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Evidence on the Effect of DoD Acquisition Policy and Process on Cost Growth of Major Defense Acquisition Programs

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OSD-Level Acquisition Policy and Process Regimes, 1970-2009

1. The Defense Systems Acquisition Review Council (DSARC), 1970–1982
2. The Post-Carlucci Initiatives DSARC, 1983–1989
3. The Defense Acquisition Board (DAB), 1990–1993
4. Acquisition Reform (AR), 1994–2000
5. The DAB – Post Acquisition Reform, 2001–2009

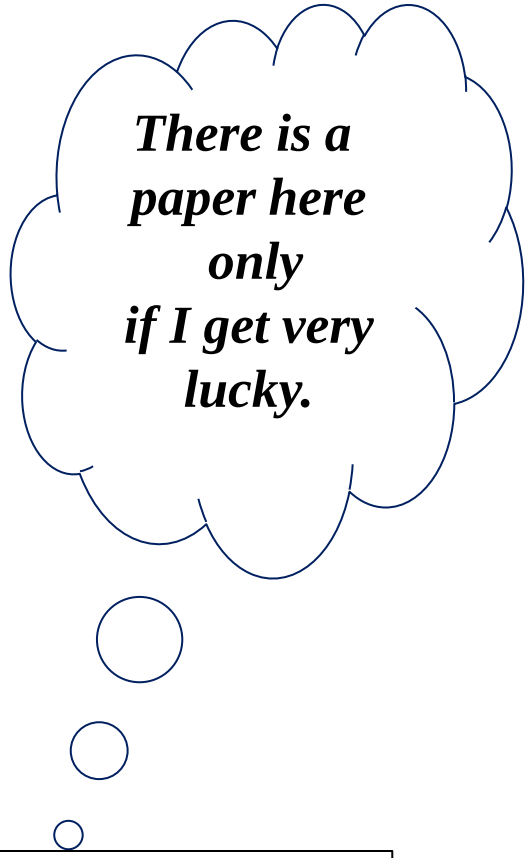
Useful reference: J. Ronald Fox, *Defense Acquisition Reform, 1960 to 2009: An Elusive Goal* (Washington, DC: U.S. Army Center of Military History, 2011).

The Outcome Metric—Growth in Program Acquisition Unit Cost (PAUC)

- The research used PAUC growth for **151** Major Defense Acquisition Programs (MDAPs) that passed MS II/B during FY 1970–FY 2007.
  - Each of these MDAPs went into production
  - There are no cancelled programs in the sample.
- PAUC growth is measured from the MS II/B baseline and **normalized to the MS II/B total quantity acquired**.
- PAUC growth **over the entire acquisition cycle** is associated with the Fiscal Year in which the MDAP passed MS II/B; for example:
  - PAUC growth for the F-22 over FY 1991-FY 2006 is assigned to FY 1991, the year in which the F-22 passed MS II.
  - The average PAUC growth for FY 1987–FY 1993 is the average quantity normalized PAUC growth of all MDAPs that passed MS II during those years.

Average PAUC Growth by Acquisition Regimes

Acquisition Regime	Average PAUC Growth
DSARC (1970–1982)	32%
Post Carlucci Initiatives DSARC (1983-1989)	19%
DAB (1990–1993)	36%
Acquisition Reform (AR) (1994–2000)	66%
DAB post AR (2001–2007)	19%



There is no evident trend in PAUC Growth across acquisition regimes.

Eureka! Average PAUC Growth by Funding Climate

Relatively Constrained Funding Climate		Relatively Accommodating Funding Climate	
1970–1980	35%	1981–1986	12%
1987–2002	53%	2003–2007	7%

Average PAUC growth is much higher for MDAPs that passed MS II/B during bust periods than those that passed during boom periods.

Methodology

Acquisition Regime	Relatively Constrained Funding Environment (FY)		Relatively Accommodating Funding Environment (FY)	
Defense Systems Acquisition Review Council (DSARC)	1970–1980		1981–1982	
Post Carlucci Initiatives DSARC	1987–1989		1983–1986	
Defense Acquisition Board (DAB)	1990–1993		*No observations*	
Acquisition Reform (AR)	1994–2000			
DAB post AR	2001–2002		2003–2007	

We have eight natural experiments on the effect of acquisition regime and three on the effect of funding climate.

Average PAUC Growth by Acquisition Regime and Funding Climate

Acquisition Regime	Relatively Constrained Funding Environment (FY)		Relatively Accommodating Funding Environment (FY)	
Defense Systems Acquisition Review Council (DSARC)	1970–1980	35% (42)	1981–1982	11% (6)
Post Carlucci Initiatives DSARC	1987–1989	34% (11)	1983–1986	13% (29)
Defense Acquisition Board (DAB)	1990–1993	36% (11)	*No observations*	
Acquisition Reform (AR)	1994–2000	66% (27)		
DAB post AR	2001–2002	57% (6)	2003–2007	7% (19)

Loosely, acquisition regime does not matter for PAUC growth but funding climate does.

Statistical Analysis and Related Issues

- An Analysis of Variance (ANOVA) was done for each budget climate. For neither climate were any of the differences across regimes in average PAUC growth statistically significant.
- A standard t-test was used to test the differences in average PAUC growth between funding regimes. Average PAUC growth in the bust period was significantly higher ($P \leq 0.01$) in each of the three cases for which the comparison could be made.
- There is a distinct bust-boom-bust-boom pattern in funding climate over 1970-2007. If budget climate is a proxy for some other variable(s) those variables would need to have the same pattern. There are no obvious candidates.
- The paper (Appendix B) provides evidence that PAUC growth is not systematically influenced by changes in budget climate post MS II/B. Further analysis to evaluate this far reaching conclusion is underway.

Additional Results

- 40 of the 151 MDAPs in the sample had a PAUC growth of ≥ 50%. Not weighted by program size, these account for just over three-quarters of cost growth.
  - 36 of these 40 programs passed MS II/B in bust periods. Nearly 40 percent of all programs that passed MS II/B in bust periods had a PAUC growth of at least 50 percent.
  - Only 4 programs with PAUC growth of at least 50 percent passed MS II/B in a boom period.
- 29 of the 151 MDAPs for which the study had a PAUC growth estimate showed negative cost growth.
  - Nearly one-third of the MDAPs that passed MS II/B in a boom funding climate had negative PAUC growth.
  - The frequency of negative PAUC growth was much lower (about 12 percent) in programs that passed MS II/B in bust periods.

The PAUC growth problem is not systemic; it is largely one of programs that passed MS II/B in bust funding climates and had exceptionally high PAUC growth.

Implications for Debates on Acquisition Reform

- It seems unlikely that further changes in the acquisition process will have a major effect on PAUC growth.
- The relevant context for understanding very high PAUC growth is the interface between the acquisition process and the program/budget process.
- The underlying cause of persistent high PAUC growth is not a deeply established culture of the DoD acquisition organizations and their professional employees.

Briefing is drawn from IDA Paper P-5126

IDA Paper P-5126, "**Evidence on the Effect of DoD Acquisition Policy and Process on Cost Growth of Major Defense Acquisition Programs"** is available at:

https://www.ida.org/~/media/Corporate/Files/Publications/IDA_Documents/CARD/P-5126.ashx

To obtain a hard copy, contact IDA Library Reference Services:

- Phone: (703) 845-2087
- E-mail: refdesk@ida.org

The hard copy of the paper comes with a CD containing the data used and spreadsheets used in the PAUC growth computations.

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Backup

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Number of MDAPs with PAUC Growth ≥ 50 Percent

Acquisition Regime	Topline Relatively Constrained (FY)		Topline Relatively Accommodating (FY)	
DSARC	**1970–1980**	15 of 42	**1981–1982**	0 of 6
Post Carlucci DSARC	**1987–1989**	2 of 11	**1983–1986**	3 of 29
DAB	**1990–1993**	3 of 11	*No observations*	
AR	**1994–2000**	13 of 27		
DAB post AR	**2001–2002**	3 of 6	**2003–2007**	1 of 19
Total	36 of 97 (37%)		4 of 54 (7%)	

The probability of a PAUC growth ≥ 50% was 27 percentage points higher in a Relatively Constrained funding climate than in a Relatively Accommodating funding climate.

IDA | Percent of PAUC Growth Accounted for by Observations ≥ 50%

Acquisition Regime	Relatively Constrained Funding Climate (FY)		Relatively Accommodating Funding Climate (FY)	
DSARC	1970–1980	73%	1981–1982	0
Post Carlucci DSARC	1987–1989	62%	1983–1986	70%
DAB	1990–1993	64%	*No observations*	
AR	1994–2000	90%		
DAB post AR	2001–2002	75%	2003–2007	43%

Not weighted by program size, MDAPs with a PAUC growth of ≥ 50% account for just over three-quarters of quantity adjusted cost growth.

Number of MDAPs with Negative PAUC Growth

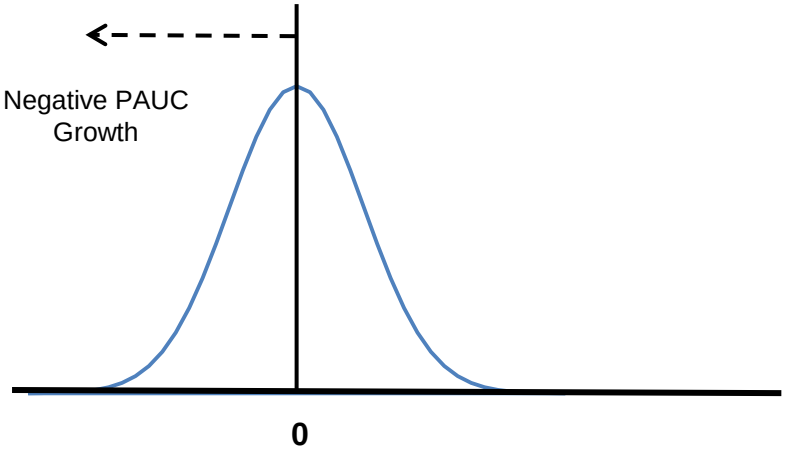
Acquisition Regime	Relatively Constrained Funding Climate (FY)		Relatively Accommodating Funding Climate (FY)	
DSARC	**1970–1980**	5 of 42	**1981–1982**	2 of 6
Post Carlucci DSARC	**1987–1989**	2 of 11	**1983–1986**	10 of 29
DAB	**1990–1993**	1 of 11	*No observations*	
AR	**1994–2000**	4 of 27		
DAB post AR	**2001–2002**	0 of 6	**2003–2007**	5 of 19
Total	12 of 97 (12%)		17 of 54 (31%)	

The probability of negative PAUC growth is 21 percentage points lower for MDAPs that passed MS II/B in a Relatively Constrained funding climate.

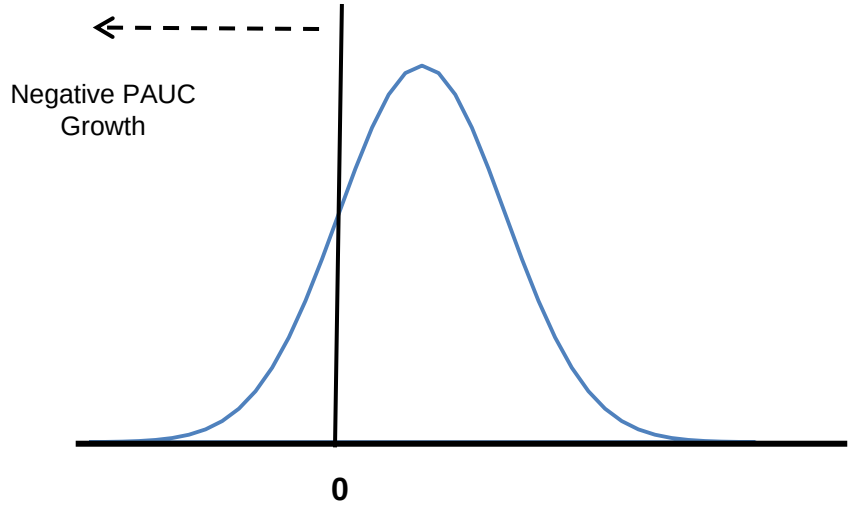
Alternative Explanations for Negative PAUC Growth and PAUC Growth ≥ 50 Percent

- **P-5126** concludes that "…the relevant context for understanding PAUC growth is the interface between the acquisition process and the resource allocation process."
- This conclusion includes two possibilities:
  - Major acquisition programs more frequently adopt more optimistic costing and programmatic assumptions in Relatively Constrained funding climates compared to Relatively Accommodating climates.
  - In Relatively Constrained funding climates, some MDAPs are issued top-down guidance (possibly from the Program/Budget process) that results in more optimistic costing and programmatic assumptions. In Accommodating funding climates, some MDAPs are over-funded so that they can be used as a "bank" to hold funds for later commitment.
- Each explanation implies more negative PAUC growth in Accommodating climates and more MDAPs with PAUC growth of ≥ 50% in Relatively Constrained climates.
- Each of the two explanations probably is correct in some instances.
- P-5126 did not attempt to distinguish between the two statistically.

Bias in the MS II/B PAUC Estimate and the Frequency of PAUC Growth ≥ 50 Percent and Negative PAUC Growth



Relatively Accommodating Funding Climate



Relatively Constrained Funding Climate

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Average PAUC Growth Excluding Negative Observations and Observations ≥ 50 Percent

Acquisition Regime	Relatively Constrained Funding Climate (FY)		Relatively Accommodating Funding Climate (FY)	
DSARC	1970–1980	21% (22)	1981–1982	22% (4)
Post Carlucci DSARC	1987–1989	22% (7)	1983–1986	14% (16)
DAB	1990–1993	22% (7)	*No observations*	
AR	1994–2000	22% (10)		
DAB post AR	2001–2002	29% (3)	2003–2007	10% (13)

Note: Numbers in parentheses are the number of observations available.

- Some decrease in variation is guaranteed by exclusion of the negative observations and those of ≥ 50%. Even so, there is a remarkable consistency across the cells of PAUC growth.
- ANOVA did not find statistically significant difference in PAUC growth across the acquisition regimes for either funding climate.
- PAUC growth was significantly lower in the Accommodating climate for the DAB post AR regime.

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(1) Acquisition Regime in Periods of Relatively Constrained Procurement Funding Climate

Acquisition Regime	Relatively Constrained (FY)	
DSARC	1970–1980	**35%** (42)
Post Carlucci DSARC	1987–1989	**34%** (11)
DAB	1990–1993	**36%** (11)
AR	1994–2000	**66%** (27)
DAB post AR	2001–2002	**57%** (6)

Note: Number of observations available in parentheses.

The differences in average PAUC growth across acquisition regimes also are not statistically significant for the Relatively Constrained funding climate.

(2) Acquisition Regime in Periods of Relatively Accommodating Procurement Funding Climate

Acquisition Regime	Relatively Accommodating (FY)	
DSARC	**1981–1982**	**11%** (6)
Post Carlucci DSARC	**1983–1986**	**13%** (29)
DAB	*No observations*	
AR		
DAB post AR	2003–2007	**7%** (19)

Note: Number of observations available in parentheses.

The differences in average PAUC growth across acquisition regimes are not statistically significant for the Relatively Accommodating funding climate.

(3) PAUC Growth and Procurement Funding Climate Given Acquisition Regime

Acquisition Regime	Relatively Constrained (FY)		Relatively Accommodating (FY)	
DSARC	1970–1980	**35%** (42)	1981–1982	**11%** (6)
Post Carlucci DSARC	1987–1989	**34%** (11)	1983–1986	**13%** (29)
DAB	1990–1993	36% (11)	*No observations*	
AR	1994–2000	66% (27)		
DAB post AR	2001–2002	**57%** (6)	2003–2007	**7%** (19)

Note: Number of observations available in parentheses.

Average PAUC growth was significantly less in the Relatively Accommodating funding climate for each of the three acquisition regimes for which the comparison can be made.

Selection of Break Points between Funding Climates

- This research used only two funding climate categories—Relatively Constrained and Relatively Accommodating.
- Our touchstone in selection of break points was major shifts in the expectation about future funding of senior DoD decision makers.
- We used three events to identify the break points between funding climates:
  - The invasion of Afghanistan by the USSR in late December 1979.
  - The passage of the Gramm-Rudman-Hollings Act in December 1985; and
  - The terrorist attack on the U.S. on Sept. 11, 2001.
- Senior decision makers could reasonably expect each of these events to result in major and sustained changes in the defense funding climate.
- After examining contemporary policy statements and events we selected:
  - FY 1981 as the first year of the Carter-Reagan buildup;
  - FY 1986 as the final year of the Carter-Reagan buildup; and
  - FY 2003 as the first year of the post-9/11 defense buildup.

PAUC Growth Acquisition Regime and Procurement Funding Climate—Alternative Break Points

Acquisition Regime	Relatively Constrained (FY)		Relatively Accommodating (FY)	
DSARC	1970–1979	37% (39)	1980–1982	7% (9)
Post Carlucci DSARC	1986–1989	25% (17)	1983–1985	14% (23)
DAB	1990–1993	36% (11)	*No observations*	
AR	1994–2000	66% (27)		
DAB post AR	*No observations*		2001–2007	19% (25)

Note: Number of observations available in parentheses.

Two conclusions change if the alternative break points are used:

1. Average PAUC growth for the Acquisition Reform years is significantly higher than in other acquisition regimes.
2. The difference in PAUC growth between the two funding climates is not statistically significant for the Post Carlucci DSARC acquisition regime.