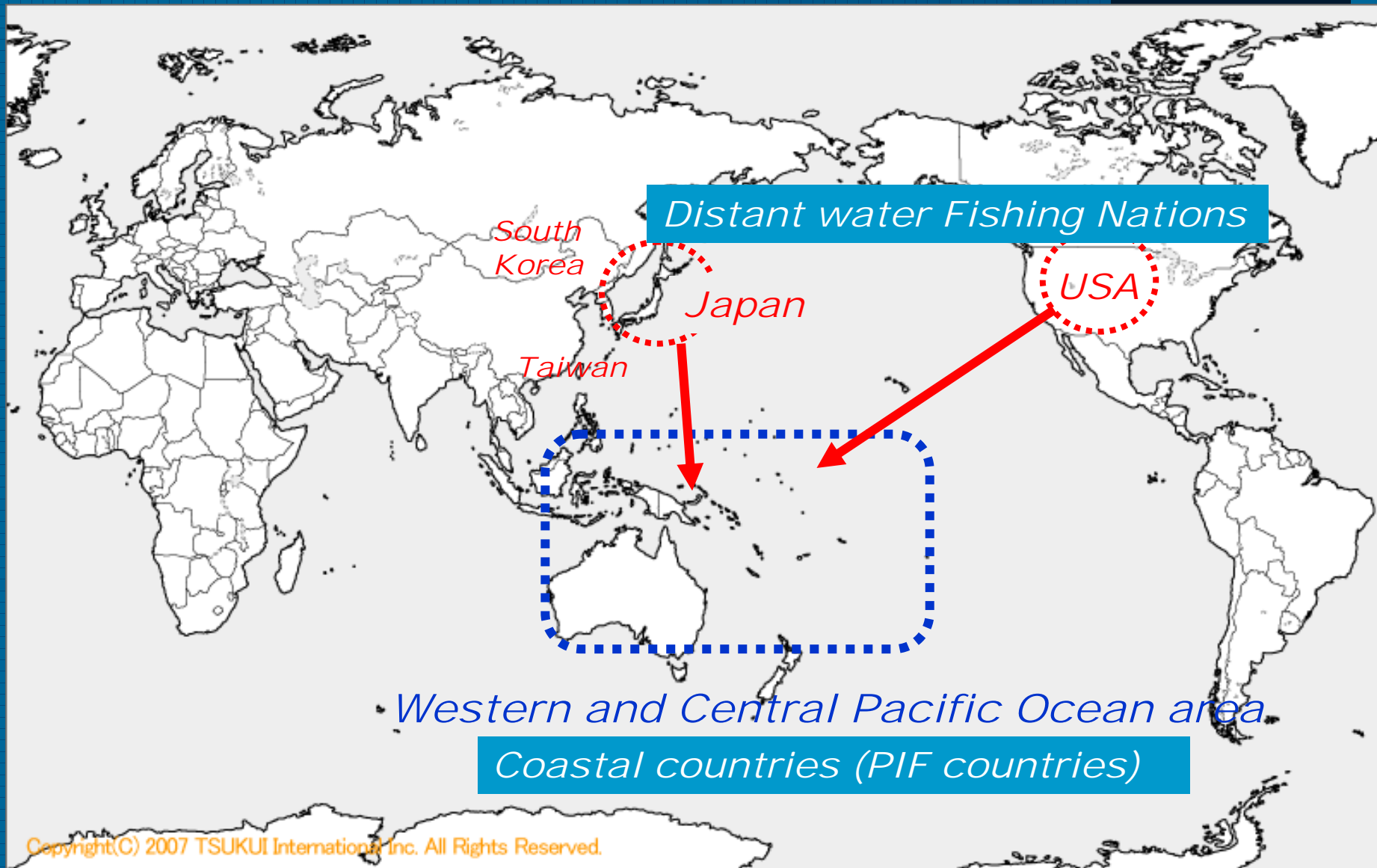


*Fisheries Negotiations
- A Game-theoretical
Consideration on the Difference
in the Negotiation Procedures*

The XIXth EAFE Conference
6th – 8th July 2009, MALTA

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Introduction

In the Western and Central Pacific Ocean area,

- *Coastal countries*

(less-developed fishing industry + large tuna fishing ground)

=> want to create money from tuna resources

- *Distant Water Fishing Nations*

(developed fishing industry)

=> need permission to access to tuna resources

Negotiations between DWFN and the PIF countries

- Japan (1978-present)
 - Procedures: **bilateral (one-to-one)**
 - Fee: 5 percent of the total value of the catch
- USA (1984-present)
 - Procedures: **multilateral (USA-PIF)**
 - Fee: 14 percent of the total value of the catch
 - **PIF distribution rule:** 15% => per country
85% => per catch

Purpose of this paper

- How and why these differences among countries concerned in the attitudes toward negotiation approaches are generated?
- Three alternative scenarios:
 1. **the pair-wise negotiation** (Japan style)
 2. **the two-stage negotiation** (USA style)
 3. **the round-table negotiation**

Model

- 3 countries (1 DWFN & 2 Coastal countries)
 - *DWFN* has the fishing technology but *no* resource (indexed by 0)
 - *Coastal country* has fishery resource in its EEZ but *no* fishing technology (indexed by 1,2)

Model (cont.)

- Catch in an country i 's EEZ: x_i
- Inputs for catch in an country i 's EEZ
 - labor inputs: L_i
 - fishery stock: K_i
- production function: $x_i = K_i^{\frac{1}{2}} L_i^{\frac{1}{2}}$
- Cost function in terms of labor:

$$L_i = C_i(x_i) = \frac{(x_i)^2}{K_i}$$



Model (cont.)

- The revenue of the coastal country i
 - DWFN pays access fee to the coastal country
 - the revenue of the country i from DWFN: u_i
- Price of fish
 - perfect competition prevails in the fish market
 - price of fish: p
- DWFN's (net) profit function:

$$\pi_0 = p \cdot x_1 - C_1(x_1) - u_1 + p \cdot x_2 - C_2(x_2) - u_2$$

The pair-wise negotiation

Coastal country 1

access
condition

$$(\pi_0 - \pi_{02}) \cdot u_1 \equiv \left\{ px_1 - \frac{(x_1)^2}{K_1} - u_1 \right\} u_1$$

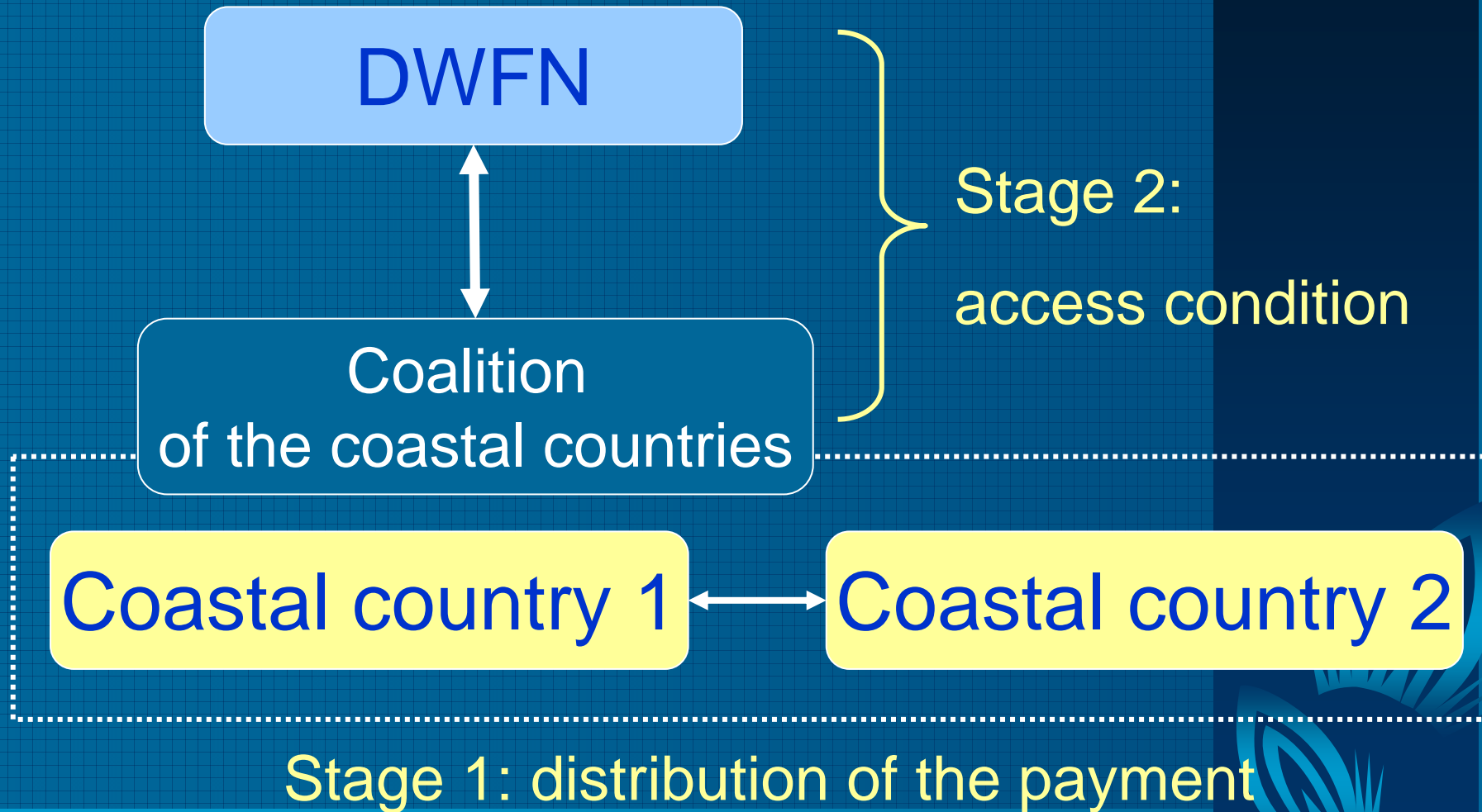
DWFN

access
condition

$$(\pi_0 - \pi_{01}) \cdot u_2 \equiv \left\{ px_2 - \frac{(x_2)^2}{K_2} - u_2 \right\} u_2$$

Coastal country 2

The two-stage negotiation



The two-stage negotiation

Stage 1: the coastal countries negotiate over the distribution of the payment from the DWFN to the coalition

=> **We assume distribution rule as given:**

total payment to the coalition from DWFN

$$u_i = \underbrace{f}_{\text{fixed portion}} + \underbrace{\frac{x_i}{x_1 + x_2} \{V - 2f\}}_{\text{variable portion}}, i = 1, 2.$$

The two-stage negotiation

Stage 2: the DWFN and the coalition of coastal countries negotiates over the catches and the total payment V to the coalition

- This negotiation is described by a two-person Nash bargaining

$$\left\{ px_1 - \frac{(x_1)^2}{K_1} + px_2 - \frac{(x_2)^2}{K_2} - V \right\} V$$

The round-table negotiation

- All the three countries assemble in one place and negotiate over the catches in the EEZs of the coastal countries and the payments to them.
- This negotiation is described by a simple three-person Nash bargaining

$$\left\{ px_1 - \frac{(x_1)^2}{K_1} + px_2 - \frac{(x_2)^2}{K_2} - u_1 - u_2 \right\} u_1 u_2$$

Summary of the Results

Variables	Pairwise ($h = P$)	Two-stage ($h = T$)	Round-table ($h = R$)
π_0^h	$\frac{p^2[K_1 + K_2]}{8}$	$\frac{p^2[K_1 + K_2]}{8}$	$\frac{p^2[K_1 + K_2]}{12}$
u_i^h	$\frac{p^2 K_i}{8}$	$\frac{p^2 K_i}{8} + f \left[\frac{K_j - K_i}{K_1 + K_2} \right]$	$\frac{p^2[K_1 + K_2]}{12}$
x_i^h	$\frac{p K_i}{2}$	$\frac{p K_i}{2}$	$\frac{p K_i}{2}$
w_i^h	$\frac{p}{4}$	$\frac{p}{4} + \frac{2f}{p} \left[\frac{K_j / K_i - 1}{K_1 + K_2} \right]$	$\frac{p[K_1 + K_2]}{6K_i}$

DWFN's preference over negotiation procedures

- Pair-wise and Two-stage are indifferent*
- Round-table is less preferred*

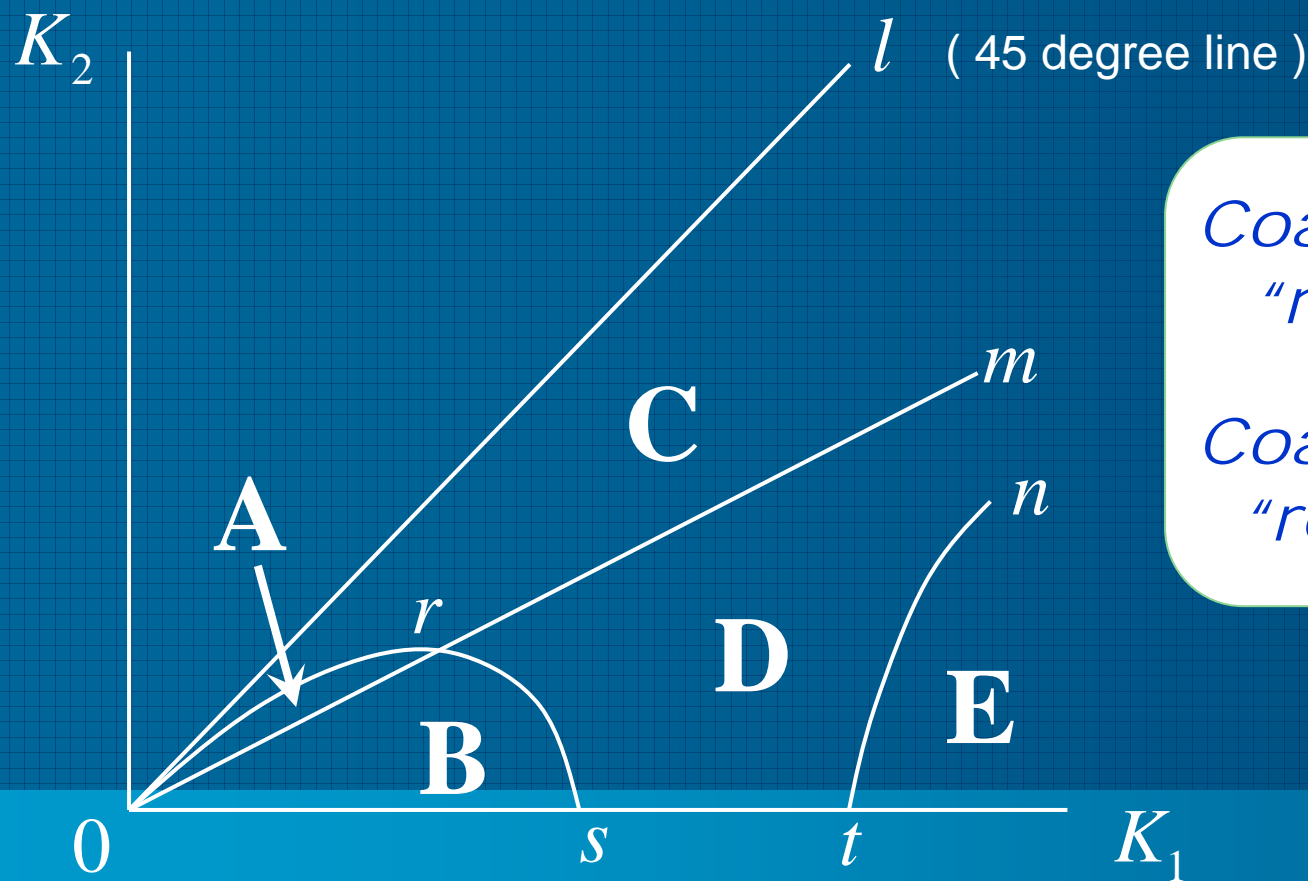
Variables	Pairwise ($h = P$)	Two-stage ($h = T$)	Round-table ($h = R$)
π_0^h	$\frac{p^2[K_1 + K_2]}{8}$	$\frac{p^2[K_1 + K_2]}{8}$	$\frac{p^2[K_1 + K_2]}{12}$

$$\pi_0^P = \pi_0^T > \pi_0^R$$



Coastal country's preference over negotiation procedures

- depends on the fishery endowments*



*Coastal country 1
"resource-rich"*

*Coastal country 2
"resource-poor"*

For the *fish-poor* country,
 the Pair-wise is the worst.

$$u_1^R > u_1^P > u_1^T, \quad u_2^T > u_2^R > \underline{u_2^P} \quad \text{if } (K_1, K_2) \in A;$$

$$u_1^P > u_1^R > u_1^T, \quad u_2^T > u_2^R > \underline{u_2^P} \quad \text{if } (K_1, K_2) \in B;$$

$$u_1^R > u_1^P > u_1^T, \quad u_2^R > u_2^T > \underline{u_2^P} \quad \text{if } (K_1, K_2) \in C;$$

$$u_1^P > u_1^R > u_1^T, \quad u_2^R > u_2^T > \underline{u_2^P} \quad \text{if } (K_1, K_2) \in D;$$

$$u_1^P > u_1^T > u_1^R, \quad u_2^R > u_2^T > \underline{u_2^P} \quad \text{if } (K_1, K_2) \in E.$$

For the *fish-rich* country,
 the Pair-wise is always
 better than the Two-stage

$$u_1^R > \underline{u_1^P} > \underline{u_1^T}, \quad u_2^T > u_2^R > u_2^P \quad \text{if } (K_1, K_2) \in A;$$

$$\underline{u_1^P} > u_1^R > \underline{u_1^T}, \quad u_2^T > u_2^R > u_2^P \quad \text{if } (K_1, K_2) \in B;$$

$$u_1^R > \underline{u_1^P} > \underline{u_1^T}, \quad u_2^R > u_2^T > u_2^P \quad \text{if } (K_1, K_2) \in C;$$

$$\underline{u_1^P} > u_1^R > \underline{u_1^T}, \quad u_2^R > u_2^T > u_2^P \quad \text{if } (K_1, K_2) \in D;$$

$$\underline{u_1^P} > \underline{u_1^T} > u_1^R, \quad u_2^R > u_2^T > u_2^P \quad \text{if } (K_1, K_2) \in E.$$

P: Pair-wise / T: Two-stage / R: Round-table

For the Coastal countries as a whole...

- The round-table negotiation is potentially the best.*

$$u_1^R + u_2^R > u_1^P + u_2^P = u_1^T + u_2^T$$

Round-table

Pair-wise

Two-stage

- This is the opposite result of DWFN's*

Concluding remarks

- Provide economic explanations for some of the characteristics of the actual fishery negotiations between the DWFNs and the coastal countries in the WCP area.
- Our analysis suggests that the choice of the negotiation procedure really matters to the determination of the welfare of the concerning countries.

Thank you for your attention

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This research is financially supported
by Japan Society for the Promotion of Science
Grant-in-Aid for Scientific Research (C), No.18530175

