



Efficient Multi-Attribute Procurement Auction

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Purpose of the Presentation

- Provide a topic of **multi-attribute tender**

{ **examples** The U.S.
 EU
 Japan

- Introduce a **theoretical approach** to public procurement

{ Auction Theory
Introduce our research (H.Fukui and K.Kobayashi)



Increasing Trend away from Traditional Procurement Tender

Price-Only Tender



**Multi-Attribute Tender
(multi-criteria selection)**

AWARD CRITERIA

Price

+

Nonmonetary attributes

- completion time
- environmental characteristics
- running cost
- etc..



EXAMPLE1. The U.S.

**The U.S. State Highway Authorities' procurement
for highway repair jobs**

A + B method

A : the estimated cost

**B : the estimated duration
for project completion**



EXAMPLE1. The U.S.

A + B method

$$TCB = ECC + (DRUC \times EPD)$$

TCB=Total Combined Bid

ECC=**Estimated Construction Cost** for the project

DRUC=**Daily Road User Cost**

EPD= **Estimated Project Duration** for project completion

The winning bidder is the bidder who submits the lowest total combined bid



EXAMPLE2. EU

In the European Union (EU), the public procurement procedure is regulated by the EU legislation.

New Public Procurement Directives

2004/18/EC

for works, supply and service contracts in the public sector;

2004/17/EC

on contracts with entities operating
in the "special sectors" of water, energy,
transport and postal service.

was adopted in 2004



EXAMPLE2. EU

PUBLIC PROCUREMENT PROCEDURES

- The open procedure
- The restricted procedure
- The negotiated procedure
- The competitive dialogue

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CONTRACT AWARD CRITERIA

The Lowest Price

or

**The Most Economically
Advantageous Tender
(MEAT)**



EXAMPLE2. EU

- Request for tenders (RFT) must state **all criteria** being applied and their **relative weightings**
- Evaluation process must be demonstrably **objective** and **transparent** based solely on the published criteria
- Objectivity and transparency are best achieved by use of a **weighted scoring system** based on the published criteria



EXAMPLE3. Japan

PUBLIC PROCUREMENT PROCEDURES

- 
- Open Bidding System
 - Nominated Tendering System
 - Negotiated Contract

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CONTRACT AWARD CRITERIA

The Lowest Price



Multi-attribute tender



EXAMPLE3. Japan

The Public Works Quality Assurance Promotion Law

The contractor is selected
on the basis of **total score**

scoring rule

designed by government

Price

+

Nonmonetary attributes



EXAMPLE3. Japan 地改革 (武藤)

		Southern Cross Group	Mitsui Fudosan, Taisei , Toshiba	Orix	Nishimatu	Itochu	Takenaka	Maeda
bidding price score (/85)	(million yen)	¥14,460	¥13,018	¥12,996	¥11,581	¥12,488	¥13,800	¥14,195
	Score	68.08	75.62	75.75	85	78.83	71.33	69.35
stability score(/5)	long term stability	4.28	5	5	3.75	5	4.28	5
	risk management							
	Continuance							
service score(/7)	functional characteristics	0.7	5.6	2.1	0	3.5	0	6.3
	total design							
	consideration to ambient surrounding							
management score(/3)	managerial stability	0.19	2.63	1.88	0	3	0.19	2.25
	work contents							
	reconcile with art museum							
Total Score (/100)		73.25	88.85	84.73	88.57	90.33	75.8	82.9

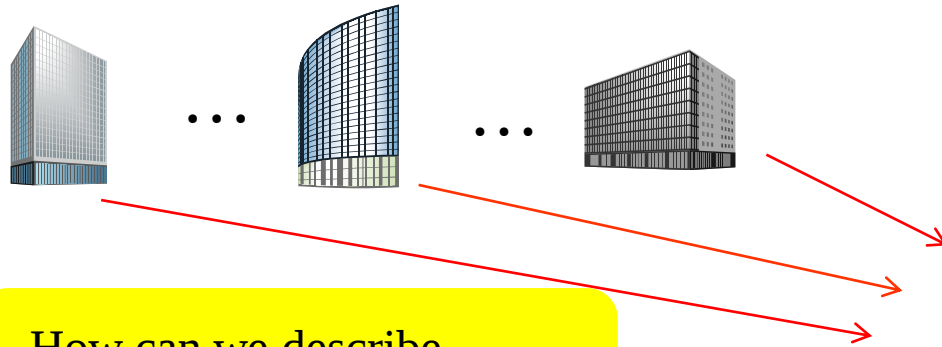


Theoretical Approach to Public Procurement

- **Auction Theory**
- **Introduce Our Research**
(2010, H.Fukui and K.Kobayashi)



Auction Theory



How can we describe
bidders' bidding behaviors ?

What type of procurement
procedure is efficient system?



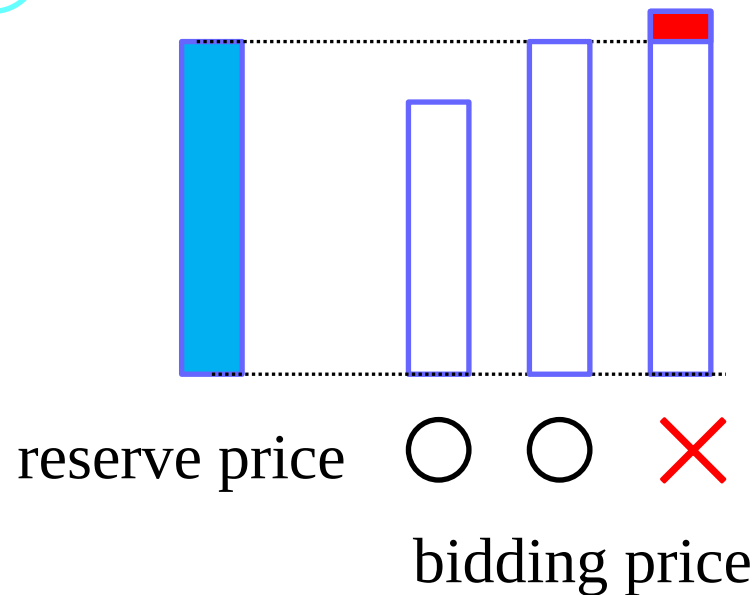
- have a new viewpoint to understand the mechanism of tender
- Obtain some implication to construct more efficient institution



Reserve Price Policy in Japan

Reserve price : an upper limit of payment
calculated by the buyer

The government must set
the reserve price in every tender
because it is strictly required by
Public Accounting Act





Effect of Reserve Price in Price-Only Tender from Auction Theory Analysis

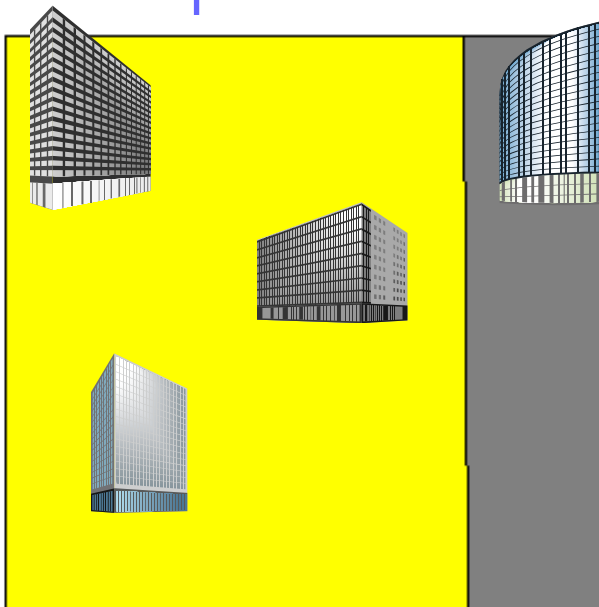
Bring highly intensified competition among bidders where all participating bidders have capacities of proposing contract price that is lower than reserve price



Buyer can make a contract with **lower** procurement cost



Not participate





Our Research(H.Fukui and K.Kobayashi)

In Japan, the government adopts **reserve price policy** in **multi-attribute tender** because of the regulation of **Public Accounting Act**

However,

- **Is it really efficient policy in multi-attribute tender?**
- **Isn't there any other policy that is more efficient ?**



Still Not Clear



Our Research

method of study

➡ Game theoretic approach (**Auction Theory**)

- Analyze the mechanism of multi-attribute tender
- Clarify the effect of reserve price in multi-attribute tender

Results

- Reserve price policy is **not** efficient in multi-attribute tender
- Reserve **score** policy that sets the lower limit of score is more efficient policy in multi-attribute tender



The Aim of Government in Public Procurement

1. Maximizes social surplus

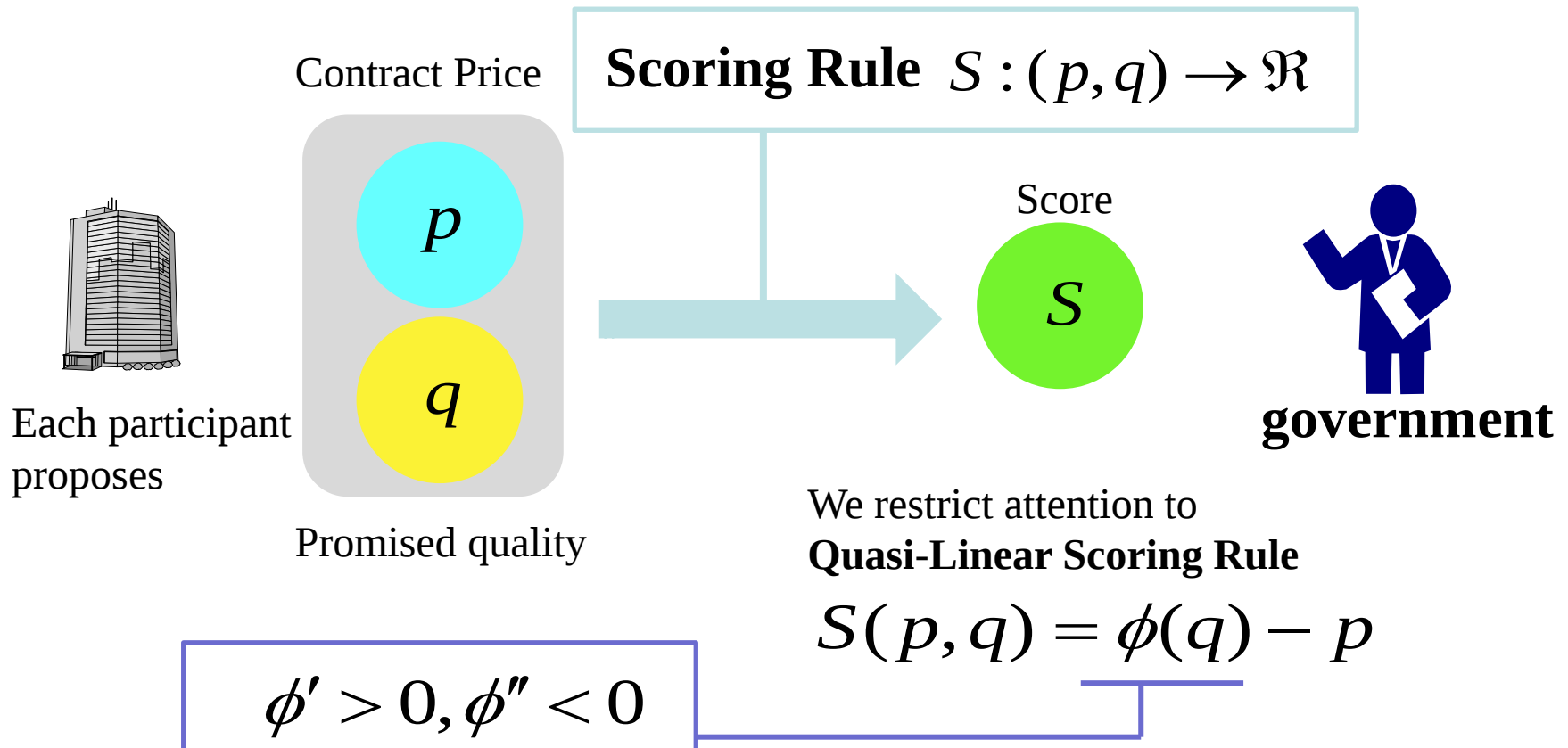
2. Improves the Expected Utility





Scoring Auction

Multi-Attribute Procurement Auction
can be analyzed by scoring auction





Model Structure

Scoring Rule

$$S(p, q) = \phi(q) - p$$

design the scoring rule



government

$$V(q) - p$$

evaluate each bidder
on the basis of score

each firm proposes
price and quality

$$(p^1, q^1) \quad (p^i, q^i) \quad (p^n, q^n)$$



...



...



n firms

make a contract



the bidder
who got the highest score



Efficient Scoring Rule

We considered the following question.

How should the government design the scoring rule?



Efficient Scoring Rule

Proposition

In order to maximize social surplus (achieve social efficient quality), government should set the scoring rule

$$S(p, q) = V(q) - p$$



1. Maximizes social surplus

2. Improve the Expected Utility



Reserve Price Policy vs. Reserve Score Policy

Both policy is intended to get more competition among bidders to improve the expected utility of government

$$S(p, q) = V(q) - p$$

Reserve score policy requires all bidders to meet the lower limit of the score ξ

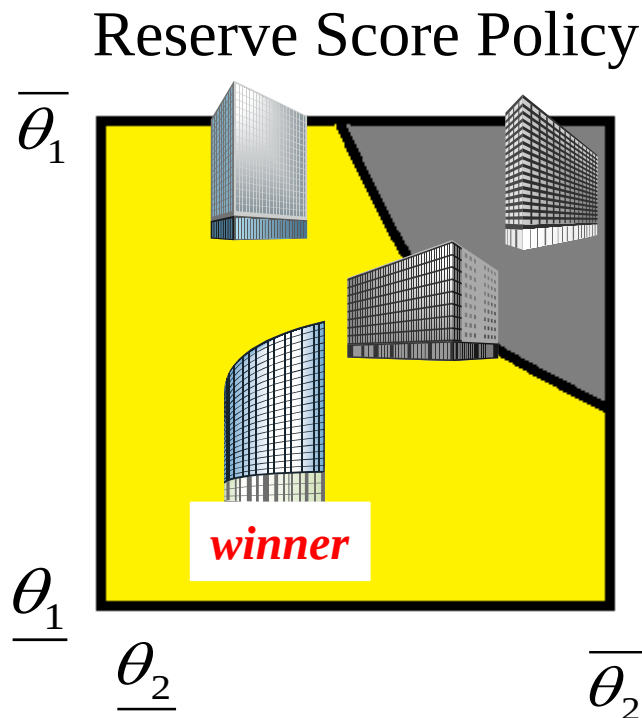
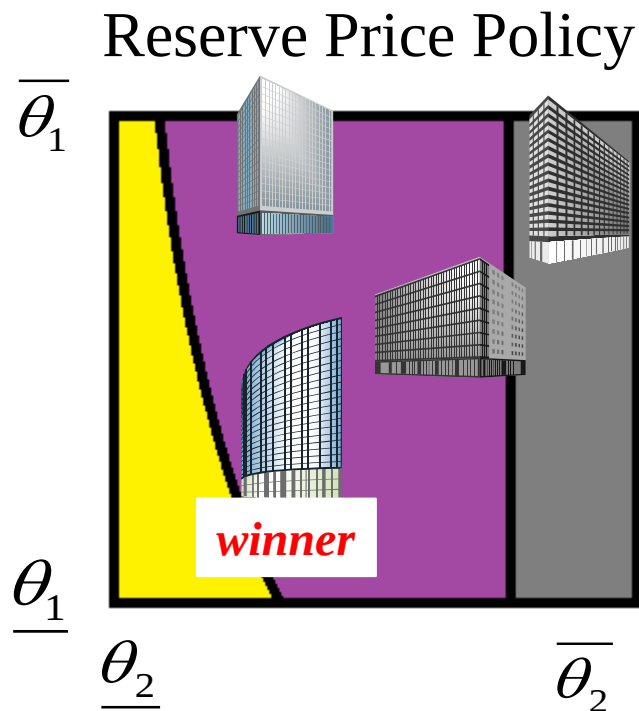
$$V(q) - p \geq \xi$$

Reserve price policy requires all bidders to bid the price that is smaller than the upper limit of price r

$$p \leq r$$



Reserve Price Policy vs. Reserve Score Policy



Propose the social efficient quality that maximizes social surplus

Propose the quality which is ***smaller*** than the social efficient quality

Not participate the auction



Conclusion

1. Maximizes Social Surplus
2. Improves the Expected Utility



- Quasi-Linear Scoring rule

$$S(p, q) = V(q) - p$$

- Reserve Score Policy



Limitation and Future Study

Several important aspects are ignored in our analysis

- **Possibility of moral hazard after the contract**
- **transaction cost**



Thank you for your attention