Trade Policy and Illegal Immigration

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### Policy Background

- **PTAs:**
  - Reduction or removal of tariff barrier to trade
  - Not much attention given to movement of labour

- **Legal immigration restricted**
  - Illegal immigration prevalent

- **Policies to minimize illegal immigration**
  - Border patrol
  - Internal surveillance
Approach

Research questions

- How effective is tariff reform in reducing illegal immigration?

Methodology

- Paper is most closely related to
  - Gaytan-Fregoso and Lahiri (2001)
Early literature
- Ethier (AER, 1986a, 1986b)
- border patrols and internal surveillance

Extensions
- either assume away risk or assume risk-neutrality

Risk
- Woodland and Yoshida (JDE, 2006)
- non-neutral risk preferences

Trade, tariffs and illegal immigration
- Gaytan-Fregoso and Lahiri (Routledge, 2001)
- Kahana and Lecker (EconGov, 2005)
This Paper

Features

- Specifies a model with two countries (+ROW)
- Impose tariffs on trade
- Illegal immigration
- Border patrol
- Prospective illegal immigrants are expected utility maximizers

We examine effect of

- Tariff reforms (North, South and Both)

upon

- Level of illegal immigration
- Welfare
Countries: North, South and ROW

World prices: $(1, \pi)$

Specific tariffs: $T$ and $t$

Domestic prices: $P = \pi + T$ and $p = \pi + t$

Expenditure functions:
- $E(P, G, U)$ North citizens
- $\tilde{e}(P, G, \tilde{u})$ Illegal immigrants
- $e(p, u)$ South residents

Revenue functions:
- $R(P, L, I)$ North
- $r(p, l)$ South

Labour supplies:
- $L^\theta = L^G + L^B$

- $L = \bar{L} - L^\theta$
- $l = \bar{l} - l$

Public good production:
- $G(L^G)$
Border protection and equilibrium illegal immigration

- Border detection probability: \( g(L^B) \) where \( g' > 0, g'' < 0 \).
- Immigration equilibrium condition

\[
(1 - g(L^B)) \tilde{u} + g(L^B) (u - k) = u
\]

- Rewrite as

\[
\tilde{u} = u + hk
\]

where \( h = h(L^B) = g/(1 - g) \) is the odds of detection.
Equilibrium Conditions

\[ E(P, U) = Y \equiv \left[ R(P, L, I) - IR_I(P, L, I) + T'M \right] / \bar{L} \]  
(1)

\[ \tilde{e}(P, \bar{u}) = \tilde{y} \equiv (1 - \alpha) R_I(P, L, I) \]  
(2)

\[ e(p, u) = y \equiv \left[ r(p, l) + \alpha IR_I(P, L, I) + t'm \right] / l \]  
(3)

\[ \bar{u} = u + hk, \]  
(4)

where \( h = g / (1 - g), \)

\[ P = \pi + T, \ p = \pi + t, \ L = \bar{L} - L^B - L^G, \ l = \bar{l} - l \]

import vectors \( M \) and \( m \) are

\[ M = \bar{L}E_P + \bar{l}\bar{e}_P - R_P \]  
(5)

\[ m = (\bar{l} - l)e_P - r_P \]  
(6)
Comparative Statics Equations

\[ \bar{L}(E_U - T' E_{PU}) dU = - [IR_{II} + T'(R_{PL} - \tilde{e}_P)] \, dl \\
- (R_L - IR_{IL} - T' R_{PL}) \, dL^B \\
+ [T' S_{PP} + \tilde{l} \tilde{e}_P - IR_{IP}] \, dT + IT' \tilde{e}_{pu} \, d\tilde{u} \]

\[ \tilde{e}_u \, d\tilde{u} = (1 - \alpha) R_{II} \, dl - (1 - \alpha) R_{IL} \, dL^B - R_l \, d\alpha \\
+ [(1 - \alpha) R_{IP} - \tilde{e}_P] \, dT \]

\[ l(e_u - t' e_{pu}) \, du = [e - r_l + \alpha (R_l + IR_{II}) + t'(r_{pl} - e_p)] \, dl \\
- \alpha IR_{IL} \, dL^B + IR_l \, d\alpha \\
+ t' s_{pp} \, dt + \alpha IR_{IP} \, dT \]

\[ d\tilde{u} = du + \lambda \, dL^B. \]
The income effects on consumption and Hatta conditions are

\[ C_Y = \frac{E_{PU}}{E_U} \]

\[ \tilde{c}_y = \left( \frac{\tilde{e}_{PU}}{\tilde{e}_u} \right) \]

\[ c_y = \frac{e_{PU}}{e_u} \]

\[ \hat{E}_U \equiv E_U (1 - T' C_Y) > 0 \]

\[ \hat{e}_u \equiv e_u (1 - t' c_y) > 0. \]
The solution for the change in illegal immigration is

\[ dl = -C_I^{-1} \left[ C_B dL^B + C_A d\alpha + C_T dT + C_t dt \right] . \] (7)

where

\[
C_I = \tilde{\varepsilon}_u^{-1}(1 - \alpha)R_{II} - l^{-1}\tilde{\varepsilon}_u^{-1}H 
\] (8)

\[
C_B = -\{\lambda + (\tilde{\varepsilon}_u^{-1}(1 - \alpha) - \tilde{\varepsilon}_u^{-1}\alpha l l^{-1}) R_{II} \} 
\] (9)

\[
C_A = -\{\tilde{\varepsilon}_u^{-1} + \hat{\varepsilon}_u^{-1}l^{-1}l \} \ R_I < 0 
\] (10)

\[
C_T = \tilde{\varepsilon}_u^{-1}[(1 - \alpha)R_{IP} - \tilde{\varepsilon}_P'] - \tilde{\varepsilon}_u^{-1}\alpha l l^{-1}R_{IP} 
\] (11)

\[
C_t = -l^{-1}\tilde{\varepsilon}_u^{-1} t' s_{pp} 
\] (12)

and Condition A (sufficient for Hicksian stability) is

\[
H \equiv e - r_I + \alpha(R_I + lR_{II}) + t'(r_p l - e_p) > 0. \] (13)
Proposition 1: Assume that Condition A \((H > 0)\) holds. Then, a unilateral proportional tariff reduction of the form \(dt = -td\kappa\), where \(d\kappa > 0\), by South reduces successful illegal immigration. The welfare level of illegal immigrants and residents of South increase equally. If North is a free-trader, Northern citizens suffer a loss in welfare.
Proposition 1: Assume that Condition A ($H > 0$) holds. Then, a unilateral proportional tariff reduction of the form $dt = -td\kappa$, where $d\kappa > 0$, by South reduces successful illegal immigration. The welfare level of illegal immigrants and residents of South increase equally. If North is a free-trader, Northern citizens suffer a loss in welfare.

Comp. stats:

$$dl = -C_l^{-1}C_t dt = C_l^{-1}l^{-1}\hat{e}_u^{-1} t's_{pp}dt$$

Proportional Reform

$$dt = -td\kappa, \text{ where } d\kappa > 0$$

Then

$$dl / d\kappa = -C_l^{-1}l^{-1}\hat{e}_u^{-1} t's_{pp}t < 0$$
Welfare Effects of Reform by South

\[
\frac{\hat{L}E_U}{d\kappa} = \left[ T'(\hat{e}_P - R_{Pl}) - IR_{II} \{1 - T'\hat{c}_y(1 - \alpha)\}\right] \frac{dI}{d\kappa} \\
\frac{\tilde{e}_u d\tilde{u}}{d\kappa} = (1 - \alpha)R_{II} \frac{dl}{d\kappa} \\
\frac{\hat{e}_u du}{d\kappa} = HdI/d\kappa - t's_{pp}\tilde{t} \\
\frac{d\tilde{u}}{d\kappa} = du/d\kappa
\]
Welfare Effects of Reform by South

\[ \bar{L}E_U dU / d\kappa = \left[ T'(\bar{e}_u - R_{PI}) - IR_{II} \{1 - T'\bar{c}_y (1 - \alpha)\} \right] dl / d\kappa \]
\[ \tilde{e}_u d\tilde{u} / d\kappa = (1 - \alpha) R_{II} dl / d\kappa \]
\[ l\tilde{e}_u du / d\kappa = Hdl / d\kappa - t's_{pp} t \]
\[ d\tilde{u} / d\kappa = du / d\kappa \]

**North not a free trader?**
Proposition 2: Assume that Condition A \((H > 0)\) holds. Then, a unilateral proportional tariff reduction of the form \(dT = -Td\kappa\), where \(d\kappa > 0\), by North reduces successful illegal immigration if (i) there are no remittances \((\alpha = 0)\) and (ii) \([\tilde{\epsilon}'_P - R_{IP}] T < 0\).
**Proposition 2:** Assume that Condition A \((H > 0)\) holds. Then, a unilateral proportional tariff reduction of the form \(dT = -Td\kappa\), where \(d\kappa > 0\), by North reduces successful illegal immigration if (i) there are no remittances \((\alpha = 0)\) and (ii) \([\bar{e}'_P - R_{IP}]T < 0\).

**Proposition 3:** Assume that Condition A \((H > 0)\) holds. Then, a unilateral proportional tariff reduction of the form \(dT = -Td\kappa\), where \(d\kappa > 0\), by North reduces successful illegal immigration if \([\bar{e}'_P - \delta R_{IP}]T < 0\), where
\[
\delta = \tilde{e}_u \gamma = \tilde{e}_u \left\{ \frac{\partial \tilde{v}}{\partial \tilde{y}} (1 - \alpha) - \frac{\partial v}{\partial y} \left( \frac{\alpha I}{I} \right) \right\}.
\]
The effect of a unilateral proportional tariff change by North:

\[
\frac{dl}{d\kappa} = -C_I^{-1} \left\{ \tilde{e}_u^{-1} \alpha I I^{-1} R_{IP} + \tilde{e}_u^{-1} [\tilde{e}_P' - (1 - \alpha) R_{IP}] \right\} T
\]

\[
= -C_I^{-1} \tilde{e}_u^{-1} [\tilde{e}_P' - R_{IP}] T \quad \text{if } \alpha = 0 \text{ (no remittances)}
\]

\[
= -C_I^{-1} \tilde{e}_u^{-1} [\tilde{e}_P' - \delta R_{IP}] T \quad \text{where}
\]

\[
\delta = \tilde{e}_u \gamma = \tilde{e}_u \left\{ \partial \tilde{v} / \partial \tilde{y} (1 - \alpha) - \partial v / \partial y (\alpha I / I) \right\}
\]
Proposition 4: Assume that Condition A \((H > 0)\) holds, and that (i) there are no remittances \((\alpha = 0)\) and (ii) \([\tilde{e}'_P - R_{IP}] T < 0\). Then, a unilateral proportional tariff reduction of the form \(dT = -Td\kappa\), where \(d\kappa > 0\), by North reduces the welfare level of illegal immigrants and residents of South equally. The effect upon the welfare of North citizens is ambiguous.
Proposition 4: Assume that Condition A \((H > 0)\) holds, and that (i) there are no remittances \((\alpha = 0)\) and (ii) \([\tilde{e}_p' - R_{IP}] T < 0\). Then, a unilateral proportional tariff reduction of the form \(dT = -Td\kappa\), where \(d\kappa > 0\), by North reduces the welfare level of illegal immigrants and residents of South equally. The effect upon the welfare of North citizens is ambiguous.

Proposition 5: Assume that Condition A \((H > 0)\) holds, and that (i) \([\tilde{e}_p' - \delta R_{IP}] T < 0\) and (ii) \(R_{IP} T > 0\). Then, a unilateral proportional tariff reduction of the form \(dT = -Td\kappa\), where \(d\kappa > 0\), by North reduces the welfare level of illegal immigrants and residents of South equally. The effect upon the welfare of North citizens is ambiguous.
The welfare effects of the reform \( dT = -Td\kappa \), where \( d\kappa > 0 \), are as follows:

\[
\bar{L}\bar{E}_U dU / d\kappa = \left[ T'(\bar{e}_P - R_{PI}) + IT'\bar{c}_y (1 - \alpha) R_{II} - lR_{II} \right] dl / d\kappa \\
- \left[ T'S_{PP} + IT'\bar{c}_y (1 - \alpha) R_{IP} \\
+ I(1 - T'\bar{c}_y)\bar{e}'_P - T'R_{PI} \right] T \\
\tilde{e}_u d\tilde{u} / d\kappa = (1 - \alpha) R_{II} dl / d\kappa + \left[ \bar{e}'_P - (1 - \alpha) R_{IP} \right] T \\
l\tilde{e}_u du / d\kappa = Hdl / d\kappa - \alpha lR_{IP} T \\
d\tilde{u} / d\kappa = du / d\kappa.
\]
Proposition 6: Assume that Condition A \((H > 0)\) holds, and that 
\([\bar{e}'_p - \delta R_{IP}] T < 0\). Then, a bilateral proportional tariff reduction of 
the form 
\[dT = -Td\kappa \quad \text{and} \quad dt = -td\kappa,\]
where \(d\kappa > 0\), by South and North reduces successful illegal immigration.
**Proposition 6**: Assume that Condition A ($H > 0$) holds, and that 
\[ [\bar{e}'_P - \delta R_{IP}] T < 0. \] Then, a bilateral proportional tariff reduction of the form 
\[ dT = -Td\kappa \] and 
\[ dt = -td\kappa, \] where 
\[ d\kappa > 0, \] by South and North reduces successful illegal immigration.

**Comparative statics:**

\[
dl / d\kappa = C_l^{-1}(C_t t + C_T T) \\
= -C_l^{-1}[l^{-1}\tilde{e}_u^{-1} t' s_{pp} t + T\tilde{e}_u^{-1} \alpha ll^{-1} R_{IP} \\
+ \tilde{e}_u^{-1}[\bar{e}'_P - (1 - \alpha) R_{IP}]] \\
= -C_l^{-1} [l^{-1}\tilde{e}_u^{-1} t' s_{pp} t + \tilde{e}_u^{-1}[\bar{e}'_P - \delta R_{IP}] T].
\]

A sufficient condition (in addition to Condition A) for the outcome 
\[ dl / d\kappa < 0 \] is that 
\[ [\bar{e}'_P - \delta R_{IP}] T < 0 \]
Bilateral Tariff Reform

- **Proposition 6:** Assume that Condition A \((H > 0)\) holds, and that \([\bar{e}'_P - \delta R_{IP}] T < 0\). Then, a bilateral proportional tariff reduction of the form \(dT = -T d\kappa\) and \(dt = -td\kappa\), where \(d\kappa > 0\), by South and North reduces successful illegal immigration.

- Comparative statics:

\[
\frac{dl}{d\kappa} = C_l^{-1}(C_t t + C_T T) \\
= -C_l^{-1}[l^{-1}\hat{e}^{-1}_u t' s_{pp} t + T\hat{e}^{-1}_u \alpha ll^{-1} R_{IP} \\
+ \hat{e}^{-1}_u [\bar{e}' - (1 - \alpha) R_{IP}]] \\
= -C_l^{-1} \left[ l^{-1}\hat{e}^{-1}_u t' s_{pp} t + \hat{e}^{-1}_u [\bar{e}' - \delta R_{IP}] T \right].
\]

A sufficient condition (in addition to Condition A) for the outcome \(dl/d\kappa < 0\) is that \([\hat{e}'_P - \delta R_{IP}] T < 0\)

- which becomes \([\bar{e}'_P - R_{IP}] T < 0\) if \(\alpha = 0\).
Proposition 7: Assume that Condition A \((H > 0)\) holds, and that 
\[
\left[\tilde{e}'_p - \delta R_{IP}\right] \mathbf{T} < 0.
\]
Then, a bilateral proportional tariff reduction of the form 
\[d\mathbf{T} = -T\kappa\] and \[d\mathbf{t} = -t\kappa,\] where \(d\kappa > 0\), by South and North effects the welfare level of illegal immigrants and residents of South equally, but with ambiguous sign. The effect upon the welfare of North citizens is also ambiguous.
Proposition 7: Assume that Condition A \((H > 0)\) holds, and that \([\tilde{e}'_P - \delta R_{IP}]T < 0\). Then, a bilateral proportional tariff reduction of the form \(dT = -Td\kappa\) and \(dt = -td\kappa\), where \(d\kappa > 0\), by South and North effects the welfare level of illegal immigrants and residents of South equally, but with ambiguous sign. The effect upon the welfare of North citizens is also ambiguous.

Contrast with Gaytan-Fregoso and Lahiri (2001):

They get (i) \(dl/d\kappa < 0\) if \([\tilde{e}'_P - R_{IP}]T < 0\) and some matrix is pd

(ii) North gains if \([\tilde{e}'_P - R_{IP}]T < 0\), some matrix is nd and some other conditions
Proposition 7: Assume that Condition A \((H > 0)\) holds, and that 
\(\tilde{e}_p' - \delta R_{IP} \) \(T < 0\). Then, a bilateral proportional tariff reduction of the form \(dT = -Td_{\kappa}\) and \(dt = -td_{\kappa}\), where \(d_{\kappa} > 0\), by South and North effects the welfare level of illegal immigrants and residents of South equally, but with ambiguous sign. The effect upon the welfare of North citizens is also ambiguous.

Contrast with Gaytan-Fregoso and Lahiri (2001):
They get (i) \(dI / d_{\kappa} < 0\) if \(\tilde{e}_p' - R_{IP} \) \(T < 0\) and some matrix is pd
(ii) North gains if \(\tilde{e}_p' - R_{IP} \) \(T < 0\), some matrix is nd and some other conditions
We get the condition \(\tilde{e}_p' - R_{IP} \) \(T < 0\) if \(\alpha = 0\).
The welfare effects of the bilateral reform $dT = -T d\kappa$ and $dt = -td\kappa$, where $d\kappa > 0$, are:

\[
\begin{align*}
\tilde{L} \tilde{E}_U dU / d\kappa &= \left[ IT' \tilde{c}_y (1 - \alpha) R_{ll} + T' (\tilde{e}_P - R_{pl}) - l R_{ll} \right] dl / d\kappa \\
&\quad - \left[ T' S_{pp} + IT' \tilde{c}_y (1 - \alpha) R_{lp} - l (1 - T' \tilde{c}_y) \tilde{e}'_p - T' R_{lp} \right] T \\
\tilde{e}_u d\tilde{u} / d\kappa &= (1 - \alpha) R_{ll} dl / d\kappa + T' [\tilde{e}_P - (1 - \alpha) R_{pl}] \\
l \tilde{e}_u du / d\kappa &= H dl / d\kappa - t' s_{pp} t - \alpha l R_{lp} T \\
\tilde{d}u / d\kappa &= du / d\kappa.
\end{align*}
\]
Concluding Remarks

Summary

- We have examined several tariff reforms and effects on illegal immigration and welfare.
- Results are clearer when there are no remittances and there is free trade.
- Tariffs and remittance create complications, especially for welfare of North.