Delocation and Trade Agreements in Imperfectly Competitive Markets

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July 1 2009
A central question in the study of commercial policy: Why do governments form international trade agreements?

Answers provide foundation from which to evaluate/interpret design of trade agreements in light of “problems” they exist to solve.

Established literature argues that governments have a reason to form a trade agreement when an international “terms-of-trade” externality is associated with their trade-policy choices.

An implication: the principle of reciprocity (and in a multi-country setting, non-discrimination) can help to “undo” the t-o-t driven inefficiency and guide governments toward efficient policies.

These results derived under perfect competition: valuable benchmark.

But for many markets, firms possess market power: can give rise to “profit-shifting” and “firm-delocation” effects that provide novel motives for trade policy intervention.

At a minimum, this suggests that other international externalities in addition to the t-o-t externality may also be present.
In this paper, we extend the analysis to imperfectly competitive markets that feature the firm-delocation effect.

Examine the rationale for a trade agreement; consider the form that an efficiency-enhancing trade agreement might take.

Venables (1985) free-entry seg. mrkt. Cournot: an import tariff or export subsidy benefits a country’s consumers; stimulates domestic entry/ reduces domestic prices through enhanced competition.

This benefit, however, comes at the expense of foreign consumers.

Venables (1987) free-entry int. mrkt. trade costs Mono. Comp.: an import tariff or export subsidy again delocates firms to home market; domestic price index reduced through savings on trade costs.

Again, benefit comes at the expense of foreign consumers.
Introduction (cont’d)

- With this novel motive for trade policy intervention, it might be expected that a novel rationale for a trade agreement would arise.
- In line with this expectation, we show that new international externalities indeed arise when the firm-delocation effect is present.
- In addition to the t-o-t/world price externality, also local price externalities that travel through domestic and foreign local prices.
- But the key question is: Do governments internalize these international externalities in an appropriate fashion from a world-wide perspective when they make their unilateral policy choices?
- In each of these firm-delocation settings, we address this question and establish a surprising answer: the only rationale for a trade agreement is to remedy the inefficiency attributable to the t-o-t externality, the same rationale that arises in perfectly competitive markets.
- Furthermore, the principle of reciprocity is efficiency enhancing, as it serves to “undo” the t-o-t driven inefficiency that occurs when governments pursue unilateral trade policies.
Our paper closely related to Ossa (2009), who first studied role and design of trade agreements in a mono. comp. model of firm delocation.

Our results differ, because we make different assumptions about available trade policy instruments.

Will relate our results further to Ossa’s once the relevant results presented.
The Cournot Delocation Model

- Firms produce a homogeneous good and compete in a Cournot fashion for sales in a domestic and foreign market under conditions of free entry.
- Demands are downward sloping, the markets are segmented, and two-way trade in identical products arises as a consequence.
- There are transport costs between the markets, and each government may also impose a trade tax/subsidy on trade flows in and/or out of its market.
- A freely traded numeraire good entering utility in a quasi-linear fashion eliminates income effects: all trade tax revenue consequences confined to numeraire good.
The Cournot Delocation Model (cont’d)

- Total trade impediments facing home and foreign imports:
  \[ \tau \equiv \varphi + t_h + t_f, \quad \text{and} \quad \tau^* \equiv \varphi + t_h^* + t_f^*. \]

- Assume \( \varphi > 0 \), so that with \((t_h = 0, t_f = 0, t_h^* = 0, t_f^* = 0)\) we have \( \tau > 0 \) and \( \tau^* > 0 \).

- Implies that, beginning from free trade, a firm’s profits are more sensitive to changes in the price it receives for its domestic sales than for its export sales.

- A firm pays fixed entry fee. Then for each market, chooses output to max operating profits given output of all other firms in that market.

- Under free entry, \( n_h \) and \( n_f \) adjust to ensure:
  \[ \Pi^h(n_h, n_f, \tau^*, \tau) = 0 = \Pi^f(n_h, n_f, \tau^*, \tau), \]
  which then defines \( n^N_h(\tau^*, \tau) \) and \( n^N_f(\tau^*, \tau) \).

- We assume that \( n^N_h(\tau^*, \tau) \) is increasing in \( \tau \) and decreasing in \( \tau^* \) while \( n^N_f(\tau^*, \tau) \) is increasing in \( \tau^* \) and decreasing in \( \tau \).
The Cournot Delocation Model (cont’d)

- Using $n_h^N(\tau^*, \tau)$ and $n_f^N(\tau^*, \tau)$, we may write the home and foreign market prices:

  $$\tilde{P}^N(\tau^*, \tau) \equiv P(Q^N(n_h^N(\tau^*, \tau), n_f^N(\tau^*, \tau), \tau)),$$
  $$\tilde{P}^*N(\tau^*, \tau) \equiv P^*(Q^*N(n_h^N(\tau^*, \tau), n_f^N(\tau^*, \tau), \tau^*))$$

- And home and foreign market sales of a representative home and foreign firm:

  $$\tilde{q}_h^N(\tau^*, \tau) \equiv q_h^N(n_h^N(\tau^*, \tau), n_f^N(\tau^*, \tau), \tau),$$
  $$\tilde{q}_f^N(\tau^*, \tau) \equiv q_f^N(n_h^N(\tau^*, \tau), n_f^N(\tau^*, \tau), \tau),$$
  $$\tilde{q}_h^*N(\tau^*, \tau) \equiv q_h^*N(n_h^N(\tau^*, \tau), n_f^N(\tau^*, \tau), \tau^*),$$
  $$\tilde{q}_f^*N(\tau^*, \tau) \equiv q_f^*N(n_h^N(\tau^*, \tau), n_f^N(\tau^*, \tau), \tau^*).$$

- Accordingly, all Nash equilibrium prices and quantities can be expressed as functions of the total trade impediments $\tau^*$ and $\tau$. 
Illustration of the firm-delocation effect: rewrite zero profit condition:

\[ (P - c)^2[-D'(P)] + (P^* - (c + \tau^*))^2[-D'^*(P^*)] - F = 0, \]  
\[ (P^* - c)^2[-D'^*(P^*)] + (P - (c + \tau))^2[-D'(P)] - F = 0. \]

Figure 1.

An import tariff or export subsidy helps domestic consumers at the expense of foreign consumers.

Now need to know full welfare impacts of trade policy.

Home welfare:

\[ CS(\tilde{P}^N) + t_h n_f^N \tilde{q}_f^N + t_h^* n_h^N \tilde{q}_h^* N. \]
Figure 1
Firm Delocation in the Cournot Model
The Cournot Delocation Model (cont’d)

- To re-express home welfare, define following prices.
- The world price for exports to the home market:
  \[ \tilde{P}^w_N(t_h, \tau^*, \tau) = \tilde{P}^N(\tau^*, \tau) - t_h \]
- The world price for exports to the foreign market:
  \[ \tilde{P}^*w_N(t_f^*, \tau^*, \tau) = \tilde{P}^*N(\tau^*, \tau) - t_f^* \]
- The price received by the home firm for foreign sales:
  \[ \tilde{R}^N(\tau^*, \tau) = \tilde{P}^*w_N(t_f^*, \tau^*, \tau) - \varphi - t_h^* \]
- The price received by the foreign firm for home-country sales:
  \[ \tilde{R}^*N(\tau^*, \tau) = \tilde{P}^w_N(t_h, \tau^*, \tau) - \varphi - t_f \]
- Note: \[ \tilde{P}^N - \tilde{R}^*N = \tau \] and \[ \tilde{P}^*N - \tilde{R}^N = \tau^* \]
So we can represent home-country imports \( M \equiv n_N^f(\tau^*, \tau) \tilde{q}_f^N(\tau^*, \tau) \)
as \( M(\tilde{P}^*_N - \tilde{R}^N, \tilde{P}^N - \tilde{R}^*_N) \); and home-country exports 
\( E \equiv n_h^n(\tau^*, \tau) \tilde{q}_h^N(\tau^*, \tau) \) as 
\( E(\tilde{P}^*_N - \tilde{R}^N, \tilde{P}^N - \tilde{R}^*_N) \).

This allows home country welfare to be expressed as a direct function of prices:

\[
W = CS(\tilde{P}^N) + \left[ \tilde{P}^N - \tilde{P}^{wN} \right] M(\tilde{P}^*_N - \tilde{R}^N, \tilde{P}^N - \tilde{R}^*_N)
\]
\[
+ \left[ \tilde{P}^{*wN} - \tilde{R}^N - \varphi \right] E(\tilde{P}^*_N - \tilde{R}^N, \tilde{P}^N - \tilde{R}^*_N)
\]
\[
\equiv W(\tilde{P}^N, \tilde{R}^N, \tilde{P}^{wN}, \tilde{P}^*_N, \tilde{R}^*_N, \tilde{P}^{*wN}).
\]

Similarly for foreign country welfare:

\[
W^* = CS^*(\tilde{P}^*_N) + \left[ \tilde{P}^{wN} - \tilde{R}^*_N - \varphi \right] M(\tilde{P}^*_N - \tilde{R}^N, \tilde{P}^N - \tilde{R}^*_N)
\]
\[
+ \left[ \tilde{P}^{*N} - \tilde{P}^{*wN} \right] E(\tilde{P}^*_N - \tilde{R}^N, \tilde{P}^N - \tilde{R}^*_N)
\]
\[
\equiv W^*(\tilde{P}^*_N, \tilde{R}^*_N, \tilde{P}^{*wN}, \tilde{P}^*_N, \tilde{R}^*_N, \tilde{P}^N).
\]

Compare to competitive setting: \( W(P, P^w) \) and \( W^*(P^*, P^{w*}) \).
The Cournot Delocation Model (cont’d)

Note: internationally efficient policy choices maximize joint welfare:

\[ W + W^* = CS(\tilde{P}^N) + [\tilde{P}^N - \tilde{R}^N - \phi] M(\tilde{P}^N - \tilde{R}^N, \tilde{P}^N - \tilde{R}^N) + [\tilde{P}^N - \tilde{R}^N - \phi] E(\tilde{P}^N - \tilde{R}^N, \tilde{P}^N - \tilde{R}^N) + CS^*(\tilde{P}^N) \]

\[ \equiv J(\tilde{P}^N, \tilde{R}^N, \tilde{P}^N, \tilde{R}^N). \]

Only local prices rel. for eff.; only \( \tau \) and \( \tau^* \) tied down by eff. cond’ s.

Efficient \( \tau \) and \( \tau^* \) satisfy:

\[ [W_{\tilde{P} N} + W^*_{\tilde{P} N}] \frac{\partial \tilde{P}^N}{\partial \tau} + [W_{\tilde{R} N} + W^*_{\tilde{R} N}] \frac{\partial \tilde{R}^N}{\partial \tau} + \]

\[ [W_{\tilde{P}^N} + W^*_{\tilde{P}^N}] \frac{\partial \tilde{P}^N}{\partial \tau} + [W_{\tilde{R}^N} + W^*_{\tilde{R}^N}] \frac{\partial \tilde{R}^N}{\partial \tau} = 0; \]

\[ [W_{\tilde{P}^N} + W^*_{\tilde{P}^N}] \frac{\partial \tilde{P}^N}{\partial \tau^*} + [W_{\tilde{R}^N} + W^*_{\tilde{R}^N}] \frac{\partial \tilde{R}^N}{\partial \tau^*} + \]

\[ [W_{\tilde{P}^N} + W^*_{\tilde{P}^N}] \frac{\partial \tilde{P}^N}{\partial \tau^*} + [W_{\tilde{R}^N} + W^*_{\tilde{R}^N}] \frac{\partial \tilde{R}^N}{\partial \tau^*} = 0. \]
Note: \( \frac{d\tau}{dt_h} = 1 = \frac{d\tau}{dt_f} \); and \( \frac{d\tau^*}{dt_f} = 1 = \frac{d\tau^*}{dt_h} \).

Levels of \( \tau \) and \( \tau^* \) implied by Nash choices of \( t_h, t_f, t_h^*, \) and \( t_f^* \) satisfy:

\[
\begin{align*}
[W_{\tilde{P}_N} + W_{\tilde{P}_N}^*] \frac{\partial \tilde{P}_N}{\partial \tau} &+ [W_{\tilde{R}_N} + W_{\tilde{R}_N}^*] \frac{\partial \tilde{R}_N}{\partial \tau} + \\
[W_{\tilde{P}_N^*} + W_{\tilde{P}_N^*}] \frac{\partial \tilde{P}_N^*}{\partial \tau} &+ [W_{\tilde{R}_N^*} + W_{\tilde{R}_N^*}] \frac{\partial \tilde{R}_N^*}{\partial \tau} = -M^N;
\end{align*}
\]

\[
\begin{align*}
[W_{\tilde{P}_N} + W_{\tilde{P}_N}^*] \frac{\partial \tilde{P}_N}{\partial \tau^*} &+ [W_{\tilde{R}_N} + W_{\tilde{R}_N}^*] \frac{\partial \tilde{R}_N}{\partial \tau^*} + \\
[W_{\tilde{P}_N^*} + W_{\tilde{P}_N^*}] \frac{\partial \tilde{P}_N^*}{\partial \tau^*} &+ [W_{\tilde{R}_N^*} + W_{\tilde{R}_N^*}] \frac{\partial \tilde{R}_N^*}{\partial \tau^*} = -E^N.
\end{align*}
\]

Nash policy choices result in trade barriers that are too high.

But why?
The Cournot Delocation Model (cont’d)

- “Politically Optimal” thought experiment: What tariffs would hypothetically be chosen by govn’s unilaterally if they did not value the pure international rent-shifting associated with the t-o-t movements induced by their unilateral tariff choices?
- Specifically, the home govn. acts as if $W_{\bar{p}_{wN}} \equiv 0$ and $W_{\bar{p}^*_wN} \equiv 0$; the foreign govn. acts as if $W^*_{\bar{p}_{wN}} \equiv 0$ and $W^*_{\bar{p}_wN} \equiv 0$.
- Recalling $\frac{d\tau}{dt_h} = 1 = \frac{d\tau}{dt_f}$; and $\frac{d\tau^*}{dt_f^*} = 1 = \frac{d\tau^*}{dt_h^*}$, Political Optimum:

$$W_{\bar{p}_N} \frac{\partial \tilde{P}^N}{\partial \tau} + W_{\bar{R}_N} \frac{\partial \tilde{R}^N}{\partial \tau} + W_{\bar{p}^*_N} \frac{\partial \tilde{P}^*_N}{\partial \tau} + W_{\bar{R}^*_N} \frac{\partial \tilde{R}^*_N}{\partial \tau} = 0,$$

$$W_{\bar{p}_N} \frac{\partial \tilde{P}^N}{\partial \tau^*} + W_{\bar{R}_N} \frac{\partial \tilde{R}^N}{\partial \tau^*} + W_{\bar{p}^*_N} \frac{\partial \tilde{P}^*_N}{\partial \tau^*} + W_{\bar{R}^*_N} \frac{\partial \tilde{R}^*_N}{\partial \tau^*} = 0,$$

$$W^*_{\bar{p}^*_N} \frac{\partial \tilde{P}^*_N}{\partial \tau^*} + W^*_{\bar{R}^*_N} \frac{\partial \tilde{R}^*_N}{\partial \tau^*} + W^*_{\bar{p}_N} \frac{\partial \tilde{P}^*_N}{\partial \tau^*} + W^*_{\bar{R}_N} \frac{\partial \tilde{R}^*_N}{\partial \tau^*} = 0,$$

and

$$W^*_{\bar{p}^*_N} \frac{\partial \tilde{P}^*_N}{\partial \tau} + W^*_{\bar{R}^*_N} \frac{\partial \tilde{R}^*_N}{\partial \tau} + W^*_{\bar{p}_N} \frac{\partial \tilde{P}^*_N}{\partial \tau} + W^*_{\bar{R}_N} \frac{\partial \tilde{R}^*_N}{\partial \tau} = 0.$$
Add together 1st and 4th; add together 2nd and 3rd:

\[
\left[ W\tilde{P}_N + W\tilde{P}_N^* \right] \frac{\partial \tilde{P}^N}{\partial \tau} + \left[ W\tilde{R}_N + W\tilde{R}_N^* \right] \frac{\partial \tilde{R}^N}{\partial \tau} + \left[ W\tilde{P}_N^* + W\tilde{P}_N^* \right] \frac{\partial \tilde{P}^{*N}}{\partial \tau} + \left[ W\tilde{R}_N^* + W\tilde{R}_N^* \right] \frac{\partial \tilde{R}^{*N}}{\partial \tau} = 0;
\]

\[
\left[ W\tilde{P}_N + W\tilde{P}_N^* \right] \frac{\partial \tilde{P}^N}{\partial \tau^*} + \left[ W\tilde{R}_N + W\tilde{R}_N^* \right] \frac{\partial \tilde{R}^N}{\partial \tau^*} + \left[ W\tilde{P}_N^* + W\tilde{P}_N^* \right] \frac{\partial \tilde{P}^{*N}}{\partial \tau^*} + \left[ W\tilde{R}_N^* + W\tilde{R}_N^* \right] \frac{\partial \tilde{R}^{*N}}{\partial \tau^*} = 0.
\]

P.O. tariffs are efficient: if govn’s could be induced not to value the pure international rent-shifting from t-o-t movements caused by their unilateral tariff choices, then they would set efficient tariffs.
The Cournot Delocation Model (cont’d)

- Intuition:
  - only local prices matter for efficiency;
  - small adj. in $t_h$ has impact on local prices which is identical to small adj. in $t_f$, and similarly for $t_f^*$ and $t_h^*$;
  - therefore, at P.O., both home and foreign indifferent to any small feasible adj. in local prices;
  - local price externality shut down/no efficiency gains from world price movements, so P.O. efficient.
- Evidently, firm-delocation motives provide no independent source of international inefficiency in the Cournot delocation model.
- Note the important role played by import and export policies here.
Proposition 1: In the Cournot delocation model, the Nash trade policies are inefficient, and the inefficiency arises only because governments value the pure international rent-shifting associated with the t-o-t movements induced by their unilateral tariff choices.

Reciprocity fixes world prices.

Going Up; beginning from P.O. tariffs, fixed world prices take away any reason to move.

Going Down; beginning from Nash tariffs, can always find reduction in $\tau$ and $\tau^*$ that preserves world prices and benefits both countries.

Corollary: In the Cournot delocation model, the principle of reciprocity serves to “undo” the t-o-t driven inefficiency that occurs when governments pursue unilateral trade policies.
A final note: the Cournot Delocation Model can deliver an interesting implication for treatment of export subsidies in trade agreements.

An export sub. – like a tariff – *improves* a country’s t-o-t in this model.

So like a tariff, in this model export subsidies should naturally be discouraged by a trade agreement.

Bagwell and Staiger (2009a): In the linear demand case, P.O. policy is free trade, while Nash is import tariff and export tax (complementarity between import and export policies).

But beginning from free trade, each government has a unilateral incentive to subsidize its exports (delocation plus t-o-t motives).

For the linear-demand case therefore, efficient political optimum (free trade) requires restraints on import tariffs *and* export subsidies, despite the fact that the unilateral incentive to subsidize exports does not arise until import tariffs are restrained to sufficiently low levels.
Monopolistically competitive firms produce differentiated goods, make sales in a domestic and foreign market under conditions of free entry.

Demands are CES, the markets are integrated, and two-way trade in differentiated products occurs.

There are “iceberg” transport costs between the markets, and each government may also impose an ad-valorem trade tax/subsidy on trade flows in and/or out of its market.

A freely traded numeraire good entering utility in a quasi-linear fashion ties down marginal costs and eliminates income effects.

All incidence of trade taxes borne by importer; all trade tax revenue consequences confined to numeraire good.
Indirect utility functions of the two countries:

\[ V(P, I) = (\epsilon\theta)^{-1} P^{-\epsilon\theta} + I, \quad \text{and} \]
\[ V^*(P^*, I^*) = (\epsilon\theta)^{-1} (P^*)^{-\epsilon\theta} + I^*. \]

where \( \epsilon = \frac{1}{1-\theta} > 1 \) and \( \theta \in (0, 1) \).

Home-country demand for variety \( i \):

\[ c^i = (p^i)^{\sigma - \epsilon} P^{\sigma - \epsilon} \equiv c^i(p^i, P). \]

where elast. of sub. btw varieties within the diff. product sector (\( \sigma \))
assumed greater than the overall price elast. (\( \epsilon \)).

Foreign-country demand for variety \( i \):

\[ c^{*i} = (p^{*i})^{-\sigma} (P^*)^{\sigma - \epsilon} \equiv c^{*i}(p^{*i}, P^*). \]
We denote (1 plus) the total ad valorem trade impediment on home exports to the foreign market:

\[ \iota^* \equiv 1 + \phi + \tau_h^* + \tau_f^*. \]

Market integration implies \( p_h^i = \iota^* p_h^i \), where \( p_h^i \) denotes the home-market price of a home-produced good and \( p_h^* \) denotes the foreign-market price of a home-produced good.

We denote (1 plus) the total ad valorem trade impediment on foreign exports to the home-country market:

\[ \iota \equiv 1 + \phi + \tau_h + \tau_f. \]

Market integration implies \( p_f^i = \iota p_f^* \), where \( p_f^* \) denotes the foreign-market price of a foreign-produced good and \( p_f^i \) denotes the home-market price of a foreign-produced good.
The Mono. Comp. Delocation Model (cont’d)

- Profit-maximizing pricing for home firm producing variety $i$:
  \[ p^i_h = \frac{\sigma}{\sigma - 1} \lambda \equiv \hat{p}, \text{ and therefore } p^*_i = \lambda \hat{p} \equiv p^*_h(i^*). \]

- Profit-maximizing pricing for foreign firm producing variety $i$:
  \[ p^*_f = \frac{\sigma}{\sigma - 1} \lambda \equiv \hat{p}, \text{ and therefore } p^i_f = \lambda \hat{p} \equiv p_f(i). \]

- Home and Foreign price indexes:
  \[ P = \left[ n_h \cdot \hat{p}^{\frac{\alpha}{\alpha - 1}} + n_f \cdot p_f^{\frac{\alpha}{\alpha - 1}} \right]^{\frac{\alpha - 1}{\alpha}} \equiv P(n_h, n_f, p_f), \text{ and } \]
  \[ P^* = \left[ n_f \cdot \hat{p}^{\frac{\alpha}{\alpha - 1}} + n_h \cdot p^*_h^{\frac{\alpha}{\alpha - 1}} \right]^{\frac{\alpha - 1}{\alpha}} \equiv P^*(n_h, n_f, p^*_h). \]

- Under free entry, $n_h$ and $n_f$ adjust to ensure:
  \[ c(\hat{p}, P(n_h, n_f, p_f)) + (1 + \phi) c^*(p^*_h, P^*(n_h, n_f, p^*_h)) = \frac{F}{(\hat{p} - \lambda)} \]
  \[ c^*(\hat{p}, P^*(n_h, n_f, p^*_h)) + (1 + \phi) c(p_f, P(n_h, n_f, p_f)) = \frac{F}{(\hat{p} - \lambda)}. \]
So zero profit conditions determine \( n_h(p_f, p_h^*) \) and \( n_f(p_f, p_h^*) \), and hence \( P(p_f, p_h^*) \) and \( P^*(p_f, p_h^*) \).

Recalling that \( p_h^*(\iota^*) \equiv \iota^* \hat{p} \) and \( p_f(\iota) \equiv \iota \hat{p} \), zero profit condition implies firm-delocation effect:

- **Incr home imp. tariff:**
  \[
  \frac{dP^*}{d\tau_h} = \frac{\partial P^*}{\partial p_f} \frac{dp_f}{d\tau_h} > 0 > \frac{dP}{d\tau_h} = \frac{\partial P}{\partial p_f} \frac{dp_f}{d\tau_h}.
  \]

- **Incr home exp. subsidy:**
  \[
  -\frac{dP^*}{d\tau_h} = -\frac{\partial P^*}{\partial p_h^*} \frac{dp_h^*}{d\tau_h} > 0 > -\frac{dP}{d\tau_h} = -\frac{\partial P}{\partial p_h^*} \frac{dp_h^*}{d\tau_h}.
  \]

- **Incr foreign imp. tariff:**
  \[
  \frac{dP^*}{d\tau_f} = \frac{\partial P^*}{\partial p_h^*} \frac{dp_h^*}{d\tau_f} > 0 > \frac{dP^*}{d\tau_f} = \frac{\partial P^*}{\partial p_h^*} \frac{dp_h^*}{d\tau_f}.
  \]

- **Incr foreign exp. subsidy:**
  \[
  -\frac{dP}{d\tau_f} = -\frac{\partial P}{\partial p_f} \frac{dp_f}{d\tau_f} > 0 > -\frac{dP^*}{d\tau_f} = -\frac{\partial P^*}{\partial p_f} \frac{dp_f}{d\tau_f}.
  \]
Now need to know full welfare impacts of trade policy.

Note:

\[ M = n_f(p_f, p_h^*)c(p_f, P(p_f, p_h^*)) = M(p_f, p_h^*), \]
\[ E = n_h(p_f, p_h^*)c^*(p_h^*, P^*(p_f, p_h^*)) = E(p_f, p_h^*), \]

and so

\[ I = L + \tau_h^*\hat{p}E(p_f, p_h^*) + \tau_h\hat{p}M(p_f, p_h^*), \]
\[ I^* = L^* + \tau_f^*\hat{p}M(p_f, p_h^*) + \tau_f\hat{p}E(p_f, p_h^*). \]

Now define following prices:

The world price for exports to the foreign market:
\[ p^{*w} = (1 + \tau_h^*)\hat{p} = p^{*w}(\tau_h^*); \]
then \( \tau_h^*\hat{p} = p^{*w} - \hat{p}, \)
and also \( \tau_f^*\hat{p} = p_h^* - \phi\hat{p} - p^{*w}. \)

The world price for exports to the domestic market:
\[ p^w = (1 + \tau_f^*)\hat{p} \equiv p^w(\tau_f^*); \]
then \( \tau_f\hat{p} = p^w - \hat{p}, \)
and also \( \tau_h\hat{p} = p_f - \phi\hat{p} - p^w. \)
With these pricing relationships, we have:

\[ I = L + [p^w - \hat{p}] E(p_f, p_h^*) + [p_f - \phi \hat{p} - p^w] M(p_f, p_h^*) \]
\[ \equiv I(p_h^*, p_f, p^w, p^*_w), \text{ and} \]
\[ I^* = L^* + [p^w - \hat{p}] M(p_f, p_h^*) + [p_h^* - \phi \hat{p} - p^*_w] E(p_f, p_h^*) \]
\[ \equiv I^*(p_h^*, p_f, p^w, p^*_w). \]

Finally, using these expressions for \( I \) and \( I^* \), we may write:

\[ V(p_h^*, p_f, p^w, p^*_w) = (\epsilon \theta)^{-1} P(p_f, p_h^*)^{-\epsilon \theta} + I(p_h^*, p_f, p^w, p^*_w), \text{ and} \]
\[ V^*(p_h^*, p_f, p^w, p^*_w) = (\epsilon \theta)^{-1} P^*(p_f, p_h^*)^{-\epsilon \theta} + I^*(p_h^*, p_f, p^w, p^*_w). \]

Compare again to competitive setting: \( W(P, P^w) \) and \( W^*(P^*, P^w) \).
Note: internationally efficient policy choices maximize joint welfare $V + V^*$. But

\[ I + I^* = L + L^* + [p_h^* - \phi \hat{p} - \hat{p}] E(p_f, p_h^*) + [p_f - \phi \hat{p} - \hat{p}] M(p_f, p_h^*) \equiv K(p_h^*, p_f), \]

and so $V + V^*$

\[ ... = (\epsilon \theta)^{-1} [P((p_f, p_h^*))]^{-\epsilon \theta} + (\epsilon \theta)^{-1} [P^*((p_f, p_h^*))]^{-\epsilon \theta} + K(p_h^*, p_f) \equiv G(p_h^*, p_f). \]

Only local prices rel. for eff.; only $\iota$ and $\iota^*$ tied down by eff. cond’s.

Efficient $\iota$ and $\iota^*$ satisfy:

\[
\left[ V_{p_h^*} + V_{p_h^*} \right] \frac{dp_h^*}{dl^*} = 0, \text{ and } \]

\[
\left[ V_{p_f} + V_{p_f} \right] \frac{dp_f}{dl} = 0.
\]
The Mono. Comp. Delocation Model (cont’d)

- Note: \( \frac{d\iota^*}{d\tau^*_h} = 1 = \frac{d\iota}{d\tau^*_f} \) and \( \frac{d\iota}{d\tau_h} = 1 = \frac{d\iota}{d\tau_f} \). Also, \( \frac{dp^*_h}{d\tau^*_h} = \frac{dp^*_h}{d\tau^*_f} = \frac{dp^*_h}{d\iota^*} \)
  and \( \frac{dp_f}{d\tau_h} = \frac{dp_f}{d\tau_f} = \frac{dp_f}{d\iota} \).

- Levels of \( \iota \) and \( \iota^* \) implied by Nash choices of \( \tau^*_h, \tau^*_f, \tau_f \) and \( \tau_h \) satisfy:

\[
\left[ V_{p_h^*} + V_{p^*_h} \right] \frac{dp^*_h}{d\iota^*} = -E \frac{dp^*^w}{d\tau^*_h}, \quad \text{and}
\]

\[
\left[ V_{p_f^*} + V_{p^*_f} \right] \frac{dp_f}{d\iota} = -M \frac{dp^w}{d\tau_f},
\]

- The terms \( E \frac{dp^*^w}{d\tau^*_h} \) and \( M \frac{dp^w}{d\tau_f} \) are positive. So Nash policy choices result in trade barriers that are too high.

- But why?
“Politically Optimal” thought experiment: What tariffs would hypothetically be chosen by govn’s unilaterally if they did not value the pure international rent-shifting associated with the t-o-t movements induced by their unilateral tariff choices?

Specifically, the home govn. acts as if $V_p^w \equiv 0$ and $V_p^{*w} \equiv 0$ when choosing its P.O. tariffs, while the foreign government acts as if $V_p^{*w} \equiv 0$ and $V_p^{*w} \equiv 0$ when choosing its P.O. tariffs.

Politically Optimal tariffs therefore satisfy:

\[ V_{p_h}^* \frac{dp_h^*}{dl^*} = 0, \]
\[ V_{p_f}^* \frac{dp_f^*}{dl^*} = 0; \text{ and} \]
\[ V_{p_h}^{*w} \frac{dp_h^*}{dl^*} = 0, \]
\[ V_{p_f}^{*w} \frac{dp_f^*}{dl^*} = 0. \]
Add together 1st and 3rd; add together 2nd and 4th:

\[
[V_{p_h}^* + V_{p_h}^*] \frac{dp_h^*}{dl^*} = 0, \quad \text{and}
\]

\[
[V_{p_f} + V_{p_r}^*] \frac{dp_f}{dl} = 0.
\]

P.O. tariffs are efficient: if govn’s could be induced not to value the pure international rent-shifting from t-o-t movements caused by their unilateral tariff choices, then they would set efficient tariffs.

Evidently, firm-delocation motives provide no independent source of international inefficiency in the Monopolistically Competitive firm delocation model.

Note again the important role played by import and export policies here.
Proposition 2: In the monopolistic competition model of firm delocation, the Nash trade policies are inefficient, and the inefficiency arises only because governments value the pure international rent-shifting associated with the terms-of-trade movements induced by their unilateral tariff choices.

Reciprocity fixes world prices.

Going Up; beginning from P.O. tariffs, fixed world prices take away any reason to move.

Going Down; beginning from Nash tariffs, any small reduction in $\tau$ and $\tau^*$ that preserves world prices must benefit both countries.

Corollary: In the monopolistic competition model of firm delocation, the principle of reciprocity serves to “undo” the terms-of-trade driven inefficiency that occurs when governments pursue unilateral trade policies.
Utilizing a mono. comp. model of firm delocation, Ossa (2009) argues that the firm-delocation effect provides a new rationale for a trade agreement, esp. relevant for (two-way) trade btw similar countries.

Offers a novel interpretation of reciprocity and non-discrimination as simple rules that can neutralize the firm-delocation effect.

Our Proposition 2 is at odds with Ossa’s first observation.

Two substantive differences between our mono. comp. models.

Ossa allows income effects on the demand for differentiated products, while we employ a quasi linear specification of utility.

Due to income effects, Ossa must abstract from revenue considerations of trade taxes and hence from export (subsidy) policies.

We can and do allow for both import tariffs and export taxes/subsidies; crucial for our result.

While not providing new rationale for trade agreement, delocation effect may still be important externality within WTO, where export subsidies prohibited by agreement.
Conclusion

- When markets are imperfectly competitive, profit-shifting and firm-delocation effects can give rise to novel motives for trade policy.
- It might then be expected that new rationales for trade agreements would arise once imperfectly competitive markets are allowed.
- In this paper, we feature the firm-delocation motive for trade policy as it arises in both Cournot and monopolistically competitive models.
- And we argue that the basic rationale for a trade agreement is, in fact, the same rationale that arises in perfectly competitive markets, namely, to remedy the inefficiency attributable to the t-o-t externality.
- We also show that the principle of reciprocity is efficiency enhancing, as it serves to “undo” the t-o-t driven inefficiency that occurs when governments pursue unilateral trade policies.
- Our analysis thus suggests that the broad implications of the terms-of-trade approach to trade agreements are quite general, as they apply not just to perfectly competitive but also to a wide range of imperfectly competitive markets.
This suggestion is further supported in our companion paper (Bagwell and Staiger, 2009), which draws analogous conclusions in an imperfectly competitive setting where the number of firms is fixed and profit-shifting effects are featured.

This does not mean that extending the analysis of trade agreements to imperfectly competitive markets is unimportant.

On the contrary, as Ossa (2009) emphasizes, such work is critical for extending the applicability of the trade agreements literature to better reflect the realities of international trading patterns.

And new insights can emerge outside the setting of perfect competition; e.g., Cournot delocation model provides new perspective on export subsidy agreements (Bagwell and Staiger, 2009a).

Rather, our point is simply that the terms-of-trade approach to trade agreements remains valid in imperfectly competitive settings as the foundation from which to evaluate and interpret the design of trade agreements in light of the underlying problems that they exist to solve.