Design of Framework Agreements

Marek Bojko[1] Lucas Condeza [1]

April 15, 2025

[1]Yale University

Introduction

- Governments make repeated purchases of certain products (e.g. medical devices, gasoline, laptops)
- Framework Agreements (FAs) streamline procurement through a two-stage process.
  - **Stage 1 (Auction):** Pre-selection of suppliers/products via auction.
  - **Stage 2 (Marketplace):** Creation of a "marketplace" where pre-selected suppliers offer goods/services to government agencies.
- **Research Question:** How to design FAs?
- Focus on FAs for vehicles between 2017 and 2024 in Chile

Motivation and Policy Relevance

- FAs are a common procurement tool. They are used in:
  - EU (2010): 17% of procured value
  - Chile: 25%
  - Brasil: 10%
  - Costa Rica, China, Trinidad & Tobago, etc.
- **Benefits of FA compared with public tenders:**
  - Centralize procurement expertise (Decarolis et al. 2020)
  - Increase competition by reducing firm participation costs
  - Decrease purchasing times
  - Decrease cost of running auctions

Stages of FAs

1. First Stage: selection through auction
   - The procurement agency calls for a public tender.
   - Firms submit bids (price, characteristics).
   - Subset of firms/products are selected.
2. Second Stage: marketplace
   - Selected firms offer products on a government-run online platform.
   - Government agencies purchase directly.
   - First-stage bid acts as a price-ceiling

Literature

- Framework Agreements
  - Choi et al. (2023), Gur et al. (2017), and Saban and Weintraub (2021)
    $\Rightarrow$ Theoretical literature, we aim to estimate a structural model
- Effects of centralizing procurement
  - Castellani et al. 2021; Dubois et al. 2021; Ferraresi et al. 2021; Lotti et al. 2024
    $\Rightarrow$ We study FAs, a specific way of centralizing procurement
- Market design
  - Agarwal and Budish (2021) and Kapor et al. (2024)
    $\Rightarrow$ Optimal design of FAs

Institutional Context and Data

Institutional Context: Chile Compra

- Chilean public procurement system managed by *Chile Compra* through the *Mercado Público* platform.
- Most gov. agencies (hospitals, ministries, universities) are required to use this platform.
  Details
- FAs account for 25% of procurement value
- Currently 18 active FA. Examples: medical devices, hardware products, food, stationery, etc.
- FA for vehicles are active for $\approx$ 3 years and the public tender takes $\approx$ 5 months

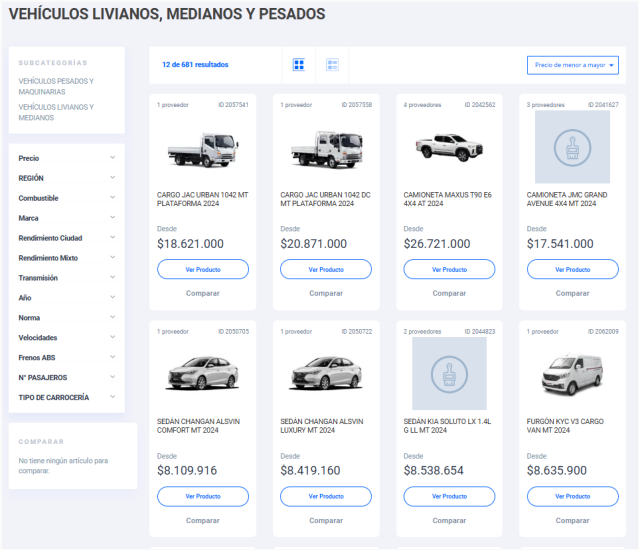


Figure 1: Marketplace for vehicles

Some details

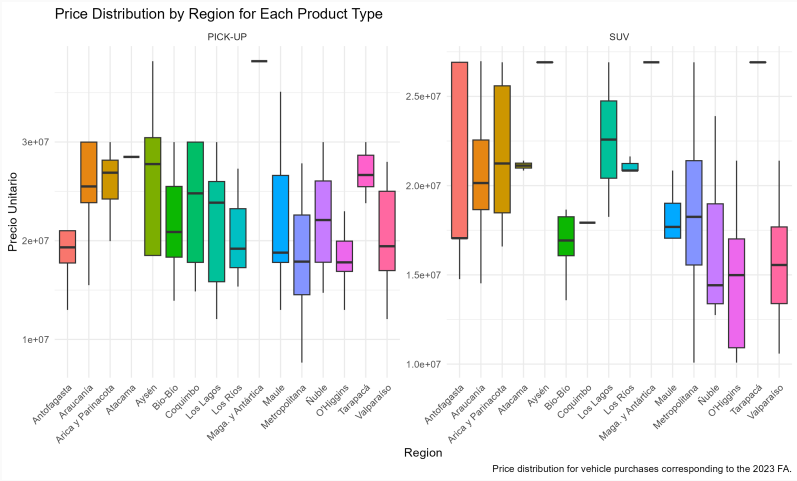
	2017	2021	2023
Categories	Pick-up, SUV, sedan, minibuses, vans	SUV and pick-up	Pick-up, SUV, sedan, minibuses, vans
Bids	Discount over list price (e.g. 8%)	Price and delivery fee	Discount over list price and delivery fee
Market	National	5 macro-regions and 4 tiers	Region
Selection criteria	Score threshold	2-3 lowest price depending on region	60% highest scores, minimum of 5
Auction level and number	1	Product-tier-region: 40	Product-region ≈ 70

The tender for a fourth FA will be implemented this year

Data

- **Purchase Data:** All vehicle transactions through FAs (2017-2024).
  - Buyer (agency type, location), Seller
  - Product (type, model)
  - Price
- **Auction Data:** Bids from 3 vehicle FAs (2017, 2021, 2023).
  - Bidder identity
  - Bids
  - Date of bid
  - Product (model, category, region)
  - List prices (work in progress)
- **Web-scraped data:** product characteristics (work in progress)

Motivation



Price distribution for vehicle purchases corresponding to the 2023 FA.

Research Question

What is the optimal design of a FA?

- Optimal number of firms to choose in auction
- Selection criteria (e.g. discount price or prices with tiers)
- Segmentation (e.g. national or regional auctions)
- other...?

Empirical model

Overview

- Model stages
  - Second stage: Demand estimation following Berry et al. (1995) and Petrin (2002)
  - First stage: Auction

Demand

- We consider the demand of gov. agencies in markets defined as a region-semester. Given evidence of different consumption patterns we group gov. agencies in types according to their sector (e.g. hospital, university, etc.)

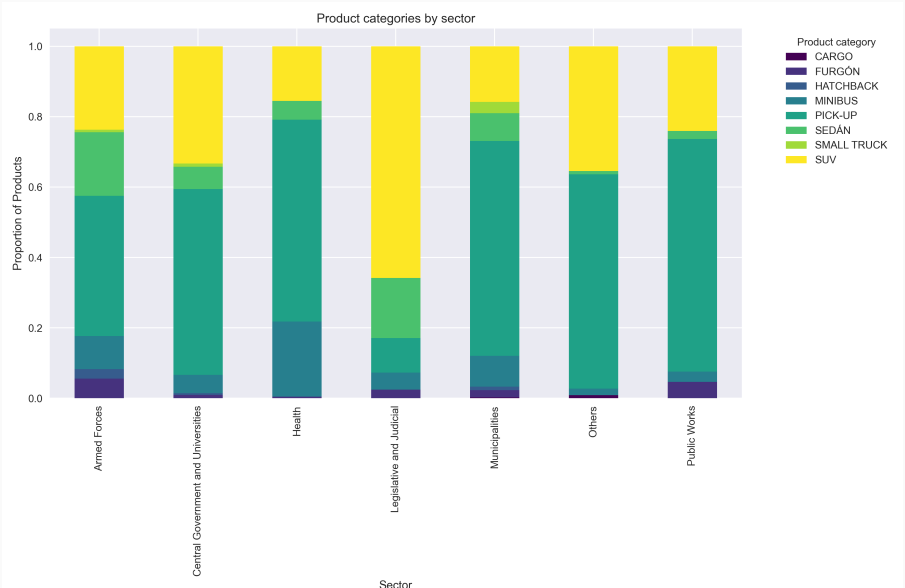
Details

- Gov. agency i, in market $t \in \mathcal{T}$ in sector s has a utility for product $j \in \mathcal{J}_t$.

$$u_{ijt} = \underbrace{x'_{jt}\beta_{s(i)} + \xi_{jt}}_{\delta_{jts(i)}} + \underbrace{x'_{jt}\Sigma\nu_{it}}_{\mu_{ijt}} + \varepsilon_{ijt}, \quad u_{i0t} = \varepsilon_{i0t} \tag{1}$$

where ν_{it} are random taste shocks.

Demand heterogeneity



Demand(2)

The probability that a buyer in sector s in market t chooses a product $j \in \mathcal{J}_t$

$$s_{jts} = \int \frac{\exp(\delta_{jts} + \mu_{ijt})}{1 + \sum_{k \in \mathcal{J}_t} \exp(\delta_{kts} + \mu_{ikt})} dF_{\mu}(\mu_{it}) \tag{2}$$

Aggregate market shares are given

$$s_{jt} = \sum_{s} w_{st} \cdot s_{jts} \tag{3}$$

where w_{st} is the share of agencies of type s in market t

The vector of parameters to estimate is $\theta = (\beta, \Sigma)$

Moments

Supply

- Firm's (z) profits, in market t are:

$$\pi_{zt} = \sum_{j \in P_z} N_t s_{jt} \left(p_{jt} - MC_{jt} \right) \tag{4}$$

  Where N_t is the number of buyers in market t and MC_{jt} is the marginal cost.

- Assuming single product firms, p^*_{jt} is the price that satisfies the FOC:

$$p^*_{jt} = MC_{jt} - s_{jt} \left[\frac{\partial s_{jt}}{\partial p_{jt}} \right]^{-1} \tag{5}$$

- Hence the observed price (p_{jt}) will satisfy

$$p_{jt} = \min\{\bar{P}_{jt}, p^*_{jt}\} = \min \left(\bar{P}_{jt}, MC_{jt} - s_{jt} \left[\frac{\partial s_{jt}}{\partial p_{jt}} \right]^{-1} \right)$$

- Cost is point identified if the price ceiling is not binding

Auction

Set-up:

- $i \in \{1, ..., N\}$ have cots c_i and bid $\bar{p}_i$, assume $c_1 < ... < c_N$
- Assume that costs are common knowledge $\rightarrow$ firms compete in the private market
- Selection of K firms using selection rule $S_k(\bar{P}_k)$
- $\Psi_k = (S_k, \bar{P}_k)$ the equilibrium selected firms (S_k) and their bids
- $\pi_i(\Psi_k)$: second-stage profits

Differences from standard auction:

- Valuations depend on 1) bids and 2) selected firms
- Discount over list prices

What lies ahead

- Obtain list prices (or assume there are no discounts)
- Model the first stage
- Estimate the model
- Counterfactuals, estimate the impact of:
  1. Choose the optimal number of sellers in the auction stage
  2. Allow the selection criteria to depend on product characteristics

descriptives
- number of selected firms
- important sources of variation in the data
wha are the effects of changin the procurement rules for the selection

1. motivation-: minimize frictions, cost of the governm

how the cost of procurement would change when we change the rules

weighted sum of the welfare and cost

Appendix

Acquisition process

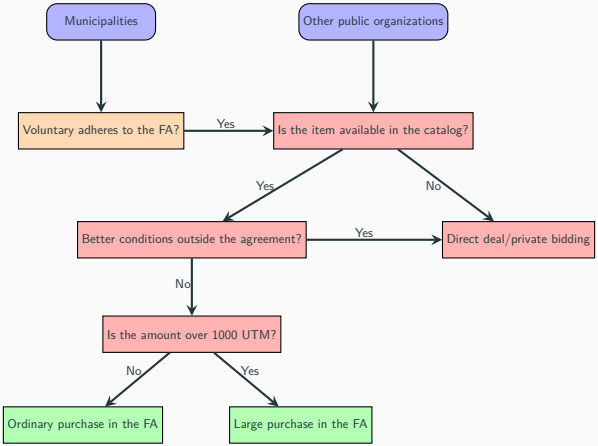


Figure 2: Procurement decision process (Castro et al. 2020)

Back

Moments

- Aggregate moments: $\mathbb{E}[\xi_{jt} \cdot z_{jt}] = 0$ with sample moment:

$$\hat{g}_A(\theta) = \frac{1}{N_A} \sum_{t \in \mathcal{T}} \sum_{j \in \mathcal{J}_t} \left(\hat{\delta}_{jt}(\Pi, \Sigma) - x'_{jt}\beta \right) \cdot z_{jt}, \tag{6}$$

- Micro-moments: target 1) buying a certain type of vehicle λ given the type of the state agency and 2) the average price of the vehicles bought by each state agency type. Denote by n a state agency, by $i(n)$ its type, $N = \sum_{n \in \mathcal{N}} 1$ and p_{j_n} the price of the good bought by n. Then the in sample moments are:

$$\bar{v}_{ip} = \frac{\frac{1}{N} \sum_{n \in \mathcal{N}} 1\{(i(n) = i)\} 1\{j_n \in \mathcal{J}_\lambda\}}{\frac{1}{N} \sum_{n \in \mathcal{N}} 1\{(i(n) = i)\}} \equiv f_1(\bar{v}) \tag{6}$$

$$\bar{v}_{i\lambda} = \frac{\frac{1}{N} \sum_{n \in \mathcal{N}} 1\{(i(n) = i)\} p_{j_n}}{\frac{1}{N} \sum_{n \in \mathcal{N}} 1\{(i(n) = i)\}} \equiv f_2(\bar{v}) \tag{7}$$

Back