



# Evaluating Consolidation and the Threat of Monopolies within Industrial Sectors

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## Purpose of Evaluating Monopolies

- Economics scholars and policy makers in recent years have rung alarm bells about the **increasing threat of consolidation and concentration within industrial sectors**
- Major concerns have risen with specific regard to the defense industry, as a **small private defense establishment has largely replaced the broad mix of federal and civilian contractors** that was at its height during World War II



"Acquisitions can be expensive, but with a few more, we can be done entirely with the cost of customer satisfaction."

Source: Wildt, Chris. Used with non-commercial electronic publication license.

## Approach to Research

- Key research question:
  - ***How does consolidation in the defense industry effect the quality of performance outcomes?***
- Two Methods:
  - Direct connection, observing concentration's effect on performance
  - Indirect connection, observing competition's effect on performance

*Subsequent stages of research will be included in the final report examining the interrelation of consolidation and competition*

## Research Hypotheses

- $H_1$ : Industrial concentration leads to changes in contract performance
- $H_2$ : Increasing (decreasing) industrial concentration leads to decreasing (increasing) competition
- $H_3$ : Decreasing (increasing) competition makes poor contract performance more (less) likely

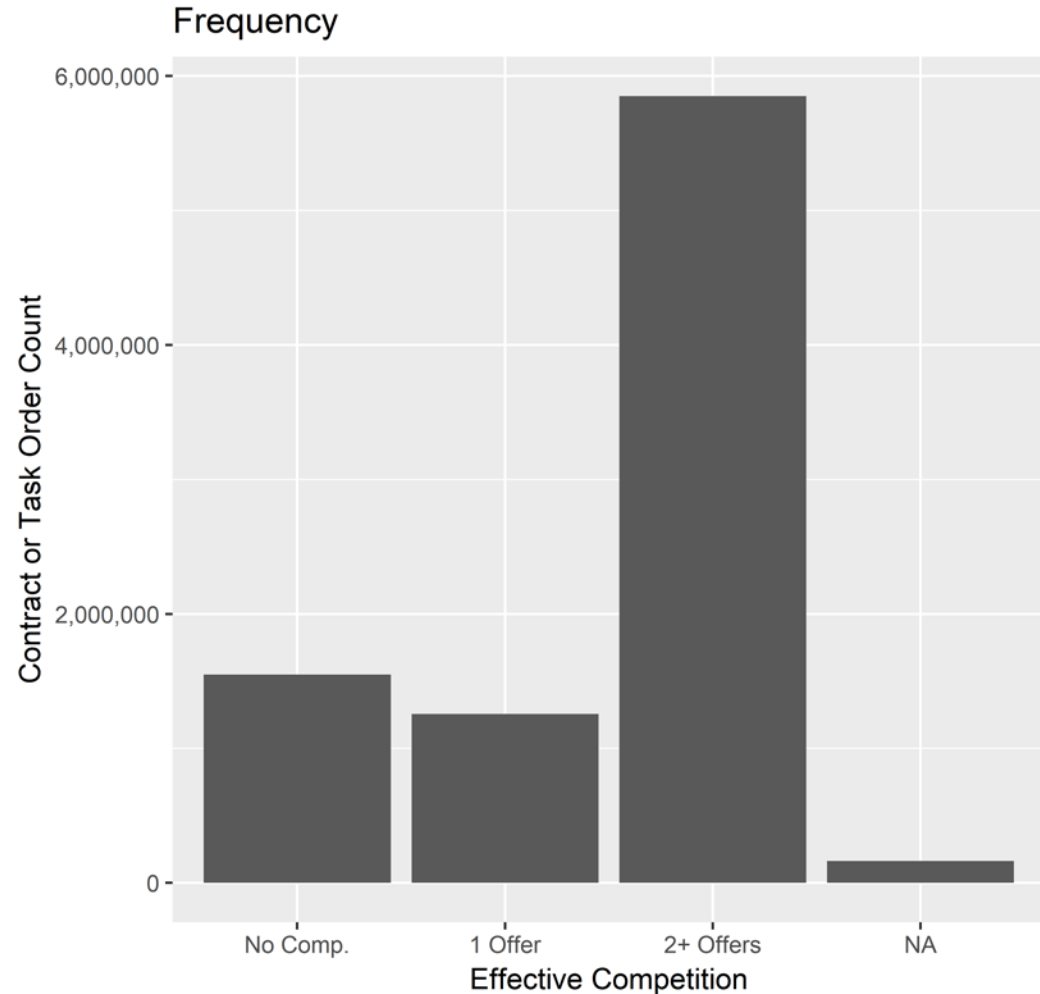
## Definition of Output Variables

- **Partial or Complete Terminations of Contract/Task Order**
  - 1.2% of contracts and task orders experience at least one partial or complete termination.
  - These contracts and task orders account for 5.6% of obligations in the dataset.
  - *FPDS does not differentiate between complete and partial terminations, so this can include both a cancelled program and a contract that was completed after being initially protested and reassigned.*
- **Ceiling Breaches**
  - Tracks whether the contract had a change order that increased its cost ceiling.
  - 1.2% of contracts and task orders experience at least one partial or complete termination.
  - These contracts and task orders account for 21% of obligations in the dataset.

## Definitions of Study Input Variables

- **Effective Competition**

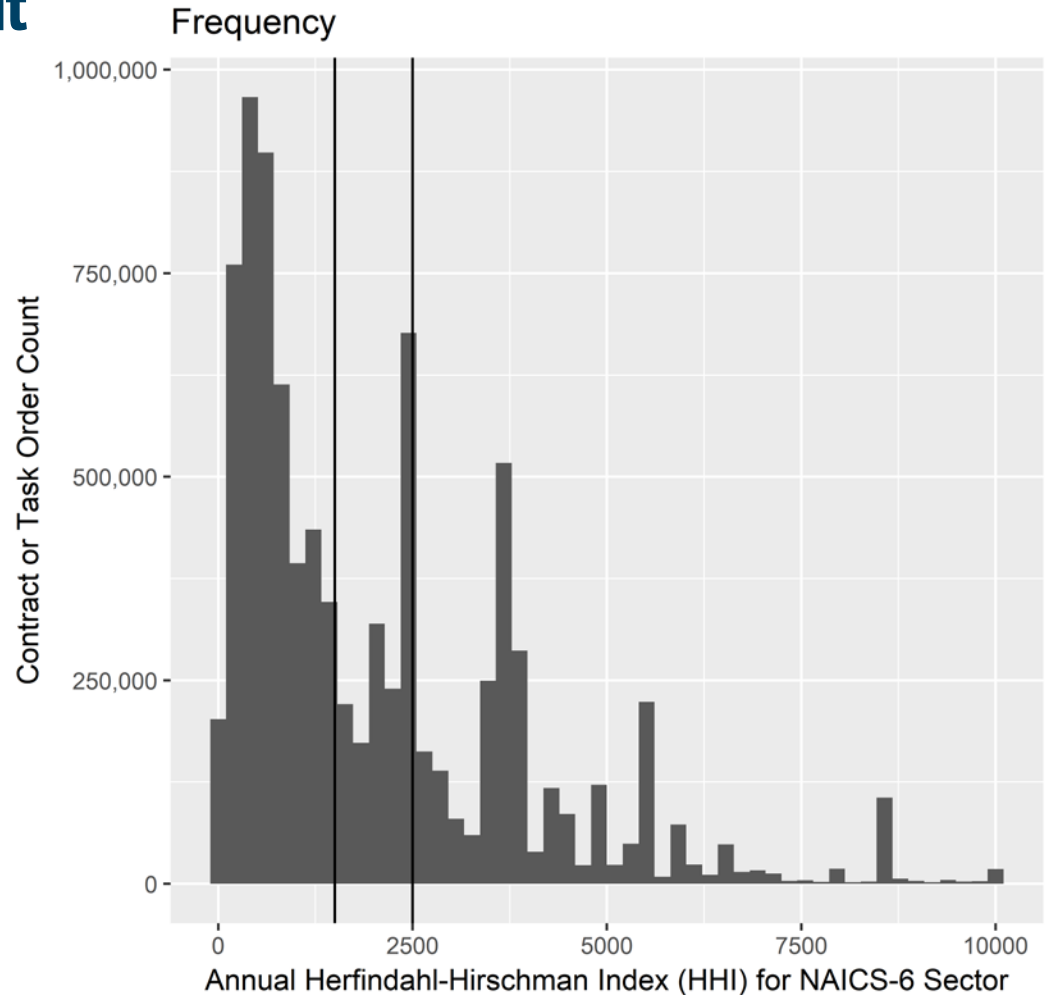
- 1 = contracts competed with multiple offers (54 percent of obligations)
- 0.5 = contracts competed receiving only 1 offer, (13 percent of obligations)
- 0 = non-competed contracts (33 percent of obligations)
- *Note: Dataset only includes completed contracts and thus captures a higher proportion of shorter duration contracts and only captures longer contracts as they finish.*



Source: FPDS, CSIS Analysis

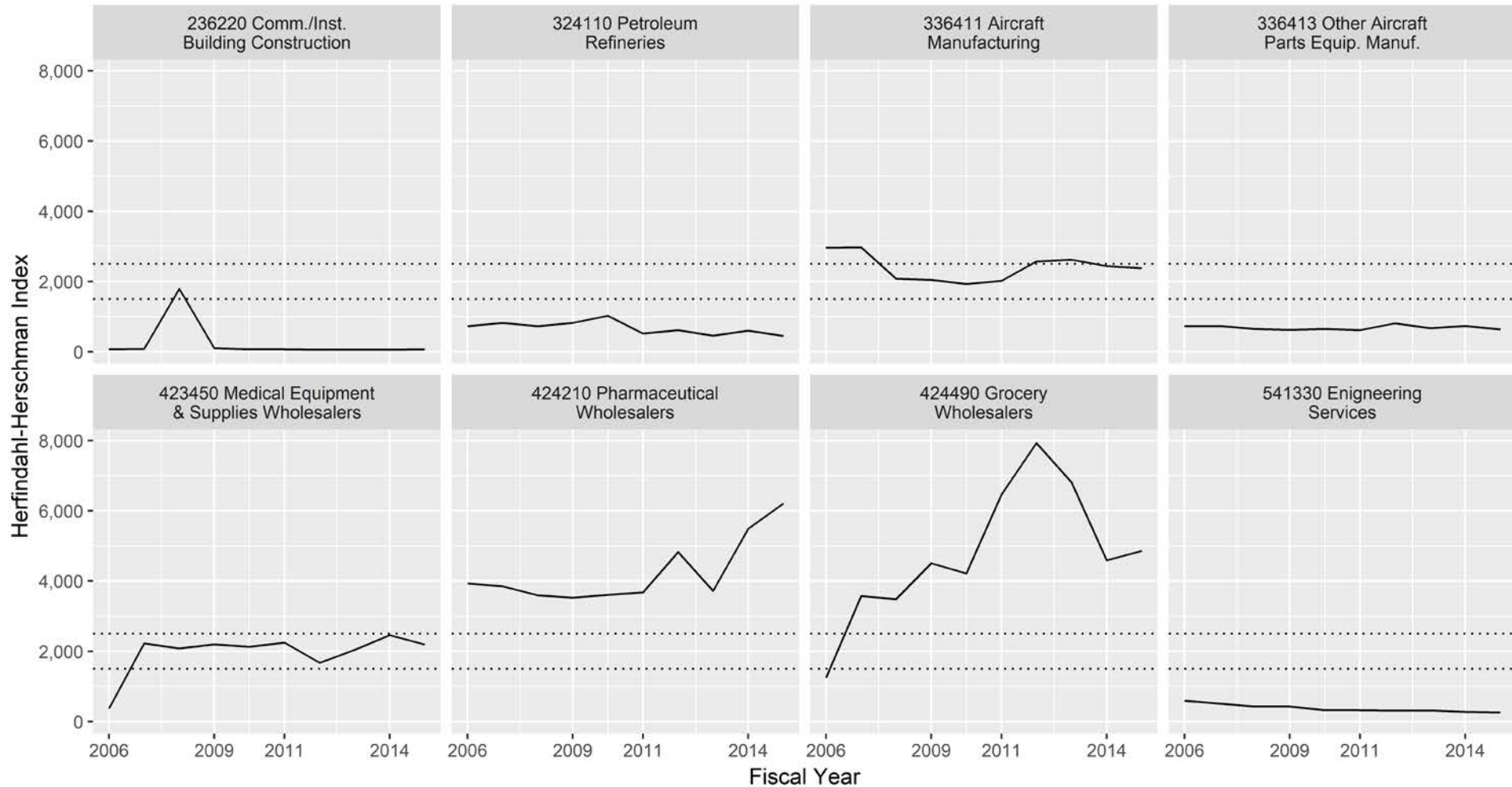
# Definitions of Study Input Variables

- Herfindahl-Hirschman Index (HHI)
  - A measure of consolidation in the defense industrial base
  - Calculated by squaring the market share of each participant in a sector then summing the resulting numbers
  - Can range from close to 0 (perfect competition) to 10,000 (monopoly)
    - <1,500 = Competitive Marketplace
    - 1,500 to 2,500 = Moderately Concentrated Marketplace
    - >2,500 = Highly Concentrated Marketplace
  - Mean (2,056) and dividing by its standard deviation (1,867)



Source: FPDS, CSIS Analysis

# Herfindahl-Hirschman Index (Y Axis)



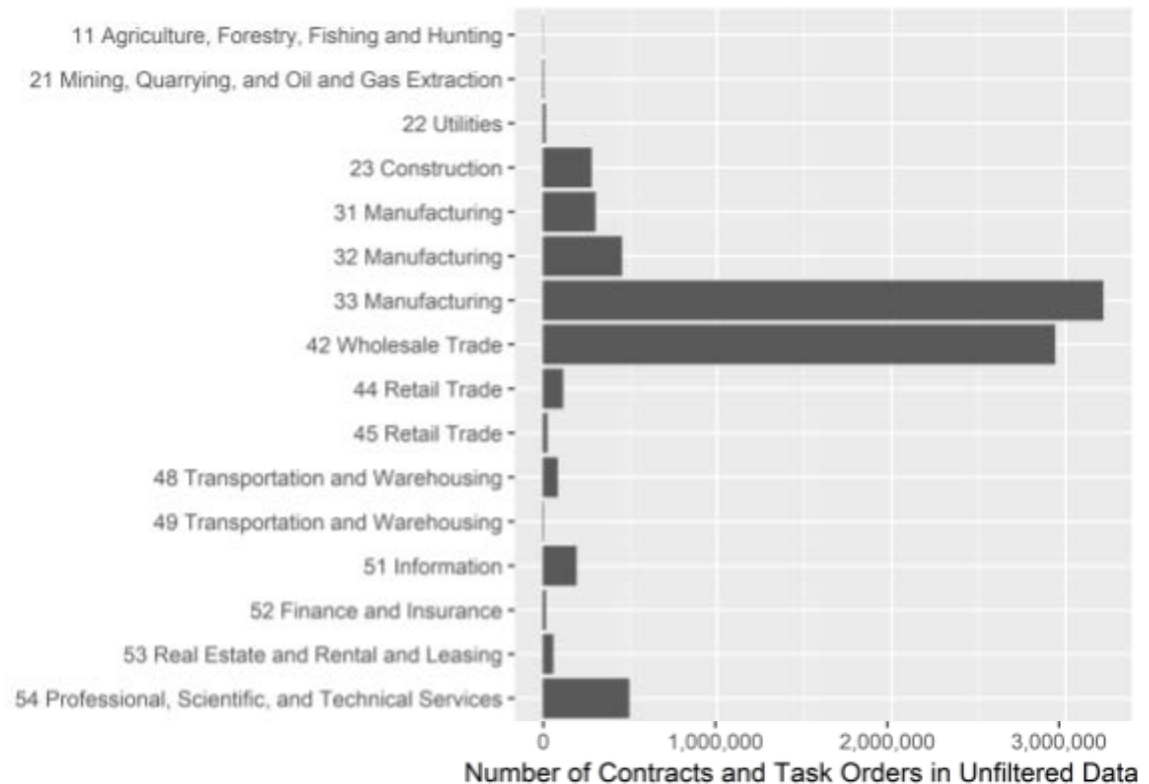


## Definitions of Other Input Variables

- North American Industrial Classification Code (NAICS)
- Initial Contract Scope
  - Natural Log of Initial Cost Ceiling
  - Natural Log of Initial Duration
- Contract Vehicle
  - Helps to define the nature of the contractor/customer relationship. Four different types of indirect delivery vehicles are observed.
    - Single-award indefinite delivery
    - Multiple-award indefinite delivery
    - Federal Supply Schedule or Government-Wide Acquisition
    - Blank Purchase Agreement or Basic Ordering Agreement
- Contract Pricing
  - Fixed Price
  - Unfixed Contract Action (UCA)
- Contract Location
  - Any International – Contracts and task orders with any transactions performed internationally = 1, Contracts with no international transactions = 0

## What is an Industrial Sector?

- NAICS codes are hierarchical, which means the shortened versions of the codes are parents of the longer version. For example:
  - 54 Professional, Scientific, and Technical Services
    - 541330 Engineering Technical Services
- The HH-Index is calculated using the 6-digit NAICS codes.
- The intercepts for each individual contract is calculated using the 2-digit NAICS codes at this stage in the research.



# Results: Consolidation and Performance – Direct Relationship

- Consolidation significantly correlated with outcome measures, support for H<sub>1</sub>.
- Consolidation positively correlated with prevalence of ceiling breaches (0.28)
  - This finding supports perceptions of industrial consolidation as a risk
- Consolidation negatively correlated with contract terminations (-0.15)
  - This may reflect a lock-in between government and industry, but warrants further research

	Complete and Partial Termination	Ceiling Breach
(Intercept)	-5.50 (0.16)*	-4.75 (0.21)*
c_HHI_lag1	-0.15 (0.02)*	0.28 (0.01)*
cl_Ceil	-0.02 (0.01)	0.64 (0.02)*
cl_Days	0.67 (0.02)*	0.19 (0.01)*
SIDV	-1.04 (0.03)*	-0.07 (0.03)*
MIDV	-0.22 (0.05)*	0.37 (0.05)*
FSSGWAC	-0.28 (0.05)*	0.16 (0.06)*
BPABOA	-0.45 (0.08)*	-0.01 (0.08)
n_Fixed	1.02 (0.09)*	0.30 (0.04)*
b_UCA	1.64 (0.07)*	2.01 (0.07)*
c_HHI_lag1:SIDV	-0.50 (0.04)*	
c_HHI_lag1:MIDV	0.18 (0.05)*	
c_HHI_lag1:FSSGWAC	0.21 (0.05)*	
c_HHI_lag1:BPABOA	-0.02 (0.11)	
c_HHI_lag1:b_UCA	0.37 (0.09)*	0.37 (0.07)*
b_Intl		-0.27 (0.03)*
c_HHI_lag1:cl_Ceil		-0.17 (0.01)*
cl_Ceil:SIDV		-0.14 (0.02)*
cl_Ceil:MIDV		-0.24 (0.03)*
cl_Ceil:FSSGWAC		0.04 (0.04)
cl_Ceil:BPABOA		-0.32 (0.08)*
cl_Ceil:b_UCA		-0.39 (0.05)*
AIC	112213.41	105872.70
BIC	112402.46	106097.20
Log Likelihood	-56090.70	-52917.35
Num. obs.	1000000	1000000
Num. groups: NAICS2	24	24
Var: NAICS2 (Intercept)	0.32	0.98

\*p < 0.05

Statistical models

# Results: Competition as a Mediating Variable

- Competition is negatively correlated with ceiling breaches, support for H3 (-0.25)
  - This correlation is strongest with smaller contracts and fades as contract ceilings get higher
- Competition is positively correlated with terminations, opposing H3 (0.58)
  - The coefficient for terminations is more than twice that of ceiling breaches
- For both consolidation and competition, ceiling breach finding is strongest for smaller contracts.

	Complete Or Partial Terminations	Ceiling Breach
(Intercept)	-6.16 (0.10)*	-5.38 (0.05)*
n_Comp	0.58 (0.03)*	-0.25 (0.03)*
cl_Ceil	-0.04 (0.01)*	0.87 (0.02)*
cl_Days	0.83 (0.01)*	0.47 (0.01)*
SIDV	-0.58 (0.04)*	0.19 (0.03)*
MIDV	0.01 (0.07)	1.11 (0.05)*
FSSGWAC	-0.57 (0.07)*	0.24 (0.05)*
BPABOA	0.00 (0.09)	0.45 (0.08)*
n_Fixed	1.42 (0.09)*	0.38 (0.04)*
b_UCA	1.81 (0.06)*	1.94 (0.07)*
n_Comp:SIDV	-0.74 (0.05)*	
n_Comp:MIDV	-0.37 (0.09)*	
n_Comp:FSSGWAC	0.20 (0.09)*	
n_Comp:BPABOA	-0.74 (0.15)*	
n_Comp:b_UCA	-1.96 (0.27)*	-0.35 (0.14)*
b_Intl		0.13 (0.03)*
n_Comp:cl_Ceil		0.24 (0.02)*
cl_Ceil:SIDV		-0.33 (0.02)*
cl_Ceil:MIDV		-0.53 (0.03)*
cl_Ceil:FSSGWAC		-0.18 (0.04)*
cl_Ceil:BPABOA		-0.64 (0.08)*
cl_Ceil:b_UCA		-0.64 (0.06)*
AIC	115293.63	115669.09
BIC	115482.68	115893.58
Log Likelihood	-57630.81	-57815.54
Num. obs.	1000000	1000000
Num. groups: NAICS2	24	24
Var: NAICS2 (Intercept)	0.00	0.00

\*p < 0.05

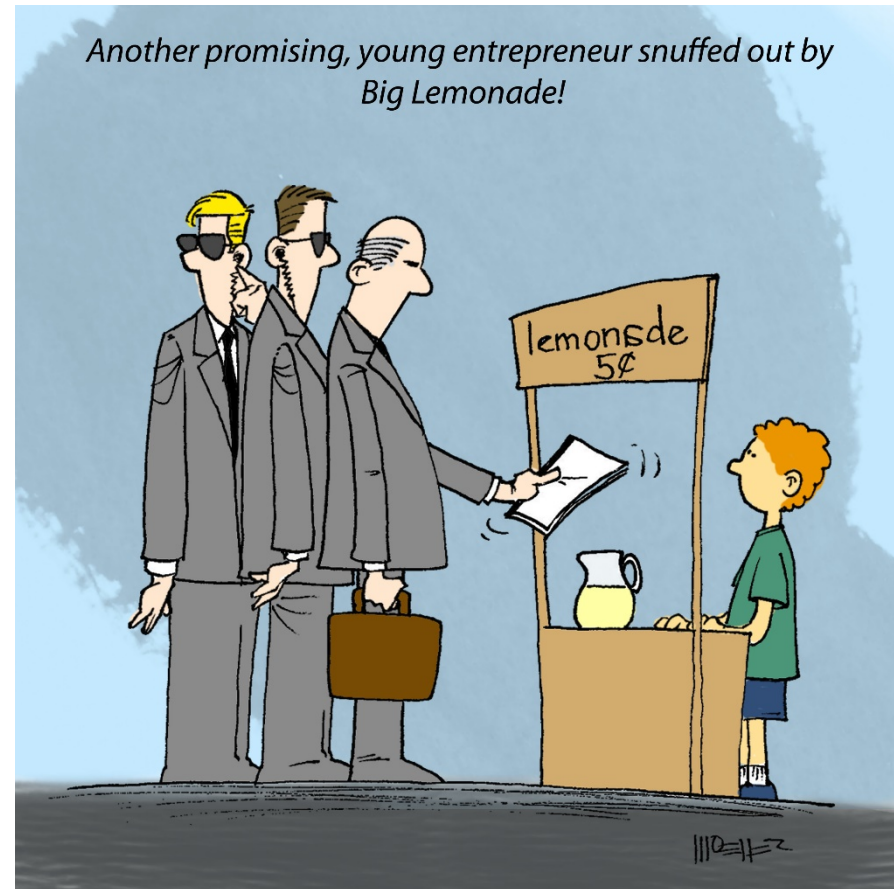
Statistical models

## Additional Noteworthy Findings

- Contract/Task order vehicles have a significant influence on contract outcomes.
- Fixed-Price contracts have strong positive correlation with terminations.
- UCAs have significant negative correlations with both terminations and ceiling breaches, justifying their classification as a high risk contract type.

## Concluding Thoughts

- Competition and lower rates of consolidation do correlate with a lower risk of cost escalation
- The choice of vehicles should be given additional attention as a factor influencing contract outcomes.
- Emphasis on the complex interactions of policy decisions and the risk of unexpected results.
- Data can support the judgment and human capital that are needed for successful acquisition policy, there are no one-size fits all solutions.



Source: Moeller, M. Used with non-commercial electronic publication license.

# Appendix

## Notes on Methodology

- The data for this analysis is drawn from the Federal Procurement Data System (FPDS), a publicly-available repository of federal contracting data.
- FPDS contains data on all prime, non-classified contracts over \$3,500 awarded by the federal government.
- The complete FPDS dataset includes 8.8 million contracts in the observed period between 2007 and 2015. After removing approximately 13.5% of the dataset due to incomplete entries, a random sample of 250,000 contracts was taken for analysis by the study team.
- Contract Ceilings are in current dollars, to avoid the risk of misestimating the spend rate of multi-year contracts.



## Empirical Approach

- Four working models are used to evaluate all combinations of **competition** and **consolidation** with **terminations** and **ceiling breaches**.
  - A maximum likelihood logit analysis analyzes both termination and ceiling breaches
  - Multilevel modeling techniques capture the differences in expected outcomes between industrial sectors

*Initial models do not address  $H_2$ , the connection between consolidation and competition. The results of this hypothesis testing will be available in the final technical report.*