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The Excessive Profits of Defense Contractors: Evidence and Determinants

8 February 2012

by

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Graduate School of Business & Public Policy
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Abstract

A long-controversial issue, one that divides academics, government officials, elected representatives, and the U.S. defense industry, is whether defense contractors earn abnormal or excessive profits at the expense of taxpayers. Using an innovative industry-year-size matched measure of excessive profit, we demonstrate three findings. First, when compared with their industry peers, defense contractors earn excessive profits. This result is evident when profit is measured by Return on Assets (ROA), Return on Common Equity (ROCE), and Profit Margin Ratio (PMR). The evidence of excessive profit is less consistent if profit is measured by Operating Margin Ratio (OMR). Second, defense contractors' excessive profit is more pronounced after 1992, consistent with the conjecture that the post-1992 significant industry consolidation enabled superior profitability due to both the improved bargaining power and increased political influence of the newly combined firms. Finally, defense contractors' excessive profitability increases with poorer corporate governance, as measured by the duality of the Chief Executive Officer (CEO) and the Chairman of the Board.

Keywords: Defense Contractors, Excessive Profits, Industry Consolidation, Corporate Governance



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I. Introduction

A long-standing controversial issue that divides academics, government officials, elected representatives, and the defense industry is whether U.S. defense contractors earn abnormal or excessive profits at the expense of taxpayers. The Aerospace Industries Association (AIA), the premier association representing the nation's best known names in the aerospace and defense industries, has consistently insisted that "defense industry profitability lags significantly behind its industrial peers" (Sylvester, 2010). On the other hand, a General Accounting Office (GAO) report in the 1980s found that defense contractors normally earned a higher Return on Assets (ROA) than their commercial counterparts (Carrington, 1986). The primary metric used by AIA is operating margin, measured as operating profit (earnings before interest and tax or EBIT) as a percentage of sales. In 2009, the Institute for Defense Analysis (IDA) issued a U.S. Department of Defense (DoD)-sponsored report, *Defense Department Profit and Contract Finance Policies and Their Effects on Contract and Contractor Performance* (Arnold, Harmon, Tyson, Fasana, & Wait, 2009). The IDA report confirms that the operating margin of the defense industry is lower than that of other sectors. However, the profit is "adequate" to sustain defense industry firms because they enjoy a more favorable financing structure under which the firm has much less of its own capital invested.

One might expect that as a source of research that is more independent and relatively free from conflict of interest, the academic literature should provide more concrete and scientific evidence on this critical issue. Unfortunately, this is not the case. First, for whatever reason, there is a long history of avoidance of military-related research among academics. As a result, studies in this field are quite limited. Second, the already-limited studies on this topic stop in the 1990s, leaving a blank for almost two decades. Early evidence on the issue of excessive profits is mixed. For example, Weidenbaum (1968) argued that defense profits are excessive. Bohi (1973) used a sample of 36 defense contractors and concluded that "there is no



evidence for arguing that defense business is any more or less profitable than nondefense business in general.” Agapos and Galloway (1970) stated, “There is almost no evidence that aerospace firms in contemporary America are able to reap unusually large or excessive profits” (p. 1103). Stigler and Friedland (1971) documented that the profit rates of the top defense contractors substantially exceeded those of comparable non-defense companies. In summary, there was no consensus among academics in the 1960s and 1970s.

The studies in the 1980s and 1990s were less divided in that, generally, they supported the proposition that defense industries earn higher profits than their non-defense peers (Carrington, 1986; Trueger 1991). For instance, Lichtenberg (1992) found that the ROA of defense contractors, as a whole, was 68–82% higher than that of non-defense contractors. Moreover, those firms with the most government contracts were almost three times as profitable as their benchmark firms. The major explanation of the excess profits of defense contractors is the cost-shifting hypothesis (Rogerson, 1992; Thomas & Tung, 1992). According to this theory, a typical defense contractor has two types of revenue. The first stream of revenue derives from the DoD products whose prices are cost based and, hence, are cost sensitive. The other source of revenue is from typical commercial products whose prices are competition based and, therefore, are cost insensitive. Rogerson (1992) argued that a firm with a combination of defense products and commercial products will have an incentive to shift the common overhead costs from cost-insensitive segments to cost-sensitive segments. Since government contracts typically are reimbursed based upon costs and, more importantly, the price is determined based on negotiation between the two parties and is often renegotiated, this cost-shifting strategy will effectively result in the firm’s higher profitability.

The early evidence has been quite consistent with the cost-shifting hypothesis. For instance, Thomas and Tung (1992) found that pension plans were overfunded when employees worked on government contracts and those excess pension assets were withdrawn when employees worked on non-DoD products.



Rogerson (1992) not only documented the excess profitability of defense contractors, but also found that the defense product segments were significantly less capital intensive than less government-oriented segments, which is consistent with the cost-shifting hypothesis that predicts an input substitution effect (between capital and direct labor). Specifically, the cost-shifting theory conjectures that the defense product sector uses excess direct labor because the overhead allocation is traditionally based upon direct labor-based measures.

A more recent study casts doubt on the validity of the cost-shifting hypothesis. McGowan and Vondracik (2002) confirmed that defense contractors enjoyed excess profit from their government work, yet found no evidence of common overhead cost shifting. Specifically, they compared ROA among three types of segments within defense-contracting firms: (1) commercial segments, (2) government segments, and (3) mixed segments. The main testable hypothesis was the following: if the cost-shifting theory underlies the excess profitability of defense contractors, one would expect to see the highest profit in the mixed segment, where managers have the most opportunities to shift common overhead costs. Opposite to what was expected, McGowan and Vondracik (2002) found either that the government segments (not the mixed segments) significantly outperformed the other two segments or that there was no significant difference across the three categories, depending on the specific time period examined. The overall evidence suggested that unusually high profitability is more likely due to non-accounting explanations than to strategic cost allocation.

The objectives of this paper are twofold. First, we fill an almost two-decade-long gap in the literature. Specifically, using up-to-date data, we investigate whether defense contractors earn excessive profits. Our contribution to this goal is beyond a pure extension of the timeline. We employ an innovative measure of excessive profit based on a match of firms on three dimensions: industry, year, and size. This novel approach better captures the “excess” of the defense contractors’ profitability, if any exists. Second, given that we have found evidence supporting the existence of



defense contractors' excessive profits and lack of consensus on the explanation of these excessive profits, we provide alternative predictors of excessive profitability.

The remainder of the paper is organized as follows. In Section II, we describe our data. In Section III, we introduce our industry-year-size matched excessive profit and the empirical results and findings based on this measure. In Section IV, we hypothesize, and confirm, that industry consolidation after 1992 and corporate governance quality are two determinants of excess profits. We present our conclusions in Section V.



II. Data

Using fedspending.org as the source, we first identified a list of the top 500 recipients (by dollar awarded) of defense contract awards for 2008. For each publicly traded company on the list, the stock ticker was used to merge with accounting data from the Compustat database. We were able to find a total of 112 public firms from this top 500 list. Table 1 reports the name, dollar awarded, rank, stock ticker, SIC code, and public stock exchange code for these 112 public firms.

Table 1. The Main Sample: 112 Public U.S. Firms From the 2008 Top 500 List

Company Name	Contracted Dollars, 2008	Rank	Stock Ticker	SIC Code	EXCHG (11=NYSE, 12=AMEX, 14=NASDAQ)
LOCKHEED MARTIN CORP.	\$29,363,894,334	1	LMT	3760	11
NORTHROP GRUMMAN CORP.	\$23,436,442,251	2	NOC	3812	11
BOEING CO.	\$21,838,400,709	3	BA	3721	11
RAYTHEON CO.	\$13,593,610,345	6	RTN	3812	11
GENERAL DYNAMICS CORP.	\$13,490,652,077	7	GD	3790	11
UNITED TECHNOLOGIES CORP.	\$8,283,275,612	8	UTX	3720	11
L-3 COMMUNICATIONS HOLDINGS	\$6,675,712,135	9	LLL	3663	11
KBR INC.	\$5,997,147,425	10	KBR	1623	11
NAVISTAR INTERNATIONAL CORP.	\$4,761,740,206	11	NAV	3711	11
ITT CORP.	\$4,355,423,578	13	ITT	3812	11
SCIENCE APPLICATIONS INTL CORP.	\$3,885,932,047	14	SAI	7373	11
GENERAL ELECTRIC CO.	\$3,518,136,891	15	GE	9997	11
COMPUTER SCIENCES CORP.	\$3,230,197,590	16	CSC	7370	11
HUMANA, INC.	\$2,952,008,623	18	HUM	6324	11
TEXTRON, INC.	\$2,827,900,303	19	TXT	3721	11
HEALTH NET, INC.	\$2,438,349,117	21	HNT	6324	11
URS CORP.	\$2,402,033,979	22	URS	8711	11
HEWLETT-PACKARD CO.	\$1,938,638,634	26	HPQ	3570	11
ALLIANT TECHSYSTEMS, INC.	\$1,928,045,694	27	ATK	3480	11
OSHKOSH TRUCK CORP.	\$1,863,726,822	30	OSK	3711	11
HARRIS CORP.	\$1,841,470,263	31	HRS	3663	11
BP P.L.C.	\$1,733,031,788	32	BP	2911	11
HONEYWELL, INC.	\$1,721,547,997	33	HON	3728	11



ROYAL DUTCH PETROLEUM CO.	\$1,712,005,958	34	RDS.A	2911	11
FORCE PROTECTION INDUSTRIES, INC.	\$1,360,427,189	36	FRPT	3790	14
CACI INTERNATIONAL INC.	\$1,324,104,004	37	CACI	7373	11
AMERISOURCE BERGEN CORP.	\$1,298,059,841	38	ABC	5122	11
ROCKWELL COLLINS	\$1,290,813,364	39	COL	3728	11
SHAW GROUP, INC.	\$1,162,267,243	40	SHAW	8711	11
VALERO ENERGY CORP.	\$1,043,869,551	43	VLO	2911	11
JACOBS ENGINEERING GROUP INC.	\$951,295,410	45	JEC	1600	11
VSE CORP.	\$910,970,473	47	VSEC	8711	14
MCKESSON CORP.	\$903,799,326	48	MCK	5122	11
CARDINAL HEALTH INC.	\$856,333,988	50	CAH	5122	11
DELL COMPUTER CORP.	\$852,813,703	51	DELL	3571	14
EXXON MOBIL CORP.	\$836,548,150	52	XOM	2911	11
MANTECH INTERNATIONAL CORP.	\$655,579,972	61	MANT	7373	14
FLIR SYSTEMS, INC.	\$507,944,847	71	FLIR	3812	14
GOODRICH CORP.	\$487,753,671	73	GR	3728	11
TETRA TECH, INC.	\$472,960,770	77	TTEK	8711	14
IBM CORP.	\$438,446,918	81	IBM	7370	11
PERINI CORP.	\$436,363,793	82	TPC	1540	11
FLUOR CORP.	\$430,878,065	84	FLR	1600	11
CERADYNE INC.	\$417,616,849	86	CRDN	3290	14
AECOM TECHNOLOGY CORP.	\$380,250,228	91	ACM	8711	11
AT&T INC.	\$371,099,463	95	T	4813	11
KRAFT FOODS INC.	\$367,840,952	97	KFT	2000	11
OWENS & MINOR INC.	\$365,861,498	99	OMI	5047	11
CUBIC CORP.	\$354,623,567	102	CUB	3812	11
GREAT LAKES DREDGE & DOCK CORP.	\$324,475,211	113	GLDD	1600	14
CATERPILLAR, INC.	\$323,676,276	114	CAT	3531	11
PROCTER & GAMBLE CO.	\$321,983,149	115	PG	2840	11
TYSON FOODS INC.	\$319,486,334	117	TSN	2011	11
VERIZON COMMUNICATIONS	\$319,365,283	118	VZ	4812	11
CHEVRONTXACO CORP.	\$310,558,853	122	CVX	2911	11
SRA INTERNATIONAL, INC.	\$297,913,799	128	SRX	7370	11
GRANITE CONSTRUCTION CO.	\$292,263,100	131	GVA	1600	11
ACCENTURE	\$288,517,607	132	ACN	8742	11
JOHNSON CONTROLS, INC.	\$285,123,825	134	JCI	2531	11
GTSI	\$271,996,636	141	GTSI	5045	14
EXPRESS SCRIPTS	\$215,750,049	162	ESRX	6411	14
NCI INFORMATION SYSTEMS	\$214,517,445	163	NCIT	7373	14
CONOCOPHILLIPS	\$206,348,789	167	COP	2911	11



TYCO INTERNATIONAL LTD.	\$202,567,751	172	TYC	9997	11
COMTECH TELECOMMUNICATIONS CORP.	\$202,082,670	173	CMTL	3663	14
GENERAL MILLS, INC.	\$200,017,932	176	GIS	2040	11
TESORO HAWAII CORP.	\$199,447,230	177	TSO	2911	11
AEROVIRONMENT INC.	\$192,462,098	182	AVAV	3721	14
SIEMENS AG	\$192,129,128	183	SI	9997	11
AAR CORP.	\$187,717,969	187	AIR	5080	11
SYSCO CORP.	\$179,074,006	195	SYX	5140	11
REFINERY HOLDING CO., L P	\$177,749,226	198	WNR	2911	11
DEERE & CO.	\$164,340,456	206	DE	3523	11
VIASAT, INC.	\$156,815,300	217	VSAT	3663	14
TOTAL SA	\$154,271,244	222	TOT	2911	11
ORBITAL SCIENCES CORP.	\$153,884,356	223	ORB	3760	11
PEPSICO INC.	\$149,527,183	231	PEP	2080	11
UNISYS	\$142,990,124	239	UIS	7373	11
TELEDYNE TECHNOLOGIES, INC.	\$134,222,291	254	TDY	3663	11
BALL CORP.	\$131,696,095	259	BLL	3411	11
ELBIT SYSTEMS LTD.	\$127,331,460	266	ESLT	7373	14
CONAGRA, INC.	\$125,264,234	270	CAG	2000	11
ORACLE CORP.	\$122,646,803	274	ORCL	7372	14
GENERAL MOTORS CORP.	\$120,929,817	279	GM	3711	11
EATON CORP.	\$117,792,917	286	ETN	3620	11
UNILEVER NV	\$112,089,508	292	UL	2000	11
MOOG, INC.	\$111,608,841	293	MOG.A	3728	11
ALON USA LP	\$111,102,800	296	ALJ	2911	11
COCA-COLA ENTERPRISES INC.	\$93,991,833	343	CCE	2086	11
XEROX CORP.	\$91,275,424	356	XRX	3577	11
JOHNSON & JOHNSON	\$89,990,235	363	JNJ	2834	11
AMERICAN APPAREL INC.	\$89,975,062	364	APP	2300	12
CAMPBELL SOUP CO.	\$88,645,010	367	CPB	2030	11
PHILIPS GLOEILAMPENFABRIEKEN	\$83,662,212	387	PHG	3600	11
INTERMEC CORP.	\$83,566,808	388	IN	3577	11
CAE CORP.	\$83,563,697	389	CAE	3690	11
IRIDIUM SATELLITE LLC	\$80,141,588	408	IRDM	4899	14
TESORO PETROLEUM CORP.	\$79,170,251	413	TSO	2911	11
DEL MONTE FOODS CO.	\$77,962,809	419	DLM	2000	11
AMERICAN SCIENCE AND ENGRG	\$76,545,302	429	ASEI	3844	14
CCI GROUP LIMITED LIABILITY CO.	\$75,872,038	432	GIB	7373	11
MICHAEL BAKER CORP.	\$74,263,592	437	BKR	8711	12
KIMBERLY-CLARK CORP.	\$69,832,351	454	KMB	2621	11



ESTERLINE TECHNOLOGIES CORP.	\$68,716,933	462	ESL	3823	11
DYNAMICS RESEARCH CORP.	\$67,638,183	470	DRCO	7373	14
INTEGRAL SYSTEMS, INC.	\$67,261,245	473	ISYS	7373	14
MINE SAFETY APPLIANCES CO.	\$67,166,647	474	MSA	3842	11
WORLD FUEL SERVICE CORP.	\$66,258,375	478	INT	5172	11
SARA LEE CORP.	\$65,361,053	482	SLE	2000	11
WILLIAMS COMPANIES INC.	\$65,024,852	483	WMB	4922	11
HORIZON LINES LLC	\$65,008,856	484	HRZ	4400	11
CASE CORP.	\$64,498,750	488	CNH	3523	11

Table 1 shows that the vast majority of firms in our sample are either traded on the NYSE or NASDAQ, consistent with the perception that top defense prime contractors tend to be big and established companies. Moreover, DoD contracts with a wide spectrum of industries as evidenced by various SIC codes. Table 2 illustrates the distribution of industry membership. In particular, our 112 sample firms cover 24 unique industry sectors, as defined by 2-digit SIC codes.

Table 2. The Distribution of 112 Sample Firms Across 2-Digit SIC Industry Sectors

Industry Name	2-Digit SIC Code	Frequency
Transportation Equipment	37	15
Business Services	73	13
Petroleum Refining	29	11
Food & Kindred Products	20	10
Electronic Equipment & Components, except Computer Equipment	36	8
Measuring, Analyzing, & Controlling Instruments; Photographic, Medical & Optical Goods	38	8
Industrial & Commercial Machinery & Computer Equipment	35	7
Engineering, Accounting, Research, Management & Related Services	87	7
Heavy Construction other than Building Construction Contractors	16	5
Wholesale Trade-Non-Durable Goods	51	5
Communications	48	3
Wholesale Trade-Durable Goods	50	3
Non-Classifiable Establishments	99	3
Chemicals & Allied Products	28	2
Fabricated Metal Products, except Machinery & Transportation Equipment	34	2
Insurance Carriers	63	2
Building Construction General Contractors	15	1



Apparel & Other Products made from Fabrics & Similar Materials	23	1
Furniture & Fixtures	25	1
Paper & Allied Products	26	1
Stone, Clay, Glass, & Concrete Products	32	1
Water Transportation	44	1
Electric, Gas, & Sanitary Services	49	1
Insurance Agents, Brokers, & Service	64	1
		Total
		112

Table 3 presents basic statistics of various accounting measures for the 112 sample firms in fiscal year 2008. In particular, we report ROA, ROCE, Total Assets, Revenue, Profit Margin Ratio (PMR), Operating Margin Ratio (OMR), Long-term Debt Ratio, and Dollar Awarded as Percentage of Revenue. The mean values of Total Assets and Total Revenue were \$42 billion and \$39 billion, respectively. The mean ROA (ROCE) was 5.76% (15.86%). Profit Margin and Operating Margin averaged at about 5.19% and 9.76%, respectively. About 18% of assets were financed by long-term debt and the government contracts contributed about 18% of the firms' 2008 revenue.



Table 3. The Basic Statistics of 112 Sample Firms in Year 2008

	Mean	Median	Min	Max	Std Dev
ROA(%)	5.76	6.21	-33.89	19.83	6.99
ROCE(%)	15.86	16.54	-206.49	112.29	34.45
Total Assets (millions)	38,737	7,433	147	797,769	92,650
Total Sales (millions)	42,034	14,246	160	458,361	79,559
PMR(%)	5.19	4.86	-20.71	24.05	6.05
OMR(%)	9.76	8.80	-8.04	36.79	6.67
Long-Term Debt Ratio	17.84	16.23	0	63.57	13.12
Dollars Awarded as Percent of Sales (%)	16.26	4.83	0.07	102.57	22.27

Note. ROA = Net Income/Total Assets; ROCE = Net Income/Common Equity; PMR = Net Income/Sales Revenue; OMR = EBIT/Sales Revenue; Long-Term Debt Ratio = LTD/Total Assets



III. Empirical Analyses and Results

A. Measuring Excessive Profits

A challenging issue that contributes to the controversy over defense contractors' excessive profits is the definition of excessive profits. We argue that some approaches are fundamentally flawed. For instance, a very common and seemingly sensible method is to compare the profitability measures of defense contractors with similar measures of the member firms of an index. In a recent report (Arnold et al., 2009), the AIA uses Figure 1 to make the point that “defense industry profitability lags significantly behind its industrial peers.”

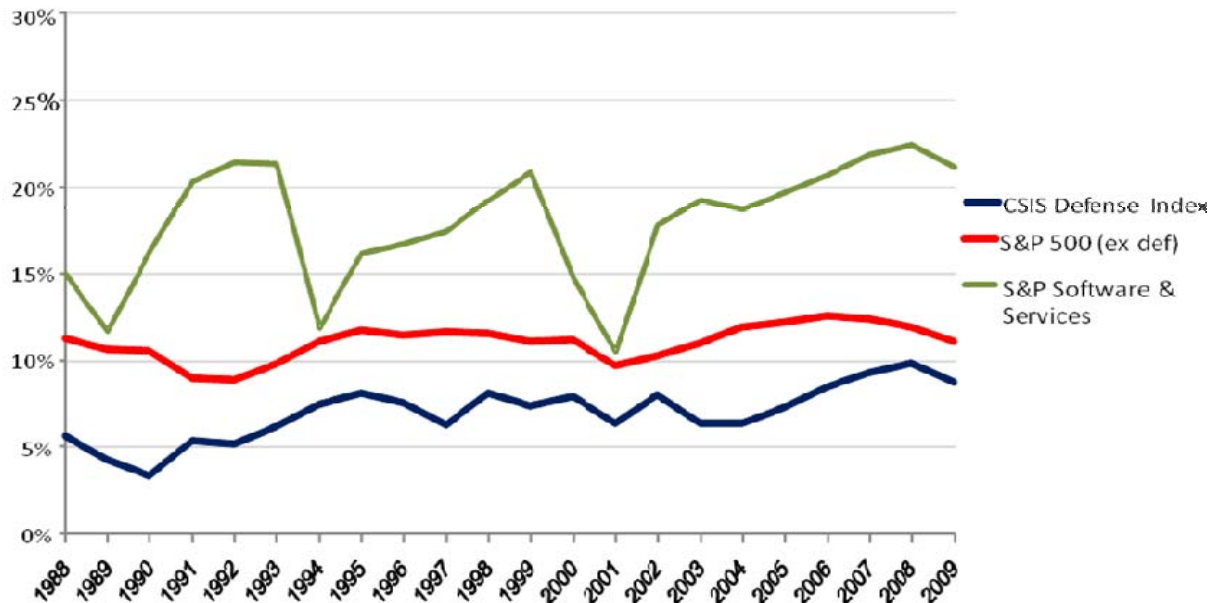


Figure 1. Defense Industry Operating Margin—The Lowest Returns Amongst its Peers
(Arnold et al., 2009)

Note. This analysis was performed by the CSIS Defense Industrial Initiatives Group, using data from Bloomberg. (1) The CSIS Defense Index comprises 34 publically traded companies with the majority of revenues derived from defense business. (2) For the S&P 500, the CSIS obtained historical data for the period 1988–2009 for the constituents as of July 2010.

This approach is also used by some defense-related research centers. A Center for Strategic & International Studies (CSIS) working paper by Berteau, Levy,



Ben-Ari, and Moore (2011) compared operating profit margins for the CSIS Defense, S&P 500, and S&P 1500 industrial indices between 1990 and 2010. Berteau et al. (2011) claimed that, while the CSIS Defense Index's operating margin is higher today than at any point in the past 20 years, it has been consistently lower than those of the commercial indices.

Worrying about the explicit and implicit inferences drawn from the above “defense versus S&P index” comparisons, we asked the following question: what implications concerning defense contractors' excessive profits, if any, can be drawn from these figures? Our answer is none. Just because we observe that defense contractors' operating margins (or any other profitability measure) are lower than that of the S&P 500 index does not necessarily rule out the possibility of defense contractors' excessive profits. The major reasoning is that it's meaningless to use a very broadly defined index as the benchmark for inferring the defense contractors' normal profitability. Defense contractors, as a whole or as individual firms, and the broad market are two different animals. Even a narrowly defined index, such as a manufacturing index, is also problematic. The bottom line is this: defense contractors span a wide range of industries. For instance, our 112 public U.S. firms on the 2008 top 500 list cover 24 unique 2-digit SIC codes. If measured by 4-digit SIC codes, the number goes up to 56 industries! As pointed out by McGahan and Porter (2002), profitability is very industry specific. Different industries have different risk exposures, competitions, and entry barriers, among many other differences. Therefore, given the wide number of industries represented by defense contractors, the correct benchmark for inferring defense contractors' normal profitability (and hence excessive profitability) must focus on the individual-firm level. There is no one-size-fits-all benchmark, not the S&P, not a manufacturing index, not any readily available index.

Based on the theoretical literature, we propose an innovative measure to assess the excessive profitability of defense contractors. McGahan and Porter (2002) documented the importance of year and industry on accounting profitability.



Moreover, numerous papers demonstrate that firm size should be considered in constructing a benchmark for comparison (Albuquerque, 2009; Dechow, Hutton, & Sloan, 1996). Hence, we devised an industry-year-size matched excessive profit measure *for each individual firm-year* and, in turn, used it as the basis for analyzing our research questions.

Our excessive profit measure was defined as follows. First, we assumed that a significant contracting relationship continuity exists between the government and defense contractors. Hence, we extended the use of our 2008 list of top defense contractors to all the other sample years, as well. This likely introduced some noise into the data. However, since any noise would only work against finding any results, we were willing to sacrifice the power of the test in order to avoid extremely time-consuming data collection work. Second, for each of the 112 firms, we used their stock ticker to map into the Compustat database and extract various accounting variables across a wide range of years, 1950–2010. So a single firm on our list would likely have multiple hits (each hit was a firm-year) depending on how long the firm had existed. Note that the maximum possible number of hits was 61 for any particular firm. We report that mapping our 112 firms to the Compustat database yielded a total of 4,099 firm-years, representing 110 firms (two tickers had no hits). On average, the number of hits per firm was 37.26, with a minimum of four and a maximum of 61. Finally, for each of the 4,099 firm-years, we tried to find a benchmark firm-year, whose profit became the proxy for “normal profit” of the firm-year investigated. The benchmark firm-year was selected based on a three-dimension match on industry, year, and size. Specifically, we went to *the same industry-year*, where industry membership was defined by 4-digit SIC codes, and identified the *non-defense* (i.e., not on our 112-firm list) firm that had the best size match with our defense firm-year. The difference between the profit of the firm-year investigated and the profit of the benchmark firm-year was the measure of “excessive profit.”



B. Empirical Results and Findings

Table 4 is similar to Table 3, except that we included all 4,099 firm-years as opposed to only year, 2008. Note that due to missing values, the sample sizes for calculating the various measures were less than 4,099 and varied across different metrics.

Table 4. The Basic Statistics of 4,099 Sample Firm-Years From 1950–2010

	N	Mean	Median	Min	Max	Std Dev
ROA(%)	4,050	5.59	5.78	-87.55	76.91	6.16
ROCE(%)	3,567	14.28	13.79	-953.98	1274.14	56.67
Total Assets (millions)	4,058	16,048	1,763	0.40	797,769	51,793
Total Sales (millions)	4,058	14,716	2,430	1.35	458,361	35,979
PMR(%)	4,037	4.36	4.11	-99.74	100.22	5.92
OMR(%)	4,050	8.61	7.86	-98.62	40.31	6.64
Long-Term Debt Ratio	4,057	16.09	14.63	0	83.40	12.21

A comparison between Table 4 and Table 3 shows that multiple-year statistics, especially the mean and the median, are fairly close to the one-year (2008) statistics. The notable difference is that the firms' assets and sales were higher in 2008, which was expected.

Next, we analyzed our key measure: excessive profit. Table 5 reports the various measures of excessive profitability. Again, the sample size varied across different measures.



Table 5. The Excessive Profitability of 4,099 Firm-Years From 1950–2010**Panel A: Size Matched by Total Assets**

	N	Mean	Min	Max	Std Dev	t	P-value
Excessive ROA(%)	3,809	1.12	-23.49	44.17	7.08	9.77****	<0.0001
Excessive ROCE(%)	3,314	3.65	-143.64	175.57	25.73	8.08****	<0.0001
Excessive PMR(%)	3,809	0.28	-31.82	74.56	7.87	2.22**	0.03
Excessive OMR(%)	3,777	-0.09	-59.59	257.33	10.32	-0.52	0.60

Note. ** indicates a 5% significance level; *** indicates a 1% significance level; and **** indicates a significance level of less than 0.01%. Excessive profitability measures were derived based on an industry-year-size matching. Industry was defined as 4-digit SIC code, while the size was defined as total assets.

Panel B: Size Matched by Revenue

	N	Mean	Min	Max	Std Dev	t	P-value
Excessive ROA(%)	3,825	1.04	-21.89	44.37	7.29	8.80****	<0.0001
Excessive ROCE(%)	3,246	3.71	-142.09	178.70	26.08	8.10****	<0.0001
Excessive PMR(%)	3,825	0.45	-31.82	74.91	7.23	3.85***	0.0001
Excessive OMR(%)	3,793	0.35	-48.23	69.29	7.80	2.77***	0.006

Note. ** indicates a 5% significance level; *** indicates a 1% significance level; and **** indicates a significance level of less than 0.01%. Excessive profitability measures were derived based on an industry-year-size matching. Industry was defined by 4-digit SIC code, while size was defined as total revenue.

Panel A of Table 5 (size matched by total assets) demonstrates that the average excessive ROA (ROCE) was 1.12% (3.65%), both statistically significant at a level of less than 0.01%. The excessive Profit Margin Ratio (PMR) was positive and had a mean of 0.28%, which was statistically significant at a 5% level. The Operating Margin Ratio (OMR), which is most often used by the defense industry to show the inferior profitability of defense contractors, did appear to have a negative



average excessive value. However, the magnitude (-0.09%) was too small to be statistically significant.

Panel B of Table 5 (size matched by Revenue) provides similar evidence as Panel A, except on Operating Margin Ratio (OMR). The average excessive ROA (ROCE) was 1.04% (3.71%), both statistically significant at a level of less than 0.01%. The excessive Profit Margin Ratio (PMR) was positive and had a mean of 0.45%, which was statistically significant at a 0.1% level. In contrast to Panel A, however, the Operating Margin Ratio (OMR) was positive and statistically significant as well, consistent with the other measures of profitability.

The overall evidence suggests that, measured by ROA, ROCE, and PMR, defense contractors consistently demonstrate superior profitability than their industry-year-size matched non-defense peers. Another important finding is that, in contrast to what the AIA claims, the Operating Margin Ratios of defense contractors are, at least, *not* significantly lower than that of their industry-year-size matched non-defense peers.



IV. Determinants of Excessive Profits

A. Time Series Variation Determinant: Industry Consolidation

We first investigated whether the defense industry consolidation in the past two decades has increased defense contractors' excessive profit. In 1993, then-Deputy Secretary of Defense Bill Perry hosted a dinner that is now called "The Last Supper" with the CEOs of the major defense companies. During the dinner, Perry urged his guests to consolidate their industry because the DoD would no longer support the high infrastructure costs of a fragmented set of industries due to lower demand induced by the "peace dividend" from the end of the Cold War. As a result, a series of high profile mergers and acquisitions (M&As) happened in subsequent years, including but not limited to the following cases: Boeing acquiring McDonnell Douglas, Lockheed acquiring Martin Marietta, and Northrop acquiring Grumman.

It is reasonable to assume that as the industry structure shifted toward a less competitive nature, the bargaining power in (re)negotiation, as well as the political influence over the Pentagon, of the largest defense contractors, would increase. Consequently, excessive profitability became more attainable. Hence, we have our first hypothesis, H1:

H1: Defense contractors' excessive profitability relative to their industry peers became more pronounced after 1992.

To test H1, we regressed various measures of excessive profit onto a dummy variable that took the value of one if the year was post 1992 and zero otherwise. Table 6 reports the regression results.

Table 6 shows that excessive profitability, measured by ROA and PMR, increased after 1992. For example, when size is matched by revenue, post-1992 ROA was almost 1% higher than pre-1992 era. Given the average public firms' ROA was around 5%, this magnitude not only is statistically significant, but also



economically significant. This result held regardless of whether the size was matched by total assets or revenue. However, the magnitude of the increase, as well as the statistical significance of the change, was more pronounced if size was matched by revenue. We did not find any statistically significant difference in ROCE and OMR between pre- and post-1992 periods.

Table 6. Excessive Profitability Increased After 1992

Independent Variables	Dependent Variable: Industry-Year-Size Matched Excessive Profit							
	Size Matched by Total Assets				Size Matched by Revenue			
	ROA (N=3,307)	ROCE (N=3,307)	PMR (N=3,307)	OMR (N=3,307)	ROA (N=3,352)	ROCE (N=3,352)	PMR (N=3,352)	OMR (N=3,352)
Intercept	0.0072	0.0505	-0.0003	-0.0034	0.0048	0.0589	-0.0009	0.0012
Post-1992 Dummy (t-value)	0.0076*** (2.99)	0.0053 (0.57)	0.0048* (1.69)	0.0006 (0.16)	0.0097*** (3.68)	-0.0074 (-0.63)	0.0077*** (2.96)	-0.0020 (-0.72)

Note. * indicates a 10% significance level; ** indicates a 5% significance level; and *** indicates a 1% significance level.

Since the most dramatic defense industry consolidation happened after 1992, we believe that the above evidence reasonably supports the conjecture that the industry consolidation made the excessive profits of defense contractors more attainable.

B. Cross-Sectional Variation Determinant: Corporate Governance

Another possible determinant of excessive profit is the quality of corporate governance. Laffont and Tirole (1993) pointed out that the information asymmetry between the government and contractors could give rise to the “extraction of information rents” that is associated with potential excessive profits. Based on this observation, we conjecture that a better governed corporation would be less likely to engage in such opportunistic and unethical “rent-seeking” behavior. Hence, we have formulated our second hypothesis, H2:



H2: The defense contractors' excessive profitability relative to their industry peers increased with poorer corporate governance.

To test H2, we referred to the finance literature for empirical measures of corporate governance. Several key governance mechanisms are documented to impact governance quality. First, Jensen (1993) argued that the separation of the CEO and Chairman of the Board is an important feature of good corporate governance because otherwise the CEO is given too much power and too little oversight. A number of other studies (Goyal & Park, 2002; Lipton & Lorsch, 1992) also support the importance of the separation of CEO and Chairman. Second, most researchers believe that the quality of oversight deteriorates when the board gets bigger due to the “free-rider” problem (Boone, Field, Karpoff, & Raheja, 2007; Yermack, 1996). Finally, board independence, as measured by the percentage of independent directors, plays a role in limiting the opportunistic behavior of management arising from conflicts of interest (Brickley & James, 1987; Weisbach, 1988; Rosenstein & Wyatt, 1990). We, therefore, regressed our various measures of excessive profit onto the corporate governance variables mentioned by the above studies. Table 7 reports the regression results. Note that we constructed our corporate governance variables based upon the firms' proxy statements and other relevant SEC filings.



Table 7. Excessive Profitability and Corporate Governance

Independent Variables	Dependent Variable: Industry-Year-Size Matched Excessive Profit							
	Size Matched by Total Assets				Size Matched by Revenue			
	ROA (N=3,307)	ROCE (N=3,307)	PMR (N=3,307)	OMR (N=3,307)	ROA (N=3,352)	ROCE (N=3,352)	PMR (N=3,352)	OMR (N=3,352)
Intercept	0.0097	0.0528	0.0003	-0.0041	0.0087	0.0491	0.0015	-0.0005
CEO-Chairman	0.0084**	0.0062	0.0116***	0.0055	0.0076**	0.0048	0.0098***	0.0035
Duality Dummy (<i>t</i> -value)	(2.48)	(0.60)	(3.06)	(1.12)	(2.18)	(0.46)	(2.84)	(0.97)
Board Size (<i>t</i> -value)	-0.0004 (-0.38)	0.0192 (0.76)	-0.0007 (-0.50)	0.0011 (0.88)	-0.0004 (-0.41)	0.0005 (0.42)	0.0005 (0.41)	0.0023** (2.01)
Board Independence (<i>t</i> -value)	-0.0132 (-0.76)	-0.0237 (-0.56)	-0.0140 (-0.62)	-0.0151 (-0.69)	0.0014 (0.08)	-0.0263 (-0.46)	-0.0143 (-0.72)	-0.0172 (-0.90)

Note. * indicates a 10% significance level; ** indicates a 5% significance level; *** indicates a 1% significance level. The CEO-Chairman dummy took a value of one if the CEO was also the chairman. Board size was defined as the number of directors. Board independence was defined as the percentage of independent directors on the board.

Table 7 shows that excessive profitability, measured by ROA and PMR, was higher for those firms with CEOs also holding the title of Chairman of the Board. This result held regardless if the size was matched by total assets or revenue. Board size and board independence did not appear to have any impact on any measure of excessive profitability except that board size marginally affected the excessive profitability measured by OMR. Similar to Table 6, we found few noteworthy results in the ROCE and OMR columns.



C. The Robustness Test

In Section IV.A, we suggested that industry consolidation played a role in determining the excessive profits of defense contractors. Moreover, in Section IV.B, we reported that the poorer quality of corporate governance, measured by the non-separation of CEO and Chairman of the Board, was positively associated with the excessive profits. Although it is unlikely, we cannot completely refute the possibility that these two factors, industry consolidation and corporate governance, have confounding effects. To make sure one factor did not subsume the other, we ran a multiple regression by including both the post-1992 dummy and the CEO-Chairman dummy as independent variables. Table 8 reports the results.

The basic result, shown in Table 8, was that the two determinants we identified in Sections IV.A and IV.B did not subsume each other. The magnitudes, as well as statistical significances, appeared to be lower than seen in Tables 6 and 7. However, the coefficients remained both statistically and economically significant.

Table 8. Two Determinants of Excessive Profitability: Industry Consolidation and Corporate Governance

Independent Variables	Dependent Variable: Industry-Year-Size Matched Excessive Profit							
	Size Matched by Total Assets				Size Matched by Revenue			
	ROA (N=3,307)	ROCE (N=3,307)	PMR (N=3,307)	OMR (N=3,307)	ROA (N=3,352)	ROCE (N=3,352)	PMR (N=3,352)	OMR (N=3,352)
Intercept	0.0072	0.0505	-0.0003	-0.0034	0.0048	0.0589	-0.0009	0.0012
Post-1992 Dummy (t-value)	0.0060** (2.13)	0.0050 (0.48)	0.0042* (1.58)	-0.0015 (-0.36)	0.0088*** (3.04)	-0.0028 (-0.36)	0.0056** (1.96)	-0.0038 (-1.26)
CEO-Chairman Duality Dummy (t-value)	0.0064** (2.25)	0.0032 (0.33)	0.0108*** (2.58)	0.0063 (1.16)	0.0058** (1.96)	0.0077 (0.58)	0.0067* (1.74)	0.0057 (1.42)

Note. * indicates a 10% significance level; ** indicates a 5% significance level; and *** indicates a 1% significance level. Note that, as another alternative, we included board size and board independence in addition to these two dummy variables. The results were little changed.



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V. Conclusion

In this study, we used an innovative industry-year-size matched measure of excessive profit and investigated the long-controversial issue of defense contractors' alleged superior profitability. Using alternative profit measures, our results indicated that defense contractors earn excessive profits relative to their industry peers. This result was strongest when profit was measured by ROA, ROCE, or PMR. The evidence of excessive profit was less consistent if profit was measured by OMR. Another important result from this research was that the defense contractors' excessive profit was more pronounced after 1992, consistent with the conjecture that the significant defense industry consolidation after 1992 enabled superior profitability due primarily to both the strong bargaining power and increased political influence of the remaining firms. A final research result was that poor corporate governance, as measured by the non-separation of the CEO and the Chairman of the Board, led to defense contractors' higher excessive profitability.



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