  \[ \tau_{jk} : \text{policy-induced} \]

- Possible scenarios:

<table>
<thead>
<tr>
<th>Scenario</th>
<th>( \delta_{BE} )</th>
<th>( \tau_{BE} )</th>
<th>( \delta_{BA} )</th>
<th>( \tau_{BA} )</th>
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<tbody>
<tr>
<td>Status quo</td>
<td>low</td>
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<tr>
<td>“Cake and Eat”</td>
<td>low</td>
<td>low</td>
<td>high</td>
<td>low</td>
</tr>
<tr>
<td>“Global Britain”</td>
<td>low</td>
<td>high</td>
<td>high</td>
<td>low</td>
</tr>
</tbody>
</table>

(1) All assumed to be bilaterally symmetric.
(2) Revenue from policy costs ignored.
Lower $\tau_{BA}$ raises demand for $Y_B$, tending to raise equilibrium wage $w_B$

$$\frac{\partial \log X_B}{\partial \log \tau_{BA}} = -(\sigma - 1)(\lambda_{BA}(1 - \theta_{BA}) - \lambda_{BB}\theta_{AB})$$

Details
Lower $\tau_{BA}$ also lowers demand for $Y_E$, though not by much if $B$ is small

$$\frac{\partial \log X_E}{\partial \log \tau_{BA}} = (\sigma - 1)(\lambda_{EA} \theta_{BA} + \lambda_{EB} \theta_{AB})$$
“Cake and Eat”

Net effect: Rise in \( w_B \), ambiguous change in \( w_E \)

\[ w_B \uparrow \iff \hat{w}_B > \hat{w}_A: \text{Because } A \text{ is bigger} \]
Complete symmetry between $A$ and $E$: No net effect

- $\tau_{BE} \uparrow$ exactly offsets the effect of $\tau_{BA} \downarrow$
“Global Britain”: Departures from Symmetry

- Depth of integration
  - Single market is a deeper trade agreement: $\tau_{BE}\bigg|_S < \tau_{BA}\bigg|_{GB}$

- Size
  - What matters is not absolute size, but size in initial UK trade
  - EU27 accounts for 40% of 2017 UK trade; but countries with EU trade agreements add another 15%

- Asymmetries between increases in low policy costs and decreases in high ones
  - This matters for discrete changes
  - Cost of 10%-point increase in $\tau_{BE}$ is greater than the gain from a 10%-point decrease in $\tau_{BA}$

- Distance a fixed cost
  $$t_{jk} = \delta_{jk} + \tau_{jk} \quad \Rightarrow \quad \hat{t}_{jk} = (1 - \omega_{jk})\hat{\tau}_{jk}, \quad \omega_{jk} \equiv \frac{\delta_{jk}}{t_{jk}}$$
Net effect: Higher trade costs with $E$ dominate

- More than offset the (only slightly) lower trade costs with $A$
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Counter-factual implications of CES preferences:

1. Firm-level markups and pass-through
   - CES demands imply constant markups and 100% pass-through
   - But: Mounting firm-level empirical evidence to the contrary

2. Elasticities of import demand across markets
   - Evidence that they vary by market size and distance
   - Novy (2013)

3. Bilateral trade surpluses
   - CES gravity imposes very strong counter-factual restrictions
   - Davis and Weinstein (2002)
Inverse demand function:

\[ p = p(x) \quad p' < 0 \]

Two key demand parameters:

1. Slope/Elasticity:
   \[ \varepsilon(x) \equiv -\frac{p(x)}{xp'(x)} > 0 \]

2. Curvature/Convexity:
   \[ \rho(x) \equiv -\frac{xp''(x)}{p'(x)} \]
In general, both $\varepsilon$ and $\rho$ vary with sales.

Exception: CES/iso-elastic case:

- $p = \beta x^{-1/\sigma}$
- $\Rightarrow \varepsilon = \sigma, \quad \rho = \frac{\sigma+1}{\sigma} > 1$
- $\Rightarrow \varepsilon = \frac{1}{\rho - 1}$
CES Demands

- In general, both $\varepsilon$ and $\rho$ vary with sales
- Exception: CES/iso-elastic case:
  - $p = \beta x^{-1/\sigma}$
  - $\Rightarrow \varepsilon = \sigma, \quad \rho = \frac{\sigma + 1}{\sigma} > 1$
  - $\Rightarrow \varepsilon = \frac{1}{\rho - 1}$
- Cobb-Douglas: $\varepsilon = 1, \rho = 2$
\( p(x) \) is subconvex at \( x^0 \) IFF:

- \( \log p(x) \) is concave in \( \log x \)
- \( p(x) \) is less convex than a CES demand function with the same elasticity: \( \rho < \frac{\varepsilon + 1}{\varepsilon} \)
- \( \varepsilon \) is decreasing in sales:
  - \( \varepsilon_x = \frac{\varepsilon}{x} \left[ \rho - \frac{\varepsilon + 1}{\varepsilon} \right] \)
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- \( \varepsilon \) is decreasing in sales:
  - \( \varepsilon_x = \frac{\varepsilon}{x} \left[ \rho - \frac{\varepsilon + 1}{\varepsilon} \right] \)

Subconvexity confirmed empirically, and theoretically plausible:

- Introspection: “Marshall’s 2nd Law of Demand”
- Dixit and Stiglitz (1977), Krugman (1979), etc.
Represent demand functions in \( \{\varepsilon, \rho\} \) space by their **Demand Manifold**

- **Definition**: A curve in \( \{\varepsilon, \rho\} \) space corresponding to the demand function \( p(x) \)
- **Existence**: A smooth manifold corresponds to every demand function
  - Except for CES: Manifold is a point
- **Invariance**: \( \varepsilon(x, \phi) \) and \( \rho(x, \phi) \Rightarrow \rho(\varepsilon) ? \)
  - Necessary and sufficient condition in Mrázová-Neary (2017)
  - Holds for most widely-used demand functions
Manifolds for Some Common Demand Functions

- All manifold-invariant
Mrázová and Neary (2017) show that $\varepsilon$ and $\rho$ can be inferred from estimates of pass-through and markups (as in de Loecker et al. (2016))

- CES lies outside the implied confidence regions
Outline

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Assume additively separable demands:

\[ u'(x_{jk}) = \lambda_k p_{jk} \quad \Rightarrow \quad x_{jk} = f(\lambda_k p_j t_{jk}) \]

\[ \hat{V}_{jk} = - (\sigma_{jk} - 1) \hat{p}_j - \sigma_{jk} \hat{\lambda}_k - (\sigma_{jk} - 1) \hat{t}_{jk} \]

Subconvexity: \( \sigma_{jk} \equiv \sigma(x_{jk}) \), decreasing in \( x_{jk} \)

To estimate this, we use quantile regression:

Order data by \( V_{jk} \)

Estimate for each quantile \( q \):

\[ \log V_{q,jk} = F_{q,j} + F_{q,k} + \beta_q \log t_{jk} + u_{q,jk} \]

Estimation and bootstrapped confidence intervals:

- Baltagi and Egger (2016), Machado and Santos Silva (2019)
Quantile Regression: Estimated Distance Coefficient

![Graph showing the estimated distance coefficient across different quantiles.](image)

- Distance Coefficient vs. Quantiles
- Quantiles range from 0.0 to 1.0
- Distance Coefficient values range from -1.60 to -1.30
Quantile Regression Results: Compared to OLS
## Quantile Regression Results: Tests

Significance Tests for Differences Between Quantile and OLS Estimates of Distance Coefficient

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<th>$\beta_{Q10}$</th>
<th>$\beta_{Q20}$</th>
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* Significantly different at 5% level
n.s. Not significant
Persuasive Evidence for Subconvexity
- Distance coefficient significantly decreasing (in absolute value) in trade
- Replication needed ...

Implications for the Trade Balances Puzzle?
- Bilateral balances now depend on distance
- Provisional evidence confirming this

Implications for Brexit?
- With subconvexity, elasticities are higher in smaller markets
- Implications for estimated effects of Brexit unlikely to be major
Outline

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Conclusion

- Gravity as Fact
  - Overwhelming evidence that trade tends to fall with distance

- Gravity as Theory
  - A simple general equilibrium system
  - New analytic tools for understanding it

- Gravity Anomalies
  - Constant Elasticity of Trade not the whole story

- Subconvex gravity a promising direction
  - Unlikely to change the Three Iron Laws of the Economics of Brexit
What They Should Have Told Us ...

Only 6% Fall in GDP
and We are Free!

Let's take back control

Vote Leave
Thanks and Acknowledgements*

Thank you for listening. Comments welcome!

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Equilibrium in market for $Y_B$:

$$\hat{X}_B = \varepsilon_{BB}\hat{p}_B + \varepsilon_{BE}\hat{p}_E + \varepsilon_{Bt_E}\hat{t}_{BE} + \varepsilon_{Bt_A}\hat{t}_{BA} = 0$$

where the elasticities of excess demand for $Y_B$ are:

$$\varepsilon_{BB} : - (\sigma - 1)\lambda_{BB}(1 - \theta_{BB}) - \lambda_{BE}\{\sigma(1 - \theta_{BE}) + \theta_{BE}\} - \lambda_{BA}\{\sigma(1 - \theta_{BA}) + \theta_{BA}\}$$

$$\varepsilon_{BE} : (\sigma - 1)\lambda_{BB}\theta_{EB} + \lambda_{BE}\{(\sigma - 1)\theta_{EE} + 1\} + (\sigma - 1)\lambda_{BA}\theta_{EA}$$

$$\varepsilon_{Bt_E} : -(\sigma - 1)\{\lambda_{BE}(1 - \theta_{BE}) - \lambda_{BB}\theta_{EB}\}$$

$$\varepsilon_{Bt_A} : -(\sigma - 1)\{\lambda_{BA}(1 - \theta_{BA}) - \lambda_{BB}\theta_{AB}\}$$

Similarly in the market for $Y_E$:

$$\hat{X}_E = \varepsilon_{EB}\hat{p}_B + \varepsilon_{EE}\hat{p}_E + \varepsilon_{Et_E}\hat{t}_{BE} = 0$$

$$\varepsilon_{EB} : (\sigma - 1)\lambda_{BB}\theta_{EB} + \lambda_{BE}\{(\sigma - 1)\theta_{EE} + 1\} + (\sigma - 1)\lambda_{BA}\theta_{EA}$$

$$\varepsilon_{EE} : -(\sigma - 1)\lambda_{BB}(1 - \theta_{BB}) - \lambda_{BE}\{\sigma(1 - \theta_{BE}) + \theta_{BE}\} - \lambda_{BA}\{\sigma(1 - \theta_{BA}) + \theta_{BA}\}$$

$$\varepsilon_{Et_E} : -(\sigma - 1)\{\lambda_{BE}(1 - \theta_{BE}) - \lambda_{BB}\theta_{EB}\}$$

$$\varepsilon_{Et_A} : 0$$
CES demands imply constant markups and 100% pass-through:

\[ \frac{p}{c} = \frac{\sigma}{\sigma - 1} \quad \text{and} \quad \frac{d \log p}{d \log c} = 1 \]

But: Mounting empirical evidence to the contrary

Mark-ups differ a lot across firms, even in narrowly-defined industries.
supplementary material

Gravity Anomalies 1: Micro Evidence

Empirical Evidence on Markups I

Figure 4.—Distribution of marginal costs and markups in 1989 and 1997. Sample only includes firm–product pairs present in 1989 and 1997. Outliers above and below the 3rd and 97th percentiles are trimmed.

Higher markups. The results indicate that firms offset the beneficial cost reductions from improved access to imported inputs by raising markups. The overall effect, taking into account the average declines in input and output tariffs between 1989 and 1997, is that markups, on average, increased by 12.6 percent. This increase offsets almost half of the average decline in marginal costs, and as a result, the overall effect of the trade reform on prices is moderated.52

Although tempting, it is misleading to draw conclusions about the pro-competitive effects of the trade reform from the markup regressions in Column 3 of Table IX. The reason is that one needs to control for the impacts of

52These results are robust to controlling India's de-licensing policy reform; see Table A.I in the Supplementary Material.

From: de Loecker, Goldberg, Khandelwal and Pavcnik (2016)
Empirical Evidence on Markups II

Markups for Bread, Wine and Jeans

From: Lamorgese, Linarello and Warzynski (2014)
CES-based models predict the same elasticity of import demand in all markets.

- Macro elasticity, not micro elasticity facing firms

By contrast, Novy (2013) finds that elasticities are systematically lower in larger and closer markets.
References


References


