Publicity and Competition in Federal Procurement

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Public Procurement and Competition

• Public procurement: 12% of GDP and 29% public spending in OECD countries

• Governments strongly favor the use of competition:
  - “Contracting officers shall promote and provide for full and open competition in soliciting offers and awarding Government contracts” (US Federal Acquisition Regulation, Part 6)

• Goals: lower procurement costs, improve quality, prevent favoritism

• A direct way of promoting competition is by publicizing contract opportunities
Competition for Incomplete Contracts

- Large share of public contracts are for goods or services hard to specify in advance
  - Often leads to costly ex-post adaptations (Bajari, Houghton & Tadelis, 2014)

- Competition may “backfire” in the context of incomplete contracts
  - Negotiation may be preferable to competitive bidding (Bajari, McMillan & Tadelis, 2008)
  - Attracting new participants may generate adverse selection on non-contractible dimensions
  - Selectively informing a subset of known contractors may help sustain relational contracts (Calzolari and Spagnolo, 2009)

- Ideally, officers could exercise discretion in when and how to promote competition
  - One way of doing this is by choosing when to publicize contract opportunities
  - But are officers choices aligned with the government’s goals?
This Paper

• We study the interplay between publicity requirements, competition, and procurement outcomes, in the context of US defense procurement.

• Using a Regression Discontinuity, we estimate the effect of advertising contracts on:
  - Competition: number of bidders
  - Characteristics of awarded vendor: location, past experience with the contracting office
  - Contractor performance: delays, cost overruns

• We then embed these estimates in a choice model to learn about the main drivers of officers’ behavior:
  - Goal is to estimate how much weight they put into:
    • Promoting competition,
    • Keeping a relation with incumbent contractors, and
    • Post-award performance?
Preview of Findings

• We find evidence that publicized contracts:
  - Attract more offers
  - New offers are *competitive*. Selected contractor more likely to be:
    • Geographically distant from contracting office
    • With less previous history with office
  - Publicized contracts result in *more* cost overruns and delays
    • Driven by contracts for goods and services that are relatively “complex”

• From our model, we conclude that:
  - Officer's choices are positively correlated with enhanced competition and incumbent-contractor relations
  - There is little evidence of selection on contracts’ ex-post performance
1. Auction entry and competition

2. Competition for incomplete contracts
   - Procurement mechanism: Bulow and Klemperer (1996); Bajari, McMillan and Tadelis (2008); Leffler et al. (2007)
   - Competition and relational contracts: Banerjee and Duflo (2000); McLeod (2007); Calzolari and Spagnolo (2009), Machiavello and Morjaria (2015, 2019)

3. The value of discretion
   - Kelman (1990); Coviello, Guglielmo and Spagnolo (2018); Duflo, Greenstone, Pande and Ryan (2018); Bandiera, Best, Khan and Prat (2019); Kang and Miller (2018); Carril (2019)
Background on US Federal Contracting

- Federal Acquisition Regulation (FAR Part 5) mandates “publicizing contract actions” to:
  - “Increase competition”
  - “Broaden industry participation in meeting Government requirements”
  - “Assist small business concerns (... and various other minority businesses...) in obtaining contracts”

- In particular, contracting officers are required to “synopsize” contracts expected to exceed $25,000 in [http://FedBizOpps.gov](http://FedBizOpps.gov)
Data

- Federal Procurement Data System: **universe of federal contracts**

- Observe:
  - Product/service code, contracting office, contractor, expected award amount, solicitation procedures, type of contract pricing, applicability of a variety of laws, ...

- Do not observe (for now, we hope):
  - Price and quantity separately, just total amounts
  - Good “outcome” measures (e.g. quality)

- Analysis sample:
  - Non-R&D, *stand-alone* contracts in FY2011-FY2017
  - Expected amount between $10K to $40K
  - Army, Navy, and Air Force
## Summary statistics

<table>
<thead>
<tr>
<th></th>
<th>Mean</th>
</tr>
</thead>
<tbody>
<tr>
<td><strong>Contract Characteristics</strong></td>
<td></td>
</tr>
<tr>
<td>Expected Award Amount</td>
<td>22,070</td>
</tr>
<tr>
<td>Expected Duration (days)</td>
<td>55.15</td>
</tr>
<tr>
<td>Fixed-Price Contract</td>
<td>0.999</td>
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<tr>
<td>Competitively Awarded</td>
<td>0.614</td>
</tr>
<tr>
<td>Set Aside Award</td>
<td>0.357</td>
</tr>
<tr>
<td>Simplified Procedure</td>
<td>0.728</td>
</tr>
<tr>
<td><strong>Competition</strong></td>
<td></td>
</tr>
<tr>
<td>Number of Offers</td>
<td>2.452</td>
</tr>
<tr>
<td>One Offer</td>
<td>0.530</td>
</tr>
<tr>
<td><strong>Contracting Office Characteristics</strong></td>
<td></td>
</tr>
<tr>
<td>Navy</td>
<td>0.422</td>
</tr>
<tr>
<td>Army</td>
<td>0.402</td>
</tr>
<tr>
<td>Air Force</td>
<td>0.134</td>
</tr>
<tr>
<td>Other</td>
<td>0.043</td>
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<tr>
<td><strong>Awarded Firm Characteristics</strong></td>
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<tr>
<td>Foreign</td>
<td>0.092</td>
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<tr>
<td>Within-State Firm</td>
<td>0.741</td>
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<tr>
<td>Small Business</td>
<td>0.620</td>
</tr>
<tr>
<td>Woman Owned Business</td>
<td>0.137</td>
</tr>
<tr>
<td><strong>Sample</strong></td>
<td></td>
</tr>
<tr>
<td>No. of Contracts</td>
<td>240,514</td>
</tr>
<tr>
<td>No. of Contracting Offices</td>
<td>760</td>
</tr>
<tr>
<td>No. of Firms</td>
<td>59,697</td>
</tr>
</tbody>
</table>
**Top product categories**

<table>
<thead>
<tr>
<th>Rank</th>
<th>Name</th>
<th>N Contracts/year</th>
<th>Name</th>
<th>N Contracts/year</th>
</tr>
</thead>
<tbody>
<tr>
<td>1</td>
<td>ADP Equipment and Software</td>
<td>3,005</td>
<td>Maintenance/Repair of Equipment</td>
<td>2,430</td>
</tr>
<tr>
<td>2</td>
<td>Medical Equipment and Supplies</td>
<td>2,998</td>
<td>Support Services (Professional)</td>
<td>1,187</td>
</tr>
<tr>
<td>3</td>
<td>Laboratory Equipment</td>
<td>1,643</td>
<td>Utilities And Housekeeping</td>
<td>1,096</td>
</tr>
<tr>
<td>4</td>
<td>Electrical Equipment Components</td>
<td>1,593</td>
<td>Transport, Travel, Relocation</td>
<td>854</td>
</tr>
<tr>
<td>5</td>
<td>Communication/Coherent Radiation</td>
<td>1,202</td>
<td>ADP and Telecommunications</td>
<td>806</td>
</tr>
<tr>
<td>6</td>
<td>Furniture</td>
<td>810</td>
<td>Lease/Rent Equipment</td>
<td>753</td>
</tr>
<tr>
<td>7</td>
<td>Power Distribution Equipment</td>
<td>697</td>
<td>Maintenance of Real Property</td>
<td>688</td>
</tr>
<tr>
<td>8</td>
<td>Ship And Marine Equipment</td>
<td>574</td>
<td>Education And Training</td>
<td>560</td>
</tr>
<tr>
<td>9</td>
<td>Hardware And Abrasives</td>
<td>530</td>
<td>Construct Of Structures/Facilities</td>
<td>335</td>
</tr>
<tr>
<td>10</td>
<td>Construction And Building Material</td>
<td>459</td>
<td>Social Services</td>
<td>286</td>
</tr>
</tbody>
</table>

Note: Products are classified with one of 1,918 codes, which can be aggregated into 101 categories.
Identification

- RDD requires that treatment assignment is “as good as random” at the threshold for treatment

- 2 possible threats:
  1. Differences in contract design on either side of the threshold
  2. Manipulation of the size of contracts (running variable)
Distribution of expected award amounts
Distribution of expected award amounts

Number of contracts (thousands)

Expected award amount ($K)
Distribution of expected award amounts

![Distribution of expected award amounts](image)

- **Number of contracts (thousands):** 5, 10, 15, 20, 25, 30, 35, 40, 45
- **Expected award amount ($K):** Data, Round Number Correction

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Distribution of expected award amounts

- Polynomial Interpolation
- Round Number Correction

Number of contracts (thousands): 5, 10, 15, 20, 25, 30, 35, 40, 45

Expected award amount ($K): 0, 10, 20, 30, 40

Graph showing the distribution with the two methods compared.
Distribution of expected award amounts

- RDD partially identified even in the presence of (small) manipulation (Gérard, Rokkanen and Roth, 2019)
- Bounds likely to be tight (net-of-round-numbers bunching looks small)
- We will ignore these points for today
First Stage: Share of contracts posted on FedBizOpps

![Graph showing the share of contracts posted on FedBizOpps against expected award amount (in $K). The graph includes a trend line with a slope of 0.431 (with a standard error of 0.008).]
RDD: outcomes

• We now look at the effect of posting a solicitation on a series of outcomes

• Different outcomes speak to different specific questions
  - Does extending information diffusion increase competition for public contracts?
    • Number of offers
  - Do characteristics of the awardee change?
    • Geographic location
    • Firm’s previous history
  - How does publicity affect ex-post contract performance?
    • Rough performance: delays and cost-overruns
RDD: outcomes

- We now look at the effect of posting a solicitation on a series of outcomes

  - Different outcomes speak to different specific questions
    - Does extending information diffusion increase competition for public contracts?
      - Number of offers
    - Do characteristics of the awardee change?
      - Geographic location
      - Firm's previous history
    - How does publicity affect ex-post contract performance?
      - Rough performance: delays and cost-overruns
Competition: Number of offers received

Number of offers received

Expected award amount ($K)

IV = 0.816
(0.136)
RDD: outcomes

- We now look at the effect of posting a solicitation on a series of outcomes
- Different outcomes speak to different specific questions
  - Does extending information diffusion increase competition for public contracts?
    - Number of offers
  - Do characteristics of the awardee change?
    - Geographic location
    - Firm’s previous history
  - How does publicity affect ex-post contract performance?
    - Rough performance: *delays* and *cost-overruns*
Geographic location: within-state firm

Expected award amount ($K)

IV = -0.012 (0.015)
Geographic location: foreign firm

IV = 0.069

\[(0.009)\]
Firm’s history with the office: share of previous dollars

IV = -0.054

(0.015)
Firm’s history with the office: “new” contractor for the office

IV = 0.021
(0.019)

Firm with no previous awards from office

Expected award amount ($K)
RDD: outcomes

- We now look at the effect of posting a solicitation on a series of outcomes
- Different outcomes speak to different specific questions
  - Does extending information diffusion increase competition for public contracts?
    - Number of offers
  - Do characteristics of the awardee change?
    - Geographic location
    - Firm’s previous history
- How does publicity affect ex-post contract performance?
  - Rough performance: delays and cost-overruns
Performance: “delays”

\[ IV = 9.165 \quad (4.024) \]

Expected award amount ($K)

Delays (days)
Performance: “delays”

\[ IV = 0.021 \pm 0.012 \]

Any delays

<table>
<thead>
<tr>
<th>Expected award amount ($K)</th>
<th>10</th>
<th>15</th>
<th>20</th>
<th>25</th>
<th>30</th>
<th>35</th>
<th>40</th>
</tr>
</thead>
<tbody>
<tr>
<td>Any delays</td>
<td>0.09</td>
<td>0.1</td>
<td>0.12</td>
<td>0.13</td>
<td>0.14</td>
<td></td>
<td></td>
</tr>
</tbody>
</table>
Performance: “cost overruns”

IV = 0.012
(0.013)

Overruns (relative to expected dollars)

Expected award amount ($K)
Performance: “cost overruns”

\[ IV = 0.029 \pm 0.010 \]

Any cost overruns

Expected award amount ($K)
What’s driving the negative effects on contract performance?

- Two explanations:
  - Heterogeneity on contractors “type” (Adverse Selection)
  - Contractors modify their behavior depending on the relation with the buyer (Moral Hazard)

- The existing literature on incomplete contracts assume the pool of bidders and/or the bidders incentives are fixed

- Possible test for Moral Hazard:
  - Controlling for contractors’ average performance (type): Do their contract performance differ between buyers (with and without publicity)?
What’s driving the effects on contract performance?

**Table: RD Estimates on “Any Cost Overruns”**

<table>
<thead>
<tr>
<th>VARIABLES</th>
<th>(1)</th>
<th>(2)</th>
<th>(3)</th>
<th>(4)</th>
<th>(5)</th>
</tr>
</thead>
<tbody>
<tr>
<td>All</td>
<td>0.0305***</td>
<td>0.00491</td>
<td>0.102***</td>
<td>0.0128</td>
<td>0.0217</td>
</tr>
<tr>
<td>Good Service</td>
<td>(0.0100)</td>
<td>(0.00787)</td>
<td>(0.0280)</td>
<td>(0.00864)</td>
<td>(0.0276)</td>
</tr>
<tr>
<td>Service</td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Mean Dep Var Left</td>
<td>0.093</td>
<td>0.055</td>
<td>0.166</td>
<td>0.053</td>
<td>0.183</td>
</tr>
<tr>
<td>Firm FE</td>
<td>No</td>
<td>No</td>
<td>No</td>
<td>Yes</td>
<td>Yes</td>
</tr>
<tr>
<td>Original N Obs</td>
<td>243395</td>
<td>167388</td>
<td>76007</td>
<td>147467</td>
<td>58163</td>
</tr>
<tr>
<td>Effective N left</td>
<td>41027</td>
<td>39212</td>
<td>10011</td>
<td>24785</td>
<td>7259</td>
</tr>
<tr>
<td>Effective N right</td>
<td>25698</td>
<td>22755</td>
<td>6269</td>
<td>15410</td>
<td>4507</td>
</tr>
</tbody>
</table>

Standard errors in parentheses

*** p<0.01, ** p<0.05, * p<0.1
What drives buyers’ behavior?

- Multiple papers studying the effect of competition policies on procurement outcomes

- Scant evidence on how competition is endogenously promoted: i.e., buyers’ preferences over the extent of competition and for particular sellers
  - Kang and Miller 2017, Bandiera, Prat and Valletti, 2009

- We combine buyers’ (revealed) choice for publicity with estimates of its’ effects on different margins to make inference on their underlying preferences
  - Generalized Roy Model: Heckman and Honore 1990, Eisenhauer et al. 2015
Publicity Choice

- A buyer $i$ decides whether to publicize a contract for product $j$ in period $t$ maximizing her expected utility:

$$P(D_{ijt} = 1) = P\left( E(U_{ijt}^P) > E(U_{ijt}^{NP}) \right)$$

$$= P\left( \beta_i'y_{ijt}^P + \epsilon_{ijt}^P > \beta_i'y_{ijt}^{NP} + \epsilon_{ijt}^{NP} \right)$$

$$= P\left( \beta_i' \Delta y_{ij} > -\Delta \epsilon_{ijt} \right)$$

- $\Delta y_{ij}$ is the effect of publicity on variable $y$.

- **Goal:**
  - Do buyers decide to publicize contracts based on its anticipated effect on different variables?
  - How do they weight different variables?
Heterogeneous Effects

- We need an estimate of the average treatment effect of publicity for buyer-product combinations.

- Our non-parametric RD estimates are estimated only over the group of compliers (local average treatment effect).
  - If publicity adoption is correlated with outcomes → we would expect different effects among non-compliers (never-takers and always-takers).

- The treatment effect heterogeneity among never-takers and always-takers are obtained by extrapolating from instrument-implied local average treatment effects.
Effect of Publicity

• We instrument the publicity adoption by $Z_{ijt} = 1 \{\text{above}\}$

\[
D_{ijt} = \kappa_i + \kappa_j + (\gamma_i + \gamma_j) Z_{ijt} + \Gamma' X_{ijt} + \eta_{ijt}
\]

\[
y_{ijt} = (\theta_1 i + \theta_2 j) D_{ijt} + \sigma_1 \hat{\eta}_{ijt} + \sigma_2 \hat{\eta}_{ijt} D_{ijt} + \Lambda' X_{ijt} + \epsilon_{ijt}
\] (1)

• The inclusion of $\hat{\eta}_{ijt}$ accounts for endogeneity, and $\hat{\eta}_{ijt} D_{ijt}$ for heterogeneous effects
  - Since $\hat{\eta}_{ijt}$ is included linearly, the extrapolation is also linear (Olsen, 1980, Garen, 1984)

• The estimation of (1) produces a vector of $I + J$ different unbiased estimators of the ATE of publicity on the outcome variable $y$:

\[
\left( \hat{\theta}_{11}^y, \ldots, \hat{\theta}_{1I}^y, \hat{\theta}_{21}^y, \ldots, \hat{\theta}_{2J}^y \right)'
\]

• Sample: Universe of contracts $\in [\$15,000, \$35,000]$, $I = 17$, $J = 97$
Effect of Publicity

- Each coefficient $\hat{\theta}_{yi}$ and $\hat{\theta}_{yj}$ are unbiased but noisy measures of the underlying specific distribution $\theta_{yi}$ and $\theta_{yj}$ respectively.

- We apply the standard shrinkage techniques of the empirical Bayes literature (Morris, 1983) to adjust for measurement error in our buyer or product-specific estimates.
  - Chetty et al., 2014, Angrist et al., 2017 Finkelstein et al., 2017, Abdulkadiroglu et al. 2019

- Finally, we assume the effect of publicity for particular $ij$ combination is the addition of the “corrected” coefficients $\theta_{yi}^*$ and $\theta_{yj}^*$:

$$\theta_{ij}^* = \theta_{yi}^* + \theta_{yj}^*$$
Effects by Product

Figure: Number of Offers

![Graph showing the relationship between ATE (EB) and the number of offers. The graph is labeled with categories such as Good Service.](image-url)
Figure: Share of Past Dollars Awarded to Contractor
Effects by Product

Figure: Cost Overruns

- ATE (EB) Cost Overruns
  - Good
  - Service
Figure: Any Delays

- ATE (EB) Any Delays

- Good Service

- Graph showing the relationship between ATE (EB) Any Delays and the percentage of good service.
Correlation Matrix of Effects

**Table: Services**

<table>
<thead>
<tr>
<th></th>
<th>N Offers</th>
<th>Overruns</th>
<th>Past Contracts</th>
</tr>
</thead>
<tbody>
<tr>
<td>N Offers</td>
<td>1</td>
<td></td>
<td></td>
</tr>
<tr>
<td>Overruns</td>
<td>-0.339</td>
<td>1</td>
<td></td>
</tr>
<tr>
<td>Past Contracts</td>
<td>-0.030</td>
<td>-0.644</td>
<td>1</td>
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</tbody>
</table>

**Table: Goods**

<table>
<thead>
<tr>
<th></th>
<th>N Offers</th>
<th>Overruns</th>
<th>Past Contracts</th>
</tr>
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<tbody>
<tr>
<td>N Offers</td>
<td>1</td>
<td></td>
<td></td>
</tr>
<tr>
<td>Overruns</td>
<td>-0.387</td>
<td>1</td>
<td></td>
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<tr>
<td>Past Contracts</td>
<td>-0.192</td>
<td>0.077</td>
<td>1</td>
</tr>
</tbody>
</table>
Estimating Preferences

- Let $U_{1ij}$ denote buyer $i$'s utility for publicizing contract for product $j$

$$U_{1ij} = \delta_{ij} + \epsilon_{1ijt}, \quad U_{0ij} = \epsilon_{2ijt}$$

- The parameter $\delta_{ij}$ is the mean utility of publicizing a contract (relative to not publicizing)

- We model unobserved tastes $\epsilon_{1ijt}, \epsilon_{2ijt} \sim iid EVI$. If the buyer decides to publicize maximizing her utility, we have:

$$P[D_{ijt} = 1|\delta_{ij}, X_{ijt}] = \frac{\exp(\delta_{ij} + \Gamma'X_{ijt})}{1 + \exp(\delta_{ij} + \Gamma'X_{ijt})}$$  \hspace{1cm} (2)

- We allow for flexible heterogeneity in tastes, by estimating by Maximum Likelihood a preference parameter $\hat{\delta}_{ij}$ separately for each $ij$ combination
Estimating Preferences

- The mean utility parameter \( \hat{\delta}_{ij} = \log \left( \frac{S_{ij|X}}{1-S_{ij|X}} \right) \), where \( S_{ij|X} \) is the conditional share of publicized by buyer \( i \) for product \( j \).

- We relate the preferences for publicity with its effects on:
  - competition (\( N \) bidders, only one bidder)
  - contractor relation (share of past contracts, distance)
  - performance (delays and overruns)

- We regress separate regressions for buyer-product mean utilities separating by services/good:

\[
\hat{\delta}_{ij} = \mu_j + \rho_1^k \theta_{ij}^{comp} + \rho_2^k \theta_{ij}^{rel} + \rho_3^k \theta_{ij}^{perf} + \xi_{ij}, \quad k \in \{ \text{service, good} \}
\]

- \( \rho_1^k \) represents the marginal effect of competition on the log odds ratio of publicity (conditioning on the relation and performance)

  - There are 160 and 355 buyer-service and buyer-good combinations, respectively. The observations are weighted by the inverse of sampling variation \( \hat{\delta}_{ij} \) and the SE are clustered at buyer level.
### Table: Preference for Competition, Performance and Contractor Relation

<table>
<thead>
<tr>
<th>VARIABLES</th>
<th>(1)</th>
<th>(2)</th>
<th>(3)</th>
<th>(4)</th>
<th>(5)</th>
<th>(6)</th>
<th>(7)</th>
<th>(8)</th>
</tr>
</thead>
<tbody>
<tr>
<td><strong>Competition:</strong></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Number of Offers (Censored at 10) (SD)</td>
<td>1.481</td>
<td>(1.056)</td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>More than 1 Offers (SD)</td>
<td>2.828**</td>
<td>(1.030)</td>
<td>2.824**</td>
<td>(0.998)</td>
<td>2.833***</td>
<td>(0.923)</td>
<td>2.401**</td>
<td>(0.902)</td>
</tr>
<tr>
<td>More than 2 Offers (SD)</td>
<td>2.492**</td>
<td>(1.015)</td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>More than 3 Offers (SD)</td>
<td>1.835*</td>
<td>(0.980)</td>
<td></td>
<td></td>
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<td></td>
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</tr>
<tr>
<td><strong>Relation with Contractor:</strong></td>
<td></td>
<td></td>
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<td></td>
<td></td>
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<td></td>
<td></td>
</tr>
<tr>
<td>Log Distance to Awarded Firm (SD)</td>
<td>-0.263</td>
<td>(0.569)</td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Share of Past Product-Dollars Awarded to Firm (SD)</td>
<td>1.287**</td>
<td>(0.488)</td>
<td>0.980</td>
<td>(0.591)</td>
<td>1.100**</td>
<td>(0.510)</td>
<td></td>
<td></td>
</tr>
<tr>
<td><strong>Performance:</strong></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Any Cost Overruns (SD)</td>
<td>0.710</td>
<td>(0.767)</td>
<td></td>
<td></td>
<td></td>
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<td></td>
<td></td>
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<tr>
<td>Any delays (SD)</td>
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Robust standard errors in parentheses

*** p<0.01, ** p<0.05, * p<0.1
### Table: Preference for Competition, Performance and Contractor Relation

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<tr>
<th>VARIABLES</th>
<th>(1)</th>
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<td>Number of Offers (Censored at 10) (SD)</td>
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<td>1.349*</td>
<td>1.418*</td>
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<td>0.860</td>
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<td>-0.792</td>
<td>-1.163</td>
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<tr>
<td>Any Cost Overruns (SD)</td>
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<tr>
<td>Any delays (SD)</td>
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</tbody>
</table>

Robust standard errors in parentheses

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Discussion

• Competition:
  - Buyers dislike having only one bidders (monopoly). Buyers’ preference for more competition is attenuated as they receive more bids
  - $1\sigma$ reduction in probability of having only one bid increases the likelihood of publicizing the contract by $\rho_{1}^{\text{serv}} s(1 - s) \approx 0.45$, $\rho_{1}^{\text{good}} s(1 - s) \approx 0.22$

• Relation with contractors:
  - Buyers’ dislike awarding a contractor with less history. The preference for contractors is negatively correlated with low performance
  - Once controlling for contract performance, they relation preference decreases, however is still relevant

• Performance:
  - Keeping the contractor relation fixed, the preference relation becomes positive (although insignificant and small)
Recap and other results

• Publicizing solicitations online:
  - Increases the number of firms participating
  - Changes characteristics of the winning firm:
    • Geographically more distant, with less previous history with the office
    - Affects contract performance: increases cost-overruns and delays
      • These effects are mostly focused on relatively “complex” products and services
  - Welfare effects are unclear
  - Results present for all agencies, and for goods and services
  - Ex-ante contract characteristics are smooth at the threshold

• The buyer decisions are positively correlated with competition and contractors’ relation, the correlation is weaker with performance
Next steps

- Incorporate key outcomes: Actual paid unit prices and additional contract quality measures
- Use preference coefficients to study policy counterfactuals
  - How would buyers behave if we gave them more discretion?
- Derive implications for optimal policy
Thank you!
<table>
<thead>
<tr>
<th>Opportunity</th>
<th>Agency/Office/Location</th>
<th>Type</th>
<th>Posted On</th>
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<tbody>
<tr>
<td>Blanket Purchase Agreement for Aerialists, TX, LA &amp; NM</td>
<td>Department of the Army U.S. Army Corps of Engineers USACE District, Fort Worth</td>
<td>Presolicit</td>
<td>Feb 13, 2019</td>
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<td>NOTICE OF INTENT TO AWARD SOLE SOURCE CONTAINERIZED REFRIGERATORS</td>
<td>Department of the Navy Space and Naval Warfare Systems Command SPAWAR Systems Center Pacific</td>
<td>Special Notice</td>
<td>Feb 13, 2019</td>
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<td>Athletic Socks</td>
<td>Department of the Army Army Contracting Command, DIBN 411TH CBB (WRVPN) RCO GAMP HUMPHREYS</td>
<td>Combined</td>
<td>Feb 13, 2019</td>
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<td>Bone Operations and Support Services R/O/SC at Homestead ANGB FLA</td>
<td>Department of the Air Force Air Force Reserve Command HQ AF Reserve Command</td>
<td>Administration</td>
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<td>W-FY18 Vehicle Lease Agreement NRFS-D, Darwin, Australia</td>
<td>Department of the Navy Naval Facilities Engineering Command NAVFAC Pacific, Site Thailand</td>
<td>Award</td>
<td>Feb 13, 2019</td>
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<td>AFCA/AFOSI Technical Order Library and Maintenance Data Base/Order (OSO) formerly FAB02-10-R-0005</td>
<td>Department of the Air Force AFCA AFCA - CONUS</td>
<td>Combined</td>
<td>Feb 13, 2019</td>
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<td>C-DG-19-009 CONTRACT FOR ARCHITECT ENGINEER SERVICES FOR ARCHITECTURAL PROJECTS AT VARIOUS LOCATIONS UNDER THE COMMAND OF NAVAL FACILITIES ENGINEERING COMMAND HAWAII</td>
<td>Department of the Navy Naval Facilities Engineering Command NAVFAC Hawaii</td>
<td>Presolicit</td>
<td>Feb 13, 2019</td>
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<td>Seeking Services for Kadena Training Academy</td>
<td>Department of the Army Army Contracting Command, DIBN 411TH CBB (WR QVN) RCO YONGSAN</td>
<td>Combined</td>
<td>Feb 13, 2019</td>
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</table>
Athletic Socks

Solicitation Number: W91VNB-19-R-0008
Agency: Department of the Army
Office: Army Contracting Command, CSAFA
Location: 411TH CSB (W91VNB), RCO CAMP HUMPHREYS

Notice Details | Packages | Interested Vendors List

Note: This opportunity allows for electronic responses. Click here to log in and submit a response.

Original Synopsis
Feb 13, 2019
9:54 pm

Return To Opportunities List
Watch This Opportunity
Add Me To Interested Vendors

Solicitation Number: W91VNB-19-R-0008
Notice Type: Combined Synopsis/Solicitation

Synopsis:
Added: Feb 13, 2019 9:54 pm
This RFP/RFQ is for the purchase of Athletic socks, see solicitation for requirements and additional details.

Please consult the list of document viewers if you cannot open a file.

Type: Other (Draft RFIs/RFQs, Responses to Questions, etc.)
Posted Date: February 13, 2019

W91VNB-19-R-0008

Contracting Office Address:
Unit 15289
APO, Non-U.S. 96205-5289
Korea, South
Place of Performance:

ALL FILES
W91VNB-19-R-0008
Feb 13, 2019
W91VNB-19-R-0008_Solicitation_Athletic_Socks.pdf (362.70 KB)

GENERAL INFORMATION
Notice Type:
Combined Synopsis/Solicitation
Posted Date:
February 13, 2019
Response Date:
Feb 20, 2019 11:59 am Eastern
Archiving Policy:
Manual Archive
Archive Date:
Original Set Aside:
N/A
Set Aside:
N/A
Classification Code:
84 – Clothing, individual equipment & insignia
NAXS Code:
316 – Leather and Allied Product Manufacturing/316210 – Footwear Manufacturing
Heterogeneity by agency

**Army**

<table>
<thead>
<tr>
<th>Expected award amount ($K)</th>
<th>Number of offers received</th>
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<tbody>
<tr>
<td>10</td>
<td>2.8</td>
</tr>
<tr>
<td>15</td>
<td>2.9</td>
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<tr>
<td>20</td>
<td>3.0</td>
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<td>25</td>
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<td>35</td>
<td>3.1</td>
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<td>2.82.9</td>
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**Navy**

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<td>20</td>
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<tr>
<td>25</td>
<td>2.8</td>
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<tr>
<td>30</td>
<td>2.42.6</td>
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<tr>
<td>35</td>
<td>2.82.6</td>
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<tr>
<td>40</td>
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**Air Force**

<table>
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<td>10</td>
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<tr>
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<tr>
<td>30</td>
<td>2.82.9</td>
</tr>
<tr>
<td>35</td>
<td>3.1</td>
</tr>
<tr>
<td>40</td>
<td>2.82.9</td>
</tr>
</tbody>
</table>
Heterogeneity: good vs services

Number of offers received

Expected award amount ($K)

Good

Service

Number of offers received

Expected award amount ($K)
Contract characteristics: set-aside

Expected award amount ($K)

Set-aside contracts
Contract characteristics: good vs. service

Expected award amount ($K) vs. Service:

- IV = -0.001
- (0.020)
- 0.28
- 0.3
- 0.32
- 0.34
- 0.36
Contract characteristics: expected duration

Expected duration (days):
- 10
- 15
- 20
- 25
- 30
- 35
- 40

Expected award amount ($K):
- 100
- 110
- 120
- 130
- 140

The graph above illustrates the relationship between the expected duration (days) and the expected award amount ($K). The data points are plotted as blue circles, with two trend lines: one dashed green line and one solid orange line. The equation for the dashed green line is $IV = -16.854 (33.676)$. The expected duration increases as the expected award amount increases.
Contract characteristics: simplified procedures

IV = 0.037 (0.010).69.7.71.72.73.74

Simplified Acquisition Procedures

Expected award amount ($K)
Fraction of contractor’s past contracts that appeared in FBO

- Good: $IV = 0.056$ (0.011)
- Service: $IV = 0.108$ (0.027)

<table>
<thead>
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<th>Share of firm’s past dollars that appeared in FBO</th>
<th>Expected award amount ($K$)</th>
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<td>0.5</td>
<td>10</td>
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<td>0.6</td>
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<td>0.7</td>
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<td>0.75</td>
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<tr>
<td>0.8</td>
<td>40</td>
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</tbody>
</table>
Heterogeneous Effects Extrapolation

- \( D_i = 1\{\gamma_0 + \gamma_1 Z_i > U_i\} \), where \( U_i \sim (0, 1) \) is the selection error.

- We extrapolate by adopting a functional form of \( U_i: E(Y_i(t)|U_i) = \alpha_t + \delta_t g(U_i) \), e.g., where \( g(U_i) = U_i \) in the linear selection model, \( g(U_i) = \Phi^{-1}(U_i) \) Heckit model.
Empirical Bayes Adjustment

• The coefficients are unbiased but noisy measures of the underlying specific parameters. We recover the distribution of $\delta_j$ and $\delta_i$ using the following hierarchical model:

$$\hat{\delta}_k | \delta_k \sim N(\delta_k, \Omega_k)$$

$$\delta_k \sim N(\mu_\delta, \Sigma_\delta)$$  \hspace{1cm} (4)

• Where $\Omega_k$ is the sampling variance of $\hat{\delta}_k$, $\mu_\delta, \Sigma_\delta$ are the parameters of the distribution of the latent parameters across $k$ contracts ("hyperparameters" describing a prior distribution for $\delta_k$)

• This hierarchical model can be used to improve estimates of parameters for individual $k$ contracts.

• The Empirical Bayes (EB) posterior mean for $\delta_k$ is:

$$\delta_k^* = \left(\hat{\Omega}_k^{-1} + \hat{\Sigma}_\delta^{-1}\right)^{-1} \left(\hat{\Omega}_k^{-1} \hat{\delta}_k + \hat{\Sigma}_\delta^{-1} \hat{\mu}_\delta\right)$$  \hspace{1cm} (5)
## Table: Preference for Competition, Performance and Contractor Relation

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<tr>
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<tr>
<td>Number of Offers (Censored at 10) (SD)</td>
<td>1.481</td>
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<tr>
<td>Only 1 Offer (SD)</td>
<td>-2.828**</td>
<td>-2.824**</td>
<td>-2.833***</td>
<td>-2.401**</td>
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<td>(0.767)</td>
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N: 160 160 160 160 160 160

Robust standard errors in parentheses

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<td>-1.418 *</td>
<td>(0.715)</td>
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<td>Log Distance to Awarded Firm (SD)</td>
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<td>(0.452)</td>
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<td>(0.709)</td>
<td>-0.914</td>
<td>(0.656)</td>
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<td>Any Cost Overruns (SD)</td>
<td>1.350 **</td>
<td>(0.527)</td>
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<td>1.825 **</td>
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