International Trade: Lecture 7

Trade Agreements

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Fall 2024

Bagwell and Staiger (1999)

- Two countries: home and foreign ($*$) and two goods x and y
- Production occurs under conditions of perfect competition
- Each country has an import tax/subsidy policy instrument
- Home's (foreign's) import good is x (y)
- Home and foreign relative prices

$$p = \frac{p_x}{p_y}, \qquad p^* = \frac{p_x^*}{p_y^*}.$$

- Home and foreign non-prohibitive ad valorem import tariff t (t^*)

$$\tau = (1 + t), \qquad \tau^* = (1 + t^*),$$

$$p = \tau p^w = p(\tau, p^w), \qquad p^* = \frac{p^w}{\tau^*} = p^*(\tau^*, p^w).$$

- Foreign (home) terms of trade p^w ($1/p^w$)

Production

- Production occurs where the slope of the production possibility frontier is equal to local relative prices
- Supply functions

$$Q_i = Q_i(p), \qquad Q_i^* = Q_i^*(p^*), \qquad i \in \{x, y\}$$

Consumption

- Consumption depends on local relative prices and tariff revenue, which is redistributed lump sum to consumers and which is measured in units of the local export good at local prices

$$D_i = D_i(p, R), \qquad D_i^* = D_i^*(p^*, R^*), \qquad i \in \{x, y\}$$

- Tariff revenue implicitly defined by

$$R = \left[D_x(p, R) - Q_x(p)\right]\left[p - p^w\right], \qquad R = R(p, p^w),$$

$$R^* = \left[D_y^*(p^*, R) - Q_y^*(p^*)\right]\left[\frac{1}{p^*} - \frac{1}{p^w}\right], \qquad R^* = R^*(p^*, p^w),$$

- Therefore national consumption can be written as:

$$C_i(p, p^w) = D_i(p, R(p, p^w)), \qquad C_i^*(p^*, p^w) = D_i^*(p^*, R(p^*, p^w)).$$

Trade Flows

- Home imports and exports

$$M_x(p, p^w) = C_x(p, p^w) - Q_x(p),$$
$$E_y(p, p^w) = Q_y(p) - C_y(p, p^w)$$

- Balanced trade

$$p^w M_x(p(\tau, p^w), p^w) = E_y(p(\tau, p^w), p^w),$$
$$M_y^*(p^*(\tau^*, p^w), p^w) = p^w E_x^*(p^*(\tau^*, p^w), p^w).$$

- Goods market clearing

$$E_y(p(\tau, \tilde{p}^w), \tilde{p}^w) = M_y^*(p^*(\tau^*, \tilde{p}^w), \tilde{p}_w),$$

where a tilde above a variable denotes the equilibrium value

Government Objectives

- Government objectives
  - Usually write objectives in terms of choice variables (tariffs)
  - Instead write objectives in terms of the local and world prices that these tariffs imply
- Home objective

$$W(p(\tau, \tilde{p}^w), \tilde{p}^w)$$

- Foreign objective

$$W^*(p^*(\tau^*, \tilde{p}^w), \tilde{p}^w)$$

- **Key assumption:** Holding its local price fixed, each government achieves higher welfare when its terms of trade improves

$$\frac{\partial W(p, \tilde{p}^w)}{\partial \tilde{p}^w} < 0 \qquad \text{and} \qquad \frac{\partial W^*(p^*, \tilde{p}^w)}{\partial \tilde{p}^w} > 0$$

- Includes government maximization of social welfare and/or political economy objectives

World and Local Prices

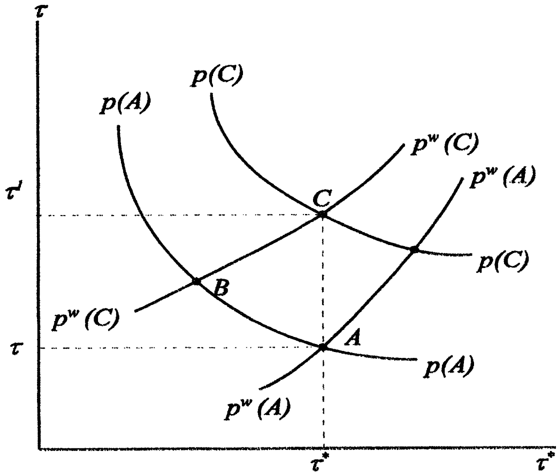

FIGURE 1. THE WORLD- AND LOCAL-PRICE EFFECTS OF A TARIFF CHANGE

Reciprocal Trade Agreements

- Assume governments seek *reciprocal trade agreements* to achieve mutually beneficial changes in trade policy
  - Pareto improvements for member countries (as measured by W and W^*) relative to unilateral tariff setting

- *Efficient reciprocal trade agreements* satisfy

$$\left.\frac{d\tau}{d\tau^*}\right|_{dW=0} = \left.\frac{d\tau}{d\tau^*}\right|_{dW^*=0},$$

so that it is impossible to increase one country's welfare without reducing the other country's welfare

Nash Non-Cooperative Equilibrium

- Each government sets its trade policy unilaterally
  - Selects a tariff to maximize its objective function taking the tariff choice of its trading partner as given
- Home and foreign first-order conditions (reaction functions)

$$W_p \frac{dp}{d\tau} + W_{p^w} \frac{\partial \tilde{p}^w}{\partial \tau} = 0,$$
$$W^*_{p^*} \frac{dp^*}{d\tau^*} + W^*_{p^w} \frac{\partial \tilde{p}^w}{\partial \tau^*} = 0,$$

which can be written as

$$W_p + \lambda W_{p^w} = 0,$$

$$W^*_{p^*} + \lambda^* W^*_{p^w} = 0,$$

where $\lambda \equiv \frac{\partial \tilde{p}^w / \partial \tau}{dp/d\tau} < 0$ and $\lambda^* \equiv \frac{\partial \tilde{p}^w / \partial \tau^*}{dp^*/d\tau^*} < 0$.

Nash Inefficiency

Proposition

Nash equilibrium tariffs are inefficient.

Proof: Totally differentiate home welfare with respect to the policies:

$$dW = W_p \frac{dp}{d\tau} d\tau + W_{p^w} \frac{\partial p^w}{\partial \tau} d\tau + W_{p^w} \frac{\partial p^w}{\partial \tau^*} d\tau^* = 0,$$

$$\frac{d\tau}{d\tau^*} \left[W_p \frac{dp}{d\tau} + W_{p^w} \frac{\partial p^w}{\partial \tau} \right] = -\frac{\partial p^w}{\partial \tau^*} W_{p^w},$$

$$\frac{d\tau}{d\tau^*} \frac{dp}{d\tau} \left[W_p + \frac{\partial p^w / \partial \tau}{dp/d\tau} W_{p^w} \right] = -\frac{\partial p^w}{\partial \tau^*} W_{p^w},$$

$$\left. \frac{d\tau}{d\tau^*} \right|_{dW=0} = -\frac{\partial p^w / \partial \tau^*}{dp/d\tau} \left[\frac{W_{p^w}}{W_p + \lambda W_{p^w}} \right].$$

Nash Inefficiency (cont'd)

Totally differentiate foreign welfare with respect to the policies:

$$
\begin{aligned}
dW^* = W^*_{p^*}\frac{dp^*}{d\tau^*}d\tau^* + W^*_{p^w}\frac{\partial p^w}{\partial \tau^*}d\tau^* + W^*_{p^w}\frac{\partial p^w}{\partial \tau}d\tau = 0, \\
W^*_{p^*}\frac{dp^*}{d\tau^*} + W^*_{p^w}\frac{\partial p^w}{\partial \tau^*} + W^*_{p^w}\frac{\partial p^w}{\partial \tau}\frac{d\tau}{d\tau^*} = 0, \\
\frac{d\tau}{d\tau^*}\frac{\partial p^w}{\partial \tau}W^*_{p^w} = -\frac{dp^*}{d\tau^*}\left[W^*_{p^*} + \frac{\partial p^w/\partial \tau^*}{dp^*/d\tau^*}W^*_{p^w}\right], \\
\left.\frac{d\tau}{d\tau^*}\right|_{dW^*=0} = -\frac{dp^*/d\tau^*}{\partial p^w/\partial \tau}\left[\frac{W^*_{p^*} + \lambda^* W^*_{p^w}}{W^*_{p^w}}\right].
\end{aligned}
$$

Nash Inefficiency (cont'd)

- Constant home and foreign welfare

$$\left.\frac{d\tau}{d\tau^*}\right|_{dW=0} = -\frac{\partial p^w/\partial \tau^*}{dp/d\tau}\left[\frac{W_{p^w}}{W_p + \lambda W_{p^w}}\right].$$

$$\left.\frac{d\tau}{d\tau^*}\right|_{dW^*=0} = -\frac{dp^*/d\tau^*}{\partial p^w/\partial \tau}\left[\frac{W^*_{p^*} + \lambda^* W^*_{p^w}}{W^*_{p^w}}\right].$$

- First-order conditions for Nash equilibrium

$$W_p + \lambda W_{p^w} = 0.$$

$$W^*_{p^*} + \lambda^* W^*_{p^w} = 0.$$

- Therefore

$$\left.\frac{d\tau}{d\tau^*}\right|_{dW=0} = \infty > \left.\frac{d\tau}{d\tau^*}\right|_{dW^*=0} = 0. \qquad \square$$

Politically Optimal Tariffs

- Consider hypothetical world in which governments assumed not to value terms of trade effects from their unilateral tariff choices
- Define *politically optimal tariffs* as any tariff pair $(\tau^{\mathsf{PO}}, \tau^{*\mathsf{PO}})$ that simultaneously satisfies the following first-order conditions

$$W_{p} = 0,$$
$$W^{*}_{p^{*}} = 0.$$

Proposition

Politically optimal tariffs are efficient.

Efficiency of Political Optimum

Proof: First-order conditions for political optimum:

$$W_p = 0,$$
$$W^*_{p^*} = 0.$$

Constant welfare for home:

$$\left.\frac{d\tau}{d\tau^*}\right|_{dW=0} = -\frac{\partial p^w/\partial \tau^*}{dp/d\tau}\left[\frac{W_{p^w}}{W_p + \lambda W_{p^w}}\right] = -\frac{\partial p^w/\partial \tau^*}{\partial p^w/\partial \tau}.$$

Constant welfare for foreign:

$$\left.\frac{d\tau}{d\tau^*}\right|_{dW^*=0} = -\frac{dp^*/d\tau^*}{\partial p^w/\partial \tau}\left[\frac{W^*_{p^*} + \lambda^* W^*_{p^w}}{W^*_{p^w}}\right] = -\frac{\partial p^w/\partial \tau^*}{\partial p^w/\partial \tau}.$$

Hence

$$\left.\frac{d\tau}{d\tau^*}\right|_{dW=0} = -\frac{\partial p_w/\partial \tau^*}{\partial p_w/\partial \tau} = \left.\frac{d\tau}{d\tau^*}\right|_{dW^*=0}. \qquad \square$$

Reciprocal Trade Agreements

- Politically optimal agreements (where $W_{\mathbf{p}} = 0 = W^*_{\mathbf{p}^*}$) are efficient
- But there are efficient agreements that are not politically optimal (where $W_{\mathbf{p}} \neq 0$ and $W^*_{\mathbf{p}^*} \neq 0$)

Purpose of Trade Agreements

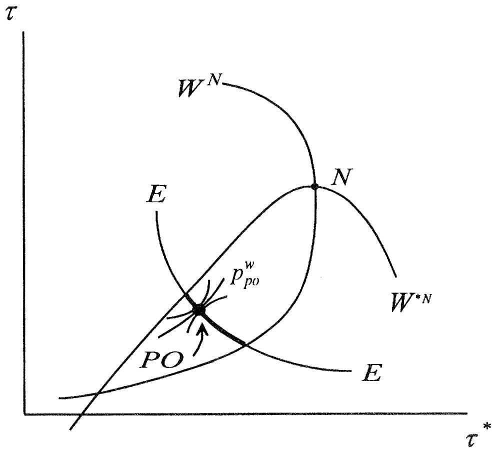

FIGURE 2. THE PURPOSE OF A RECIPROCAL TRADE AGREEMENT

GATT Principle of Reciprocity

- *Reciprocity* is one of the key principles of GATT
- Refers to the "ideal" of mutual changes in trade policy that bring about equal changes in import volumes across trading partner, measured using existing world prices
- A set of tariff changes $\Delta\tau = (\tau^1 - \tau^0)$ and $\Delta\tau^* = (\tau^{*1} - \tau^{*0})$ conforms to the principle of reciprocity if

$$\tilde{p}^{w0}\left[M_x(p(\tau^1, \tilde{p}^{w1}), \tilde{p}^{w1}) - M_x(p(\tau^0, \tilde{p}^{w0}), \tilde{p}^{w0})\right]$$
$$= \left[M_y^*(p^*(\tau^{*1}, \tilde{p}^{w1}), \tilde{p}^{w1}) - M_y^*(p^*(\tau^{*0}, \tilde{p}^{w0}), \tilde{p}^{w0})\right]$$

- Using balanced trade and goods market clearing, the reciprocity condition reduces to:

$$\left[\tilde{p}^{w1} - \tilde{p}^{w0}\right] M_x(p(\tau^1, \tilde{p}^{w1}), \tilde{p}^{w1}) = 0.$$

- Therefore mutual changes in trade policy that conform to reciprocity *leave world prices unchanged*

Reciprocal Trade Negotiations

Proposition

Beginning at a Nash equilibrium, reciprocal trade liberalization that conforms to reciprocity will increase each government's welfare until this liberalization has proceeded to the point where $\min\left[-W_{\mathbf{p}}, W^*_{\mathbf{p}^*}\right] = 0$. If countries are symmetric, this liberalization path leads to the political optimal outcome.

- Intuition: Reciprocity has the effect of neutralizing the world price effects of a government's decision to raise tariffs
- Therefore reciprocity can eliminate the externality that causes governments to make inefficient trade policy

Symmetric Case

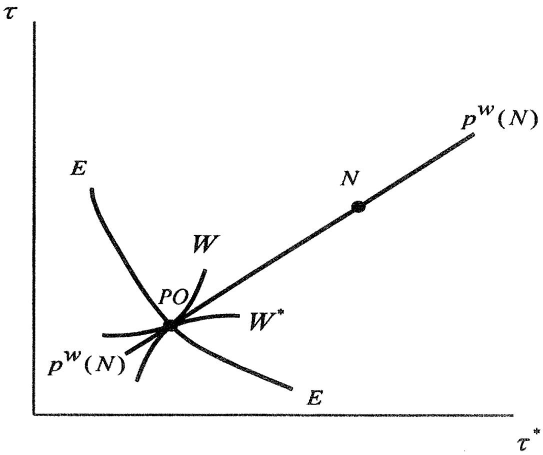

Figure 3A. Liberalization According to Reciprocity —The Symmetric Case

Asymmetric Case

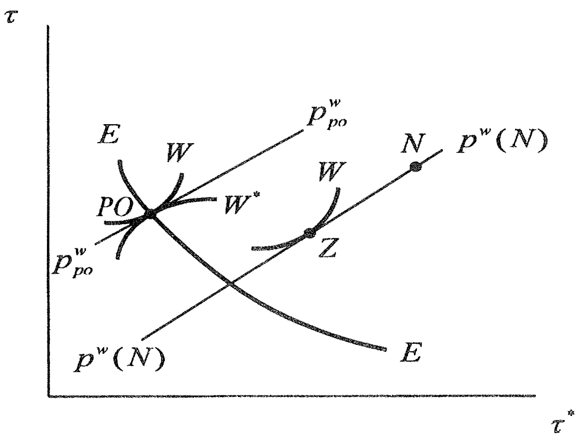

FIGURE 3B. LIBERALIZATION ACCORDING TO RECIPROCITY —THE ASYMMETRIC CASE

Reciprocal Trade Negotiations

Proposition

An efficient trade agreement can be implemented under reciprocity if and only if it is characterized by tariffs which are set at their political optimal levels.

Non-discrimination

- *Non-discrimination* – as embodied in the Most Favored Nation (MFN) clause – is a second key principle of GATT
- Non-discrimination: any tariff on a given product applied to the imports of one trading partner applies equally to all other trading partners
- One home country and three foreign countries
- Home country is a natural importer of x
- Thee foreign countries are natural importers of y
- Each foreign country trades only with the home country, and the home country is the only country that has the opportunity to set discriminatory tariffs

Local Price Externality

- If a country discriminates when setting its trade policy, all else equal, it would prefer that a greater fraction of a given import volume be provided by the export source on whom it places the highest tariff
- But the export volumes from trading partners are in turn determined in part by the local prices in these countries, so that a local price externality is created
- If the importing country adopts non-discrimination, the preference for one export source over another is removed, and the only remaining externality is the world price externality
- Principle of reciprocity neutralizes this world price externality

Most-Favored Nation Principle (MFN)

Proposition

Politically optimal tariffs are efficient if and only if they conform to MFN.

Proposition

An efficient multilateral trade agreement can be implemented under reciprocity if and only if it is characterized by tariffs which conform to the principle of MFN and are set at their politically optimal levels.

Bagwell and Staiger (2011)

- Consider a multi-good, multi-country partial equilibrium setting
- Consider a product imported by a particular domestic country
- Domestic demand

$$D(p) = \alpha - \delta(p), \qquad \delta'(p) > 0.$$

- Domestic supply

$$S(p) = \lambda + \kappa(p), \qquad \kappa'(p) > 0.$$

- Volume of domestic imports

$$M(p) = D(p) - S(p) = [\alpha - \lambda] - [\delta(p) + \kappa(p)]$$

- Government has an import tariff policy instrument
- International arbitrage (non-prohibitive tariff)

$$p = (1 + \tau)p^w = p(\tau, p^w)$$

Government Objective

- Government objective is a weighted sum of producer surplus, consumer surplus and imports

$$W(p(\tau, \tilde{p}^w), \tilde{p}^w) = \gamma PS(p(\tau, \tilde{p}^w)) + CS(p(\tau, \tilde{p}^w)) + \left[p(\tau, \tilde{p}^w) - \tilde{p}^w\right] M(p(\tau, \tilde{p}^w)) \tag{1}$$

  - $\gamma > 1$ reflects political economy concerns
  - $\gamma = 1$ reflects national income maximization
- Using subscripts for partial derivatives

$$W_{\tilde{p}^w} = -M(p(\tau, \tilde{p}^w)). \tag{2}$$

- Holding local prices fixed, the magnitude of the (negative) income effect of deterioriation in terms of trade equals the volume of imports of the relevant product

Nash Noncooperative Equilibrium

- Government chooses τ unilaterally to maximize W taking trade taxes of all other countries as given; First-order condition:
$$W_p \frac{dp}{d\tau} + W_{\tilde{p}^w} \frac{d\tilde{p}^w}{d\tau} = 0, \tag{3}$$
where assume that W is globally concave so that this reaction function defines a unique best-response tariff τ^{BR}
$$W_{pp} < 0. \tag{4}$$

- Using (2), this first-order condition can be written as:
$$\begin{aligned} W_p \frac{dp}{d\tau} - M \frac{d\tilde{p}^w}{d\tau} &= 0 \\ -\frac{W_p}{\tilde{p}^w} &= -\frac{M}{(dp/d\tau)\tilde{p}^w} \frac{d\tilde{p}^w}{d\tau} \end{aligned}$$

Goods Market Clearing

- Goods market clearing condition

$$M(p(\tau, \tilde{p}^w)) = E^*(\tilde{p}^w, \cdot)$$
$$\frac{dM}{dp}\frac{dp}{d\tau} = \frac{dE^*}{d\tilde{p}^w}\frac{d\tilde{p}^w}{d\tau}$$
$$\Rightarrow \qquad \frac{d\tilde{p}^w}{d\tau} = \frac{(dM/dp)(dp/d\tau)}{dE^*/d\tilde{p}^w}$$

- Using this result in the first-order condition above:

$$-\frac{W_p}{\tilde{p}^w} = \frac{M}{p}\left(-\frac{(dM/dp)(p/M)}{(dE^*/d\tilde{p}^w)(\tilde{p}^w/E^*)}\right) = \frac{M}{p}\frac{\sigma}{\omega^*}.$$

- $\sigma = -(dM/dp)(p/M)$ is elasticity of domestic import demand
- $\omega^* = (dE^*/d\tilde{p}^w)(\tilde{p}^w/E^*)$ is elasticity of foreign export supply

Nash Non-Cooperative Tariffs

- Nash Non-Cooperative Tariffs

$$-\frac{W_p(p^{BR}, \tilde{p}^{wBR})}{\tilde{p}^{wBR}} = \eta^{BR} \equiv \frac{\sigma^{BR}}{\omega^{*BR}} \frac{M^{BR}}{p^{BR}},$$

where small country case corresponds to $\omega^* \to \infty$ and $\eta^{BR} \to 0$

Politically Optimal Tariffs

- Politically optimal tariff is the tariff that the government would set if it acted as if it did not value the terms of trade consequences of its tariff choice (i.e. as if $W_{\tilde{p}^w} = 0$)

$$W_p(p^{PO}, \tilde{p}^{wPO}) = 0.$$

Welfare-Maximizing Government

- Corresponds to the case in which $\gamma = 1$

$$W(p(\tau, \tilde{p}^w), \tilde{p}^w) = PS(p(\tau, \tilde{p}^w)) + CS(p(\tau, \tilde{p}^w)) + \left[p(\tau, \tilde{p}^w) - \tilde{p}^w\right] M(p(\tau, \tilde{p}^w))$$

- Thus

$$W_p = S - D + M + \left[p(\tau, \tilde{p}^w) - \tilde{p}^w\right] M_p$$

- Hence

$$W_p = \tau \tilde{p}^w M_p$$

- Therefore we have:

$$W_p \frac{dp}{d\tau} = \tau \tilde{p}^w M_p \frac{dp}{d\tau}$$

Political Optimum Under Welfare Max

- Political optimum tariff under welfare max implies

$$W_p \frac{dp}{d\tau} = \tau \tilde{p}^w M_p \frac{dp}{d\tau} = 0,$$

  which can only be satisfied at $\tau^{PO} = 0$.

- Since $M_p < 0$, political optimum tariff under welfare max implies free trade
- In contrast, when $\gamma > 1$, $\tau^{PO} > 0$

Predictions for Trade Agreements

- Nash Non-Cooperative Tariffs

$$-\frac{W_p(p^{BR}, \tilde{p}^{wBR})}{\tilde{p}^{wBR}} = \eta^{BR} = \frac{\sigma^{BR}}{\omega^{*BR}} \frac{M^{BR}}{p^{BR}}.$$

- Politically optimal tariff

$$W_p(p^{PO}, \tilde{p}^{wPO}) = 0.$$

- As $\omega^{*BR} \to \infty$, we have that τ^{BR} satisfies $W_p(p^{BR}, \tilde{p}^{wBR}) = 0$

$$\tau^{BR} - \tau^{PO} = 0.$$

- Therefore, for products where an importing country is small relative to world markets, we should expect to observe small negotiated tariff cuts when the country joins a political optimal trade agreement

Predictions for Trade Agreements (cont'd)

- Nash Non-Cooperative Tariffs

$$-\frac{W_p(p^{BR}, \tilde{p}^{wBR})}{\tilde{p}^{wBR}} = \eta^{BR} = \frac{\sigma^{BR}}{\omega^{*BR}} \frac{M^{BR}}{p^{BR}}.$$

- Politically optimal tariff

$$W_p(p^{PO}, \tilde{p}^{wPO}) = 0.$$

- Suppose that the importing country is not small, but its best-response tariff is near prohibitive, so that $M^{BR} \to 0$
- As $M^{BR} \to 0$, we have that τ^{BR} satisfies $W_p(p^{BR}, \tilde{p}^{wBR}) = 0$
- Therefore, for products where an importing country has raised tariffs to near prohibitive levels, we should expect to observe small negotiated tariff cuts, regardless of the export supply elasticity

Predictions for Trade Agreements (cont'd)

- Nash Non-Cooperative Tariffs

$$-\frac{W_p(p^{BR}, \tilde{p}^{wBR})}{\tilde{p}^{wBR}} = \eta^{BR} = \frac{\sigma^{BR}}{\omega^{*BR}} \frac{M^{BR}}{p^{BR}}.$$

- Politically optimal tariff

$$W_p(p^{PO}, \tilde{p}^{wPO}) = 0.$$

- With ω^{*BR} finite and $M^{BR} > 0$, assumption (4) implies

$$\tau^{BR} - \tau^{PO} > 0.$$

- Intuition: Terms of trade manipulation is mechanism by which countries shift some of the costs of tariffs onto foreign exporters
- When governments induced to ignore these cost-shifting incentives and cost the full costs of their tariff choices, they will reduce tariffs

Linear Demand and Supply

- Consider linear demand and supply

$$D(p) = \alpha - \delta p$$

$$S(p) = \lambda + \kappa p$$

$$M(p) = D(p) - S(p) = (\alpha - \lambda) - \left[\delta p + \kappa p\right]$$

$$\Rightarrow \frac{\partial M}{\partial P} \qquad \text{and} \qquad \frac{\partial E^*}{\partial p^w} \qquad \text{constant}$$

- Define

$$\theta = -\frac{\partial M/\partial p}{\partial E^*/\partial p^w} \qquad \text{constant}$$

- Goods market clearing implies

$$M = E^*$$

Nash Non-cooperative Tariffs

- Best-response tariffs
$$-\frac{W_p}{\tilde{p}^w} = \frac{M}{p}\left(-\frac{(dM/dp)(p/M)}{(dE^*/d\tilde{p}^w)(\tilde{p}^w/E^*)}\right),$$
- Using linear demand and supply and goods market clearing
$$-\frac{W_p}{\tilde{p}^w} = \theta\frac{M^{BR}}{\tilde{p}^{wBR}} = \theta m^{BR}, \text{where } \theta = -\frac{dM/dp}{dE^*/d\tilde{p}^w}.$$
- For products that share the same political economy and demand and supply slope parameters, expect larger negotiated tariff cuts with larger ratio of pre-negotiation import volume to world price (m^{BR})

Pre-negotiation Import Volume/World Price

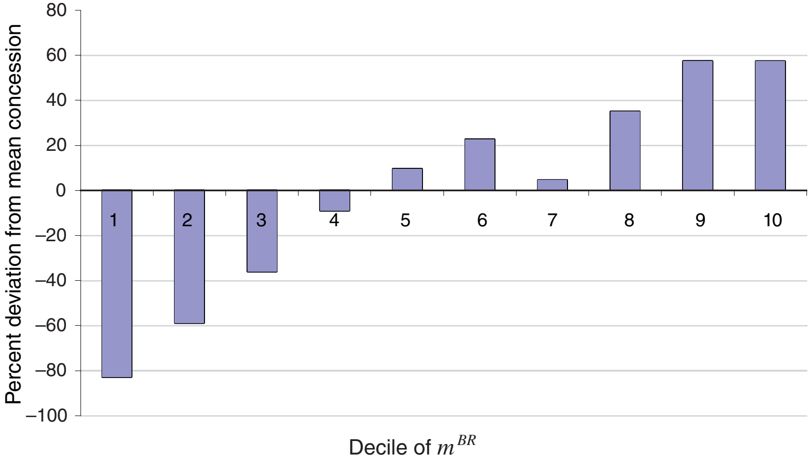

FIGURE 1. PERCENT DEVIATION FROM MEAN CONCESSION BY m^{BR} DECILE

Pre-negotiation Cost Shifting

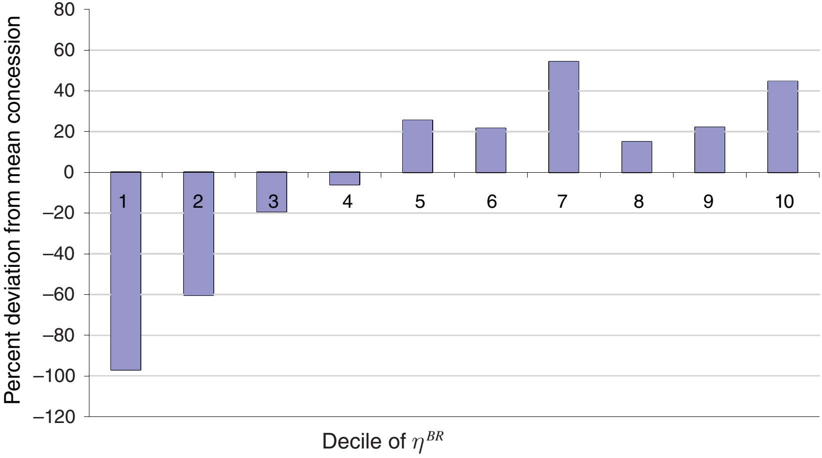

FIGURE 2. PERCENT DEVIATION FROM MEAN CONCESSION BY η^{BR} DECILE

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- Bagwell, Kyle and Staiger, Robert W. (1999) "An Economic Theory of GATT," *American Economic Review*, 89(1), 215-248.
- Bagwell, Kyle and Staiger, Robert W. (2011) "What Do Trade Negotiators Negotiate About? Empirical Evidence from the World Trade Organization," *American Economic Review*, 101, 1238-1273