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School of Management**  
St. Petersburg State University

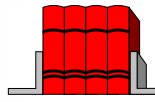
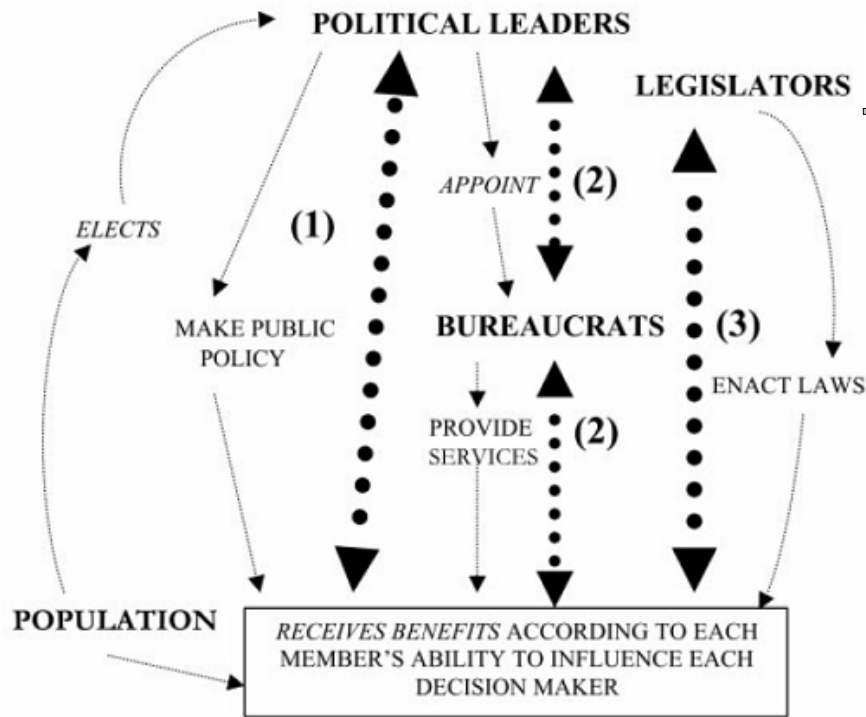
# **Applying modeling in the process of anti-corruption expertise of legal regulation of public procurement**

**Andrew Ivanov**



**INTERNATIONAL CONFERENCE ON APPLIED RESEARCH IN ECONOMICS**  
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# Methodology: dramatis personae of the “Principal-Agent” Model in Public Sector



Jain A. K. (2001). ‘Corruption: a review’, Journal of Economic Surveys, vol. 15(1).

Definition 1. We call that the principal (agent) *mala fide* if its preference order is different from the basic principal's preference order:  $\succ_P \neq \succ_{BP}$  ( $\succ_A \neq \succ_{BP}$ ), and *bona fide* if otherwise.

Position	Actors	Preferences
Basic Principal	Populace	$\succ_{BP} (\Omega)$
Principal	Government, Legislator	$\succ_P (\Omega)$
Agent	Contracting Authority (CA)	$\succ_A (\Omega)$

# The Mainstream

Principal	Agent	Model Title	Some references
Bona Fide $\gamma_P \equiv \gamma_{BP}$	Mala Fide $\gamma_A \neq \gamma_{BP}$	Administr. Corruption $\gamma_A \neq \gamma_P$	Rose-Ackerman S. (1975) The economics of Corruption
Mala Fide $\gamma_P \neq \gamma_{BP}$	Mala Fide $\gamma_A \neq \gamma_{BP}$	Efficient Corruption $\gamma_A \neq \gamma_P$	Nye J.S. (1967) Corruption and Political Development: A Cost-Benefit Analysis
		Totalitarian Corruption $\gamma_A \equiv \gamma_P$	Huntington S. (1968) Political Order in Changing Societies
Bona Fide $\gamma_P \equiv \gamma_{BP}$	Bona Fide $\gamma_A \equiv \gamma_{BP}$	Non-conflict Model $\gamma_A \equiv \gamma_P$	Laffont J.-J., Tirole J. A (1993) Theory of Incentives in Procurement and Regulation.

We have: BM,  $M_1M_2$  ( $M_1 \neq M_2$ ), ( $M_1 = M_2$ ) and BB.

But We do not have: MB.

# The Typology of the “Principal-Agent” Models

Basic principal	Principal	Agent	Model Title
Bona Fide	Bona Fide $\succ_P \equiv \succ_{BP}$	Bona Fide $\succ_A \equiv \succ_{BP}$	Non-conflict Model $\succ_A \equiv \succ_P$
		Mala Fide $\succ_A \neq \succ_{BP}$	Administr. Corruption $\succ_A \neq \succ_P$
	Mala Fide $\succ_P \neq \succ_{BP}$	Mala Fide $\succ_A \neq \succ_{BP}$	Efficient Corruption $\succ_A \neq \succ_P$
			Totalitarian Corruption $\succ_A \equiv \succ_P$
		Bona Fide $\succ_A \equiv \succ_{BP}$	Quasi-Corruption $\succ_A \neq \succ_P$

Def. 2. *Bona fide* agent’s actions violating the rules of regulation created by the *mala fide* principal will be called quasi-corruptive behavior.

Def. 3. The model, which examines *bona fide* agent’s behavior in institutional conditions created by *mala fide* principal, will be called quasi-corruption model.

# The Tradition Anti-corruption Expertise (TACE)

The question is: have Agents possibilities and incentives to avoid of making a choice optimal for the Principal?

$$\succ_A \equiv \succ_P$$

The RF Regulation aimed at to avoid Agent's rent-seeking behavior:

Federal Law N172 "On Anticorruption Expertise ..." (17.07.2009 )

Government Decree N96 "On Anticorruption Expertise ..." (26.02.2010)

But what will happen if

$$\succ_P \neq \succ_{BP}$$

Huntington S. "In terms of economic growth, the only thing worse than a society with a rigid, over-centralized, *dis-honest* bureaucracy is one with a rigid, over-centralized and *honest* bureaucracy"

# The Extended Anti-corruption Expertise (EACE)

Def. 4. Anti-corruption expertise, which includes in its algorithm the identifying of principal's bona fides, called the extended anti-corruption expertise.

The idea is: to complete TACE with specifically formalized regulation impact evaluation.

Two cases of EASE

- An expertise of a new regulation tool: we have not information of agent's behavior.

The face-to-face outcry price (English) auctions in FL-94

- An expertise of an applied regulation tool: we have information of agent's behavior.

The e-auctions in FL-44.

# Algorithm of EACE: case 1

Step 1. Set up the investigated problem, define alternatives



Step 2. Model the BP's preference order  $\succeq_{BP}$



Step 3. Use the regulation rules to model the P's preference order  $\succeq_P$



Step 4. Identify P's bona fides

**$\Pi - BF$** :  $\succeq_P \equiv \succeq_{BP}$



Step 5. TACE



**$\Pi - MF$** :  $\succeq_P \neq \succeq_{BP}$

Step 5. Improvement of the  
Regulation tools



Go to the Step 3

# Algorithm of EACE: case 2

Step 1. Set up the investigated problem, define alternatives



Step 2. Model the BP's preference order  $\succeq_{BP}$



Step 3. Identify the Principal and the Agent



Step 4. Use the regulation rules to model the P's preference order  $\succeq_P$  and identify P's bona fides

$\Pi - BF: \succeq_P \equiv \succeq_{BP}$



$\Pi - MF: \succeq_P \neq \succeq_{BP}$



Step 5. Identify the Existence of agency problem

Step 5. Identify the Existence of agency problem

Yes:  $\exists A \succeq_A \neq \succeq_P$     No:  $\succeq_A \equiv \succeq_P$

Step 6. TACE  
Administrative  
Corruption

Step 6. No  
expertise

Yes :  $\exists A \succeq_A \neq \succeq_P$

No:  $\succeq_A \equiv \succeq_P$

Yes:  $\exists A \succeq_A \equiv \succeq_{BP}$

Step 6. Identify the Existence of bona fide agents

Step 6. Improvmt  
of the RT&P  
Totalitarian  
Corruption

No:  $\succeq_A \neq \succeq_{BP}$

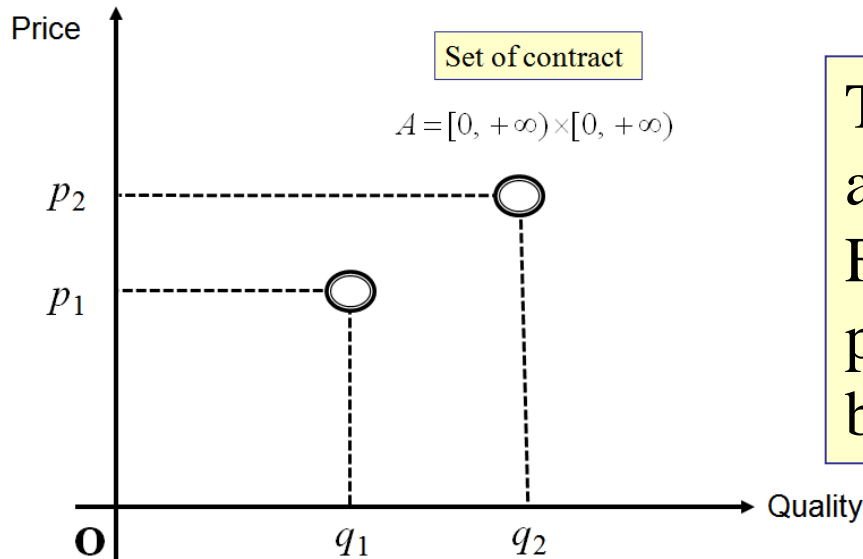
Step 7. Improvmt of  
the RT&P  
Quasi-Corruption

Step 7. Improvmt of the  
RT&P  
Efficient Corruption



# Case: Some Lessons from the Russian Experience of Applying Auctions in Public Procurement

## Step 1. The Main Problem of Procurement



There are two main criteria: quality and price.  
For simplicity: Quality of the purchased object can be determined by the only numeric parameter.

## The Instruments to Obtain Contracts

- Single-source procurement
- Negotiations
- Competitive Procedures: Tenders, Auctions (English, Dutch, ~~first-price~~, Vickrey)

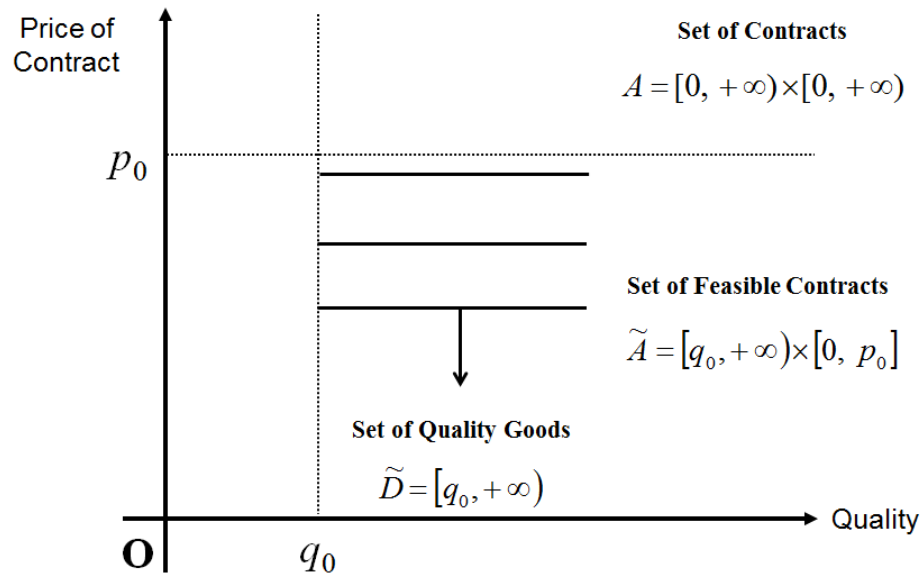
## Step 2. Basic Principal's preference order

The Basic Principal is assumed to be able to formalize the supplied good as a bundle of its specifications and to point out the feasible sets for every specification:

$$q_i \in \tilde{D}_i \subset D_i, \quad i = 1, 2, \dots, n, \quad \tilde{D} = \tilde{D}_1 \times \tilde{D}_2 \times \dots \times \tilde{D}_n.$$

### The case of homogeneous goods

$$a^1 = (q_1, p_1), \quad a^2 = (q_2, p_2) \quad (q_i \geq q_0): \quad \begin{cases} p_1 < p_2 \Rightarrow a^1 \succ a^2 \\ p_1 = p_2 \Rightarrow a^1 \sim a^2 \end{cases}$$



## Step 2. BP's preference order: the case of differentiated goods

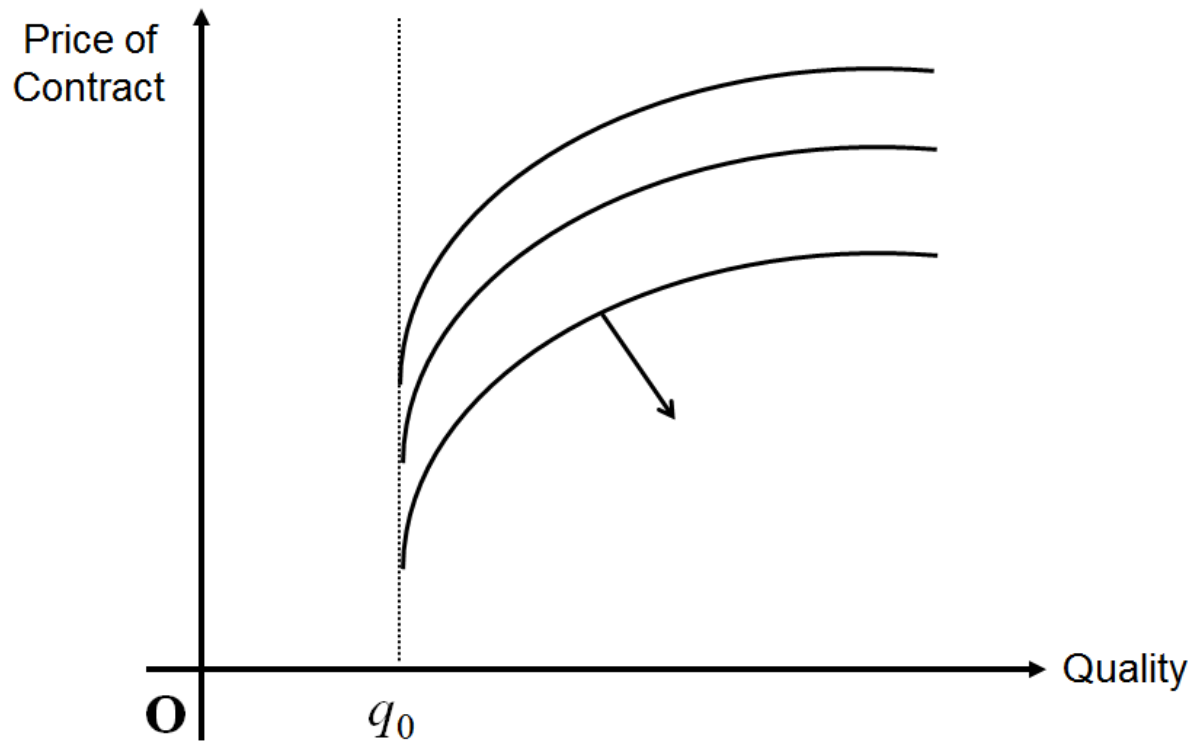
BPPO is reflexive, complete, transitive, “monotonic”, convex and is not dependent from the third alternative: preference in any pair of contracts does not change when the set of contracts is changed (leaving affordable the compared contracts):

$$\succeq_{BP}(A) \subseteq \succeq_{BP}(A^*), \quad A \subseteq A^*.$$

Assumption	Definition	Reasons
Reflexivity	$\forall a^1, a^2 : a^1 = a^2 \Rightarrow a^1 \sim a^2$	Identical contracts are indifferent each other
Completeness	$\forall a^1 = (q_1, p_1), a^2 = (q_2, p_2) : \begin{cases} a^1 \succeq a^2 \\ a^2 \succeq a^1 \end{cases}$	For every two contracts BP knows how much additional money he is ready to pay for additional quality
Transitivity	$\forall a^1, a^2, a^3 : \begin{cases} a^1 \succeq a^2 \\ a^2 \succeq a^3 \end{cases} \Rightarrow a^1 \succeq a^3$	From any finite set of contracts BP can choose the most preferable one
“Monotony”	$a^1 = (q_1, p_1), a^2 = (q_2, p_2) : (a^1 \neq a^2) \begin{cases} q_1 \geq q_2 \\ p_1 \leq p_2 \end{cases} \Rightarrow a^1 \succ a^2$	
Convexity	$\forall a : B(a) \text{ is convex}$	The BP do not pay more for the extra quality

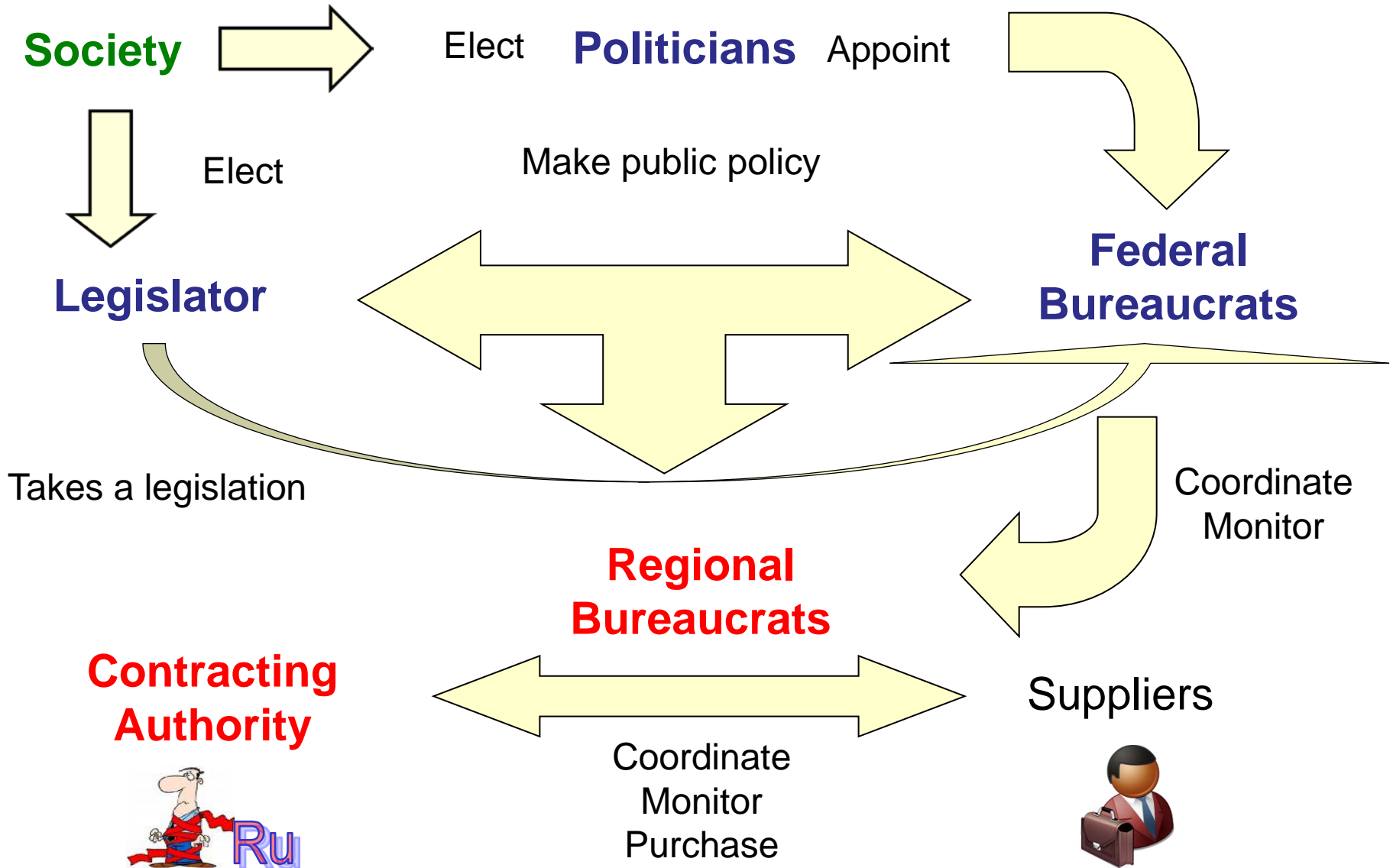
## Step 2. BP's preference order: the case of differentiated goods

Given assumptions, basic principal's indifference curves are the graphs of strictly monotonically increasing, continuous, concave functions:



# Step 3. The Identification of the Principal and Agents

## Basic Principal, Principal and Agent in the simplified Model of the RF PPS



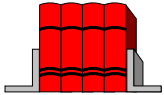
## Step 4. Principal's preference order: the main tool of last Russian PPL

Russia is a country with transitional economy:

- the institutional system is formed,
- elite are changing.



Corruption level is getting higher



Samuel P. Huntington, Political Order in Changing Societies, 1968.

### The three necessary conditions of the corrupt behavior

- Discretionary Power
- Rent extraction behavior
- Weakness of the Institutions

### Auction as the preferred procurement method (2006-New PPL)

- There is an Auction list consists of homogeneous (paper, cleaning and so on) and differentiated (cars, engines, drugs and so on) goods, services and works
- For goods and services from the AL impossible to award contract by the criterion of the most economically advantageous offer, Agent must apply an action
- Agent can apply the reverse (an English) auction in any case (second-price)
- Agent can apply the first-price sealed-bid auction for small contracts
- Agent cannot apply the Dutch or Vickrey auction in any case

## Step 4. The Principal's *bona fides* identification (1)

### Main assumptions

Agent defines the set of acceptable goods as BP and there are  $N$  suppliers who can deliver the goods from this set:

$$x^i \in \tilde{D}, \quad i \in I = \{1, \dots, N\}.$$

Each supplier knows what his own production and delivery costs will be if he wins a contract:

$$c_i = C_i(x^i), \quad x^i \in \tilde{D}, \quad i \in I.$$

The set of suppliers  $S$  is a union  $M$  ( $1 \leq M \leq N$ ) of disjoint sets (classes of suppliers):

$$S = S_1 \cup S_2 \cup \dots \cup S_M, \quad |S_i| = n_i, \quad S_i \cap S_j = \emptyset \quad (i \neq j), \quad i, j = 1, 2, \dots, M,$$

and all the bidders of each class appear to be the same to the buyer and to each other. Assume that suppliers of each class independently draw their costs from the probability distribution  $F_i(\mu_i, \sigma_i)$ ,  $i=1, 2, \dots, M$ , defined on the intervals

$$[\underline{c}_i, \overline{C}_i]: \overline{C}_i < \underline{c}_j, \quad i = 1, 2, \dots, M-1, \quad j = i+1, \dots, M.$$

## Step 4. The Principal's *bona fides* identification (2)

- All suppliers are supposed to be rational and risk-neutral.
  - There is no collusion among suppliers.
  - There are no dumping suppliers (nobody bids lower his costs).
- 
- The auction is designed in such a way that each supplier has no information on the participation / non-participation in the auction other suppliers.
  - Agent sets the initial (maximum) contract price  $p_0$  such a way that the following inequality is satisfied:

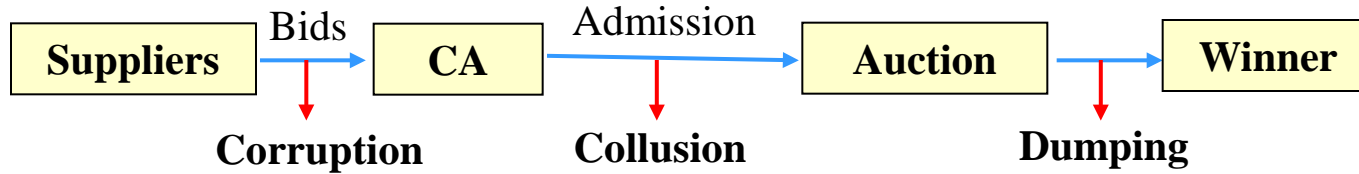
$$\max_{i \in I} c_i \leq p_0, \quad i \in I.$$

Proposition. If the Principal prescribes to the contracting authority to procure indivisible goods by the English auction, then given assumptions the Principal is *mala fide*.



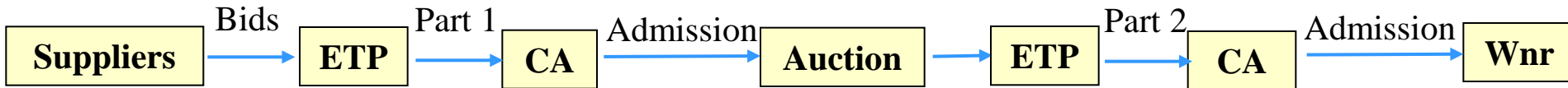
# Step 5. The Identification of the 'Principal – Agent' problem

## The Performance of the live outcry auctions



	2007	2008	2009
Competition in the auction (bids/auction)	9.05	2.88	3.64
Average price reduction (%)	15.02	12.19	10.5

## The Performance of the e-auctions in 2010



	M-etp	S-etp	T-etp	Total
Competition in the auction (second parts of bids/auction)	1.5	1.6	1.8	1.6
The auctions did not take place (%)	75	69	71	72
Average price reduction (%)	6	4	4	4.7

## Step 5. The Identification of the 'Principal – Agent' problem



The questions are:

- Who has limited the competition
- Why the competition had been limited
- How the competition had been limited

Who can limit the competition in the auctions:

- Principal (Regulator)
- Agent (CA)
- Supplier
- ETP

The Suppliers: in the course of transition from outcry auctions to e-auctions collusion problem cannot be sharpened.

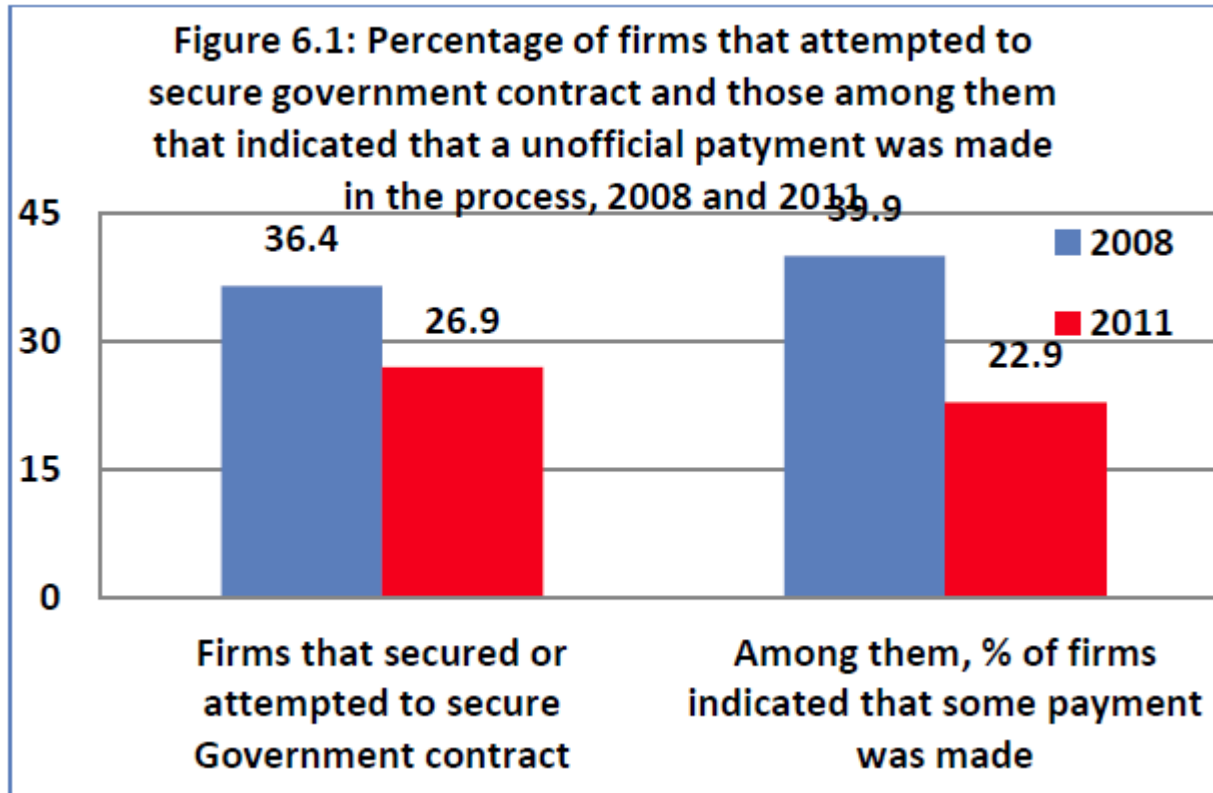


*Who*

The Agent has limited the competition in the auctions

# Step 6. The Identification of the *bona fide* Agents

Russian economic report: recovery and beyond'. (2013) The World Bank in Russia, №29, Spring.

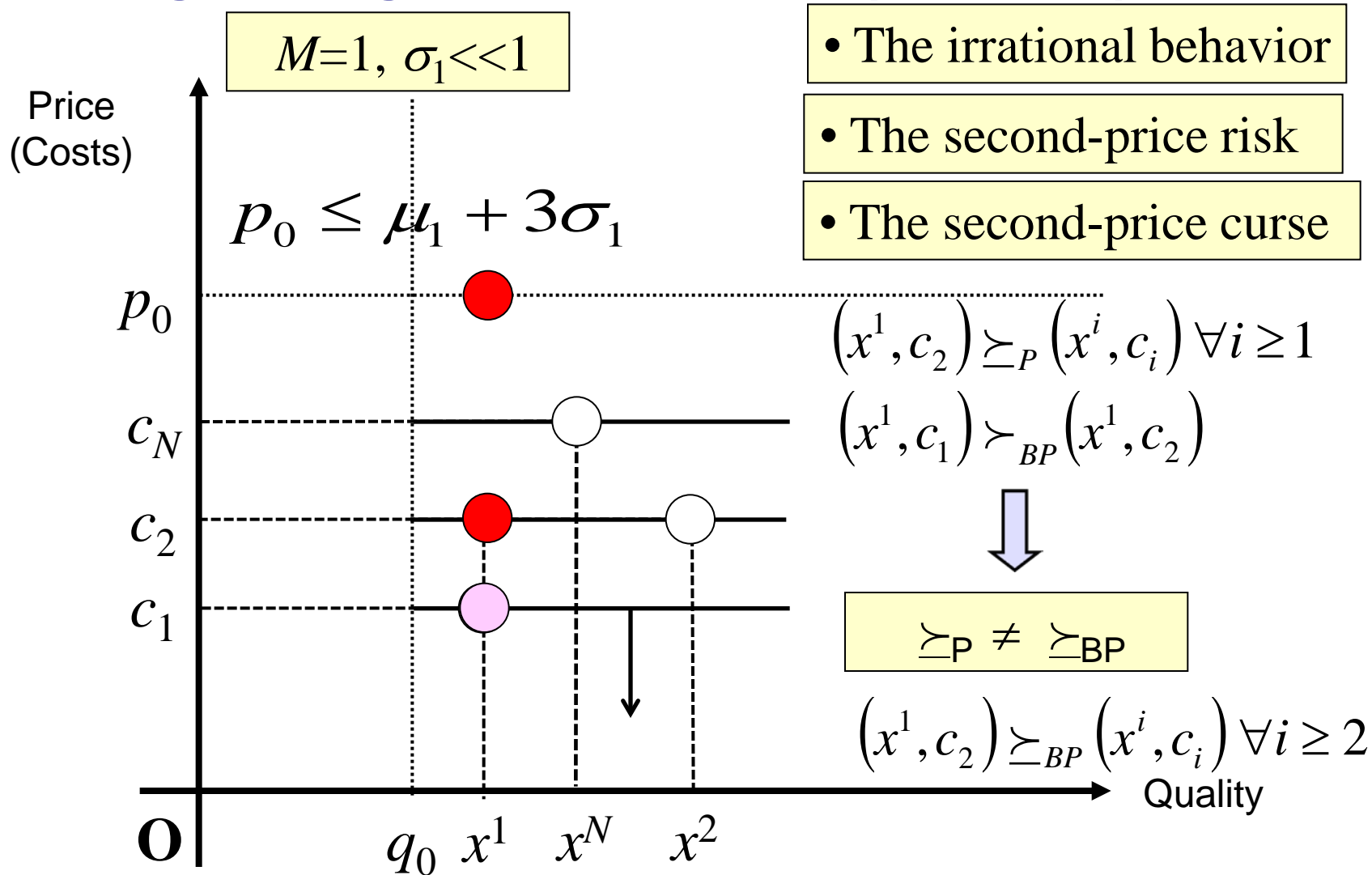


↓ Who

The Agents: there is “*mala fide*” corruption (bribes or “kickbacks”) and there is “*bona fide*” corruption (no bribes, no “kickbacks”).

# Step 7. The application of the quasi-corruption model

## Homogeneous goods: incentives to quasi-corruption

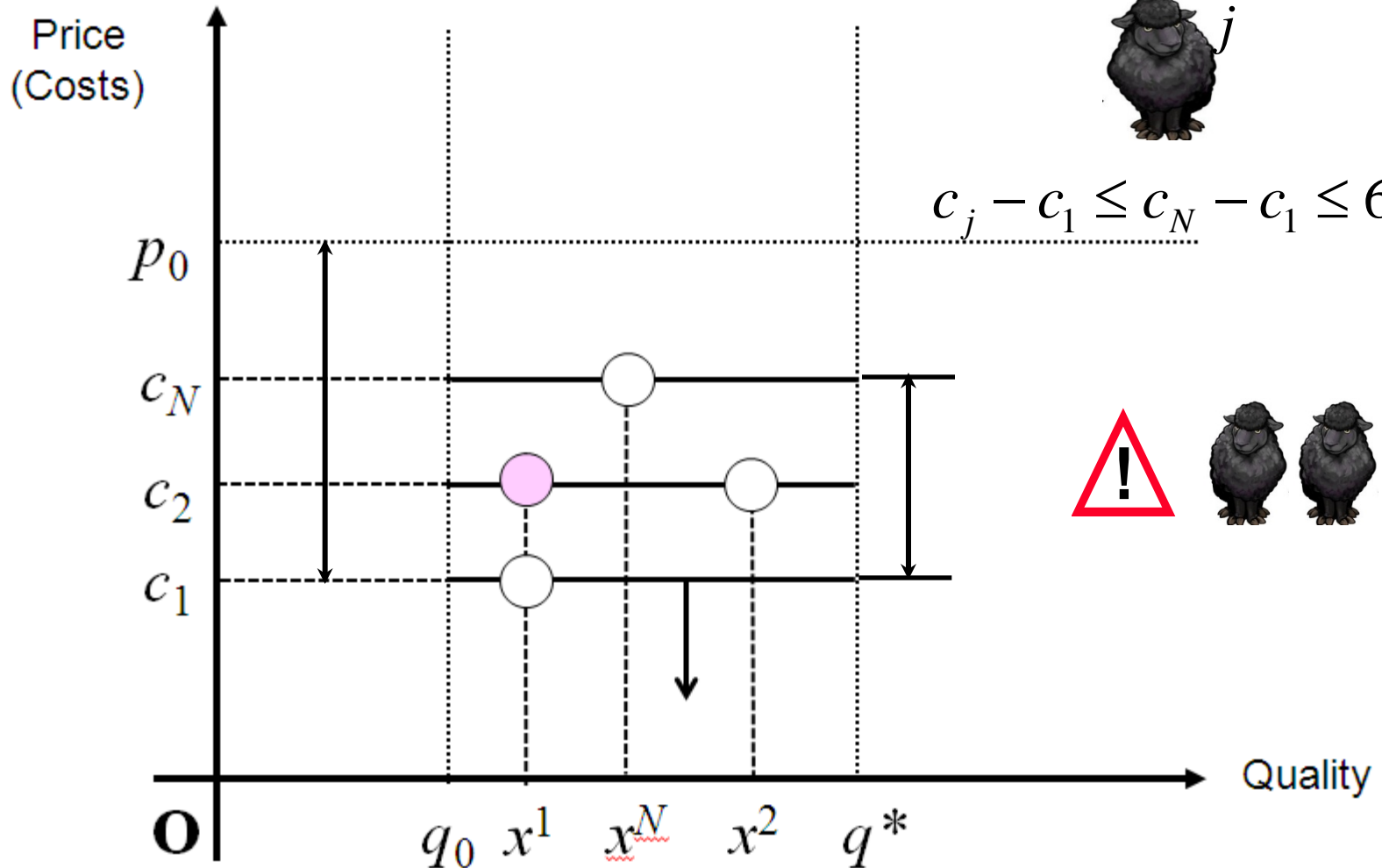


$$P(c_2 < \mu_1) = 1 - P(c_2 \geq \mu_1) = 1 - \prod_{i=2}^N P(c_i \geq \mu_1) = 1 - \frac{1}{2^{N-1}} \Rightarrow 6\sigma_1 \rightarrow 3\sigma_1.$$

# Homogeneous goods: incentives to quasi-corruption (2)

• The collusion risk

• The dumping risk



$$p_0 - c_i \leq p_0 - c_1 \leq 6\sigma_1, \quad i = 1, 2, \dots, N.$$

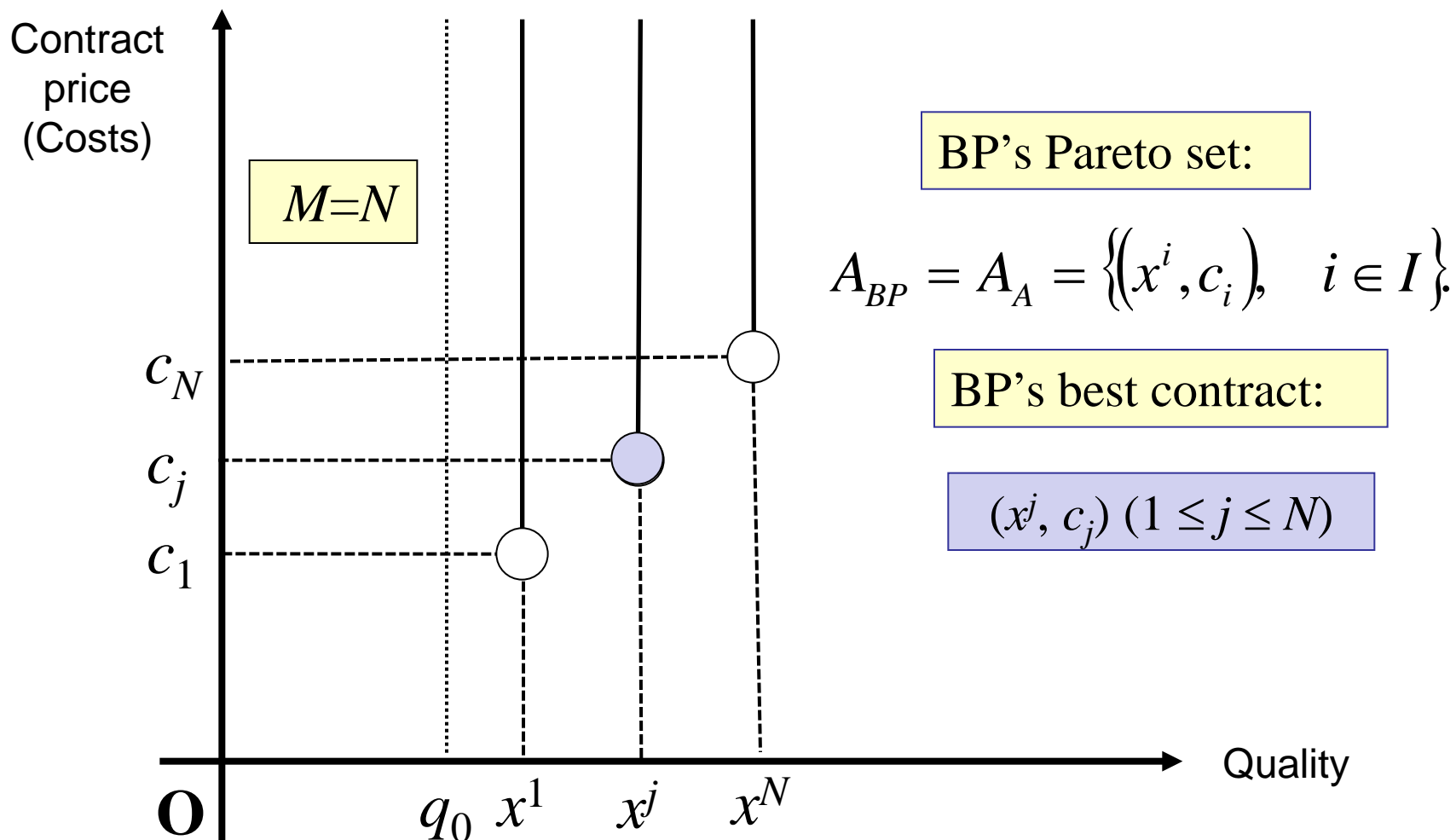
# Basic Principal: the best contract

## Differentiated goods: incentives to quasi-corruption

$$M \neq 1, \sigma_1 \ll 1$$

The set of feasible to BP contacts:

$$\{(x^i, p), p \geq c_i, i \in I\}$$



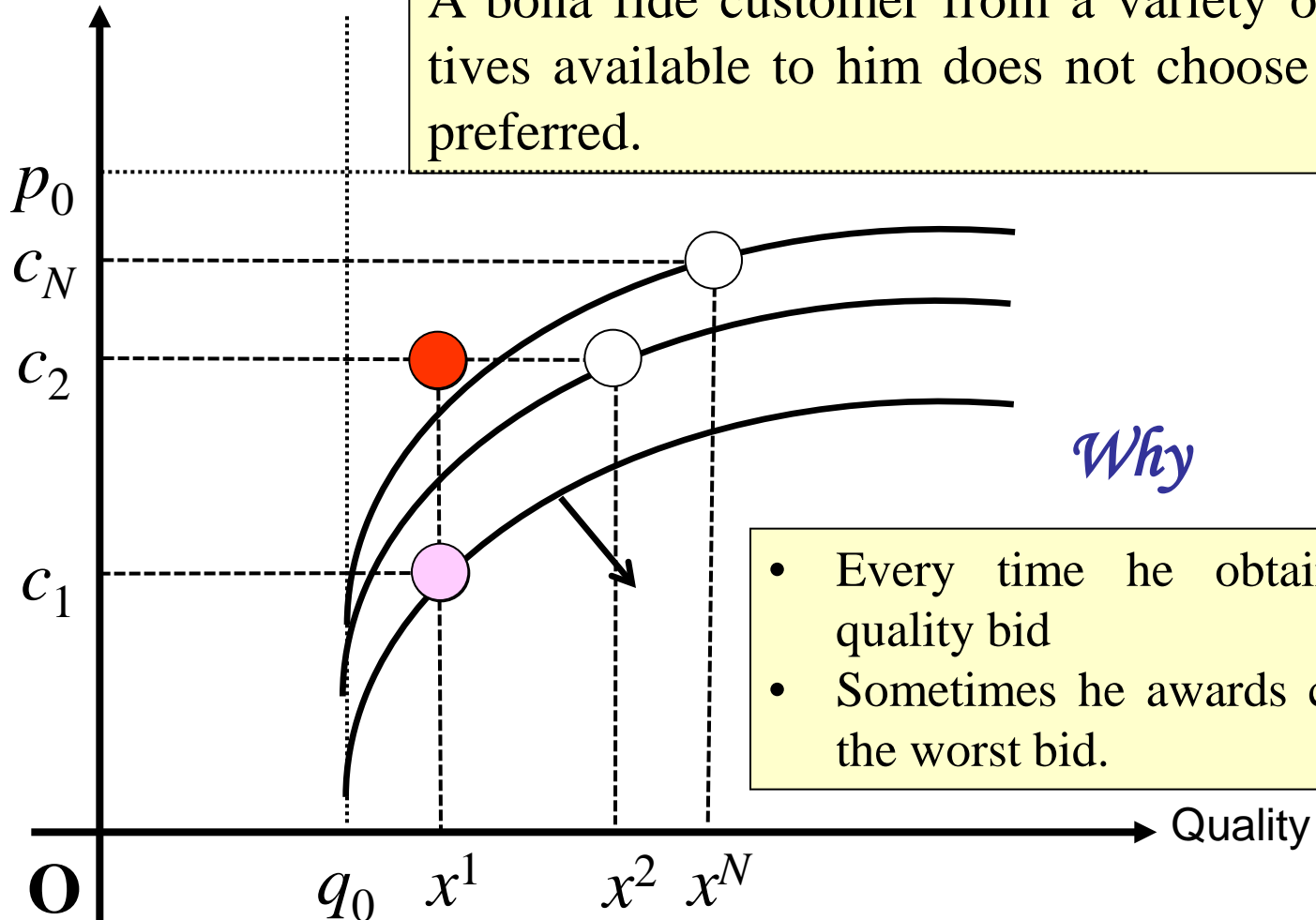
# Differentiated goods: incentives to quasi-corruption

- The risk of irrational behavior

$$(x^i, c_i) \succ (x^1, c_2) \quad i = 1, 2, \dots, N.$$

A bona fide customer from a variety of alternatives available to him does not choose the most preferred.

Price of Contract  
(Costs)



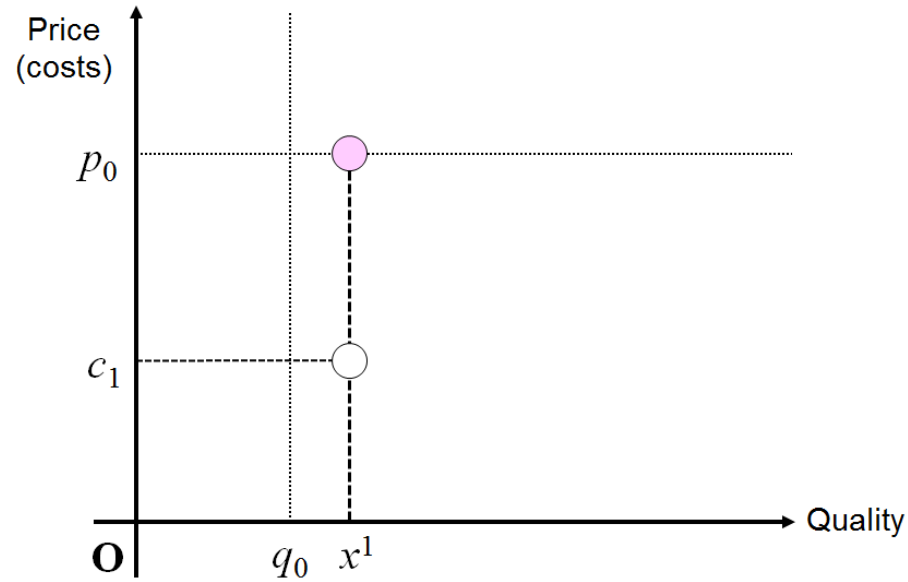
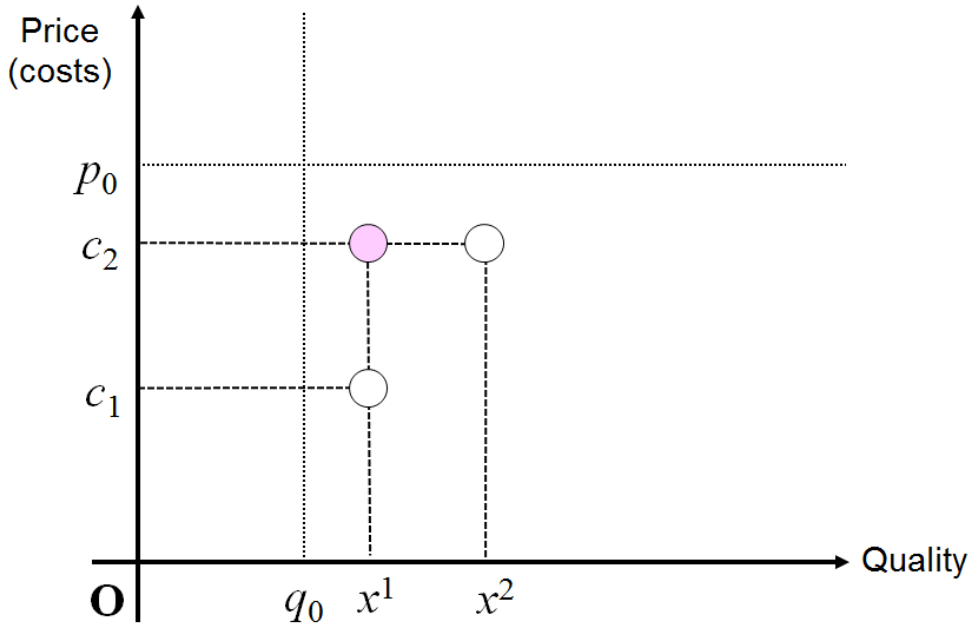
- Every time he obtains worst-quality bid
- Sometimes he awards contract to the worst bid.

# Differentiated goods: incentives to quasi-corruption (2)

- The second-price risk

*Why*

- The second-price curse



	M-etp	S-etp	T-etp	Total
The auctions did not take place (%)	75	69	71	72

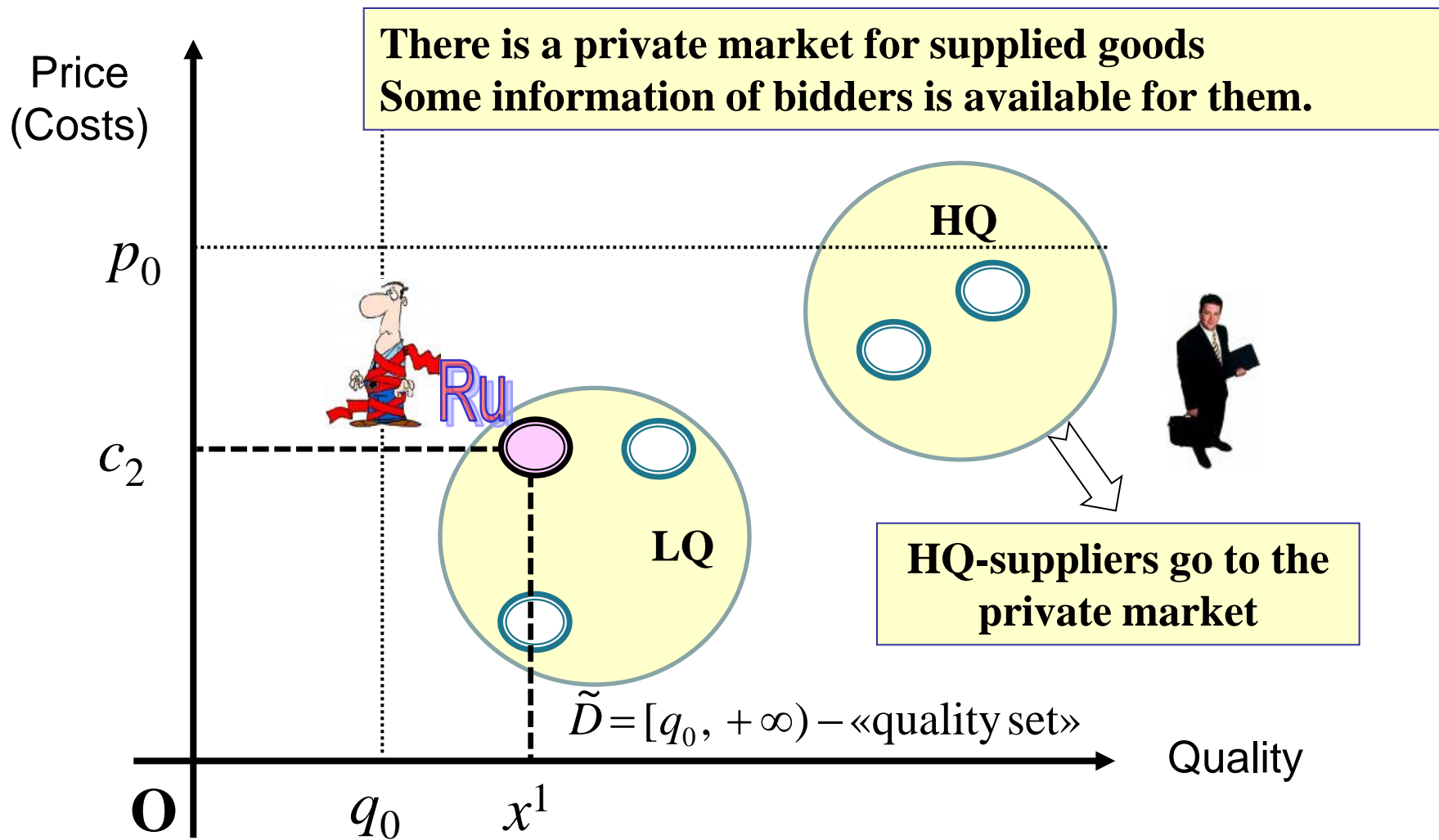
- The collusion risk

- The dumping risk



# Differentiated goods: Long Run auctions risks

- The risk of Information Transparency



The “Lemon’s market” mechanism is launching.

## Last step. Policy implications RF (1)

1. To award contract to the most economically advantageous bid by the auctions which give the possibility of compensating the higher contract price by the higher quality of the purchased goods:

- Scoring auctions,
- Handicap auctions.

2. To introduce the Dutch auction into the list of acceptable procurement methods. This auction:

- The first-price auction
- A proven means of limiting opportunities for collusion of suppliers
- Does not demand the establishing of initial price
- Does not demand the auction step
- Need not the shutting time
- Decrease the time of auction procedure.

## Last step. Policy implications RF (2)

3. The applying of an auction must be approved by a designated organ (ML, 28-3).
4. To designate in the auction documentation the minimum number of suppliers for the auction to be performed (ML, 53-j).
5. To increase price thresholds.
6. In the development of Laws fit the hierarchy structure of the considering Model Law at the top.

## Last step. Policy implications

WHEREAS the [Government] [Parliament] of ... considers it desirable to regulate procurement so as to promote the objectives of:

- (a) Maximizing economy and efficiency in procurement;
- (b) Fostering and encouraging participation in procurement proceedings by suppliers and contractors regardless of nationality, thereby promoting international trade;
- (c) Promoting competition among suppliers and contractors for the supply of the subject matter of the procurement;
- (d) Providing for the fair, equal and equitable treatment of all suppliers and contractors;
- (e) Promoting the integrity of, and fairness and public confidence in, the procurement process;
- (f) Achieving transparency in the procedures relating to procurement.

WHEREAS the [Government] [Parliament] of ... considers it desirable to regulate procurement so as to maximizing economy and efficiency in procurement.

To maximizing economy and efficiency in procurement ... : (b) -(f).