A Dynamic Mechanism to Reveal the Expected Welfare-optimal Monopoly Franchise Duration

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Introduction

- The term *competition for the field* as opposed to the term *competition in the field* was first coined by Chadwick (1859), who considered the former to be a solution to the problems of what we now call public utilities.

- He criticised that competition in the field could lead to a *duplication of facilities and infrastructure* in water services and railways, whereas, in his view, competition for the field, by means of bidding for the right to monopolise, could lead to significant *cost savings*.

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- In modern economics, Demsetz (1968) reintroduced this concept as a substitute for traditional-style price regulation for natural monopolies.

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- Public authorities could thereby
  - define and award monopoly concessions
  - for a given good or service
  - to the firm willing to offer the good or service at the lowest price
  - on fixed terms and
  - over a predetermined period of time.

- If this auction takes place repeatedly over subsequent franchise periods, it is usually referred to as *repeated franchise bidding*.

Introduction

- Assume that...

  …transaction costs can be neglected, the bidders’ cost functions exhibit economies of scale and the number of bidders approaches infinity at the bidding stage.

- Then...

  …the winner cannot expect to earn more than zero economic profit in the limit with least cost production.

- With stationary cost and demand functions within the contractual period,…

  …the price would be bid down to the point at which the winner sets a price as low as average cost in the limit in the single-product case (e. g., Crew and Harstad, 1992; Borrmann, 2008).

Introduction

- Yet, the influential early criticism of franchise bidding by institutional economists (Goldberg, 1976; Williamson, 1976) *appeared* to have answered Demsetz's question ‘Why regulate utilities?’ with a resounding ‘Because franchise bidding is no viable alternative’.

- Transaction costs, especially with regard to asset-specific investments and hold-up, halted interest in franchise bidding before it got off the ground, at least until the late 1990s.

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- While the discipline of regulatory economics has been growing and advancing steadily, and infrastructure policies have moved many industries from public ownership to private ownership or public-private partnerships, interest in franchise bidding has re-emerged only in the past 15 years (see, e. g., Harstad and Crew, 1999; Doni, 2004; Meister, 2005).

Introduction

- For most utilities, the degree of asset specificity is *significant*.

- Therefore, the opportunities for alternative uses of assets are, in general, *very limited*.

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- This introduces *hold-up problems* when specific assets have to be transferred at the end of the franchise period.
- Thus, an incumbent anticipating such problems may decide to keep investments in existing infrastructure *low*.
- Moreover, the values of some types of infrastructure are extremely *difficult to assess*, e. g. water pipelines buried deep in the ground.

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- To ease some of those issues, *long-term contracts* have been proposed as a possible solution (Williamson, 1976).

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- However, long-term contracts may create problems of their own, as highlighted by the incomplete contracts literature (see, e. g., Grossman and Hart, 1986; Hart and Moore, 1988).
  - With contract conditions and prices fixed over the entire franchise period, long-term contracts may be less suitable to account for changing demand and cost conditions.
  - Even though some contingencies can be written into the contract, contracts will remain incomplete.
  - There is at least episodic evidence that the inherent uncertainty in long-term franchise contracts may lead to renegotiation and to early contract termination.

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- Obviously, the choice of contract length is not solely related to theoretical treatments of franchise bidding, it is also of great *practical* importance.
  - In the very least, any regulatory or governmental agency interested in implementing a concession scheme must first decide on the length of the franchise term.
  - Defining optimality with regard to some welfare concept, one may think of a number of important factors which may influence the optimal length of a given franchise contract.
    - If, for example, bidding costs are large, longer-term contracts will, ceteris paribus, lead to a higher discounted total surplus.
    - Similarly, the degree of uncertainty and the longevity of assets may be important factors when determining the optimal franchise duration.

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- To model the optimal franchise duration, one would rely on some kind of *welfare measure*, such as *discounted total surplus*, i. e. the discounted sum of profits and consumer surplus.

- Problem:

  Any auctioneer or regulator aiming to determine the contract length maximising total surplus would need *information on cost and demand conditions*.

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- However, one key argument in favour of franchise bidding is that it requires less information on part of the auctioneer than traditional-style regulation, and that information rents do not accrue (Harstad and Crew, 1999).

- Therefore, if we are unwilling to relax informational assumptions, we need to find a way for potentially better informed firms to share their knowledge about the optimal contract length with the auctioneer.

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- For this reason, we propose a mechanism which, under certain conditions, can induce firms to *reveal the optimal franchise duration to the auctioneer*.

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- We make the extreme assumption that the auctioneer does not have any information on the cost and demand functions and, hence, cannot determine the total surplus maximising contract length directly.

- The auctioneer is, however, able to enforce a set of auction rules in which bidders not only submit a price bid but also a contract length message.

Introduction

- We argue that the issue of truth revelation can be broken down into two parts.
  - First, a mechanism created with the aim of determining the optimal franchise duration should *establish incentives for bidders to coordinate*.
  - Second, *mere coordination does not suffice*, as potentially interested bidders may gather around an 'undesired' equilibrium such as the contract duration maximising expected discounted profits.

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- In accordance with these requirements, our dynamic revelation mechanism provides two distinct instruments for the regulator, i. e.
  - one instrument for *coordination* and
  - one instrument for *punishment for undesired behaviour*.

Some Stylised Facts on the Length of Franchise Contracts

- Concessions for the right to monopolise have been awarded in a variety of industries and countries.

- Examples include:
  - cable television (CATV) licenses in the US,
  - concessions in the water and sewage industries,
  - electricity,
  - gas,
  - transport infrastructure (roads, railways, airports, ports), and
  - telecommunications.

Some Stylised Facts on the Length of Franchise Contracts

- Across industries and countries, the *types of contracts awarded*, from management contracts to a full transfer of ownership and risk, and the *fashion in which contracts are awarded* differ greatly, from sophisticated auction mechanisms to less formal ‘beauty contests’ (Affuso, 2002).

Some Stylised Facts on the Length of Franchise Contracts

- In the context of our model, the main aspect of interest is the *length* of franchise contracts.
- Generally, the length of franchising contracts *varies* across industries and countries.
- Medium-term contracts and long-term contracts, however, are more common than the short-term contracts envisioned by Posner (1972).

Some Stylised Facts on the Length of Franchise Contracts

- This may be an indication that, in infrastructure industries, *hold-up problems* and *investment incentives* are considered to be major issues.

- Depending on the type of industry and on regulator preferences, concessions are awarded for periods up to 100 years, although the typical period for infrastructure, such as water and railways, appears to be much shorter, with most governments and regulators opting for 15 to 30 year periods.

Some Stylised Facts on the Length of Franchise Contracts

- In the *French water sector*, contracts are often renewed without competitive tendering. Prior to the ‘Public Services Delegation Law’ of 1995, which laid out new rules governing the provision of public services, some contracts were running for periods of 75 years or longer. One extreme example would be the municipality of Nice, which had been having the same water supplier since the end of the 19th century (Elnaboulsi, 2001; Chong et al., 2006).

Some Stylised Facts on the Length of Franchise Contracts

- *Water concessions in Latin America* were awarded for different periods. Whereas Chile and Mexico awarded franchises of 20 to 25 years, franchises in Brazil and Ecuador were running for 30 years. In Bolivia, for instance in Cochabamba, water concession contracts were awarded for a longer period, i. e. for 40 years (Hall and Lobina, 2002).

Some Stylised Facts on the Length of Franchise Contracts

- Similarly, *water privatisation in Africa* (see, e. g., Bayliss, 2001) involved renewable contracts of 15, 20 or 30 years, with some shorter management contracts also being awarded. These water concessions were typically tied with *electricity* concessions, for instance in Chad, Gabon, Guinea-Bissau and Mali.

Some Stylised Facts on the Length of Franchise Contracts

- The case of the *British railway sector* is of particular interest. Considering the longevity of the assets involved, franchises were fairly short in the first round. The rail franchises were awarded for seven or ten years depending on investment. However, in the second round, a policy change was enacted, and much longer franchises of 20 years and more were awarded. The electricity distribution system of the London Underground, on the other hand, was awarded for a much longer period, namely 30 years (Littlechild, 2002).

Some Stylised Facts on the Length of Franchise Contracts

- This can be compared to the *railway sector in Latin America*. Brazil opted for 30-year concessions in railways, whereas Argentina differentiated between 30-year freight concessions, plus a possible ten year extension, and 10-year passenger concessions, plus a possible 10-year extension (Estache, Gonzáles and Trujillo, 2002).

Some Stylised Facts on the Length of Franchise Contracts

- What can be learned from these selected cases is that franchise bidding schemes have been implemented widely in the past years, maybe more so than commonly assumed.

- Further, franchise duration varies considerably, partially in accordance with risk sharing mechanisms, i.e. short-term management contracts vs. long-term full privatisation.

Some Stylised Facts on the Length of Franchise Contracts

- By and large, however, *medium-term* contracts seem to be the favoured policy.

- *Typically*, the length of franchise contracts in infrastructure tends to be around ten to 30 years.

- It is somewhat disconcerting that the length of concessions appears to be *arbitrary*.

Some Stylised Facts on the Length of Franchise Contracts

- One is even tempted to argue that medium-length contracts are chosen out of convenience or habit.
- In addition, it is, obviously, difficult to establish whether the bracket is too wide and should optimally be much narrower.
- This highlights the view that decisions on contract length are *inherently difficult* to make.

Motivation and Key Features of the Mechanism

- *In theory*, repeated franchise bidding does *not* require a finite time horizon.

- However, *in practice*, an auctioneer might want
  - to have the option to change the definition of a franchise in the future, or
  - to adapt the franchise duration due to changing cost and demand conditions, or
  - to terminate the franchise agreement.

Motivation and Key Features of the Mechanism

- At the same time, an auctioneer will aim to provide a *stable economic environment*.

- Therefore, we realistically assume that there is a fixed finite time interval, $[0, T]$, which is divided n times to yield franchises of equal contract length, $l = T/n$, where n is a strictly positive integer.

Motivation and Key Features of the Mechanism

- Let the expected value, E, of total surplus, $TS(\cdot)$, be a function of time, t, and denote the social discount rate chosen by the auctioneer by r.

- Then, we can describe n^*, the number of bidding periods which maximises the expected value of discounted total surplus in the time interval $[0,T]$ as:

$$n^* = \arg\max\left(\sum_{i=1}^{n}\left(\int_{(i-1)\frac{T}{n}}^{i\frac{T}{n}} E[TS(t)]e^{-rt}dt\right)\right).$$

Motivation and Key Features of the Mechanism

- Using this formula, we are able to distinguish between two cases.
  - If bidders, *j*, are perfectly informed about each other's (prospective) cost and demand functions, and if they use the same social discount rate, and if they expect the same numbers of bidders and the same administrative costs of the auctioneer, then they will agree on n^*.
  - Otherwise, bidders will form individual (and possibly different) estimates of n^*, which we denote by $E_j [n^*]$.

Motivation and Key Features of the Mechanism

- How about the auctioneer?
- We assume that she is not able to determine n^* directly, since she does not have any information on cost and demand functions.
- In contrast, we assume bidders, *j*, to be better informed than the auctioneer.
- For this reason, the average of their individual estimates of n^* will be more accurate than a random guess.

Motivation and Key Features of the Mechanism

- At first glance, it therefore seems reasonable to require bidders to report their best estimates, $E_j\,[n^*]$,of n^* to the auctioneer.

- The difficulty, however, is that risk-neutral bidders can be assumed to maximise *expected discounted profits*, as opposed to expected discounted total surplus. Thus, we cannot trust that they will submit truthful reports of their best estimates, $E_j\,[n^*]$.

Motivation and Key Features of the Mechanism

- Let the expected value, E, of the profits, $\Pi_j(\cdot)$, of a bidder, j, be a function of time, t, and denote the discount rate chosen by a bidder, j, by ρ_j.

- Then, we can describe v_j^*, the number of bidding periods which maximises, for a bidder, j, the expected value of his discounted profits in the time interval $[0, T]$ by:

$$v_j^* = \arg\max\left(\sum_{i=1}^{v_j}\left(\int_{(i-1)\frac{T}{v_j}}^{i\frac{T}{v_j}} E[\Pi_j(t)]e^{-\rho_j t}dt\right)\right).$$

Motivation and Key Features of the Mechanism

- Given his objective function, v_j^* is the value which a risk-neutral bidder, *j*, will report.

- In the absence of a truth-revealing mechanism, he has no incentive to report his true best estimate, $E_j[n^*]$, of n^*.

- Therefore, the auctioneer is not able to identify n^* in a simple way.

Motivation and Key Features of the Mechanism

- To solve that problem, she may implement the mechanism described in the following as a second-best solution.

Rules and Timing of the Mechanism

Rule 1

At $t = 0$, the auctioneer informs all interested parties about an exactly defined monopoly franchise for the provision of a particular good to be repeatedly awarded via competitive bidding in sealed-bid auctions without a reserve price within the fixed time interval $[0, T]$. She also informs them about the general framework (Rules 2-10).

Rules and Timing of the Mechanism

- To inform *all* interested parties is essential, in order to maximise the likelihood that the number of bidders is sufficiently large to ensure a competitive outcome.

- Using an *exactly defined* monopoly franchise serves the purpose of homogenising the good to be provided.

Rules and Timing of the Mechanism

Rule 2

At t = 1, the auctioneer requires all bidders, j, j = 1,...,M, willing to participate in the bidding process to register.

Rules and Timing of the Mechanism

- The registration of bidders is important in order to gain information on the number of participants.

Rules and Timing of the Mechanism

Rule 3

If it is common knowledge among all registered bidders as well as the auctioneer that all registered bidders are homogeneous, the auctioneer sets the coordination variable, h, to 0 at t = 2. In all other cases, the auctioneer sets the coordination variable, h, to a strictly positive value at t = 2. The more heterogeneous the auctioneer expects the registered bidders' reports, m_j, on their best estimates, $E_j[n^*]$, of n^* to be, the larger is the value which h assumes.

Rules and Timing of the Mechanism

- The coordination variable, h, reflects the expectations of the auctioneer on the degree of heterogeneity of the registered bidders' reports, m_j.

Rules and Timing of the Mechanism

- In the extreme case, where it is common knowledge that all registered bidders are identical, the auctioneer expects registered bidders' *reports*, m_j, to be identical.
- Obviously, she can also expect *registered bidders* to expect this outcome as well.
- Therefore, the auctioneer does not allow deviations from this outcome and forces registered bidders to submit reports, m_j, which are identical under common knowledge.

Rules and Timing of the Mechanism

- She does this by setting the coordination variable equal to 0. This implies that, in the case that not all reports, m_j, are identical, no franchise auctions will take place and a supplier of last resort is chosen instead. If, for example, one registered bidder reports 114 franchise periods and another registered bidder 117 franchise periods, then at least one of them is lying. The auctioneer will not accept this and will not start the bidding process.

Rules and Timing of the Mechanism

- In all other instances, the value of the coordination variable, h, will have to be greater than zero, because registered bidders will have individual, possibly differing best estimates, $E_j [n^*]$, of n^* and, therefore, submit possibly differing reports, m_j.

- As the coordination variable is meant to give registered bidders an incentive not to deviate too much from their true best estimates, $E_j [n^*]$, of n^* in their reports, m_j, the coordination variable has to vary with the degree of expected heterogeneity.

Rules and Timing of the Mechanism

- For instance, if *registered bidders* are very heterogeneous, the *reports*, m_j, they will submit can also be expected to be very heterogeneous, even if the reports will be very near their true best estimates, $E_j[n^*]$. In this case, the coordination variable needs to take on a high value.

Rules and Timing of the Mechanism

- The value of the coordination variable, *h*, which the auctioneer will choose is also related to her subjective belief of the degree of common knowledge in the industry with regard to n^*.

- Under the assumption of a common market demand and a common social discount rate, differences between the best estimates, $E_j [n^*]$, of n^* of registered bidders, *j*, will be a result of different cost functions.

Rules and Timing of the Mechanism

- In the absence of common knowledge from the point of view of the auctioneer, the value of the coordination variable, *h*, is a result of the inability of individual registered bidders to observe n^*.

- Implicitly, the coordination variable, *h*, is connected to the auctioneer's belief on the registered bidders' beliefs on the other registered bidders' cost functions and to their individual best estimates, $E_j [n^*]$, of n^*.

Rules and Timing of the Mechanism

- Furthermore, the value of the coordination variable, *h*, will also be related to the *auctioneer's* knowledge of the cost differences in the industry.

- These cost differences could, for example, be a result of differences in the utilisation of technology, different efficiency levels, different ratios of capital to labour, and so on.

Rules and Timing of the Mechanism

- Obviously, an auctioneer who has little knowledge of the industry will have more difficulty in determining an adequate value for the coordination variable, *h*, than an auctioneer who is a well-informed regulator switching from some existing regulatory regime to franchise bidding.

Rules and Timing of the Mechanism

Rule 4

At t = 3, the auctioneer informs all registered bidders, j, about the magnitude of the coordination variable, h, and about the social discount rate, r. She also informs all registered bidders about the number, b, of bidders expected by her, which is assumed to be constant over auctions. In addition, the auctioneer informs all registered bidders of her own administrative costs, a, per auction which she expects. Administrative costs, a, are assumed to be constant over auctions, and will be billed to bidders. Furthermore, the auctioneer informs all registered bidders that they will have to calculate their best estimates, $E_j[n^*]$, of n^* until t = 4. The auctioneer obliges registered bidders to base their best estimates on the social discount rate, r, on the auctioneer's expected number, b, of bidders, on the auctioneer's administrative costs, a, per auction, and on the assumption that all participants are equal.

Rules and Timing of the Mechanism

- Rule 4 shall ensure that all registered bidders are *able* to calculate the expected payoff from taking part in the actual franchise bidding auctions and that there will be *no superfluous heterogeneity* in their reports, m_j.

- Note that the number of bidders will, all other things being equal, have an effect on the probability to win and thus affect bidders' valuations.

Rules and Timing of the Mechanism

- Therefore, informing bidders about *b* is essential.
- For simplicity, the auctioneer could, for example, declare that *b* will be equal to the number, *M*, of registered bidders, *j*.

Rules and Timing of the Mechanism

Rule 5

Let $E_A[n^*]$ be the updated belief of n^* of the auctioneer. If she later detects, for one registered bidder (several registered bidders), j, that $|m_j - E_A[n^*]| >> 0$, she imposes a penalty, p, on this bidder (these bidders), j, who submitted a report (reports), m_j, which meets (meet) this condition. The auctioneer determines the magnitude of this penalty, p, fulfilling $p < 0$, at $t = 3$. She also informs all registered bidders on p and on the general circumstances under which the penalty will have to be paid by one or more of the registered bidders, without referring to a specific value of $E_A[n^*]$. In the special case where $h = 0$, p will be imposed on all registered bidders as soon as reports, m_j, differ, i.e. $m_j \neq m_k$ for any $j \neq k$. In addition, the auctioneer informs all registered bidders that, in all other cases, only large deviations, i.e. only those which fulfil $0 \leq h << |m_j - E_A[n^*]|$, can lead to punishment.

Rules and Timing of the Mechanism

- In order to understand better, how Rule 5 works, please note that the auctioneer will have the opportunity of learning a lot over time.

- This knowledge can be used by her to form an updated belief, denoted by $E_A [n^*]$,of n^*.

Rules and Timing of the Mechanism

- There are two reasons for the possibility of updating.
  - First, the auctioneer will be able to learn from the reports, m_j, of the registered bidders.
  - Second, she will gain knowledge on cost and demand conditions over the course of franchise auctions, in case they take place.

Rules and Timing of the Mechanism

Rule 6

At t = 4, the auctioneer asks all registered bidders to submit their reports, m_j, on their best estimates, $E_j[n^*]$, of n^* to the auctioneer.

Rules and Timing of the Mechanism

- Submitting reports, m_j, has to be done simultaneously, in the sense that no registered bidder, j, knows the other registered bidders', k, $j \neq k$, reports, m_k, when submitting his own report, m_j .

Rules and Timing of the Mechanism

Rule 7

At t = 5, the auctioneer announces to start the bidding process at t = 7, if $|m_j - m_k| \leq h$ $\forall j \neq k$. If there are at least two registered bidders, $j \neq k$, with $|m_j - m_k| > h$, the auctioneer does not start the bidding process. In this case, the good is delivered by some supplier of last resort over the entire fixed finite time interval, $[0, T]$. This supplier of last resort is appointed by the government. If the good is delivered by the supplier of last resort, the game ends.

Rules and Timing of the Mechanism

- Rule 7 determines what will happen, if messages, m_j, are too heterogeneous.

Rules and Timing of the Mechanism

Rule 8

If the auctioneer's coordination variable, h, equals 0, and if $|m_j - m_k| = h = 0 \ \forall \ j \neq k$, then $n = m_j$, $j = 1,2,\ldots,M$. In case that the auctioneer's coordination variable, h, is strictly positive, i.e. $h > 0$, then $n = \text{nint}\ ((1/M)\ (m_1+m_2+\ldots+m_M))$, where nint $(\cdot)$ represents the nearest integer function.

Rules and Timing of the Mechanism

- Rule 8 establishes the way of determining *n*, the number of bidding periods.
- The auctioneer simply uses the nearest integer to the arithmetic mean of the values of the registered bidders', *j*, messages, m_j.
- This procedure has the desirable property that no further information is required on part of the auctioneer.

Rules and Timing of the Mechanism

- It reflects the view that a more reliable estimate of the true n^* than any single report, m_j, on a single best estimate, $E_j [n^*]$, is the average of the aggregate.

Rules and Timing of the Mechanism

Rule 9

In case that the bidding process was started, an exactly defined monopoly franchise for the provision of a particular good will be repeatedly awarded via competitive bidding in sealed-bid auctions without a reserve price within the fixed finite time interval, $[0,T]$. At $t = 6$, the auctioneer informs all registered bidders that bidding will take place n times at the beginning of time intervals of equal contract length, l. Each time when an auction will take place, the monopoly franchise will be awarded to the firm bidding the lowest price. In the event of a tie, only one of the bidders will be chosen by a predetermined allocative mechanism, e. g. a lottery. The winning bidder will have to supply the total quantity demanded of the good in the ensuing contractual period at the price he bid. The first auction takes place at $t = 7$, which is identical with the lower bound of the fixed finite time interval, $[0,T]$, i. e. 0.

Rules and Timing of the Mechanism

- Rule 9 defines the details of the bidding process in case that the bidding process is started.

Rules and Timing of the Mechanism

Rule 10

In case that the first auction takes place at t = 7, the auctioneer updates her belief to $E_A[n^*]$ over time. This is done in order to enforce Rule 5. The auctioneer announces, which (if any) bidders, j, have to pay the penalty, p.

Rules and Timing of the Mechanism

- The formation of the updated belief, $E_A\,[n^*]$, serves the purpose of enforcing Rule 5. Rule 10 describes the enforcement.

Rules and Timing of the Mechanism

Timeline	Auctioneer	Bidders
$t = 0$	Informs the public about the monopoly franchise and the rules	
$t = 1$	Requires all bidders to register	
$t = 2$	Sets the value of the coordination variable, *h*	
$t = 3$	Announces the value of the coordination variable, *h*, the social discount rate, *r*, the expected number, *b*, of bidders, the expected administrative costs, *a*, and the magnitude of the penalty, *p*	
$t = 4$		Submit reports on best estimates of n^*
$t = 5$	Announces, whether the bidding process will take place or not	
$t = 6$	Announces the contract length, if bidding takes place	
$t = 7$	Franchise auctions start	Take part in first franchise auction

Players of the Game

- Registered Bidders
  - Each registered bidder, j, maximises expected discounted profits.
  - He assumes that he has at least one non-colluding competitor at each stage of the bidding process.
  - When submitting his report, m_j, on his best estimate, $E_j [n^*]$, of n^*, the discounted profits expected by any registered bidder, j, are greater than zero.
  - Registered bidders are perfectly informed about their own cost functions and the market demand function at each point in time in the time interval, $[0, T]$ (private values assumption).
  - For simplicity, the market demand function is assumed to be common to all registered bidders.

Players of the Game

- Registered Bidders (continued)
  - Either registered bidders know that they are homogeneous, or, alternatively, they cannot observe the cost functions of any other registered bidder.
  - The cost functions of registered bidders exhibit economies of scale.
  - None of the registered bidders is financially constrained.
  - Registered bidders form subjective beliefs on the likelihood that a report, m_j, will trigger a penalty, p.
  - Furthermore, registered bidders, j, form subjective beliefs on the likelihood that all submitted reports, m_j, are equal.

Players of the Game

- Auctioneer
  - The auctioneer is assumed to be risk-neutral.
  - Prior to the bidding process she has neither knowledge of the cost function of the registered bidder(s) with the most efficient technology, nor of the market demand function.
  - She is able to credibly commit herself to the mechanism, in particular to the values of the variables set by herself, i. e. of the social discount rate, *r*, the penalty, *p*, the coordination variable, *h*, the number, *b*, of bidders, expected by her, the expected administrative costs, *a*, per auction, and to the assumption to be used by registered bidders that all participants are equal.

Players of the Game

- Auctioneer (continued)
  - Over time, as bidding takes place in $[0, T]$, she is able to gather information which facilitates the estimation of n^*.
  - Thus, the auctioneer is able to update her belief to $E_A [n^*]$, which is known to registered bidders.

Players of the Game

- Evaluation
  - From the outset, it is apparent that the usefulness of truth revelation will be related to two factors.
    - First, if n^* and v_j^* are similar for all bidders, not much is to be gained from revealing n^*.
    - Second, if the best estimates, $E_j [n^*]$, of n^* of registered bidders, j, differ in a biased and systematic way from n^*, then the collective estimate of the optimum might not be much nearer to n^* than the auctioneers' updated belief, $E_A [n^*]$.
  - The mechanism is useful only, if registered bidders collectively have a better understanding of the industry than the auctioneer.

Homogeneous Bidders under Common Knowledge among all Players

- As a first step, we look at an extreme case, which we can use as a *first reference point for the analysis* of our mechanism.

- We assume that all players, i. e. all registered bidders and the auctioneer, know that all registered bidders are homogeneous, and that all players also know that all other players know.

Homogeneous Bidders under Common Knowledge among all Players

- In this case, the first part of Rule 3 applies. The auctioneer sets the coordination variable, h, to 0.
- Furthermore, she will enforce the penalty, p, as soon as (some of) the submitted reports, m_j, differ.
- In this instance, the analysis of the mechanism is straightforward.

Homogeneous Bidders under Common Knowledge among all Players

Proposition 1

If it is common knowledge among all registered bidders, j, $j = 1,\ldots,M$, as well as the auctioneer that all registered bidders, j, are homogeneous, and if expected discounted profits as a function of v are single-peaked, and if the absolute value of the penalty, p, is sufficiently large, then there exists a unique equilibrium where all registered bidders, j, reveal their best estimates, $E_j\,[n^*]$, of n^* truthfully, i. e. $m_j = E_j\,[n^*]$, $\forall\, j = 1,\ldots,M$.

Homogeneous Bidders under Common Knowledge only among Bidders

- As a second step, we look at a less extreme case, which we can use as a *second reference point* for the analysis of our mechanism.
- We assume that it is common knowledge among all registered bidders that they are homogeneous, but the auctioneer is not aware of this fact.

Homogeneous Bidders under Common Knowledge only among Bidders

- In this case, the second part of Rule 3 applies.
- The auctioneer's coordination variable, h, takes a strictly positive value, whose magnitude depends on her prior belief of the heterogeneity of registered bidders.
- The analysis of the mechanism is more complicated, and we can no longer be sure that it is the best strategy for registered bidders, j, to submit truthful reports, m_j, on their best estimates, $E_j\,[n^*]$, of n^*.

Homogeneous Bidders under Common Knowledge only among Bidders

Proposition 2

If it is common knowledge among all registered bidders that they are homogeneous, but the auctioneer is uninformed about the homogeneity, and if expected discounted profits as a function of v are single-peaked, and if the absolute value of the penalty, p, is sufficiently large, then there exists an equilibrium where registered bidders, j, submit identical reports, m_j, either equal to $n^* + h$ or equal to $n^* - h$, whichever value leads to higher expected payoffs for registered bidders.

Homogeneous Bidders under Common Knowledge only among Bidders

- This result can be described as follows.
  - Strategies yielding expected payoffs lower than those associated with n^* and strategies close or equal to v^* are not feasible.
  - Because of Rule 5, players now have a new point, where coordination is possible, i. e. either $n^* + h$ or $n^* – h$, depending on circumstances.
  - The point chosen will result from dominant strategies, if registered bidders believe that deviations larger than h may trigger the penalty.

Homogeneous Bidders under Common Knowledge only among Bidders

- In this case, registered bidders may exploit the rent generated by the announcement of the coordination variable, *h*, even though they are identical.

- Intuitively, this result is not surprising, since, in the case of homogeneous registered bidders under common knowledge only among registered bidders, registered bidders can benefit from their informational advantage.

Homogeneous Bidders under Common Knowledge only among Bidders

- Further, the size of the information rent is determined by *h*, the prior belief of the regulator, so that if the auctioneer ‘gets it very wrong’, the cost in terms of welfare losses can be very high.

Heterogeneous Bidders from the Point of View of all Players

- The possibility most relevant to economic policy is the case when some or all of the registered bidders are *heterogeneous* from the point of view of all players.

- Depending on her prior beliefs, the auctioneer will announce some $h > 0$ as outlined in Rule 3.

Heterogeneous Bidders from the Point of View of all Players

Proposition 3

If some or all registered bidders are heterogeneous from the point of view of the other registered bidders and the auctioneer, and if expected discounted profits as functions of v_j are single-peaked for all registered bidders, j, and if the absolute value of the penalty, p, is sufficiently large, then deviations from n^* are limited by h.

Heterogeneous Bidders from the Point of View of all Players

- In the case of heterogeneous registered bidders, the mechanism limits the deviations from n^* by forcing bidders to take into account other bidders' possible valuations.

- Similarly to the previous case, with common knowledge only among bidders, a sufficiently large penalty ensures, that deviations larger than h are not an equilibrium strategy.

Heterogeneous Bidders from the Point of View of all Players

- The deviations from n^* will, in general, not be larger and will, typically, be smaller than in the previous case, as registered bidders as a group now have no longer an informational advantage.

- Thus, this case falls between the previous two cases.

Conclusion

- We have demonstrated how an uninformed auctioneer who tries to determine the franchise duration maximising expected welfare can devise a simple mechanism with the aim of forcing registered bidders to reveal their estimates of the optimal contract length.

Conclusion

- In the case where it is *common knowledge among all registered bidders as well as the auctioneer* that all registered bidders are identical, we obtain the result that the number of bidding maximising expected welfare periods is revealed truthfully.

Conclusion

- In all *other* cases, registered bidders are able to extract a strictly positive *information rent*.

- This implies that franchise bidding comes at a *cost* unless registered bidders are identical and it is known that they are.

Conclusion

- At *first* sight, this may seem *discouraging*, since franchise bidding is most useful when the auctioneer has little or no information on cost and demand conditions.

Conclusion

- At *second* sight, however, it becomes apparent that the mechanism enables the auctioneer to keep the information rent *low*, as she can use a small value of the coordination variable.
- By setting the value of the coordination variable, the auctioneer gives the other players a coordination point, and thereby ensures that deviations from the number of bidding periods maximising expected welfare are limited.

Conclusion

- From the point of view of the *auctioneer*, the information requirements discussed in this talk are almost *negligible*.
- Yet this is *not* the case for registered bidders.
- This is *adequate*, as it seems natural to assume that registered bidders are better informed than the auctioneer.

Conclusion

- We have also shown that revelation is *difficult*.
- The mechanism introduced can *mitigate* problems, albeit *not* perfectly.
- It will work best when potential bidders are known to be *similar*, which is most likely the case in infrastructure industries with an *established technology* and *few differences in demand* such as *water*, *postal services*, as well as *electricity transmission and distribution*.

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