Exploring Drivers of Better Strategic Sourcing in the Air Force Using Analytics

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- Services acquisition is big business in DoD
  - DoD obligated approx. $239B for supplies/services (2016)
  - Services account for over half of DoD procurement budget
  - DoD applying a strategic approach to services acquisition
  - Establishment of DoDI 5000.74 *Defense Acquisition of Services* (2016)
    - Use of portfolio management approach incorporating "should cost" methods
    - Identify cost reduction opportunities

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- Air Force Category Management
  - Focus on leveraging buying power, improving efficiencies, and managing consumption
  - Use of performance levers and identification of cost drivers to reduce cost and increase efficiency and effectiveness

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- Development of an optimization model for selecting a set of proposals from among multiple offerors for services to be performed at multiple installations (Apte, Rendon, & Salmerón, 2011).

  – Selection achieved the most favorable objective by balancing the confidence level in an offeror's past performance with the cost of services to the Air Force.

  – The research findings demonstrated improvements over the sourcing process in both overall performance and cost

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- Analyze price drivers for integrated solid waste management (ISWM) services
  - Identify relationship between price drivers (service-related, contract-related), price, and contractor performance

What effect do <u>price drivers</u> have on <u>contract price</u> and <u>contractor performance</u>?

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Is there a relationship between price drivers, price, and performance?

Service-Related Price Drivers
Tons of Waste
Number of Containers
Wage Rate

Contract-Related Price Drivers
Number of Offers
Type of Small Business
Competition Environment

Total Price

Contractor Performance
Quality
Cost
Schedule
Small Business
Subcontracting
Management

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- Uses FY14 ISWM data for CONUS bases
  - CBIS
  - Sub-AMP
  - PPIRS-RC

- 57 base-level observations, 50 after outlier deletion

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Variable name	Description (units/rating sale)
Total Price	Total price of the ISWM contract ($)
Contractor Performance: Quality	Buyer-rated assessment of the contractor's performance related to quality (1-5)
Contractor Performance: Cost	Buyer-rated assessment of the contractor's performance related to cost (1-5)
Contractor Performance: Schedule	Buyer-rated assessment of the contractor's performance related to schedule (1-5)
Contractor Performance: Small Business Subcontracting	Buyer-rated assessment of the contractor's performance related to meeting small business subcontracting requirements (1-5)
Contractor Performance: Management	Buyer-rated assessment of the contractor's performance related to management (1-5)
Contractor Performance: Average Rating	Average of all available performance ratings (quality, cost, schedule, small business subcontracting, management) (1-5)

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Variable name	Description (units/rating sale)
Tons of Waste	Annual amount of solid waste (tons)
Number of Containers	Number of dumpsters serviced by the ISWM contract (dumpsters)
Wage Rate	Dollars per hour paid to ISWM contractors ($/h)[*]
Number of Offers	Number of offers received and evaluated prior to contract award (offers)
8(a) Sole Source—SB Set-Aside[**]	Contract was provided without competition to a qualified 8(a) contractor (yes or no)
8(a) Competed—SB Set-Aside[**]	Contract was competed among qualified 8(a) contractors (yes or no)

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Variable name	Description (units/rating sale)
HUBZone—SB Set-Aside	Contract was competed among qualified HUBZone contractors (yes or no)
Service-Disabled Veteran-Owned—SB Set-Aside	Contract was competed among qualified SDVOSB contractors (yes or no)
Total Small Business Set-Aside	Contract was competed among all qualified small businesses (yes or no)
Full & Open Competition	Contract was competed among all qualified contractors (large and small) (yes or no)

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- ## Price-Related Methods

  - ### Sequential Multiple Regression

$$p_k = a_k + \sum_{i \in \text{Group } 1...k} b_{ik} v_i + e_k, \quad \forall k = 1...5$$

  - ### Wilcoxon Rank Sum Test

- ## Performance-Related Method

  - ### Ordered Logistic Regression

$$P(Y > j) = \frac{e^u}{1 + e^u}$$

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- Influence on Price
  - ISWM variables account for 45% of the variance in price
  - Contracting variables account for 32% of the variance in price

Take away:

How much contracting influence

on price is "okay?"

- ISWM Variables' Influence on Price (η^2)
  - # containers 18%
  - Tons of waste 2%
  - Wage rate 1%

Take away:

Containers are the price-driving variable - demand management! This matches what the CIR found re: trucks/# tips.

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- Contracting Variables' Influence on Price (η^2)
  - SB set-aside 11%
  - # offers 3%

Take away:
  - SB set-asides also drive price; we are paying a premium.
  - Need market research to figure out why the premium exists. Is it just diseconomies of scale?
  - Know premium we can expect to pay.

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Hypothesis	Group 1	Group 2	Result
	Contracts with Small Business Set-Aside Categories 8(a) Sole Source 8(a) Competed HUBZone SDVOSB Total Small Business Set-Aside	Contracts with No Small Business Set-Aside Full & Open Competition	
H4a Price/Ton	$198.39 $n=35$	$131.61 $n=14$	ns
H4b Price/Container	$2,100.78 $n=31$	$1,406.78 $n=13$	p<.01
	Less Inclusive Small Business Set-Aside Categories 8(a) Sole Source 8(a) Competed HUBZone SDVOSB	More Inclusive Small Business Set-Aside Category Total Small Business Set-Aside	
H5a Price/Ton	$155.76 $n=19$	$249.02 $n=16$	ns
H5b Price/Container	$2,132.03 $n=17$	$2,062.82 $n=14$	ns
	Sole-Source Small Business Set-Aside Category 8(a) Sole Source	Competed Small Business Set-Aside Categories 8(a) Competed HUBZone SDVOSB	
H6a Price/Ton	$139.07 $n=10$	$174.30 $n=9$	ns
H6b Price/Container	$2,115.51 $n=10$	$2,155.63 $n=7$	ns

Note: Need 15 cases/group for adequate statistical power. 16

- No differences in performance (CPARS ratings) based on:
  - Tons of waste (small v. large)
  - # containers (few v. many)
  - Prevailing wage rate
  - SB set-aside or F&O competition
  - # offers (small v. large)
- Based on 32 observations

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- Use regression / more advanced stat methods to assess service data

- More data = more accurate analyses

- "Not statistically different" does not equal "not monetarily different"

- Know prices paid by different socioeconomic categories

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DVs: (1) Total annual cost of service (2) CPARS data fields

Contracting-related IVs

- – # offers
- – SB set-aside status
  - F&O - 14
  - Total SB Set-Aside - 16
  - 8(a) Competed - 5
  - 8(a) Sole Source - 11
  - HUBZone - 3
  - SDVOSB - 1

ISWM-related IVs

- – Tons of waste
- – # containers
- – Wage rate

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