

Competition Design for Local Public Services with Learning-by-Doing and Transferability

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Contracts, Procurement, and Public-Private Arrangements

Chaire PPP - Paris - May 2011

Organization of Local Public Services

- The local authority in charge of the organization of local public services:
 - water provision, public transportation, garbage collection, street repair
- Organization:
 - periodic selection of the service provider and price regulation
 - it requires sequential selection of suppliers
 - ownership: public (civil servants or state company) or private firm
- Such organization is a common feature in many countries:
 - France: Chong, Huet, Saussier and Steiner (2006) - water distribution
 - England: Szymanski (1996) - waste collection
 - France: Gagnepain, Ivaldi, Martimort (2010) - public transportation
 - U.S.: Levin and Tadelis (2010) - Several local public goods

Learning-by-Doing and Asymmetric Suppliers

- Learning-by-Doing

- Accumulation of valuable information on the local public utilities
 - waste collection in UK: Gomez-Lobo et al. (2001)
 - water network in France: Aubert et. al. (2005, 2006)

Incumbent reduces its cost through time: more efficient

- Asymmetric Suppliers: Local and Global Firms

- Global in several markets, and Local only in the local market
- Firms are ex-ante identical symmetry, different dynamics
- Key difference btw Local vs Global:

Global's Transferability of Learning among Concessions

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Global's Transferability of Learning among Concessions

- Design of a sequential competition for local public services, when
 - Objective: maximizes social welfare (consumers surplus + firms profit)

and there are:

- 1 Learning-by-doing
 - Incumbent expects cost reduction through time
- 2 Asymmetry between Global and Local Firms
 - Global Firm's Transferability

Approach: Optimal Sequential Direct Mechanism

- Sequential Procurement: 2 periods
- In each contingency,
 - Local Public Authority, defines a mechanism:
 - an awarding rule - determines who has to be the supplier
 - a payment rule - monetary transfer for firms
 - Mechanism maximizes Social Welfare
 - Expectations about firms costs are consistent with contingencies

- 1st Period: Discrimination in favor of the Local firm
 - Reason: to stimulate future competition
 - Intuition:
 - if local firm incumbent, it is efficient as global one in the future
 - global is efficient due transferability
 - ⇒ lower monetary transfer to local and global effect
- 2nd Period: Discrimination in favor of Weak firm (higher expected cost)
 - Reason: to reduce virtual cost: production cost + informational rent
 - Intuition:
 - weak firm (high cost and low informational rent) and strong firm (low cost and high informational rent)
 - Selection: (weak) firm with high cost and low information rent

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- City-Economy
 - Consumers
 - Demand an indivisible public good for 2 subsequent periods
 - Sum of consumers utility for the public good is S per period: S high enough
 - Local Public Authority
 - Firms: a Local and Global one
- All are risk-neutral and live for 2 periods, $t \in \{1, 2\}$.
 - Discount factor =1.

- Two firms: Global (G) and Local (L) firm
- Production cost per period: c_{it} , $i \in \{G, L\}$, $t \in \{1, 2\}$
 - drawn at the beginning of each period according to
 - cdf $F_{c_{it}}(\cdot)$ on $[\underline{c}_{it}, \bar{c}_{it}]$, with pdf $f_{c_{it}}(\cdot)$,
 - it can be: $F_w(\cdot)$ - weak, $F_s(\cdot)$ - strong
 - c_{it} independent of $c_{jt'}$
 - firm- i privately learns its c_{it} at the beginning of t
- Learning-by-doing: incumbent expects cost reduction in $t = 2$.
 - in $t = 1 \rightarrow F_{c_{i1}}(\cdot) = F_w(\cdot)$, weak
 - in $t = 2$ incumbent $\rightarrow F_{c_{i2}}(\cdot) = F_s(\cdot)$, strong
 - $F_s(\cdot)$ conditionally stochastically dominates $F_w(\cdot)$

Global Firm's Transferability

- Transferability

- Probability $\theta \in [0, 1)$: global firm is incumbent elsewhere
 - c_{G2} from $F_s(\cdot)$, strong
- Probability $(1 - \theta)$: global firm is not incumbent elsewhere
 - If global incumbent in the city: c_{G2} from $F_s(\cdot)$, strong
 - If global entrant in the city: c_{G2} from $F_w(\cdot)$, weak

- The Role of θ : global firm's ability in transferring learning btw cities

- Higher $\theta \rightarrow$ higher transferability \rightarrow higher global firm's advantage
- Why $\theta \in [0, 1)$? Uncertainty of being elsewhere
- Remark: $\theta = 0 \rightarrow$ Global = Local

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Technologies in the Second Period: Possible States

- Contingencies in the Second period: different distributions of c_{G2} and c_{L2}
- A state variable X summarizes possible states in the second period
 - $X = 1$: Local selected in the city in $t = 1$, Global without Transferability
 - Local strong, and Global weak
 - $X = 2$: Local selected in the city in $t = 1$, Global with Transferability
 - Local and Global Strong
 - $X = 3$: Global selected in the city in $t = 1$
 - Local weak, and Global strong

Local Public Authority and Sequential Mechanism

- Benevolent: sequentially designs a Mechanism to select the supplier
- Maximizes Social Welfare: Consumers Surplus + Firms' Profit
 - consumers weight normalized to 1, firms' weight $\alpha \in (0, 1]$
 - cost of public funds: $\lambda > 0$

$$W_t = S + \alpha(U_{Lt} + U_{Gt}) - (1 + \lambda)(t_{Lt} + t_{Gt})$$

- Ex-Ante Social Welfare: $W = W_1 + E_X[W_2(X)]$
- Direct Mechanism (Allocation Rule):

$$\{p_{it}(c_t), t_{it}(c_t)\}$$

- $p_{it}(c_t)$: probability of firm- i is selected at t
- $t_{it}(c_t)$: monetary transfer to the firm- i is at t

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Solving Backwards

Second-Period Optimal Mechanism

- **Result**: Preferential treatment to the weak firm
- State $X = 1$: Local strong , Global weak
 - Preferential treatment to **Global** firm
 - $\exists c_2^*$, for all $c_{G2} \in [c_{L2}, c_2^*] \rightarrow$ Global is chosen, even tough higher cost.
- State $X = 2$: Both Strong
 - **No preferential treatment** to any firm (all are strong)
- State $X = 3$: Global strong, and Local weak
 - Preferential treatment to **Local** firm
 - similar to $X = 1$: replace G by L , and vice-versa

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Continuation Payoffs: Nature drawn Second-Period cost

Social Welfare

- $W_2(X)$
 - $X = 1$: Local strong, Global weak $\Rightarrow W_2(X = 1) = \underline{W}$
 - $X = 2$: Local strong, Global strong $\Rightarrow W_2(X = 2) = \overline{W}$
 - $X = 3$: Local weak, Global strong $\Rightarrow W_2(X = 3) = \underline{W}$
- where: $\overline{W} > \underline{W}$
 - $\overline{W} \equiv \overline{S} - (1 + \lambda - \alpha)(2U^C), \quad \underline{W} \equiv \underline{S} - (1 + \lambda - \alpha)(\overline{U} + \underline{U})$
 - $\overline{S} > \underline{S}$: expected net surplus

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First-Period Optimal Mechanism

$$\begin{aligned} \max_{\{p_{il}(c_1), t_{il}(c_1)\}} W &= W_1(p_{G1}(c_1), p_{L1}(c_1), t_{G1}(c_1), t_{L1}(c_1)) + \\ &+ \int_{\Delta_1} \left[p_{L1}(c_1)[\theta \overline{W} + (1 - \theta) \underline{W}] + p_{G1}(c_1) \underline{W} \right] f_w(c_1) dc_1 \end{aligned}$$

- Result: Preferential treatment to local firm
 - $\exists c_1^*$, for all $c_{L1} \in [c_{G1}, c_1^*] \rightarrow$ Local is selected, and higher cost.
 - Reason: $[\theta \overline{S} + (1 - \theta) \underline{S}] > \underline{S}$
- **Trade-off**: High cost **today** and low average cost **tomorrow**
 - selecting local firm with high today
 - \uparrow number of firms with low cost tomorrow: Learning-by-doing effect

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- Model: Global = Big, and Local = Small
- Optimal Mechanism suggests Discrimination in favor of Small Firms
 - Economic foundation for the US Small Business Act (1953):

Fair proportion of government contracts to small business.

- Favoritism to Small Business must be properly designed to reduce contracting cost:

Denes (1997), Marion (2007), Nakabayashi (2009), Athey et al. (2011)

Learning-by-Doing and Transferability

Testable Implications

- If standard first-price auction rather than optimal mechanism?
- Learning-by-doing:
 - (1) **Incumbent** firm has higher probability of winning than the entrant.
 - GEA-ENGREF (2002) and Szymaski (1996)
 - (2) The **period 1** expected transfer is lower than **period 2** one.
 - Gagnepain, Ivaldi and Martimort (2008), Shaulol (1997)
- Transferability + Learning-by-Doing:
 - (3) The period 2 expected transfer **under global** (private) ownership is higher than period 2 one **under local** (public) ownership.
 - Bontemps, Martimort and Thomas (2010)

Conclusions and Final Remarks

- Optimal Sequential competition for local public services, when
 - Local Authority: maximizes social welfare
 - Technology with Learning-by-doing and Global Firm's Transferability
- Results: Discrimination in favor of Local (Small) Firms
- Implementation by Modified Sequential FP and SP auctions
- A Economic foundation for the US Small Business Act (1953)
- Evidence suggests existence of Learning-by-Doing and Transferability