

From Budget Saving to Sustainable Procurement

Economics of Public Procurement as Mechanism Design

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Outline

- 1 Introduction: public procurement as a mechanism design problem
 - Asymmetries of information
 - Revelation Principle
 - Optimal Mechanism
- 2 Optimal sustainable public procurement: where do we stand ?
 - Favoring Targeted Firms in Public Procurement: theories and practices.
 - Multi-attribute optimal procurement: how to consider non-pecuniary dimensions of public purchases.
- 3 Why entrusting the public procurement with a sustainability goal?
 - entrusting the PP with a sustainability goal in practice
 - entrusting the PP with a sustainability goal in theory

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Asymmetries of information

Forewords

- ▶ The literature addressing socially sustainable public procurement is, within the field of economics, very scarce...
- ▶ ...and yet...
 - ▶ Vickrey, Nobel Prize
 - ▶ Myerson, Nobel Prize
 - ▶ Tirole, Nobel Prize

Asymmetries of information

Forewords

- ▶ In 1938, the United States passed the Wagner-O'Day Act, 'to create a Committee on Purchases of Blind-made Products, and for other purposes' (McCrudden, *"Using public procurement to achieve social outcomes"*, 2004)
- ▶ The Committee was "to **determine the fair market price** of all brooms and mops and other suitable commodities manufactured by the blind and offered for sale to the federal Government by any non-profit-making agency for the blind"
- ▶ revised in 1971, extending it to include 'other severely handicapped' among the beneficiaries, and 'services' as well as 'commodities' that should be **given priority in procurement** by the federal Government from non-profit agencies

Asymmetries of information

Adverse Selection and Moral Hazard

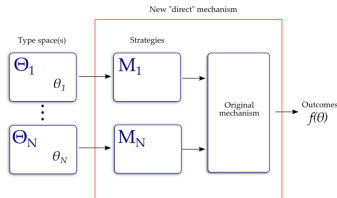
- ▶ The company is more familiar with its costs and the economic environment than the public party
- ▶ Contractual incompleteness: it is impossible to foresee every possible event that might arise during the execution of the contract.
- ▶ the economic analysis recommends that **competitive forces** be used wherever possible when it comes to **selecting partners** and that **incentive mechanisms** be put in place to establish a real commitment of the parties concerned.

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Revelation Principle

- ▶ How to check whether a mechanism exists that satisfies some particular goal ? Search over all possible procedures ?



The Revelation Principle (for Bayes-Nash equilibrium):

A social choice function f is implementable in Bayes-Nash equilibrium if and only if it is Bayes-Nash incentive compatible.

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Optimal Procurement Mechanism

Example: looking for cost saving

- ▶ Incentive compatibility: my profit when revealing my true cost \geq my profit when lying.
- ▶ Natural incentives to lie "upward": overestimate my true cost.
- ▶ Informational rents: greater rents for low costs firms, lower rents for high costs firms.
 - ▶ Costly rents: try to minimize its.
 - ▶ Public buyer: consider "virtual costs" (i.e. costs + informational rents) rather than true costs
 - ▶ $c_i + \frac{F_i(c_i)}{f_i(c_i)}$ where $c_i \sim F_i(\cdot)$, the a priori statistical distribution of costs.

Optimal Procurement Mechanism

Example: looking for cost saving

- ▶ Usually the term optimal procurement stands for cost minimization.
- ▶ What is minimal expenditure ?
- ▶ We can always reimburse the winner his cost.
- ▶ Minimal expenditure: **optimal expected expenditure in equilibrium**.
 - ▶ Assuming a probability distribution on the costs.
 - ▶ Over all the possible mechanisms.
 - ▶ Under incentive and individual-rationality constraints (later).

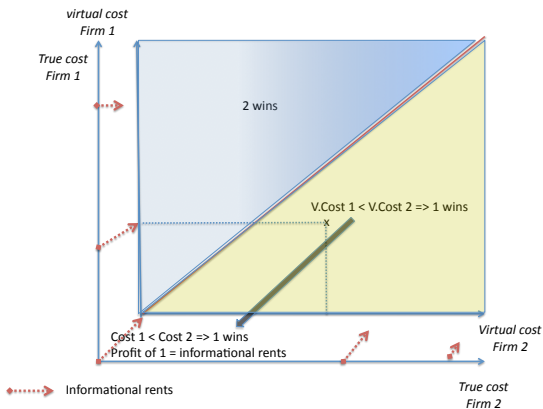
Optimal Procurement Mechanism

Example: looking for cost saving

- ▶ An optimal auction allocates the contract to the firm with the lowest virtual cost.
- ▶ Can we do this in equilibrium?
- ▶ Is the firm with the lowest cost the bidder with the lowest virtual cost?
- ▶ Yes, when the virtual cost is monotone non-decreasing.
- ▶ And when values are distributed according to the same F
- ▶ Therefore, Vickrey with a reserve price is optimal.

Graphical analysis

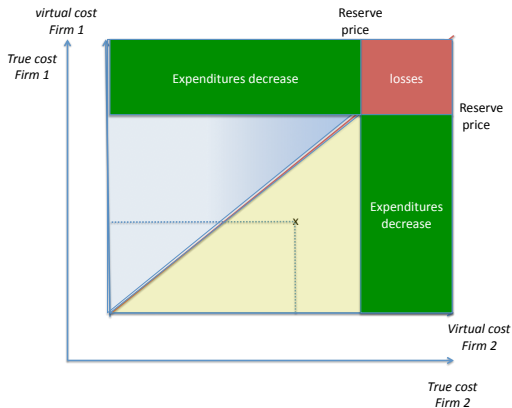
Symmetric firms, the public buyer tries to minimize the expected procurement cost
The mechanism can be implemented via first price sealed bid or Vickrey (2nd price) auction



Graphical analysis

Can we achieve lower expenditure than the 2nd-price/1st price?

If so, we must sacrifice efficiency. All efficient auction have the same revenue.



Optimal Procurement Mechanism

The optimal selection rule. Which firm must be selected ?

- ▶ An optimal auction allocates the contract to the firm with the lowest virtual cost.
- ▶ Can we do this in equilibrium?
- ▶ Is the firm with the lowest cost the bidder with the lowest virtual cost?
- ▶ Yes, when the virtual cost is monotone non-decreasing.
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Optimal Procurement Mechanism

The optimal payment rule.

- ▶ What if we modify the payment rule ?
- ▶ Can we do better with first price, open cry, reverse, japanese ... auctions?

the Revenue Equivalence Theorem, Vickrey (61), Myerson (81), Riley and Samuelson (81)

(Given certain conditions) any mechanism that results in the same outcomes (i.e. allocates the contract to the same bidders) also has the same expected revenue.

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Favoring Targeted Firms in Public Procurement: which targets ?

- ▶ SMEs: Small Business Act in the US, European Small Business Portal...
- ▶ "Governments can use public procurement to leverage the potential of women-owned businesses for their economies. "
- ▶ Service-Disabled Veteran-Owned Small Business
- ▶ Work Integration Social Entreprises.
- ▶ Minorities...
 - ▶ South Africa: contracting with persons, or categories of persons, historically disadvantaged by unfair discrimination on the basis of race, gender or disability
 - ▶ Bumiputeras in Malaysia
 - ▶ Canadian preferences for aboriginal businesses

Favoring Targeted Firms in Public Procurement: Why ?

- ▶ Because targeted firms have inherent cost-disadvantages ?
 - ▶ Competing in an equal footing = low/null probability of winning
- ▶ Because 1 euro profit for them have greater social value than 1 euro for traditional firms ?
 - ▶ if (informational) rents are costly (shadow cost of public funds concept), rents to targeted firms are less costly than rents to traditional firms.
- ▶ Both of them ?

$$\text{▶ } C_{nt} + \frac{1+\lambda-\alpha_{nt}}{1+\lambda} \frac{F_{nt}(c_{nt})}{f_{nt}(c_{nt})} < \underbrace{C_t}_{\text{true cost}} + \frac{\overbrace{1+\lambda-\alpha_t}^{\text{social cost}}}{1+\lambda} \frac{\overbrace{F_t(c_t)}^{\text{info rents}}}{f_t(c_t)}$$

- ▶ with λ the shadow cost of public funds, α the social value of profits/rents.

Favoring Targeted Firms in Public Procurement: How ?

Example: favoring Small Business Firms in Public Procurement

- ▶ "Old" EU doctrine: procuring entities evaluate tenders only on the basis of lowest price or economic advantage, and evaluate the qualifications of tenders only on the basis of the technical and financial requirements needed to perform the contract in question.
- ▶ and evaluate the qualifications of tenders only on the basis of the technical and financial requirements needed to perform the contract in question.
- ▶ US Federal Law of Acquisition defines two types of **discriminatory policy tools** (which can be found in many other countries): **set-asides** and direct discriminatory **price adjustment**.
- ▶ British method of '**offer back**' under which a registered supplier can submit a revised tender for part in order to match the best offer.



Favoring Targeted Firms in Public Procurement: How (practically) ?

Example: favoring Small Business Firms in Public Procurement

- ▶ set-asides is to award certain acquisitions exclusively to small business concerns:

contracting officer sets aside an individual acquisition or class of acquisitions over \$100,000 for competition among small businesses "when it is determined to be in the interest of maintaining or mobilizing the Nation's full productive capacity, war or national defense programs; or assuring that a fair proportion of Government contracts in each industry category is placed with small business concerns"

to be done when there is a reasonable expectation that offers will be obtained from at least two SBFs and that award will be made at fair market prices.

- ▶ Discriminatory selection rules exists for specific SMEs (so called disadvantaged business, like minority or women owned SMEs).

The US federal acquisition policy is to give offers from small disadvantaged business concerns a price evaluation adjustment by adding the factor determined by the DoC to all offers, unless when it would cause award, to be made at a price that exceeds fair market price by more than the factor as determined by the DoC.

- ▶ Allotment, subcontracting plans.



Favoring Targeted Firms in Public Procurement: How (theoretically) ?

freely adapted from Morand (2003) "SMEs and public procurement policy", *Review of Economic Design*

- ▶ $c_{nt} + \frac{1+\lambda-\alpha_{nt}}{1+\lambda} \frac{F_{nt}(c_{nt})}{f_{nt}(c_{nt})} < c_t + \frac{1+\lambda-\alpha_t}{1+\lambda} \frac{F_t(c_t)}{f_t(c_t)}$ and $c_{nt} < c_t$?
- ▶ $\iff \alpha_{nt} = \alpha_t$ and $F_{nt}(\cdot) = F_t(\cdot)$
- ▶ **Price adjustment is the rule**, equal footing competition the exception
- ▶ **Set-asides** are generally **suboptimal** unless $c_t^+ \cong c_{nt}^-$, λ small, $\alpha_t \gg \alpha_{nt}$
- ▶ that is: low shadow cost of public funds, high social value of targeted firms relative to other ones.
- ▶ in a more general setting: numerous targeted firms competing.

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Multi-attribute optimal procurement

how to consider non-pecuniary dimensions of public purchases ?

- ▶ 'Quality' (environmental or social requirements, ILO core labour standards) is either **fixed** (as in Myerson (1981)) or **contractible** (as in Che (1993), Branco (1997)).
- ▶ => the sellers can adapt their level of 'quality' supplied to a specific requirement.
- ▶ But may be determined by prior sellers? choice
- ▶ 'Quality' = intrinsic parameter of the seller.
- ▶ Asymmetry in the information available to the buyer on the quality of the product. Sellers know what they are selling, while buyers often do not know what they are buying. Quality becomes observable by the buyer after contract completion.
- ▶ But observable quality is not necessarily at odds with verifiable quality => **non-contractible quality** , **credence goods**.

Multi-attribute optimal procurement

Integrating non-pecuniary dimensions in practice

- ▶ minimum standard requirements
 - ▶ conform to ILO labor standards
 - ▶ technical standards and label criteria
 - ▶ recruitment of unemployed person in large contracts
- ▶ requirements = multi-attributes' version of set asides
- ▶ scoring rule weighting multiple dimensions
 - ▶ score card
 - ▶ Ex: South Africa. For contracts with a rand value above a prescribed amount, a maximum of 10 points may be allocated for the specific social policy, provided that the lowest acceptable tender scores 90 points for price.
- ▶ scoring rule = multi-attributes' version of price adjustment

Multi-attribute optimal procurement

The Procura+ Manual A Guide to Cost-Effective Sustainable Public Procurement, 2nd Edition

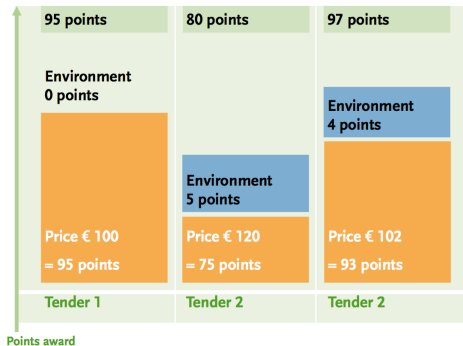


Figure 2:
Using a price ceiling
in the award phase
of a tender

Multi-attribute optimal procurement

Pick the firms, let them choose the quality

- ▶ The buyer derives utility from a contract offering quality q at price p : $V(q) - p$, value increasing with quality.
- ▶ A firm i , upon winning, earns from a contract (q, p) profits $p - c(q, \theta_i)$, cost increasing with quality.

Design competition through multidimensional auctions, Che (1993)

In the optimal revelation mechanism, the firm with the lowest θ is selected; the winning firm is induced to choose quality q_θ , which for each θ maximizes: $V(q) - c(q, \theta) - \frac{F(\theta)}{f(\theta)} c_q(q, \theta)$

- ▶ If the buyer can commit to a scoring rule in his best interest, the resulting optimal scoring rule underrewards quality relative to the buyer's utility function and implements the optimal outcome for the buyer first-score and second-score auctions.

Multi-attribute optimal procurement

Non-contractible quality, based on Morand and Thomas (2006)

- ▶ If cost only depends on unverifiable quality, Manelli and Vincent (1995) first suggested that take-it-or-leave-it offers rather than procurement auction might be optimal.
- ▶ What if cost depends on both quality and efficiency ?
- ▶ The buyer faces conflict : his own incentives => favor high quality and private incentives, favoring low cost firms.
- ▶ Since HQ is preferred but costly, selecting HQ firms impedes private incentives because it leads the LQ firm to tender non-truthfully.

Multi-attribute optimal procurement

Non-contractible quality, based on Morand and Thomas (2006)

- ▶ **Procurement auction** is optimal only if the buyer's incentives and private incentives are commonotonic.
- ▶ The optimal procurement rules implies a **take-it-or-leave-it offer** only if the buyer's incentives always favor the high quality regardless of the efficiency.
- ▶ In general, both of them : two or more different quotes may obtain the same score, and this does not correspond to any actual procurement practices.

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Why entrusting the public procurement with a sustainability goal ?

Illustration: regulation of work integration social enterprises in France

- ▶ Transcribing a 2004 European directive on the coordination of public procurement procedures, the decree of 1 August 2006 establishes the rules of competition through **calls-for-tender incorporating social and occupational clauses**.
- ▶ The way financing WISE is now modulated => **incentive contracts**. The financing consists of a base amount paid annually in proportion to full-time employment through integration, plus a modulated amount (between 0 and 10%) depending on what are considered to be 'measurable and objectifiable' indicators for each of the three chosen (and ponderated) criteria.
 - ▶ the 'situation of persons at entry' (criterion 1)
 - ▶ the 'integration efforts' (criterion 2)
 - ▶ the 'outcomes in terms of integration?' (criterion 3)

Why entrusting the public procurement with a sustainability goal?

note to the French council of economic advisor, 2014's Nobel Prize Jean Tirole

- ▶ Why using public procurement for something else than public purchase if you can use, laws, regulations, taxes or subsidies to correct market failures?

Recognise that the aim of public procurement, regardless of the values at stake, is primarily to meet an identified need by achieving the best possible performance in terms of cost and service or expected functionalities. Entrusting the public procurement system with the task of achieving social, environmental and innovation-related objectives is ineffective.

Why entrusting the public procurement with a sustainability goal?

Illustration: Green Public Procurement

- ▶ a policy designed to rectify a market failure must be uniform and comprehensive if it is to be effective.
 - ▶ Ex: incorporating gas emission criteria into PP = placing a greater value on a tonne of carbon than does the carbon tax or the market value of tradable emission rights,
 - ▶ => differentiated carbon prices, increases the overall cost of achieving the environmental objective.
 - ▶ low-emission company specialise in public contracts, whilst higher-emission specialise in other contracts,
 - ▶ => contracts are not necessarily shared rationally and the reduction in pollutant emissions is minimal.
- ▶ Measurement: unlike the State, local public authorities do not necessarily have the means to measure pollution.
- ▶ Taking into account various objectives increases the (ever-present) risk of favouritism.

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Why entrusting the public procurement with a sustainability goal?

Optionality of PP

- ▶ Ex: GPP attracts already green suppliers,
- ▶ (Marron 1997) => a counteractive effect among private consumers (changes in the relative prices.)
- ▶ Solution: stipulate green criteria that require potential suppliers to invest in greener technology.
- ▶ (Lundberg and Marklund 2011, 2013), unless suppliers with less green production choose to adapt => at most a relatively small reduction in emissions.
- ▶ Environmental policy via the entry mechanism in public procurement is thus most likely weaker than the use of more traditional instruments.

Why (nevertheless) entrusting the public procurement with a sustainability goal?

Because of the weakness of the other tools...

- ▶ When regulation is weak
- ▶ Developing countries and weak law standards: procurement has been used as an instrument to promote human rights transnationally (see e.g. I.L.O.)
- ▶ For subsidiarity reasons: local public procurement level VS national regulation.

Thank you for your attention.

Any questions ?