

Preferential Trade Agreements and Global Sourcing

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The world

- Expansion of global sourcing
- Proliferation of PTAs

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- Proliferation of PTAs
- General sense that the 2 trends are linked (e.g. Baldwin, 2011, 2016; Johnson & Noguera, 2014; WTO, 2011)

The questions

- ① How do PTAs affect the efficiency of global sourcing?
- ② How does global sourcing affect the welfare consequences of PTAs?

Our approach

- Incomplete contracts
- Trade of customized inputs
- Relationship-specific investments
- Partial equilibrium

- GVCs and PTAs (Baldwin, 2011; Johnson & Noguera, 2014)
- Welfare impacts of PTAs (Freund & Ornelas, 2010; Maggi, 2014)
- Trade of intermediates in the context of incomplete contracts (Antras & Helpman, 2004; Ornelas & Turner, 2012; Antras & Staiger, 2012; Antras, 2016)
- The investment/innovation consequences of trade liberalization (Lileeva & Trefler, 2010; Bustos, 2011)

Basic model

- 3 countries
 - *Home* has a mass of producers, or *buyers* (B), which assemble final goods from outsourced inputs
 - Inputs are available from suppliers located in either *Foreign* or *ROW*; the mass of suppliers in either location is large relative to the mass of B in *Home*

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- A buyer B obtains revenue $V(Q)$ from purchasing and processing Q units of intermediate inputs; $V'(Q) > 0$, $V''(Q) < 0$
- When sourcing, B can purchase:
 - Standardized inputs, g , from *ROW* at unit cost (adjusted for quality and compatibility) $p_w + t$
 - g is produced by a competitive fringe; t is the per-unit MFN tariff on intermediate goods
 - Customized inputs, q , from a specialized supplier S , located in either *Foreign* or *ROW*, at a negotiated price in addition to the unit tariff

- Each supplier S is identified by parameter ω :

$$C(q, i, \omega) = (A + \omega - bi)q + \frac{c}{2}q^2$$

- MC increases with q : $C_q = A + \omega - bi + cq$
- ω shifts MC up: higher ω , lower productivity; $\omega \in [0, \bar{\omega}]$, $\omega \sim G(\omega)$
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- Investment:

- Costs

$$I(i) = i^2$$

- Observed by both B and S , but not verifiable in a court of law
- Assume that $2c > b^2$

Dual sourcing

Basic model

- Focus on case where B uses both g and q
- Assume $C_q(0, 0, \omega) < p_w$ for all ω
 - ▶ $q^* \gg 0$
- Assume $V'(0) > p_w + t$
 - ▶ Level of total inputs sourced, Q^* , pinned down: $V'(Q^*) = p_w + t$
- Assume $C_q(Q^*, i^{max}, 0) > p_w + t$
 - ▶ $g^* \gg 0$

- Each B searches and matches with a supplier in either *Foreign* or *ROW*; once B decides to form a match, the two parties adapt their technologies towards each other
-

- S makes relationship-specific investment
- B and S bargain over price and quantity of q
- If bargaining is successful, trade of q takes place and payments are made
- B purchases g
- Final production occurs and final goods are sold

Privately optimal sourcing

No trade agreement

- Conditional on i , privately optimal sourcing requires:

$$\begin{cases} V'(Q^*) = p_w + t \\ Q^* = q_N^* + g_N^* \\ C_q(q_N^*, i, \omega) = p_w \end{cases}$$

Bargaining

No trade agreement

- After S chooses i , B and S determine terms of trade through Generalized Nash Bargaining
 - S has bargaining power $\alpha \in (0, 1)$
- Bargaining surplus:

$$\Omega \equiv (U_b^T - U_b^0) + (U_s^T - U_s^0)$$

- No TA:

$$\Omega_N = p_w q_N - C(q_N, i_N, \omega)$$

- Bargaining outcome: in addition to their reservation payoffs, S receives $\alpha\Omega_N$ and B receives $(1 - \alpha)\Omega_N$

Investment

No trade agreement

- S chooses i_N to

$$\max_{i_N} \alpha \Omega_N - I(i_N)$$

$$\Rightarrow I'(i_N^*) = -\alpha C_i(\cdot)$$

$$\Leftrightarrow i_N^* = \left(\frac{\alpha b}{2c - \alpha b^2} \right) (p_w - A - \omega)$$

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- Using condition for optimal sourcing:

$$q_N^* = \left(\frac{2}{\alpha b} \right) i_N^*$$

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- ▶ t affects Q^* but has no effect on q_N^* or i_N^*

Efficient investment

No trade agreement

- Social welfare:

$$\Psi = V(Q^*) - p_w Q^* + p_w q_N - C(q_N, i, \omega) - I(i)$$

- Efficient investment maximizes Ψ :

$$I'(i^e) = -\alpha C_i(\cdot)$$

$$\Leftrightarrow i^e = \left(\frac{b}{2c - b^2} \right) (p_w - A - \omega)$$

- Since $\alpha < 1$, $i^e < i_N^*$
 - $(i^e - i_N^*) \nearrow$ as $\omega \downarrow$: contract incompleteness more consequential for relationships that involve more productive suppliers

- PTA: no tariffs between *Home* and *Foreign*; sourcing from *Foreign* now tariff-free
- g still purchased from *ROW*
 - ▶ Level of Q^* unchanged, but its composition changes
 - »» No trade creation

- Conditional on i , privately optimal sourcing now requires:

$$\left\{ \begin{array}{l} V'(Q^*) = p_w + t \\ Q^* = q_P^* + g_P^* \\ C_q(q_P^*, i_P, \omega) = p_w + t \end{array} \right.$$

$$\Omega_P = (p_w + t)q_P - C(q_P, i_P, \omega)$$

- S chooses i_P to maximize

$$\max_i \alpha \Omega_P - I(i_P)$$

$$\Rightarrow i_P^* = \left(\frac{\alpha b}{2c - \alpha b^2} \right) (p_w + t - A - \omega)$$

- As before,

$$q_P^* = \left(\frac{2}{\alpha b} \right) i_P^*$$

Effects of the PTA

- Changes in i and in q are proportional to the tariff preference:

$$\Delta i \equiv i_P^* - i_N^* = \left(\frac{\alpha b}{2c - \alpha b^2} \right) t$$
$$\Delta q \equiv q_P^* - q_N^* = \left(\frac{2}{2c - \alpha b^2} \right) t$$

Effects of the PTA

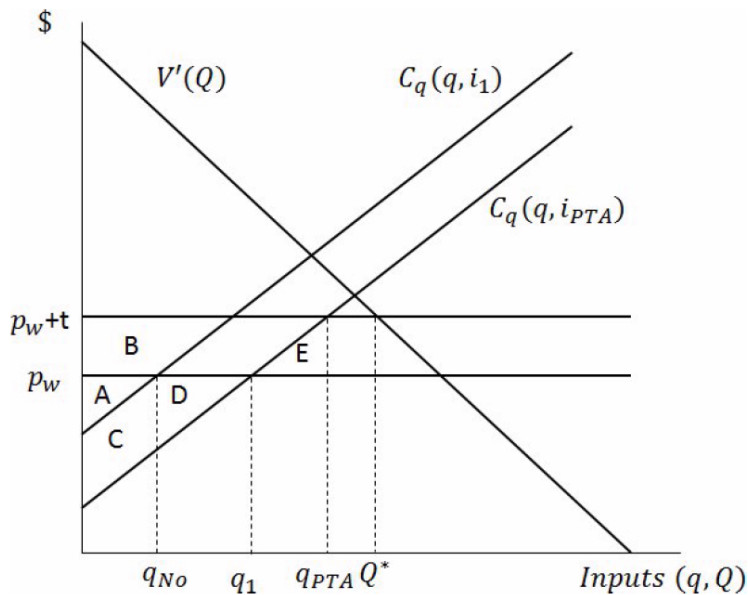
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- Part of Δq is standard trade ('sourcing') diversion:

$$\Delta q(\alpha = 0) = \frac{t}{c}$$

- Under the PTA i has a bigger impact on Ω , because $q_P(i) > q_N(i)$; S anticipates that and invests more, lowering its MC curve
 - ▶ With the PTA, more units of q *should* be traded: $C_q(q_1, i_P, \omega) = p_w$
 - ▶ $q_P^* = q_1 + \frac{t}{c}$



The welfare effects of the PTA

- A “within relationship” tradeoff between classic Vinerian trade diversion and a novel “investment enhancing” effect
 - Recall: by construction, no Vinerian trade creation
 - Consumer’s welfare from consumption of the final good unchanged

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 - Recall: by construction, no Vinerian trade creation
 - Consumer’s welfare from consumption of the final good unchanged
- 2 effects ($\Delta\Psi = \Delta\Psi_R + \Delta\Psi_S$): a **relationship-strengthening** effect and a **sourcing-diversion** effect

The relationship-strengthening effect

The welfare effects of the PTA

Relationship-strengthening effect

Difference in surplus created by Δi , inclusive of the extra investment cost:

$$\begin{aligned}\Delta\Psi_R &= p_w(q_1^* - q_N^*) + [C(q_N^*, i_N^*) - C(q_1^*, i_P^*)] - [I(i_P^*) - I(i_N^*)] \\ &= \Delta i \left[\underbrace{(1 - \alpha)bq_N^*}_{>0} + \underbrace{\left(\frac{b^2}{2c} - 1\right)\Delta i}_{<0} \right]\end{aligned}$$

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- $\frac{\partial \Delta\Psi_R}{\partial \omega} = (1 - \alpha)b\Delta i \frac{\partial \Delta q_N^*}{\partial \omega} < 0$: the relationship-strengthening effect of the PTA is more important for more productive firms
 - Low- ω suppliers produce more at any given trade regime: when cost-reducing i rises due to the PTA, the cost savings apply to more units for low- ω suppliers

The sourcing-diversion effect

The welfare effects of the PTA

Sourcing-diversion effect

Deadweight loss from using too expensive customized inputs:

$$\begin{aligned}\Delta\Psi_S &= C(q_1, i_P) - C(q_P, i_P) + p_w(q_P - q_1) \\ &= -\frac{t^2}{2c}\end{aligned}$$

- $\Delta\Psi_S$ is unaffected by i or ω

The effect of supplier productivity

The welfare effects of the PTA

Lemma As S 's productivity rises, the cost savings from the PTA increase, but its sourcing diversion remains unchanged.

- Define $\hat{\omega}$ implicitly as $\Delta\Psi_R(\hat{\omega}) + \Delta\Psi_S = 0$

The effect of supplier productivity

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Lemma As S 's productivity rises, the cost savings from the PTA increase, but its sourcing diversion remains unchanged.

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(Considering a single relationship:)

Proposition The PTA enhances welfare only if S is sufficiently productive: $\omega < \hat{\omega}$.

Proposition $\frac{\partial \hat{\omega}}{\partial t} < 0$: more discriminatory PTA \Rightarrow stricter requirement on supplier productivity to make $\Delta\Psi > 0$.

The effect of the tariff preference

The welfare effects of the PTA

- The tariff preference t affects the welfare impact of the PTA through the 2 channels:

① $\partial \Delta \Psi_S / \partial t < 0$

② $\Delta \Psi_R > 0$ for low t , \nearrow initially with t but eventually \searrow with t

Proposition $\Delta \Psi$ has a \cap -shape w.r.t. t ; $\Delta \Psi > 0$ for 'low t ' but $\Delta \Psi < 0$ for 'high t '.

The effect of HUP intensity

The welfare effects of the PTA

Proposition The PTA can enhance welfare only when the *HUP* is ‘moderate’.

- If $\alpha \rightarrow 0$, the *HUP* is too severe and the PTA is a poor substitute for incomplete contracts: PTA merely distorts sourcing decisions
- If $\alpha \rightarrow 1$, there is little contractual inefficiency to substitute for: PTA distorts sourcing decisions *and* yields excessive investment

Search and matching

- Each B searches as many times as he wants, with no recall, in either *ROW* or *Foreign*
- Cost of single search (which yields one match): $K > 0$

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- Cost of single search (which yields one match): $K > 0$
- Payoff of B that finds S with productivity ω' :

$$V_B^N(\omega') = \max \left\{ U_B^N(\omega'), \int_0^{\bar{\omega}} V_B^N(\omega) dG(\omega) - K \right\}$$

Equilibrium

Search and matching

- Equilibrium characterized by cutoff rule that makes B indifferent between stopping and searching:

$$U_B^N(\tilde{\omega}_N) = -K + \int_0^{\tilde{\omega}} V_B^N(\omega) dG(\omega) \quad (1)$$

- If $\omega > \tilde{\omega}_N$, new search: $V_B^N(\omega) = -K + \int_0^{\tilde{\omega}} V_B^N(\omega) dG(\omega) = U_B^N(\tilde{\omega}_N)$
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- If $\omega \leq \tilde{\omega}_N$, stop searching: $V_B^N(\omega) = U_B^N(\omega)$
- Substituting back into (1):

$$U_B^N(\tilde{\omega}_N) = -K + \int_0^{\tilde{\omega}_N} U_B^N(\omega) dG(\omega) + [1 - G(\tilde{\omega}_N)] U_B^N(\tilde{\omega}_N)$$

$$\Leftrightarrow U_B^N(\tilde{\omega}_N) = E \left[U_B^N(\omega; \omega \leq \tilde{\omega}_N) \right] - \frac{K}{G(\tilde{\omega}_N)}$$

- Analogous expressions for cutoff ω under PTA: $\tilde{\omega}_P$
- However,

$$\tilde{\omega}_P < \tilde{\omega}_N$$

- At $\tilde{\omega}_N$, $U_B \nearrow$ with PTA
- At $\tilde{\omega}_N$, $V_B \nearrow$ even more with PTA
- Key: gain with PTA rises with productivity of supplier (as $\omega \downarrow$), so benefit from searching for a great supplier increases with PTA

Adjustments with PTA

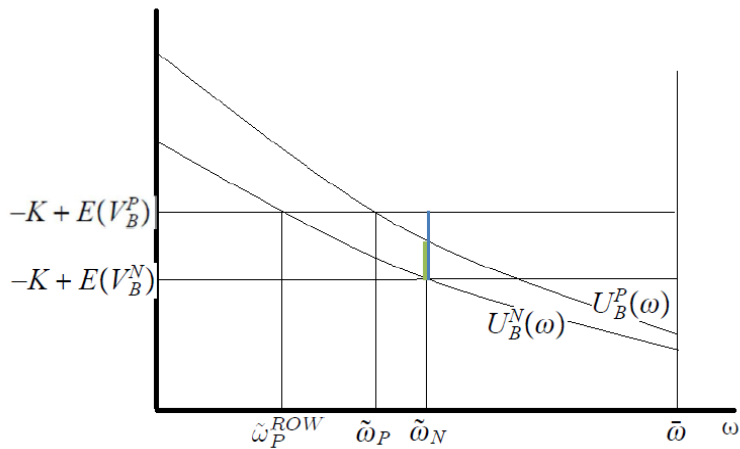
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Search and matching

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- *Bs* with initial matches in *ROW*:
 - Comparison is now between keeping match in *ROW* vs. re-matching in *Foreign*
 - If $\omega \leq \tilde{\omega}_P^{ROW} (< \tilde{\omega}_P)$: keep match
 - If $\omega \in (\tilde{\omega}_P^{ROW}, \tilde{\omega}_N)$: re-match in *Foreign*



Consequences of the PTA

Search and matching

[TO COMPLETE]

- Because B does not consider U_S and TR , initially there is too little search
- With PTA, more search and better average matches for Bs in *Foreign*
- Furthermore, Bs without great matches in *ROW* move to inside PTA

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- Furthermore, Bs without great matches in *ROW* move to inside PTA
 - More search \Rightarrow welfare \nearrow because of too little search without the PTA
 - Better matches \Rightarrow welfare impact of PTA greater exactly in that case
 - Could the PTA induce too much search?

- The consequences of PTAs under global sourcing and incomplete contracts can be quite different from the usual type
 - A PTA can be welfare-enhancing even if trade creation $\equiv 0$
 - The beneficial investment effect is especially valuable for high-productivity suppliers
 - Search & matching reinforce those effects and justify view that PTAs and GVCs 'go together'
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- Baldwin (2011): 'new regionalism' in world of international fragmentation needs new thinking
 - Here: a step toward a framework that incorporates the Vinerian view to the world of international fragmentation