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Contract Design, Supply Chain Complexity, and Accountability in Federal Contracts

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THE OHIO STATE UNIVERSITY
JOHN GLENN COLLEGE OF PUBLIC AFFAIRS

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Purpose

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- Supply chains are fundamentally complex (Vachon and Klassen, 2002; Galbraith 1973)

- Are supply chains managed differently based upon the susceptibility of the supply chain to
 - ▣ Endogenous disruptions?
 - ▣ Exogenous disruptions?

- Contract design as a risk management strategy

Supply Chain Risk

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□ Endogenous

- Supply risks
 - Resource related
- Demand risks
 - Market related
- Complexity of the product, number of exchange partners exacerbates risk (Flynn and Flynn 1999)
- Might be decreased by the firm (Folta 1998)

□ Exogenous

- Discrete events (Trkman and McCormack 2009)
 - Unpredictable shocks
- Continuous risks
 - More stable e.g., political environment
- Largely unaffected by firm actions (Folta 1998)

Risk Management Strategies

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- Endogenous risk management
 - ▣ *Supply risks*: Hedge (multiple suppliers), internally produce
 - ▣ *Demand risks*: Postpose production, maintain inventory (Manuj, Esper, and Stank 2014)
 - ▣ Share information with SC partners

- Exogenous risk management
 - ▣ Assume and internalize risk
 - ▣ Mutual understanding of risks among partners to lower transaction costs as much as possible (Weber and Mayer 2014)
 - ▣ Flexibility in contract, contingency plans (Brown, et al 2015)

Public Sector Supply Chains

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- **Public managers tend to be more externally focused**
(Frumkin and Galaskiewicz 2004)
- **Inefficient SC can thrive if valued by/benefit powerful actors** (Kim and Brown 2010; Eckerd and Snider 2016)
- **Public sector SC behave more/less like private sector depending upon exogenous disruption**
- **Contract design as a risk management strategy**

	Low exogenous risk	High exogenous risk
Low endogenous risk	Fixed price	Idiosyncratic to product
High endogenous risk	Cost reimbursement	Incentive/award fee

Hypotheses

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- 1) Fixed price contracts will be favored over other contract types when both *endogenous risk* and *exogenous risk* are low.
- 2) Cost reimbursement contracts will be favored over other contract types when *endogenous risk* is high and *exogenous risk* is low.
- 3) Award/incentive fee contracts will be favored over other contract types when both *endogenous risk* and *exogenous risk* are high.

Data

Source: FPDS-NG

22
product/service
contracts
FY2000-2014

Sample size:
274,440 contracts

Product Category	PSC	NAICS	Number of Contracts	Product complexity
Solid waste collection	S205	562111	17,907	3.08
Landscaping	S208	561730	37,774	3.16
Laundry and dry cleaning	S209	812320	8,051	3.26
Janitorial service	S201	561720	47,058	3.30
Court reporting	R606	561492	19,940	3.51
Warehousing and storage	S215	493110	2,104	3.61
Security guard and patrol	S206	561612	25,522	3.77
Advertising	R701	541810	5,445	4.43
Auditing	R704	541211	2,682	4.77
Legal service	R418	541110	9,732	4.97
Professional and management training	U008	611430	12,816	5.02
Equipment maintenance and repair	J099	811310	5,971	5.22
Program management and support	R408	541611	12,401	5.62
Logistics support	R706	541614	3,175	5.63
Program review and development	R409	541611	615	5.87
Engineering	R425	541330	55,822	6.76
Computer system development	D302	541512	4,196	7.58
Weapons-basic research	AC51	541710	578	7.60
Defense aircraft - basic research	AC11	541710	880	7.94
Defense aircraft - engineering development	AC14	541330	122	8.46
Weapons - applied R&D	AC52	541710	659	8.60
Defense aircraft - applied R&D	AC12	541710	990	8.66

Source: Kim, Roberts, and Brown 2016

Measures and Method

Dependent variable

- *Contract pricing type*: 1 Fixed price, 2 Incentive/award fee, 3 Cost reimbursement, 4 Time and material

Explanatory variables

- *Endogenous risk*:
 - ▣ *Product complexity*
- *Exogenous risk*:
 - ▣ *Contract value*: total dollars obligated (log)
 - ▣ *Market competition*: number of offers received (log)
 - ▣ *Competitive limitation*: coded 1 if the contract is a set aside

Control variables

- *Contract length*: total length of contract in years
- *Unrestricted competition*: coded 1 if full and open
- *DOD*
- *FY dummies*

Method

- Multinomial logistical regression, robust SE, clustered at IDV level

Results

Hypotheses	Findings
<p><i>H1: Fixed price contracts will be favored over other contract types when both endogenous risk and exogenous risk are low.</i></p>	<p>Partial Yes Complexity (-) Contract value (-)</p>
<p><i>H2: Cost reimbursement contracts will be favored over other contract types when endogenous risk is high and exogenous risk is low.</i></p>	<p>Partial Yes Complexity (+) Contract value (+FP/-AI)</p>
<p><i>H3: Award/incentive fee contracts will be favored over other contract types when both endogenous risk and exogenous risk are high.</i></p>	<p>Partial Yes Complexity (+FP/-CR) Contract value (+)</p>

Discussion

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- Endogenous risk
 - ▣ Fixed price more likely for less complex products/services
 - ▣ Cost reimbursement more likely for most complex products/services

- Exogenous risk
 - ▣ If characterize high dollar value as a proxy for political attention, then incentive/award fee most likely
 - ▣ If characterize market strength as a proxy for political attention, then results are not clear

- Findings suggest relationship between varying types of SC risk and contract design choices

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