Parallel Imports and Cost Reducing Research and Development *

Abstract:

w T w T

q_A q_B

q_B

w_i c_i $i = H \; L$

$$\pi_A = \quad - q_A - c_i \;\; q_A$$

$$\pi_B = \;\; a - q_B - w_i \;\; q_B$$

T T

w_i

w_i

T

w_i M w_i c_i A c_i B w_i $w_i - c_i$ q_B w_i $- k$

4 0 0 11.9894 307.3197 34 T7 T67c

$R_M \quad w_L \quad c_L \qquad R_M \quad w_H \quad c_H \qquad w_L$

$w_H \qquad \alpha \qquad = d$

k

$$\Delta R_M = R_M \quad w_L \quad c_L \quad - R_M \quad w_H \quad c_H \quad = \pi_M \quad w_L \quad c_L \quad - \pi_M \quad w_H \quad c_H \quad = \frac{c_H - c_L \qquad + a \; - \; c_H + c_L}{}$$

$$k = \frac{}{b} \quad d - \frac{}{\Delta R_M}$$

A1: $\alpha \qquad = d$

2.2. The case in which we allow parallel imports

$$\pi_{AM} = \quad - \quad q_{AM} + q_{AD} \quad - c_i \quad q_{AM}$$

$$\pi_{AD} = \quad - \quad q_{AM} + q_{AD} \quad - w_i - t \quad q_{AD}$$

c

q_{AM} q_{AD} $q_{AM} + q_{AD}$

w_i T π_{AM} π_{AD}

$$_{q_B} \quad \pi_B = a - q_B - w_i \;\; q_B$$

$$_{w_i \geq} \quad \pi_M \;\; w_i \;\; c_i \;\; = \pi_{AM} \;\; w_i \;\; c_i \;\; + \pi_{AD} \;\; w_i \;\; c_i \;\; + \pi_B \;\; w_i \;\; c_i \;\; + \;\; w_i - c_i \;\; q_{AD} \;\; w_i \;\; c_i \;\; + q_B \;\; w_i \;\; c_i \;\; - k^p$$

$$E_M^p = \alpha \;\; k^p \;\; R_M^p \;\; w_L \;\; c_L \;\; + \;\; - \alpha \;\; k \;\; R_M^p \;\; w_H \;\; c_H \;\; - k^p$$

R_M^p w_L c_L R_M^p w_H c_H

w_L w_H

$$\Delta R_M^p = R_M^p \;\; w_L \;\; c_L \;\; - R_M^p \;\; w_H \;\; c_H \;\; = \pi_M^p \;\; w_L \;\; c_L \;\; - \pi_M^p \;\; w_H \;\; c_H$$

$$k^p = \frac{}{b} \;\; d - \frac{}{\Delta R_M^p}$$

$c_i \geq \; + \; t$

Proposition 1: *The relationship between* T *and* c_i *is not monotonic.*

$_i$

$+$

$+ c_i \quad + \quad c_i$

$$t \geq \frac{-c_i}{}$$

$w_i \geq$

$$_M = \frac{-c_i}{} + \frac{a - w_i}{} + \frac{w_i - c_i \quad a - w_i}{} - k^p$$

Corollary 1 t , $\le t < \frac{-c_i}{}$ *such that* π_M *decreases in* t *when* $\le t < t$ *, increases in* t *when* $t \le t < \frac{-c_i}{}$ *and is constant when* $t \ge \frac{-c_i}{} > t$.

π_M

profit curve

global welfare curve.

t

$\le t < t$

t

$t \le t < \frac{-c_i}{}$ t

π_M t $\frac{-c_i}{} \le t < \frac{-c_i}{}$

$_i = \frac{c_i}{} - t$

$t \quad \frac{c_i}{}$

$$\pi_M^p \;\; w_L \;\; c_L \;\; \geq \pi_M^p \;\; w_H \;\; c_H$$

$R_M^p \;\; w_L \;\; c_L \;\; \geq R_M^p \;\; w_H \;\; c_H$ $\qquad c_j \in \;\; c_L \;\; c_H$

$\pi_M^p \;\; w_j \;\; c_j \qquad R_M^p \;\; w_j \;\; c_j \qquad c_j$

Assumption 2: $- \;\; c_H + \;\; c_L >$

Proposition 3: $\dfrac{\partial \pi_M^p \;\; w_j \;\; c_j}{\partial c_j} < \quad all \;\; t \geq \;\; .$

Proposition 4: *Given assumption 1, the manufacturer has incentives to make investment in cost-reducing innovation.*

$\leq t < \dfrac{-c_H}{} \qquad w_H = \dfrac{+ \;\; t + \;\; c_H}{}$

$$\frac{\quad - c_H}{\quad} \le t < \frac{\quad - c_H}{\quad}$$

$$_H = \frac{\quad + c_H}{\quad} - t$$

Proposition 3. *Successful cost-reducing innovation is helpful in reducing the wholesale price.*

t

t

Corollary 4: *For every*

E_M E_M^p

3.5. Impact of restricting parallel imports on expected welfare

Proposition 8: *Under assumption 1 and 2, restricting parallel imports*

(i). reduces the expected consumer surplus in country A, raises the expected consumer surplus in country B and has ambiguous impact on expected global welfare when

$\leq t < \frac{- c_H}{}$;

(ii). lowers the expected consumer surplus in country A, increases the expected consumer surplus in country B and has ambiguous impact on expected global welfare when

$\frac{- c_H}{} \leq t < \frac{- c_L}{}$;

(iii). does not impact on the expected consumer surplus in country A, but raises the expected consumer surplus in country B and increases expected global welfare when

$\frac{- c_L}{} \leq t < \frac{- c_H}{}$;

(iv). has no impact on the expected consumer surplus in country A, but increases the expected consumer surplus in country B and raises the expected global welfare when

$\frac{- c_H}{} \leq t < \frac{- c_L}{}$;

(v). does not impact on the expected consumer surplus in both countries and the expected global welfare when $t > \frac{- c_L}{}$.

Appendix

A. *not*

$$\pi_A = \quad -q_A - c_i \;\; q_A$$

$$\pi_B = \; a - q_B - w_i \;\; q_B$$

$$i = L \;\; H$$

$$q_A \;\; c_i \;\; = \frac{-c_i}{} \qquad p_A \;\; c_i \;\; = \frac{+c_i}{} \qquad \pi_A \;\; c_i \;\; = \frac{-c_i}{}$$

$$q_B \;\; w_i \;\; = \frac{a - w_i}{} \qquad p_B \;\; w_i \;\; = \frac{a + w_i}{} \qquad \pi_B \;\; w_i \;\; = \frac{a - w_i}{}$$

$$_{w_i \geq} \;\; \pi_M \;\; w_i \;\; c_i \;\; = \pi_A \;\; c_i \;\; + \pi_B \;\; w_i \;\; + \;\; w_i - c_i \;\; q_B \;\; w_i \;\; - k$$

$$\frac{-c_i}{} + \frac{a - w_i}{} + \frac{a - w_i \;\; w_i - c_i}{} - k$$

$$\frac{- \;\; w_i - c_i}{} = \qquad\qquad w_i = c_i$$

$$T_i = \frac{a - c_i}{} \qquad \pi_M \;\; w_i \;\; c_i \;\; = \frac{-c_i}{} + \frac{a - c_i}{} - k$$

B. *allow*

$$T_i = \begin{cases} C & if \quad \le t < \dfrac{-c_i}{} \\ \dfrac{a + \; t - \; - c_i}{} & if \quad \dfrac{-c_i}{} \le t < \dfrac{-c_i}{} \\ \dfrac{a - c_i}{} & if \quad t \ge \dfrac{-c_i}{} \end{cases}$$

$$= \begin{cases} \frac{}{} \; + \; - \; - \; + \; - \; + \; + \; - & \le \; < \dfrac{-}{} \\ \frac{}{} \; + \; - \; + \; - \; - \; - \; + \; - & \dfrac{-}{} \le \; < \dfrac{-}{} \\ \dfrac{- \; + \; -}{} - & \ge \dfrac{-}{} \end{cases}$$

$$w_L = \frac{+c_L}{} - t \qquad \frac{-c_H}{} \leq t < \frac{-c_L}{}$$

$$w_L = \frac{+c_L}{} - t \leq \frac{+c_L}{} - \frac{-c_H}{} = \frac{c_H + c_L}{} < c_H \qquad \spadesuit$$

$$\underset{t\to\frac{-c_H}{}+}{Lim}\Delta R_M^p = \frac{}{} \quad c_H + \quad ac_H - \quad c_H - \quad c_L - \quad ac_L - \quad c_H c_L + \quad c_L = \underset{t\to\frac{-c_H}{}-}{Lim}\Delta R_M^p$$

$$\underset{t\to\frac{-c_L}{}-}{Lim}\Delta R_M^p = \frac{}{} \quad c_H + \quad ac_H - \quad c_H - \quad c_L - \quad ac_L - \quad c_H c_L + \quad c_L$$

$$= \frac{}{} \; c_H - c_L \quad + \; t - \; c_H + c_L \quad > \qquad \Delta R_M > \Delta R_M^p \qquad k > k^p$$

$$\frac{-c_H}{} \leq t < \frac{-c_L}{} \qquad \Delta R_M - \Delta R_M^p \; = \frac{c_H - c_L \quad + a \; - \; c_H + c_L}{}$$

$$\frac{}{} \qquad a \; c_H \quad c_L \qquad t \qquad t \; + \quad c_H - \quad c_L + \quad tc_H + \quad tc_L - \quad c_H + \quad c_L$$

$$\frac{\partial \ \Delta R_M - \Delta R_M^p}{\partial t} = - \ \ + \ \ t + \ \ c_L = - \ \ t - \frac{-c_L}{} \ \ < \qquad \Delta R_M - \Delta R_M^p$$

$$t = \frac{-c_L}{} \qquad \Delta R_M - \Delta R_M^p \ \ > \ \ \Delta R_M - \Delta R_M^p \ \Big|_{t=\frac{-c_L}{}} =$$

$\Delta R_M > \Delta R_M^p$ $\qquad k > k^p$

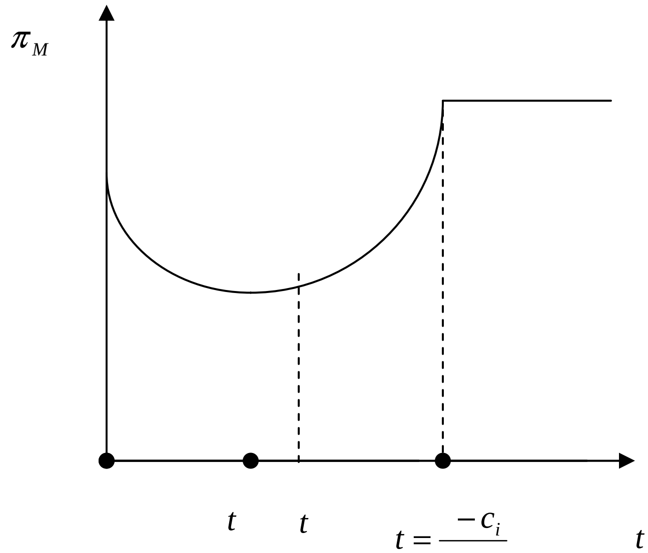
$t \geq \frac{-c_L}{}$ $\qquad k$

$$ECS_A^p = \frac{}{} \quad - \; t - \; c_L \quad \alpha \, k \; + \frac{}{} \quad - \; t - \; c_H \quad - \alpha \, k$$

$$ECS_B^p = \frac{}{} \quad a - \; - \; t - \quad c_L \quad \alpha \, k \; + \frac{}{} \quad a - \; - \; t - \quad c_H \quad - \alpha \, k$$

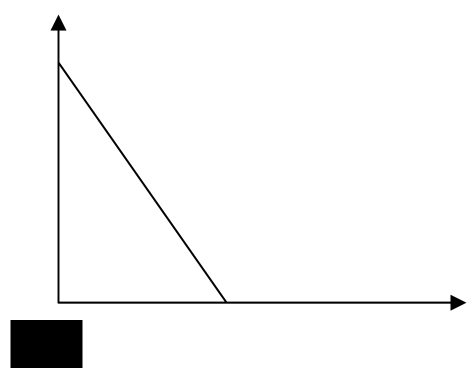
$$- \quad - c_i \quad - \frac{}{} \quad - \; t - \; c_i \qquad\qquad t$$

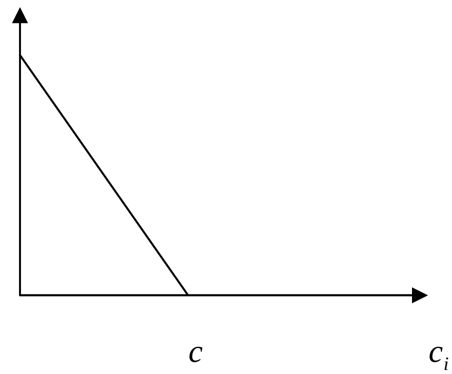

w_i



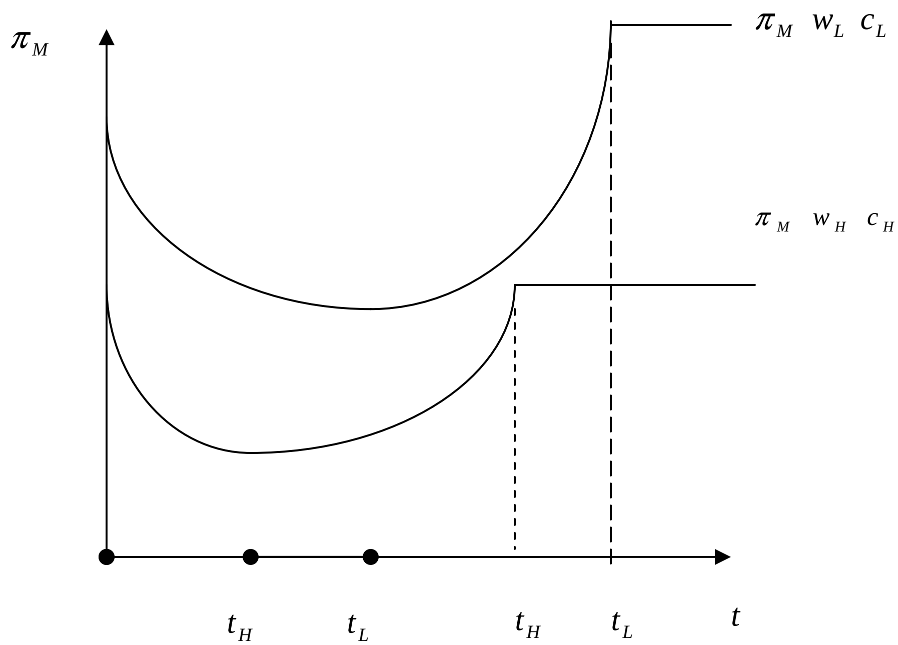
π_M

$t \ = \frac{-c_i}{}$ $\quad t \ = \frac{-c_i}{}$

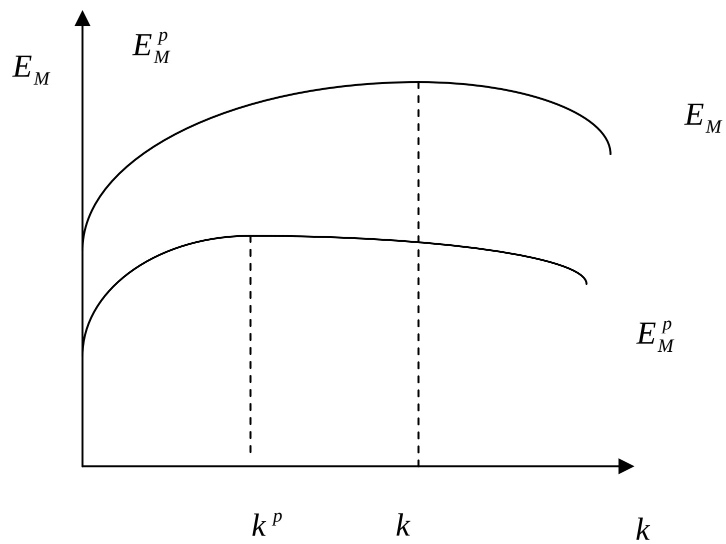




$$\frac{- \quad t}{} \qquad c = -\frac{t}{}$$



$$t_H = \frac{-c_H}{} \qquad t_L = \frac{-c_L}{}$$


E_M
E_M^p
E_M
E_M^p
k^p
k
k

References