Intellectual Property Provisions in North-South Trade Agreements

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July 2008
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- Developed country view: strong IPR protection regimes necessary for providing adequate incentives for innovation and/or technology transfer.
- Developing countries: TRIPS will merely greater rents for innovating firms, most of which come from the developed world and have no substantive effect on innovation and technology transfer.
Existing empirical findings

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I As always, more theory!

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- What is gained by having the second instrument when one is already available?
Framework

- Two-country world: North (N) and South (S).
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- Two stage policy game:
  - In the first stage, South decides whether or not to extend IPR protection to the Northern firm while North chooses its tariff.
  - Given the policy choices of the two countries, trade and consumption takes place.
Goods markets

- Let $t$ denote the Northern tariff on Southern exports of good $y$. 

$$\text{No arbitrage in good } y \text{ implies } p_n(y)(t) = p_s(y)(t) + t.$$ 

$$\text{Let } y_j(t) \text{ denote the quantity of good } i \text{ consumed by country } j. \text{ We have } \sum_j y_j(t) = e.$$ 

$$\text{Northern firm discriminate across markets and chooses } x_{jn} \text{ to maximize its profits:}$$ 

$$\max x_{jn} \pi_{jn} = \max x_{jn} p_{jn}(x_{jn}) x_{jn}(3).$$ 

$$\text{Optimal sales } x_{jn} \text{; and associated price } p_{jn}.$$
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  \[ \max_{x^j_n} \pi^j_n = \max_{x^j_n} p^j_x(x^j_n) x^j_n \] (3)
- Optimal sales $x^j_n^*$; and associated price $p^j_x$. 
North’s policy decision

- The optimal Northern tariff maximizes its welfare which can be written as

\[ w^n = w_x^n + w_y^n \]  \hspace{1cm} (4)

where \( w_i^n \) is sum of CS and any revenue.
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- FOC for optimal Northern tariff is

\[ \frac{dw^n_y}{dt} = y^n (1 - \frac{dp^n_y}{dt}) + t \frac{dy^n}{dt} = 0 \]  

(5)

\[ = y^n (-\frac{dp^n_y}{dt}) + t \frac{dy^n}{dt} = 0 \]  

(6)
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- Terms of trade gain versus loss in consumer surplus.
South’s decision

- If South protects Northern firm’s IP, its technology does not leak out and it is free to act as a monopolist in both markets.
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- If not, a local Southern imitator enters and it can produce $x$ at marginal cost $\mu \geq 0$. 
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- If South protects Northern firm’s IP, its technology does not leak out and it is free to act as a monopolist in both markets.
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- Cournot competition follows and price in the Southern market falls: $p_{x}^{s\mu} \leq p_{x}^{s*}$. 
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- Imitator cannot export to North.
Nash Equilibrium

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In Nash equilibrium, South does not protect IPRs while North imposes $t^n$. Denote this Nash outcome as $(t^n, p^s_{x\mu})$. Similarly interpret $(0, p^s_{x*})$. When is global welfare higher under $(0, p^s_{x*})$?
Nash Equilibrium

- In Nash equilibrium, South does not protect IPRs while North imposes \( t^n \).
- Denote this Nash outcome as \((t^n, p^{s\mu}_x)\). Similarly interpret \((0, p^{s\mu}_x)\).
- When is global welfare higher under \((0, p^{s\mu}_x)\)?
- \( \omega(0, p^{s\mu}_x) > \omega(t^n, p^{s\mu}_x) \) can be written as

\[
\sum_j u(y^j(0)) - \sum_j u(y^j(t^n)) > u(x^{s\mu}) - u(x^{s\mu}) - \mu x^{s\mu}_s
\]

(7)
Nash Equilibrium

- In Nash equilibrium, South does not protect IPRs while North imposes $t^n$.
- Denote this Nash outcome as $(t^n, p_x^{s\mu})$. Similarly interpret $(0, p_x^{s\ast})$.
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- $ww(0, p_x^{s\ast}) > ww(t^n, p_x^{s\mu})$ can be written as
  \[ \sum_j u(y^j(0)) - \sum_j u(y^j(t^n)) > u(x^{s\mu}) - u(x^{s\ast}) - \mu x_s^{s\mu} \]
  \[ (7) \]
- Focus on the LHS. Under $t = 0$, $y^j(0) = e/2$. Also $\sum_j y^j(t^n) = \sum_j y^j(0) = e$ and $y^n(t^n) < e < y^s(t^n)$. 

Introduction
Evidence
Research questions
Basic model
North-South cooperation
Cooperation under a transfer
Cooperation under $(t, T)$
The Role of a tariff
Concluding remarks
Effects of tariff and imitation

- Since $u$ is concave and $\sum_j y^j(t^n) = e$, we know that

$$u(e/2) > \frac{u(y^n(t^n))}{2} + \frac{u(y^s(t^n))}{2}$$

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- A Northern tariff creates a deadweight loss *not* by lowering its output but rather by altering its *allocation across the two regions*. 
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- A Northern tariff creates a deadweight loss not by lowering its output but rather by altering its allocation across the two regions.

- The RHS of (7) captures two conflicting effects of imitation: increases world output of good \( x \) but also allocates production away from an efficient firm to an inefficient one (since \( \mu \geq 0 \)).
Repeated interaction

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- But Northern monopoly pricing is a *distortion* and North-South cooperation over IPR protection is a *second best* issue. Not obvious that cooperation will succeed.
- Consider the infinite repetition of the two stage game.
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But Northern monopoly pricing is a *distortion* and North-South cooperation over IPR protection is a *second best* issue. Not obvious that cooperation will succeed.

Consider the infinite repetition of the two stage game.

Countries sustain cooperation via trigger strategies: any defection results in a permanent policy war wherein both countries revert to their Nash equilibrium policies.
Per period payoffs

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- South punishes a Northern defection by revoking IPR protection forever.
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- Welfare during the period of defection is $w^n(t^n, p_x^{s*})$ where $w^n(t^n, p_x^{s*}) > w^n(0, p_x^{s*})$.
- South punishes a Northern defection by revoking IPR protection forever.
- Under the resulting policy war, Northern gets $w^n(t^n, p_x^{s\mu})$ where $w^n(t^n, p_x^{s\mu}) < w^n(t^n, p_x^{s*})$. 
Incentive constraints

- Northern IC constraint

\[ w^n(t^n, p^s_x) - w^n(0, p^s_x) \leq \frac{\delta}{1 - \delta} \left[ w^n(0, p^s_x) - w^n(t^n, p^s_{x\mu}) \right] \]  

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- This holds iff \( \delta \geq \delta^n \) where

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**Proposition 1**: North-South cooperation over free access to the Northern market in return for Southern IPR protection succeeds iff $\delta > \max\{\delta^s, \delta^n\}$. 

As $\mu$ increases, South becomes more willing to cooperate; opposite effect on North: 

$$d_{\delta^n} \mu < 0 < d_{\delta^s} \mu$$

In fact, 

$$\lim_{\mu \to p^s} x_{\delta^n} = \infty$$ whereas 

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Cooperation under a tariff

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\[
\lim_{\mu \to p_x^{s*}} \delta^n = \infty \quad \text{whereas} \quad \lim_{\mu \to p_x^{s*}} \delta^s = 0. \tag{15}
\]
When does cooperation occur?

- Key intuition: bilateral cooperation is most likely to succeed when Southern imitation is efficient enough to make cooperation attractive enough to North while at the same time it is not so efficient that South has no incentive to cooperate.
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- **Key intuition:** bilateral cooperation is most likely to succeed when Southern imitation is efficient enough to make cooperation attractive enough to North while at the same time it is not so efficient that South has no incentive to cooperate.

- **Assumption 1:**

\[
\lim_{\mu \to 0} w^n(t^n, p^{s^\mu}_x) < w^n(0, p^{s*}_x) \quad (16)
\]

\[
\text{and } \lim_{\mu \to 0} w^s(t^n, p^{s^\mu}_x) < w^s(0, p^{s*}_x)
\]
When does cooperation occur?

- Key intuition: bilateral cooperation is most likely to succeed when Southern imitation is efficient enough to make cooperation attractive enough to North while at the same time it is not so efficient that South has no incentive to cooperate.

- **Assumption 1:**

  \[
  \lim_{\mu \to 0} w^n(t^n, p_x^s) < w^n(0, p_x^{s*}) \tag{16}
  \]

  and

  \[
  \lim_{\mu \to 0} w^s(t^n, p_x^s) < w^s(0, p_x^{s*})
  \]

- Assumption 1 implies that when \( \mu \to 0 \), \( \delta^s > \delta^n \).
Figure 1A: Cooperation succeeds under a tariff
Compensating South

- Suppose North cannot use a tariff to improve its own terms of trade and restrict South’s access to its market.
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- Can bilateral cooperation be sustained via the use of a per period transfer $T$ from North to South?
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- If North cooperates, it pays per period transfer $T$. If it defects, it stop paying $T$. 

\[
\delta_1 \delta \left[ w_n(0, p_s x) T \right] = T \delta \left[ w_n(0, p_s x) w_n(0, p_s \mu x) \right] > 0
\]
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- North’s IC

$$w^n(0, p^s_X) - [w^n(0, p^s_X) - T] \leq \frac{\delta}{1 - \delta} [w^n(0, p^s_X) - T - w^n(0, p^s_{\mu X})]$$

which is the same as

$$T \leq T^n \quad \text{where} \quad T^n \equiv \delta [w^n(0, p^s_X) - w^n(0, p^s_{\mu X})] > 0$$
Southern incentive constraint

- If South cooperates, it collects $T$ and does not permit imitation. Defection: take $T$ and permit imitation.
Southern incentive constraint

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- Southern IC

$$w^s(0, p^s_{x\mu}) + T - [w^s(0, p^s_{x*}) + T] \quad (19)$$

$$\leq \frac{\delta}{1 - \delta}[w^s(0, p^s_{x*}) + T - w^s(0, p^s_{x\mu})]$$

which is the same as

$$T \geq T^s \text{ where } T^s \equiv \frac{w^s(0, p^s_{x\mu}) - w^s(0, p^s_{x*})}{\delta} > 0 \quad (20)$$
Southern incentive constraint

- If South cooperates, it collects $T$ and does not permit imitation. Defection: take $T$ and permit imitation.

- Southern IC

$$w^s(0, p^s_{x\mu}) + T - [w^s(0, p^s_{x*}) + T] \leq \frac{\delta}{1 - \delta}[w^s(0, p^s_{x*}) + T - w^s(0, p^s_{x\mu})]$$

which is the same as

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- **Proposition 2**: If North cannot use a tariff, it is willing to pay a per period transfer $T$ to South to sustain cooperation only if $T < T^n$ and South is willing to engage in such cooperation only if $T > T^s$. 
What hope for cooperation?

- $T^n$ is increasing in $\delta$ while $T^s$ is decreasing in it.
- As $\delta \to 0$, $T^s \to \infty$ whereas $T^n \to 0$ implying cooperation fails when $\delta$ is close to zero.
- Cooperation cannot occur for any feasible $\delta$ if at $\delta = 1$ we have $T^n < T^s$ i.e. we have

$$w^n(0, p_x^{s*}) - w^n(0, p_x^{s\mu}) < w^s(0, p_x^{s\mu}) - w^s(0, p_x^{s*})$$

(21)

which is the same as

$$ww(0, p_x^{s\mu}) < ww(0, p_x^{s*})$$

(22)

for cooperation to occur for any range of feasible parameters, imitation must lower world welfare. In other words, the above inequality is necessary for $T$ to work at all.
Condition on world welfare

- When is $ww(0, p^s_{x\mu}) < ww(0, p^s_*)$ likely to hold?
Condition on world welfare

- When is $ww(0, p_x^{s\mu}) < ww(0, p_x^{s*})$ likely to hold?
- We know that

$$ww(0, p_x^{s\mu}) - ww(0, p_x^{s*}) = u(x^{s\mu}) - u(x^{s*}) - \mu x_s^{s\mu}$$

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(23)

- Implies that cooperation yields higher global welfare only when the cost of the Southern imitator (i.e. $\mu$) is large enough for the world to be better off under an efficient Northern monopoly.
Figure 2A: Cooperation succeeds under a transfer

\[ w^n(0,p^s\mu)-w^n(0,p^s\bar{\mu}) \]

\[ w^s(0,p^s\bar{\mu})-w^s(0,p^s\bar{\mu}) \]

\[ T \]

\[ T^s \]

\[ T^n \]

\[ 0 \quad \delta^T \quad 1 \]

\[ \delta \]
Figure 3: Critical transfer levels
Tariff versus Transfer

- Which instrument is more effective in supporting cooperation?
Tariff versus Transfer

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- Somewhat surprisingly, one instrument does not dominate the other.
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**Proposition 3:** Let $\Delta T \equiv T^n - T^s$. At $\delta = \delta^*$, $\Delta T|_{\delta = \delta^*} = \WW(t^n, p^{s\mu}_x) - \WW(0, p^{s\mu}_x) < 0$. 

Figure 4: Superimposes $\Delta T = 0$ on Figure 1.
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- Figure 4A superimposes \( \Delta T = 0 \) on figure 1.

- Intuition for region D: Tariff lowers per-period welfare for South under a policy war relative to a transfer:
  \[ w^s(t^n, p_x^{s\mu}) < w^s(0, p_x^{s\mu}) \] thereby relaxing the Southern IC constraint.
Figure 4A: Tariff versus transfer
Why transfer helps

- As before can show that North is willing to cooperate iff \( T \leq T^n_t \) whereas South is willing iff \( T \geq T^s_t \).

- **Proposition 4**: Let \( \Delta T_t \equiv T^n_t - T^s_t \). At \( \delta = \delta^* \), \( \Delta T_t = 0 \).
Why transfer helps

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- **Proposition 4**: Let $\Delta T_t \equiv T^n_t - T^s_t$. At $\delta = \delta^*$, $\Delta T_t = 0$.

- Transfer necessarily helps since it *aggregates* the two ICs into one.
Figure 4B: Contribution of a transfer
Effect of tariff on ICs

- Straightforward to show that

\[ T^s_t - T^s = w^s(t^n, p^s_{x^M}) - w^s(0, p^s_{x^M}) < 0 \]  \hspace{1cm} (24)

i.e. South’s incentive constraint is easier to satisfy when North can use both instruments.
Effect of tariff on ICs

- Straightforward to show that
  \[ T_t^s - T^s = w^s(t^n, p_x^{s\mu}) - w^s(0, p_x^{s\mu}) < 0 \]  \hspace{1cm} (24)
  i.e. South’s incentive constraint is *easier* to satisfy when North can use both instruments.

- However,
  \[ T_t^n - T^n = -w^n(t^n, p_x^{s\mu}) + w^n(0, p_x^{s\mu}) < 0 \]  \hspace{1cm} (25)
  i.e. Northern incentive constraint *harder* to satisfy.
Proposition 5: Relative to the $T$ only case, the maximum transfer North is willing to pay and the minimum transfer that South requires are both lower under $(t, T)$: $T^j_t - T^j < 0$ for $j = n, s$. 
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Furthermore

$$\Delta T_t = \Delta T + [w(t, p^{s\mu}) - w(t^n, p^{s\mu})] > 0 \quad (26)$$
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Proposition 6: If $\Delta T \geq 0$ then $\Delta T_t \geq 0$. 
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In other words, if cooperation occurs under a transfer, it necessarily occurs when North can use both instruments.
Why does a tariff facilitates cooperation?

- North less willing but South more willing, so why is overall effect positive?

- Northern tariff imposes a deadweight loss – South’s loss always exceeds what North gains.

- So what the tariff does to reduce North’s incentive to cooperate is more than offset by its positive effect on South’s incentive to cooperate.
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Figure 5: Contribution of a tariff
The rather divergent views of developed and developing countries about IPR protection both have some merit.
Summary

- The rather divergent views of developed and developing countries about IPR protection both have some merit.
- For global negotiations over IPRs to succeed inclusion of non-IPR related issues might be necessary.
Introduction

Evidence

Research questions

Basic model

North-South cooperation

Cooperation under a transfer

Cooperation under (t, T)

The Role of a tariff

Concluding remarks

Summary

- The rather divergent views of developed and developing countries about IPR protection both have some merit.
- For global negotiations over IPRs to succeed inclusion of non-IPR related issues might be necessary.
- Idea is formalized in a stylized North-South model that captures the trade-off between market access and IPR protection.
The rather divergent views of developed and developing countries about IPR protection both have some merit. For global negotiations over IPRs to succeed inclusion of non-IPR related issues might be necessary. Idea is formalized in a stylized North-South model that captures the trade-off between market access and IPR protection. Model abstracts from innovation effects of IPR enforcement.
Summary

- The rather divergent views of developed and developing countries about IPR protection both have some merit.
- For global negotiations over IPRs to succeed inclusion of non-IPR related issues might be necessary.
- Idea is formalized in a stylized North-South model that captures the trade-off between market access and IPR protection.
- Model abstracts from innovation effects of IPR enforcement.
- Reasonable? Many small countries have accepted changes in their IPR regimes under bilateral FTAs with large markets. Hard to believe that innovation effects of such agreements are significant.