

SEQUESTRATION: IMPACT ON SMALL BUSINESS CONTRACTING WITH  
THE DEPARTMENT OF DEFENSE

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By

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# SEQUESTRATION: IMPACT ON SMALL BUSINESS CONTRACTING WITH THE DEPARTMENT OF DEFENSE

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## ABSTRACT

It is an explicit policy goal of the United States (U.S.) to promote small business, including in contracting with the federal government. The majority of federal contract dollars are awarded by the Department of Defense (DoD), which recently took steps to increase contracting opportunities for small businesses. However, DoD suffered severe and unexpected budget cuts in fiscal 2013 as a result of sequestration and was forced to dramatically reduce contract obligations. Previous studies investigated the relationship between DoD and small business contractors and highlighted factors that predict the extent of awards to small vendors. This paper builds on that research to examine the effect of sequestration on the likelihood of small vendors winning prime contract awards from DoD, using a probability model with data from the Federal Procurement Data System - Next Generation. Additionally, this paper reports on the current limitations of federal subcontracting data available from the Federal Funding Accountability and Transparency Act Subaward Reporting System, which was found to be too incomplete and unrepresentative to allow meaningful analysis of trends in small business subcontracting.

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Many thanks,  
Loren Lipsey

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## **Background – Small Business Contracting**

### *Small Business Administration Federal Procurement Goals*

Congress regards the promotion of small business as an important policy objective, and passed the Small Business Act (Pub L. 83-163) in 1953 to create the Small Business Administration (SBA) as the lead agency for small business promotion. Later, Congress set a statutory goal for the proportion of federal procurement dollars awarded to small businesses (Pub. L. 100-656 §502), and the goal has been 23 percent since 1997 (Pub. L. 105-135 §603(b)(1)(B)).

SBA tracks the proportion of both prime contracts and subcontracts awarded to small businesses for federal procurement, using data from the Federal Procurement Data System (FPDS) and Electronic Subcontracting Reporting System (Small Business Administration, 2015). For procurement contracts over \$500,000, prime contractors are required to submit a subcontracting plan that includes a negotiated goal for small business subcontracting and anticipated steps to meet the goal (Pub. L. 95-507 §211). Prime contractors also must follow up by providing data on small business subcontracting in such cases (Beale, 2014).

Because extensive contracting with small businesses is more practicable for some agencies than for others, the SBA negotiates an individual goal with each agency, while ensuring that the proportion of small business contracting will meet the overall statutory target if all agencies meet their individual goals. SBA has no authority to impose penalties for agencies that fall short; courts have construed the small-business contracting goals as “aspirational,” avoiding Constitutional issues about potentially discriminatory quotas favoring, for example, minority-owned small businesses (Beale, 2014, p.7).

## *Department of Defense Performance on Small Business Contracting*

The Department of Defense (DoD) is by far the largest source of federal government contracts, and therefore exerts the most influence on small business contracting goal performance. As of 2014, DoD represents \$285 Billion of the \$447 Billion market in federal government contracting - more than every other agency combined (National Contract Management Association, 2015, p.10). Increases in the DoD small business contracting rate helped the SBA to meet its 23 percent prime contracting goal for the first time in fiscal 2013, with further improvements in fiscal 2014 and fiscal 2015 (Small Business Administration, 2016).

In the most recent two fiscal years DoD prime contracting with small business has increased but subcontracting has decreased. DoD awarded 24.6 percent of prime contracts to small businesses in fiscal 2015, following 23.5 percent in fiscal 2014 and exceeding SBA goals in both years (DoD Office of Small Business Programs, 2015). These yearly rates represent two of the three highest yearly rates of DoD prime contract awards to small businesses since the start of tracking in 2003. By contrast, small businesses received 32.3 percent of total DoD subcontracting by dollar value for fiscal 2015, down from 33.2 percent in fiscal 2014 and 35.4 percent in fiscal 2013 (Small Business Administration, 2016). These rates did not meet the SBA goals of 36 percent in each year, and represent two of the three lowest recorded small business subcontracting rates since DoD began tracking them in 2003.

In recent years DoD launched a series of acquisition policy reform initiatives under the banner of “Better Buying Power,” beginning with Better Buying Power (BBP) 1.0 in 2010. Introduced by future Secretary of Defense Ashton Carter, then the Undersecretary of Defense for Acquisition Technology and Logistics, BBP 1.0 explicitly aimed to “make every effort to provide

for small business participation” (Carter, 2010, p.5) and included specific implementation directives to compete more types of contracts to small businesses and to give preferences to small businesses during source selection (OSD:AT&L, 2010).

DoD followed up with the Better Buying Power 2.0 initiative in 2012, reiterating that “Small businesses, as both prime contractors to the Department and subcontractors within the supply chain, are effective sources of innovation and reduced cost. The Department will continue its emphasis on improving small business opportunities” (Kendall, 2012, p.5). Most recently Better Buying Power 3.0, released in 2015, continued DoD’s focus on promoting small business contracting and particularly emphasized increasing small business participation in DoD research and development contracting.

## **Background – Sequestration**

The Budget Control Act of 2011 (Pub. L. 112–25 §365) attempted to control the growth of federal budget deficits by forming a “supercommittee” which would recommend deficit-reduction legislation to be voted on by the full legislative bodies without amendment or filibuster. When the supercommittee failed to reach a compromise and did not recommend any legislation, the BCA deadline triggered broad automatic cuts to discretionary spending. The automatic budget cuts, known as sequestration, took effect in 2013 and, proportionally, had the largest effect on DoD (Matthews, 2013).

Two-year bipartisan deals in 2013 (Pub. L. 113-67) and 2015 (Pub. L. 114-74) raised the budget caps above sequestration levels and provided some relief to the DoD budget beginning in fiscal year 2014, but extended the caps through 2025. Under sequestration and the two follow-

up deals, the DoD budget fell dramatically in fiscal 2013 then remained roughly steady at that level until the present, coming in far below the levels the Department had expected and planned for (Harrison, 2016).

### *Predicted Impact of Budget Cuts on Defense Industrial Base*

Policymakers, academics, and industry had long worried about the impact of periods of defense drawdown on the capability of industry to respond to future needs. As the authors of a major survey of the industrial base during the previous drawdown after the cold war put it, “the base grows ‘cold’ from neglect; the risk to national security increases correspondingly” (Boezer, Gutmanis & Muckerman, 1997, p.27). Of particular concern are “defense-unique” industrial capabilities: design or production skills and infrastructure which are not applicable for commercial purposes and which may atrophy during a drawdown, proving difficult or impossible to rebuild later if needed (Aerospace Industries Association, 2009). Additionally, defense industry consolidation during periods of falling budgets reduces competition among firms, which may lead to higher costs and less innovation for DoD. (Kovacic & Smallwood, 1994).

The effect of budget cuts on subcontractors - of ten small businesses that produce components used in larger work or provide key services used in larger projects - is of particular concern. Researchers have noted that the trend in many sectors of the defense industry had been towards increased subcontracting of more critical components, with prime contractors acting as system integrators. “[W]ith primes increasingly focused on integrating complex systems, significant innovations are now expected to occur in second-tier firms as well as at the prime contractor level” (Birkler et al. 2011, p. xix).

Besides being crucial to the capability of the industrial base, policymakers feared small business would be more vulnerable to impacts from budget cuts. Because large prime contractors had the connections and support to weather the storm, they predicted, smaller suppliers would suffer most from diminishing budgets (Samuelsohn, 2013). Furthermore, because long-term planning and budgeting processes had not anticipated for the 2013 sequestration, DoD was forced to make disproportionate reductions to training, maintenance, and readiness programs, which could be more quickly and easily cut (Pellerin, 2013). DoD service contracts, such as those for training and maintenance, are much more likely to be awarded to small businesses than contracts for products or R&D (Ellman et al., 2016).

Public reports during fiscal 2013 highlighted the danger to small defense contractors. Pentagon procurement officials put “small business at the top of their list of worries about sequestration’s effect on the industrial base,” and trade industry associations reported that “smaller companies are seeing the impact first” and “are being hit pretty hard” (Serbu, July 2013). Deputy Secretary of Defense Ashton Carter repeated the concern that small contractors “are more whipsawed by [the impact of sequestration], and frequently they don’t have the resiliency to go through that and still survive.” (Serbu, March 2013).

## **Previous Research**

### *Sector-by-Sector Tier-by-Tier Survey*

DoD, in part due to fears about the impact of sequestration and the subsequent budget cuts on the defense industrial base, commissioned an in-depth survey of supplier relationships within the defense industry (Serbu, 2011). The sector-by-sector tier-by-tier survey (S2T2) began in 2012 and continued at least through 2013. Officials reported that the effort was expensive and

although data was very valuable it was quickly obsolete; efforts to maintain and update the S2T2 database are no longer continuing (Bertheau, Broitman 2016). Although the findings of the S2T2 are confidential, officials have indicated that small businesses at the lower tiers of the defense industrial base bore the brunt of budget cuts and in many cases were forced to modify their business models (Maucione, 2014).

### *SBA Independent Evaluation*

An independent evaluation of SBA goal attainment (Beale 2014) found that “the largest gaps between procurement rates and goals—the largest barriers to small business—are found in industries with the most procurement dollars going to a relatively small number of large businesses . . . [where] contracting dollars are very concentrated” (Beale, 2014, p.73). The study classified contractors by industry rather than by the customer agency, but the three largest industries with small business contractor shares under 8.5 percent are all Department of Defense mainstays: Aircraft Manufacturing, Aircraft parts and equipment, and Ship Building (Beale, 2014, p.76 fn. 108).

### *Research by the Center for Strategic and International Studies*

Ellman et al. (2016) found that DoD prime contract obligations to small vendors as a share of overall prime contract obligations had been “largely stable” at fifteen to sixteen percent every year from fiscal 2000 to fiscal 2013. In Fiscal 2014, though, overall DoD prime contract obligations to small vendors increased to 19 percent the highest share in the sample. This increase represented an absolute rise in DoD prime contract obligations to small vendors, amid a trend of declining observations overall. The increase was broad-based, with each military service increasing prime contract obligations from fiscal 2013 to fiscal 2014. The Army had the

highest share of prime contract obligations to small vendors, 26 percent in fiscal 2014. In a simple comparison of contract obligations at the level of individual vendors, the researchers found that the Defense industrial base was moderately less concentrated in fiscal 2014 than it had been ten years prior (Ellman et al. 2016, p. 55).

In an earlier study Ellman & Bell (2015) looked specifically at DoD prime contracts for products (as opposed to services or research and development) and used data extending back to 1990 in an effort to compare the modern situation to a previous period of declining defense budgets – the drawdown after the end of the cold war. The researchers found that the share of DoD prime contracts for products that was awarded to small businesses had remained stable at ten to eleven percent of overall prime contract obligations for products during the decade after the cold war. The share of products obligations to small businesses varied widely by product category: small businesses captured more than 40 percent of DoD contract obligations for clothing and subsistence at times during the nineties, but captured a negligible share of DoD contract obligations for missile and space systems throughout the sample (Ellman & Bell, 2015, p. 26-36).

McCormick & Sanders (2015) examined three-month lagging averages of small business prime contracting in the years after major DoD policy reforms, as part of a project to study the impact of the policy changes. The researchers found that small business DoD prime contracting share is consistently highest in the fourth quarter of the fiscal year, and noted that obligations to small businesses had risen after the implementation of Better Buying Power 2.0 (McCormick & Sanders, 2015, p. 54).

### *Research by the RAND Corporation*

Moore et al. (2014) were the first researchers to make use of the publicly available subcontracting data from the FFATA Subaward Reporting System (FSRS) to analyze DoD procurement trends at the subcontract level. They demonstrated that FSRS data can be used to verify a prime contractor's SBA-required subcontracting plan and performance. As an illustration and trial case, they found that within the data coverage of the FSRS, Lockheed Martin awarded a share of subcontracts to small businesses that exceeded DoD's SBA-assigned subcontracting goal (Moore et al., 2014, p.22). However, broad-based analysis was not possible because of insufficient data reported in FSRS.

In a comprehensive review of small business contracting with DoD, Moore et al. (2008) find that small businesses participation in DoD contracting varies by industry and has been highest in construction and family housing, lowest in aircraft manufacturing and engineering services. Small businesses who had performed DoD contracts in previous years tended to remain small (44 percent) or stop contracting with DoD (43 percent), rather than "graduate" to contracting as a large business. In a quantitative overview of the DoD industrial base, Moore et al. (2016) found that the defense industry was consolidating overall, as measured by the Herfindahl-Hirshman Index, and that the share of procurement dollars going to the largest firms had steadily increased from 1997 to 2012.

### *Other Research*

Kidalov (2012) examined the effect of contract bundling and consolidation on small business contracting share within the Department of the Navy, finding that bundling and consolidation of contracts represented a significant barrier to small business participation in Navy

contracting. Most contracts that were bundled or consolidated could have been performed by small firms, and bundling reduced competition and was harmful to the defense industrial base (Kidalov, 2012, p. 3676).

Bick (2016) also investigated Navy contracting, focusing on subcontracting to small businesses and finding that small business mandates and more-engaged contracting officers were effective to increase subcontract awards to small businesses, while incentives, best value determination, and corporate social responsibility initiatives did not. Small Business Administration (2012) also studied the determinants of small business contracting share across the federal government, finding that use of fixed price contracts was associated with high small business participation, while competitive awards, manufacturing industry contracts, and larger contracts were associated with low small business participation.

## **Hypothesis**

*At the prime contract level, sequestration will reduce the chance that a small business wins a new contract, after controlling for the size of the contract, DoD component, and industry.*

## **Data**

### *Data Sources*

Prime contracting data for the project is originally from the Federal Procurement Data System - Next Generation (FPDS-NG), a publicly available database of U.S. federal government contracts. FPDS-NG is maintained by the General Services Administration, and contract obligation data is input by the contracting agencies for any prime contract over \$3000 in total

value. The FPDS-NG database is available at the USAspending.gov website as far back at 2000, although data quality improves substantially in later years.

This project also examined federal subcontracting data from the FFATA Subaward Reporting System (FSRS), also publicly available on USAspending.gov. However, FSRS reporting requirements were more recently instituted than for FPDS, and apply to prime contractors rather than to government agencies. Reporting has been low and, as a result, the data quality and coverage of FSRS is still poor. It proved insufficiently complete and representative to allow for meaningful analysis, and as a result the analysis in this paper will focus on prime contracting. Some treatment of the potential future application and policy relevance of the FSRS data is provided later in the discussion section.

FPDS data has been cleaned, validated, and cross-referenced with other data sets by the Defense Industrial Initiatives Group at the Center for Strategic and International Studies (CSIS). In particular, previous work on the CSIS database enabled more detailed analysis of vendor size - breaking out vendors into four size categories rather than simply small or not small - and more consistent association of contracts with both vendors and DoD components.

### *Data Summary*

The data comes from FPDS at the level of contract actions, but for purposes of this analysis will be aggregated to the level of the contract-year, rolling up multiple actions on the same contract in the same year to a yearly aggregate. Using contract-year as the unit of analysis, there are still more than six million observations in fiscal years 2012 and 2013 combined.

Relevant variables for analysis are listed in table 1, along with their mean and their predicted effect on the probability of a contract going to a small business. The independent

variable is whether a contract was signed before sequestration (FY 2012) or after sequestration (FY 2013), and the dependent variable is whether the contract went to a small business.

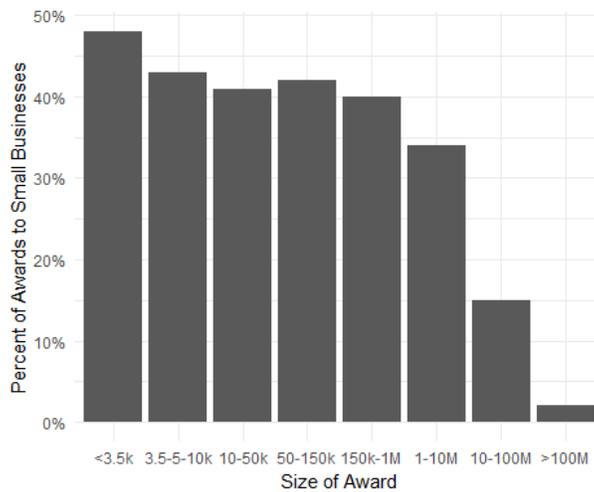
Table 1: Summary of Relevant Variables

Variable	Description	Format For Use	Mean (weighted by dollar value)	Expected Relationship with DV
<b>Signed Date</b>	<b>Independent Variable</b> - the date of the contract award agreement	Dummy coded 0 if before sequestration, 1 if after	0.4633	Negative
<b>Business Size</b>	<b>Dependent Variable</b> - the contracting officer's determination whether the vendor qualifies as a small business for the NAICS code that is applicable to the contract	Coded 1 for small business, 0 otherwise	0.1575	----
<b>Dollars Obligated</b>	The net dollar amount obligated by the transaction	Continuous	93,430	Negative
<b>Army</b>	Whether the Army issued the contract	1 if Army, 0 if not	0.2956	Positive
<b>Navy</b>	Whether the Navy issued the contract	1 if Navy, 0 if not	0.2842	Negative
<b>Air Force</b>	Whether the Air Force issued the contract	1 if Air Force, 0 if not	0.1890	Negative
<b>MDA</b>	Whether the Missile Defense Agency issued the contract	1 if MDA, 0 if not	0.0219	Negative
<b>DLA</b>	Whether the Defense Logistics Agency issued the contract	1 if DLA, 0 if not	0.1164	Positive
<b>Other DoD</b>	Whether another DoD component issued the contract	Catch-all for DoD component categories; 1 if no other component indicated	0.0929	Positive
<b>Industry</b>	The industry of the vendor, by NAICS code	Dummy Variable for each industry	Multiple	Some of each

The key control variable is the size of the contract award, represented by the dollars obligated. Small businesses are incapable of performing the largest contracts, and are more likely to bid on and win contracts as the size of the contract decreases. Because contracts with values between \$3,500 and \$150,000 are set aside for small business (FAR, 48 C.F.R. § 19.5), it might

make sense to segment the contract amount variable to capture whether contract awards fall in this range. However, as shown in figure 1, the proportion of contracts awarded to small business decreases steadily with contract size and does not appear to be substantially inflated within the set-aside range. Therefore contract size is included in the main model as a continuous variable, as the natural log of the contract dollar value.

Figure 1: Contract Awards to Small Businesses by Award Size, 2009-2013



Another relevant control variable is the industry classification of the contract award. One goal of this analysis is to distinguish the effects of sequestration on small business due to shifts in the industry structure of DoD contracting (i.e. towards or away from small-business-friendly industries) from the effects on small business of shifts to different vendors within an industry. In other words, was any sequestration-associated change in small business contracting patterns reflective of DoD contracting more with some industries and less with others, or more reflective of choosing different vendors within a given industry?

Table 2 shows the top 10 industries for DoD contracts for fiscal 2012 and fiscal 2013, revealing both lower overall contracting dollars under sequestration and an impact on the distribution of contracting obligations by industry. Of particular note is that building construction - the number one industry by dollar value for small business DoD contractors - declined by nearly a third under sequestration. Meanwhile Aircraft Manufacturing, which has a very small proportion of small businesses, was essentially unaffected by sequestration.

Table 2: Top 10 DoD Contracting Industries by NAICS Description, 2012 vs. 2013

<b>Rank</b>	<b>NAICS Description (2012)</b>	<b>Total Contract Obligations (2012)</b>	<b>NAICS Description (2013)</b>	<b>Total Contract Obligations (2013)</b>
<b>1</b>	Aircraft Manufacturing	\$46.7 billion	Aircraft Manufacturing	\$45.8 billion
<b>2</b>	Engineering Services	\$28.8 billion	Engineering Services	\$24.9 billion
<b>3</b>	Petroleum Refineries	\$18.4 billion	R&D in the Physical, Engineering, and Life Sciences	\$15.3 billion
<b>4</b>	R&D in the Physical, Engineering, and Life Sciences	\$16.6 billion	Ship Building and Repairing	\$15.2 billion
<b>5</b>	Ship Building and Repairing	\$16.6 billion	Facilities Support Services	\$11.2 billion
<b>6</b>	Commercial and Institutional Building Construction	\$15.4 billion	Other Aircraft Parts and Auxiliary Manufacturing	\$10.8 billion
<b>7</b>	Other Aircraft Parts and Auxiliary Manufacturing	\$13.5 billion	Petroleum Refineries	\$10.6 billion
<b>8</b>	Facilities Support Services	\$10.9 billion	Guided Missile and Space Vehicle Manufacturing	\$10.6 billion
<b>9</b>	Guided Missile and Space Vehicle Manufacturing	\$10.7 billion	Commercial and Institutional Building Construction	\$10.4 billion
<b>10</b>	Direct Health and Medical Insurance Carriers	\$10.0 billion	Direct Health and Medical Insurance Carriers	\$9.8 billion

Table 3 provides a few example industries to illustrate the great extent to which small business participation varies by industry. All industries listed are among the fifteen with the most small business participation by dollar value, but their rates of small business participation vary from only 5.7 percent in the ship building industry to 99.9 percent in wholesale service

supplies. Aircraft manufacturing, by far the largest industry for DoD contracting, was not among the largest fifteen for small businesses; its small business participation rates are extremely low.

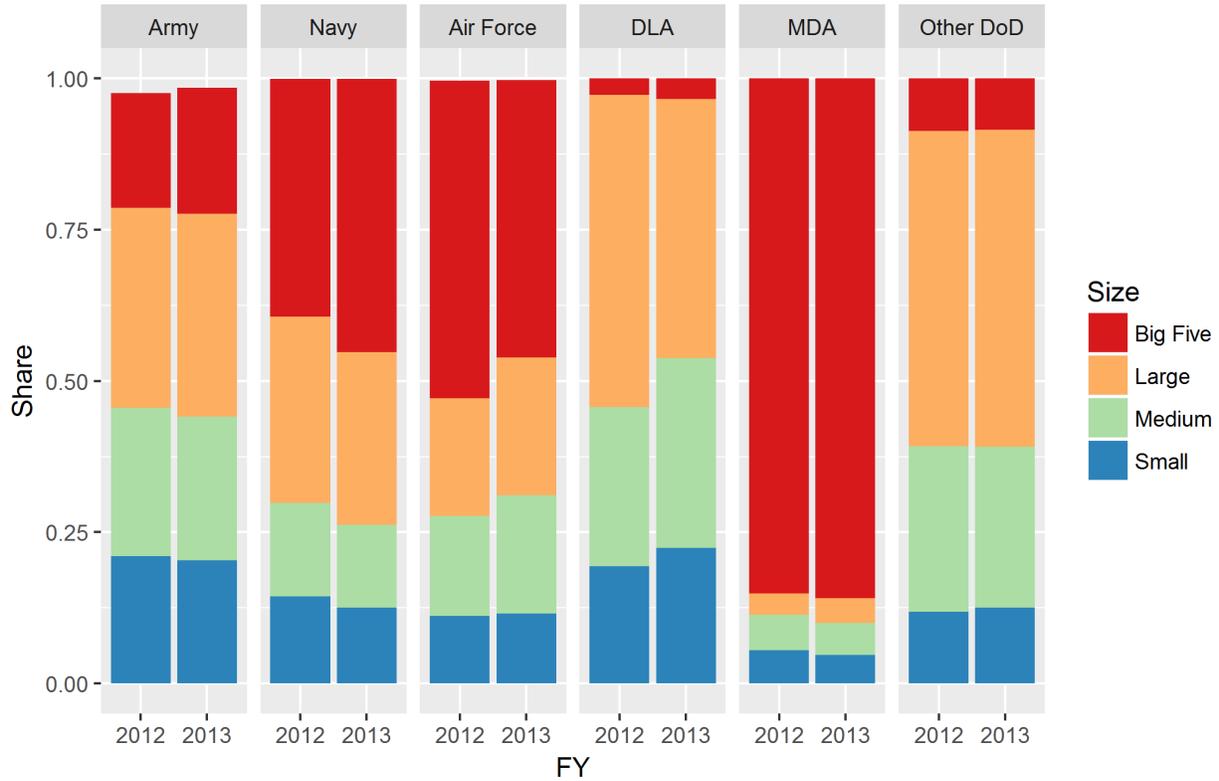
Table 3: Selected Industries by NAICS Code, 2012-2013 Combined

<b>NAICS Industry Description</b>	<b>DoD Contract Obligations to Small Business (2012 + 2013 combined)</b>	<b>Share of DoD Contract Obligations going to Small Businesses (2012 + 2013)</b>
<b>Ship Building and Repairing</b>	\$1.8 billion	5.7 percent
<b>Facilities Support Services</b>	\$3.5 billion	15.7 percent
<b>Computer Systems Design Services</b>	\$2.0 billion	28.0 percent
<b>Commercial and Institutional Building Construction</b>	\$11.0 billion	42.7 percent
<b>Remediation Services</b>	\$2.1 billion	51.6 percent
<b>Service Establishment Equipment and Supplies Merchant Wholesale</b>	\$1.7 billion	99.9 percent

A final covariate is the DoD component issuing the contract. Previous research found that the Army and the Defense Logistics Agency (DLA) awarded a higher share of contracts to small business than the other DoD components, while the Air Force and the Missile Defense Agency awarded low shares of contracts to small businesses.

Figure 2 shows the share of contracts won by vendors of various sizes for each of the DoD components, in fiscal 2012 and fiscal 2013. Several features are of note. The Missile Defense Agency, followed by the Air Force, awarded the smallest proportion of contracts to small businesses (the blue bars) in both years. The Big Five prime defense contractors dominate obligations in both. The DLA and Army award more contracts to small vendors. Finally, there is no readily apparent net change in DoD contract obligations to small businesses between fiscal 2012 and fiscal 2013, although shares within components change a bit.

Figure 2: Share of Contract Obligations to Vendors by Size in 2012 and 2013, for Various DoD Components



## Model

$$Pr(\text{Small}) = \beta_0 + \beta_1 (\text{Sequester}) + \beta_{2 \dots n} X_{2 \dots n} + \varepsilon$$

Where  $Pr(\text{Small})$  is the probability that a given contract is awarded to a small business, and  $\text{Sequester}$  is a dummy variable indicating whether the contract was awarded before sequestration (0) or after sequestration (1).  $\beta_1$ , the coefficient on the sequestration dummy, is the variable of interest in the analysis. Additional betas represent the effect of covariates  $X_2, X_3 \dots X_n$  which include contract size, DoD component dummies, and industry dummies.

## Methods

Initial estimation of the probability of a contract being awarded to a small business is done using Ordinary Least Squares, as the Linear Probability Model (LPM). Because some predicted probabilities under the LPM fall significantly outside the (0,1) range - likely because of the presence of a few extremely large contracts in the dataset - logit models are estimated as robustness checks. Additional analyses are conducted, serving as both extensions of the main model and as robustness checks.

## Results

### *Primary model*

Table 4 shows the results of the primary specification, which applies the LPM to analyze the impact of sequestration on the probability that a given DoD contract would be awarded to a small business, using data from fiscal 2009-2013. Covariates in the primary specification include the size of the contract award (in natural logs), the DoD component awarding the contract (as dummy variables, with Defense Logistics Agency as the reference category), and the industry classification of the contract (as dummies for two-digit NAICS categories, with Financial Services as the reference category). Full results for all models are included in the appendix.

In the primary model, sequestration is represented by a dummy variable, “Sequester,” coded 1 for contracts awarded in Fiscal Year 2013 and 0 for contracts awarded before Fiscal Year 2013. The large size of the data set – more than six million observations – leads to high levels of statistical significance for nearly all of the covariates, with P-values that round to zero. Because of this, it is helpful when looking for the most influential covariates to examine the coefficients first. The coefficient on Sequester is positive, indicating that a given DoD contract was about two

percentage points more likely to be awarded to a small business in 2013 than in previous years, contrary to the hypothesis.

Table 4: Primary Model (LPM)

<b>Primary Model (n = 5,699,479)</b>	<b>Coefficient</b>	<b>SE</b>	<b>P-value</b>
<b>(Intercept)</b>	0.2202	0.0037	0.000
<b>Amount (ln)</b>	-0.0295	0.0001	0.000
<b>Sequester</b>	0.0270	0.0005	0.000
<b>Additional control variables:</b> Industry dummies, Component dummies			

The key covariate is the size of the contract (“Amount (ln)”). Larger contract awards are less likely to go to small businesses. Since the contract size variable is in natural logs, its coefficient can be interpreted to mean that a one percent increase in contract size is associated with roughly a 0.03 percentage-point decrease in the chance of a small business winning the contract.

Within the DoD component dummies, it is noteworthy that the Defense Logistics Agency (the reference category) and the Other DoD catchall were substantially less likely to award contracts to small businesses, when controlling for industry and contract size. Within the industrial classification dummies, the Finance and Insurance (NAICS code 52, the reference category) and Public Administration (NAICS code 92) industries were particularly unlikely to award contracts to small businesses, while the Health Care and Social Assistance industry (NAICS code 62) was the most likely.

Because the dataset contains both very small and very large contracts – the highest are well over ten billion dollars – the LPM predicts probabilities of less than zero or greater than one for a number of observations. As a check on the reasonability of the LPM in this case, table 5 contains results from a logistic regression using the same variables.

Table 5: Logit Model

<b>Logit Model (n = 5,699,479)</b>	<b>Coefficient</b>	<b>SE</b>	<b>P-value</b>
<b>(Intercept)</b>	-2.4839	0.0419	0.0000
<b>Sequester</b>	0.1310	0.0026	0.0000
<b>Amount (ln)</b>	-0.1388	0.0006	0.0000
<b>Additional control variables:</b> Industry dummies, Component dummies			

Logistic regression coefficients are not meaningful without additional interpretation, but the Sequestration dummy and the covariates have the same sign as in the LPM, and are once again significant. This offers some confirmation that the LPM gives a reasonable result in the primary model. Additionally, the marginal effect of sequestration at the mean of all other covariates was a 3.17 percentage point increase in the chance of a small business winning the contract.

Table 6: Interaction Model (LPM)

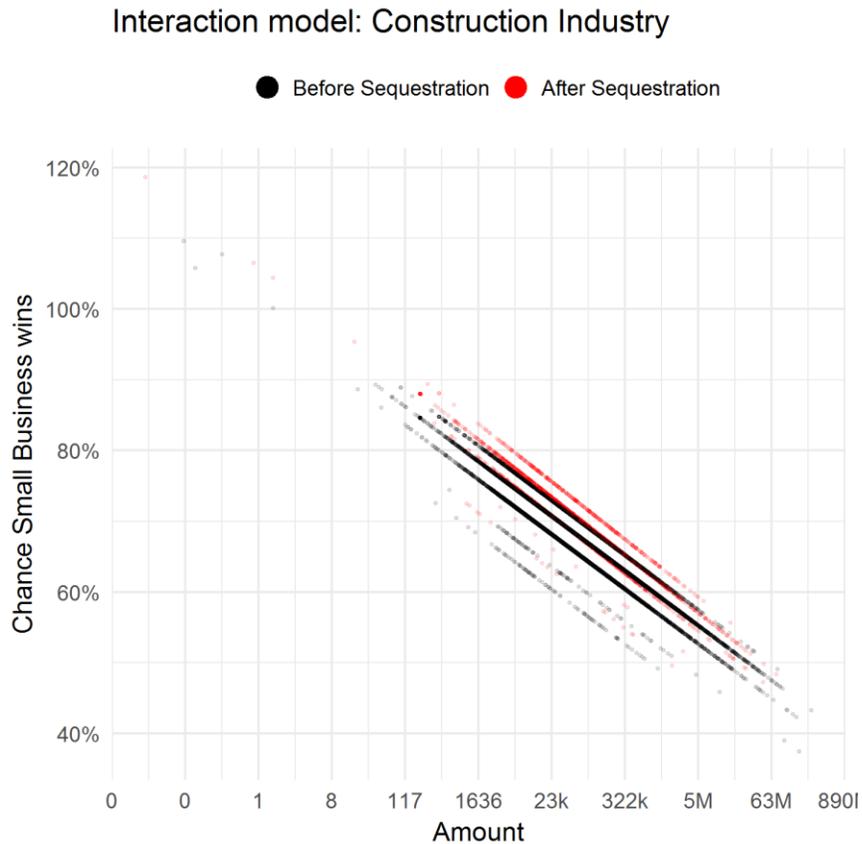
<b>Interaction Model (n = 5,699,479)</b>	<b>Coefficient</b>	<b>SE</b>	<b>P-value</b>
<b>(Intercept)</b>	0.2182	0.0037	0.0000
<b>Amount (ln)</b>	-0.0293	0.0001	0.0000
<b>Sequester</b>	0.0427	0.0031	0.0000
<b>Amount * Sequester</b>	-0.0016	0.0003	0.0000
<b>Additional control variables:</b> Industry dummies, Component dummies			

Finally, an interaction term was added to investigate whether the relationship between sequestration and the chance for small businesses to win contract awards was different for different sizes of contract. In the results for this model, shown in table 6, the interaction between logged contract size and the sequestration dummy is negative and significant, indicating a significantly stronger negative relationship between size and a small business winning a contract after sequestration than before. However, the magnitude of the interaction term's coefficient is less

than a tenth of that of logged amount. This indicates that, despite statistical significance, the change in the relationship after sequestration is unlikely to be of practical significance.

Figure 3 shows a plot of the model predictions from the interaction model, using the Construction industry as an example. The X-axis shows contract amount (on a log scale), while the Y-axis shows the model predicted probability that a contract will go to a small business. Points represent individual contracts, randomly sampled from Construction industry contracts used in the interaction model. Contracts after sequestration are show in red, before sequestration in black.

Figure 3: Predicted Probabilities of Small Business Award From Interaction Model



The figure demonstrates several aspects of the model. First, the clear negative (downward) association demonstrates that larger contracts were less likely to go to small businesses.

Additionally, the slope of the trend for the red (sequestration) points is not much different than for the black (pre-sequestration) points, demonstrating that the interaction term is not very influential. Finally, the parallel lines of points occur because of the inclusion of dummy variables for different DoD components (Army, Navy, etc.). Some components were more likely to award contracts to small business than others, which shows up in the figure as separate lines of model-predicted points.

### *Robustness Tests*

Table 7 contains coefficients, standard errors, and P-values for a number of additional models. These models represent robustness tests, which examine the sensitivity of the results to different decisions about the years and types of contracts included in the sample, or about the covariates included in the model. Overall, these specifications confirm the finding that the probability that DoD would award a given contract to a small business, all else being equal, rose under sequestration in Fiscal Year 2013. Full results from all regressions, including these robustness tests, are available in the Appendix.

Table 7: Robustness Tests

<b>Robustness Tests</b>	<b>N</b>	<b>Sequester (SE)</b>	<b>Amount (ln) (SE)</b>	<b>Included Dummies</b>
<b>Bivariate</b>	5,699,479	0.0137*** (0.0006)	-	-
<b>Bivariate plus Amount (ln)</b>	5,699,479	0.0137*** (0.0006)	-0.0163*** (0.0001)	-
<b>2008-2016</b>	12,249,747	0.0261*** (0.0003)	-0.0314*** (0.0002)	Industry, Component
<b>2012 vs. 2013 only</b>	1,712,656	0.0273*** (0.0007)	-0.0314*** (0.0002)	Industry, Component
<b>Indefinite Delivery Vehicles only</b>	3,587,526	0.0290*** (0.0006)	-0.0208*** (0.0001)	Industry, Component

First, simple bivariate regression shows a highly significant trend towards a higher probability of contract awards to small businesses in 2013. This relationship is unchanged by including the size of the contract as a covariate in the simple model.

The primary specification uses data from 2008 through 2013, contrasting four years of pre-sequestration contracts against contracts in 2013. To check for sensitivity to the choice of date range, robustness checks were estimated using the same method as the primary model, but with either a narrower (2012 vs. 2013) or wider (2009-2012 vs. 2013-2016) time scope. Both found a significant positive impact of sequestration on small business contracting probability, of similar magnitude to the primary specification.

More than half of the contracts in the dataset were defined as Indefinite Delivery Vehicles, in which the government contracts with a vendor to fill supply or service orders on an ongoing basis. This is in contrast to contracts representing one-time orders for goods or services, and the two types of contract vehicles may differ enough that grouping them together for analysis obscures trends in small business contracting. As a check, a model using only the Indefinite Delivery Vehicles was estimated. Results were similar to the main specification.

The appendix contains regression results for a series of regressions applying the main LPM model to single industries (Tables A7 to A12). These single industry models all show a positive, statistically significant effect of sequestration on the probability of a contract being awarded to a small business. The slightest – but still positive – effect occurred in the Wholesale Trade industry, where sequestration was associated with a 0.4 percentage point increase in the probability a small business wins a contract. The strongest effect occurred in the Professional, Scientific, and

Technical Services industry, where sequestration was associated with a 5.4 percentage point increase in the probability that a small business wins a contract.

Finally, an LPM model was estimated with a segmented contract size variable (Table A6 in Appendix). Because contracts above the minimum threshold (\$3,500) and below the Simplified Acquisition Threshold (\$150,000) are set aside for small businesses, it is reasonable to expect sharp changes in small business win probability at the borders of this range. However, the segmented model shows no evidence of such changes, as increasing contract size is associated with a steady decrease in small business win probability through all categories, both within the set-aside range and outside it.

## **Discussion**

The above results demonstrate that, contrary to expectation, small businesses were more likely to win a given Department of Defense contract award in 2013 than in previous years, when controlling for award size, industry, and awarding component. In combination with previous research showing no decline in the small business share of DoD prime contracting during sequestration, and with DoD's progress towards reaching Small Business Administration contracting goals during Fiscal 2013, this analysis provides evidence against the hypothesis that small contractors were disproportionately harmed by cuts to the DoD budget associated with sequestration.

### *Possible Explanations for Increased Chance of Award to Small Business*

Why might the chance for small businesses to win DoD contracts have increased during sequestration, contrary to the expectations and fears of both DoD and the contractors themselves?

Variation in the definition of small business may be one potential explanation. SBA defines small business differently in different industries, as represented by the NAICS code. In the middle of fiscal year 2012, SBA increased for the maximum size allowable for small businesses in several industries, as the first round of a review ordered by the Small Business Jobs Act (Federal Register, February 10 2012). Industries that saw their small business size limit raised include Scientific, Professional, and Technical Services (NAICS code 54), one of the most common industries for DoD contract awards.

There is some anecdotal evidence that, in the leaner environment for contracting dollars, midsize and large vendors were willing to compete for more small-dollar contracts than previously. However, because the government sets aside contracts under the Simplified Acquisition Threshold (currently \$150,000) for small businesses prime contractors, larger vendors may not be able to bid directly as the prime. One industry source suggested that large vendors were more active in “trying to find smaller companies to front-end smaller size deals,” passing work along to the larger vendors through subcontracts (Moore 2013). This possibility is difficult to investigate without access to reliable subcontracting data.

However, the most likely explanation for the lack of a negative impact from sequestration on small business contracting chances is that it reflects intentional policy by DoD and the strong influence of the SBA contracting goals. DoD made an explicit commitment, through its Better Buying Power reform efforts, to increase small business participation in contracting (Kendall 2012). By all accounts, DoD management emphasized increased contracting with small businesses to contracting officers, who took the message seriously (Moore 2013). One industry source indicated that, during sequestration, contracts were “either being bundled for large companies or .

. . . set aside for smalls,” potentially at the expense of mid-tier contractors (O’Connell 2013). Bundling for large companies may have been a way to complete contract award procedures more easily amidst the chaotic environment of sequestration. But preserving, and even increasing, the number of set-asides for small business shows a commitment in both policy and practice.

### *Policy Relevance*

The U.S. Department of Defense is one of the largest collective enterprises on Earth, with a budget that exceeds the annual revenue of any company in the world (Fortune, 2016). DoD’s annual contract obligations alone exceed the revenue of Exxon Mobil or Apple. When sequestration went into effect in fiscal 2013, DoD was faced with massive and unexpected budget cuts on a timeline too short to allow careful planning, gradualism, or decommitment from long term obligations. Instead, DoD absorbed sequestration’s cuts in the most immediately available place: contract obligations. Studying the result - including the impact on small business contracting - can shed light on the workings of DoD’s contracting system, the consequences of poor Congressional fiscal planning on government-serving firms, and the impact of demand shocks on industry generally.

Here, the research provides evidence that a sharp and surprising downturn in contracting did not diminish the chance for small businesses to win Department of Defense contracts, when controlling for relevant covariates. Sequestration may still have harmed small business contractors through a shift in contracting patterns away from industries favorable to small business, or simply by inflicting widespread losses to which small businesses were less resilient than large businesses. Indeed, the increased probability for small businesses to win contracts may reflect a management decision attempting to mitigate these possibilities: DoD officials feared small businesses would be

disproportionately harmed by the shock of sequestration, and compensated by favoring them in contract award decisions. It is not clear what role sequestration itself played in this policy choice, as opposed to longer-term policy changes within the Department such as Better Buying Power. Either way, this research provides evidence that a concerted policy effort by top management can effectively influence decision-making in a vast enterprise, even in the face of countervailing fiscal and economic conditions.

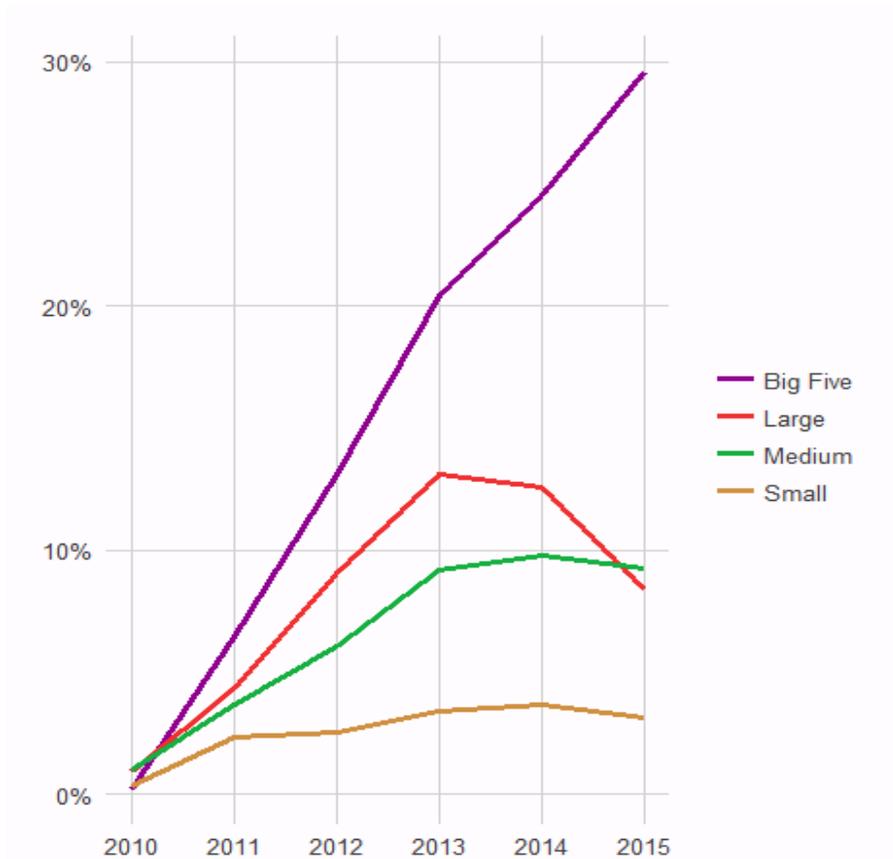
#### *Notes on Subcontracting Data and the FFATA Subaward Reporting System*

This research attempted to include data from the FFATA Subaward Reporting System, a public database of federal subcontracting data which is still in its infancy. In this research, subcontracting data would have been extremely relevant to help examine the impact of sequestration on lower tiers of the defense industrial base, where small businesses form a key part of supply chains. In addition, subcontracting data could have provided insight into the prevalence of “pass-through” contracts, where the prime contractor subcontracts out a substantial proportion of the work. Without access to subcontracting data, it is not possible to investigate to what extent larger businesses attempted to gain access to small business set-asides via accepting subcontract work from a small business acting as a prime contractor.

The FSRS data available from USAspending.gov, unfortunately, are not adequate for the task of investigating pass-through contracts or deeper tiers of the supply chain. Data from subcontracts are rarely associated with the correct prime contract – when subcontracting data are reported at all. Figure 4 shows the proportion of eligible prime contracts reporting subcontracting data to FSRS, weighted by dollar value. Of note, less than five percent of the eligible prime contract dollars awarded to small businesses were associated with a contract that reported

subcontracting data. Even this grim view understates the problem: contractors who receive large awards are disproportionately likely to meet their subcontracting reporting requirements, so weighting by dollar value obscures the reporting rate. By simple count, less than one in a hundred eligible prime contracts is associated with subcontracting data in FSRS.

Figure 4: Proportion of Prime Contracting Dollars Associated With Subawards in FSRS



The public will benefit highly from the development of a reliable subcontracting resource, which has great potential to offer insight into the presently murky area of subcontracting for federal procurement. So, too, will the government: the GAO has noted that, as of 2014, associating prime contracts with subcontracting data was “not currently feasible” even with access to the

government's Electronic Contracting Report System, which is not publicly available (GAO, 2014). Efforts currently underway to improve the quality and coverage of FSRS are as part of the DATA Act, with a planned rollout in May 2017, are a promising development for public transparency and better-informed public management.

## Appendix: Full Results of Regression Models

A1. Main Specification (LPM)			
	Coefficient	Standard Errors	P-value
(Intercept)	0.2202	0.0037	0.0000
Amount (ln)	-0.0295	0.0001	0.0000
Sequester	0.0270	0.0005	0.0000
Air Force [Component]	0.1258	0.0009	0.0000
Army [Component]	0.1036	0.0006	0.0000
MDA [Component]	0.2154	0.0072	0.0000
Military Health [Component]	0.1150	0.0083	0.0000
Navy [Component]	0.0777	0.0006	0.0000
Other DoD [Component]	0.0322	0.0013	0.0000
Unlabeled [Industry]	0.1034	0.0067	0.0000
Agriculture, Forestry [Industry]	0.5593	0.0096	0.0000
Mining [Industry]	0.5281	0.0067	0.0000
Utilities [Industry]	0.3521	0.0051	0.0000
Construction [Industry]	0.6799	0.0036	0.0000
Manufacturing 31 [Industry]	0.4515	0.0037	0.0000
Manufacturing 32 [Industry]	0.4225	0.0036	0.0000
Manufacturing 33 [Industry]	0.5887	0.0035	0.0000
Wholesale Trade [Industry]	0.2228	0.0035	0.0000
Retail Trade 44 [Industry]	0.5606	0.0038	0.0000
Retail Trade 45 [Industry]	0.6306	0.0048	0.0000
Transportation 48 [Industry]	0.3014	0.0040	0.0000
Transportation 49 [Industry]	0.3762	0.0070	0.0000
Information [Industry]	0.1839	0.0037	0.0000
Real Estate Leasing [Industry]	0.2885	0.0040	0.0000
Prof, Scientific, Tech Services [Industry]	0.4335	0.0035	0.0000
Management Services [Industry]	0.0490	0.1220	0.6879
Admin, Support Services [Industry]	0.5504	0.0036	0.0000
Educational Services [Industry]	0.4376	0.0041	0.0000
Health Care [Industry]	0.6816	0.0041	0.0000
Arts, Recreation [Industry]	0.6042	0.0062	0.0000
Accommodation, Food Services [Industry]	0.4253	0.0038	0.0000
Other Services [Industry]	0.4562	0.0038	0.0000
Public Administration [Industry]	0.1777	0.0050	0.0000
(Observations = 5,699,479)			

A2. Logistic Regression Specification			
	Coefficient	Standard Errors	P-value
(Intercept)	-2.4839	0.0419	0.0000
Amount (ln)	-0.1388	0.0006	0.0000
Sequester	0.1310	0.0026	0.0000
Air Force [Component]	0.5725	0.0040	0.0000
Army [Component]	0.4715	0.0028	0.0000
MDA [Component]	0.9619	0.0323	0.0000
Military Health [Component]	0.5049	0.0394	0.0000
Navy [Component]	0.3525	0.0028	0.0000
Other DoD [Component]	0.1268	0.0062	0.0000
Unlabeled [Industry]	1.1713	0.0619	0.0000
Agriculture, Forestry [Industry]	3.7607	0.0577	0.0000
Mining [Industry]	3.6424	0.0489	0.0000
Utilities [Industry]	2.9051	0.0452	0.0000
Construction [Industry]	4.3049	0.0418	0.0000
Manufacturing 31 [Industry]	3.3385	0.0420	0.0000
Manufacturing 32 [Industry]	3.2096	0.0418	0.0000
Manufacturing 33 [Industry]	3.9025	0.0416	0.0000
Wholesale Trade [Industry]	2.1898	0.0417	0.0000
Retail Trade 44 [Industry]	3.7687	0.0422	0.0000
Retail Trade 45 [Industry]	4.0726	0.0444	0.0000
Transportation 48 [Industry]	2.6481	0.0426	0.0000
Transportation 49 [Industry]	3.0044	0.0502	0.0000
Information [Industry]	2.0364	0.0420	0.0000
Real Estate Leasing [Industry]	2.6198	0.0426	0.0000
Prof, Scientific, Tech Services [Industry]	3.2739	0.0417	0.0000
Management Services [Industry]	0.8443	1.0398	0.4168
Admin, Support Services [Industry]	3.7361	0.0418	0.0000
Educational Services [Industry]	3.2751	0.0427	0.0000
Health Care [Industry]	4.3124	0.0428	0.0000
Arts, Recreation [Industry]	3.9447	0.0478	0.0000
Accommodation, Food Services [Industry]	3.2113	0.0422	0.0000
Other Services [Industry]	3.3320	0.0421	0.0000
Public Administration [Industry]	1.9442	0.0468	0.0000
(Observations = 5,699,479)			

A3. LPM with Interaction			
	Coefficient	Standard Errors	P-value
(Intercept)	0.2182	0.0037	0.0000
Amount (ln)	-0.0293	0.0001	0.0000
Sequester	0.0427	0.0031	0.0000
Air Force [Component]	0.1258	0.0009	0.0000
Army [Component]	0.1036	0.0006	0.0000
MDA [Component]	0.2156	0.0072	0.0000
Military Health [Component]	0.1153	0.0083	0.0000
Navy [Component]	0.0778	0.0006	0.0000
Other DoD [Component]	0.0322	0.0013	0.0000
Unlabeled [Industry]	0.1032	0.0067	0.0000
Agriculture, Forestry [Industry]	0.5593	0.0096	0.0000
Mining [Industry]	0.5281	0.0067	0.0000
Utilities [Industry]	0.3520	0.0051	0.0000
Construction [Industry]	0.6798	0.0036	0.0000
Manufacturing 31 [Industry]	0.4514	0.0037	0.0000
Manufacturing 32 [Industry]	0.4224	0.0036	0.0000
Manufacturing 33 [Industry]	0.5886	0.0035	0.0000
Wholesale Trade [Industry]	0.2227	0.0035	0.0000
Retail Trade 44 [Industry]	0.5606	0.0038	0.0000
Retail Trade 45 [Industry]	0.6306	0.0048	0.0000
Transportation 48 [Industry]	0.3013	0.0040	0.0000
Transportation 49 [Industry]	0.3763	0.0070	0.0000
Information [Industry]	0.1839	0.0037	0.0000
Real Estate Leasing [Industry]	0.2884	0.0040	0.0000
Prof, Scientific, Tech Services [Industry]	0.4335	0.0035	0.0000
Management Services [Industry]	0.0490	0.1220	0.6878
Admin, Support Services [Industry]	0.5503	0.0036	0.0000
Educational Services [Industry]	0.4375	0.0041	0.0000
Health Care [Industry]	0.6816	0.0041	0.0000
Arts, Recreation [Industry]	0.6042	0.0062	0.0000
Accommodation, Food Services [Industry]	0.4252	0.0038	0.0000
Other Services [Industry]	0.4562	0.0038	0.0000
Public Administration [Industry]	0.1776	0.0050	0.0000
Amount*Sequester	-0.0016	0.0003	0.0000

A4. Logistic Regression with Interaction			
	Coefficient	Standard Errors	P-value
(Intercept)	-2.4935	0.0419	0.0000
Amount (ln)	-0.1377	0.0006	0.0000
Sequester	0.2080	0.0147	0.0000
Air Force [Component]	0.5726	0.0040	0.0000
Army [Component]	0.4716	0.0028	0.0000
MDA [Component]	0.9631	0.0323	0.0000
Military Health [Component]	0.5064	0.0394	0.0000
Navy [Component]	0.3527	0.0028	0.0000
Other DoD [Component]	0.1272	0.0062	0.0000
Unlabeled [Industry]	1.1706	0.0619	0.0000
Agriculture, Forestry [Industry]	3.7602	0.0577	0.0000
Mining [Industry]	3.6421	0.0489	0.0000
Utilities [Industry]	2.9046	0.0452	0.0000
Construction [Industry]	4.3039	0.0418	0.0000
Manufacturing 31 [Industry]	3.3377	0.0420	0.0000
Manufacturing 32 [Industry]	3.2087	0.0418	0.0000
Manufacturing 33 [Industry]	3.9019	0.0416	0.0000
Wholesale Trade [Industry]	2.1890	0.0417	0.0000
Retail Trade 44 [Industry]	3.7682	0.0422	0.0000
Retail Trade 45 [Industry]	4.0721	0.0444	0.0000
Transportation 48 [Industry]	2.6473	0.0426	0.0000
Transportation 49 [Industry]	3.0045	0.0502	0.0000
Information [Industry]	2.0355	0.0420	0.0000
Real Estate Leasing [Industry]	2.6190	0.0426	0.0000
Prof, Scientific, Tech Services [Industry]	3.2732	0.0417	0.0000
Management Services [Industry]	0.8441	1.0398	0.4169
Admin, Support Services [Industry]	3.7354	0.0418	0.0000
Educational Services [Industry]	3.2744	0.0427	0.0000
Health Care [Industry]	4.3119	0.0428	0.0000
Arts, Recreation [Industry]	3.9443	0.0478	0.0000
Accommodation, Food Services [Industry]	3.2105	0.0422	0.0000
Other Services [Industry]	3.3314	0.0421	0.0000
Public Administration [Industry]	1.9434	0.0468	0.0000
Amount*Sequester	-0.0079	0.0015	0.0000
(Observations =5,699,479)			

A5. LPM with Extended years, 2008-2016			
	Coefficient	Standard Errors	P-value
(Intercept)	0.0003	0.0035	0.9406
Amount (ln)	-0.0065	0.0001	0.0000
Sequester	0.0182	0.0003	0.0000
Agriculture, Forestry [Industry]	0.5951	0.0083	0.0000
Mining [Industry]	0.5530	0.0060	0.0000
Utilities [Industry]	0.3117	0.0048	0.0000
Construction [Industry]	0.6668	0.0035	0.0000
Manufacturing 31 [Industry]	0.4245	0.0035	0.0000
Manufacturing 32 [Industry]	0.3684	0.0035	0.0000
Manufacturing 33 [Industry]	0.5905	0.0035	0.0000
Wholesale Trade [Industry]	0.2238	0.0035	0.0000
Retail Trade 44 [Industry]	0.5367	0.0037	0.0000
Retail Trade 45 [Industry]	0.6145	0.0046	0.0000
Transportation 48 [Industry]	0.3396	0.0038	0.0000
Transportation 49 [Industry]	0.3442	0.0061	0.0000
Information [Industry]	0.1955	0.0036	0.0000
Real Estate Leasing [Industry]	0.2933	0.0038	0.0000
Prof, Scientific, Tech Services [Industry]	0.4168	0.0035	0.0000
Management Services [Industry]	0.0492	0.1181	0.6772
Admin, Support Services [Industry]	0.5553	0.0035	0.0000
Educational Services [Industry]	0.4249	0.0039	0.0000
Health Care [Industry]	0.6626	0.0039	0.0000
Arts, Recreation [Industry]	0.6195	0.0056	0.0000
Accommodation, Food Services [Industry]	0.4598	0.0037	0.0000
Other Services [Industry]	0.4607	0.0037	0.0000
Public Administration [Industry]	0.1426	0.0048	0.0000
Air Force [Component]	0.1161	0.0007	0.0000
Army [Component]	0.1042	0.0005	0.0000
MDA [Component]	0.1503	0.0059	0.0000
Military Health [Component]	0.0255	0.0046	0.0000
Navy [Component]	0.0755	0.0005	0.0000
Other DoD [Component]	0.0077	0.0011	0.0000
(Observations = 11,731,541)			

A6. LPM with Bucketed Amount			
	Coefficient	Standard Errors	P-value
(Intercept)	-0.0097	0.0035	0.0060
value 3.5-10k	-0.0242	0.0006	0.0000
value 10-50k	-0.0606	0.0006	0.0000
value 50-150k	-0.0904	0.0008	0.0000
value 150k-1M	-0.1386	0.0009	0.0000
value 1-10M	-0.2244	0.0013	0.0000
value 10-100M	-0.4386	0.0031	0.0000
value >100M	-0.5849	0.0096	0.0000
Sequester	0.0268	0.0005	0.0000
Air Force [Component]	0.1272	0.0009	0.0000
Army [Component]	0.1071	0.0006	0.0000
MDA [Component]	0.2294	0.0072	0.0000
Military Health [Component]	0.1313	0.0083	0.0000
Navy [Component]	0.0825	0.0006	0.0000
Other DoD [Component]	0.0346	0.0013	0.0000
Unlabeled [Industry]	0.1033	0.0067	0.0000
Agriculture, Forestry [Industry]	0.5539	0.0096	0.0000
Mining [Industry]	0.5230	0.0067	0.0000
Utilities [Industry]	0.3522	0.0051	0.0000
Construction [Industry]	0.6747	0.0036	0.0000
Manufacturing 31 [Industry]	0.4507	0.0037	0.0000
Manufacturing 32 [Industry]	0.4233	0.0036	0.0000
Manufacturing 33 [Industry]	0.5871	0.0035	0.0000
Wholesale Trade [Industry]	0.2208	0.0035	0.0000
Retail Trade 44 [Industry]	0.5584	0.0038	0.0000
Retail Trade 45 [Industry]	0.6280	0.0048	0.0000
Transportation 48 [Industry]	0.3039	0.0040	0.0000
Transportation 49 [Industry]	0.3764	0.0070	0.0000
Information [Industry]	0.1806	0.0037	0.0000
Real Estate Leasing [Industry]	0.2853	0.0040	0.0000
Prof, Scientific, Tech Services [Industry]	0.4284	0.0035	0.0000
Management Services [Industry]	0.0475	0.1220	0.6966
Admin, Support Services [Industry]	0.5480	0.0036	0.0000
Educational Services [Industry]	0.4314	0.0041	0.0000
Health Care [Industry]	0.6748	0.0041	0.0000
Arts, Recreation [Industry]	0.6009	0.0062	0.0000

Accommodation, Food Services [Industry]	0.4233	0.0038	0.0000
Other Services [Industry]	0.4540	0.0038	0.0000
Public Administration [Industry]	0.1741	0.0050	0.0000
(Observations = 5,699,479)			

A7. Wholesale Industry (LPM)			
	Coefficient	Standard Errors	P-value
(Intercept)	0.3419	0.0021	0.0000
Amount (ln)	-0.0226	0.0002	0.0000
Sequester	0.0039	0.0008	0.0000
Air Force [Component]	0.5117	0.0028	0.0000
Army [Component]	0.4810	0.0013	0.0000
MDA [Component]	0.5934	0.0943	0.0000
Military Health [Component]	0.3941	0.0176	0.0000
Navy [Component]	0.4778	0.0015	0.0000
Other DoD [Component]	0.5845	0.0048	0.0000
(Observations = 1,567,730)			

A8. Other Industry (LPM)			
	Coefficient	Standard Errors	P-value
(Intercept)	0.4930	0.0033	0.0000
Amount (ln)	-0.0067	0.0003	0.0000
Sequester	0.0167	0.0017	0.0000
Air Force [Component]	0.0357	0.0026	0.0000
Army [Component]	-0.0274	0.0022	0.0000
MDA [Component]	0.0036	0.0372	0.9237
Military Health [Component]	-0.0636	0.0148	0.0000
Navy [Component]	-0.0230	0.0023	0.0000
Other DoD [Component]	-0.2489	0.0025	0.0000
(Observations = 730,177)			

A9. Construction Industry (LPM)			
	Coefficient	Standard Errors	P-value
(Intercept)	0.9047	0.0120	0.0000
Amount (ln)	-0.0156	0.0004	0.0000
Sequester	0.0400	0.0029	0.0000
Air Force [Component]	0.0377	0.0113	0.0009
Army [Component]	-0.1017	0.0112	0.0000
MDA [Component]	0.1177	0.1639	0.4727
Military Health [Component]	-0.0060	0.1288	0.9627
Navy [Component]	-0.0346	0.0113	0.0021
Other DoD [Component]	-0.0563	0.0161	0.0005
(Observations = 254,613)			

A10. Manufacturing Industry (LPM)			
	Coefficient	Standard Errors	P-value
(Intercept)	0.9401	0.0018	0.0000
Amount (ln)	-0.0422	0.0002	0.0000
Sequester	0.0416	0.0009	0.0000
Air Force [Component]	0.0076	0.0014	0.0000
Army [Component]	0.0179	0.0009	0.0000
MDA [Component]	0.0637	0.0298	0.0327
Military Health [Component]	-0.1342	0.0206	0.0000
Navy [Component]	0.0094	0.0008	0.0000
Other DoD [Component]	-0.0519	0.0029	0.0000
(Observations = 2,428,528)			

A11. Professional, Scientific, and Technical Services Industry (LPM)			
	Coefficient	Standard Errors	P-value
(Intercept)	0.6404	0.0062	0.0000
Amount (ln)	-0.0165	0.0003	0.0000
Sequester	0.0535	0.0021	0.0000
Air Force [Component]	0.0301	0.0054	0.0000
Army [Component]	-0.0714	0.0052	0.0000
MDA [Component]	0.0613	0.0097	0.0000
Military Health [Component]	-0.0639	0.0197	0.0012
Navy [Component]	-0.0523	0.0052	0.0000
Other DoD [Component]	-0.0626	0.0057	0.0000
(Observations= 498,771)			

A12. Administrative and Support Services Industry (LPM)			
	Coefficient	Standard Errors	P-value
(Intercept)	0.6495	0.0053	0.0000
Amount (ln)	-0.0172	0.0005	0.0000
Sequester	0.0348	0.0029	0.0000
Air Force [Component]	0.0959	0.0040	0.0000
Army [Component]	0.1821	0.0030	0.0000
MDA [Component]	0.2636	0.0778	0.0007
Military Health [Component]	0.4450	0.0279	0.0000
Navy [Component]	-0.0510	0.0032	0.0000
Other DoD [Component]	-0.0265	0.0074	0.0004
(Observations = 219,660)			

A13. 2012 vs. 2013 (LPM)			
	Coefficient	Standard errors	P-value
(Intercept)	0.2576	0.0090	0.0000
Amount (ln)	-0.0314	0.0002	0.0000
Sequester	0.0273	0.0007	0.0000
Air Force [Component]	0.0969	0.0016	0.0000
Army [Component]	0.0900	0.0012	0.0000
MDA [Component]	0.2021	0.0120	0.0000
Military Health [Component]	0.1023	0.0091	0.0000
Navy [Component]	0.0324	0.0011	0.0000
Other DoD [Component]	-0.0172	0.0023	0.0000
Unlabeled [Industry]	0.1861	0.0235	0.0000
Agriculture, Forestry [Industry]	0.6133	0.0195	0.0000
Mining [Industry]	0.5578	0.0135	0.0000
Utilities [Industry]	0.2013	0.0117	0.0000
Construction [Industry]	0.7094	0.0089	0.0000
Manufacturing 31 [Industry]	0.3915	0.0089	0.0000
Manufacturing 32 [Industry]	0.4005	0.0089	0.0000
Manufacturing 33 [Industry]	0.6018	0.0087	0.0000
Wholesale Trade [Industry]	0.1720	0.0088	0.0000
Retail Trade 44 [Industry]	0.5906	0.0094	0.0000
Retail Trade 45 [Industry]	0.5548	0.0123	0.0000
Transportation 48 [Industry]	0.3199	0.0094	0.0000
Transportation 49 [Industry]	0.3913	0.0139	0.0000
Information [Industry]	0.1780	0.0089	0.0000
Real Estate Leasing [Industry]	0.3052	0.0095	0.0000
Prof, Scientific, Tech Services [Industry]	0.4908	0.0088	0.0000
Management Services [Industry]	0.0075	0.4475	0.9866
Admin, Support Services [Industry]	0.5620	0.0089	0.0000
Educational Services [Industry]	0.4529	0.0096	0.0000
Health Care [Industry]	0.6778	0.0095	0.0000
Arts, Recreation [Industry]	0.5743	0.0130	0.0000
Accommodation, Food Services [Industry]	0.4892	0.0093	0.0000
Other Services [Industry]	0.4532	0.0091	0.0000
Public Administration [Industry]	0.0685	0.0113	0.0000
(Observations = 1,712,656)			

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