Appendices for Trade, Law and Product Complexity

Appendix 1

1. Functional Forms For Transaction Costs

The transactions cost functions are $r(I^{\exp}, c)$: $c = 0$ (simple), 1 (complex) and $h(I^{\imp})$. We assume that $r(\cdot)$ and $h(\cdot)$ are increasing, strictly concave and homogenous in institutions:

$$\frac{h_c(\cdot)}{h(\cdot)} \cdot I^{\exp} = \tilde{h}$$  \hspace{1cm} (A1)

$$\frac{r_1(\cdot)}{r(0)} \cdot I^{\exp} = \tilde{r}(0)$$  \hspace{1cm} (A2)

$$\frac{r_1(\cdot)}{r(1)} \cdot I^{\exp} = \tilde{r}(1)$$  \hspace{1cm} (A3), where

$$\tilde{h} \in (0,1); \text{ and } 0 \leq \tilde{r}(0) \leq \tilde{r}(1) < 1$$  \hspace{1cm} (A4)

Thus $r(I^{\exp}, 0)$, and $r(I^{\exp}, 1)$ satisfy the properties of $r(\cdot)$ derived in section II (see equations (4), (5) and (6)); and $h(\cdot)$ satisfies its properties described in Section II.

2. Comparative Static Properties

Equations (10*) and (11*) in strict equality form and equation (16) form a system of three equations that can determine $\omega, Z_1$, and $Z_2$. Assuming that a solution exists, and converting the equations into logs, we can use it to analyze the impact of institutions:

$$\phi^I = \ln A(3, 1, I^*) - \ln \omega - \ln g(I^*, 1) - \ln h(I) \equiv 0$$
\[ \phi^H = \ln A(3_2, I, I^*) - \ln \omega + \ln g(I^*, 1) + \ln h(I^*) \equiv 0 \]
\[ \Gamma = \ln \omega + \ln L + \ln \{1 - [\beta 3_2 + s]\} - \ln L^* - \ln \{1 - [\beta 3_1 + s^*]\} \]

where

\[ s = \text{share of home income spent on } S; \]
\[ s^* = \text{share of foreign income spent on } S; \]

\[ s = (1 - \beta) \cdot \left[ 1 + (P_s)^{\sigma - 1} \right]^{-1} \]
\[ s^* = (1 - \beta) \cdot \left[ 1 + (P_s^*)^{\sigma - 1} \right]^{-1}, \]

and by equations (12) and (13) from the text:

\[ P_s = \omega \cdot r(0, I^*) \cdot h(1) \cdot \tau(\cdot) \quad (12) \]
\[ P_s^* = \omega \cdot \left\{ r(0, I^*) \cdot h(1^*) \cdot \tau(\cdot) \right\}^{-1} \quad (13) \]

Therefore,

\[ s = (1 - \beta) \cdot \left[ 1 + \left\{ P_s(\omega, I, I^*) \right\}^{\sigma - 1} \right]^{-1} \quad (A5) \]
\[ s^* = (1 - \beta) \cdot \left[ 1 + \left\{ P_s^*(\omega, I, I^*) \right\}^{\sigma - 1} \right]^{-1} \quad (A6) \]

Differentiating

\[ \text{sgn} \frac{\partial s}{\partial P_s} = -\text{sgn}(\sigma - 1) < 0 \]
\[ \text{sgn} \frac{\partial s^*}{\partial P_s} = -\text{sgn}(\sigma - 1) < 0 \]

(Note: This just says that when simple goods are substitutes; \( \sigma > 1 \), then you can spend a greater share of income on a simple good when its relative price falls; and a smaller share when its relative price increases.)

Furthermore,
\[
\frac{\partial P_s}{\partial \omega} = \frac{P_s}{\omega} > 0; \quad \frac{\partial P_s^*}{\partial \omega} = \frac{P_s^*}{\omega} > 0;
\]

\[
\frac{\partial P_s}{\partial I} = P_s \frac{\bar{h}}{\bar{I}} > 0; \quad \frac{\partial P_s^*}{\partial I} = -P_s^* \frac{\bar{r}(0)}{I} < 0;
\]

\[
\frac{\partial P_s^*}{\partial I^*} = P_s^* \frac{\bar{r}(0)}{I^*} > 0; \quad \frac{\partial P_s^*}{\partial I^*} = -P_s^* \frac{\bar{h}}{I^*} < 0.
\]

Therefore, we form a three equation system, \(D\), defining the triplet \((3_1, 3_2, \omega)\) as a function of \(I\) and \(I^*\):

\[
\psi^I(3_2, \omega, I, I^*) \equiv 0
\]

\[
\psi^I(3_1, \omega, I, I^*) \equiv 0 \quad \text{(D)}
\]

\[
\Gamma \left(3_1, 3_2, \omega, S \left(P_s \left(\omega, I, I^*\right)\right), \bar{P}_s^* \left(\omega, I, I^*\right)\right) \equiv 0
\]

We assume an interior solution \(\{3_1, 3_2, \omega\}\) exists: \(0 < 3_1 < 3_2 < 1\), and \(\omega \in (0, \infty)\).

Clearly, \(\frac{\partial \chi^I}{\partial 3_1} = 0, \frac{\partial \chi^I}{\partial 3_2} = 0\).

Differentiating w.r.t. \(\omega, 3_1\), and \(3_2\), then

\[
\frac{\partial \phi^1}{\partial 3_2} = \frac{A'(3_2)}{A(3_2)} < 0,
\]

\[
\frac{\partial \phi^I}{\partial 3_1} = \frac{A'(3_1)}{A(3_1)} < 0, \quad \text{(A7)}
\]

\[
\frac{\partial \phi^I}{\partial \omega} = \frac{\partial \phi^I}{\partial \omega} = -\frac{1}{\omega} < 0.
\]

Let, \(1 - (\beta 3_1 + s^*)\) and \(1 - (\beta 3_2 + s)\) denote fimpsh (share of income spent by the foreign country on imports) and himpsh (share of income spent by the home country on imports). Since
$\frac{\partial s}{\partial P_s} < 0, \frac{\partial s^*}{\partial P_s} < 0, \frac{\partial P_s}{\partial \omega} > 0, \frac{\partial P_s^*}{\partial \omega} > 0$, then it follows that

$$\frac{\partial \Gamma}{\partial \beta_1} = \frac{-\beta}{1-(\beta_3^* + s^*)} < 0,$$

$$\frac{\partial \Gamma}{\partial \beta_2} = \frac{-\beta}{1-(\beta_3^* + s)} < 0,$$

$$\frac{\partial \beta}{\partial \omega} = \frac{1}{\omega} \frac{\partial s}{\partial P_s} \frac{\partial P_s}{\partial \omega} - \frac{1}{\omega} \frac{\partial s^*}{\partial P_s} \frac{\partial P_s^*}{\partial \omega} > 0,$$

Let $\tilde{D}$ denote $|D|$ (the determinant of the system $D$). Then,

$$\tilde{D} = \begin{bmatrix} 0 & -\frac{1}{\omega} \\ -\frac{1}{\omega} & 1 \end{bmatrix} = -\frac{1}{\omega} \left[ \begin{bmatrix} -\frac{1}{\omega} \end{bmatrix} \partial \phi^1 \partial \phi^2 \partial \Gamma \right]$$

$$= -(-)(-)(+) = \frac{1}{\omega} \left[ (-)(-) + (-)(-) \right]$$

$$= -(+)(+) < 0$$

$\Rightarrow \text{sgn} \tilde{D} < 0.$

From the text, we know that foreign spending on complex and simple imports is

$$M^*_C = \beta L^* Z_1, \quad M^*_S = S^* L'$$

We are interested in characterizing the following institutional elasticities:
\[ \frac{\partial M_c^*}{\partial I} \frac{I}{M_c^*} = \frac{\partial \delta_{3_1}^*}{\partial I} \frac{I}{3_1}, \]

\[ \frac{\partial M_c^*}{\partial I^*} \frac{I^*}{M_c^*} = \frac{\partial \delta_{3_1}^*}{\partial I^*} \frac{I^*}{3_1}, \]

(A10)

\[ \frac{\partial M_s^*}{\partial I} \frac{I}{M_s^*} = \frac{\partial \delta_{s_1}^*}{\partial I} \frac{I}{s^*} \]

\[ = (\sigma - 1) \cdot (1 - s^*) \cdot \left[ \tilde{r}(0) - \frac{\partial \omega}{\partial I} \frac{1}{\omega} \right], \]

\[ \frac{\partial M_s^*}{\partial I^*} \frac{I^*}{M_s^*} = \frac{\partial \delta_{s_1}^*}{\partial I^*} \frac{I^*}{s^*} \]

\[ = (\sigma - 1) \cdot (1 - s^*) \cdot \left[ \tilde{h} - \frac{\partial \omega}{\partial I^*} \frac{1}{\omega} \right]. \]

Since \((\sigma - 1)(1 - s^*) > 0\), then

\[ \text{sgn} \frac{\partial M_s^*}{\partial I} \frac{I}{M_s^*} = \text{sgn} \left[ \tilde{r}(0) - \frac{\partial \omega}{\partial I} \frac{1}{\omega} \right] \]

(A12)

Thus we proceed by computing the elasticity of \(3_1\) w.r.t. to \(I\) and \(I^*\) and the elasticity of \(\omega\) w.r.t. to \(I\) and \(I^*\).

3. Comparative Static Results—Complex Products

The goal is to decompose the impact of institutions into the production and transaction cost effects.

In order to isolate the product cost effect, we eliminate transaction costs and set \(\tilde{h} = \tilde{r}(0) = \tilde{r}(1) = 0\). Therefore, \(\frac{\partial \Gamma}{\partial I} = \frac{\partial \Gamma}{\partial I^*} = 0\), and
\[
D \cdot \begin{bmatrix}
\frac{\partial \mathbf{3}_1}{\partial \mathbf{I}} \\
\frac{\partial \mathbf{3}_2}{\partial \mathbf{I}} \\
\frac{\partial \mathbf{\omega}}{\partial \mathbf{I}} \\
\frac{\partial \mathbf{\omega}}{\partial \mathbf{I}^*}
\end{bmatrix} = \begin{bmatrix}
-1/1 \\
-1/1 \\
1/1 \\
0
\end{bmatrix} \quad (D.1)
\]

\[
D \cdot \begin{bmatrix}
\frac{\partial \mathbf{3}_1}{\partial \mathbf{I}^*} \\
\frac{\partial \mathbf{3}_2}{\partial \mathbf{I}^*} \\
\frac{\partial \mathbf{\omega}}{\partial \mathbf{I}^*}
\end{bmatrix} = \begin{bmatrix}
1/1' \\
1/1' \\
0
\end{bmatrix} \quad (D.2)
\]

Manipulating the system, then

\[
\frac{\partial \mathbf{3}_1}{\partial \mathbf{I}} \cdot \frac{\mathbf{I}}{3_i} = \frac{\partial \varphi^1}{\partial \mathbf{3}_2} \cdot \frac{\partial \mathbf{I}}{\partial \mathbf{\omega}} > 0,
\]

production

\[
\frac{\partial \mathbf{3}_1}{\partial \mathbf{I}^*} \cdot \frac{\mathbf{I}^*}{3_i} = -\frac{\partial \varphi^1}{\partial \mathbf{3}_2} \cdot \frac{\partial \mathbf{I}}{\partial \mathbf{\omega}} < 0.
\]

production

Therefore

\[
\frac{\partial \mathbf{M}_c^*}{\partial \mathbf{I}} \frac{\mathbf{I}}{\mathbf{M}_c^*} > 0, \quad \frac{\partial \mathbf{M}_c^*}{\partial \mathbf{I}^*} \frac{\mathbf{I}^*}{\mathbf{M}_c^*} < 0, \text{ and}
\]

production production
\[
\frac{\partial M_c^*}{\partial I} \frac{I}{M_c^*} + \frac{\partial M_c^*}{\partial I^*} \frac{I^*}{M_c^*} = 0.
\]

In order to compute the transaction cost effect, replace the right hand side of (D.1) and (D.2) with column vectors (D.3) and (D.4):

\[
\begin{bmatrix}
    h(I) \\
    h(\cdot) \\
    -r_1^*(l) \\
    r(l) \\
    -\frac{\partial \Gamma}{\partial I}
\end{bmatrix}
= \begin{bmatrix}
    r_1^*(l) \\
    r(l) \\
    -h_1^* \\
    h(\cdot) \\
    -\frac{\partial \Gamma}{\partial I^*}
\end{bmatrix}
\]

where,

\[
-\frac{\partial \Gamma}{\partial I} = \frac{(\sigma - 1)}{I(1-\beta)} \left[ S' \left( 1 - S - \beta \right) \cdot \bar{r}(l) - \frac{S(1 - S - \beta) \bar{h}}{\text{fimpsh}} \right]
\]

\[
-\frac{\partial \Gamma}{\partial I^*} = \frac{(\sigma - 1)}{I^*(1-\beta)} \left[ S' \left( 1 - S^* - \beta \right) \cdot \tilde{h} - \frac{S(1 - S - \beta) \bar{r}(l)}{\text{fimpsh}} \right]
\]

It follows from simple manipulation that

\[
\frac{\partial 3_1}{\partial I} \frac{I}{3_1}
= \text{transaction}
\]

\[
\frac{1}{3_1 \omega \tilde{D}} \left[ \bar{r}(l) + \frac{\left( \sigma - 1 \right)}{1-\beta} \cdot \frac{s \cdot (1-s-\beta) \cdot \left( \bar{r}(l) + \bar{h} \right)}{\text{fimpsh}} \right] \left[ \begin{bmatrix}
    -\beta \cdot \left[ \bar{h} + \bar{r}(l) \right] \\
    \underline{\text{fimpsh}}
\end{bmatrix} + \right.
\]

\[
\left. \begin{bmatrix}
    A'(3_2) \left\{ \frac{\bar{r}(l)}{3_1} + \frac{\left( \sigma - 1 \right)}{1-\beta} \cdot \frac{s \cdot (1-s-\beta) \cdot \left( \bar{r}(l) + \bar{h} \right)}{\text{fimpsh}} \right\} \\
    A(3_2) \left\{ + \frac{\left( \sigma - 1 \right)}{1-\beta} \cdot \frac{s^* \left( 1 - S^* - \beta \right) \left( \bar{r}(l) - \bar{r}(0) \right)}{\text{fimpsh}} \right\}
\end{bmatrix} \right]
\]
\[ (-) \left[ (-) + (-) \{ (+) + (+) + (+) \} \right] \]

Since \( \sigma - 1 > 0, \quad \tilde{r}(1) - \tilde{r}(0) \) by assumption,

\[ \text{sgn} \frac{\partial 3_i}{\partial I} \frac{I}{3_i} > 0. \]

Therefore,

**translation**

\[ \frac{\partial 3_i}{\partial I} \frac{I}{3_i} = \]

**translation**

\[ \frac{1}{3_i \omega D} A_i(3_{2}) \left[ \frac{\tilde{h} + (\sigma - 1)(1 - \beta)(\tilde{r}(1) - \tilde{r}(0))}{A(3_{2})} \right] \]

\[ = (-) \left[ (-) + (-) \{ (+) + (+) \} \right]. \] Therefore,

\[ \text{sgn} \frac{\partial 3_i}{\partial I^*} \frac{I^*}{3_i} > 0, \]

Summarizing our results:

\[ \frac{\partial M_c^*}{\partial I} \frac{I}{M_c^*} > 0, \quad \frac{\partial M_c^*}{\partial I^*} \frac{I}{M_c^*} > 0; \]

**transaction**

and,
\[
\frac{\partial M_c^*}{\partial I} \frac{I}{M_c^*} = \left( \frac{\partial M_c^*}{\partial I} \frac{I}{M_c^*} \right) \text{ production} + \left( \frac{\partial M_c^*}{\partial I} \frac{I}{M_c^*} \right) \text{ transaction} \\
= \quad (+) \quad + \quad > 0;
\]

\[
\frac{\partial M_c^*}{\partial I^*} \frac{I^*}{M_c^*} = \left( \frac{\partial M_c^*}{\partial I^*} \frac{I^*}{M_c^*} \right) \text{ production} + \left( \frac{\partial M_c^*}{\partial I^*} \frac{I^*}{M_c^*} \right) \text{ transaction} \\
= \quad -(+) \quad + \quad = ?;
\]

\[
\frac{\partial M_c^*}{\partial I} \frac{I}{M_c^*} + \frac{\partial M_c^*}{\partial I^*} \frac{I^*}{M_c^*} = \left( \frac{\partial M_c^*}{\partial I} \frac{I}{M_c^*} \right) \text{ transaction} + \left( \frac{\partial M_c^*}{\partial I^*} \frac{I^*}{M_c^*} \right) \text{ transaction} > 0
\]

4. Comparative Static Results—Simple Products

When there are only production effects, then \( \bar{r}(1) = \bar{r}(0) = \bar{h} = 0 \) and

\[
\frac{\partial M_s^*}{\partial I} \frac{I}{M_s^*} = -\left( \sigma - 1 \right) \left( 1 - s^* - \beta \right) \frac{\partial \omega}{\partial I} \frac{I}{\omega} \text{ production}
\]

\[
\frac{\partial M_s^*}{\partial I^*} \frac{I^*}{M_s^*} = -\left( \sigma - 1 \right) \left( 1 - s^* - \beta \right) \frac{\partial \omega}{\partial I^*} \frac{I^*}{\omega} \text{ production}
\]

Solving (D.1) and (D.2) for \( \partial \omega \); then
\[ \frac{\partial \omega}{\partial I} \cdot \frac{I}{\omega} = \frac{\partial \varphi'}{\partial \varphi} \cdot \frac{\partial \Gamma}{\partial \Gamma} + \frac{\partial \varphi^*}{\partial \varphi^*} \cdot \frac{\partial \Gamma}{\partial \Gamma} > 0 \]

Therefore,
\[ \frac{\partial \omega}{\partial I} \cdot \frac{I}{\omega} + \frac{\partial \omega}{\partial I^*} \cdot \frac{I^*}{\omega} = 0 \]

Therefore, 
\[ \frac{\partial M_s^*}{\partial I} \cdot \frac{I}{M_s} < 0, \quad \frac{\partial M_s^*}{\partial I^*} \cdot \frac{I^*}{M_s^*} > 0, \text{ and} \]

\[ \frac{\partial M_s}{\partial I} \cdot \frac{I}{M_s} + \frac{\partial M_s^*}{\partial I^*} \cdot \frac{I^*}{M_s^*} = 0. \]

The pure transaction effect is difficult to characterize (see discussion that follows). Therefore, we characterize the overall effect (production + transaction) of institutions and then back out the transaction effect.

Using (A.11) and recalling that \((\sigma - 1) \cdot (1 - s^*) > 0\), then
\[ \text{sgn} \frac{\partial M_s}{\partial I} \cdot \frac{I}{M_s} = \text{sgn} \left[ \tilde{r}(0) - \frac{\partial \omega}{\partial I} \cdot \frac{I}{\omega} \right] \]
\[ \text{sgn} \frac{\partial M_s^*}{\partial I^*} \cdot \frac{I^*}{M_s^*} = \text{sgn} \left[ \tilde{h} - \frac{\partial \omega}{\partial I^*} \cdot \frac{I^*}{\omega} \right] \]
To compute the overall impact of institutions on $\omega$, replace the right hand side of (D.1) and (D.2) with the overall effects column vectors (D.5) and (D.6):

\[
\begin{pmatrix}
-\frac{1}{I} (1 - \tilde{h}) \\
-\frac{1}{I} (1 + \tilde{r}(1)) \\
-\frac{\partial \Gamma}{\partial \Gamma I}
\end{pmatrix}
\begin{pmatrix}
\frac{1}{I} (1 + \tilde{r}(1)) \\
\frac{1}{I} (1 - \tilde{h}) \\
-\frac{\partial \Gamma}{\partial \Gamma I'}
\end{pmatrix}
\]

(D.5)  \hspace{1cm}  (D.6)

where $\frac{\partial \Gamma}{\partial \Gamma I}$ and $\frac{\partial \Gamma}{\partial \Gamma I'}$ have been already defined.

Manipulating and simplifying, then

\[
\frac{\partial \omega}{\partial \Gamma I} \cdot \frac{I}{\omega} = \frac{\beta}{I} \left[ \left( \frac{1 + \tilde{r}(1)}{\text{fimpsh}} \right) \cdot \frac{A'(3_2)}{A(3_2)} + \left( \frac{1 - \tilde{h}}{\text{himpsh}} \right) \frac{A'(3_1)}{A(3_1)} \right] + \frac{A'(3_2) \cdot A'(3_1) \cdot \partial \Gamma}{A(3_2) \cdot A(3_1) \cdot \partial \Gamma I} \frac{\omega}{\tilde{D}}
\]

Substituting in for $\frac{\partial \Gamma}{\partial \Gamma I}$ and manipulating,

\[
\frac{\partial \omega}{\partial \Gamma I} \cdot \frac{I}{\omega} = \frac{A'(3_2)}{A(3_2)} \cdot \frac{1}{\text{fimpsh}} \cdot \left[ \beta \cdot (1 + \tilde{r}(1)) - \left( \frac{\sigma - 1}{1 - \beta} \right) \cdot \frac{A'(3_1)}{A(3_1)} \cdot s^* (1 - s^* - \bar{\beta}) \tilde{r}(1) \right] + \frac{A'(3_1)}{A(3_1)} \cdot \frac{1}{\text{himpsh}} \cdot \left[ \beta (1 - \tilde{h}) + \left( \frac{\sigma - 1}{1 - \beta} \right) \cdot \frac{A'(3_2)}{A(3_2)} \cdot s (1 - s - \beta) \tilde{h} \right] \frac{\omega}{\tilde{D}}
\]

Therefore,
\[
\operatorname{sgn} \frac{\partial \omega}{\partial I} \cdot \frac{1}{\omega} = \frac{(-) \left[ (+) - (-) \right] + (-) \left[ (+) + (-) \right]}{(-)} = (+) + \left[ (+) + (-) \right] = ?
\]

Let \( \xi \) denote the ambiguous component of the numerator:

\[
\xi = \beta (1 - \bar{h}) + \left( \frac{\sigma - 1}{1 - \beta} \right) \cdot s(1 - s - \beta) \cdot \bar{h} \cdot \frac{A'(3_2)}{A(3_2)}
\]

A sufficient (but not necessary condition) for \( \frac{\partial \omega}{\partial I} \cdot \frac{1}{\omega} > 0 \) is that \( \xi \geq 0 \). Note that if \( \bar{h} = 0 \), then \( \xi = \beta (1 - \bar{h}) > 0 \). Furthermore, \( \frac{\partial \xi}{\partial \bar{h}} < 0 \) and \( \frac{\partial \xi}{\partial \sigma} < 0 \). Then if \( \sigma \) is sufficiently close to \( I \) and/or \( \bar{h} \) is sufficiently close to \( 0 \), \( \xi \geq 0 \). Thus, in general

\[
\operatorname{sgn} \frac{\partial \omega}{\partial I} \cdot \frac{1}{\omega} > 0.
\]

Similarly,

\[
\frac{\partial \omega}{\partial \Gamma} \cdot \frac{I^*}{\omega} \cdot \frac{1}{\Gamma} = -\beta \cdot \left[ \left( \frac{1 + \bar{\Gamma}(1)}{\text{fimpsch}} \right) \cdot \left( \frac{A'(3_1)}{A(3_1)} \right) + \left( \frac{1 - \bar{h}}{\text{fimpsh}} \right) \cdot \left( \frac{A'(3_2)}{A(3_2)} \right) \right]
\]

\[
+ \frac{A'(3_2)}{A(3_2)} \cdot \frac{A'(3_1)}{A(3_1)} \cdot \frac{\partial \Gamma}{\partial \Gamma^*}
\]

Substituting in for \( \frac{\partial \Gamma}{\partial \Gamma^*} \) and manipulating,

\[
\frac{\partial \omega}{\partial \Gamma} \cdot \frac{I^*}{\omega} = -\frac{1}{\Gamma^*} \cdot \frac{A'(3_1)}{A(3_1)} \cdot \frac{1}{\text{fimpsch}} \cdot \left[ \beta \cdot (1 + \bar{\Gamma}(1)) - \left( \frac{\sigma - 1}{1 - \beta} \right) \cdot A'(3_2) \cdot s(1 - s - \beta) \cdot \bar{\Gamma}(1) \right]
\]

\[
- \frac{1}{\Gamma^*} \cdot \frac{A'(3_2)}{A(3_2)} \cdot \frac{1}{\text{fimpsh}} \cdot \left[ B \cdot (1 - \bar{h}) + \left( \frac{\sigma - 1}{1 - \beta} \right) \cdot A'(3_1) \cdot s^*(1 - s^* - \beta) \bar{h} \right]
\]

Therefore,
\[
\text{sgn} \frac{\partial \omega}{\partial I} \cdot I^* \omega = - \left( \begin{array}{c}
(-) \\
(+)
\end{array} \right) - \left( \begin{array}{c}
(-) \\
(+)
\end{array} \right) \frac{(-)}{(+)}
\]

\[- \left( (+) - \left[ (+) + (-) \right] \right) =?
\]

Let \( \lambda \) denote the ambiguous component of the numerator:

\[
\lambda = \beta \left( 1 - \tilde{h} \right) + \left( \frac{\sigma - 1}{1 - \beta} \right) \cdot s^* (1 - s^* - \beta) \tilde{h} \cdot \frac{A' (3_i)}{A (3_i)}.
\]

A sufficient but not necessary condition for \( \frac{\partial \omega}{\partial I} \cdot I^* > 0 \) is that \( \lambda \geq 0 \). Following our previous argument, then this holds if \( \sigma \) is sufficiently close to \( I \) and/or \( \tilde{h} \) is sufficiently close to 0. Thus, in general

\[
\text{sgn} \frac{\partial \omega}{\partial I} \cdot I^* \omega < 0.
\]

Therefore, by (A.12)

\[
\text{sgn} \frac{\partial M}{\partial I} \cdot I^* M^* = \text{sgn} \left[ \tilde{r}(0) - \frac{\partial \omega}{\partial I} \cdot I \omega \right]
\]

\[
= \text{sgn} \left[ (+) - (+) \right] =?
\]

\[
\text{sgn} \frac{\partial M}{\partial I} \cdot I^* M^* = \text{sgn} \left[ \tilde{h} - \frac{\partial \omega}{\partial I} \cdot I^* \omega \right]
\]

\[
= \text{sgn} \left[ (+) - (-) \right] < 0.
\]

Note also that

\[
\frac{\partial M}{\partial I} \cdot I^* = \frac{\partial M}{\partial I} \cdot I^* - \frac{\partial M}{\partial I} \cdot I^* - \frac{\partial M}{\partial I} \cdot I
\]

\[
\mid \text{transaction} \quad \mid \text{production}
\]

\[
= (?) - (-) = ?
\]
\[ \frac{\partial M_S}{\partial I^*} \cdot I^* = \frac{\partial M_S}{\partial I^*} \cdot I^* - \frac{\partial M_S}{\partial I^*} \cdot I^* \]

\text{transaction} \quad \text{production}

\[ = (+) - (-) < ? \]

It is not possible to sign transaction components by analyzing the algebra of the system in any more detail.

Appendix 2-Propositions 1 and 2 from the text.

**Proposition 1.** The overall effect of importer institutions on complex product imports is negative if and only if their production effect dominates their transaction effect (i.e., the absolute effect of production costs dominates the absolute impact of transaction costs). If production effects of importer institutions dominate, then the overall absolute effect of exporter institutions is stronger than importer institutions in complex product markets.

Proof. Let \( \text{prod-exp} \) and \( \text{trans-exp} \) denote the impact of production and transaction cost effects of exporter institutions; let \( \text{prod-imp} \) and \( \text{trans-imp} \) denote the production and transactions cost effects of importer institutions and let \( \text{abs} \) denote the absolute value operator. Since \( \text{prod-imp} < 0 \) and \( \text{trans-imp} > 0 \), then \( \text{prod-imp} + \text{trans-imp} < 0 \) if and only if \( \text{abs(\text{prod-imp})} > \text{abs(\text{trans-imp})} \).

Note that \( \text{prod-exp} > 0, \text{prod-exp} + \text{prod-imp} = 0 \) and \( \text{trans-exp} > 0 \) and \( \text{trans-imp} > 0 \). Then, if production costs dominate: \( \text{abs(\text{prod-imp})} > \text{abs(\text{trans-imp})} \), then \( \text{abs(\text{prod-imp} + \text{trans-imp})} < \text{abs(\text{prod-imp})} \) and \( \text{abs(\text{prod-exp} + \text{trans-exp})} > \text{abs(\text{prod-exp})} \). Since \( \text{abs(\text{prod-exp})} = \text{abs(\text{prod-imp}), then abs(\text{prod-exp} + \text{trans-exp})} > \text{abs(\text{prod-imp} + \text{trans-imp}).} \)
Proposition 2. If the production effect of exporter institutions in simple product markets dominates their transaction effect, then the overall impact of importer institutions in simple product imports is negative.

Proof. Since \( \text{prod-exp} < 0 \) and the sign of \( \text{trans-exp} \) is ambiguous, then the production dominance condition \( \text{abs}(\text{prod-exp}) > \text{abs}(\text{trans-exp}) \) is sufficient for \( \text{prod-exp} + \text{trans-exp} > 0 \).