Fear of Crowds in WTO Disputes: Why Don’t More Countries Participate?

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Dispute- and state-specific payoffs

Assume that the expected payoffs for each player $i$ for case $j$ can depend on factors besides the player’s trade stake, $\tau_i$. Then payoffs are as follows:

<table>
<thead>
<tr>
<th></th>
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<th>Litigation</th>
</tr>
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<tbody>
<tr>
<td>Join</td>
<td>$R_{ij} (\tau_i) + b_{ij} \tau_i$</td>
<td>$L_{ij} (\tau_i) + v_{ij} \tau_i$</td>
</tr>
<tr>
<td>Don’t Join</td>
<td>$R_{ij} (\tau_i)$</td>
<td>$L_{ij} (\tau_i)$</td>
</tr>
</tbody>
</table>

where $R_{ij} (\tau_i) = L_{ij} (\tau_i) + v_{ij} \tau_i + \rho_{ij}$.

Player $i$ thus has the following expected utility functions if $\hat{n}$ other countries join as third parties:

$$EU_i (\text{Join}|\hat{n}) = s (\hat{n} + 1) [L_{ij} (\tau_i) + v_{ij} \tau_i + \rho_{ij} + b_{ij} \tau_i] + [1 - s (\hat{n} + 1)] [L_{ij} (\tau_i) + v_{ij} \tau_i]$$

$$EU_i (\text{Don’t Join}|\hat{n}) = s (\hat{n}) [L_{ij} (\tau_i) + v_{ij} \tau_i + \rho_{ij}] + [1 - s (\hat{n})] L_{ij} (\tau_i)$$

The benefit of joining when $\hat{n}$ other countries join is thus:

$$\Delta_{ij} (\hat{n}, \tau_i) = v_{ij} \tau_i + s (\hat{n} + 1) (\rho_{ij} + b_{ij} \tau_i) - s (\hat{n}) (v_{ij} \tau_i + \rho_{ij})$$

Then:

$$\frac{\partial \Delta_{ij} (\hat{n}, \tau_i)}{\partial \tau_i} = [1 - s (\hat{n})] v_{ij} + s (\hat{n} + 1) b_{ij} > 0$$

$$\lim_{\tau_i \to 0} \Delta_{ij} (\hat{n}, \tau_i) = [s (\hat{n} + 1) - s (\hat{n})] \rho_{ij} < 0$$

$$\lim_{\tau_i \to \infty} \Delta_{ij} (\hat{n}, \tau_i) = \lim_{\tau_i \to \infty} \{[1 - s (\hat{n})] v_{ij} \tau_i + s (\hat{n} + 1) b_{ij} \tau_i\} > 0$$

By the intermediate value theorem, each $(i, j, \hat{n})$-triplet has a unique cutpoint $\hat{\tau}_{ij} (\hat{n}) > 0$ such that $\Delta_{ij} (\hat{n}, \hat{\tau}_{ij} (\hat{n})) = 0$. So $\Delta_{ij} (\hat{n}, \tau_i) < 0$ for all $\tau_i < \hat{\tau}_{ij} (\hat{n})$ and $\Delta_{ij} (\hat{n}, \tau_i) > 0$ for all $\tau_i > \hat{\tau}_{ij} (\hat{n})$.

Define the following difference function:

$$\Psi_{ij} (\hat{n}, \tau_i) \equiv \Delta_{ij} (\hat{n}, \tau_i) - \Delta_{ij} (\hat{n} + 1, \tau_i)$$

$$= [s (\hat{n} + 1) - s (\hat{n} + 2)] (\rho_{ij} + b_{ij} \tau_i) - [s (\hat{n}) - s (\hat{n} + 1)] (v_{ij} \tau_i + \rho_{ij})$$

Note that $\Psi_{ij} (\hat{n}, \tau_i) > 0$ when $b_{ij}$ is relatively large. Note also that $\Psi_{ij} (\hat{n}, \tau_i) < 0$ when $v_{ij}$ is relatively large.

Also, when $b_{ij}$ is relatively large, $\hat{\tau}_{ij} (\hat{n}) < \hat{\tau}_{ij} (\hat{n} + 1)$ for every $\hat{n}$. 

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Entry costs

Suppose there is a small cost, \( \epsilon > 0 \), to joining the dispute. Then payoffs are as follows:

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</tr>
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<td>( R(\tau_i) )</td>
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</tbody>
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where \( R(\tau_i) \equiv L(\tau_i) + v\tau_i + \rho \).

Player \( i \) thus has the following expected utility functions if \( \hat{n} \) other countries join as third parties:

\[
EU_i(\text{Join}|\hat{n}) = s(\hat{n} + 1)\left[L(\tau_i) + v\tau_i + \rho + b\tau_i + [1 - s(\hat{n} + 1)]\right] - \epsilon
\]

\[
EU_i(\text{Don’t Join}|\hat{n}) = s(\hat{n})\left[L(\tau_i) + v\tau_i + \rho + [1 - s(\hat{n})]\right] L(\tau_i)
\]

The benefit of joining when \( \hat{n} \) other countries join is thus:

\[
\Delta(\hat{n}, \tau_i) = v\tau_i + s(\hat{n} + 1)(\rho + b\tau_i) - s(\hat{n})(v\tau_i + \rho) - \epsilon
\]

Then:

\[
\frac{\partial \Delta(\tau_i)}{\partial \tau_i} = s(\hat{n} + 1)b + [1 - s(\hat{n})]v > 0
\]

\[
\lim_{\tau_i \to 0} \Delta(\hat{n}, \tau_i) = (s(\hat{n} + 1) - s(\hat{n}))\rho - \epsilon < 0
\]

\[
\lim_{\tau_i \to \infty} \Delta(\hat{n}, \tau_i) = \lim_{\tau_i \to \infty} \left\{ s(\hat{n} + 1)b\tau_i + [1 - s(\hat{n})]v\tau_i \right\} > 0
\]

By the intermediate value theorem, each \( \hat{n} \) has a unique cutpoint \( \hat{\tau}(\hat{n}) > 0 \) such that \( \Delta(\hat{n}, \hat{\tau}(\hat{n})) = 0 \). So \( \Delta(\hat{n}, \tau_i) < 0 \) for all \( \tau_i < \hat{\tau}(\hat{n}) \) and \( \Delta(\hat{n}, \tau_i) > 0 \) for all \( \tau_i > \hat{\tau}(\hat{n}) \).

Define the following difference function:

\[
\Psi(\hat{n}, \tau_i) \equiv \Delta(\hat{n}, \tau_i) - \Delta(\hat{n} + 1, \tau_i)
\]

\[
= [s(\hat{n} + 1) - s(\hat{n})] \left\{ \rho + b\tau_i \right\} - [s(\hat{n}) - s(\hat{n} + 1)](v\tau_i + \rho)
\]

Note that \( \Psi(\hat{n}, \tau_i) > 0 \) when \( b \) is relatively large. Note also that \( \Psi(\hat{n}, \tau_i) < 0 \) when \( v \) is relatively large.

Also, when \( b \) is relatively large, \( \hat{\tau}(\hat{n}) < \hat{\tau}(\hat{n} + 1) \) for every \( \hat{n} \).

Filing strategies (Article XXII versus XXIII)

Note that the analysis above holds for a generic small value of \( \epsilon \). Suppose that there are two possible values: \( 0 < \epsilon_L < \epsilon_H \). When the complainant makes her filing decision, she is in effect choosing the value of \( \epsilon \). Note that:

\[
\Delta(\hat{n}, \tau_i, \epsilon_L) - \Delta(\hat{n}, \tau_i, \epsilon_H) = \epsilon_H - \epsilon_L > 0
\]

So for any given value of \( \hat{n}, \hat{\tau}(\hat{n}, \epsilon_L) < \hat{\tau}(\hat{n}, \epsilon_H) \).
Litigation costs

Suppose there is a small cost, $\phi > 0$, to joining a dispute that goes to litigation. Then payoffs are as follows:

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where $R(\tau_i) \equiv L(\tau_i) + v\tau_i + \rho$.

Player $i$ thus has the following expected utility functions if $\hat{n}$ other countries join as third parties:

$$EU_i(Join|\hat{n}) = s(\hat{n}+1) [L(\tau_i) + v\tau_i + \rho + b\tau_i] + [1 - s(\hat{n}+1)] [L(\tau_i) + v\tau_i - \phi]$$

$$EU_i(Don’t\ Join|\hat{n}) = s(\hat{n}) [L(\tau_i) + v\tau_i + \rho] + [1 - s(\hat{n})] L(\tau_i)$$

The benefit of joining when $\hat{n}$ other countries join is thus:

$$\Delta(\hat{n}, \tau_i) = v\tau_i + s(\hat{n}+1)(\rho + b\tau_i) - s(\hat{n})(v\tau_i + \rho) - [1 - s(\hat{n}+1)] \phi$$

Then:

$$\frac{\partial \Delta(\tau_i)}{\partial \tau_i} = s(\hat{n}+1)b + [1 - s(\hat{n})]v > 0$$

$$\lim_{\tau_i \to 0} \Delta(\hat{n}, \tau_i) = [s(\hat{n}+1) - s(\hat{n})] (\rho) - [1 - s(\hat{n}+1)] \phi < 0$$

$$\lim_{\tau_i \to \infty} \Delta(\hat{n}, \tau_i) = \lim_{\tau_i \to \infty} \{s(\hat{n}+1)b\tau_i + [1 - s(\hat{n})]v\tau_i\} > 0$$

By the intermediate value theorem, each $\hat{n}$ has a unique cutpoint $\hat{\tau}(\hat{n}) > 0$ such that $\Delta(\hat{n}, \hat{\tau}(\hat{n})) = 0$. So $\Delta(\hat{n}, \tau_i) < 0$ for all $\tau_i < \hat{\tau}(\hat{n})$ and $\Delta(\hat{n}, \tau_i) > 0$ for all $\tau_i > \hat{\tau}(\hat{n})$.

Define the following difference function:

$$\Psi(\hat{n}, \tau_i) \equiv \Delta(\hat{n}, \tau_i) - \Delta(\hat{n}+1, \tau_i)$$

$$\Psi(\hat{n}, \tau_i) = [s(\hat{n}+1) - s(\hat{n}+2)] (\rho + b\tau_i + \phi) - [s(\hat{n}) - s(\hat{n}+1)] (v\tau_i + \rho)$$

Note that $\Psi(\hat{n}, \tau_i) > 0$ when $b$ is relatively large. Note also that $\Psi(\hat{n}, \tau_i) < 0$ when $v$ is relatively large. Also, when $b$ is relatively large, $\hat{\tau}(\hat{n}) < \hat{\tau}(\hat{n}+1)$ for every $\hat{n}$.

General functional forms

We now consider general function forms of $\rho(\tau_i)$ and $s(n, \tau_i)$.

Payoffs are as follows:

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where \( R(\tau_i) = L(\tau_i) + v\tau_i + \rho(\tau_i) \).

Player \( i \) thus has the following expected utility functions if \( n \) other countries join as third parties:

\[
EU_i(\text{Join}|n) = s(n + 1, \tau_i)[L(\tau_i) + v\tau_i + \rho(\tau_i) + b\tau_i] + [1 - s(n + 1, \tau_i)][L(\tau_i) + v\tau_i]
\]

\[
EU_i(\text{Don’t Join}|n) = s(n, \tau_i)[L(\tau_i) + v\tau_i + \rho(\tau_i)] + [1 - s(n, \tau_i)]L(\tau_i)
\]

The benefit of joining when \( n \) other countries join is thus:

\[
\Delta(n, \tau_i) = v\tau_i + s(n + 1, \tau_i)[\rho(\tau_i) + b\tau_i] - s(n, \tau_i)[v\tau_i + \rho(\tau_i)]
\]

Then:

\[
\frac{\partial \Delta(\tau_i)}{\partial \tau_i} = v + s(n + 1, \tau_i)[\rho'(\tau_i) + b] + \frac{\partial s(n + 1, \tau_i)}{\partial \tau_i}[\rho(\tau_i) + b\tau_i] - s(n)[v + \rho'(\tau_i)] - \frac{\partial s(n, \tau_i)}{\partial \tau_i}[v\tau_i + \rho(\tau_i)]
\]

This is positive if \( b \) is relatively large and \( \frac{\partial s(n + 1, \tau_i)}{\partial \tau_i} \geq 0 \). This latter condition holds in Johns and Pelc (2014).

Also:

\[
\lim_{\tau_i \to 0} \Delta(n, \tau_i) = \lim_{\tau_i \to 0} [s(n + 1, \tau_i) - s(n, \tau_i)] \rho(\tau_i)
\]

This is negative if \( \rho(0) > 0 \); that is, if players receive some benefit from having the case resolved even when they do not have an economic interest in the dispute.

Finally:

\[
\lim_{\tau_i \to \infty} \Delta(n, \tau_i) = \lim_{\tau_i \to \infty} \{[1 - s(n, \tau_i)]v\tau_i + s(n + 1, \tau_i)b\tau_i - [s(n, \tau_i) - s(n + 1, \tau_i)]\rho(\tau_i)\}
\]

When this quantity is positive, then the intermediate value theorem ensures that each \( n \) has a unique cutpoint \( \bar{\tau}(n) > 0 \) such that \( \Delta(n, \bar{\tau}(n)) = 0 \). So \( \Delta(n, \tau_i) < 0 \) for all \( \tau_i < \bar{\tau}(n) \) and \( \Delta(n, \tau_i) > 0 \) for all \( \tau_i > \bar{\tau}(n) \). Define the following difference function:

\[
\Psi(n, \tau_i) = \Delta(n, \tau_i) - \Delta(n + 1, \tau_i)
\]

\[
= [s(n + 1, \tau_i) - s(n + 2, \tau_i)][\rho(\tau_i) + b\tau_i] - [s(n, \tau_i) - s(n + 1, \tau_i)][v\tau_i + \rho(\tau_i)]
\]

This is positive if \( b \) is relatively large, and negative if \( v \) is relatively large.