Appendix for "The Impact of Industry Consolidation on Government Procurement: Evidence from Department of Defense Contracting"

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A. ADDITIONAL TABLES

Table A1: Budget authority and contract awards by agency, FY2016

Department or Major Agency	Budget Authority		Contract Awards		Contracts / Budget (%)
	$M	% of total budget	$M	% of total contracts	
Health and Human Services	1,119,006	28.2	23,860	5.0	2.1
Social Security Administration	982,952	24.7	1,534	0.3	0.2
Defense	**661,896**	**16.7**	**304,900**	**64.2**	**46.1**
Treasury	519,865	13.1	6,147	1.3	1.2
Agriculture	168,801	4.2	6,003	1.3	3.6
Veterans Affairs	163,330	4.1	23,200	4.9	14.2
Office of Personnel Management	93,745	2.4	944	0.2	1.0
Education	76,977	1.9	2,472	0.5	3.2
Transportation	75,727	1.9	7,177	1.5	9.5
Housing and Urban Development	48,843	1.2	1,131	0.2	2.3
Labor	46,991	1.2	1,813	0.4	3.9
Homeland Security	46,021	1.2	14,200	3.0	30.9
Justice	32,114	0.8	7,411	1.6	23.1
State	29,828	0.8	8,894	1.9	29.8
All Others	148,198	3.7	51,934	10.9	35.0
Undistributed Offsetting Receipts	(241,362)	-	-	-	-
Total	**3,972,932**	**100.0**	**474,811**	**100.0**	**12.0**

Notes: Budget authority data obtained from the Office of Management and Budget's (OMB) historical tables (https://www.whitehouse.gov/omb/historical-tables/). Data from contract awards come from www.usaspending.gov. We show the 15 departments or major agencies of the Federal Government with most budget authority in FY2016, and group the remaining in the "All Others" category.

Table A2: Separating non-competed and single-offer awards: non-competed

DV: Share of dollars awarded without competition

	OLS (1)	RF (2)	RF (3)	RF (4)	RF (5)	IV (6)	IV (7)
HHI_{it}	0.5031*** (0.1840)					3.1808** (1.3328)	3.9177** (1.6395)
$sim\Delta HHI_{it}$		4.0360*** (0.9135)	4.5852*** (0.4472)	4.4297*** (0.8518)	4.9434*** (0.4364)		
$sim\Delta HHI_{it}^{LMNG}$				-5.8767*** (1.3715)	-6.4819*** (1.4155)		
Category group by year FE?	No	No	Yes	No	Yes	No	Yes
$sim\Delta HHI_{it}$ includes placebo?	No	No	No	Yes	Yes	No	No
Observations	1,649	1,649	1,632	1,649	1,632	1,649	1,632
R^2	0.8048	0.8104	0.8355	0.8107	0.8357	-	-
Mean D.V.	0.372	0.372	0.372	0.372	0.372	0.372	0.372

Notes: The data source is the Defense Contract Action Data System. Observations are generated by aggregating individual contract actions at the product category level (market) by fiscal year. This generates a balanced panel of 97 markets over 17 fiscal years. Product categories are defined by the Federal Supply Classification (FSC), aggregated to two digits for goods, and to one digit (letter) for services. Monetary variables are measured in constant 2016 dollars. The dependent variable in all specifications is the share of dollars in a given market-year that was awarded without competitive procedures. The simulated change in HHI is the expected change in HHI associated with a merger, based on pre-merger market shares an assuming everything else constant. In all columns except for columns (4) and (5), $sim\Delta HHI_{it}$ is defined as the sum of the simulated change in HHI associated with the first four mergers listed in Table 2. In columns (4) and (5), $sim\Delta HHI_{it}$ is defined by also adding the simulated change in HHI associated with the placebo merger of Lockheed Martin and Northrop Grumman. In all columns, observations are weighted according to the market's average number of contracts in FY1980-FY1984. All specifications include a set of market and fiscal year fixed-effects. In columns (3), (5) and (7), we also include a separate set of fiscal year fixed-effects for products, services, and R&D (we refer to these as category groups). Asterisks denote p-value < .10 (∗), < .05 (∗∗), or < .01 (∗∗∗).

Table A3: Separating non-competed and single-offer awards: single-offer

DV: Share of dollars awarded in single-offer contracts (conditional on competition)

	OLS (1)	RF (2)	RF (3)	RF (4)	RF (5)	IV (6)	IV (7)
HHI_{it}	0.0320					1.3030**	1.2737
	(0.1190)					(0.6511)	(0.8149)
$sim\Delta HHI_{it}$		1.6536**	1.4910**	1.6645***	1.6973**		
		(0.6742)	(0.7361)	(0.5707)	(0.6868)		
$sim\Delta HHI_{it}^{LMNG}$				-1.7048*	-2.5836**		
				(0.8930)	(1.0250)		
Category group by year FE?	No	No	Yes	No	Yes	No	Yes
$sim\Delta HHI_{it}$ includes placebo?	No	No	No	Yes	Yes	No	No
Observations	1,647	1,647	1,630	1,647	1,630	1,647	1,630
R^2	0.3888	0.4050	0.4328	0.4050	0.4335	-	-
Mean D.V.	0.0901	0.0901	0.0901	0.0901	0.0901	0.0901	0.0901

Notes: The data source is the Defense Contract Action Data System. Observations are generated by aggregating individual contract actions at the product category level (market) by fiscal year. This generates a balanced panel of 97 markets over 17 fiscal years. Product categories are defined by the Federal Supply Classification (FSC), aggregated to two digits for goods, and to one digit (letter) for services. Monetary variables are measured in constant 2016 dollars. The dependent variable in all specifications is the share of dollars in a given market-year that was awarded with competitive procedures, but where a single offer was received. The simulated change in HHI is the expected change in HHI associated with a merger, based on pre-merger market shares an assuming everything else constant. In all columns except for columns (4) and (5), $sim\Delta HHI_{it}$ is defined as the sum of the simulated change in HHI associated with the first four mergers listed in Table 2. In columns (4) and (5), $sim\Delta HHI_{it}$ is defined by also adding the simulated change in HHI associated with the placebo merger of Lockheed Martin and Northrop Grumman. In all columns, observations are weighted according to the market's average number of contracts in FY1980-FY1984. All specifications include a set of market and fiscal year fixed-effects. In columns (3), (5) and (7), we also include a separate set of fiscal year fixed-effects for products, services, and R&D (we refer to these as category groups). Asterisks denote p-value < .10 (∗), < .05 (∗∗), or < .01 (∗∗∗).

Table A4: The effect of concentration on contract modifications

DV: Share of contract actions that are modifications

	RF (1)	RF (2)	IV (3)	IV (4)
HHI_{it}			-0.8279*** (0.2228)	-0.8060*** (0.2529)
$sim\Delta HHI_{it}$	-1.0505*** (0.2740)	-0.9433*** (0.2694)		
Category group by year FE?	No	Yes	No	Yes
Observations	1,649	1,632	1,649	1,632
R^2	0.6099	0.6427	-	-
Mean D.V.	0.0094	0.0094	0.0094	0.0094

Notes: The data source is the Defense Contract Action Data System. Observations are generated by aggregating individual contract actions at the product category level (market) by fiscal year. This generates a balanced panel of 97 markets over 17 fiscal years. Product categories are defined by the Federal Supply Classification (FSC), aggregated to two digits for goods, and to one digit (letter) for services. Monetary variables are measured in constant 2016 dollars. The dependent variable in all specifications is the share of contract actions in a given market-year that correspond to modifications (within the scope of the original agreement). The simulated change in HHI is the expected change in HHI associated with a merger, based on pre-merger market shares an assuming everything else constant. In all columns, $sim\Delta HHI_{it}$ is defined as the sum of the simulated change in HHI associated with the first four mergers listed in Table 2. In all columns, observations are weighted according to the market's average number of contracts in FY1980-FY1984. All specifications include a set of market and fiscal year fixed-effects. In columns (2) and (4), we also include a separate set of fiscal year fixed-effects for products, services, and R&D (we refer to these as category groups). Clustered standard errors at the market level are shown in parentheses. Asterisks denote p-value < .10 (∗), < .05 (∗∗), or < .01 (∗∗∗).

Table A5: The effect of concentration on contract terminations

DV: Share of contract actions that are terminations

	RF (1)	RF (2)	IV (3)	IV (4)
HHI_{it}			-0.0662 (0.0539)	-0.1056* (0.0591)
$sim\Delta HHI_{it}$	-0.0840 (0.0607)	-0.1236** (0.0543)		
Category group by year FE?	No	Yes	No	Yes
Observations	1,649	1,632	1,649	1,632
R^2	0.6099	0.6427	-	-0
Mean D.V.	0.00941	0.00941	0.00941	0.00941

Notes: The data source is the Defense Contract Action Data System. Observations are generated by aggregating individual contract actions at the product category level (market) by fiscal year. This generates a balanced panel of 97 markets over 17 fiscal years. Product categories are defined by the Federal Supply Classification (FSC), aggregated to two digits for goods, and to one digit (letter) for services. Monetary variables are measured in constant 2016 dollars. The dependent variable in all specifications is the share of contract actions in a given market-year that correspond to terminations. The simulated change in HHI is the expected change in HHI associated with a merger, based on pre-merger market shares an assuming everything else constant. In all columns, $sim\Delta HHI_{it}$ is defined as the sum of the simulated change in HHI associated with the first four mergers listed in Table 2. In all columns, observations are weighted according to the market's average number of contracts in FY1980-FY1984. All specifications include a set of market and fiscal year fixed-effects. In columns (2) and (4), we also include a separate set of fiscal year fixed-effects for products, services, and R&D (we refer to these as category groups). Clustered standard errors at the market level are shown in parentheses. Asterisks denote p-value < .10 (∗), < .05 (∗∗), or < .01 (∗∗∗).

Table A6: Controlling for market-specific pre-trends

	Share non-competed or single-offer			Share fixed price			Log of market spending		
	RF (1)	RF (2)	RF (3)	RF (4)	RF (5)	RF (6)	RF (7)	RF (8)	RF (9)
$sim\Delta HHI_{it}$	4.3292***	4.6977***	2.6090***	-3.2477**	-2.2358**	-2.7977*	-6.0611**	-5.8212*	-3.3702
	(0.7004)	(0.5735)	(0.8743)	(1.2886)	(0.8790)	(1.5348)	(2.9028)	(3.0073)	(3.4803)
Category group by year FE?	No	Yes	No	No	Yes	No	No	Yes	No
Market pre-trends?	No	No	Yes	No	No	Yes	No	No	Yes
Observations	1,649	1,632	1,649	1,649	1,632	1,649	1,649	1,632	1,649
R^2	0.8023	0.8200	0.8248	0.9445	0.9251	0.9462	0.9695	0.9705	0.9797
Mean D.V.	0.420	0.420	0.420	0.849	0.849	0.849	21.28	21.28	21.28

Notes: The data source is the Defense Contract Action Data System. Observations are generated by aggregating individual contract actions at the product category level (market) by fiscal year. This generates a balanced panel of 97 markets over 17 fiscal years. Product categories are defined by the Federal Supply Classification (FSC), aggregated to two digits for goods, and to one digit (letter) for services. Monetary variables are measured in constant 2016 dollars. The dependent variable in the three first columns is the share of dollars in a given market-year that was awarded with competitive procedures, but where a single offer was received. The dependent variable in columns (4) through (6) is the share of dollars in a given market-year that was awarded via fixed-price contracts (as opposed to cost-plus contracts). The dependent variable in the last three columns is the natural logarithm of market-level contract spending (the sum of all dollar obligations in a given market-year). The simulated change in HHI is the expected change in HHI associated with a merger, based on pre-merger market shares an assuming everything else constant. In all columns, $sim\Delta HHI_{it}$ is defined as the sum of the simulated change in HHI associated with the first four mergers listed in Table 2. In all columns, observations are weighted according to the market's average number of contracts in FY1980-FY1984. All specifications include a set of market and fiscal year fixed-effects. In columns (2), (4) and (6), we also include a separate set of fiscal year fixed-effects for products, services, and R&D (we refer to these as category groups). In columns (3), (5), (7), we control for market specific pre-trends, estimated in a previous step using data for fiscal years 1985 through 1993. Asterisks denote p-value < .10 (∗), < .05 (∗∗), or < .01 (∗∗∗).

Table A7: Robustness to market definitions: competition

DV: Share of dollars awarded without competition or in single-offer contracts

	RF (1)	RF (2)	RF (3)	RF (4)	RF (5)	RF (6)
$sim\Delta HHI_{it}$	4.3292*** (0.7004)	3.9926*** (0.8448)	1.8767*** (0.4565)	4.6977*** (0.5735)	4.3402*** (0.5509)	1.9092*** (0.4813)
Implied effect size	**0.665**	**0.668**	**0.708**	**0.721**	**0.726**	**0.720**
Market definition	Baseline	2-digit services	4-digit goods & serv.	Baseline	2-digit services	4-digit goods & serv.
Category group by year FE?	No	No	No	Yes	Yes	Yes
Observations	1,649	2,176	15,848	1,632	2,176	15,848
R^2	0.8023	0.7912	0.6239	0.8200	0.8137	0.6375
Mean D.V.	0.420	0.417	0.387	0.420	0.417	0.387
Mean HHI	0.0645	0.0698	0.146	0.0645	0.0698	0.146

Notes: The data source is the Defense Contract Action Data System. Observations are generated by aggregating individual contract actions at the product category level (market) by fiscal year. Product categories are defined by the Federal Supply Classification (FSC), aggregated at different levels. In columns (1) and (4), we use the baseline market definition of codes aggregated to two digits for goods, and to one digit (letter) for services. In columns (2) and (5), we use de-aggregate services at the two-digit level. In columns (3) and (6), we take the de-aggregated 4-digit FSC codes as the market definition. Monetary variables are measured in constant 2016 dollars. The dependent variable in all specifications is the share of dollars in a given market-year that was awarded either without competitive procedures or with competitive procedures where a single offer was received. The simulated change in HHI is the expected change in HHI associated with a merger, based on pre-merger market shares an assuming everything else constant. In all columns, $sim\Delta HHI_{it}$ is defined as the sum of the simulated change in HHI associated with the first four mergers listed in Table 2. In all columns, observations are weighted according to the market's average number of contracts in FY1980-FY1984. All specifications include a set of market and fiscal year fixed-effects. In columns (4), (5) and (6), we also include a separate set of fiscal year fixed-effects for products, services, and R&D (we refer to these as category groups). Clustered standard errors at the market level are shown in parentheses. Implied effects sizes are computed by multiplying the estimated coefficient by the mean of the HHI variable and dividing by the mean of the dependent variable. Asterisks denote p-value < .10 (∗), < .05 (∗∗), or < .01 (∗∗∗).

Table A8: Robustness to market definitions: contractual form

DV: Share of dollars awarded through fixed-price contracts

	RF (1)	RF (2)	RF (3)	RF (4)	RF (5)	RF (6)
$sim\Delta HHI_{it}$	-3.2477** (1.2886)	-3.2260*** (1.1068)	-1.5194*** (0.4047)	-2.2358** (0.8790)	-2.8654*** (0.9840)	-1.5030*** (0.4023)
Implied effect size	**-0.247**	**-0.259**	**-0.249**	**-0.170**	**-0.230**	**-0.247**
Market definition	Baseline	2-digit services	4-digit goods & serv.	Baseline	2-digit services	4-digit goods & serv.
Category group by year FE?	No	No	No	Yes	Yes	Yes
Observations	1,649	2,176	15,837	1,632	2,176	15,837
R^2	0.9445	0.9280	0.8683	0.9251	0.9311	0.8695
Mean D.V.	0.849	0.868	0.889	0.849	0.868	0.889
Mean HHI	0.0645	0.0698	0.146	0.0645	0.0698	0.146

Notes: The data source is the Defense Contract Action Data System. Observations are generated by aggregating individual contract actions at the product category level (market) by fiscal year. Product categories are defined by the Federal Supply Classification (FSC), aggregated at different levels. In columns (1) and (4), we use the baseline market definition of codes aggregated to two digits for goods, and to one digit (letter) for services. In columns (2) and (5), we use de-aggregate services at the two-digit level. In columns (3) and (6), we take the de-aggregated 4-digit FSC codes as the market definition. Monetary variables are measured in constant 2016 dollars. The dependent variable in all specifications is the share of dollars in a given market-year that was awarded via fixed-price contracts (as opposed to cost-plus contracts). The simulated change in HHI is the expected change in HHI associated with a merger, based on pre-merger market shares an assuming everything else constant. In all columns, $sim\Delta HHI_{it}$ is defined as the sum of the simulated change in HHI associated with the first four mergers listed in Table 2. In all columns, observations are weighted according to the market's average number of contracts in FY1980-FY1984. All specifications include a set of market and fiscal year fixed-effects. In columns (4), (5) and (6), we also include a separate set of fiscal year fixed-effects for products, services, and R&D (we refer to these as category groups). Clustered standard errors at the market level are shown in parentheses. Implied effects sizes are computed by multiplying the estimated coefficient by the mean of the HHI variable and dividing by the mean of the dependent variable. Asterisks denote p-value < .10 (∗), < .05 (∗∗), or < .01 (∗∗∗).

Table A9: Robustness to market definitions: contract spending

DV: Log of market-level contract spending

	RF (1)	RF (2)	RF (3)	RF (4)	RF (5)	RF (6)
$sim\Delta HHI_{it}$	-6.0611**	-6.1955**	-2.1017	-5.8212*	-6.1195**	-1.6372
	(2.9028)	(2.4083)	(1.7399)	(3.0073)	(2.4952)	(1.9905)
Implied effect size	**-0.018**	**-0.021**	**-0.017**	**-0.018**	**-0.020**	**-0.013**
Market definition	Baseline	2-digit services	4-digit goods & serv.	Baseline	2-digit services	4-digit goods & serv.
Category group by year FE?	No	No	No	Yes	Yes	Yes
Observations	1,649	2,176	15,861	1,632	2,176	15,861
R^2	0.9695	0.9604	0.9001	0.9705	0.9680	0.9083
Mean D.V.	21.28	20.98	18.52	21.28	20.98	18.52
Mean HHI	0.0645	0.0698	0.146	0.0645	0.0698	0.146

Notes: The data source is the Defense Contract Action Data System. Observations are generated by aggregating individual contract actions at the product category level (market) by fiscal year. Product categories are defined by the Federal Supply Classification (FSC), aggregated at different levels. In columns (1) and (4), we use the baseline market definition of codes aggregated to two digits for goods, and to one digit (letter) for services. In columns (2) and (5), we use de-aggregate services at the two-digit level. In columns (3) and (6), we take the de-aggregated 4-digit FSC codes as the market definition. Monetary variables are measured in constant 2016 dollars. The dependent variable in all specifications is the natural logarithm of market-level contract spending (the sum of all dollar obligations in a given market-year). The simulated change in HHI is the expected change in HHI associated with a merger, based on pre-merger market shares an assuming everything else constant. In all columns, $sim\Delta HHI_{it}$ is defined as the sum of the simulated change in HHI associated with the first four mergers listed in Table 2. In all columns, observations are weighted according to the market's average number of contracts in FY1980-FY1984. All specifications include a set of market and fiscal year fixed-effects. In columns (4), (5) and (6), we also include a separate set of fiscal year fixed-effects for products, services, and R&D (we refer to these as category groups). Clustered standard errors at the market level are shown in parentheses. Implied effects sizes are computed by multiplying the estimated coefficient by the mean of the HHI variable and dividing by the mean of the dependent variable. Asterisks denote p-value < .10 (*), < .05 (**), or < .01 (***).

Table A10: Robustness to measure of concentration: competition

DV: Share of dollars awarded without competition or in single-offer contracts

	IV (1)	IV (2)	IV (3)	IV (4)
HHI_{it}	3.4119*** (1.2749)		4.0138** (1.7049)	
$Share\ Top\ 5_{it}$		1.6475** (0.7909)		2.3346** (0.9978)
Category group by year FE?	No	No	Yes	Yes
Observations	1,649	1,649	1,632	1,632
Mean D.V.	0.420	0.420	0.420	0.420

Notes: The data source is the Defense Contract Action Data System. Observations are generated by aggregating individual contract actions at the product category level (market) by fiscal year. This generates a balanced panel of 97 markets over 17 fiscal years. Product categories are defined by the Federal Supply Classification (FSC), aggregated to two digits for goods, and to one digit (letter) for services. Monetary variables are measured in constant 2016 dollars. The dependent variable in all specifications is the share of dollars in a given market-year that was awarded either without competitive procedures or with competitive procedures where a single offer was received. All columns present Instrumental Variable (IV) specifications, where concentration proxy (HHI or share top 5) is instrumented by the simulated change in HHI. The simulated change in HHI is the expected change in HHI associated with a merger, based on pre-merger market shares an assuming everything else constant. In all columns, the instrument is defined as the sum of the simulated change in HHI associated with the first four mergers listed in Table 2. In all columns, observations are weighted according to the market's average number of contracts in FY1980-FY1984. All specifications include a set of market and fiscal year fixed-effects. In columns (3), and (4), we also include a separate set of fiscal year fixed-effects for products, services, and R&D (we refer to these as category groups). Clustered standard errors at the market level are shown in parentheses. Asterisks denote p-value < .10 (∗), < .05 (∗∗), or < .01 (∗∗∗).

Table A11: Robustness to measure of concentration: contractual form

DV: Share of dollars awarded through fixed-price contracts

	IV (1)	IV (2)	IV (3)	IV (4)
HHI_{it}	-2.5596** (1.1392)		-1.9103* (1.0580)	
$Share\ Top\ 5_{it}$		-1.2360*** (0.3268)		-1.1111** (0.4461)
Category group by year FE?	No	No	Yes	Yes
Observations	1,649	1,649	1,632	1,632
Mean D.V.	0.849	0.849	0.849	0.849

Notes: The data source is the Defense Contract Action Data System. Observations are generated by aggregating individual contract actions at the product category level (market) by fiscal year. This generates a balanced panel of 97 markets over 17 fiscal years. Product categories are defined by the Federal Supply Classification (FSC), aggregated to two digits for goods, and to one digit (letter) for services. Monetary variables are measured in constant 2016 dollars. The dependent variable in all specifications is the share of dollars in a given market-year that was awarded via fixed-price contracts (as opposed to cost-plus contracts). All columns present Instrumental Variable (IV) specifications, where concentration proxy (HHI or share top 5) is instrumented by the simulated change in HHI. The simulated change in HHI is the expected change in HHI associated with a merger, based on pre-merger market shares an assuming everything else constant. In all columns, the instrument is defined as the sum of the simulated change in HHI associated with the first four mergers listed in Table 2. In all columns, observations are weighted according to the market's average number of contracts in FY1980-FY1984. All specifications include a set of market and fiscal year fixed-effects. In columns (3), and (4), we also include a separate set of fiscal year fixed-effects for products, services, and R&D (we refer to these as category groups). Clustered standard errors at the market level are shown in parentheses. Asterisks denote p-value < .10 (∗), < .05 (∗∗), or < .01 (∗∗∗).

Table A12: Robustness to measure of concentration: contract spending

DV: Log of market-level contract spending

	IV (1)	IV (2)	IV (3)	IV (4)
HHI_{it}	-4.7768* (2.5508)		-4.9738 (2.9994)	
Share Top 5_{it}		-2.3066 (1.4827)		-2.8930 (1.8697)
Category group by year FE?	No	No	Yes	Yes
Observations	1,649	1,649	1,632	1,632
Mean D.V.	21.28	21.28	21.28	21.28

Notes: The data source is the Defense Contract Action Data System. Observations are generated by aggregating individual contract actions at the product category level (market) by fiscal year. This generates a balanced panel of 97 markets over 17 fiscal years. Product categories are defined by the Federal Supply Classification (FSC), aggregated to two digits for goods, and to one digit (letter) for services. Monetary variables are measured in constant 2016 dollars. The dependent variable in all specifications is the natural logarithm of market-level contract spending (the sum of all dollar obligations in a given market-year). All columns present Instrumental Variable (IV) specifications, where concentration proxy (HHI or share top 5) is instrumented by the simulated change in HHI. The simulated change in HHI is the expected change in HHI associated with a merger, based on pre-merger market shares an assuming everything else constant. In all columns, the instrument is defined as the sum of the simulated change in HHI associated with the first four mergers listed in Table 2. In all columns, observations are weighted according to the market's average number of contracts in FY1980-FY1984. All specifications include a set of market and fiscal year fixed-effects. In columns (3), and (4), we also include a separate set of fiscal year fixed-effects for products, services, and R&D (we refer to these as category groups). Clustered standard errors at the market level are shown in parentheses. Asterisks denote p-value < .10 (∗), < .05 (∗∗), or < .01 (∗∗∗).

Table A13: First-stage diagnostics and robust inference to weak instruments

	Share non-competed or single-offer		Share fixed price		Log of market spending	
	IV (1)	IV (2)	IV (3)	IV (4)	IV (5)	IV (6)
HHI_{it}	3.4119*** (1.2749)	4.0138** (1.7049)	-2.5596** (1.1392)	-1.9103* (1.058)	-4.7768* (2.5508)	-4.9738 (2.9994)
First-stage F-stat (Kleibergen-Paap)	10.096	5.657	10.096	5.657	10.096	5.657
Anderson-Rubin 95% confidence set	[1.788, 9.032]	[2.186, 18.466]	[-6.466, -0.662]	[-9.023, -0.570]	[-13.023, -0.529]	[-22.217, -0.590]
Category group by year FE?	No	Yes	No	Yes	No	Yes
Observations	1,649	1,632	1649	1632	1,649	1,632
Mean DV	0.420	0.420	0.849	0.849	21.28	21.28

Notes: The data source is the Defense Contract Action Data System. Observations are generated by aggregating individual contract actions at the product category level (market) by fiscal year. This generates a balanced panel of 97 markets over 17 fiscal years. Product categories are defined by the Federal Supply Classification (FSC), aggregated to two digits for goods, and to one digit (letter) for services. Monetary variables are measured in constant 2016 dollars. The dependent variable in each specification is written at the top of each pair of columns. All columns present Instrumental Variable (IV) specifications, where the HHI is instrumented by the simulated change in HHI. The simulated change in HHI is the expected change in HHI associated with a merger, based on pre-merger market shares an assuming everything else constant. In all columns, the instrument is defined as the sum of the simulated change in HHI associated with the first four mergers listed in Table 2. In all columns, observations are weighted according to the market's average number of contracts in FY1980-FY1984. All specifications include a set of market and fiscal year fixed-effects. In columns (2), (4) and (6), we also include a separate set of fiscal year fixed-effects for products, services, and R&D (we refer to these as category groups). Clustered standard errors at the market level are shown in parentheses. Asterisks denote p-value < .10 (∗), < .05 (∗∗), or < .01 (∗∗∗). Anderson-Rubin confidence sets are presented, which are fully robust regardless of the strength of the first stage.

Table A14: Summary Statistics of Major Acquisition Programs Data

Panel A: Selected Acquisition Reports	Mean	s.d.	p10	p50	p90
Program-level variables					
Baseline Cost (2016 $M)	10,782	15,451	1,348	4,913	28,801
Number of years	6.5	3	3	6	10
Number of programs	194				
Program-year level variables					
Current Cost (2016 $M)	14,048	18,727	1,900	6,794	42,576
Cumulative Cost Growth (2016 $M)	933	5,693	-1,115	319	4,244
Annual Cost Growth (2016 $M)	165	2,118	-487	18	924
Cumulative Cost Growth (%)	16.8	43.1	-14.5	6.7	58.9
Annual Cost Growth (%)	2.5	22.6	-6.6	0.3	12.4
No. of observations (program-year)	1,267				
Sample years	1985-2001				

Panel B: MDAP Analysis Sample	All programs	Treated	Control
Current Cost (2016 $M)	14,048	15,231	12,331
Cumulative Cost Growth (2016 $M)	933	857	1,043
Annual Cost Growth (2016 $M)	165	218	90
Cumulative Cost Growth (%)	16.8	19.7	12.7
Annual Cost Growth (%)	2.5	3.0	1.9
Northrop-Grumman (%)	8.2	13.9	0
Lockheed-Martin (%)	18.9	31.9	0
Boeing-McDonnell Douglas (%)	22.9	38.7	0
Raytheon-Texas Instrument-Hughes Aircraft (%)	14.4	24.3	0
Number of observations (program-year)	1,267	750	517
Number of programs	194	118	76
Only pre-merger	-	65	-
Only post-merger	-	23	-
Pre- and post-merger	-	30	-

Notes: Panel A presents summary statistics from the selected acquisition reports summary tables, for all programs active for at least three consecutive years between 1985 and 2001. Panel B presents summary statistics of our major acquisition programs analysis sample. The data source is the Selected Acquisition Reports (SAR) summary tables. An observation is a program-year, and the sample includes all programs that were active for at least three consecutive years between 1985 and 2001, leaving an unbalanced panel of 194 programs. A program is "Treated" if its prime contractor is listed on Table 2 and is "Control" otherwise. In the lower part of the table, we show the number of treated programs that were active only before the merger date of their contractor (only pre-merger), those active only on or after the merger (only post-merger), and those with at least one observation prior and one observation on or after the merger (pre- and post-merger). The merger dates are referred to as t^* in Table 2.

Table A15: The effect of consolidation on procurement costs of major acquisition programs (weighted regressions)

| | Panel A: DV is $logCost_{it}$ | | | | |
	(1)	(2)	(3)	(4)	(5)
$Merged_{it}$	0.3208	0.3306	0.3254	0.0053	0.0113
	(0.2387)	(0.2404)	(0.2416)	(0.0563)	(0.0574)
Age_{it}		0.0065	0.0158		
		(0.0134)	(0.0301)		
Age_{it}^2			-0.0005		
			(0.0015)		

| | Panel B: DV is $Annual\ Cost\ Growth_{it}$ | | | | |
	(1)	(2)	(3)	(4)	(5)
$Merged_{it}$	-2.2726	-2.5778	-2.5694	-1.7897	-2.1972
	(2.7077)	(2.7485)	(2.7611)	(1.9374)	(2.1360)
Age_{it}		-0.2124*	-0.2288		
		(0.1235)	(0.3155)		
Age_{it}^2			0.0008		
			(0.0135)		

| | Panel C: DV is $\mathbf{1}(Annual\ Cost\ Growth_{it} > 10\%)$ | | | | |
	(1)	(2)	(3)	(4)	(5)
$Merged_{it}$	-0.0096	-0.0200	-0.0165	-0.1148	-0.0992
	(0.0364)	(0.0358)	(0.0361)	(0.0758)	(0.0763)
Age_{it}		-0.0072***	-0.0139*		
		(0.0023)	(0.0076)		
Age_{it}^2			0.0003		
			(0.0004)		

	(1)	(2)	(3)	(4)	(5)
Branch FE	Yes	Yes	Yes	No	No
Age FE	No	No	No	No	Yes
Program FE	No	No	No	Yes	Yes

Notes: The data source is the Selected Acquisition Reports summary tables. An observation is an acquisition program by fiscal year. The sample is an unbalanced panel of 194 programs over the period FY1986-FY2001. Since annual cost growth is a variable computed as a first-difference, regressions in panel B and C have less observations relative to Panel A (one less per program). Number of observations: Panel A = 1,267; Panel B = 1,071; Panel C = 1,071. Mean of dependent variable: Panel A = 21.94; Panel B = 2.53; Panel C = 0.14. $Merged_{it}$ is an indicator that takes the value of 1 if the prime contractor of the program was involved in one of the authorized mergers in Table 2, *and* if the current year is on or after the merger date. In all regressions, we weight an observation by the natural logarithm of the program's baseline cost estimate. All specifications include fiscal year fixed-effects. The age of a program is defined as the difference between the current year and the base year of the program. Branch FE refers to the inclusion of dummies that identify whether the program depends on the Department of the Army, the Department of the Navy, the Department of the Air Force, or other DoD agency. Asterisks denote p-value < .10 (∗), < .05 (∗∗), or < .01 (∗∗∗).
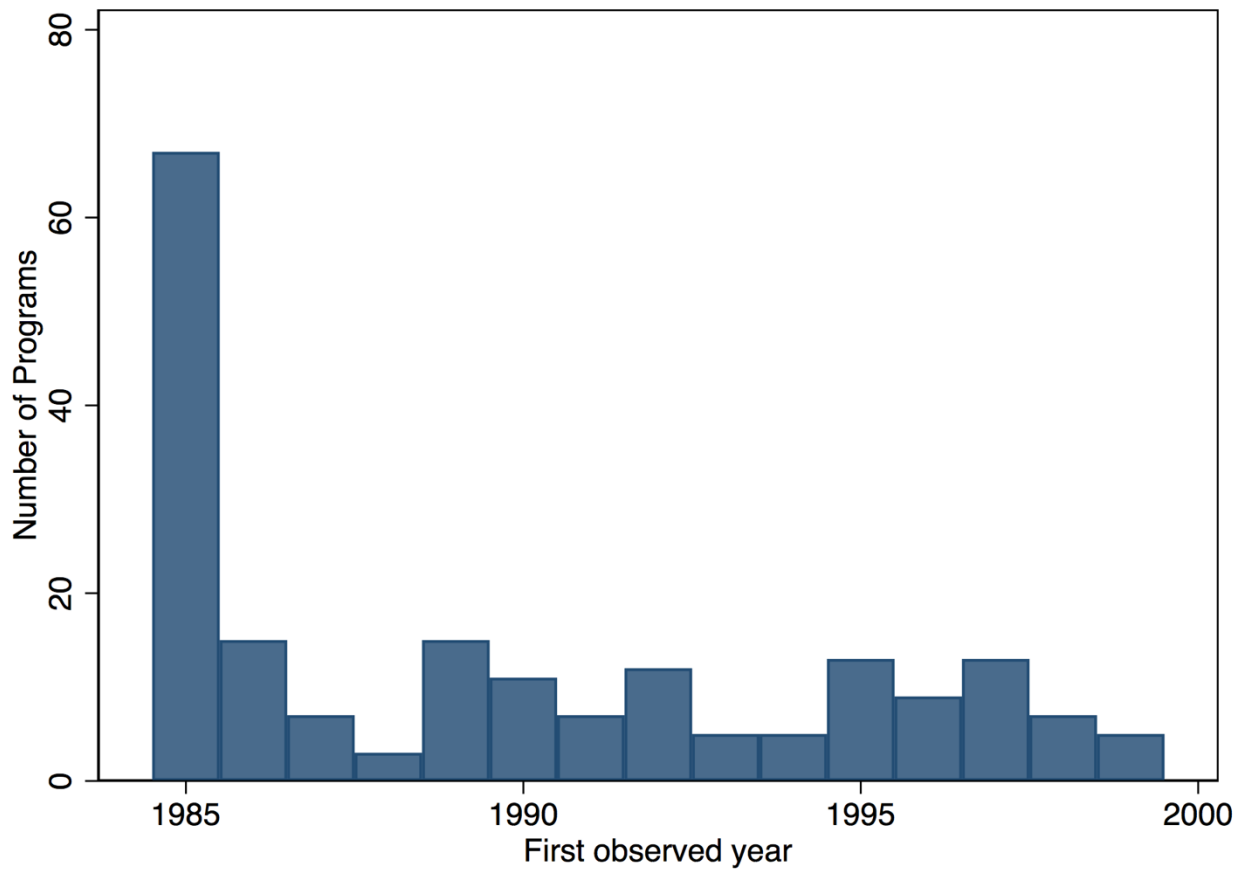
B. ADDITIONAL FIGURES

Figure B1: Distribution of base years of major acquisition programs
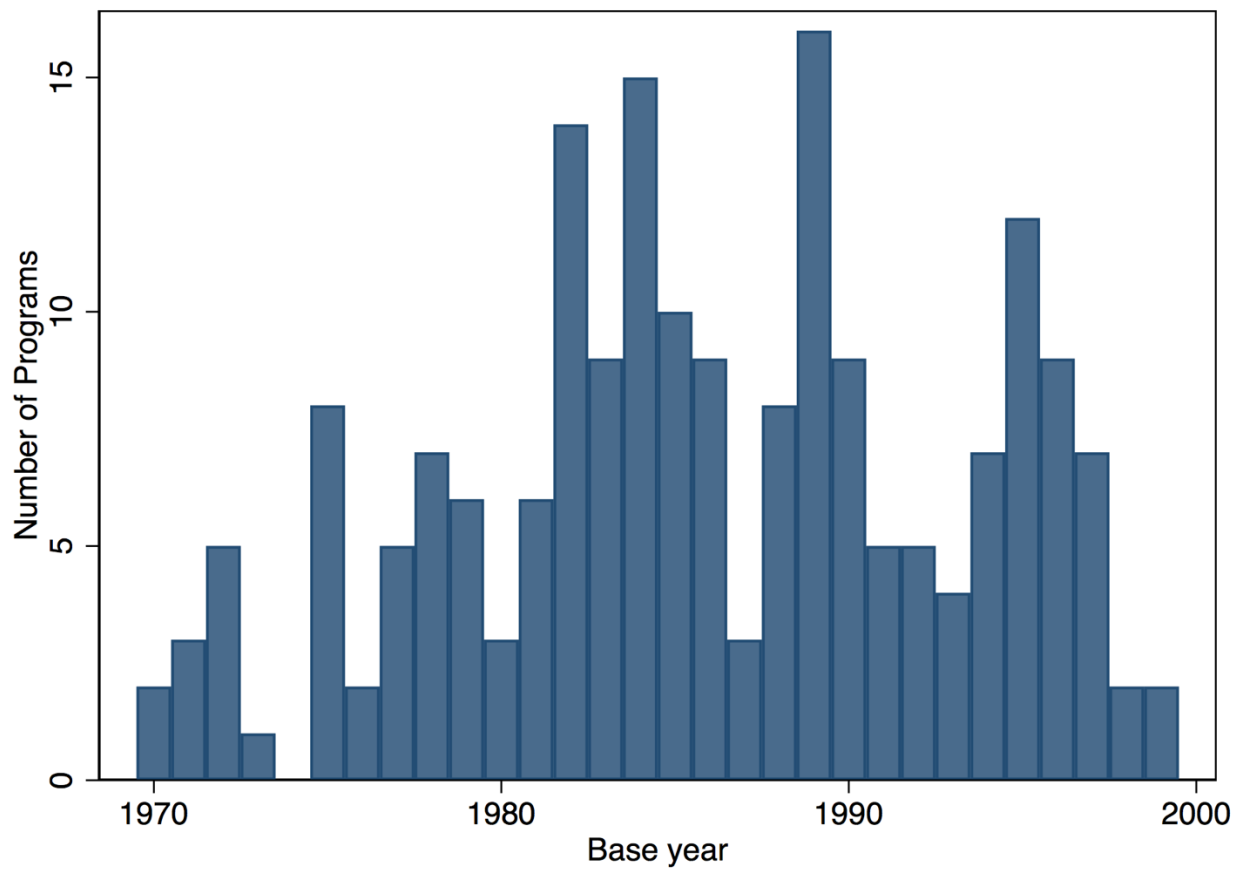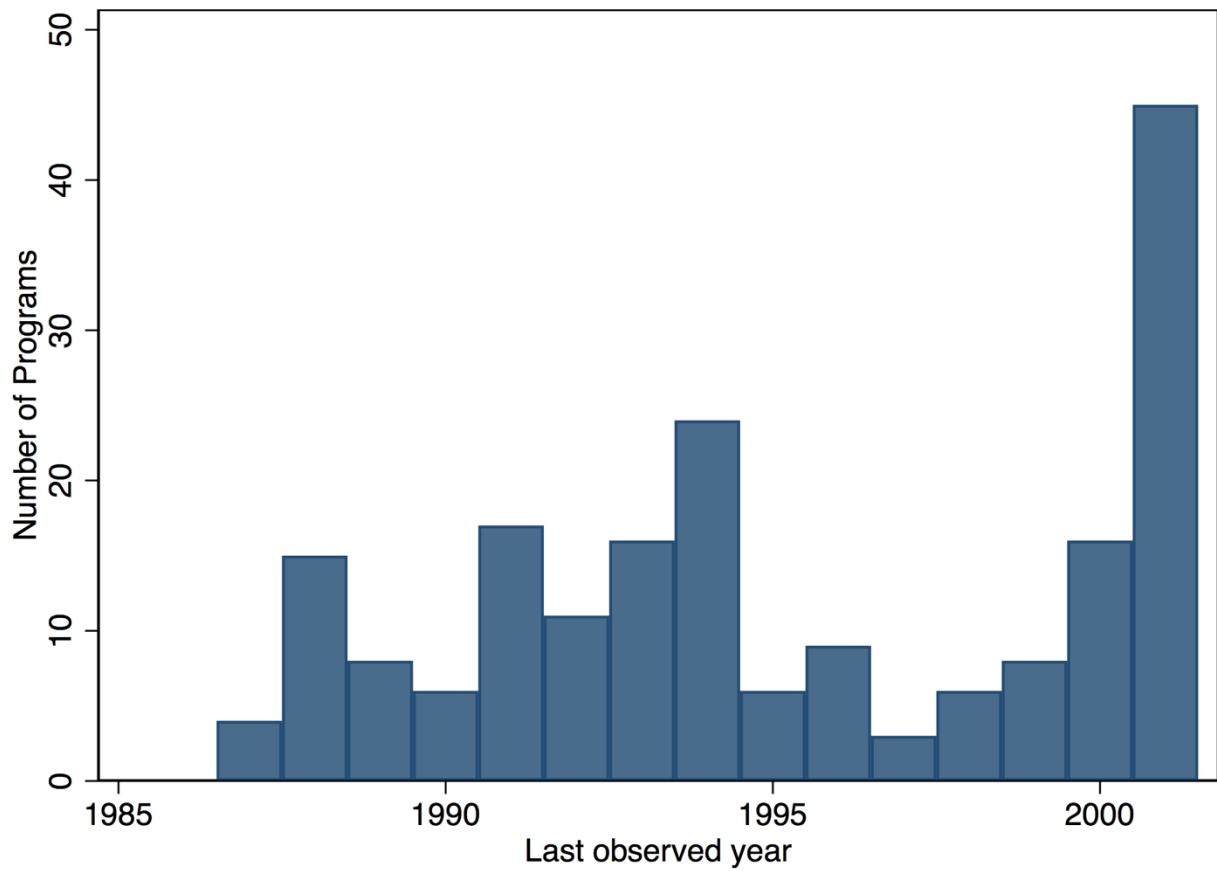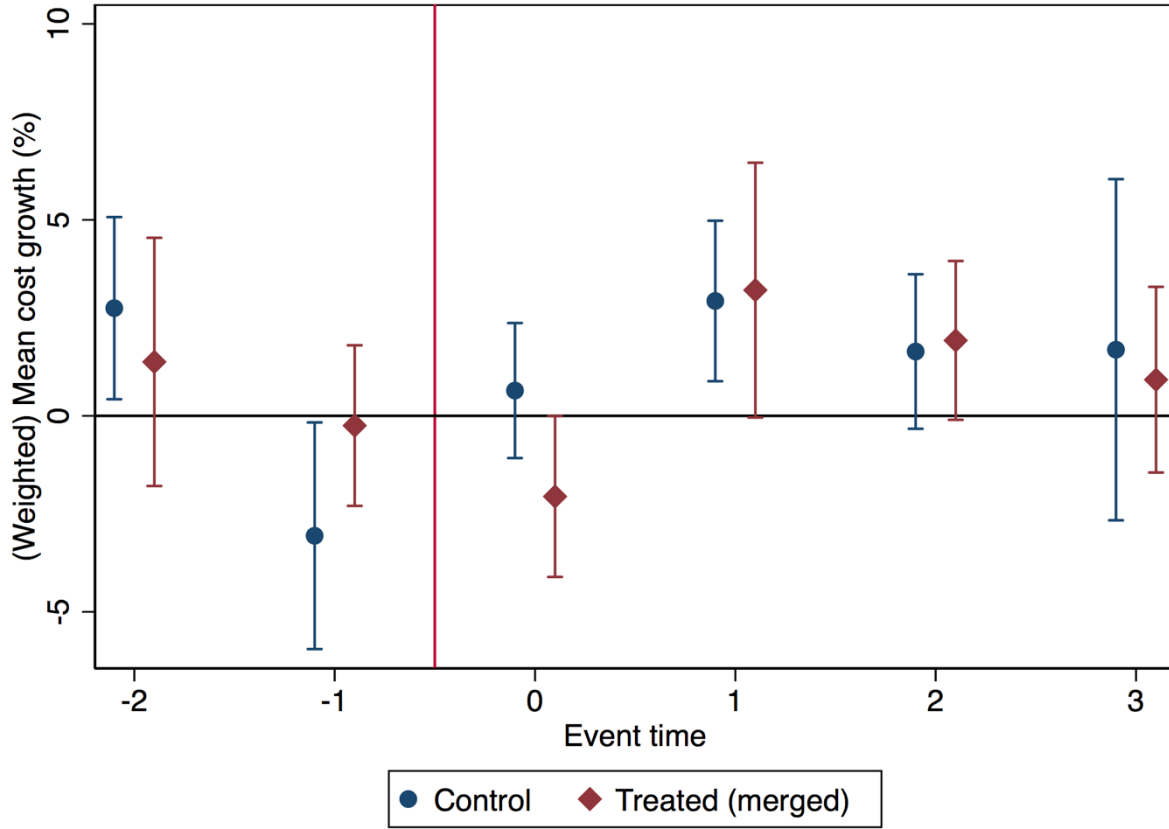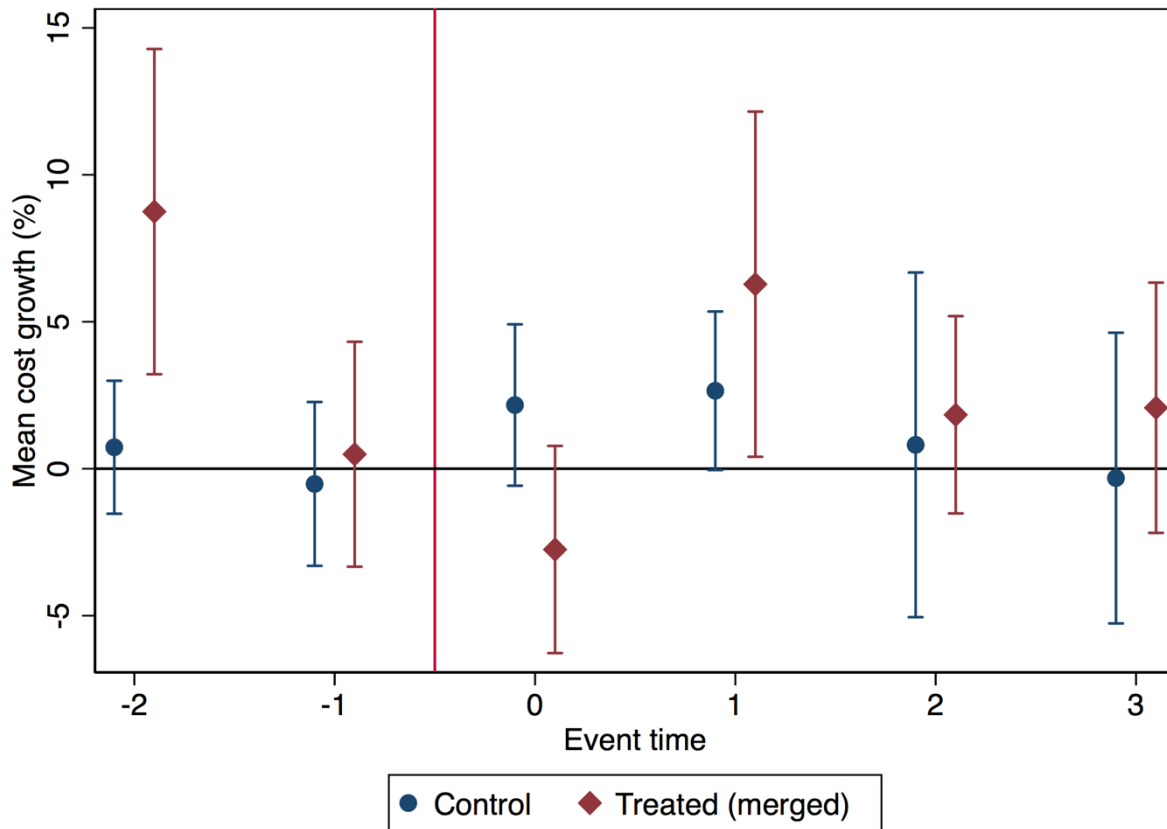

Notes: The data source is the Selected Acquisition Reports summary tables. The analysis sample consists on 194 major acquisition programs that were active for at least three consecutive periods between 1985 and 2001. The figure depicts the distribution of base years of these programs. The base year is typically the year in which the program started, and when baseline cost estimates are computed. Each bar represents the number of programs that have a base year equal to the position in the horizontal axis.

Figure B2: Distribution of first observed years of major acquisition programs

Notes: The data source is the Selected Acquisition Reports summary tables. The analysis sample consists on 194 major acquisition programs that were active for at least three consecutive periods between 1985 and 2001. The figure depicts the distribution of the first observed years of these programs. This variable is truncated at 1985 and 1999 because of our sample definition. Each bar represents the number of programs that we observe for the first time in the year equal to the position in the horizontal axis.

Figure B3: Distribution of last observed years of major acquisition programs

Notes: The data source is the Selected Acquisition Reports summary tables. The analysis sample consists on 194 major acquisition programs that were active for at least three consecutive periods between 1985 and 2001. The figure depicts the distribution of the last observed years of these programs. This variable is truncated at 1987 and 2001 because of our sample definition. Each bar represents the number of programs that we observe for the last time in the year equal to the position in the horizontal axis.

Figure B4: Event study analysis of program cost growth (weighted annual growth)


Notes: The data source is the Selected Acquisition Reports summary tables. The unit of observation is an acquisition program by fiscal year. This figure depicts weighted averages of annual cost growth for each date in "event time", and separately for "merged" and "not merged" programs. We weight each program by their estimated baseline cost. Treated programs are defined as those that have a prime contractor participating in one of the approved mergers in Table 2. The rest are defined as control programs. Event time is calendar years relative to the merger date of a given program (t^* in Table 2). We select treated programs that were observed for at least one year before *and* one year after the merger. Then, we construct a sample of control programs by restricting them to have been active between the same years as the merged sample. Finally, we assign placebo merger dates for control programs at random, following the same distribution of merger dates among treated programs. We use this placebo merger dates to calculate event time for the control sample.

Figure B5: Event study analysis of program cost growth (unweighted annual growth)


Notes: The data source is the Selected Acquisition Reports summary tables. The unit of observation is an acquisition program by fiscal year. This figure depicts (unweighted) averages of annual cost growth for each date in "event time", and separately for treated and control programs. Treated programs are defined as those whose prime contractor was involved in one of the approved mergers in Table 2. The rest are defined as control programs. Event time is calendar years relative to the merger date of a given program (t^* in Table 2). We select treated programs that were observed for at least one year before *and* one year after the merger. Then, we construct a sample of control programs by restricting them to have been active between the same years as the merged sample. Finally, we assign placebo merger dates for control programs at random, following the same distribution of merger dates among treated programs. We use this placebo merger dates to calculate event time for the control sample.

Figure B6: Event study analysis of program cost growth (share of annual cost growth above 10%)
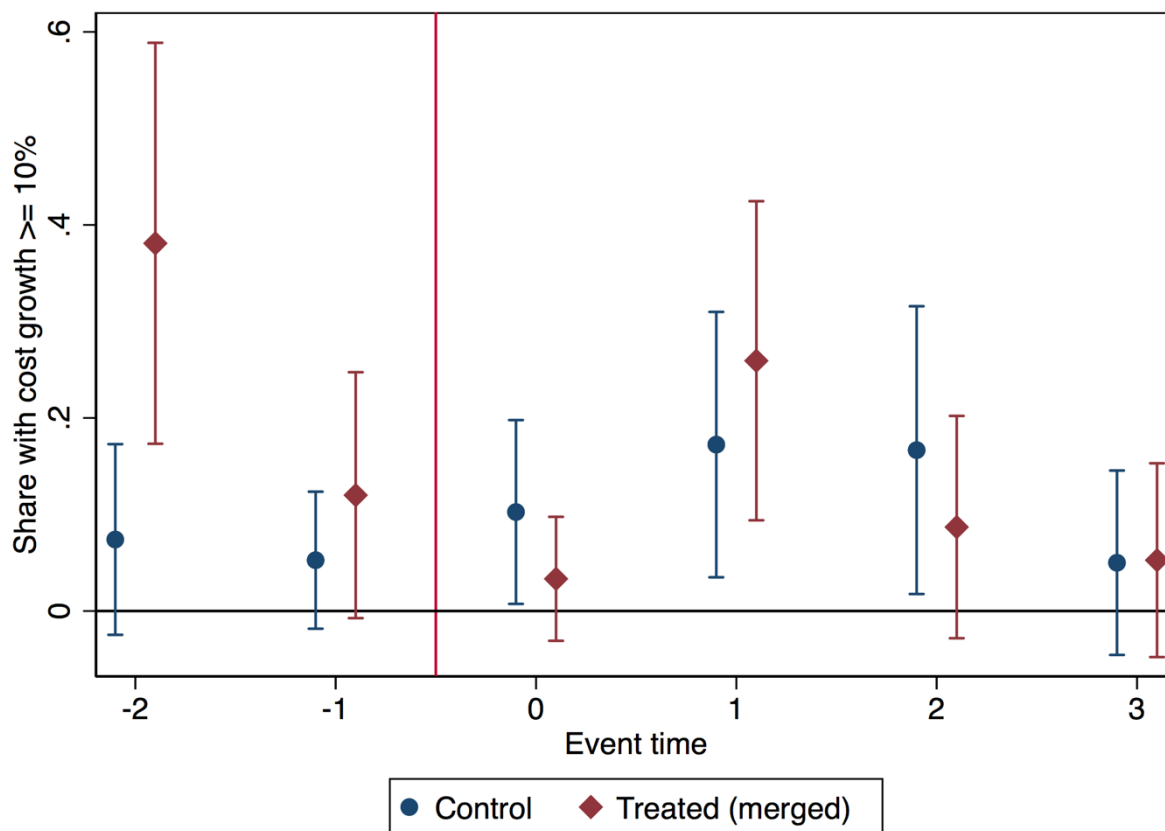
Notes: The data source is the Selected Acquisition Reports summary tables. The unit of observation is an acquisition program by fiscal year. This figure depicts the share of acquisition programs that experienced a cost growth of more than 10%, for each date in "event time", and separately for treated and control programs. Treated programs are defined as those whose prime contractor was involved in one of the approved mergers in Table 2. The rest are defined as control programs. Event time is calendar years relative to the merger date of a given program (t^* in Table 2). We select treated programs that were observed for at least one year before *and* one year after the merger. Then, we construct a sample of control programs by restricting them to have been active between the same years as the merged sample. Finally, we assign placebo merger dates for control programs at random, following the same distribution of merger dates among treated programs. We use this placebo merger dates to calculate event time for the control sample.

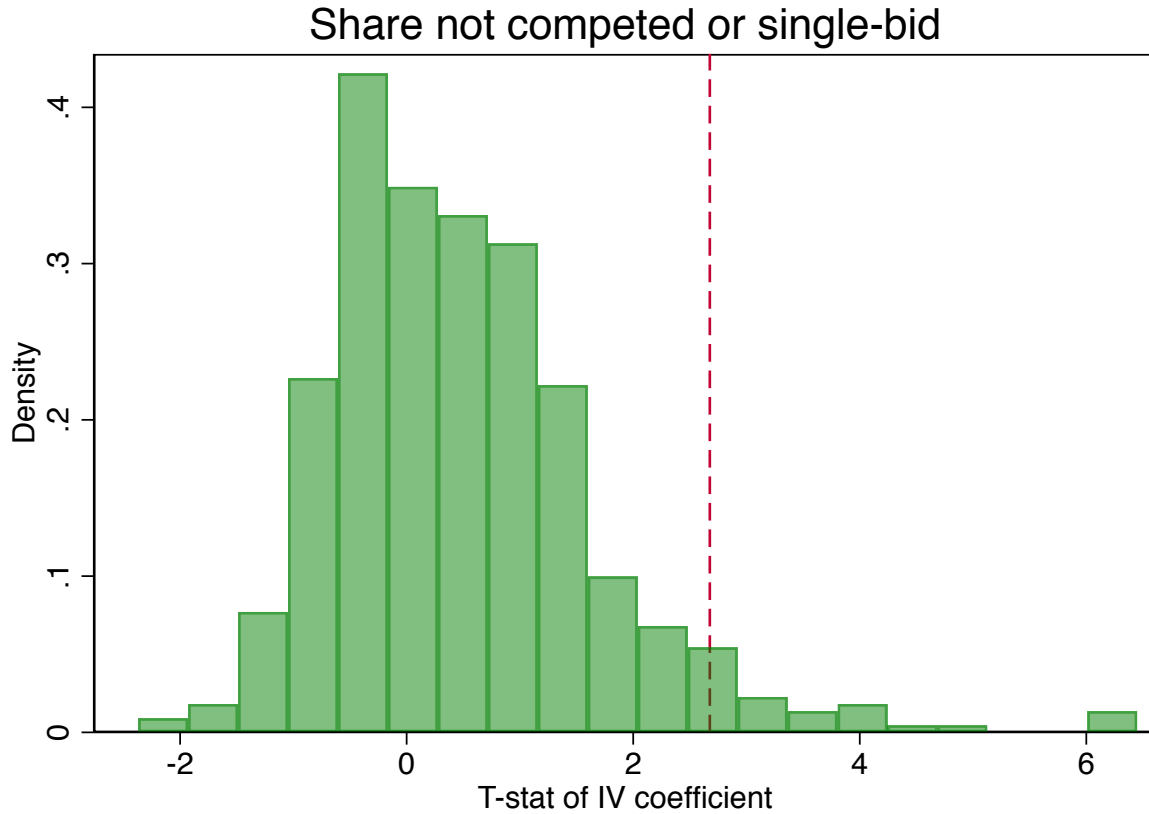**Figure B7: Distribution of reduced form coefficients based on placebo mergers: competition**
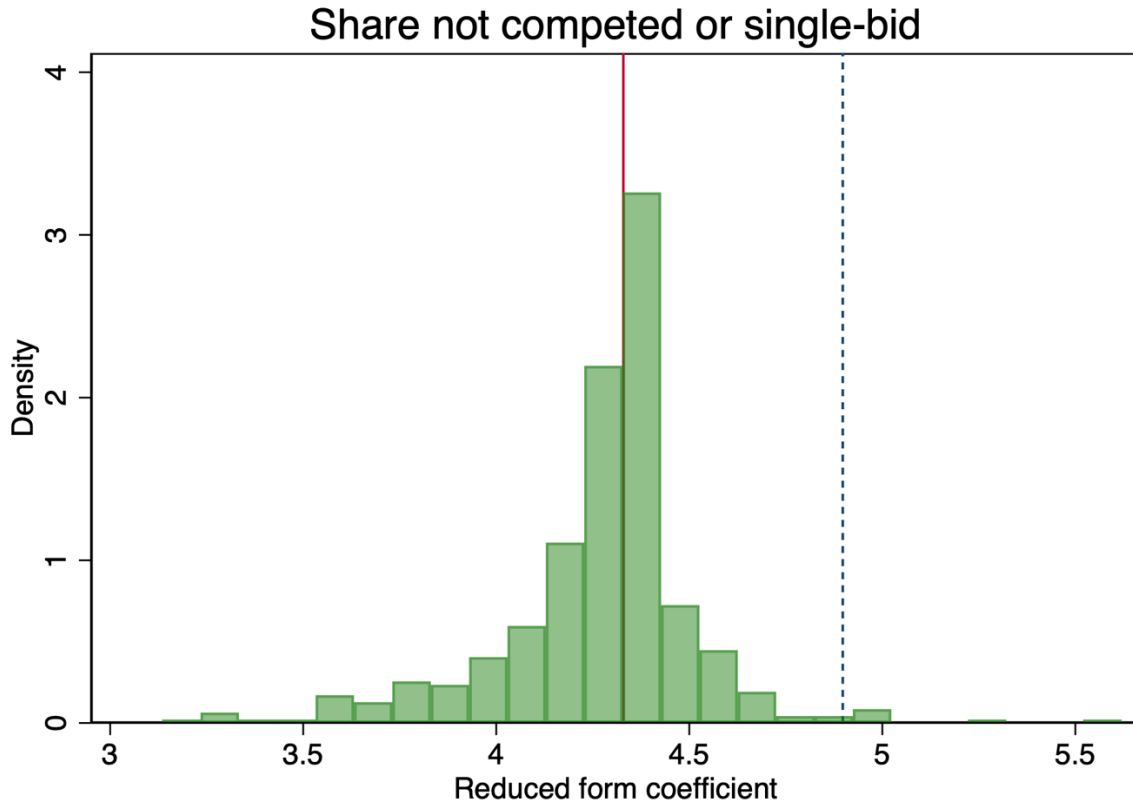
Notes: The histogram shows the distribution of N=500 reduced-form coefficients when a placebo merger is introduced. The placebo mergers are generated by randomly selecting two firms from the list of top 30 contractors in FY1990 and drawing a random fiscal year between 1988 and 2001. A simulated change in HHI is computed for this placebo merger and then included both in the combined instrument and as a separate regressor. The dependent variable is the share of dollars in a given market-year that was awarded either without competitive procedures or with competitive procedures where a single offer was received. The regression includes a set of market and fiscal year fixed-effects. Observations are weighted according to the market's average number of contracts in FY1980-FY1984. The baseline reduced form coefficient (column 2 of Table 6) is shown in the vertical solid line. The vertical dashed line shows the coefficient when the merger of Lockheed Corporation and Martin Marietta in FY 1995 is treated as placebo.

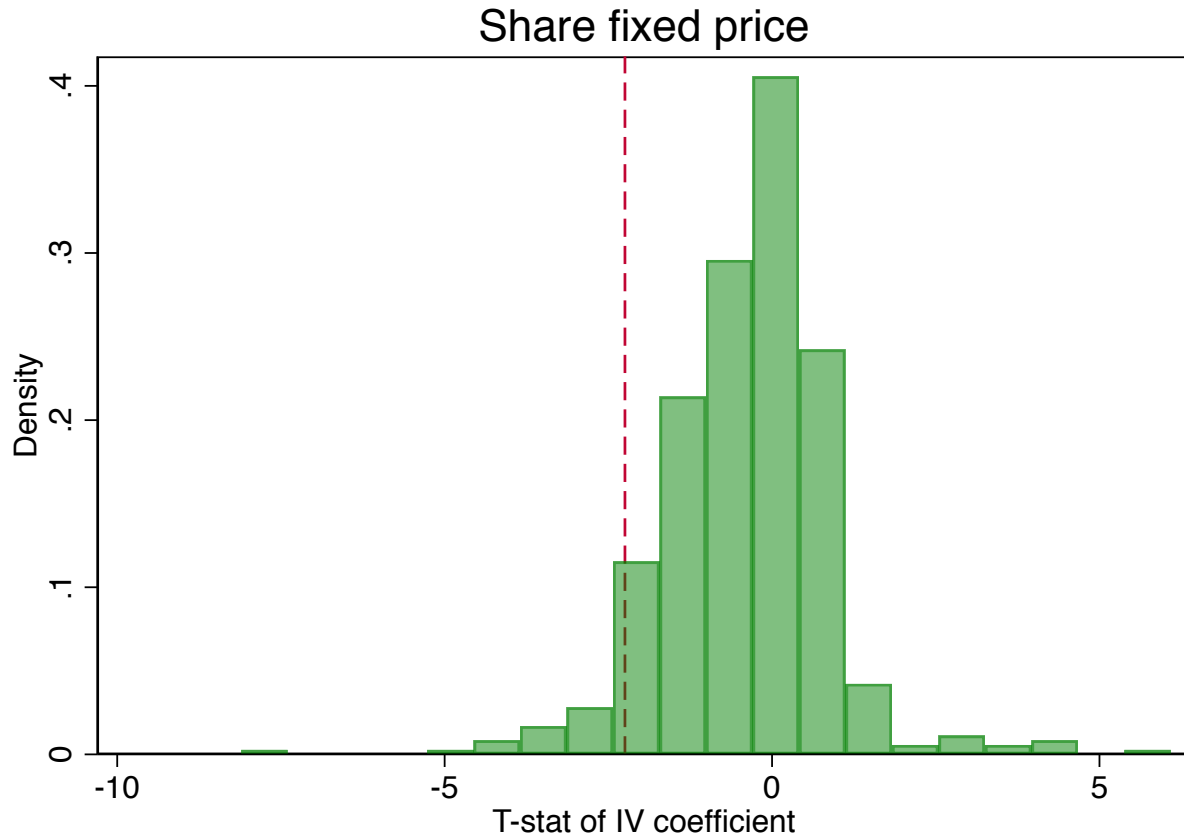**Figure B8: Distribution of reduced form coefficients based on placebo mergers: contractual form**
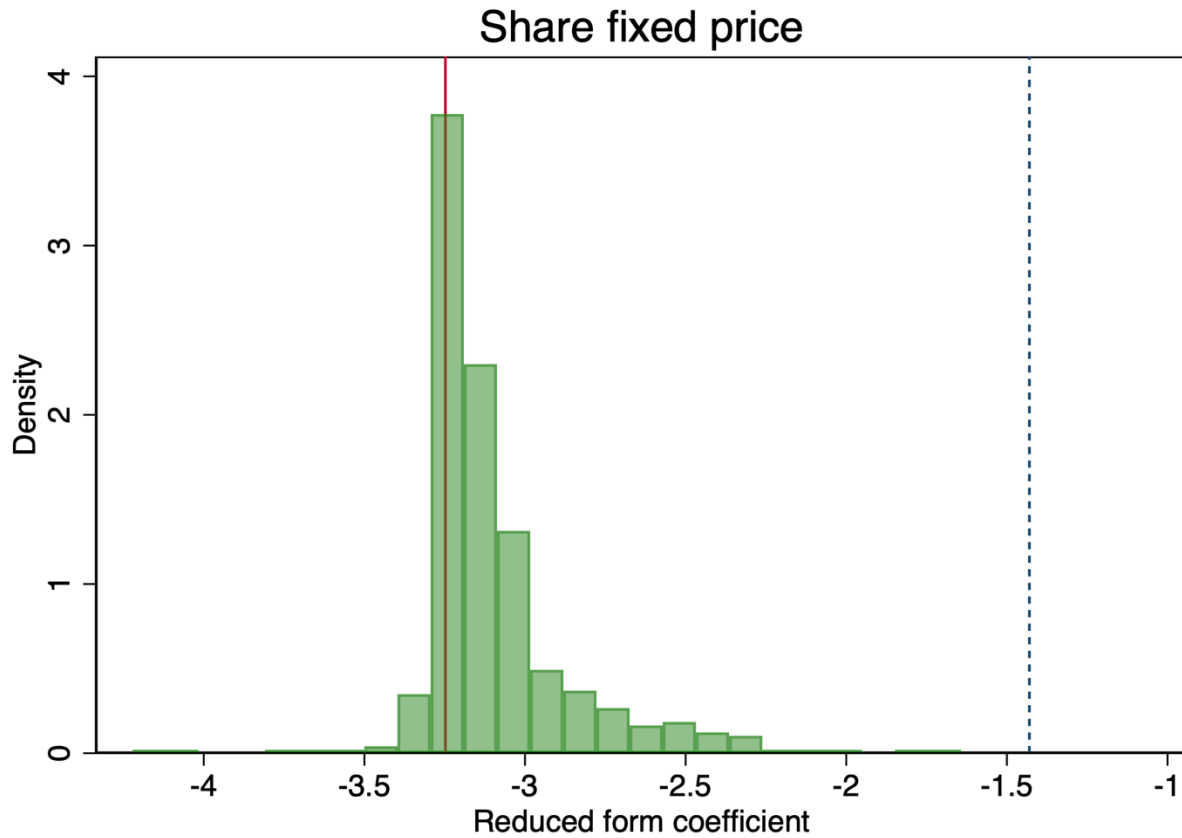
Notes: The histogram shows the distribution of N=500 reduced-form coefficients when a placebo merger is introduced. The placebo mergers are generated by randomly selecting two firms from the list of top 30 contractors in FY1990 and drawing a random fiscal year between 1988 and 2001. A simulated change in HHI is computed for this placebo merger and then included both in the combined instrument and as a separate regressor. The dependent variable is the share of dollars in a given market-year that was awarded via fixed-price contracts (as opposed to cost-plus contracts). The regression includes a set of market and fiscal year fixed-effects. Observations are weighted according to the market's average number of contracts in FY1980-FY1984. The baseline reduced form coefficient (column 2 of Table 7) is shown in the vertical solid line. The vertical dashed line shows the coefficient when the merger of Lockheed Corporation and Martin Marietta in FY 1995 is treated as placebo.

Figure B9: Distribution of random T-statistics for IV coefficient: competition

Share not competed or single-bid

Notes: The histogram shows the distribution of N=500 the T-statistic (coefficient divided by standard error) of IV coefficients based on four randomly generated placebo mergers. The placebo mergers are generated by randomly selecting four pairs of firms from the list of top 30 contractors in FY1990, excluding the ones that actually merged: Northrop, Grumman, Lockheed, Martin Marietta, Boeing, McDonnell Douglas, Raytheon, Texas Instruments, and Hughes Aircraft. The placebo merger year is assigned by drawing four random fiscal years between 1988 and 2001. A simulated change in HHI is computed by combining the four placebo mergers. Then the IV T-statistic is obtained by running 2SLS of a dependent variable on a set of market and fiscal year fixed-effects, and on HHI, instrumenting the latter with the simulated change in HHI. The dependent variable is the share of dollars in a given market-year that was awarded either without competitive procedures or with competitive procedures where a single offer was received. Observations are weighted according to the market's average number of contracts in FY1980-FY1984. The baseline IV T-statistic (calculated from column 6 in Table 6) is shown in the vertical dashed line. The implied two-sided p-value (probability that the random T-statistic is greater in absolute value to the baseline estimate) is 0.040.

Figure B10: Distribution of random T-statistics for IV coefficient: contractual form

Notes: The histogram shows the distribution of N=500 the T-statistic (coefficient divided by standard error) of IV coefficients based on four randomly generated placebo mergers. The placebo mergers are generated by randomly selecting four pairs of firms from the list of top 30 contractors in FY1990, excluding the ones that actually merged: Northrop, Grumman, Lockheed, Martin Marietta, Boeing, McDonnell Douglas, Raytheon, Texas Instruments, and Hughes Aircraft. The placebo merger year is assigned by drawing four random fiscal years between 1988 and 2001. A simulated change in HHI is computed by combining the four placebo mergers. Then the IV T-statistic is obtained by running 2SLS of a dependent variable on a set of market and fiscal year fixed-effects, and on HHI, instrumenting the latter with the simulated change in HHI. The dependent variable is the share of dollars in a given market-year that was awarded via fixed-price contracts (as opposed to cost-plus contracts). Observations are weighted according to the market's average number of contracts in FY1980-FY1984. The baseline IV T-statistic (calculated from column 6 in Table 7) is shown in the vertical dashed line. The implied two-sided p-value (probability that the random T-statistic is greater in absolute value to the baseline estimate) is 0.076.

C. ANALYSIS OF MAJOR DEFENSE ACQUISITION PROGRAMS

In Section VI we refer to complementary evidence from Major Defense Acquisition programs. Here we provide additional details about the institutional background, the data, the empirical framework, and additional results.

Institutional Background

The DoD conducts special procedures for acquisitions that are expected to exceed certain expenditure levels. These programs are called Major Defense Acquisition Programs (MDAP) and are subjected to special acquisition rules and to an additional level of scrutiny. An MDAP is a program for which it is estimated that total expenditure for research, development, and test and evaluation (RDT&E) will exceed $480 million or that procurement expenditures will exceed $2.79 billion.[1] Examples of these programs include the F-22 fighter aircraft, the Blackhawk helicopters, and the Tomahawk missiles.

Given the substantial size of these acquisition programs, the DoD is required by law to submit to Congress detailed periodic reports with the evolution of their costs, schedule, and performance. These are known as Selected Acquisition Reports (SAR). The standard requirement is to submit a new SAR for each program annually. However, if a particular program experiences a per-unit cost increase of more than 15% or a schedule delay of more than 6 months, an additional SAR has to be submitted at the end of the next quarter. We use the information contained in these reports to track the evolution of acquisition costs for these especially large contracts and to test whether they are impacted following industry consolidation.

Data: Selected acquisition reports (SARs) summary tables

We compiled information from the Selected Acquisition Reports (SARs) that the DoD is required to periodically submit to Congress. Each report summarizes the cost, schedule, and performance status of Major Defense Acquisition Programs (MDAPs). Each report is a lengthy and detailed document, but the DoD publishes summary tables that compile the key variables for all active MDAPs, most importantly unit acquisition costs.

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[1] Figures in FY 2014 constant dollars.

We use the data included in these summary tables from 1985 through 2001 to build this dataset. The tables list each active acquisition program by name, the military branch in charge of it, the year in which the program started (referred to as the base year), current estimates of total acquisition costs and quantities, and the cost and quantity estimates that were available in the base year. With these pieces of information, the DoD computes an estimate of the *change* in total acquisition costs in the current year with respect to the baseline estimates. Importantly, this cost growth estimate adjusts for changes in quantities purchased, which occur frequently.[2]

By combining the information in all of these annual tables, we can construct a panel dataset in which we follow acquisition programs over the years that they remain active. We restrict attention to the 190 programs that we observe for at least three years during our study period. Panel A of Appendix Table A14 presents summary statistics of this dataset. The average program in our sample is active for 6.3 years during our study period, which gives us 1,192 program-year observations. The average program was estimated to have a total cost of $10.8B (in FY2016 dollars) at baseline. On average, total acquisition costs grow by 2.8% annually (adjusting for changes in quantity purchased).

Empirical framework

Sample construction

From the compiled SAR data, we consider 194 MDAPs programs that were active for at least three consecutive years on FY1986-FY2001, generating an unbalanced panel with 1,267 program (i) – year (t) observations.

Note that we observe the identity of the prime contractors of each program. Key for our identification strategy below, we distinguish between programs run by the contractors participating in the large mergers of Table 2. We will refer to these programs as "treated" and to the rest of the programs as "control".

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[2] As an example, consider a program that is expected to last 3 years, and suppose that there are no inflation or quantity changes. At baseline (year 1), this program is expected to have a *total cost* of $10B over its lifetime. In year 2, suppose the *total cost* is now estimated to be $11B, either because of higher realized costs or because of increased expected costs. In year 3, the program ends and suppose the estimate of *total cost* is now fully realized and equals $11B, just like in the previous year. The *cost growth* estimate (difference between current year and baseline) would be 10% for year 2, and also 10% for year 3. We define the *annual cost growth* as the first difference of this variable, to measure year-to-year changes in cost estimates. In this case, *annual cost growth* would have been equal to 10% and 0% in years 2 and 3 respectively. In practice, when translating the *total cost* estimates into *cost growth* estimates, the DoD adjusts the magnitudes to account for the effects of inflation and quantity changes.

Each program has a baseline year, which is typically the year in which the program started, and when initial acquisition costs estimates are recorded. Every year after that, we observe updates of these cost estimates, which start to be partially realized. The DoD also computes measures of cost growth based on the difference between the current and baseline estimates of program cost, adjusting for both inflation and any changes in quantity procured. This is important because these adjustments occur frequently and can imply large changes in the overall level of expenditure without necessarily being related to underlying cost changes. From this information we construct acquisition cost variables that we describe below.

Panel B of Appendix Table A14 presents summary statistics on the MDAP analysis sample. Note that we present separate statistics for the 118 "treated" and 76 "control" programs. Appendix Figures B1, B2, and B3 present the distributions of base years, first observed years, and last observed years, respectively.

Difference-in-differences strategy

Our approach relies on combining the time variation in the mergers of Table 2 with variation across acquisition programs, depending on whether they were directly affected by the mergers. In other words, we implement a difference-in-differences (DiD) strategy, in which we compare the evolution of acquisition costs for programs whose prime contractor experienced a merger relative to those programs that did not, before and after the consolidation. We will refer to the former as "treated" programs, while we will call the latter "control" programs. The DiD specification is:

$$Y_{it} = \gamma + \eta_i + \tau_t + \delta \cdot Merge_{it} + v_{it} \tag{4}$$

in which Y_{it} is some measure of acquisition costs, $Merge_{it}$ is an indicator equal to one if program i's main contractor is involved on the mergers listed in Table 2 (i is a treated program), *and* $t \geq t^*$ (the year of the merger). This specification also controls for program fixed effects (to account for baseline differences across programs) and year fixed effects (to account for the effects of common changes across all programs in procurement policies, expenditures, or related factors). We are especially interested in δ, the estimated effect of a firm's merger on the cost of procuring from them. The identifying assumption is that absent any merger, the acquisition costs of programs awarded to firms like Lockheed or Northrop that were both involved in mergers would have evolved in a parallel way with respect to those run by firms like General Dynamics or Litton Industries that were not.

We use three specific measures of acquisition cost as dependent variables. First, we will use the estimated full cost of program i in fiscal year t (in logs), which is updated in every new SARs. Second, we will use the estimated real annual cost growth adjusted by quantity changes. Third, we will generate an indicator from the (corrected) annual cost growth variable that will take the value of 1 if in a given year the annual cost growth exceeds 10%.

The results from these specifications are presented in Table 9 and discussed in Section VI.

Simple event study

The DiD specification from above is estimated using all 194 programs in our sample. But while using all available programs maximizes the statistical precision of the estimation, the identification of our main coefficient of interest δ is driven primarily by treated programs for which we observe activity both before and after the merger of their contractor, as well as from control programs of similar ages that are active in similar years. Given this, we complement our DiD analysis with a simple event study, which focuses only on the programs that drive the estimation of δ, and which provides us with transparent graphical evidence on the relative evolution of acquisition costs for treated and control groups.

We implement our event study in the following way. We first restrict attention to treated programs for which we have at least one observation on the year preceding *and* one observation on the year following the merger. At the bottom of Table 5 we can see that these correspond to 30 programs (the other 88 treated programs are observed either only before or only after the relevant merger).

We then build a comparable control group by selecting programs that were active between the same fiscal years as the subsample of treated programs. For these control programs, we assign placebo merger dates at random, with the condition that the distribution of merger years across both groups looks similar. We let event time to be fiscal years relative to the one in which the merger (real or placebo) occurred. With this approach we can perform our event study by plotting the different measures of acquisition costs over event time for both treated and control programs.

Figures B4, B5, and B6 present the results of this analysis. We plot the mean annual cost growth for treated and control programs as a function of event time. This graphical evidence is consistent with our previously presented null result, since we see the different measures of annual cost growth of treated and control programs evolve in a roughly parallel trend.

D. PLACEBO MERGERS AND RANDOMIZATION INFERENCE

In the main body of the paper, we present evidence from a "placebo" merger between Lockheed Martin and Northrop Grumman, which was announced but blocked by antitrust authorities. Here we expand the analysis by implementing two exercises that use many randomly generated placebo mergers. We focus on the specifications on the share of non-competitive contract dollars (or competitive, but with a single bid) and on the share of fixed-price contract dollars.

D1. Stability of reduced form coefficient to inclusion of random mergers

In Tables 6, 7 and 8, we show that the reduced form coefficients of interest on the simulated change in HHI are remarkably stable when we introduce the blocked merger by Lockheed Martin and Northrop Grumman. Here we explore the extent to which this holds when we include other placebo mergers. We construct these placebos by drawing two firms at random from the list of top 30 firms in FY 1990, and randomly selecting a merger year between 1988 and 2000.[3] We then construct the simulated change in HHI associated with this fictitious merger, and estimate regressions analogous to column (4) of Tables 6 and 7. That is, we include the placebo in the combined instrument $sim\Delta HHI_{it}$ and also as a separate regressor. From this we obtain and store the coefficient on the combined instrument $sim\Delta HHI_{it}$. We repeat this exercise $N = 500$ times.

Appendix Figures B7 and B8 show the full distribution of the instrument's coefficient for each of the two main specification (non-competitive awards and fixed-price awards). In both cases, the coefficient is remarkably stable. To see this, we can compare these distributions to the coefficient that we obtain when we would obtain when we treat one of the actual consummated mergers as placebo. In particular, we take the merger between Lockheed and Martin in 1995 as a placebo and include it as a separate regressor. In this case, the coefficient of the combined instrument $sim\Delta HHI_{it}$ —shown as a vertical dashed line— changes abruptly: the coefficient is a relatively extreme event in the context of the full distribution of coefficients augmented with placebo mergers.

D2. Distribution of IV T-statistics

In a similar vein, we use placebo mergers to reflect on inference relative to our main IV estimates. For each of the two main outcomes (non-competitive awards and fixed-price awards), we estimate many

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[3] We omit the first three sample years (1985, 1986 and 1987) because our construction of the instrument requires three years of pre-merger data. We omit the last sample year (2001) to allow the merger to have at least one year of "post" data.

IV specifications using randomly generated placebo mergers as the basis for the simulated change in HHI. We estimate the equivalents of the specifications in column (6) of Tables 6 and 7.

For this exercise we completely omit the actual mergers from the analysis and construct the placebo mergers by randomly selecting four pairs of firms in the top 30 contractors in FY1990 that did not participate in one of the four actual mergers. Again, we assign a year at random between 1988 and 2000. We focus on the T-statistic of the IV coefficients, in order to account for the fact that very weak instruments might generate large yet extremely imprecise estimates. We consider $N = 500$ replications of this exercise.

In other words, we are asking how often we would have found IV coefficients with a T-stat as large as the ones we obtained, had we generated instruments based on purely random mergers between non-merging firms. The results are presented in Appendix Figures B9 and B10. Reassuringly, our estimates appear close to the tail of the distributions. We can calculate a (two-sided) p-value for our T-stats as the share of placebo estimates that are larger than our actual estimate (in absolute value). This p-value is 0.040 for the share of noncompetitive or single-bid dollars and 0.076 for the share of fixed price dollars.