Estimating Policy Barriers to Trade

Brendan Cooley

Political Economy Graduate Colloquium

6 December 2018

Free and Fair?

> **Donald J. Trump** ✔
> @realDonaldTrump
>
> [Follow]
>
> The United States must, at long last, be treated fairly on Trade. If we charge a country ZERO to sell their goods, and they charge us 25, 50 or even 100 percent to sell ours, it is UNFAIR and can no longer be tolerated. That is not Free or Fair Trade, it is Stupid Trade!
>
> 10:51 AM - 2 Jun 2018

- **Free:** Foreign firms enjoy same market access conditions as domestic competitors
- **Fair:** Barriers that do exist affect all trade partners symmetrically

Free and Fair?

Donald J. Trump ✓
@realDonaldTrump

The United States must, at long last, be treated fairly on Trade. If we charge a country ZERO to sell their goods, and they charge us 25, 50 or even 100 percent to sell ours, it is UNFAIR and can no longer be tolerated. That is not Free or Fair Trade, it is Stupid Trade!

10:51 AM - 2 Jun 2018

- **Free:** Foreign firms enjoy same market access conditions as domestic competitors
- **Fair:** Barriers that do exist affect all trade partners symmetrically

Free and Fair?
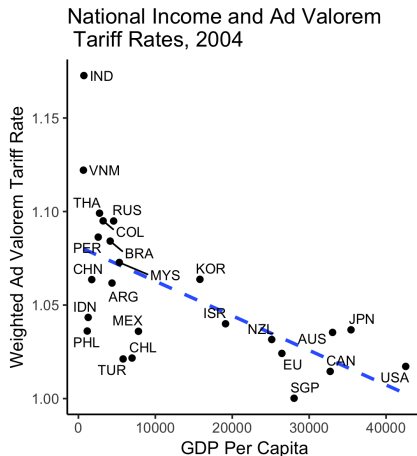

Donald J. Trump ✓
@realDonaldTrump

The United States must, at long last, be treated fairly on Trade. If we charge a country ZERO to sell their goods, and they charge us 25, 50 or even 100 percent to sell ours, it is UNFAIR and can no longer be tolerated. That is not Free or Fair Trade, it is Stupid Trade!

10:51 AM - 2 Jun 2018

- **Free:** Foreign firms enjoy same market access conditions as domestic competitors
- **Fair:** Barriers that do exist affect all trade partners symmetrically

The Tariff System (GATT/WTO)

- **Free?** Applied tariff rates are low, ~5% on average (Baldwin 2016)
- **Fair?** WTO members (vast majority of world economy) commit to principle of non-discrimination (Most Favored Nation)

National Income and Ad Valorem Tariff Rates, 2004

Varieties of Barriers

Direct

- Tariffs
- Non-Tariff Measures (NTMs)
    - Price controls, quotas, health and safety regulations, technical barriers
    - Mansfield and Busch (1995), Lee and Swagel (1997), Gawande and Hansen (1999), Kono (2006), Rickard (2012), Maggi, Mrázová, and Neary (2018)

Indirect (Behind-the-Border)

- Government procurement
    - Evenett and Hoekman (2004), Kono and Rickard (2014)
- Subsidies
- Excise taxes
- Regulations

Effective Discrimination: Target trade-disorting instruments to disproportionately affect disfavored trading partners.

- E.g. high agricultural duties by developed countries disproportionately harm developing countries

Varieties of Barriers

Direct
- Tariffs
- Non-Tariff Measures (NTMs)
    - Price controls, quotas, health and safety regulations, technical barriers
    - Mansfield and Busch (1995), Lee and Swagel (1997), Gawande and Hansen (1999), Kono (2006), Rickard (2012), Maggi, Mrázová, and Neary (2018)

Indirect (Behind-the-Border)
- Government procurement
    - Evenett and Hoekman (2004), Kono and Rickard (2014)
- Subsidies
- Excise taxes
- Regulations

Effective Discrimination: Target trade-disorting instruments to disproportionately affect disfavored trading partners.
- E.g. high agricultural duties by developed countries disproportionately harm developing countries

Varieties of Barriers

Direct
- Tariffs
- Non-Tariff Measures (NTMs)
  - Price controls, quotas, health and safety regulations, technical barriers
  - Mansfield and Busch (1995), Lee and Swagel (1997), Gawande and Hansen (1999), Kono (2006), Rickard (2012), Maggi, Mrázová, and Neary (2018)

Indirect (Behind-the-Border)
- Government procurement
  - Evenett and Hoekman (2004), Kono and Rickard (2014)
- Subsidies
- Excise taxes
- Regulations

Effective Discrimination: Target trade-disorting instruments to disproportionately affect disfavored trading partners.
- E.g. high agricultural duties by developed countries disproportionately harm developing countries

Approach

Trade Costs: Policy distortions and transportation costs to access market i in excess of those faced by firms in country i

Overview

1. Build model of international economy subject to trade costs (Eaton and Kortum 2002)
2. Derive structural relationship linking trade costs to price levels, trade flows, market shares of home producers

   - Anderson and Van Wincoop (2003), Waugh (2010), Simonovska and Waugh (2014), Sposi (2015), Waugh and Ravikumar (2016)

3. Decompose trade costs into economic (transportation costs) and political (policy barriers) components
4. Model transportation costs, combine with data on variables in (2) to separately estimate magnitude of policy barriers

$\tau_{ij} - 1 \geq 0$ - ad valorem tariff equivalent of policy barriers country i imposes on country j

Approach

Trade Costs: Policy distortions and transportation costs to access market i in excess of those faced by firms in country i

Overview

1. Build model of international economy subject to trade costs (Eaton and Kortum 2002)
2. Derive structural relationship linking trade costs to price levels, trade flows, market shares of home producers

   - Anderson and Van Wincoop (2003), Waugh (2010), Simonovska and Waugh (2014), Sposi (2015), Waugh and Ravikumar (2016)

3. Decompose trade costs into economic (transportation costs) and political (policy barriers) components
4. Model transportation costs, combine with data on variables in (2) to separately estimate magnitude of policy barriers

$\tau_{ij} - 1 \geq 0$ - ad valorem tariff equivalent of policy barriers country i imposes on country j

Approach

Trade Costs: Policy distortions and transportation costs to access market i in excess of those faced by firms in country i

Overview

1. Build model of international economy subject to trade costs (Eaton and Kortum 2002)
2. Derive structural relationship linking trade costs to price levels, trade flows, market shares of home producers
   - Anderson and Van Wincoop (2003), Waugh (2010), Simonovska and Waugh (2014), Sposi (2015), Waugh and Ravikumar (2016)
3. Decompose trade costs into economic (transportation costs) and political (policy barriers) components
4. Model transportation costs, combine with data on variables in (2) to separately estimate magnitude of policy barriers

$\tau_{ij} - 1 \geq 0$ - ad valorem tariff equivalent of policy barriers country i imposes on country j

Approach

Trade Costs: Policy distortions and transportation costs to access market i in excess of those faced by firms in country i

Overview

1. Build model of international economy subject to trade costs (Eaton and Kortum 2002)
2. Derive structural relationship linking trade costs to price levels, trade flows, market shares of home producers
   - Anderson and Van Wincoop (2003), Waugh (2010), Simonovska and Waugh (2014), Sposi (2015), Waugh and Ravikumar (2016)
3. Decompose trade costs into economic (transportation costs) and political (policy barriers) components
4. Model transportation costs, combine with data on variables in (2) to separately estimate magnitude of policy barriers

$\tau_{ij} - 1 \geq 0$ - ad valorem tariff equivalent of policy barriers country i imposes on country j

Approach

Trade Costs: Policy distortions and transportation costs to access market i in excess of those faced by firms in country i

Overview

1. Build model of international economy subject to trade costs (Eaton and Kortum 2002)
2. Derive structural relationship linking trade costs to price levels, trade flows, market shares of home producers
   - Anderson and Van Wincoop (2003), Waugh (2010), Simonovska and Waugh (2014), Sposi (2015), Waugh and Ravikumar (2016)
3. Decompose trade costs into economic (transportation costs) and political (policy barriers) components
4. Model transportation costs, combine with data on variables in (2) to separately estimate magnitude of policy barriers

$\tau_{ij} - 1 \geq 0$ - ad valorem tariff equivalent of policy barriers country i imposes on country j

Approach

Trade Costs: Policy distortions and transportation costs to access market i in excess of those faced by firms in country i

Overview

1. Build model of international economy subject to trade costs (Eaton and Kortum 2002)
2. Derive structural relationship linking trade costs to price levels, trade flows, market shares of home producers
   - Anderson and Van Wincoop (2003), Waugh (2010), Simonovska and Waugh (2014), Sposi (2015), Waugh and Ravikumar (2016)
3. Decompose trade costs into economic (transportation costs) and political (policy barriers) components
4. Model transportation costs, combine with data on variables in (2) to separately estimate magnitude of policy barriers

$\tau_{ij} - 1 \geq 0$ - ad valorem tariff equivalent of policy barriers country i imposes on country j

Adjacent Literatures

- Indices of Trade Openness
    - Sachs and Warner (1995), Anderson and Neary (1996), Kee, Nicita, and Olarreaga (2009)

- Political Economy of Protectionism
    - Goldberg and Maggi (1999), Mansfield, Milner, and Rosendorff (2000), Milner and Kubota (2005), Tavares (2008), Kono (2009), Gawande, Krishna, and Olarreaga (2009), Betz (2017), Kim (2017)

- Bargaining and International Institutions
    - Hirschman (1945), Pollins (1989), Gowa and Mansfield (1993), Milner (1997), Bagwell and Staiger (1999), Maggi (1999), Steinberg (2002), Davis (2006), Aghion, Antràs, and Helpman (2007), Head, Mayer, and Ries (2010), Antràs and Padró i Miquel (2011), Dube, Kaplan, and Naidu (2011), Berger et al. (2013), Ossa (2014), Carnegie (2014), Bagwell, Staiger, and Yurukoglu (2018)

Adjacent Literatures

- Indices of Trade Openness
  - Sachs and Warner (1995), Anderson and Neary (1996), Kee, Nicita, and Olarreaga (2009)

- Political Economy of Protectionism
  - Goldberg and Maggi (1999), Mansfield, Milner, and Rosendorff (2000), Milner and Kubota (2005), Tavares (2008), Kono (2009), Gawande, Krishna, and Olarreaga (2009), Betz (2017), Kim (2017)

- Bargaining and International Institutions
  - Hirschman (1945), Pollins (1989), Gowa and Mansfield (1993), Milner (1997), Bagwell and Staiger (1999), Maggi (1999), Steinberg (2002), Davis (2006), Aghion, Antràs, and Helpman (2007), Head, Mayer, and Ries (2010), Antràs and Padró i Miquel (2011), Dube, Kaplan, and Naidu (2011), Berger et al. (2013), Ossa (2014), Carnegie (2014), Bagwell, Staiger, and Yurukoglu (2018)

Adjacent Literatures

- Indices of Trade Openness
  - Sachs and Warner (1995), Anderson and Neary (1996), Kee, Nicita, and Olarreaga (2009)

- Political Economy of Protectionism
  - Goldberg and Maggi (1999), Mansfield, Milner, and Rosendorff (2000), Milner and Kubota (2005), Tavares (2008), Kono (2009), Gawande, Krishna, and Olarreaga (2009), Betz (2017), Kim (2017)

- Bargaining and International Institutions
  - Hirschman (1945), Pollins (1989), Gowa and Mansfield (1993), Milner (1997), Bagwell and Staiger (1999), Maggi (1999), Steinberg (2002), Davis (2006), Aghion, Antràs, and Helpman (2007), Head, Mayer, and Ries (2010), Antràs and Padró i Miquel (2011), Dube, Kaplan, and Naidu (2011), Berger et al. (2013), Ossa (2014), Carnegie (2014), Bagwell, Staiger, and Yurukoglu (2018)
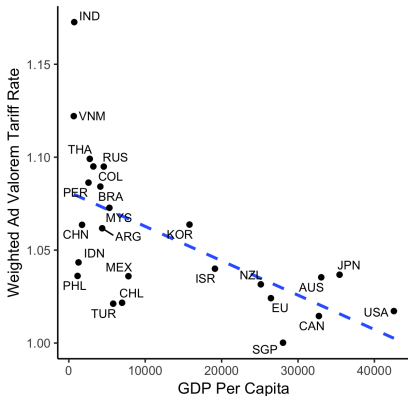
Bottom Line
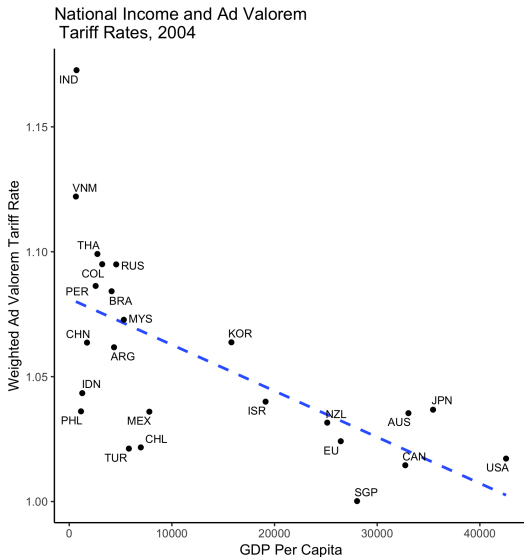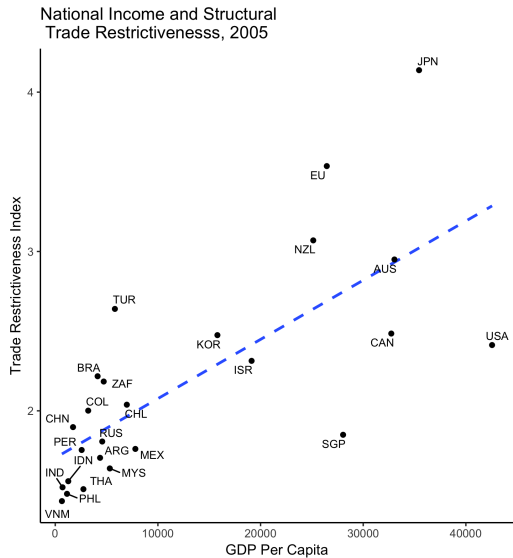
National Income and Ad Valorem Tariff Rates, 2004

Bottom Line

National Income and Structural Trade Restrictivenesss, 2005
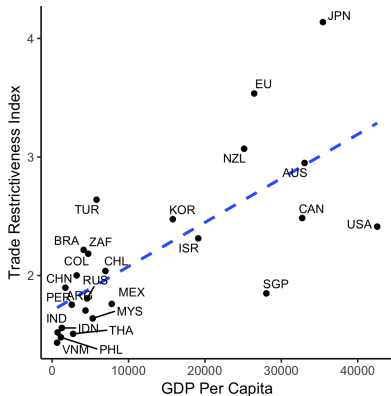
Bottom Line

National Income and Ad Valorem Tariff Rates, 2004

National Income and Structural Trade Restrictivenesss, 2005

Model

Model Intuition

- N countries $i \in \{1, ..., N\}$ with representative consumers
  - Value C-D mixture of tradable goods and nontradable services
  - Earn wage w_i for every unit of labor endowment L_i supplied
- Competitive economy, stochastic technology
  - Production requires labor and bundle of intermediate inputs

Structural Relationship

$$d_{ij} = \left(\frac{\lambda_{ij}}{\lambda_{jj}} \right)^{-\frac{1}{\theta}} \frac{P_i}{P_j} \qquad (1)$$

- d_{ij} - trade costs
- λ_{ij} - share of j's producers in i's market for tradables
- λ_{jj} - share of j's producers in home market for tradables
- P_i - price level of tradables
- θ - trade elasticity

Model Intuition

- N countries $i \in \{1, ..., N\}$ with representative consumers
  - Value C-D mixture of tradable goods and nontradable services
  - Earn wage w_i for every unit of labor endowment L_i supplied
- Competitive economy, stochastic technology
  - Production requires labor and bundle of intermediate inputs

Structural Relationship

$$d_{ij} = \left(\frac{\lambda_{ij}}{\lambda_{jj}} \right)^{-\frac{1}{\theta}} \frac{P_i}{P_j} \qquad (1)$$

- d_{ij} - trade costs
- λ_{ij} - share of j's producers in i's market for tradables
- λ_{jj} - share of j's producers in home market for tradables
- P_i - price level of tradables
- θ - trade elasticity

Model Intuition

- N countries $i \in \{1, ..., N\}$ with representative consumers
  - Value C-D mixture of tradable goods and nontradable services
  - Earn wage w_i for every unit of labor endowment L_i supplied
- Competitive economy, stochastic technology
  - Production requires labor and bundle of intermediate inputs

Structural Relationship

$$d_{ij} = \left(\frac{\lambda_{ij}}{\lambda_{jj}} \right)^{-\frac{1}{\theta}} \frac{P_i}{P_j} \tag{1}$$

- d_{ij} - trade costs
- λ_{ij} - share of j's producers in i's market for tradables
- λ_{jj} - share of j's producers in home market for tradables
- P_i - price level of tradables
- θ - trade elasticity

Consumption

Consumer's Problem

$$\begin{aligned} \max \quad & Q_i^{\alpha_i} S_i^{1-\alpha_i} \\ \text{subject to} \quad & P_i Q_i + P_i^s S_i \le w_i L_i \end{aligned} \tag{2}$$

CES Preferences over Tradable Varieties

$$Q_i = \left(\int_{[0,1]} q_i(\omega)^{\frac{\sigma-1}{\sigma}} d\omega \right)^{\frac{\sigma}{\sigma-1}} \tag{3}$$

Tradable Price Index

$$P_i = \left(\int_{[0,1]} p_i(\omega)^{1-\sigma} \right)^{\frac{1}{1-\sigma}} \tag{4}$$

Expenditure on Tradables

$$E_i^q = \alpha_i I_i + D_i = P_i Q_i^\star$$

Consumption

Consumer's Problem

$$\begin{aligned}
\max \quad & Q_i^{\alpha_i} S_i^{1-\alpha_i} \\
\text{subject to} \quad & P_i Q_i + P_i^s S_i \leq w_i L_i
\end{aligned} \tag{2}$$

CES Preferences over Tradable Varieties

$$Q_i = \left(\int_{[0,1]} q_i(\omega)^{\frac{\sigma-1}{\sigma}} d\omega \right)^{\frac{\sigma}{\sigma-1}} \tag{3}$$

Tradable Price Index

$$P_i = \left(\int_{[0,1]} p_i(\omega)^{1-\sigma} \right)^{\frac{1}{1-\sigma}} \tag{4}$$

Expenditure on Tradables

$$E_i^q = \alpha_i l_i + D_i = P_i Q_i^{\star}$$

Consumption

Consumer's Problem

$$
\begin{aligned}
\max \quad & Q_i^{\alpha_i} S_i^{1-\alpha_i} \\
\text{subject to} \quad & P_i Q_i + P_i^s S_i \leq w_i L_i
\end{aligned}
\tag{2}
$$

CES Preferences over Tradable Varieties

$$
Q_i = \left(\int_{[0,1]} q_i(\omega)^{\frac{\sigma-1}{\sigma}} d\omega \right)^{\frac{\sigma}{\sigma-1}}
\tag{3}
$$

Tradable Price Index

$$
P_i = \left(\int_{[0,1]} p_i(\omega)^{1-\sigma} \right)^{\frac{1}{1-\sigma}}
\tag{4}
$$

Expenditure on Tradables

$$
E_i^q = \alpha_i I_i + D_i = P_i Q_i^\star
$$

Consumption

Consumer's Problem

$$
\begin{aligned}
\max \quad & Q_i^{\alpha_i} S_i^{1-\alpha_i} \\
\text{subject to} \quad & P_i Q_i + P_i^s S_i \leq w_i L_i
\end{aligned}
\tag{2}
$$

CES Preferences over Tradable Varieties

$$
Q_i = \left(\int_{[0,1]} q_i(\omega)^{\frac{\sigma-1}{\sigma}} d\omega \right)^{\frac{\sigma}{\sigma-1}}
\tag{3}
$$

Tradable Price Index

$$
P_i = \left(\int_{[0,1]} p_i(\omega)^{1-\sigma} \right)^{\frac{1}{1-\sigma}}
\tag{4}
$$

Expenditure on Tradables

$$
E_i^q = \alpha_i I_i + D_i = P_i Q_i^{\star}
$$

Production

Costs

$$c_i = w_i^{1-\beta} P_i^{\beta} \tag{5}$$

- w_i - cost of labor
- P_i - cost of composite intermediate good
  - equivalent to composite consumption good

$$E_i^x = \beta X_i$$

Local Prices

$$p_{ii}(\omega) = \frac{c_i}{z_i(\omega)} \tag{6}$$

Technology (Frechet)

$$F_i(z) = \Pr\{z_i(\omega) \le z\} = \exp\left\{-T_i z^{-\theta}\right\} \tag{7}$$

Production

Costs

$$c_i = w_i^{1-\beta} P_i^{\beta} \tag{5}$$

- w_i - cost of labor
- P_i - cost of composite intermediate good
  - equivalent to composite consumption good

$$E_i^x = \beta X_i$$

Local Prices

$$p_{ii}(\omega) = \frac{c_i}{z_i(\omega)} \tag{6}$$

Technology (Frechet)

$$F_i(z) = \Pr\{z_i(\omega) \le z\} = \exp\left\{-T_i z^{-\theta}\right\} \tag{7}$$

Production

Costs

$$c_i = w_i^{1-\beta} P_i^{\beta} \tag{5}$$

- w_i - cost of labor
- P_i - cost of composite intermediate good
  - equivalent to composite consumption good
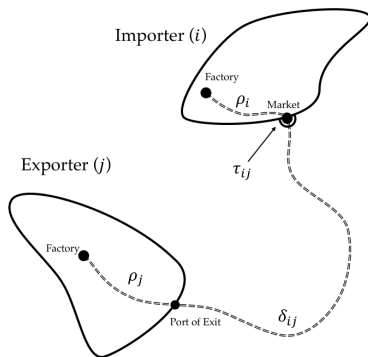
$$E_i^x = \beta X_i$$

Local Prices

$$p_{ii}(\omega) = \frac{c_i}{z_i(\omega)} \tag{6}$$

Technology (Frechet)

$$F_i(z) = \Pr\{z_i(\omega) \le z\} = \exp\left\{-T_i z^{-\theta}\right\} \tag{7}$$

Production

Costs

$$c_i = w_i^{1-\beta} P_i^{\beta} \tag{5}$$

- w_i - cost of labor
- P_i - cost of composite intermediate good
  - equivalent to composite consumption good

$$E_i^x = \beta X_i$$

Local Prices

$$p_{ii}(\omega) = \frac{c_i}{z_i(\omega)} \tag{6}$$

Technology (Frechet)

$$F_i(z) = \Pr\{z_i(\omega) \leq z\} = \exp\{-T_i z^{-\theta}\} \tag{7}$$
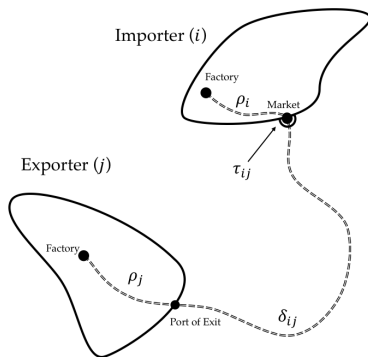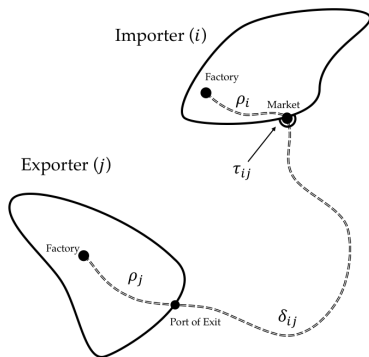
Trade Costs

$$p_{ji}(\omega) = d_{ji} p_{ii}(\omega)$$

$$d_{ij} = \rho_j \delta_{ij} \tau_{ij} \qquad (8)$$

- $\tau_{ij} = 1 \implies$ no policy distortion
- $\tau_{jj} = \delta_{jj} = 1$

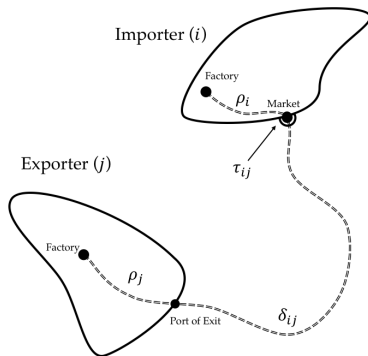$$p_i^\star(\omega) = \min_{j \in \{1, \dots, N\}} \{p_{ij}\}$$

Trade Costs

$$p_{ji}(\omega) = d_{ji}p_{ii}(\omega)$$

$$d_{ij} = \rho_j\delta_{ij}\tau_{ij} \qquad (8)$$

- $\tau_{ij} = 1 \implies$ no policy distortion
- $\tau_{jj} = \delta_{jj} = 1$

$$p_i^\star(\omega) = \min_{j\in\{1,\ldots,N\}}\{p_{ij}\}$$

Trade Costs

$$p_{ji}(\omega) = d_{ji}p_{ii}(\omega)$$

$$d_{ij} = \rho_j \delta_{ij} \tau_{ij} \qquad (8)$$

- $\tau_{ij} = 1 \implies$ no policy distortion
- $\tau_{jj} = \delta_{jj} = 1$

$$p_i^\star(\omega) = \min_{j \in \{1,\dots,N\}} \{p_{ij}\}$$

Trade Costs

$$p_{ji}(\omega) = d_{ji}p_{ii}(\omega)$$

$$d_{ij} = \rho_j \delta_{ij}\tau_{ij} \qquad (8)$$

- $\tau_{ij} = 1 \implies$ no policy distortion

- $\tau_{jj} = \delta_{jj} = 1$

$$p_i^\star(\omega) = \min_{j \in \{1,\ldots,N\}} \{p_{ij}\}$$

Equilibrium

Total Expenditure on Tradables

$$X_i = \underbrace{E_i^q + E_i^x}_{E_i} - D_i \tag{9}$$

Trade Shares

$$\Omega_{ij}^\star = \left\{ \omega \in [0,1] \mid p_{ij}(\omega) \leq \min_{k \neq j} \left\{ p_{ik} \right\} \right\}$$

$$\lambda_{ij}(\boldsymbol{w}) = \frac{1}{E_i} \int_{\Omega_{ij}^\star} p_{ij}(\omega) q_i \left(p_{ij}(\omega) \right) d\omega \tag{10}$$

Market Clearing

$$X_i = \sum_{j=1}^{N} \lambda_{ji}(\boldsymbol{w}) E_j \tag{11}$$

Definition: An *international equilibrium* is a vector of wages $\boldsymbol{w}$ such that Equations 9, 10, and 11 hold for all $i \in \{1, ..., N\}$.

Equilibrium

Total Expenditure on Tradables

$$X_i = \underbrace{E_i^q + E_i^x}_{E_i} - D_i \tag{9}$$

Trade Shares

$$\Omega_{ij}^\star = \left\{ \omega \in [0,1] \mid p_{ij}(\omega) \leq \min_{k \neq j} \{p_{ik}\} \right\}$$

$$\lambda_{ij}(\boldsymbol{w}) = \frac{1}{E_i} \int_{\Omega_{ij}^\star} p_{ij}(\omega) q_i\left(p_{ij}(\omega)\right) d\omega \tag{10}$$

Market Clearing

$$X_i = \sum_{j=1}^{N} \lambda_{ji}(\boldsymbol{w}) E_j \tag{11}$$

Definition: An *international equilibrium* is a vector of wages $\boldsymbol{w}$ such that Equations 9, 10, and 11 hold for all $i \in \{1, ..., N\}$.

Equilibrium

Total Expenditure on Tradables

$$X_i = \underbrace{E_i^q + E_i^x}_{E_i} - D_i \tag{9}$$

Trade Shares

$$\Omega_{ij}^\star = \left\{ \omega \in [0,1] \mid p_{ij}(\omega) \leq \min_{k \neq j} \{ p_{ik} \} \right\}$$

$$\lambda_{ij}(\boldsymbol{w}) = \frac{1}{E_i} \int_{\Omega_{ij}^\star} p_{ij}(\omega) q_i \left(p_{ij}(\omega) \right) d\omega \tag{10}$$

Market Clearing

$$X_i = \sum_{j=1}^{N} \lambda_{ji}(\boldsymbol{w}) E_j \tag{11}$$

Definition: An *international equilibrium* is a vector of wages $\boldsymbol{w}$ such that Equations 9, 10, and 11 hold for all $i \in \{1, ..., N\}$.

Equilibrium

Total Expenditure on Tradables

$$X_i = \underbrace{E_i^q + E_i^x}_{E_i} - D_i \tag{9}$$

Trade Shares

$$\Omega_{ij}^\star = \left\{ \omega \in [0,1] \mid p_{ij}(\omega) \leq \min_{k \neq j} \{p_{ik}\} \right\}$$

$$\lambda_{ij}(\boldsymbol{w}) = \frac{1}{E_i} \int_{\Omega_{ij}^\star} p_{ij}(\omega) q_i \left(p_{ij}(\omega) \right) d\omega \tag{10}$$

Market Clearing

$$X_i = \sum_{j=1}^{N} \lambda_{ji}(\boldsymbol{w}) E_j \tag{11}$$

Definition: An *international equilibrium* is a vector of wages $\boldsymbol{w}$ such that Equations 9, 10, and 11 hold for all $i \in \{1, ..., N\}$.

Isolating Policy Barriers (I)

Trade Shares (w/ Frechet)

$$\lambda_{ij}(\boldsymbol{w}) = \frac{T_j \left(d_{ij} w_j^{1-\beta} P_j^{\beta} \right)^{-\theta}}{\sum_j T_j \left(d_{ij} w_j^{1-\beta} P_j^{\beta} \right)^{-\theta}}$$

$$= \frac{T_j \left(\underbrace{\rho_j \delta_{ij} \tau_{ij}}_{d_{ij}} w_j^{1-\beta} P_j^{\beta} \right)^{-\theta}}{\frac{1}{\gamma} P_i^{-\theta}}$$

In Differences

$$\frac{\lambda_{ij}}{\lambda_{jj}} = \left(\underbrace{\delta_{ij} \tau_{ij} \frac{P_j}{P_i}}_{\text{observables}} \right)^{-\theta}$$

Isolating Policy Barriers (I)

Trade Shares (w/ Frechet)

$$\lambda_{ij}(\boldsymbol{w}) = \frac{T_j \left(d_{ij} w_j^{1-\beta} P_j^{\beta} \right)^{-\theta}}{\sum_j T_j \left(d_{ij} w_j^{1-\beta} P_j^{\beta} \right)^{-\theta}}$$

$$= \frac{T_j \left(\underbrace{\rho_j \delta_{ij} \tau_{ij}}_{d_{ij}} w_j^{1-\beta} P_j^{\beta} \right)^{-\theta}}{\frac{1}{\gamma} P_i^{-\theta}}$$

In Differences

$$\frac{\lambda_{ij}}{\lambda_{jj}} = \left(\underbrace{\delta_{ij} \tau_{ij} \frac{P_j}{P_i}}_{\text{observables}} \right)^{-\theta}$$

Isolating Policy Barriers (II)

$$\tau_{ij} = \left(\frac{\lambda_{ij}}{\lambda_{jj}}\right)^{-\frac{1}{\theta}} \frac{P_i}{P_j} \underbrace{\frac{1}{\delta_{ij}}}_{\substack{\text{freight cost} \\ \text{correction}}} \tag{12}$$

Calibration

Prices (I)

Data

- International Comparison Program (World Bank)
- M tradable expenditure categories $m \in \{1, ..., M\}$ Empirical Categories

$$P_i = \sum_{m=1}^{M} e_i^m P_i^m$$

Expenditure on Tradables

$$\alpha_i = \frac{1}{I_i} \sum_{m=1}^{M} e_i^m$$

$$E_i = \underbrace{I_i + \beta X_i}_{\text{gross consumption}} - \underbrace{(1 - \alpha_i) I_i}_{\text{services exp.}}$$

Home Expenditure

$$\lambda_{jj} = E_j \left(1 - \sum_{i \neq j} \lambda_{ji} \right)$$

Prices (I)

Data

- International Comparison Program (World Bank)
- M tradable expenditure categories $m \in \{1, ..., M\}$ Empirical Categories

$$P_i = \sum_{m=1}^{M} e_i^m P_i^m$$

Expenditure on Tradables
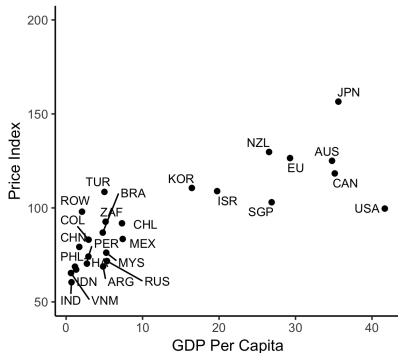
$$\alpha_i = \frac{1}{I_i} \sum_{m=1}^{M} e_i^m$$

$$E_i = \underbrace{I_i + \beta X_i}_{\text{gross consumption}} - \underbrace{(1-\alpha_i)I_i}_{\text{services exp.}}$$
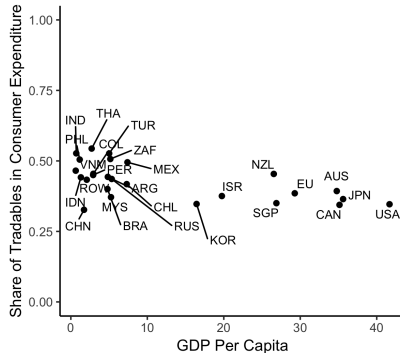
Home Expenditure

$$\lambda_{jj} = E_j \left(1 - \sum_{i \neq j} \lambda_{ji} \right)$$

Prices (I)

Data

- International Comparison Program (World Bank)
- M tradable expenditure categories $m \in \{1, ..., M\}$ Empirical Categories

$$P_i = \sum_{m=1}^{M} e_i^m P_i^m$$

Expenditure on Tradables

$$\alpha_i = \frac{1}{I_i} \sum_{m=1}^{M} e_i^m$$

$$E_i = \underbrace{I_i + \beta X_i}_{\text{gross consumption}} - \underbrace{(1 - \alpha_i) I_i}_{\text{services exp.}}$$

Home Expenditure

$$\lambda_{jj} = E_j \left(1 - \sum_{i \neq j} \lambda_{ji} \right)$$

Prices (II)

$$\delta_{ij} : \mathbf{Z}_{ij} \to \hat{\delta}_{ij}$$

Data

- Transportation Mode Shares
  - United States, Japan, European Union, Brazil
- Freight Costs
  - United States Census Bureau
  - OECD Maritime Transport Costs
- Geographic Covariates ($\mathbf{Z}_{ij}$)
  - Sea Distance
  - Population-weighted great circle distance
 - Island indicators
  - Contiguity

Freight Cost Model

Freight Costs (I)

$$\delta_{ij} : \boldsymbol{Z}_{ij} \to \hat{\delta}_{ij}$$

Data

- Transportation Mode Shares
  - United States, Japan, European Union, Brazil
- Freight Costs
  - United States Census Bureau
  - OECD Maritime Transport Costs
- Geographic Covariates ($\boldsymbol{Z}_{ij}$)
  - Sea Distance
  - Population-weighted great circle distance
  - Island indicators
  - Contiguity

Freight Cost Model

Freight Costs (II)

Factual and Predicted Freight Costs, 2005
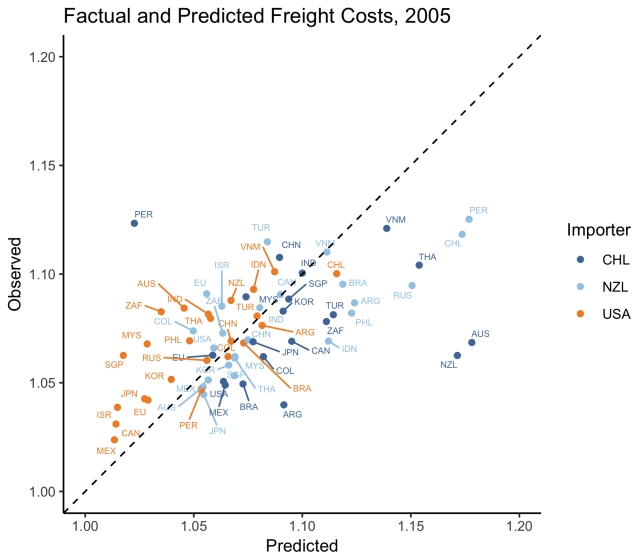
Isolating Policy Barriers (Again)

$$\tau_{ij} = \left(\frac{\lambda_{ij}}{\lambda_{jj}}\right)^{-\frac{1}{\theta}} \frac{P_i}{P_j} \underbrace{\frac{1}{\delta_{ij}(\boldsymbol{Z}_{ij})}}_{\substack{\text{freight cost} \\ \text{correction}}} \tag{13}$$

- 25 countries, representing 91 percent of world GDP.
  - Rest of World as aggregate outside economy
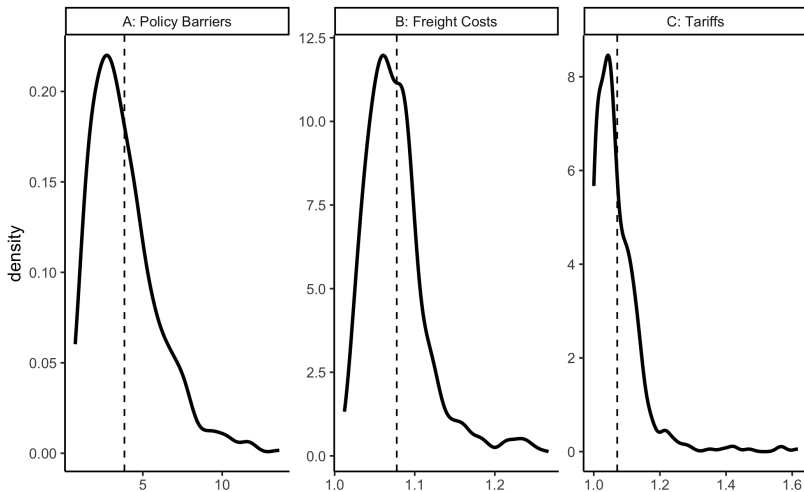- $\theta = 5$

Isolating Policy Barriers (Again)

$$\tau_{ij} = \left(\frac{\lambda_{ij}}{\lambda_{jj}}\right)^{-\frac{1}{\theta}} \frac{P_i}{P_j} \underbrace{\frac{1}{\delta_{ij}(\boldsymbol{Z}_{ij})}}_{\substack{\text{freight cost} \\ \text{correction}}} \tag{13}$$

- 25 countries, representing 91 percent of world GDP.
  - Rest of World as aggregate outside economy
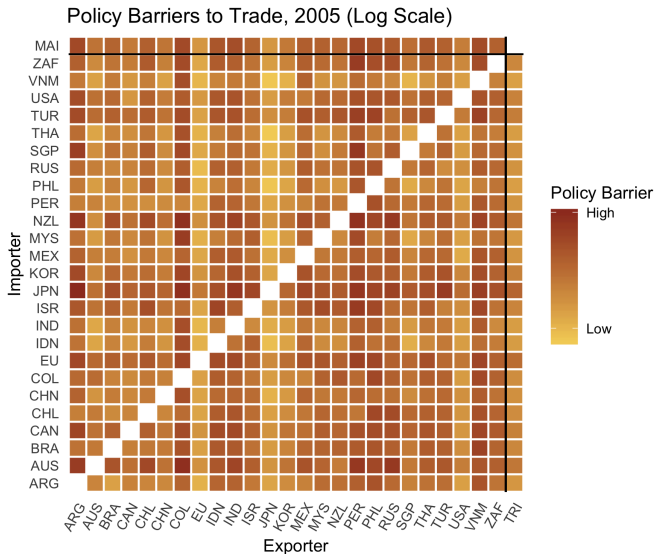- $\theta = 5$

Results

Magnitude of Policy Barriers

- **Free?** Average policy barrier equivalent to 284 percent import tariff ($\tau = 3.84$)

Distribution of Policy Barriers

- **Fair?** Within-country standard deviation of τ_{ij} is 1.72

Policy Barriers to Trade, 2005 (Log Scale)

Trade Restrictiveness and Market Access (I)

Trade Restrictiveness Index

$$\text{TRI}_i = \frac{1}{\sum_{j \neq i} E_j} \sum_{j \neq i} \tau_{ij} E_j \tag{14}$$

Market Access Index

$$\text{MAI}_j = \frac{1}{\sum_{i \neq j} E_i} \sum_{i \neq j} \tau_{ij} E_i \tag{15}$$
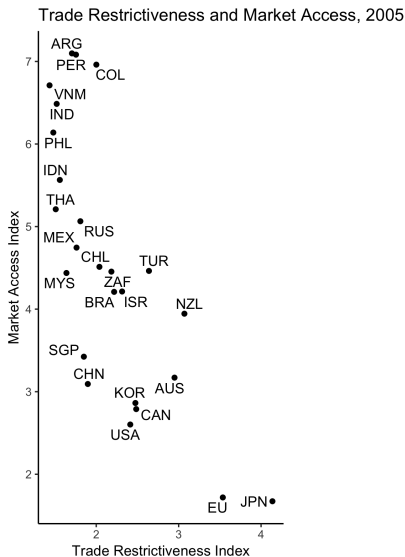
Trade Restrictiveness and Market Access (I)

Trade Restrictiveness Index

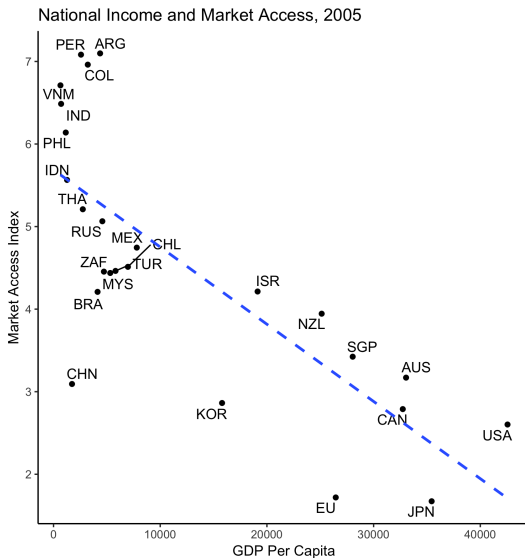$$\text{TRI}_i = \frac{1}{\sum_{j \neq i} E_j} \sum_{j \neq i} \tau_{ij} E_j \tag{14}$$

Market Access Index

$$\text{MAI}_j = \frac{1}{\sum_{i \neq j} E_i} \sum_{i \neq j} \tau_{ij} E_i \tag{15}$$

Trade Restrictiveness and Market Access (II)

Trade Restrictiveness and Market Access, 2005

Market Access Barriers

National Income and Market Access, 2005

Correlates of Policy Barriers

	Dependent variable:
	Structural Policy Barrier
Tariffs	2.886***
	(0.875)
PTAs	−0.706***
	(0.133)
Core NTM	−0.285
	(0.440)
Health/Safety NTM	−0.160
	(0.351)
Other NTM	−0.241
	(0.691)
Importer Fixed Effects	✓
Exporter Fixed Effects	✓
Observations	506
R^2	0.781
Note:	*p<0.1; **p<0.05; ***p<0.01

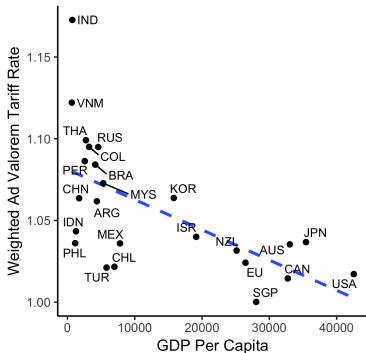# U.S. Barriers and Market Access

U.S. Trade Restrictiveness and Market Access, 2005
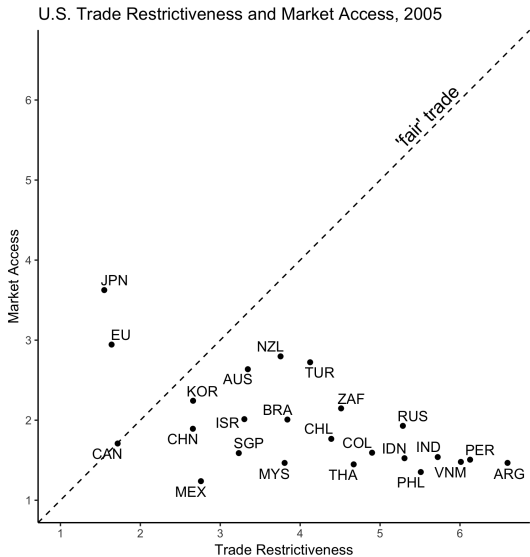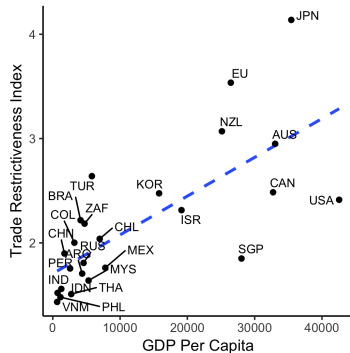
Measurement Matters

National Income and Ad Valorem Tariff Rates, 2004

National Income and Structural Trade Restrictivenesss, 2005

Conclusion

State Capacity and Protectionism

- Tariffs as "second-best" solution to revenue-raising problem facing low-capacity governments
    - Acemoglu (2005), Rodrik (2008), and Queralt (2015)
- Developing (more autocratic) world not necessarily more "welfare-concious" than developed counterparts
    - Milner and Kubota (2005), Gawande, Krishna, and Olarreaga (2009); Gawande, Krishna, and Olarreaga (2015)

Development and Trade Discrimination

- Growth causally linked to market access conditions abroad (Romalis 2007)
- Lack of market access by developing countries may hinder development prospects
    - Redding and Venables (2004), Romalis (2007), Waugh (2010)

International trading system neither free nor fair – and developing world bears brunt of inequality

Conclusion

State Capacity and Protectionism

- Tariffs as "second-best" solution to revenue-raising problem facing low-capacity governments
    - Acemoglu (2005), Rodrik (2008), and Queralt (2015)
- Developing (more autocratic) world not necessarily more "welfare-concious" than developed counterparts
    - Milner and Kubota (2005), Gawande, Krishna, and Olarreaga (2009); Gawande, Krishna, and Olarreaga (2015)

Development and Trade Discrimination

- Growth causally linked to market access conditions abroad (Romalis 2007)
- Lack of market access by developing countries may hinder development prospects
    - Redding and Venables (2004), Romalis (2007), Waugh (2010)

International trading system neither free nor fair – and developing world bears brunt of inequality

Conclusion

State Capacity and Protectionism

- Tariffs as "second-best" solution to revenue-raising problem facing low-capacity governments
    - Acemoglu (2005), Rodrik (2008), and Queralt (2015)
- Developing (more autocratic) world not necessarily more "welfare-concious" than developed counterparts
    - Milner and Kubota (2005), Gawande, Krishna, and Olarreaga (2009); Gawande, Krishna, and Olarreaga (2015)

Development and Trade Discrimination

- Growth causally linked to market access conditions abroad (Romalis 2007)
- Lack of market access by developing countries may hinder development prospects
    - Redding and Venables (2004), Romalis (2007), Waugh (2010)

International trading system neither free nor fair – and developing world bears brunt of inequality

Table of Contents

Freight Cost Model

- Products $m \in \{1, ..., M\}$
- Transportation modes $k \in \{1, ..., K\}$
- ζ_{ij}^{mk} share of product m transported by mode k

Mode and Cost Functions

$$g : \{\boldsymbol{Z}_{ij}, d^m\} \to \delta_{ij}^{mk}$$

$$h : \{\boldsymbol{Z}_{ij}, d^m\} \to \zeta_{ij}^{mk}$$

Aggregate Freight Costs

$$\hat{\delta}_{ij}\left(\boldsymbol{Z}_{ij}, \boldsymbol{d}_{ij}\right) = \frac{1}{X_{ij}} \sum_{m=1}^{M} x_{ij}^m \sum_{k=1}^{K} g\left(\boldsymbol{Z}_{ij}, d^m\right) h\left(\boldsymbol{Z}_{ij}, d^m\right)$$

Back

Tradable Expenditure Categories

Expenditure Category	Tradable?
Food and non-alcoholic beverages	✓
Alcoholic beverages and tobacco	✓
Clothing and footwear	✓
Housing, water, electricity, gas and other fuels	
Furnishings, household equipment and household maintenance	✓
Health	
Transport	✓
Communication	✓
Recreation and culture	✓
Education	
Restaurants and hotels	
Miscellaneous goods and services	
Net purchases from abroad	
Collective consumption expenditure by government	
Machinery and equipment	✓
Construction	
Other products	
Changes in inventories and valuables	
Balance of exports and imports	