

Organizing Competition For the Market

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- Provision of public services (buses, rail, prison, waste collection)
- Trend towards **Competitive Tendering**

In-house (public) provision → Competition *for* the market

- EU: Rail & road passengers contracts tendered by law

In London...

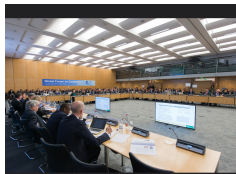


- Since 1992, competition for the market for **London bus services**
- In-house incumbent broken up in 12 companies, and privatized
- Recurrent tenders organized route-by-route
- Bundled bids allowed
- 5 year contracts
- Fixed price contracts (since 2001)
- OECD (2013): Best practice with persistent competition



- In-house operator ATAC costly and poor performing
- 2019 Referendum for introducing Competitive Tendering
- 74% in favour!
- **How to do it?**
- Break-up the incumbent?
- Start tendering synchronously (all markets in 06/2021) or sequentially (some later in 06/2021)?
- Which contract duration?

Meantime in Paris...



- O.E.C.D.: Global Competition Forum in December 2019
- Move to competitive tendering continues
- Incumbency advantage main issue
- Concerns:
 - Some UK tendered services show increasing prices (N.A.O. 2013)
 - France bus tenders: 60% with one bid (Avenal et al. 2013)
 - German rail: In-house incumbent 67% share, due to informational advantage (Weiergraeber and Wolf 2018)

Organizing competition for the market:

- **Q1) Market Structure:** Breaking up or not the incumbent
Ensuring a level playing field when historical operator present
- **Q2) Tendering Timing:** Staggered vs Synchronous
Reducing risk of lock-in
- **Interplay between Q1 and Q2**
- **New: Contract duration**

- **Two markets**/lots A (West Rome) and B (East Rome) infinitely repeatedly up for tender
- **Break-up decision:**
 - Break up: Incumbent in market A, incumbent in market B (State \mathcal{D})
 - Do not break-up: Same incumbent in both markets (State \mathcal{M})
- Three types of firms:
 - Incumbent in market A
 - Incumbent in market B (may be the same)
 - Infinite number of entrants E
- **Two possible states:**
 - State \mathcal{M} (*Monopoly*): Same incumbent serves both markets, competing only against E
 - State \mathcal{D} (*Duopoly*): One incumbent in each market, competing against each other and E
- Zero variable costs

Incumbency advantage

- **Incumbency advantage arises from sunk costs:** irreversible investments in key assets required to provide service
- To serve a market, firm must incur sunk cost, lower for active firms:
 - Incumbent: has already sunk this cost
 - Neighboring incumbent: must incur $s > 0$
 - Entrants: must incur $S > s$
- New: Alternatively, could stem from Knowledge, acquired through experience, of market specific conditions
 - **Information Decay:** conditions change over time
→ recent knowledge more useful than past knowledge
 - Incumbency advantage: more accurate signals

Tendering rules and timing

- Recurrent tendering of two-period contracts
- **Staggered tenders:** one market up for tender in each period
 - Each firm submits a price for market up for tender
 - Lowest price wins and winner services the market at that price
- **Synchronous tenders:** both markets up for tender every other period
 - Each firm submits prices for each individual market and for “bundle”
 - Best combination of bids wins, winner services the markets at bid prices
- Markov Perfect equilibria
 - Equilibrium strategies depend only on current state, \mathcal{M} or \mathcal{D}
 - Coalition-Proof Nash equilibria (in our setting, this is equivalent to Pareto-efficient Nash eqb in each period, given continuation values)
 - δ : common discount factor

Preview of results

- Two possible outcomes:
 - *Persistent Monopoly* (state \mathcal{M} forever)
 - *Persistent Competition* (state \mathcal{D} forever)
- Outcome depends on Market structure & Tendering Timing **interlinked:**
- *Market structure*: Optimal to **break up** historical incumbent to start in competitive structure (\mathcal{D})
- *Tendering Timing*
 - **Synchronous**: Best to enhance **pressure by entrants** when *Persistent Monopoly* expected (high δ , low s/S)
 - **Staggered**: Best to enhance **pressure by other Incumbent** when *Persistent Competition* sustainable (low δ , high s/S)
- New: Optimal **contract duration** ensures *Persistent Competition*

Preview of equilibria

Under both Synchronous and Staggered Tenders:

- **Single-state Equilibrium (SSE)**

- In state $\mathcal{M} \rightarrow \mathcal{M}$: \mathcal{M} wins both markets against E
- In state $\mathcal{D} \rightarrow \mathcal{M}$: One incumbent wins both markets (\rightarrow *Persistent Monopoly*)

- **Dual-state Equilibrium (DSE)**

- In state $\mathcal{M} \rightarrow \mathcal{M}$: \mathcal{M} wins both markets against E (*Persistent Monopoly*)
- In state $\mathcal{D} \rightarrow \mathcal{D}$: Each incumbent wins own market (*Persistent Competition*)

- **New: Robustness**

- No bundled bids under Sync: coalition-proof equilibria unaffected
No new equilibria; may eliminate eqb where incumbents compete for bundle
- Removing coalition-proof requirement allows above equilibrium to survive: Low prices \rightarrow Tilts balance in favour of Synchronous

Staggered, State M

M vs E

- Monopolist:

$$v_M = \begin{cases} p + \delta V_M & \text{if win} \\ \delta V_I & \text{if lose} \end{cases} \rightarrow \text{Lowest bid } p_M = -\delta (V_M - V_I)$$

- Entrant:

$$v_E = \begin{cases} p - S + \delta V_C & \text{if win} \\ 0 & \text{if lose} \end{cases} \rightarrow \text{Lowest bid : } p_E = S - \delta V_C$$

- Monopolist always wins as $p_E \geq p_M$:

Value of monopolization: $V_M - V_I - V_C \geq 0$

Sunk cost advantage: $S \geq 0$

- V_M Monopoly profit increasing in S (entry cost for E)

Staggered: State D

I vs C (vs E)

- Incumbent:

$$v_I = \begin{cases} p + \delta V_C & \text{if win} \\ 0 & \text{if lose} \end{cases} \rightarrow \text{Lowest bid : } p_I = -\delta V_C$$

- Challenger:

$$v_C = \begin{cases} p - s + \delta V_M & \text{if win} \\ \delta V_I & \text{if lose} \end{cases} \rightarrow \text{Lowest bid : } p_C = s - \delta (V_M - V_I)$$

- Comparison: larger benefit for C , lower cost for I
 - C : **Value of monopolization** $\delta (V_M - V_I - V_C)$
 - I : **Sunk cost advantage**: s

Staggered Contracts: Single State equilibrium

$$\delta (V_M - V_I - V_C) \geq s \iff \frac{s}{S} \leq \sigma^{Stag}(\delta) \equiv \frac{\delta}{1 - \delta}$$

- **Single State equilibrium**

- In state $\mathcal{D} \rightarrow \mathcal{M}$: Challenger C wins against Incumbent I at p_I
- In state $\mathcal{M} \rightarrow \mathcal{M}$: Monopolist M wins against E
(\longrightarrow *Persistent Monopoly*)

- **Monopolization value $\delta (V_M - V_I - V_C)$ exceeds sunk cost s**

- Future matters a lot (δ high)
- High monopoly profits V_M , due to high entry cost (S high)
- Cost disadvantage for C vis-à-vis I not too high (s low)

- **Equilibrium price**

$$p_{\mathcal{M}}^{Stag} \equiv (1 - \delta) [(1 + \delta) S + \delta s]$$

Staggered Contracts: Dual-state equilibrium

$$\delta (V_M - V_I - V_C) \leq s \iff \frac{s}{S} \geq \sigma^{Stag}(\delta)$$

- **Dual-state equilibrium:**

- In state $\mathcal{D} \rightarrow \mathcal{D}$: Incumbent I wins against Challenger at p_C (*Persistent Competition*)
- In state $\mathcal{M} \rightarrow \mathcal{M}$: Monopolist M wins against E (*Persistent Monopoly*)

- **Monopolization value $\delta (V_M - V_I - V_C)$ smaller than s**

- Future matters little (δ low)
- Low monopoly profits as E 's entry cost is low (S low)
- Cost disadvantage for C vis-à-vis I high (s high)

- Equilibrium prices

$$p_M^{Stag} \equiv \frac{1 - \delta}{1 - 2\delta} [(1 - \delta - \delta^2) S - \delta^2 s] ; p_D^{Stag} \equiv \frac{1 - \delta^2}{1 - 2\delta} [(1 - \delta) s - \delta S]$$

Synchronous tenders: Single-state equilibrium

Single-state equilibrium

- Same logic: if **value of monopolization** exceeds s , i.e.,

$$\delta^2(V_M - 2V_D) \geq s \iff \frac{s}{S} \leq \sigma^{Sync} \equiv 2\delta^2$$

in state \mathcal{D} one incumbent wins both markets

- In state $\mathcal{D} \rightarrow \mathcal{M}$

- The two incumbents D (and E) compete for the bundle
- Tough competition: both incumbents obtain $V_D = 0$

- In state $\mathcal{M} \rightarrow \mathcal{M}$

M wins against E at P_E (E 's price for bundle):

$$P_E = 2S - \delta^2 V_M < 2p_E = 2S - \delta^2 (2V_D)$$

- *Persistent Monopoly*:

$$p_{\mathcal{M}}^{Sync} \equiv (1 - \delta^2) S$$

Synchronous tenders: Dual-state equilibrium

Dual-state equilibrium

- Occurs if instead

$$\delta^2(V_M - 2V_D) \leq s \iff \frac{s}{S} \geq \sigma^{Sync}$$

- In state $\mathcal{M} \rightarrow \mathcal{M}$ (*Persistent Monopoly*)

M wins against E at P_E

- In state $\mathcal{D} \rightarrow \mathcal{D}$ (*Persistent Competition*)

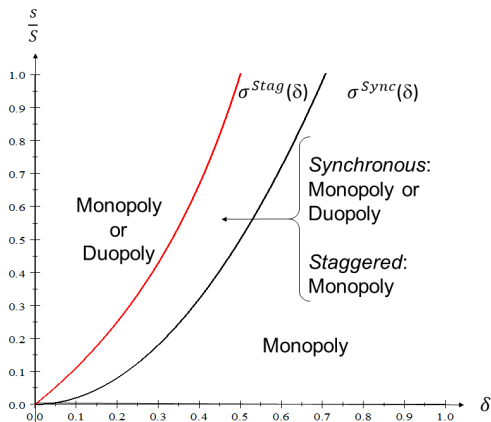
- Each incumbent wins a market, at $p(= \frac{P}{2} \leq p_E, P_E/2)$
- p is such that it is not profitable to win both markets:

$$p + \delta^2 V_D \geq P - s + \delta^2 V_M$$

- Equilibrium prices:

$$p_{\mathcal{M}}^{Sync} \equiv (1 - \delta^2) S; \quad p_{\mathcal{D}}^{Sync} \equiv (1 - \delta^2) \frac{s - 2S\delta^2}{1 - 2\delta^2}$$

Recap



$$p_{\mathcal{M}}^{Stag} > p_{\mathcal{M}}^{Sync} > p_{\mathcal{D}}^{Sync} > p_{\mathcal{D}}^{Stag}$$

1 Monopoly prices are lower under Synchronous tenders:

$$p_{\mathcal{M}}^{Stag} > p_{\mathcal{M}}^{Sync}$$

- Competitive pressure comes from E ; greater under synchronous tenders

Reward for E from monopolization comes earlier under Sync (e.g., in dual state eqb, if under Stag E wins against M , it becomes C and never monopolizes)

- Cabral (2017): Staggered tenders increase monopoly power (economies of scale)

2 Duopoly prices are lower under Staggered tenders:

$$p_D^{Sync} > p_D^{Stag}$$

- Competitive pressure comes from C and Staggered tenders increase C 's pressure on I

From (1), C 's gain from monopolization is greater under Stag

3 Duopoly prices are lower than Monopoly prices, under both tendering regimes:

$$p_M > p_D$$

- C exerts more competitive pressure than E , due to $s < S$

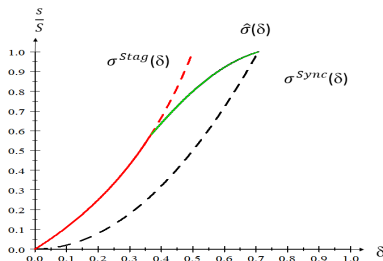
4 Duopoly more likely under Synchronous:

$$\sigma^{Stag}(\delta) > \sigma^{Sync}(\delta)$$

- Synchronous tenders reduce value of monopolization: lower p_M (and thus V_M) and higher p_D (and thus V_D)

- *Decide whether to break-up the historical operator:*
 - if break-up: first tenders take place in state \mathcal{D}
 - otherwise: first tenders take place in state \mathcal{M}
- *Finding: **Always optimal to break-up the historical operator***
 - Dual-state equilibrium: duopoly prices are lower
- Single-state equilibrium: by starting in \mathcal{D} initial prices are minimized as competition for monopolization
- **New cutoff due to initial price effect: $\hat{\sigma}(\delta)$**
 - (i) If $s/S > \min\{\sigma^{Sync}(\delta), \hat{\sigma}(\delta)\}$, total discounted prices lower under staggered
 - (ii) If $s/S < \min\{\sigma^{Sync}(\delta), \hat{\sigma}(\delta)\}$, total discounted prices under synchronous

Market liberalization

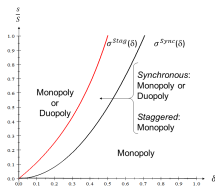


Market Design

- High future rents under staggered tenders induce more aggressive bidding in initial period
- Effect greater when future profits not discounted heavily (for δ high $\rightarrow \hat{\sigma}(\delta) < \sigma^{Stag}(\delta)$)
- New: Insights hold also with initial 1 period contract under Staggered

Contract duration (New)

- Define underlying model in continuous time: period length Δ ; discount factor $\delta = \exp(-\Delta r)$
- Choose δ to get on boundary btw SSE and DSE: σ^{Stag} or σ^{Sync}
 \Rightarrow (Start from and) Preserve competition (state \mathcal{D}) but with continuation value $\rightarrow V_D = 0$



\Rightarrow Incumbent duopolists supply at cost \rightarrow Efficient structure and
 $p_D^{Stag}(\delta^{Stag}) = p_D^{Sync}(\delta^{Sync}) = 0$

- **If can choose contract duration (δ), then tendering regime does not matter**

Best practice in TPL

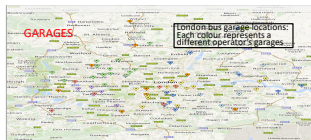
(Cantillon Pesendorfer, 2006; Amaral et al 2013; Iossa Waterson 2018)

- Data 2003-2014; 800 contracts (600 markets)
- Persistent competition (state \mathcal{D}): 10 companies still active
- Mix of Sync and Stag contracts
- Incumbency advantage: 75% Incumbent wins; otherwise C wins: OK
- Incumbent wins more often with bundled bids (?)

Second tender winner	Contracts awarded	Percentage
Same company	194	48,3
Different division/ name	106	26,4
Different company	102	25,4
Total	402	

Incumbency advantage

- Garage proximity: 47% won by firm with garage closest to route
- But dispersed garage ownership (explains *Persistent Competition*)



- At least 3 firms able to compete (3 bids per tender)

Winner's rank	Count	Percentage
1	262	47
2	123	22,1
3	77	13,8
4	49	8,8
5 or greater	46	8,3

Garage proximity

Time from garage to route	Winner's time %	Minimum time %	Second min. %	Third min. %
< 10 minutes	53,1	84,2	31,4	6,8
< 15 minutes	77,6	99,3	83,3	46,5
< 20 minutes	89,0	99,8	96,8	75,6

Other firms able to compete

- Incumbency also yields better knowledge of how to satisfy PVR

• Synchronous vs Staggered

Cabral (2017): two sellers and an infinite sequence of short-lived buyers, staggered vs synchronous contracts with economies of scale; monopolization always occurs and synchronous is better – initial market structure does not matter
Dana and Fong (2011) Iacobucci and Winter (2012): staggered contracts in infinite period setting but focus on collusion
Iossa, Marx, Loerscher and Rey (2020): collusion by market allocation under staggered vs synchronous contracts

• Maintaining competition in recurring Procurement

Asymmetries are common place: cost distribution, location, capacity constraint, switching cost, better information, ownership of assets
Optimality of discriminatory procurement rules (Myerson, 1981; Maskin and Riley 2000; Laffont and Tirole, 1988, Lewis and Yildirim, 2002; Barbosa Boyer, 2017); ignoring switching cost in evaluation supply (Cabral and Greenstein, 1990); splitting supply (Anton and Yao, 1987, 1992), using shorter or more frequent contracts (Saini 2012), or enhancing information (De Silva et al, 2009)

- Market structure and tendering timing inherently interlinked
- Optimal to break up historical provider (net of transaction costs)
- Staggered tendering enhances **entry** and competition **across** markets
- Synchronous tendering enhances competition **for** the market
- Discount factors and relative sunk costs play key role
- Optimal **Contract duration** preserves competition regardless of timing
- Entry: next