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MONTEREY, CALIFORNIA

THESIS

**THE HEALTH OF THE U.S. NAVAL SHIPBUILDING
INDUSTRIAL BASE**

by

Evan Parrish

March 2020

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THE HEALTH OF THE U.S. NAVAL SHIPBUILDING INDUSTRIAL BASE

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requirements for the degree of

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ABSTRACT

Using the knowledge that the naval shipbuilding industrial base has gone through multiple stages of consolidation since 1945, this thesis explores what causal factors have caused weaknesses in the industrial base? And, why has the naval shipbuilding industrial base consolidated since 1945? To answer these questions, this thesis tested the hypotheses that boom-and-bust cycle of military spending, congressional distribution, and preferences for fixed-price contracts cause shipbuilding company failure. The resulting findings suggest that the boom-and-bust cycle of military spending plays the largest role in company failure; however, this hypothesis was not able to explain all cases of consolidation. Congressional distribution theory and preferences for fixed-price contracts also have a hand in company failure. The causal factors that were studied in this thesis were not able to explain all cases of failure, which indicates additional internal and external factors also play a role in naval shipbuilding industrial base consolidation since the end of World War II. These findings have broad implications for the Navy, Congress, and the Executive Branch with regard to maintaining and strengthening the naval shipbuilding industrial base of the future.

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LIST OF ACRONYMS AND ABBREVIATIONS

BA	Budget Authority
BCA	Budget Control Act
BCP	Budget Change Proposal
BES	Budget Executions System
CG	Guided Missile Cruiser
CLF	Combat Logistics Force
CPI	Consumer Price Index
CPI-U	Urban Consumer Price Index
CVN	Nuclear Aircraft Carrier
DAS	Defense Acquisitions System
DDG	Guided Missile Destroyer
DFARS	Defense Acquisitions Regulation Supplement
DoD	Department of Defense
EPF	Expeditionary Fast Transport
FAR	Federal Acquisition Regulation
FASA	Federal Acquisition Streamlining Act
FFG	Guided Missile Frigates
FSA	Force Structure Assessment
GPC	Great Power Competition
LCS	Littoral Combat Ship
LHA	Landing Helicopter Assault
LHD	Landing Helicopter Dock
LPD	Landing Platform Dock
MMG	Mine Warfare Ship
NDAA	National Defense Acquisitions Act
NMS	National Military Strategy
NSS	National Security Strategy
POM	Program Objective Memorandum
PPBES	Planning, Programming Budgets, and Execution System
SSBN	Ballistic Missile Nuclear Submarine

SSN

Nuclear Attack Submarine

TPP

Total Package Procurement

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I. INTRODUCTION

The Department of Defense (DoD) in recent years has shifted away from the War on Terror and toward Great Power Competition (GPC) with two potential adversaries, Russia and China.¹ Considering this recent shift, the U.S. Navy reassessed its required force structure. The resulting 2016 Navy Force Structure Assessment (FSA) claims that a 355 ship force is required to meet the operational requirements imposed by strategic competition with Russia and China.² This 355-ship benchmark was then made into the law of the land by Congress in the 2018 National Defense Acquisitions Act (NDAA) section 1025.³ Based on the April 2019 force size of 289 ships, the Navy will need to ensure that private defense contractors can meet the added demand.⁴ Thus, to meet the goal of 355 ships, the DoD and Congress must understand the problems in the shipbuilding industrial base and the possible remedies. Most of the theories of weakness explored in this thesis are based on a broad analysis of military industrial base or military spending, but do not directly analyze the effects on the shipbuilding industry. By applying these broad theories for what causes industrial base weakness to the naval shipbuilding industry we can determine their relative weights as causal mechanisms.

As this thesis explores, the potential remedies for the shipbuilding industries weaknesses are not only military in nature. They have distinct implications on future political decisions in Congress and by the Executive Branch. Potential remedies of managing sequestration, smoothing boom-and-bust cycles of procurement demand, and acquisitions reform all affect the long term planning of naval procurement, Executive

¹ Department of Defense, *Summary of the 2018 National Defense Strategy* (Washington, DC: Department of Defense, 2018), <https://dod.defense.gov/Portals/1/Documents/pubs/2018-National-Defense-Strategy-Summary.pdf>.

² U.S. Navy, “Executive Summary 2016 Navy Force Structure Assessment (FSA)” (Washington, DC: U.S. Navy, December 14, 2016), https://news.usni.org/wp-content/uploads/2016/12/FSA_Executive-Summary.pdf.

³ Mac Thornberry, “National Defense Authorization Act for Fiscal Year 2018,” Pub. L. No. 115–91, H.R.2810 (2017), 267, <https://www.congress.gov/115/plaws/publ91/PLAW-115publ91.pdf>.

⁴ Ronald O’Rourke, *Navy Force Structure and Shipbuilding Plans: Background and Issues for Congress*, CRS Report No. RL32665 (Washington, DC: Congressional Research Service, 2018), 54, <https://fas.org/sgp/crs/weapons/RL32665.pdf>.

Budget requests, and congressional approval for military spending. Looking back at past administrations' attempts to strengthen the shipbuilding industrial base, it seems that only a whole of government approach will be able to correct problems in the naval shipbuilding industrial base.

A. RESEARCH QUESTION

My aim is to provide a detailed response to the following questions. Overall, why has the United States industrial capacity for naval shipbuilding diminished since the end of World War II? And subsequently, what causal factors have caused decline in U.S. industrial base? Out of these factors, which is the leading cause of company failure?

B. BACKGROUND

Since the end of World War II, the U.S. has seen a reduction in naval shipbuilding ability. The number of U.S. maritime shipbuilders has dwindled to ten parent companies that sustain twenty shipyards. Of those ten parent companies only seven are involved in defense contracts.⁵ While private shipbuilders have shrunk in number, public shipbuilding has gone extinct. Public shipyards through the years have either been closed for fiscal reasons or repurposed to support maintenance and repair of nuclear vessels. Along with its reduction in size, the U.S. naval shipbuilders have not been able to keep up with the Navy's procurement schedule and has led many ships to be over budget, late for scheduled delivery date, and delivered with faulty equipment. These problems are only the initial indicators in the U.S. naval shipbuilding industrial base.

Ships being over budget, late for delivery, and deficient when delivered has become prevalent across the naval shipbuilding industry. A Government Accountability Office report reviewed the Navy's shipbuilding performance from 2008 to 2018 and found that

⁵ Tim Colton, "U.S. Shipbuilding History, Shipbuilding Records," Shipbuilding History, 2019, <http://shipbuildinghistory.com/>.

out of the ten classes of ship being produced all except the support ships⁶ were over budget or late for delivery, and most had deficiencies upon delivery.⁷ They give further detail by showing that lead ships of a class and follow-on ships have cost more than estimated. The USS Ford (CVN-78) has had the largest budget growth, as a lead ship, at around \$2.4 billion prior to delivery, with additional cost deferred to the post delivery period.⁸ Follow-on ships have also experienced cost growth. The Virginia-class SSNs have the largest cost growth of follow on ships with a “39.47 percent difference between projected start cost and average initial budget.”⁹

Delays in scheduled delivery and post-delivery work requiring delayed deployment have also been prominent features in the reduced capacity of the naval shipbuilding industrial base. Oakley reports that all eight of the lead warships studied had more than 6 months of schedule slip with the biggest offender was the USS Zumwalt (DDG-1000) at 72 months of schedule slip.¹⁰ Ronald O’Rourke notes that,

In March and April 2019, it was reported that GD[General Dynamics]/ EB [Electric Boat], HII [Huntington Ingalls Industries]/NNS [Newport News Shipbuilding], and their supplier firms were experiencing challenges in meeting scheduled delivery times as the Virginia-class program transitions over time from production of two “regular” Virginia-class boats per year to two VPM [Vertical Payload Module]-equipped boats per year. As a result of these challenges, it was reported, the program has experienced months-

⁶ For this thesis U.S. “warships” is used to describe Ballistic Missile submarines (SSBNs), Attack submarines (SSNs), Aircraft carriers (CVNs), Large Surface Combatants [i.e., Guided Missile Cruisers (CGs) and Guided Missile Destroyers (DDGs)], Small surface combatants [i.e., frigates (FFGs), Littoral Combat Ships (LCSs), and Mine warfare ships (MMG)] and Amphibious ships (LHA/LHD/LPD). “Support ships” is used to describe Combat Logistics Force (CLF) and Command and Support ships. All other smaller vessels are not considered in the analysis of naval shipbuilding capacity due to them not being included in the 355 ship goal mandated by the 2016 Force Structure Assessment.

⁷ Shelby Oakley, “Navy Shipbuilding: Past Performance Provides Valuable Lessons for Future Investment” (Washington, DC: Government Accountability Office, June 1, 2018), 8–11, <https://www.gao.gov/assets/700/692331.pdf>.

⁸ Government Accountability Office, “Ford-Class Aircraft Carrier: Follow-On Ships Need More Frequent and Accurate Cost Estimates to Avoid Pitfalls of Lead Ship,” GAO-17-575 (Washington, DC: Government Accountability Office, June 2017), 4–6, <https://www.gao.gov/assets/690/685498.pdf>; Oakley, “Navy Shipbuilding Key Findings,” 8.

⁹ Oakley, “Navy Shipbuilding Key Findings,” 8.

¹⁰ Oakley, 9.

long delays in efforts to build boats relative to their targeted delivery dates.¹¹

With the USS Ford (CVN-78) there has not only been delays in ship delivery but it has seen delays in the post-shakedown availability.¹² The Navy and Huntington Ingalls Industries are day-by-day getting closer to the planned 2020 first deployment date due to crucial pieces of equipment still being inoperable.

Another cause for questioning the shipbuilding industries' capacity is the number of discrepancies noted upon delivery to the Navy. O'Rourke details that USS Ford (CVN-78) was delivered May 31, 2017, and commissioned two months later, but the ship is still "working to complete construction, testing and certification of the ship's 11 weapons elevators."¹³ Congressional leaders have also taken interest in ships being delivered with discrepancies, due to their role in governmental oversight and budget approval. Representative Visclosky questioned the Navy's acceptance of deficiencies and the process for improvement going forward during an April 30, 2019, House Appropriations Subcommittee hearing on the 2020 Budget Request. During his inquiry he notes that the USS Ford (CVN-78) had defects in the "main turbine generators, the electromagnetic aircraft launch system, the advanced (INAUDIBLE) gear, the advanced web and elevator, dual band radar and integrated warfare system."¹⁴ Although it is well known that companies are delivering ships with deficiencies, the Navy has made it a recent practice of accepting rather than pushing back against the producers. Oakley's assessment of

¹¹ Ronald O'Rourke, *Navy Virginia (SSN-774) Class Attack Submarine Procurement: Background and Issues for Congress*, CRS Report No. RL32418 (Washington, DC: Congressional Research Service, 2019), <https://crsreports.congress.gov/product/pdf/RL/RL32418/167>.

¹² A post-shakedown availability is a six to nine month maintenance period after a vessels initial period of at sea testing. A post-shakedown availability allows the contractor to fix any deficiencies that may not have been found during the in-port testing period and allows that contractor to upgrade equipment and technologies that may not have been in the original contract.

¹³ Ronald O'Rourke, *Navy Ford (CVN-78) Class Aircraft Carrier Program: Background and Issues for Congress*, CRS Report No. RS20643 (Washington, DC: Congressional Research Service, 2019), 5, <https://crsreports.congress.gov/product/pdf/RS/RS20643>.

¹⁴ John Richardson, Richard Spencer, and Robert Neller, "House Appropriations Subcommittee on Defense Holds Hearing on Fiscal 2020 Budget Request for the Navy and Marine Corps," § Appropriations Committee (2019), 42–43, <https://www.navy.mil/navydata/people/cno/Richardson/Speech/CNO%20FY20%20HAC-D%20Transcript%20-%2030%20April%202019.pdf>.

deficiencies on delivery shows that, although not as bad as the USS Ford, other lead warships studied had upward of 10 or more starred deficiencies upon delivery.¹⁵ She continues by showing that most of the starred deficiencies were accepted by the Navy, rather than being corrected prior to delivery. These practices of delivering faulty systems have also been a symptom of the shipbuilding industrial base's reduced capacity.

For the purposes of this thesis, it is necessary to define the objective metric used to measure decline in the naval shipbuilding industrial base. The health of an industry and the potential for growth can be measured based on accumulation, innovation, and intangible metrics.¹⁶ However, this thesis will use accumulation to measure the naval shipbuilding industrial base decline. In this thesis, the number of companies in the industry was chosen as the accumulation metric to represent naval shipbuilding industrial base decline. William Kovacic and Dennis Smallwood, writing about competition in the defense industry in 1994, argue that as the number of companies in industry decline and monopolies emerge there is less incentive for innovation and companies no longer compete to provide the lowest price.¹⁷ Kovacic and Smallwood contend that it is important to maintain competition within the defense industry because it creates higher level of competency, spurs innovation, and reduces cost for the U.S. government. They continue stating that continued mergers and consolidation events undermine these byproducts of competition and reduces the industry's ability to serve the customers interests. Thus, in this thesis naval shipbuilding industrial base decline is measured by shipbuilding company consolidations. And

¹⁵ Starred Deficiencies are defined as deficiencies that are required to be corrected or waived by the Navy prior to delivery. Oakley, "Navy Shipbuilding Key Findings," 10.

¹⁶ See the following authors for discussion on economic growth potential: Davide Gualerzi, "Schumpeter's Theory of Economic Development and Potential Demand," *Review of Radical Political Economics* 26, no. 3 (1994): 41–46; J. Patrick Raines and Charles G. Leathers, "Behavioral Influences of Bureaucratic Organizations and the Schumpeterian Controversy," *Journal of Socio-Economics* 29, no. 4 (August 2000): 375, [https://doi.org/10.1016/S1053-5357\(00\)00081-0](https://doi.org/10.1016/S1053-5357(00)00081-0); Kiminori Matsuyama, "Growing through Cycles," *Econometrica; Evanston* 67, no. 2 (March 1999): 335–47; Paul M. Sweezy, "Professor Schumpeter's Theory of Innovation," *The Review of Economics and Statistics* 25, no. 1 (1943): 93–96, <https://doi.org/10.2307/1924551>.

¹⁷ William E Kovacic and Dennis E Smallwood, "Competition Policy, Rivalries, and Defense Industry Consolidation," *Journal of Economic Perspectives* 8, no. 4 (November 1994): 91–110, <https://doi.org/10.1257/jep.8.4.91>.

consolidation is defined in this thesis as mergers, bankruptcy, sale of shipyard assets, and company exit from the naval shipbuilding market.

Although intangible factors and innovation metrics are also viable means of measuring industrial base health, these metrics were not used because of lack of access to company data and inability to study each company's day to day practices. Intangible factors in an industry can range from supplier and consumer interface to established processes for assessing production delays. These intangible factors are hard to define on a company basis, let alone in an industry. Measure of these intangible factors also requires face-to-face interaction with a multitude of personnel that are involved in company operations, which requires access to facilities and personnel that are not practicable to study during the course of this thesis. Level of innovation can be objectively measured through research and development funding and the number of patents that a company submits. However, due to lack of access to patent data and long-term research and development expenditures for each company, innovation metrics are not used to measure naval shipbuilding industrial base decline for this thesis.

C. ALTERNATIVE EXPLANATIONS FOR NAVAL INDUSTRIAL BASE DECLINE

There are two main arguments for why the naval shipbuilding industrial base has declined since the end of World War II. First, the boom-and-bust cycle of U.S. shipbuilding demand has created financial burdens on companies, which has caused shipbuilding companies to fail. Second, the Defense Acquisition System (DAS), managed improperly, has the potential to reduce profit margin and create losses for companies in the shipbuilding industry. Both of these potential answers for industrial base weakness provide broad reasons for failure and can be broken down into sub-arguments. Each of these sub-arguments indicate a more granular mechanism for failure and several responsible agencies/entities.

The boom-and-bust cycle argument theorizes that cycles in shipbuilding demand and spending by the DoD on ship acquisition cause companies to invest heavily during

boom periods.¹⁸ When the demand for ships busts, companies are left with excess capacity, which turn into liabilities when government funds dry up. There are multiple mechanisms that cause this boom-and-bust cycle in shipbuilding demand. Economic crisis, changes in strategic threat, war, peace dividend, presidential politics, and Congressional Distribution Theory¹⁹ all have been named as factors that have the potential to change defense spending.²⁰ Each of these factors potentially identifies one or more agencies responsible and as a group create the boom-and-bust cycle in overall defense spending.

¹⁸ See the following articles/reports for more information on the boom and bust cycle and the potential effects on the defense industry: Office of the Under Secretary of Defense for Acquisition and Sustainment, “Assessing and Strengthening the Manufacturing and Defense Industrial Base and Supply Chain Resiliency of the United States” (Washington, DC: Office of the Under Secretary of Defense for Acquisition and Sustainment, September 1, 2018), <https://media.defense.gov/2018/Oct/05/2002048904/-1/-1/1/ASSESSING-AND-STRENGTHENING-THE-MANUFACTURING-AND%20DEFENSE-INDUSTRIAL-BASE-AND-SUPPLY-CHAIN-RESILIENCY.PDF>; Sunil Chopra and Peter Meindl, *Supply Chain Management: Strategy, Planning, and Operation*, Fifth (Upper Saddle River, New Jersey: Prentice Hall, 2013); Lawrence J Korb, Laura Conley, and Alex Rothman, “A Return to Responsibility: What President Obama and Congress Can Learn About Defense Budgets from Past Presidents” (Washington, DC: Center for American Progress, July 14, 2011), <https://www.americanprogress.org/issues/security/reports/2011/07/14/10016/a-return-to-responsibility/>.

¹⁹ Congressional Distribution Theory is described as the distribution of government funds to home districts/states. Rundquist, Lee, and Rhee describe show that there is increase in defense contracts for districts/states with senior representation on congressional defense committees. Once districts/states lose representation on these committees there is a subsequent loss of defense contracts until new representatives from the district/state attain seniority. See: Barry Rundquist, Jeong-Hwa Lee, and Jungho Rhee, “The Distributive Politics of Cold War Defense Spending: Some State Level Evidence,” *Legislative Studies Quarterly* 21, no. 2 (1996): 265–81, <https://doi.org/10.2307/440183>; Gary Zuk and Nancy Woodbury, “U.S. Defense Spending, Electoral Cycles, and Soviet-American Relations,” *Journal of Conflict Resolution* 30, no. 3 (1986): 445–68.

²⁰ See: Greg Bruno, “Defense Spending During Economic Crisis,” *Council on Foreign Relations*, accessed August 15, 2019, <https://www.cfr.org/backgrounder/defense-spending-during-economic-crisis>; Harvey Starr et al., “The Relationship Between Defense Spending and Inflation,” *Journal of Conflict Resolution* 28, no. 1 (1984): 103–22; Korb, Conley, and Rothman, “A Return to Responsibility: What President Obama and Congress Can Learn About Defense Budgets from Past Presidents”; Ernest Schneider, “Causal Factors in Variations in Us Postwar Defense Spending,” *Defense Analysis* 4, no. 1 (January 1988): 53–79, <https://doi.org/10.1080/07430178808405329>; Alex Mintz and Chi Huang, “Defense Expenditures, Economic Growth, and The ‘Peace Dividend,’” *The American Political Science Review* 84, no. 4 (1990): 1283–93, <https://doi.org/10.2307/1963264>; Michael D. Ward and David R. Davis, “Sizing up the Peace Dividend: Economic Growth and Military Spending in the United States, 1948–1996,” *The American Political Science Review* 86, no. 3 (1992): 748–55, <https://doi.org/10.2307/1964136>; Charles W. Ostrom and Robin F. Marra, “U.S. Defense Spending and the Soviet Estimate,” *The American Political Science Review* 80, no. 3 (1986): 819–42, <https://doi.org/10.2307/1960540>; Robert Higgs and Anthony Kilduff, “Public Opinion: A Powerful Predictor of U.S. Defense Spending,” *Review of Education, Pedagogy, and Cultural Studies* 17, no. 1 (January 1995): 1–6, <https://doi.org/10.1080/1071441950170102>; Rundquist, Lee, and Rhee, “The Distributive Politics of Cold War Defense Spending”; Zuk and Woodbury, “U.S. Defense Spending, Electoral Cycles, and Soviet-American Relations”; Steven Stashwick, “The U.S. Navy’s New 30 - Year Plan Grows Its Fleet Realistically, but Slowly,” *The Diplomat*, February 16, 2018, https://search.proquest.com/docview/2002461989?rfr_id=info%3Axri%2Fsid%3Aprim.

The explanation regarding inefficiencies in the DAS due to improper management has three sub-arguments: (1) Fixed-price-contracts, used in the DAS and federal acquisitions, applied to technological development stages of a program minimize companies' profits are minimized, which can cause company weakness or even failure;²¹ (2) Reporting and oversight requirement transfers inefficiencies in the DAS to the shipbuilding industrial base;²² and (3) Improper implementation of the DAS creates the potential for rework and redesign, which reduces the potential for profits for the naval shipbuilding industrial base.²³

D. POTENTIAL HYPOTHESES

Two major hypotheses can be drawn from the alternative explanations for naval shipbuilding industrial base weakness. First, that the U.S. naval shipbuilding industry has been negatively affected by the boom-and-bust cycle of DoD procurement spending. Second, Defense Acquisition System (DAS), managed improperly, has the potential to reduce profit margin and create losses for companies in the shipbuilding industry.

The boom-and-bust cycle hypothesis can then be split further into the following sub-hypotheses: (1a) Fluctuations of naval procurement are created by outbreak of war; (1b) Fluctuations of naval procurement are caused by strategic considerations; (1c) Fluctuations of naval procurement are caused by economic considerations; (1d) Fluctuations of naval procurement are caused by the peace dividend; (1e) Fluctuations in naval procurement are caused by presidential party politics; and (1f) Changes in

²¹ Frank Kendall, "Getting Defense Acquisition Right," *Defense Acquisition University Press*, 2015, 228.

²² See: David Sorenson, *The Process and Politics of Defense Acquisition: A Reference Handbook* (Westport, CT: Praeger Security International, 2009), 140–60; Moshe Schwartz and Heidi M Peters, "Acquisition Reform in the FY2016-FY2018 National Defense Authorization Acts (NDAAs)," Governmental (Washington, DC: Congressional Research Service, 2018), CRS-19, <https://crsreports.congress.gov/product/pdf/R/R45068>; Michael Sullivan, "Acquisition Reform: DoD Should Streamline Its Decision-Making Process for Weapons Systems to Reduce Inefficiencies," Governmental (Washington, DC: Government Accountability Office, February 2015), <https://www.gao.gov/assets/670/668629.pdf>.

²³ Oakley, "Navy Shipbuilding Key Findings."

congressional members on the acquisitions and defense committees cause fluctuations in naval procurement (Congressional Distribution Theory).

The improper management of the DAS hypothesis can also be split into three sub-hypotheses: (2a) Fixed-price contracts used in technological development stages of the program acquisition minimize company profits, which can cause company weakness or even failure; (2b) Reporting and oversight requirements transfer inefficiencies in the DAS to the shipbuilding industrial base; and (2c) Improper implementation of the DAS creates potential for rework and redesign, which reduces potential profits for the naval shipbuilding industrial base.

Based on limited time and resources to conduct this research the following sub-hypotheses have been chosen for further inspection. The boom-and-bust cycle hypothesis and the use of fixed contracts hypothesis are chosen as main points of study for this thesis. The boom-and-bust cycle hypothesis is studied for two reasons. First, no compiled dataset proves that the boom-and-bust cycle exists in the naval shipbuilding industry. However, DoD shipbuilding expenditure data is available in past presidential budget requests that can help prove the cycle exists for the industry. Second, the boom-and-bust cycle is important to understand further because in multiple documents, from the past three years, either industry officials or the Chief of Naval Operations has indicated that the cycle has been a major issue that has plagued the industry.²⁴

As a sub-hypothesis, Congressional Distribution Theory's role in the shipbuilding industry was also chosen for further study because of Congress's powers of appropriation and oversight and because Congressional Distribution Theory is the least written about of the boom-and-bust sub-hypotheses. The literature makes the broad claim that the defense industry through government contracts is affected by Congressional Distribution Theory,

²⁴ O'Rourke, *Navy Force Structure and Shipbuilding Plans: Background and Issues for Congress*, 101–4; "FY-19 Navy and Marine Corps Budget Hearing Before House Appropriations Committee on Defense," § House Appropriations Committee on Defense (2018), 8, https://www.navy.mil/navydata/people/cno/Richardson/Speech/20180307__HACD_DoN_Posture_FY19.pdf.

however, it does not explain how it effects naval procurement.²⁵ By studying this sub-hypothesis we are able to explore if the theory can be applied to naval procurement and the naval shipbuilding industrial base.

War, changes in strategic threat, and economic crisis are not included because extensive writing on these topics has already proved that they have dramatic effects on defense spending, which can translate to fluctuation in naval procurement.²⁶ The Korb and Schneider articles show defense spending over time and in each case war causes large increases in defense spending that is accompanied by a subsequent drawdown after the conflict is over.²⁷ Schneider as well as Ostrom and Marra argue that strategic threat is an important factor that causes changes in defense spending.²⁸ Finally, Schneider and Bruno, in their respective articles, show that there is a varying response to economic crisis when it comes to defense spending.²⁹

With respect to the peace dividend it is not included because the literature seemed incomplete and an entire thesis would have to be written on this topic alone prior to relating it to the naval shipbuilding industrial base.³⁰ Ward and Davis look at changes in defense spending from 1948 to 1996 and find that increased “military spending detracts from

²⁵ Guy D. Whitten and Laron K. Williams, “Buttery Guns and Welfare Hawks: The Politics of Defense Spending in Advanced Industrial Democracies,” *American Journal of Political Science* 55, no. 1 (January 2011): 117–34, <https://doi.org/10.1111/j.1540-5907.2010.00479.x>; Karl Derouen and U K Heo, “Defense Contracting and Domestic Politics,” *Political Research Quarterly* 53, no. 4 (December 2000): 753–69, <https://doi.org/10.1177/106591290005300404>; Rundquist, Lee, and Rhee, “The Distributive Politics of Cold War Defense Spending.”

²⁶ Korb, Conley, and Rothman, “A Return to Responsibility: What President Obama and Congress Can Learn About Defense Budgets from Past Presidents”; Schneider, “Causal Factors”; Ostrom and Marra, “U.S. Defense Spending and the Soviet Estimate”; Bruno, “Defense Spending During Economic Crisis”; Silk Leonard, “Surviving The Recession,” *New York Times*, January 10, 1982, <https://search.proquest.com/docview/424278391/4140073E255B4A6FPQ/1?accountid=12702>; Starr et al., “The Relationship Between Defense Spending and Inflation.”

²⁷ Korb, Conley, and Rothman, “A Return to Responsibility: What President Obama and Congress Can Learn About Defense Budgets from Past Presidents”; Schneider, “Causal Factors.”

²⁸ Ostrom and Marra, “U.S. Defense Spending and the Soviet Estimate”; Schneider, “Causal Factors.”

²⁹ Bruno, “Defense Spending During Economic Crisis”; Schneider, “Causal Factors.”

³⁰ Ward and Davis, “Sizing up the Peace Dividend”; Mintz and Huang, “Defense Expenditures, Economic Growth, and The ‘Peace Dividend.’”

economic growth,” proving that countries should strive for the “peace dividend.”³¹ Mintz and Huang report the same findings in their study of defense spending compared to investment.³² Although these studies have furthered our understanding of how military spending effects the economy and prescribe the “peace dividend” as a route for economic growth, no study has been done to determine how the “peace dividend” has changed political action or military spending. Thus, the “peace dividend” will not be included in order to limit the scope of research for this thesis.

The second major hypothesis that is studied further is the application of fixed price contract types during the technological development phase of the acquisition program. This hypothesis is selected for three reasons. First, the hypothesis that the Defense Acquisition System implemented improperly creates the potential for company failure has been thoroughly studied by Oakley.³³ Second, an entire thesis can be written on the hypothesis that oversight requirements slow/hinder the acquisitions process. The oversight topic is too broad for study in the course of this thesis. Third, congressional records, laws dealing with acquisitions, and Presidential Executive Orders and directives are easily accessible making the comparison of contract type preferences and naval shipbuilding industrial base failures possible.

E. RESEARCH DESIGN

In order to determine the overall trends in the U.S. naval shipbuilding industrial base I broke up the analysis into four major parts. First, the analysis of active naval shipbuilders since 1945 gives the reader a sense of the underlying dynamics inherent in the naval shipbuilding industrial base. Keels laid data from shipbuildinghistory.com is used to determine which shipyards were involved in naval shipbuilding from 1945 to present. From that point, the history of each shipyard is researched to determine the parent company over time and industry consolidation events. The number of keels laid by parent company is then plotted over time to determine major parent companies in the industry and to give a

³¹ Ward and Davis, “Sizing up the Peace Dividend.”

³² Mintz and Huang, “Defense Expenditures, Economic Growth, and The ‘Peace Dividend.’”

³³ Oakley, “Navy Shipbuilding Key Findings.”

visual representation of a parent company's production. Information about the parent companies and keels laid are a means to chronical consolidation events and determine overall trends in the U.S. naval shipbuilding industrial base. These consolidation events are the basis for testing our hypotheses in future sections.

Second, the boom-and-bust cycle hypothesis is tested by determining whether the boom-and-bust cycle applies to the naval shipbuilding industrial base. Having established that the boom-and-bust cycle applies, we can determine the point in the cycle at which shipbuilding companies tend to fail and, thus, the weight of the boom-and-bust cycle as a causal mechanism. In order to test this hypothesis, Shipbuilding and Conversion and Navy Research and Development account data is collected from presidential budget requests. In order to best represent money going to the naval shipbuilding industrial base account outlays are used to represent these accounts. The budget figures are then converted into 2018 dollars using yearly inflation rates in order to remove the effects of inflation and make a standard dollar amount over time. The 2018-dollar value of each account is then plotted over time to determine if the boom-and-bust cycle applies to the U.S. naval shipbuilding industrial base. Comparisons between booms and busts in the cycle and consolidation events are then performed to determine the boom-and-bust cycle's effect on the U.S. naval shipbuilding industrial base. Knowing that the theory predicts company failure during busts in the cycle, we should expect that U.S. naval shipbuilding industrial base consolidation events to occur at low points of shipbuilding expenditures and slow production periods for keels laid.

Third, to test one of the boom-and-bust cycle's sub-hypotheses, we dive further into the Congressional Distribution Theory to determine whether or not congressional committee membership is able to sway the means by which naval shipbuilding dollars are spent or the overall amount that is appropriated. In order to make this determination, first, Shipbuilding and Conversion account budget authority requests from the presidential budget are compared to the amount appropriated in the National Defense Authorization Acts. Based on the theory, we should expect that when there is a higher level of membership or leadership from districts/states with shipyards on specific defense and appropriations committees the amount appropriated by Congress should be higher than

what is requested in the presidential budget request. To determine the committee membership, Committee on Appropriations and its Defense Subcommittee membership and leadership are analyzed based on House of Representatives and Senate histories and committee rosters. The membership on Senate and House Committees on Appropriations from states with shipyards is then calculated as a percentage. Along with base membership, committee chair and ranking member constituency shipyard status are noted for comparison. This membership data is then compared to the difference between congressional appropriation and presidential budget request to verify the Congressional Distribution Theory hypothesis. To take the analysis one step further, the National Defense Authorization Acts are analyzed to determine if there are any additional cases in which Congress has mandated the distribution of funds to specific shipyards.

Fourth, we test the hypothesis that over dependence on fixed-price contracts during the technological development phase of the acquisitions process causes industrial base consolidation. This is accomplished by comparing historical contract type preferences to company failure in the naval shipbuilding industrial base. In order to determine historical contract type preferences, NDAAs, Presidential Executive Orders, acquisition laws, and acquisitions histories are reviewed for changes in the employment of fixed-price and cost-type contracts. An administration's preference is then binned into four specific categories: fixed-price, slight fixed-price, slight cost-type, and cost type. These categories are determined based on how the administration employed fixed-price and cost-type contracts. The consolidation events from the first section are then compared to administration preference at the time of consolidation to determine how preferences for fixed-price contracts relate to naval shipbuilding industrial base consolidation.

Finally, these four factors are compared to determine which causal mechanism holds more weight for U.S. naval shipbuilding industrial base consolidation. By understanding which causal factor has the highest weight we can then prescribe the political implications of this thesis and suggest areas for future study.

F. SUMMARY

In summary, with Great Power Competition driving the push for additional ships the U.S. government needs to find ways to increase the production capacity of a naval shipbuilding industry that has seemed to have reached capacity. With projects going over cost, over deadline and delivered with discrepancies, the U.S. Navy, the DoD, Congress, and the Executive all have a part to play in finding and correcting what ails the naval shipbuilding industrial base. This thesis aims to determine why there is apparent weakness in the naval shipbuilding industrial base by determining the reasons behind the industrial base's consolidation. In order to accomplish this task this thesis explores potential underlying causes of naval shipbuilding company failure.

Chapter II of this thesis, "Naval Shipbuilding Companies Since 1945," performs three tasks. First, the chapter looks at the naval ships built and the shipyard's parent companies since the end of World War II and provides evidence that the naval shipbuilding industrial base has consolidated since the end of World War II. Second, the chapter provides the empirical background, by establishing what companies have failed and when, for use in future chapters for testing the base hypotheses. Finally, the chapter finds that market dynamics have favored large corporations that own multiple building facilities or multinational companies that have a long history in the shipbuilding industry. The companies that remain in the industry today fit into one of these two descriptive categories.

Chapter III, "Boom-and-Bust Cycle: Basics, Potential Causes, and Proving It Extends to Navy Ship Acquisitions," tests the boom-and-bust cycle theory of failure by comparing cases of industry consolidation from Chapter II to DoD shipbuilding expenditures. This analysis is performed in four distinct tasks. First, the boom-and-bust theory of failure is explored in greater detail, which finds that the most likely time for company failure is during a bust in the cycle. Second, the reader is presented with some underlying causes and potential actors responsible for the continuation of the boom-and-bust cycle. Third, the boom-and-bust cycle is proved to exist in the shipbuilding industry by compiling DoD shipbuilding expenditures from 1945 to present. Finally, the cases of industry consolidation are analyzed to determine at what stage of the boom-and-bust cycle shipbuilding company failure occurred. The resulting findings suggest that the boom-and-

bust cycle plays a significant role in the naval shipbuilding industry consolidation, however, it is not the only causal factor for company failure.

Chapter IV, “Congressional Distribution Theory and Naval Shipbuilding,” evaluates the Congressional Distribution Theory, as a sub factor of the boom-and-bust cycle, as another potential causal factor for naval industrial base consolidation. To establish if congressional distribution applies to the naval shipbuilding industrial base, changes in appropriation made by Congress are compared to Committee on Appropriations and its Defense Subcommittee membership and leadership. Although no correlation is found between these two factors, the texts of past NDAAAs indicate that Congress has used its appropriations authorities to direct funds to specific shipyards. This has been done through mandates on specific builders, mandates for programs being produced by specific builders, and splitting programs between multiple builders. These mandates, however, do not overlap with cases of consolidation that are found in Chapter II. Thus, correlation between consolidation events and congressional distribution is unable to be determined.

Chapter V, “Preference for Fixed Price Contracts a Limited Factor in Naval Shipbuilding Industrial Base Consolidation” tests the hypothesis that the fixed price contract type used during the technological development phase of acquisition cycle can cause company failure. To test the hypothesis, the chapter gives the reader a baseline understanding for federal acquisitions contract types, gives a rough timeline of presidential and congressional contract type preferences, and then compares the timeline to the cases of consolidation from Chapter II. Overall this chapter finds that there is a limited correlation between preference for fixed price contracts and naval shipbuilding industrial base failure.

Chapter VI, “Conclusion,” weighs each of the hypotheses that are tested to determine what factor has had the biggest impact on the consolidation of the naval shipbuilding industrial base. With the findings from the previous chapters in hand, this chapter also discusses underlying policy implications that may be derived from this thesis. This chapter also goes on to recommend areas of future study that may answer some the base questions where this thesis has fallen short.

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II. NAVAL SHIPBUILDING COMPANIES SINCE 1945

This chapter performs three functions in the context of this thesis. First, it establishes that there has been an overall reduction in companies in the naval shipbuilding industrial base and looks at each company individually to determine when and how companies have failed since the end of World War II. Second, by establishing when and how companies fail in this chapter we have the empirical timeline necessary to answer why companies have failed in subsequent chapters. Third, this chapter confirms that the naval shipbuilding industry has consolidated and finds that only large conglomerate companies have been able to continue operations.

The number of companies that are employed in the naval shipbuilding industrial base has shrunk from ten at its height down to four companies building ships today. Analysis of the companies that remain suggests that only large domestic companies that own multiple shipyards or large foreign multinational companies with previous shipbuilding experience are able to sustain operations. There is reason for hope, however, new multinational companies with previous experience in shipbuilding have entered the market in recent years and are building warships for the Navy.

A. NAVAL SHIPBUILDING COMPANIES SINCE 1945: METHOD

In order to determine the number of U.S. naval shipbuilding companies from 1945 to present, data is analyzed using shipbuilding construction records from the website Shipbuilding History.³⁴ From this point the LCS, DEG/DE/FF/FFG, CLK/DD/DLG/DDG, CGN/CG, CVA/CVN, LSD/LPD/LPH/LHA/LHD, and SS/SSN/SSR/SSRB/SSBN class ships built from 1945 to present are analyzed by shipyard and by date the keel was laid. The data is limited to these classes of ships because they closely match with the 2016 Force Structure Assessment (FSA). The keel laid date is chosen to represent the overall build dates because contract dates are unreliable due to the fact that contracts are often rewarded for multiple ships all in one year, which would have skewed the data to the years that

³⁴ Colton, "U.S. Shipbuilding History, Shipbuilding Records."

contracts are awarded. Either keel laid or delivery date could have been chosen, however, to maintain ease of continuity, keel laid dates are chosen to represent the dataset. To further constrain the data, the analysis did not include ships that were cancelled or that were built by U.S. companies for foreign military sales. Additional studies are necessary to determine how foreign military sales effect the U.S. naval shipbuilding industrial base. Constraining ships built for U.S. acquisitions ensures that the analysis is limited to how the U.S.'s acquisition of ships affect the shipbuilding industrial base, while ship cancellation is not included for ease of data evaluation.³⁵ This basic data and the aforementioned constraints are the basis for analysis.

Using the base keel laying dates, the name of the ship built, and the shipyard in which it was built the overall picture is put together. Each shipyard is traced back to its parent company from 1945 to present in order to determine which parent company was responsible for each naval ship that was built. Then the number keels laid per year is plotted over time based on parent company and is shown as Figures 1 through 9.

³⁵ Although cancellations do cause loss of work and loss of potential profits companies are often awarded contract penalties when the government cancels contracts. See: Federal Acquisition Regulation, "Federal Acquisition Regulation: Volume I" (Washington, DC: Federal Acquisition Regulation, 2019), 17.1-1-17.1-3, <https://www.acquisition.gov/sites/default/files/current/far/pdf/FAR.pdf>.

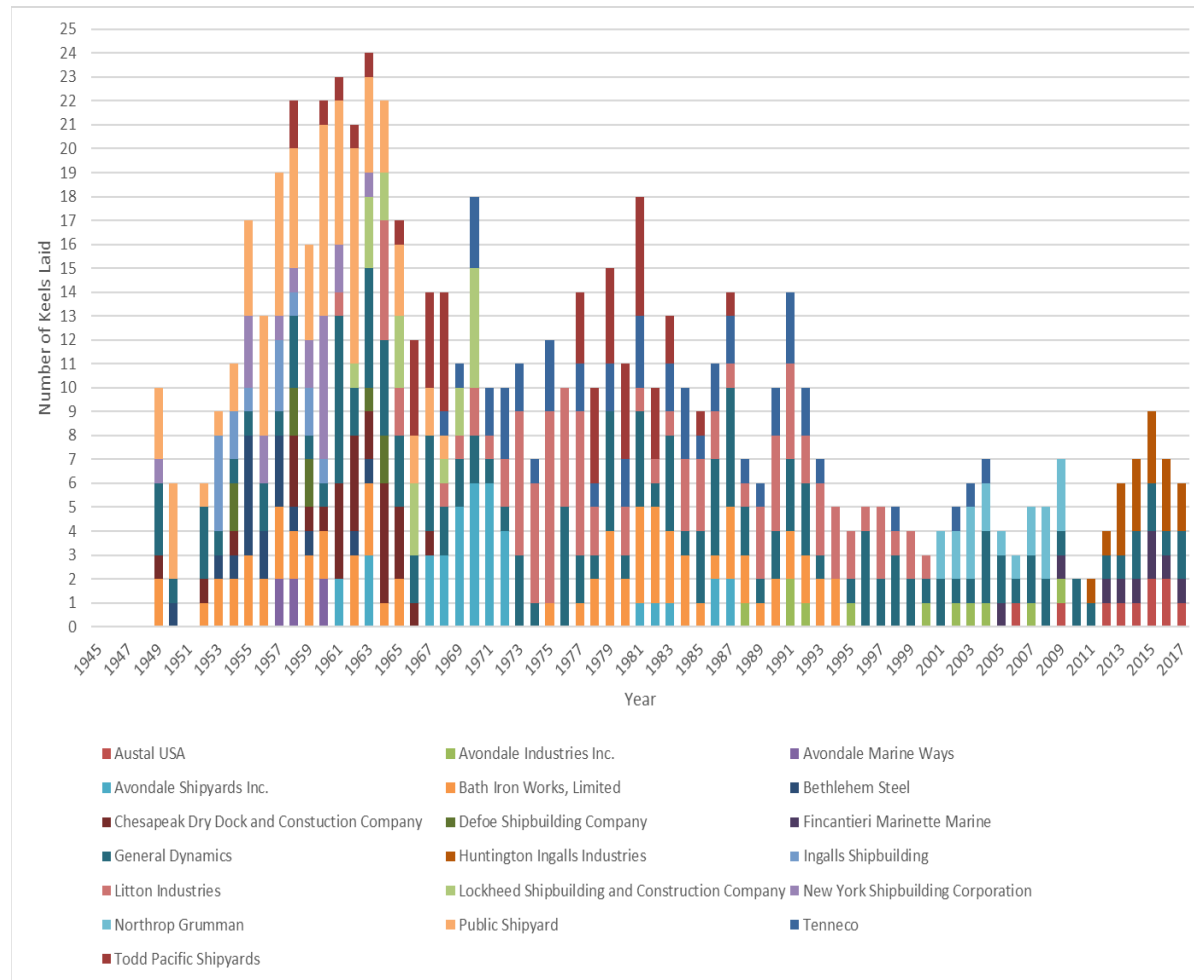


Figure 1. Naval Keels Laid Per Year³⁶

³⁶ See Appendix A for citation information.

B. NAVAL SHIPBUILDING COMPANIES SINCE 1945: FINDINGS

Based on the data compiled in Figure 1, from 1945 to today there have been seventeen private parent companies that built warships for the United States Navy. At their height in 1963, ten different parent companies laid the keels of twenty-four warships. These are impressive numbers compared 2017, when the four major shipbuilders laid the keels of six warships. It is clear that the shipbuilding industrial base has shrunk due to companies leaving the market or due to mergers with other shipbuilders. However, there is reason for hope. Relatively new companies have entered the market in recent years taking up the mantle where others have left off while other companies have reorganized to prioritize naval shipbuilding. The following sections use the data gleaned from the previous section to determine how four companies came to dominate the naval shipbuilding industrial base.

1. General Dynamics and Subsidiaries

The first group of companies that we analyze centers around what has become General Dynamics, which remains one of the major shipbuilders today. Like the other companies in the shipbuilding industrial base we see that multiple companies were absorbed by General Dynamics. Tim Colton notes that General Dynamics got its start when Electric Boat Company, a major U.S. submarine producer in World War II, bought Canadair, a Canadian aircraft manufacturer.³⁷ Colton continues stating that in an attempt to reconcile the differences between the two companies Electric Boat Company established General Dynamics to operate as a parent company for the two different manufacturers. General Dynamics, and its now subsidiary Electric Boat Company, would continue to be the lead design yard for U.S. submarines. General Dynamics, as a parent company, has also grown into other sectors of shipbuilding by obtaining Bethlehem Steel and Bath Iron Works (Figure 2 is charted to show General Dynamics and its subsidiaries production of ships overtime.).

³⁷ Tim Colton, "Electric Boat, EB, GD/EB," Shipbuilding History, August 8, 2018, <http://shipbuildinghistory.com/shipyards/large/electricboat.htm>.

Bethlehem San Francisco shipyard and Quincy Shipyard in Massachusetts were both owned by Bethlehem Steel leading up to World War II and would continue to be a major shipbuilder throughout the war.³⁸ After a foray into multiple classes of ships, with limited production, both shipyards would close their doors. Bethlehem Quincy would be sold in 1963 to General Dynamics.³⁹ Figure 2 shows that Bethlehem Quincy was still receiving naval shipbuilding contracts prior to the shipyards operations being sold to General Dynamics, so we can argue that it is not demand alone that created the need for sale of the shipyard, but this mechanism is studied further in Chapter III. General Dynamics would continue to produce military vessels at the Quincy shipyard until 1967. Once production of military vessels was no longer viable at the location General Dynamics would shift its manufacturing base to corporate vessels at the Quincy location until the venture was permanently closed in 1986.⁴⁰

Bethlehem San Francisco would face the same fate, although in a slightly different manner, in 1982 when the shipyard was sold by Bethlehem Steel to the city of San Francisco.⁴¹ Bethlehem San Francisco had an even shorter period of naval shipbuilding compared to its Quincy sister shipyard. Bethlehem San Francisco would only build four warships for the U.S. Navy from 1955 to 1963 and would not be awarded another naval contract from 1963 until its closure in 1982. Even during Bethlehem San Francisco's short foray into naval contracts its primary source of contracts came from the commercial sector building cargo ships, barges, and tankers.⁴² Although it seems like Bethlehem San Francisco exited the naval shipbuilding market in 1963 after the last keel was laid, it is unclear if the company still sought government contracts. Thus, the exact year of the market exit is unknown.

³⁸ Tim Colton, "Bethlehem San Francisco, Union Iron Works," Shipbuilding History, May 29, 2017, <http://shipbuildinghistory.com/shipyards/large/bethsanfrancisco.htm>.

³⁹ "Bethlehem Steel Corporation: Quincy," Destroyers History Foundation, 2019, <https://destroyerhistory.org/destroyers/bethqu/>.

⁴⁰ Destroyers History Foundation.

⁴¹ Colton, "Bethlehem San Francisco, Union Iron Works."

⁴² Colton.

Bath Iron Works, which started as an incorporated company in 1884, was a shipbuilding behemoth in its own right, however, it would also have to look for a savior by the end of the 20th century. From 1945 to the time that it was incorporated into General Dynamics in 1995, Bath Iron Works delivered 73 Cruisers, Destroyers, and Destroyer Escorts to the United States Navy as an independent company (see Figure 1 and Figure 2 for background data on keels laid by Bath Iron Works).⁴³ In the five years before Bath Iron Works was incorporated into General Dynamics it had maintained a rate of two keels laid per year between the Arleigh Burke class DDGs and the Destroyer Escorts. The the main source of production would shift to FFGs under the new lead of General Dynamics. The reason given by the LA Times for the Bath Iron Works eventual failure, and need for saving by General Dynamics, is the reduction in U.S. military spending in the years leading up to the buyout.⁴⁴ Chapter III works to verify these claims by the LA Times by comparing the timeline of Bath Iron Works buyout to Shipbuilding and Conversion account expenditures from yearly Presidential Budget Requests. As seen in Figure 1, Bath Iron Works was still maintaining a higher rate of keels laid in the years leading up to being bought out by General Dynamics. However, the shipyard would work at a slower rate under General Dynamics. So we can assume that potential for merger, buyout, or failure in the Bath Iron Works' case can not just be based on previous work, but on future contracts.

The companies that have combined to create General Dynamics provide examples of shipbuilding consolidation that will be used as an empirical base in future chapters. The buyout of Bethlehem Quincy in 1961 and the Bath Iron Works' merger in 1995 provide two cases of company failure that can be used to determine an overall mechanism for company failure in subsequent chapters. Bethlehem San Fransico is not be included as a case study because exact date of its market exit is unknown.

⁴³ "Bath Iron Works: History," General Dynamics, accessed October 28, 2019, <https://www.gdbiw.com/History/index.html#timeline>.

⁴⁴ Los Angeles Times, "General Dynamics to Buy Bath Iron Works Shipyard: Defense: The Purchase Would Give the Contractor Access to \$2 Billion in Orders for Navy Ships," *Los Angeles Times*, August 18, 1985, <https://www.latimes.com/archives/la-xpm-1995-08-18-fi-36555-story.html>.

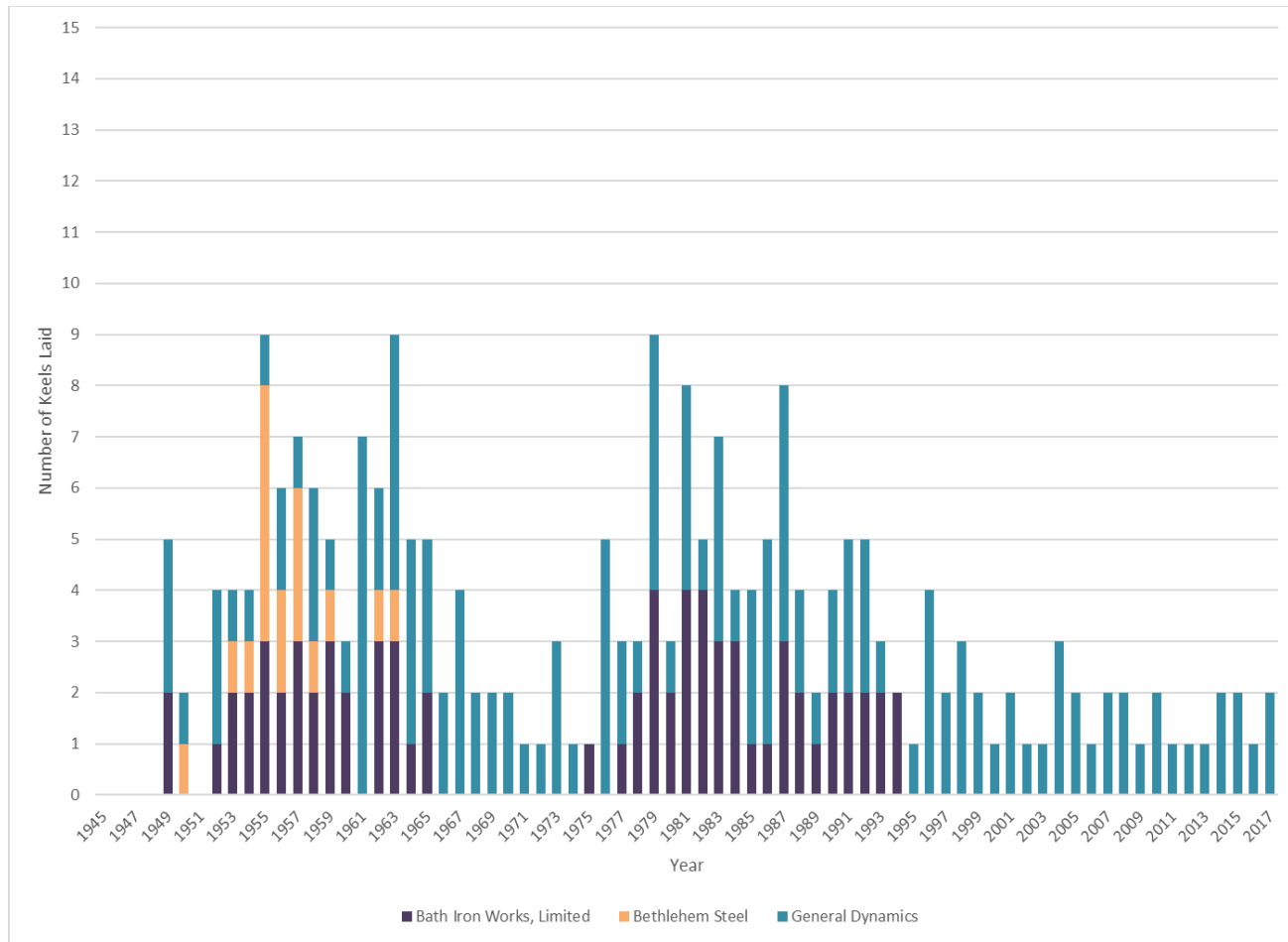


Figure 2. Naval Keels Laid by General Dynamics Corporation⁴⁵

⁴⁵ See Appendix A for citation information.

2. Huntington Ingalls Industries

Huntington Ingalls Industries, relatively new as an individual corporation, has a long history in the U.S. naval shipbuilding industry. Although rising in a much different way than General Dynamics, Huntington Ingalls Industries is yet another example of the U.S. naval shipbuilding industrial base constriction since 1945. Huntington Ingalls continues to operate two shipyards, Newport News Shipbuilding in Virginia and Ingalls Shipbuilding in Mississippi. Huntington Ingalls has a diversified standing in the naval shipbuilding market as one of two submarine builders, the only builder for aircraft carriers, and continues to be a major builder for non-nuclear ship classes.

The history of both of Huntington Ingalls Industries' shipyards starts prior to World War II as separate entities. Colton finds that Newport News shipyard emerged from World War II privately held under the Chesapeake Dry Dock and Construction Company.⁴⁶ Colton notes that Newport News shipyard maintained this status until it was acquired by Tenneco in 1968. It was then spun off as an independent company in 1996.⁴⁷ It would again change hands in 2001 when it was bought by Northrop Grumman.⁴⁸ We study these transitions in future chapters to get a sense of why these companies failed to continue in the naval shipbuilding market.

Ingalls shipyard in Mississippi has a similar story to its sister in Virginia. Created during World War II under Ingalls Shipbuilding company the shipyard would build a plethora of ships for the Navy during the war.⁴⁹ This successful partnership between the Navy and Ingalls Shipbuilding continued until it was acquired by Litton Industries in 1961.⁵⁰ Litton had acquired the Ingalls shipyard at a low point for Ingalls Shipbuilding. Avondale Industries,

⁴⁶ Tim Colton, "Newport News Shipbuilding, NGSB Newport News," Shipbuilding History, January 4, 2019, <http://shipbuildinghistory.com/shipyards/large/newportnews.htm>.

⁴⁷ Colton.

⁴⁸ Colton.

⁴⁹ Deanne Nuwer, "Shipbuilding Along the Mississippi Gulf Coast," Mississippi History Now, October 2010, <http://www.mshistorynow.mdah.ms.gov/articles/351/shipbuilding-along-the-mississippi-gulf-coast>.

⁵⁰ Nuwer.

along with its Avondale shipyard in Louisiana, was also acquired by Litton Industries in 1999.⁵¹ Litton Industries, although growing in size throughout its span, had major contracting issues with the Department of Defense, which caused it to lag behind.⁵² Northrop Grumman would eventually step in to salvage the company's assets in 2001 after Litton Industries reported \$1.3 billion dollars in net debt that Northrop Grumman would assume.⁵³

Northrop Grumman, a multi-faceted defense company, after its acquisitions of the Newport News, Ingalls, and Avondale shipyards had become the largest shipbuilding company in the United States. Eventually, in 2011 due to its size and the independence of its shipbuilding division, Northrup Grumman Ship Systems would spin off as Huntington Ingalls Industries.⁵⁴ That same year Colton notes that the company closed the doors on the Avondale shipyard. The Avondale shipyard being a liability for the newly spun off Huntington Ingalls Industries was sold to Avondale Marine. Avondale shipyard remains a possible builder for the Navy, however, it has not built any ships for the Navy under its new management.⁵⁵

As we have seen from the previous section on General Dynamics, the past companies that now make up the Huntington Ingalls Industries follow a similar model of consolidation. Ingalls Shipbuilding merger in 1961, Avondale Industries and Litton Industries being bought out in 1999 and 2001, provide cases for analysis that can be used in subsequent chapters to determine possible failure mechanisms. The Huntington Ingalls Industries case is also another example that only large corporations with multiple diversified shipbuilding operations are able to sustain operations. Keels laid data is depicted in Figure 3 for Huntington Ingalls Industries.

⁵¹ Tim Colton, "Avondale Shipyards, Avondale Industries, NGSB New Orleans, Northrop Grumman Ship Systems," Shipbuilding History, 2015, <http://shipbuildinghistory.com/shipyards/large/avondale.htm>.

⁵² "Litton Industries Inc.," Encyclopedia.com, 2019, <https://www.encyclopedia.com/social-sciences-and-law/economics-business-and-labor/businesses-and-occupations/litton-industries-inc>.

⁵³ "Northrop Grumman to Acquire Litton Industries for \$80 per Share Cash," Sperry Marine, accessed November 1, 2019, <https://www.sperrymarine.com/news/northrop-grumman-acquire-litton-industries-80-share-cash>; Encyclopedia.com, "Litton Industries Inc."

⁵⁴ Colton, "Newport News Shipbuilding, NGSB Newport News."

⁵⁵ Ben Werner, "HII Closes Sale of Shuttered Avondale Shipyard," *USNI News* (blog), October 4, 2018, <https://news.usni.org/2018/10/04/37094>.

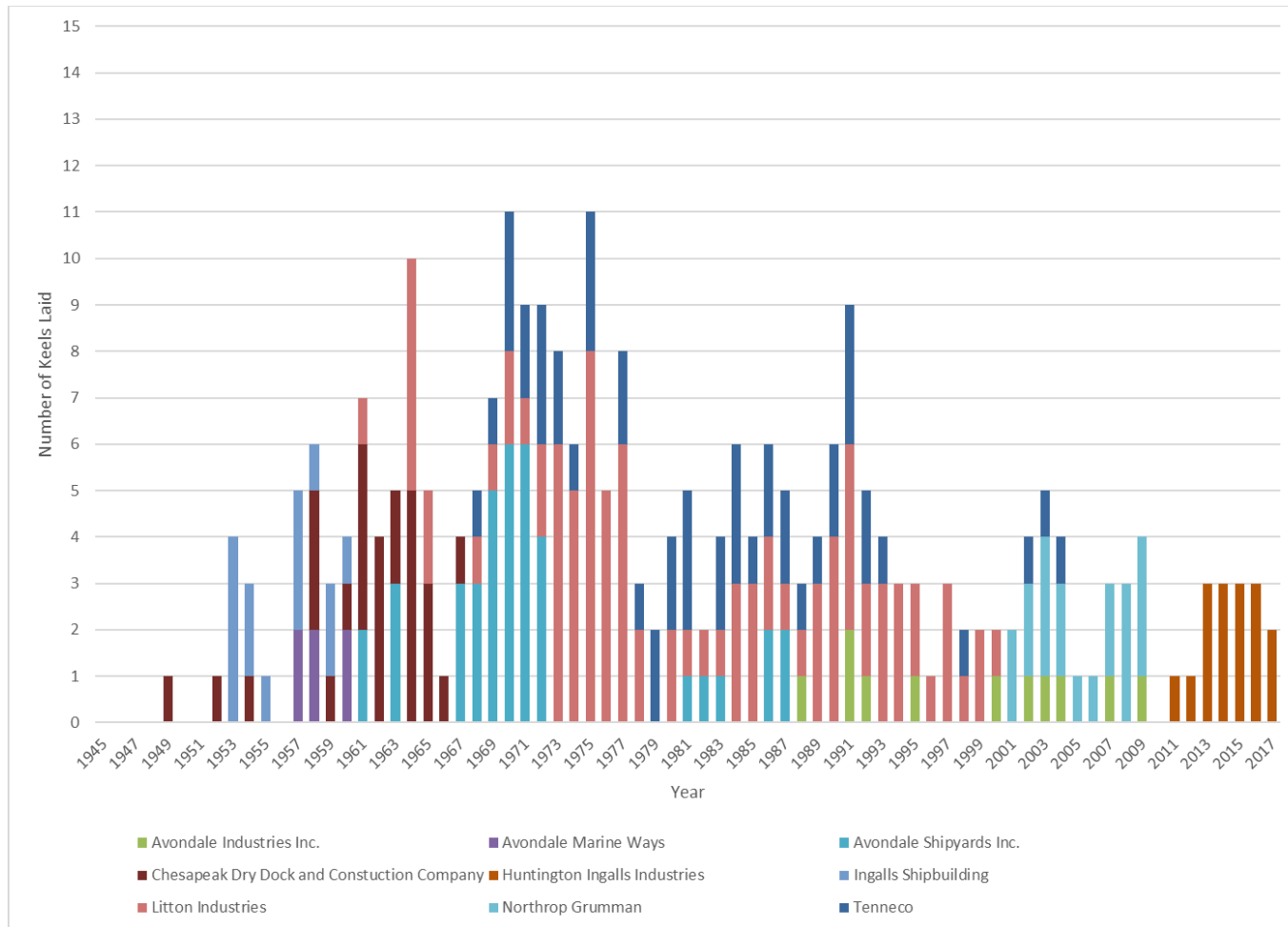


Figure 3. Naval Keels Laid by Huntington Ingalls Industries Corporations⁵⁶

⁵⁶ See Appendix A for citation information.

3. Austal USA

Austal USA, a relative newcomer to U.S. shipbuilding contracts, has cut its own small slice out of the shipbuilding market in the last few years. Austal International, headquartered in Australia, broke into the U.S. market with its subsidiary Austal USA in 1999, with a production facility in Mobile Alabama.⁵⁷ Since its start Austal has delivered the Expeditionary Fast Transport (EPF) to the U.S. Navy. In 2005, Austal expanded by winning a contract to deliver Littoral Combat Ships (LCSs) to the Navy.⁵⁸ Since that time Austal USA has laid the keels of ten more LCSs and contracting continues into the future. LCS keels laid by Austal USA are shown in Figure 4. Austal USA shows that a foreign multinational company with previous shipbuilding experience can break into the market. Austal USA, as a large multinational company with multiple holdings abroad, also reinforces the fact that only large companies with multiple revenue streams are able to sustain themselves in the naval shipbuilding industry. See Figure 4 for data on keels laid by Austal USA.

⁵⁷ “Our History,” Austal USA, 2019, <https://usa.austal.com/our-story>.

⁵⁸ Austal USA.

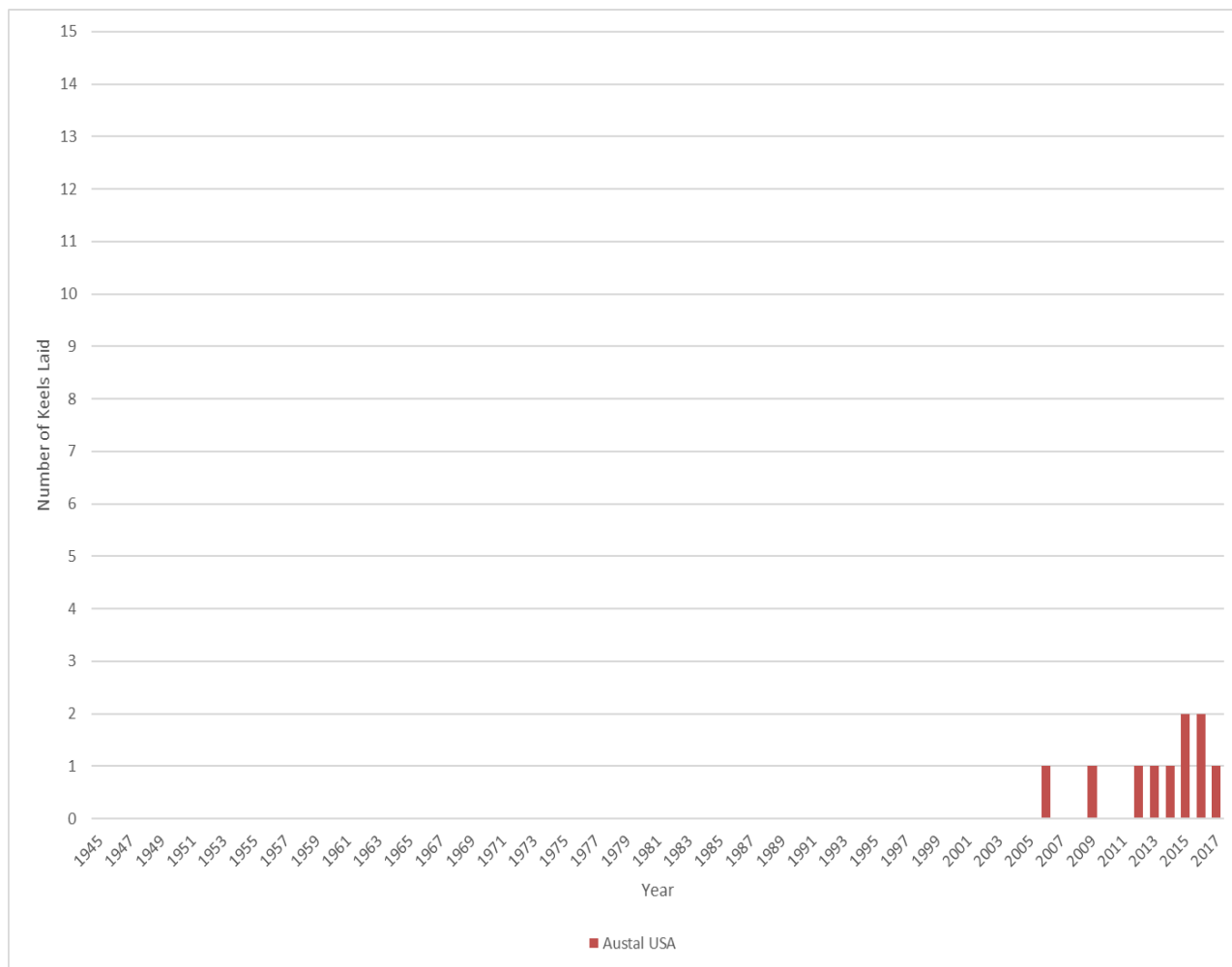


Figure 4. Keels Laid by Austal USA⁵⁹

⁵⁹ See Appendix A for citation information.

4. Fincantieri (Marinette Marine)

Another relative newcomer to the U.S. the naval shipbuilding industry, Fincantieri, has also cornered a section of the naval shipbuilding market. Fincantieri being a multi-domain multinational corporation, based out of Italy, has many different ventures around the world. However, it has had the most success in the maritime domain building anything from yachts to warships, along with engines, navigation systems, and cruise ship cabins.⁶⁰ Fincantieri started its venture into U.S. naval shipbuilding in 2008 when it acquired the Marinette Marine shipyard in Marinette Wisconsin from Manitowoc Corporation.⁶¹ Colton shows that prior to being owned by Fincantieri the Marinette shipyard, which was privately held until being bought by Manitowoc in 1999, had been a primary supplier of support craft, patrol boats, and landing craft to the U.S. Navy and has continued that process until today. It was only after the shipyard was taken over by Fincantieri that the first LCS was delivered to the Navy. Since that time Fincantieri has shared the LCS market with Austal USA (see Figure 5 for market entry data and number of ships built per year). Fincantieri is another company, like Austal, that provides further evidence that only large multinational companies with previous experience in shipbuilding can break into the U.S. naval shipbuilding market.

⁶⁰ “Fincantieri Company Profile: Seven Seas One Company,” Fincantieri, 2019, https://www.fincantieri.com/globalassets/gruppo/fincantieri_cp_01_19_web.pdf.

⁶¹ Tim Colton, “Marinette Marine,” Shipbuilding History, 2019, <http://shipbuildinghistory.com/shipyards/large/marinette.htm>.

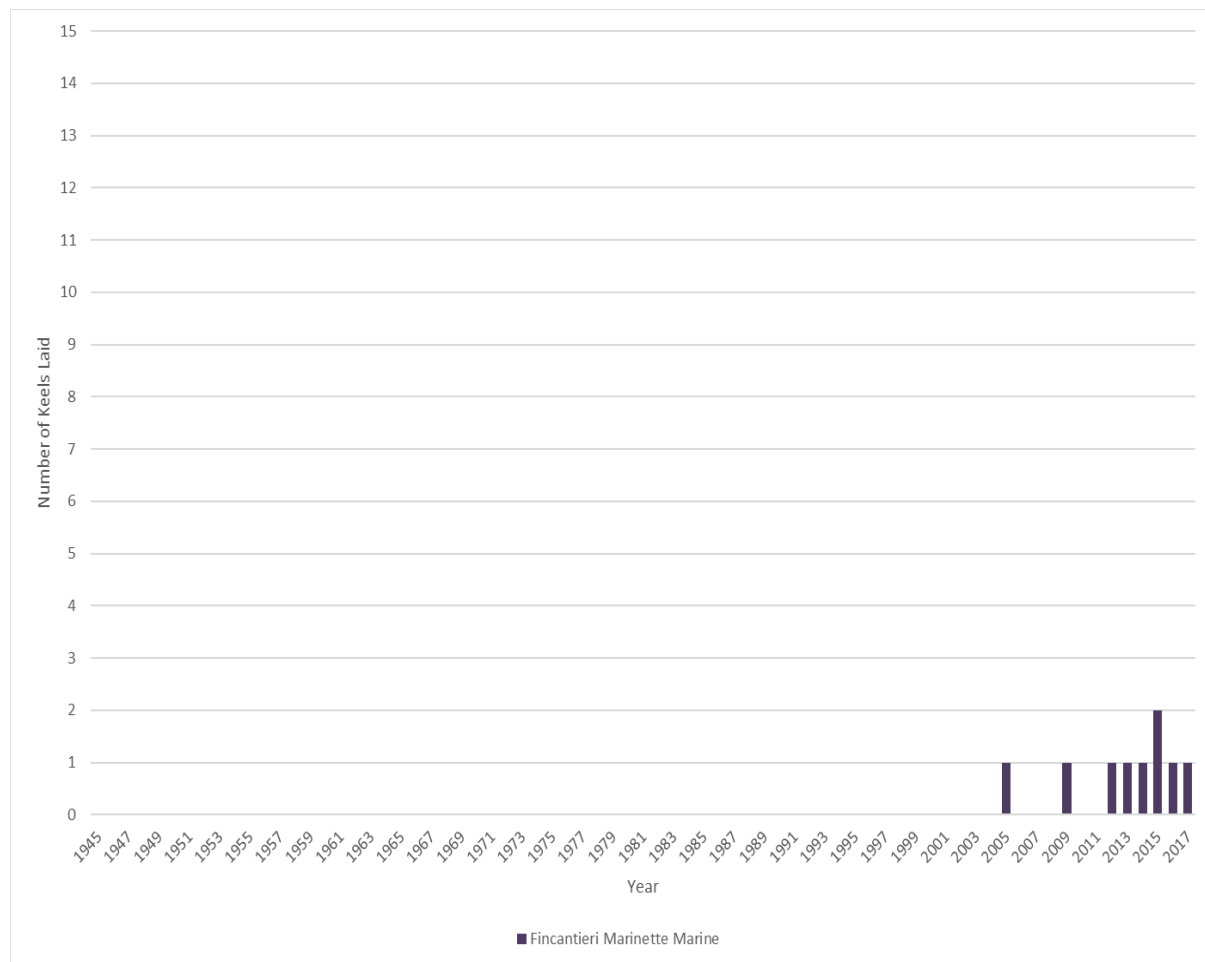


Figure 5. Keels Laid by Fincantieri Corporation⁶²

⁶² See Appendix A for citation information.

5. Defoe Shipbuilding Company

Defoe Shipbuilding Company and its shipyard in Michigan had a long history with the Navy, but as work from the Navy went to competing shipyards Defoe was unable to continue operations. Ryan Bancroft notes that Defoe Shipbuilding Company got its start in 1905 and had been producing anything from yachts to warships prior to World War II.⁶³ See Figure 6 for Defoe Shipbuilding Company keels laid data. Bancroft continues, noting that during the war, however, manufacturing shifted to productions of patrol craft, minesweepers, and tugs. After the war, Bancroft notes that, contracts from the Navy had all but dried up until the company was awarded the contracts for Destroyer Escorts, Guided Missile Destroyers, and Frigates. This would be a short lived and sparse venture into the mainstream shipbuilding industry. Bancroft recalled that after this short stint in warships Defoe reverted back to production of smaller vessels for the U.S. Navy through research vessels and as the Vietnam War started to ramp up it once again established itself as a main producer of landing craft. The production of landing craft would eventually dry up as the Vietnam War drew down. Bancroft states that Defoe Shipbuilding closed its facilities in 1976 and the shipyard was subsequently turned into a scrapyard after Defoe Shipbuilding Company assets were liquidated. Defoe Shipbuilding is another case of naval shipbuilding industrial base consolidation that is used to analyze potential failure mechanisms in subsequent chapters.

⁶³ Ryan Bancroft, "Defoe Shipbuilding Company – Military History of the Upper Great Lakes," *Military History of the Upper Great Lakes* (blog), October 21, 2017, <https://ss.sites.mtu.edu/mhugl/2017/10/21/history-of-the-defoe-shipbuilding-company/>.

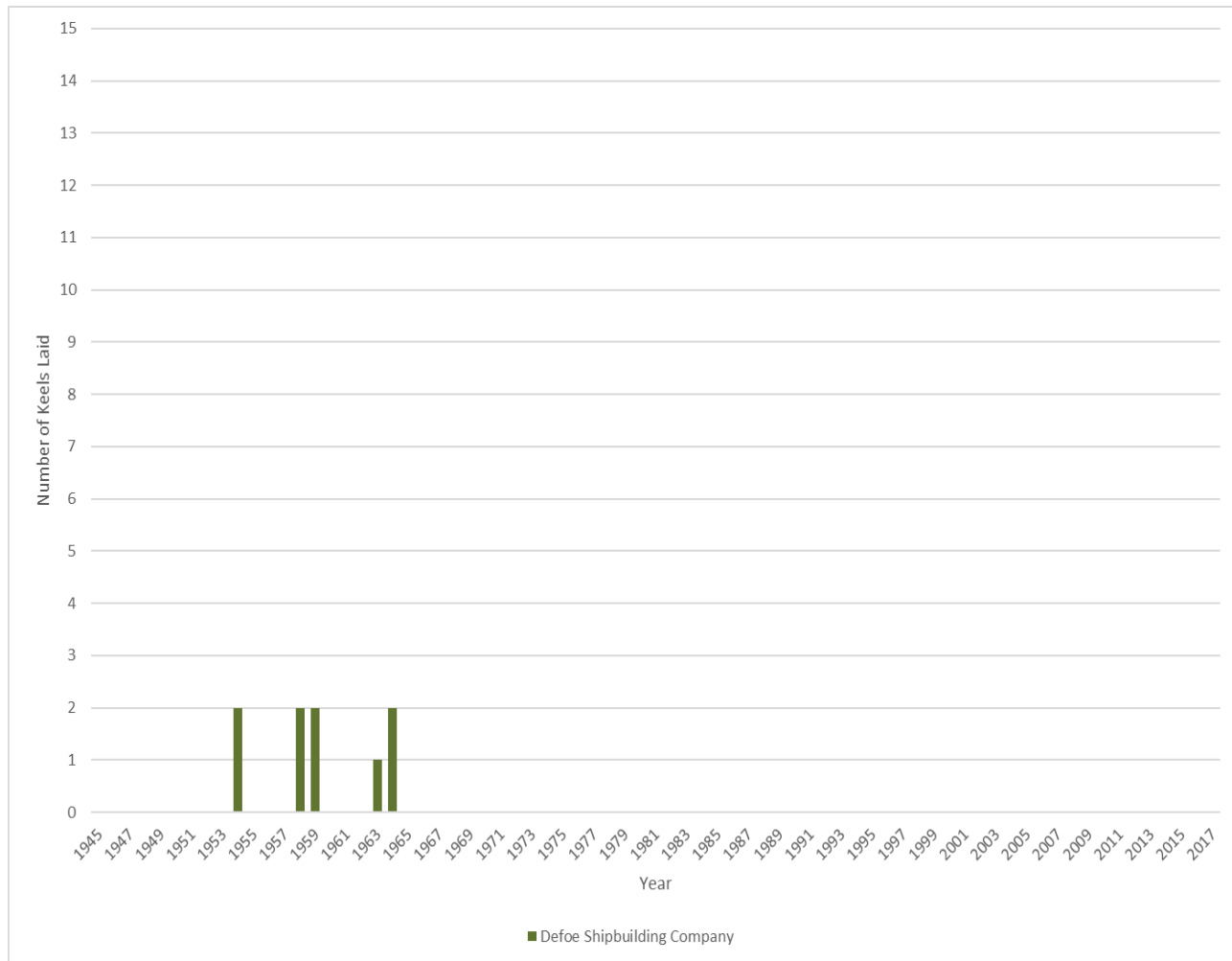


Figure 6. Keels Laid by Defoe Shipbuilding Company⁶⁴

⁶⁴ See Appendix A for citation information.

6. New York Shipbuilding Corporation

New York Shipbuilding Corporation with its shipyard located in Camden, New Jersey, like Defoe Shipbuilding was a long running shipbuilder with both public and private contracts that was unable to survive. Colton writes that New York Shipbuilding, established in 1905, would struggle during the interwar years, but after an investment by the U.S. Navy the shipyard would expand its capabilities to become a major producer, employing up to 30,000 people at its peak.⁶⁵ As with most other U.S. companies during World War II, New York Shipbuilding would shift its production to assist in the war effort. Colton shows that production prewar was primarily focused on private contracts for Car Floats and Passenger/Cargo liners. Once the war broke out, however, production shifted to public contracts. Colton continues by showing that New York Shipbuilding would primarily build Landing Craft throughout the war, but production would shift to supply Cruisers to the U.S. Navy toward the end of the war. Of the twenty seven Cruiser contracts that were issued to New York Shipbuilding near the end of the war, fifteen ended up being cancelled after the end of hostilities.⁶⁶ The loss of contracts, although hard to recover from, would not be the end of New York Shipbuilding. Colton's data shows that after the war ended New York Shipbuilding would diversify its contracts with a roughly equal mix of government and private ships being produced. Figure 7 shows the keels laid by New York Shipbuilding from 1945 until its closure. This trend would remain throughout the 1950s, but during the 1960s New York Shipbuilding's revenue stream was yet again dominated by public contracts for warships.⁶⁷ Colton shows that, even with Navy shipbuilding contracts, New York Shipbuilding would close in 1967 after delivering a Cruiser, an attack submarine, and a fleet supply ship for the U.S. Navy that same year. New York Shipbuilding, like Defoe Shipbuilding Company, provides another case that is used to study the causal mechanisms for company failure in future chapters.

⁶⁵ Tim Colton, "New York Shipbuilding," Shipbuilding History, March 17, 2014, <http://shipbuildinghistory.com/shipyards/large/newyorkship.htm>.

⁶⁶ Colton.

⁶⁷ Colton, "Newport News Shipbuilding, NGSB Newport News."

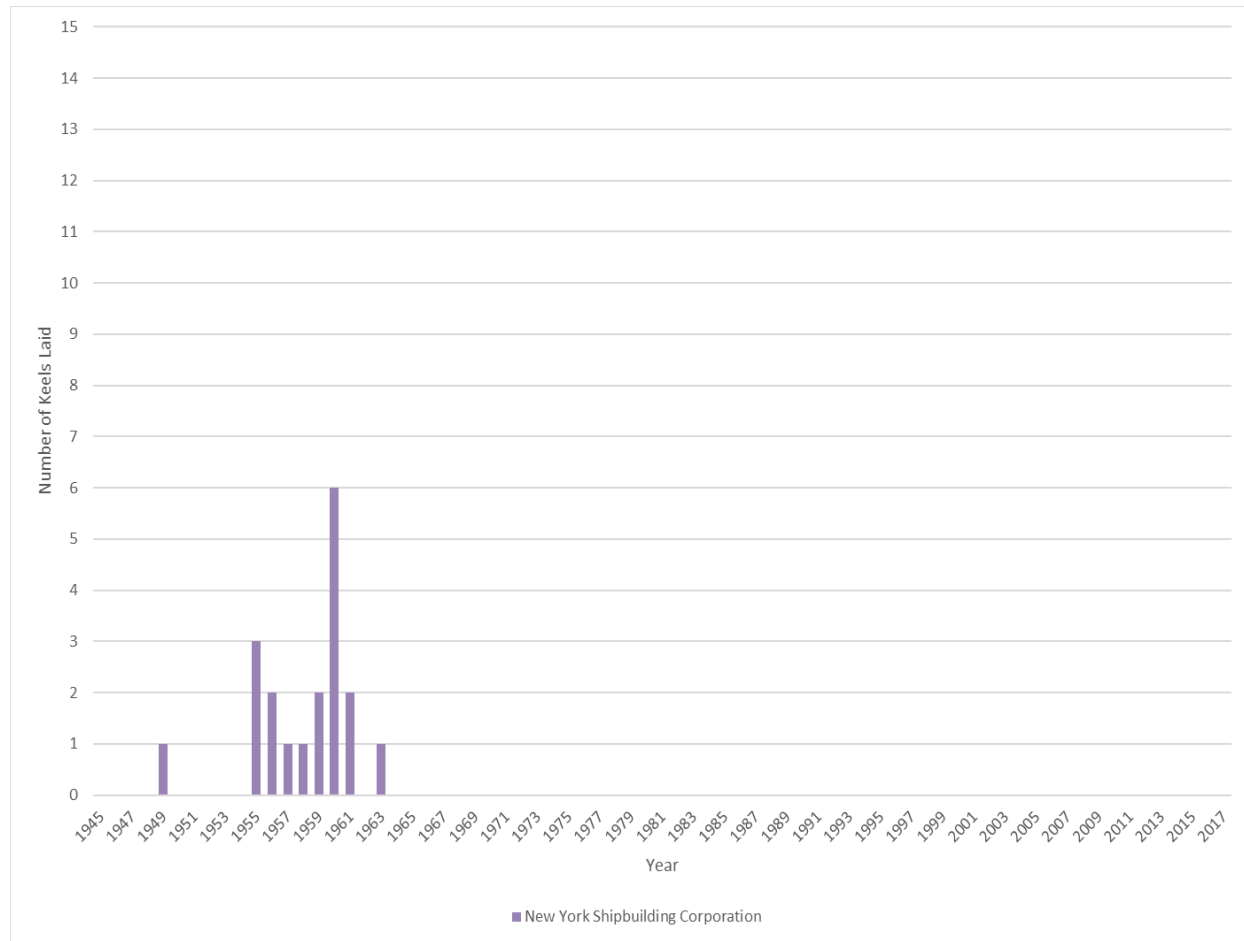


Figure 7. Keels Laid by New York Shipbuilding Corporation⁶⁸

⁶⁸ See Appendix A for citation information.

7. Todd Pacific Shipyards

Todd Pacific Shipyards the parent company of the San Pedro Shipyard in Los Angeles Harbor and the Todd Seattle yard at Seattle's Harbor Island. Both of these shipyards, as well as the parent company, would eventually succumb to closure/buyout. Ralph Vartabedian and Sheryl Stolberg of the Los Angeles Times notes that after 72 years of operations Todd's San Pedro shipyard closed in July of 1989.⁶⁹ Vartabedian and Stolberg describes that the Todd Pacific Shipyards had operated under bankruptcy during the last two years of operation of the San Pedro Shipyard. They continue their description of the Shipyards failure by paraphrasing the company President Hans K. Schaefer, stating that, "Schaefer insisted that the shipyard was not profitable and could not be operated profitably under the current agreements with the Harbor Commission and the union. Those agreements include the lease on the land occupied by the yard and the union labor contract."⁷⁰ This failure cannot be attributed to a lack of previous contracts. Figure 8 shows that between the two shipyards the Todd Pacific Shipyards had laid multiple naval keels leading up to the closure in 1987. Vartabedian and Stolberg recounted that,

As recently as 1983, Todd employed more than 5,600 workers on a multibillion-dollar Navy program to build 18 frigates. Ironically, Todd signed the last ship built under the program to the Navy on Friday in a ceremony held just an hour after the company disclosed that it would shut down the shipyard.⁷¹

Vartabedian and Stolberg, however, did emphasize that Todd had failed to win multiple future contracts. Todd Pacific Shipyards' San Pedro Shipyard would be the first of the company's failures. Production was shifted to the Seattle's Harbor Island Shipyard, but that too would eventually end in failure. The Todd Pacific Harbor Island Shipyard would continue production for the company, but would fail to gain another Navy contract until the company was bought out. Todd Seattle shipyard started as Seattle Dry Dock and

⁶⁹ Ralph Vartabedian and Sheryl Stolberg, "Todd, the Last Shipyard in L.A. Harbor, to Shut Down," *Los Angeles Times*, July 8, 1989, <https://www.latimes.com/archives/la-xpm-1989-07-08-mn-2596-story.html>.

⁷⁰ Vartabedian and Stolberg.

⁷¹ Vartabedian and Stolberg.

Shipbuilding prior to World War I and would change ownership and name multiple times until becoming part of Todd Pacific Shipyards after World War II.⁷² During World War II under the Seattle-Tacoma Shipbuilding, Seattle Division, the shipyard would turn out forty-five Destroyers for the U.S. Navy. Colton's data shows that after the war under the management of Todd Pacific Shipyards the company used a mix of public and private contracts to sustain itself, but it was not until the late 1950 that the shipyard regained contracts to build warships for the Navy. Like the shipyard in San Pedro the Seattle yard was not able to attain additional Navy contracts after the Oliver Hazard Perry class Frigates were delivered to the Navy in 1989.⁷³ Instead of completely closing the shipyard Todd Pacific Shipyard Corporation chose to shift production to its Seattle shipyard, which continued to produce vessels for the U.S. Coast Guard and ferries for Washington State, but would no longer produce warships for the Navy. In the end, Colton reports that the shipyard was acquired by Vigor Industrial in 2011.

The Todd Pacific Shipyard case provides further evidence that only large corporations are able to sustain operations in the naval shipbuilding industry and also provides a case of failure that can be used for further analysis. With limited revenue streams that were not diversified in the naval shipbuilding sector the Todd Pacific Shipyard eventual sale of its San Pedro Shipyard and the its exit from the market after 1987 reinforces the claim that only large conglomerate companies are able to sustain operations in naval shipbuilding. The Todd San Pedro case, with sustained naval shipbuilding until its closure in 1989, provides an excellent case for analysis of the potential causal mechanisms that are reviewed in future chapters. Todd Seattle's eventual buyout by Vigor Industrial, however, is not used in future analysis. Since Todd Seattle shifted out of the naval shipbuilding market in the late 1980s, using its eventual merger with Vigor Industrial in 2011 as a point of analysis would not improve our study of the naval shipbuilding industrial base.

⁷² Tim Colton, "Todd Seattle Moran Seattle Dry Dock Vigor Industrial," Shipbuilding History, 2018, <http://shipbuildinghistory.com/shipyards/large/toddseattle.htm>.

⁷³ Tim Colton, "Guided-Missile Frigates FFG," Shipbuilding History, December 21, 2017, <http://shipbuildinghistory.com/navalships/frigates.htm>.

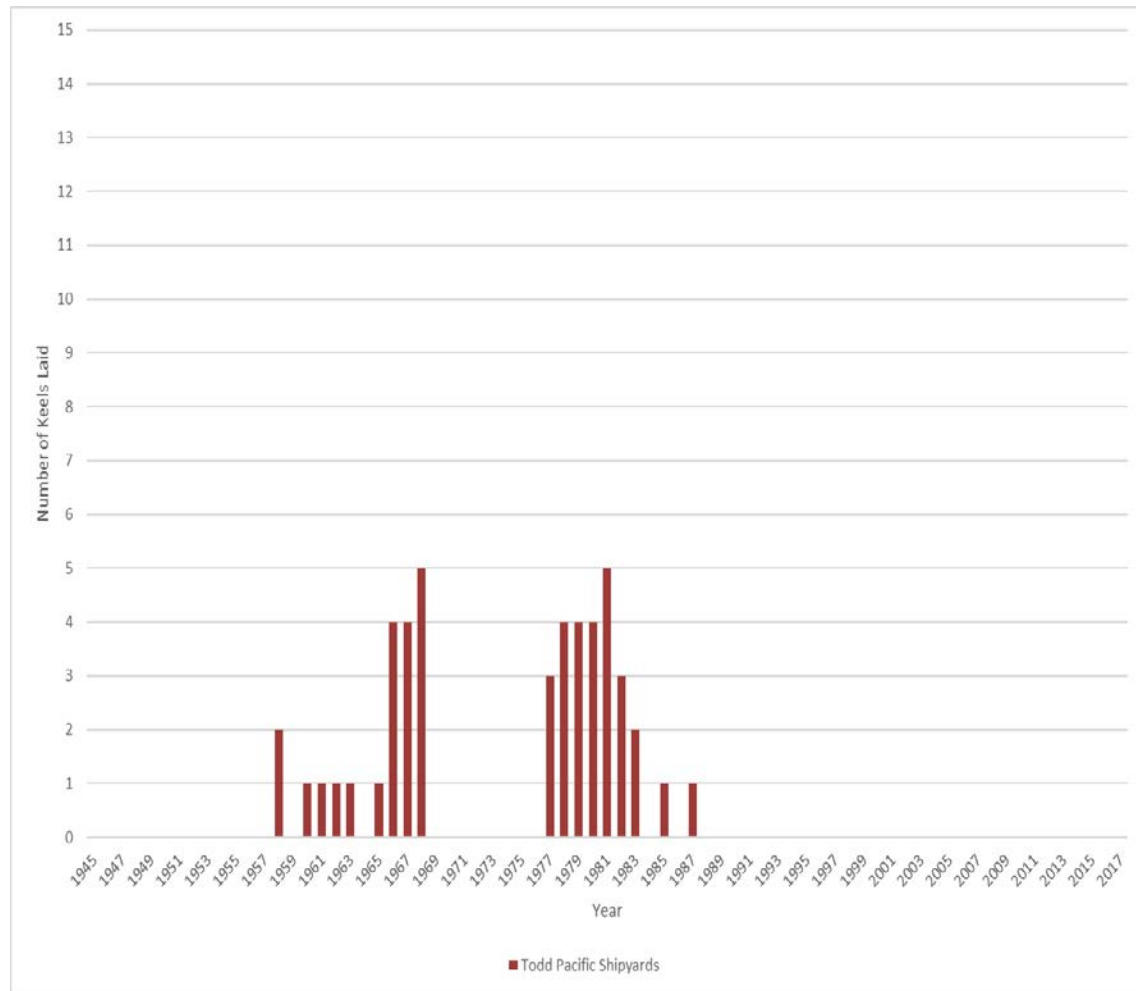


Figure 8. Keels Laid by Todd Pacific Shipyards⁷⁴

⁷⁴ See Appendix A for citation information.

8. Government-Owned Shipyards

Although government-owned shipyards no longer produce warships for the U.S. Navy, their efforts as a producer must be factored into the analysis of past shipyard performance. Mare Island in San Francisco, Brooklyn, Philadelphia, Portsmouth, and Puget Sound in Washington from the 1940s to the early 1970s played their part in production of ships for the Navy (See Figure 9 for government owned shipyard keels laid data). Still geared up after the Second World War these shipyards were an easy fallback for the Navy for production needed for the Korean War and for the early stages of the Vietnam War.

These shipyards would eventually be repurposed or closed. The Brooklyn, Philadelphia, and Mare Island Naval Shipyards would be closed due to Base Realignment and Closure during the Bush and Clinton eras. The Defense Authorization Amendment and Base Realignment and Closure Act of 1989 signed by President George H. W. Bush set the ground work for these shipyards to be closed.⁷⁵ The law created a commission of 12 members to be designated by the Secretary of Defense that would recommend bases for closure or realignment. The Commission report describes that process by which each base was chosen for closure or realignment. The report notes that “Public Law 101-510... required the Secretary of Defense to submit a list of proposed military base closures and realignments to the Commission by March 15, 1993.”⁷⁶ The report adds that each of the recommendations was based on the force structure plan that was submitted along with the FY 1994 budget request. The Commission then held public hearings to determine which bases would be closed. In the end, the Commission emphasizes that shipyards selected for closure were either excess capacity above force structure needs, duplication of resources and services, or underperforming compared to other government owned shipyards. Upon

⁷⁵ “Defense Authorization Amendments and Base Closure and Realignment Act,” Pub. L. No. 100–526, 102 Stat. 2623 (1988), https://congressional.proquest.com/congressional/result/congresultpage:pdfevent?rsId=16DA7170AF6&pdf=/app-bin/gis-publiclaw/3/3/5/f/pl100-526.pdf&uri=/app-gis/publiclaw/100_pl_526.

⁷⁶ Jim Courter et al., “Defense Base Closure and Realignment Commission 1993 Report to the President” (Virginia: Defense Base Closure and Realignment Commission, 1993), vii, <https://permanent.access.gpo.gov/lps111641/1993com2.pdf>.

receipt of the Commission's report the Secretary of Defense was required to enact all recommendations of closure or realignment by September 30, 1995.

These closures can be attributed to a shift in focus for the two administrations. The Soviet Union was no longer the military threat that it once was, which allowed the administrations to shift government spending away from military programs and toward social programs.⁷⁷ As Chapter III discusses in more detail, this shift has been attributed to the administration seeking a "peace dividend."

Although many shipyards would be closed under Base Realignment and Closure, there are still shipyards that performed important tasks for the Navy. The surviving shipyards, Norfolk, Puget Sound, Portsmouth, and Pearl Harbor Naval Shipyards, have all been repurposed in recent years to service the Navy's SSNs and CVNs. Having not been involved in building ships since the late 1980s these shipyards are used to facilitate continued operations and are funded by the Operations and Maintenance section of the appropriations bill.⁷⁸

Although government shipyards no longer play a part in shipbuilding, their use cannot be discounted when assessing failures in private shipyards. As they were once part of the naval shipbuilding industrial base their closure and repurposing has also been a part of the naval shipbuilding industrial base consolidation. Their closure and realignment happened during the late 1980s and early 1990s due to a shift in government spending that can be explained by the "peace dividend."

⁷⁷ "New York Navy Yard, Brooklyn, NY," Destroyers History Foundation, 2019, <https://destroyerhistory.org/destroyers/newyorkny/>; "Navy Yard Philadelphia History," Navy Yard Philadelphia, accessed October 24, 2019, <https://navyyard.org/about-the-campus/history>; "Former Naval Shipyard Mare Island," Naval Facilities Engineering Command, March 2017, https://www.bracpmo.navy.mil/brac_bases/california/former_shipyard_mare_island.html.

⁷⁸ Mac Thornberry, "John S. McCain National Defense Authorization Act for Fiscal Year 2019," Pub. L. No. 115–232, 132 Stat. 1636 (2018), 2383–84, <https://www.congress.gov/115/plaws/publ232/PLAW-115publ232.pdf>.

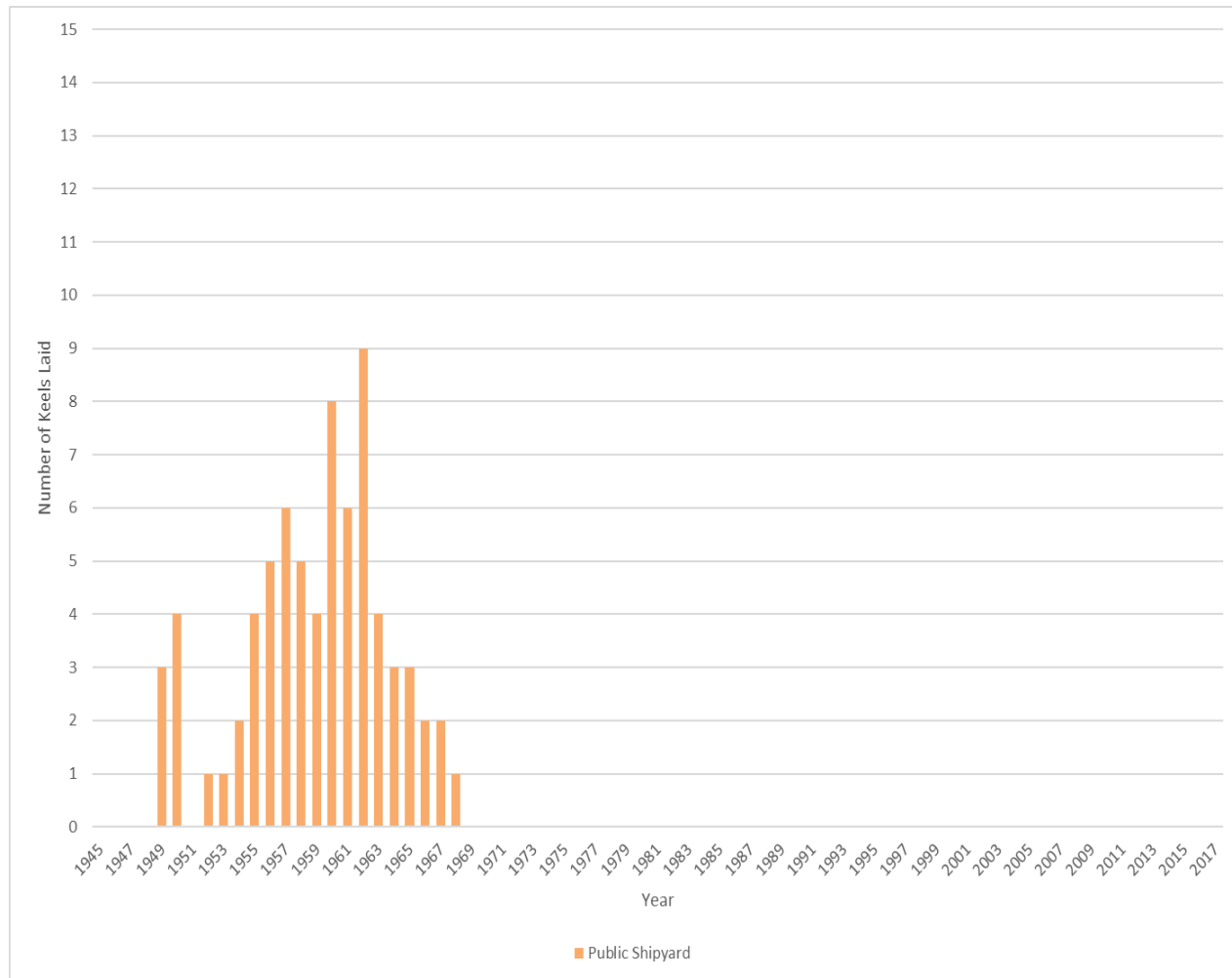


Figure 9. Keels Laid by Government-Owned Shipyards⁷⁹

⁷⁹ See Appendix A for citation information.

C. SHIPBUILDING COMPANIES SINCE 1945: CONCLUSIONS

Overall, this chapter served three purposes. First, by studying companies involved in naval shipbuilding since the end of World War II it confirmed the claims of naval shipbuilding industrial base consolidation. Second, by determining when companies fail, merge, or exit the U.S. naval shipbuilding market we set the analytical framework for analysis in future chapters. Third, we find that only large diversified companies have been able to sustain operations in the U.S. naval shipbuilding industry.

The U.S. naval shipbuilding industrial base, through company mergers, failures, exit of the market, or assets being sold has consolidated since the end of World War II. The four shipbuilding companies that remain share certain characteristics. All four are large diversified companies with multiple revenue streams. Two of the four are large domestic companies that own multiple shipyards. The other two, which have broken into the U.S. naval shipbuilding market more recently, are large foreign multinational companies that have previous experience in the industry.

The cases of consolidation since the of end World War II are used to analyze possible causal mechanism for company failure. The closures/mergers of Ingalls Shipbuilding (1961), Bethlehem Quincy (1963), New York Shipbuilding (1967), Chesapeake Dry Dock and Construction Company (1968), Defoe Shipbuilding (1976), Todd San Pedro (1989), Bath Iron Works (1995), Avondale Industries (1999), Tenneco Industries (2001), and Litton Industries (2001) are all be used as cases to analyze hypotheses in future chapters. Although Todd Seattle and Bethlehem San Francisco are other examples of failure, both shipyards would shift away from naval shipbuilding contracts long before eventual failure. Since the exact year that Todd Seattle and Bethlehem San Francisco exited the naval shipbuilding market is unclear these two cases are not used during future chapters for hypotheses analysis.

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III. BOOM-AND-BUST CYCLE: BASICS, POTENTIAL CAUSES, AND PROVING IT EXTENDS TO NAVY SHIP ACQUISITIONS

The boom-and-bust cycle of military spending has been confirmed by other authors, however, there is little substantive research into how it applies to the shipbuilding industrial base.⁸⁰ To determine the relative effect that the boom-and-bust cycle has on the consolidation of the U.S. naval shipbuilding industrial base this chapter takes a four pronged approach. First, this chapter gives the reader a basic understanding of the basic theories on why the boom-and-bust cycle has potential to cause defense industry weakness. Second, we review the political, strategic, and economic factors that the literature has determined as causal factors for changes in defense spending. This gives the reader a sense of what causes this boom-and-bust cycle in shipbuilding demand and the potential actors that have a hand in perpetuating the boom-and-bust cycle. Third, this chapter uses yearly Presidential Budget requests to confirm the boom-and-bust cycle applies to naval shipbuilding expenditures. Lastly, the chapter applies the boom-and-bust cycle theory of failure to the cases of U.S. naval shipbuilding industry consolidation. Analysis of the data suggests that there is a correlation between U.S. naval shipbuilding company failure and the boom-and-bust theory of failure, however, it is not clear that this is the only factor.

A. THE BOOM-AND-BUST CYCLE: THE BASICS

The boom-and-bust cycle in the shipbuilding naval context is the governmental procurement of multiple ships in a multi-year time frame, which peaks with a maximum procurement number. This is followed by a sharp decline, in which demand for ships then reaches a minimum level. The cycle then repeats based on the potential causal factors that are discussed in the next section. Admiral Richardson describes, in a 2018 congressional hearing, how the feast and famine, or boom and bust, cycle in defense spending was, “very, very hard for workloads.”⁸¹ Korb et al. accurately depicts these cycles in defense spending

⁸⁰ Schneider, “Causal Factors”; Korb, Conley, and Rothman, “A Return to Responsibility: What President Obama and Congress Can Learn About Defense Budgets from Past Presidents.”

⁸¹ FY-19 Navy and Marine Corps Budget Hearing Before House Appropriations Committee on Defense, 9.

by compiling defense budgets between FY 1950 to FY 2012 using FY 2012 constant dollars, as shown in Figure 10.⁸² However, Korb's data does not show how naval shipbuilding procurement budgets are affected.

These large booms and busts create a bullwhip effect, which then leads to defense industrial base weakness. A report by the DoD characterized the decline of the defense industrial base due to the boom-and-bust cycle by stating,

Fluctuations in defense procurement create production and cost inefficiencies. With procurement and investments, suppliers will take on high fixed costs to develop expensive capacity in order to meet programmatic needs. When programs die down, companies are left with highly specialized production capabilities that may go unused for decades.⁸³

The report goes on to characterize the mismatch between demand and available production as the bullwhip effect. Sunil Chopra and Peter Meindl, leading authors on supply chain management, defined the bullwhip effect as a magnification of forecasted demand caused by irregular spikes in demand at the consumer level without proper coordination throughout the supply chain.⁸⁴ Thus, the bullwhip effect created by the irregular spikes of the boom-and-bust cycle has created inefficiencies throughout the defense production supply chain. The DoD report emphasizes that large capital investments that are required to hire a new labor force and buy platform specific production material leaves companies vulnerable to heavy capital losses during periods of low production.⁸⁵ To minimize losses companies are forced to lay-off large portions of their workforce and are unable to inject excess capital into maintaining infrastructure. Thus, the continuation of the boom-and-bust cycle has the potential to cause consolidation of the naval shipbuilding industrial base, with the bust in the cycle being the most likely period for company failure.

⁸² Korb, Conley, and Rothman, "A Return to Responsibility: What President Obama and Congress Can Learn About Defense Budgets from Past Presidents," 2.

⁸³ Office of the Under Secretary of Defense for Acquisition and Sustainment, "Assessing and Strengthening," 22.

⁸⁴ Chopra and Meindl, *Supply Chain Management: Strategy, Planning, and Operation*, 250–52.

⁸⁵ Office of the Under Secretary of Defense for Acquisition and Sustainment, "Assessing and Strengthening."

B. BOOM-AND-BUST CYCLE POTENTIAL CAUSES AND RESPONSIBLE ACTORS

The boom-and-bust cycle of defense spending is a problem which potentially stems from party politics, prominent politicians injecting spending into their own districts, war production and the subsequent peace dividend, changes in strategic threat and changes in the domestic economy. Thus, the causes for the boom-and-bust cycle can be separated into the economic factors, strategic factors, and political factors controlled by Congress and the Executive. This section conducts a brief analysis of potential causes for the boom-and-bust cycle of defense spending, so that the reader can understand the actors involved.

1. Boom-and-Bust: War

War is seen as the most prominent causal factor for booms in military spending. As shown by Korb, the three largest increases in military spending have been due to the wars in Korea, Vietnam, Afghanistan, and Iraq. The most substantial buildup of military spending, by sheer size and in the shortest amount of time, was the Truman administration's direct response to the North Korean invasion into South Korea. Ernest Schneider detailed that prior to the invasion of South Korea the U.S. Congress was deliberating a defense budget of around \$15 billion and after the attack Congress authorized a \$60 billion budget.⁸⁶ However, he qualified this huge increase by stating that, "The invasion of South Korea occurred at a time when Western Allies were seriously concerned about an apparent Soviet military threat to Western Europe."⁸⁷ While the Korean war had the largest effect on military spending, the wars in Vietnam, Afghanistan, and Iraq follow the same rough pattern in which an international incident causes military spending to dramatically increase.

Defense spending during peacetime, on the other hand, is harder to explain. Defense spending during peacetime can be seen as a means of political gain (party or district), based on the most likely strategic threat at the time, or based on the economic health of the nation. I analyze these potential causes in the following sections.

⁸⁶ Schneider, "Causal Factors," 54–55.

⁸⁷ Schneider, 55.

2. Boom-and-Bust: Strategic Threat

The idea that a strategic threat can shape how defense spending changes over time is a possible explanation for instability in defense spending and ship procurement. Charles Ostrom and Robin Marra provided an outlook on the Cold War stating that, “changes in U.S. defense spending are directly related to perceived spending changes in Soviet spending, as well as to the perceived spending gap between the U.S. and USSR.”⁸⁸ Another example of increased spending due to a perceived strategic threat is the current buildup to a 355 ship Navy. In his article, Steven Stashwick notes that the increased spending levels that accompanied the 355 ship goal were either due to “a more permissive fiscal environment” or, more likely, due to the focus on great power competition between the United States, China, and Russia.⁸⁹ However, Stashwick does not specify what fiscal environment is necessary other than a passing comment about the recurring need for Continued Resolutions and Congress’s inability to come to a timely agreement regarding appropriations. Thus, changes in strategic threat can have an effect on defense spending and naval ship procurement, however, other factors do play a role in changes in defense spending.

3. Boom-and-Bust: Peace Dividend

Since the end of the Cold War, the peace dividend is one particular facet of peacetime defense spending that has become a contested topic with respect to its validity and effect. Alex Mintz and Chi Huang, writing in 1990, help to define the peace dividend by stating that, “Recent developments in Eastern Europe have created expectations of a ‘peace dividend’ associated with reduced levels of U.S. defense expenditures.”⁹⁰ In other words, the peace dividend is the reduction of military spending by the state, due to the absence of a major strategic threat, shifting the excess funds to support welfare programs and economic growth. Michael Ward and David Davis propose that, “military spending is a significant drain on the economy,” and since the cold-war era level of spending was no

⁸⁸ Ostrom and Marra, “U.S. Defense Spending and the Soviet Estimate,” 838.

⁸⁹ Stashwick, “The U.S. Navy’s New 30 - Year Plan Grows Its Fleet Realistically, but Slowly.”

⁹⁰ Mintz and Huang, “Defense Expenditures, Economic Growth, and The ‘Peace Dividend,’” 1.

longer needed, the money could then be spent on other sectors. Their findings show that without a transition away from military spending, economic growth would continue to be slow. Mintz and Huang give a more granular view of the peace dividend. They find that military expenditures have a significant indirect negative effect on economic long term growth but does not play a role in short term growth. These articles discuss the peace dividend as possible, but no recent study has been found that discusses the peace dividend as having a major role in political decisions or military budgets.

The question remains, does this argument for a peace dividend impact government spending habits, let alone naval procurement? Ernest Schneider believes that up until the late 1980s, when he wrote the article, economic considerations “had little effect on defense outlays.”⁹¹ This being said, the idea of a peace dividend and the subsequent effects on military spending have largely been understudied. This, again, begs the question, do previous studies and rationale dealing with the peace dividend have an effect on military spending or naval procurement? And since the data supporting the peace dividend has only come out in the last thirty to thirty-five years, can it be applied to military spending habits that predate its findings?

4. Boom-and-Bust: Economic Crisis

In line with other peace-time hypotheses, the economic health of the nation has also been used as an argument to both increase and decrease defense spending. Schneider notes that Eisenhower and Truman both, “tended to place economic health of the nation ahead of strictly military needs,” while, “Reagan and Kennedy agree that defense needs are paramount.”⁹² The old concept of “guns vs butter” is often held to be true. The previous section on the “peace dividend” shows this exact relationship that military spending (guns) has a negative effect on the economy (butter). However, Guy Whitten and Laron Williams cite multiple cases from outside of the U.S. where this relationship is questioned and overturned.⁹³ Thus, governments may be willing to increase military spending to stimulate

⁹¹ Schneider, “Causal Factors,” 76.

⁹² Schneider, 68.

⁹³ Whitten and Williams, “Buttery Guns and Welfare Hawks.”

a sluggish economy. From their study, Whitten and Williams supply evidence that the argument “guns yield butter” holds water and that the oversimplification of government ideology in left vs right does not adequately explain government policy toward military spending. They conclude that, “while right governments may be more hawkish and thus inclined to spend more on the military, left-leaning governments that see the opportunity to use military spending as welfare policy in disguise will also raise military spending.”⁹⁴ These conclusions do well to explain that military spending decisions vary based on economic conditions and based on how political parties view the benefits of military spending.

To take this argument a step further, we examine how economic crisis effects military spending. Schneider argues that Kennedy was the only President to use military spending to break a recession.⁹⁵ However, Leonard Silk writing for the New York Times in 1982 acknowledges that the U.S. had entered into a “steep recession” in the previous year under Reagan’s leadership. He notes that in an effort to combat the effects of the recession the Reagan administration used a mixture of tax cuts and military spending increases to stabilize the economy and slow down the inflation rate. President Obama, on the other hand, would react differently to economic recession. Greg Bruno makes it clear that after the 2008 Recession the Obama administration responded by reducing military spending.⁹⁶

The 2011 Budget Control Act (BCA), also known as budget sequestration, put caps on military spending starting in Fiscal Year 2013 in order to balance the budget and reduce the national debt.⁹⁷ Although the BCA allowed for the President to exempt certain military accounts, military procurement was not one of them. In response to the reduction in procurement funds, previous DoD heads have called the BCA disastrous for military

⁹⁴ Whitten and Williams, 132.

⁹⁵ Schneider, “Causal Factors,” 68.

⁹⁶ Bruno, “Defense Spending During Economic Crisis.”

⁹⁷ Tom Harkin, “Budget Control Act of 2011,” Pub. L. No. 112–25 (2011), <https://www.congress.gov/112/plaws/publ25/PLAW-112publ25.pdf>.

readiness.⁹⁸ As Secretary of the Navy Richard Spencer notes in 2011, “during sequestration, we lost people out of the [shipbuilding] industry who never came back.”⁹⁹ A 2014 DoD report on BCAs effects notes that, because of the lowered funding levels, the Navy would have to, “lay-up 6 destroyers (in addition to 11 cruisers),” and would procure 8 fewer ships than required by the FY2015 Presidential Budget Request.¹⁰⁰ Based on these two cases alone, it is clear that Presidents, along with Congress, have used military spending in a range of ways to break economic recession, however, a drastic decrease in military spending like the BCA are seen as a detriment to military readiness.

5. Boom-and-Bust: Presidential Politics

By looking at changes in defense spending as a presidential political balancing act there are some that would agree and others that would disagree that presidential politics plays a role in defense spending. Gary Zuk and Nancy Woodbury argue that, “The dollars involved in defense spending and the president’s ability to influence such spending gain more importance when it is realized that total requests for military spending from the chief executive are cut relatively seldom by Congress.”¹⁰¹ Thus, because of the executive’s ability to impact defense budgets and the potential use of defense contracts to create jobs in certain districts there may be a correlation between presidential election cycles and

⁹⁸ See the following articles regarding the military’s response to sequestration: Paul McLeary, “Navy’s Ray Mabus: ‘Sequestration Looms Over Everything’ On Shipbuilding,” *Breaking Defense* (blog), accessed July 22, 2019, <https://breakingdefense.com/2013/04/navys-ray-mabus-sequestration-looms-over-everything-on-shipb/>; Department of Defense, “Estimated Impacts of Sequestration-Level Funding: United States Department of Defense Fiscal Year 1015 Budget Request:” (Fort Belvoir, VA: Defense Technical Information Center, April 1, 2014), <https://doi.org/10.21236/ADA599263>; Richard M. Miller, “This Time, It’s Different,” *United States Naval Institute. Proceedings; Annapolis* 139, no. 1 (January 2013): 52–56; Wolf Blitzer; Candy Crowley; Susan Roesgen; Jack Cafferty; Zain Verjee; Chris Lawrence; Lou Dobbs; Brian Todd; Mary Snow; Brooke Anderson; Hilary Rosen, “\$3.6 Trillion Spending Plan - Pentagon Lifts Ban on Coffin Images - Small Defense Boost in Budget,” *Situation Room, The [CNN] (USA)*, February 26, 2009, <https://infoweb.newsbank.com/resources/doc/nb/news/15348A1CD197CCA8?p=AWNB>.

⁹⁹ John Richardson, Richard Spencer, and Robert Neller, “Senate Armed Services Committee Holds Hearing on Navy Posture,” § Senate Armed Services Committee (2019), 39, <https://www.navy.mil/navydata/people/cno/Richardson/Speech/Senate%20Armed%20Services%20Committee%20Holds%20Hearing%20on%20Navy%20Posture%209%20APR%2019.pdf>.

¹⁰⁰ Department of Defense, “Estimated Impacts of Sequestration-Level Funding,” 3–3.

¹⁰¹ Zuk and Woodbury, “U.S. Defense Spending, Electoral Cycles, and Soviet-American Relations,” 446.

defense spending. However, Zuk and Woodbury find that increases in defense spending are independent of the presidential election cycle. Zuk and Woodbury do concede that if they had looked at specific sectors of defense spending there may have been a positive correlation. In contrast to Zuk and Woodbury, Karl Derouen and Uk Heo find that, “Presidents are likely to shore-up their political approval rate when needed [by increasing military spending] rather than only at election time.”¹⁰² Thus, depending on the frame of analysis presidential politics may or may not play a role in changes in defense spending.

Changes in defense spending compared to the presidential party politics, however, has a more conclusive result. Korb shows that at the overall defense spending is independent of a president’s political party.¹⁰³ Korb specifically cites that both Eisenhower, as a Republican, and Obama, a Democrat, both reduced defense spending. The opposite was true of Carter (a Democrat) and George W. Bush (a Republican). However, Reagan (a Republican) increased defense spending during his first term and lowered spending during his second term. This suggests that in the post-World War II era presidential party affiliation is independent of changes in defense spending.

6. Boom-and-Bust: Congressional Distribution Theory

The Congressional Distribution Theory holds, that congressional leaders on defense committees can alter defense spending to benefit their own districts through defense contracts. These practices may also lead to drastic changes in investment and procurement. Zuk and Woodbury note that, “Congress is prone to make ‘programmatic’ changes in the defense spending categories of procurement, and research and development—and the subcategory of military construction.”¹⁰⁴ While this analysis scratches the surface of congressional distributive politics, Barry Rundquist, Jeong-Hwa Lee, and Jungho Rhee confirm that, “during two decades under study, representation on defense committees in the House and/or Senate was related to level of military contracts in a state,” and “states

¹⁰² Derouen and Heo, “Defense Contracting and Domestic Politics,” 764.

¹⁰³ Korb, Conley, and Rothman, “A Return to Responsibility: What President Obama and Congress Can Learn About Defense Budgets from Past Presidents.”

¹⁰⁴ Zuk and Woodbury, “U.S. Defense Spending, Electoral Cycles, and Soviet-American Relations,” 446.

that lost representation on the House committees lost contracts, but newcomers to defense committees did not help their state get additional contracts.”¹⁰⁵ Although there is no data directly supporting congressional political distributive policy’s effect on naval shipbuilding it is logical that it would also apply in this case as well and has been selected for further analysis in Chapter IV.

C. BOOM-AND-BUST CYCLE IN U.S. SHIPBUILDING CONFIRMED

With major players in the DoD blaming U.S. naval shipbuilding industrial base issues on the boom-and-bust cycle, it is important to establish if the cycle in fact applies to the naval shipbuilding industrial base. It is easy to see the boom-and-bust cycle in the DoD budget shown by Korb’s compilation of DoD expenditures reproduced as Figure 10, however, this section goes one step further and proves that the boom-and-bust cycle of defense spending also applies to naval shipbuilding expenditures. Also, the compiled data from this section is used as an analytical base for studying the cases of consolidation in the next section.

¹⁰⁵ Rundquist, Lee, and Rhee, “The Distributive Politics of Cold War Defense Spending,” 275.

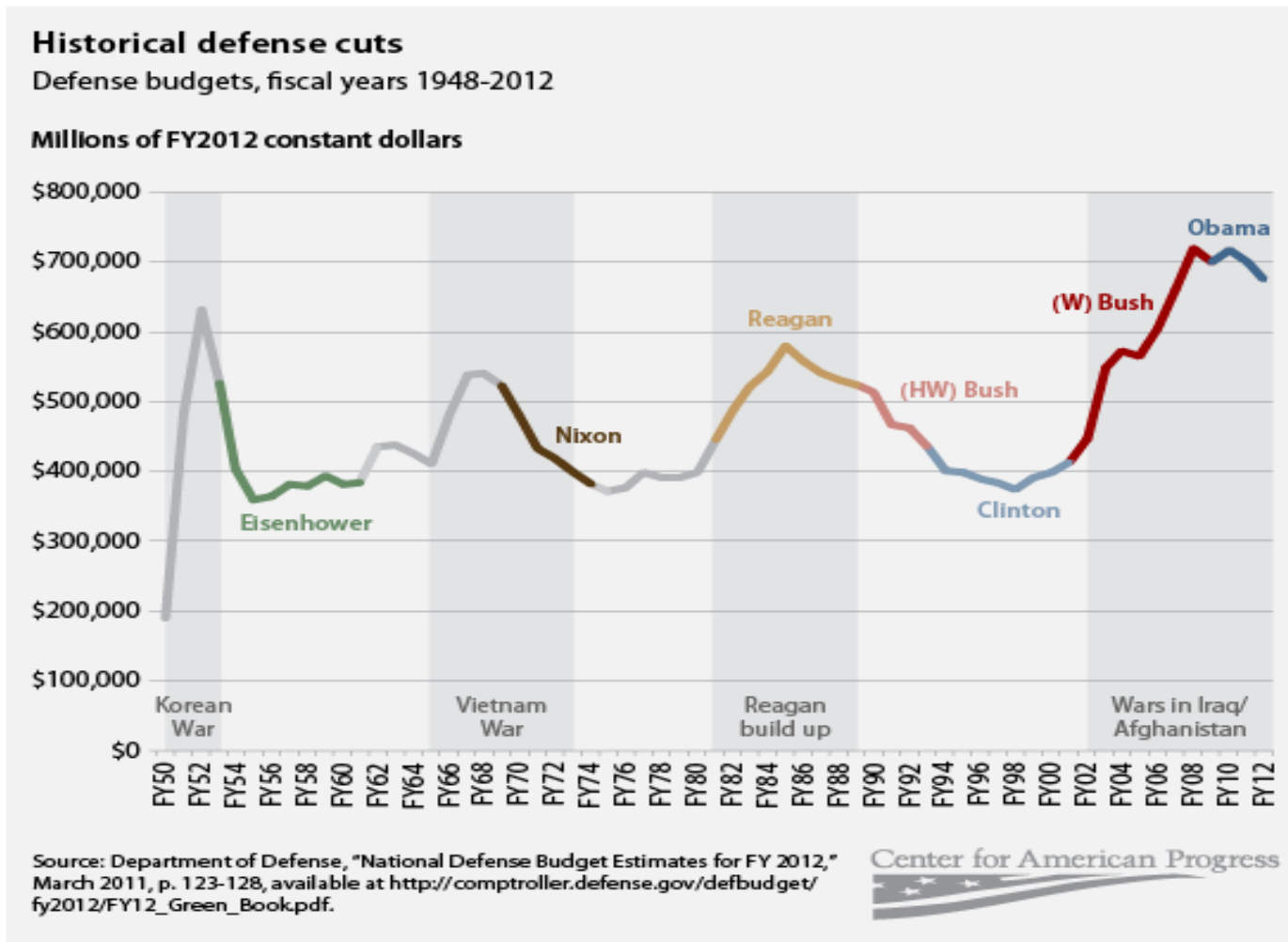


Figure 10. Historical Defense Spending in 2012 U.S. Dollars¹⁰⁶

¹⁰⁶ See Appendix A for citation information.

1. Boom-and-Bust in U.S. Shipbuilding Confirmed: Method

In order to analyze the effect of the budget on the naval shipbuilding industrial base and to prove whether or not there is a boom-and-bust cycle of naval procurement, U.S. Federal Budget data is compiled from 1945 to 2018.¹⁰⁷ The following accounts are used to best represent the money going to the shipbuilding industry: Shipbuilding and Conversion, Navy Research and Development, Construction of Ships, Ordnance for New Construction, Ordnance for Shipbuilding and Conversion, Increase and Replacement of Naval Vessels Construction and Machinery, Increase and Replacement of Naval Vessels Armor, Armament, and Ammunition, and Increase and Replacement of Naval Vessels Emergency Construction.¹⁰⁸

The Shipbuilding and Conversion account is chosen because its stated budget description,

For expenses necessary for the construction, acquisition, or conversion of vessels as authorized by law, including armor and armament therefor, plant equipment, appliances and machine tools, and installation thereof in public or private plants; procurement, production, and modernization of electronic equipment and material for ships; procurement of critical long lead time components and designs for vessels to be constructed or converted in the future; expansion of public and private plants, including land necessary therefor, without regard for section 3734, Revised Statutes, as amended, and such land and interests therein, may be acquired and construction prosecuted thereon prior to approval of title by the Attorney General as

¹⁰⁷ Budget data from 1943–1946 is compiled using ProQuest Congressional, from 1946–1993 is compiled using FRASER database, and data from 1994–2018 is compiled using Govinfo budget Appendices. For source information see: “Budget of the United States Government,” govinfo, accessed October 15, 2019, <https://www.govinfo.gov/app/collection/budget/2020>; “Budget of the United States Government,” FRASER, accessed October 15, 2019, <https://fraser.stlouisfed.org/title/54>; “Congressional Results,” ProQuest Congressional, 2019, <https://congressional.proquest.com/congressional/result/congresultpage?accountid=12702&groupid=100340&rsId=16D54B82099&p=2>.

¹⁰⁸ The U.S. Government Accountability Office defines an account as, “A separate financial reporting unit for budgeting management, and/or accounting purposes. All budgetary transactions are recorded in accounts.” See: Government Accountability Office, *A Glossary of Terms Used in the Federal Budget Process* (Washington, DC: Government Accountability Office, 2005), <https://www.gao.gov/new.items/d05734sp.pdf>.

required by section 355, Revised Statutes, as amended; and departmental salaries necessary for the purposes of appropriation.¹⁰⁹

While the Navy Research and Development account is chosen because of its description as stated,

For expenses necessary for basic and applied scientific research and development, including maintenance, rehabilitation, lease, and operation or facilities and equipment, as authorized by law.¹¹⁰

These two accounts, Shipbuilding and Conversion and Navy Research and Development, are the best representation due to their descriptors in the budgets, but since the Shipbuilding and Conversion account can only be found going back to 1952 the other accounts are added as a means to give a complete picture back to 1945. Construction of Ships, Ordnance for New Construction, Ordnance for Shipbuilding and Conversion, and Increase and Replacement of Naval Vessels accounts are used to bridge the gap. These accounts would all be phased out by 1959, when they were replaced by the Shipbuilding and Conversion account.

Both the Shipbuilding and Conversion and Navy Research and Development accounts are not a perfect representation of money spent toward the shipbuilding industrial base, but they are very close approximations. A portion of the Shipbuilding and Conversion account funds does go to modernization of naval vessels, which cuts into the funds directed toward shipbuilding, however, the funds represented by the account is the closest approximation for funds going to the naval shipbuilding industrial base for production of ships. In the same vein, the Navy Research and Development account is not a perfect representation because it also funds research outside of the shipbuilding sector (i.e., aircraft and equipment, guided missiles and related equipment, ammunition and related equipment, etc.), however, it is still be best representative data for research and development dollars spent in the shipbuilding industry.¹¹¹

¹⁰⁹ U.S. Government Printing Office, *The Budget of the United States Government for the Fiscal Year Ending June 30 1958* (Washington, DC: U.S. GPO, 1957), 522–23, https://fraser.stlouisfed.org/files/docs/publications/usbudget/bus_1958.pdf.

¹¹⁰ U.S. Government Printing Office, 531.

¹¹¹ U.S. Government Printing Office, 531.

Once the accounts are selected, the budget data is compiled by date using budget outlays. To give a true representation of dollars spent, the actual or enacted amount from the previous year's accounting balance is used instead of estimated current or future year amounts. For example, the 1956 actual, or enacted, data is taken from The Budget of the United States Government for Fiscal Year Ending June 30 1958. This ensures that a complete accounting of the year had been completed and no estimates are included in the data. This method is done for each year with one exception. The data collected for 1950 used the account estimate from The Budget of the United States Government for Fiscal Year Ending June 30 1951. This exception is made because the Military Budget in The Budget of the United States Government for Fiscal Year Ending June 30 1952 was not released to Congress with the original budget request.¹¹² It was supposed to be released later in that year, but the archives searched did not have a corresponding record of the military budget. Thus, in order to give the best estimate of the accounts the 1951 budget request is used because a portion of the 1950 budget cycle had already occurred when the 1951 budget was released, reducing the forecasting error.

To ensure that the data collected appropriately represented money that is transferred to the naval shipbuilding industry, Outlays (net) are chosen to represent the accounts rather than Total Budget Authority (net).¹¹³ As described by Tyszkiewicz and Daggett in their 1998 *A Defense Budget Primer*, "When Congress provides funds for defense programs, it provides budget authority to government agencies."¹¹⁴ This means, in layman's terms, that the money has been contracted for a certain account. They continue by stating, "At the end

¹¹² U.S. Government Printing Office, *The Budget of The United States Government for Fiscal Year Ending June 30 1952* (Washington, DC: U.S. GPO, 1951), M14, https://fraser.stlouisfed.org/files/docs/publications/usbudget/bus_1952.pdf.

¹¹³ The U.S. Governmental Accountability Office defines Budget Authority as, "Authority provided by federal law to enter into financial obligations that will result in immediate or future outlays involving federal government funds..." and Outlays as, "The issuance of checks, disbursement of cash or electronic transfer of funds made to liquidate a federal obligation... Outlays during a fiscal year may be for payment of obligations incurred in prior years (prior-year obligations) or in the same year. Outlays, therefore, flow in part from unexpended balances of prior year budgetary resources and in part from budgetary resources provided for the year in which the money is spent." See: Government Accountability Office, *A Glossary of Terms Used in the Federal Budget Process*.

¹¹⁴ Mary Tyszkiewicz and Stephen Daggett, "A Defense Budget Primer," Governmental (Washington, DC: Congressional Research Service, 1998), 2, <https://fas.org/sgp/crs/natsec/RL30002.pdf>.

of the process are budget outlays, which occur when the government actually issues payments to employees or to private parties.”¹¹⁵ This is the money leaving the hands of the government and going to individual contractors or government employees. Outlays can also be expressed in the federal budget as expenditures. By choosing to represent the accounts by their outlays it is an effort to show the money that is actually being taken in by the shipbuilders. Although a portion of these funds do go to pay government employees in the sector, use of outlays represents the closest approximation for payments to naval shipbuilders. The data is then compiled and can be reviewed in Table 2 in Appendix B.

The raw U.S. federal budget data of Table 2 is then used along with Urban Consumer Price Index (CPI-U)¹¹⁶ annual average inflation rates from the Federal Reserve Bank of Minneapolis to determine the value in 2018 constant dollars.¹¹⁷ By using 2018 constant dollars the data skew caused by inflation is removed providing a more accurate depiction of the boom-and-bust cycle. Using the basic formula $Value_{T+1} = Value_T \left(\frac{CPI-U_{T+1}}{CPI-U_T} \right)$, where $\left(\frac{CPI-U_{T+1}}{CPI-U_T} \right)$ is the average annual inflation rate and T is defined by year, each year’s Shipbuilding and Conversion and Navy Research and Development account data is converted into 2018 constant dollars.¹¹⁸ The 2018 constant dollar data is displayed in Table 3 in Appendix B and the 2018 constant dollar data is charted for ease of review in Figure 11.

¹¹⁵ Tyszkiewicz and Daggett, 2.

¹¹⁶ The U.S. Bureau of Labor and Statistics detailed that, “The Consumer Price Index (CPI) is a measure of the average change over time in the prices of consumer items—goods and services that people buy for day-to-day living.” As a subset the CPI-U, “represents the buying habits of residents of urban or metropolitan areas in the United States,” and “covers about 88 percent of the U.S. population.” See: U.S. Department of Labor, “The Consumer Price Index” (Washington, DC: U.S. Department of Labor, 2019), 2–5, <https://www.bls.gov/opub/hom/pdf/cpihom.pdf>.

¹¹⁷ “Consumer Price Index, 1913-,” Federal Reserve Bank of Minneapolis, accessed October 13, 2019, <https://www.minneapolisfed.org/community/financial-and-economic-education/cpi-calculator-information/consumer-price-index-and-inflation-rates-1913>.

¹¹⁸ Federal Reserve Bank of Minneapolis.

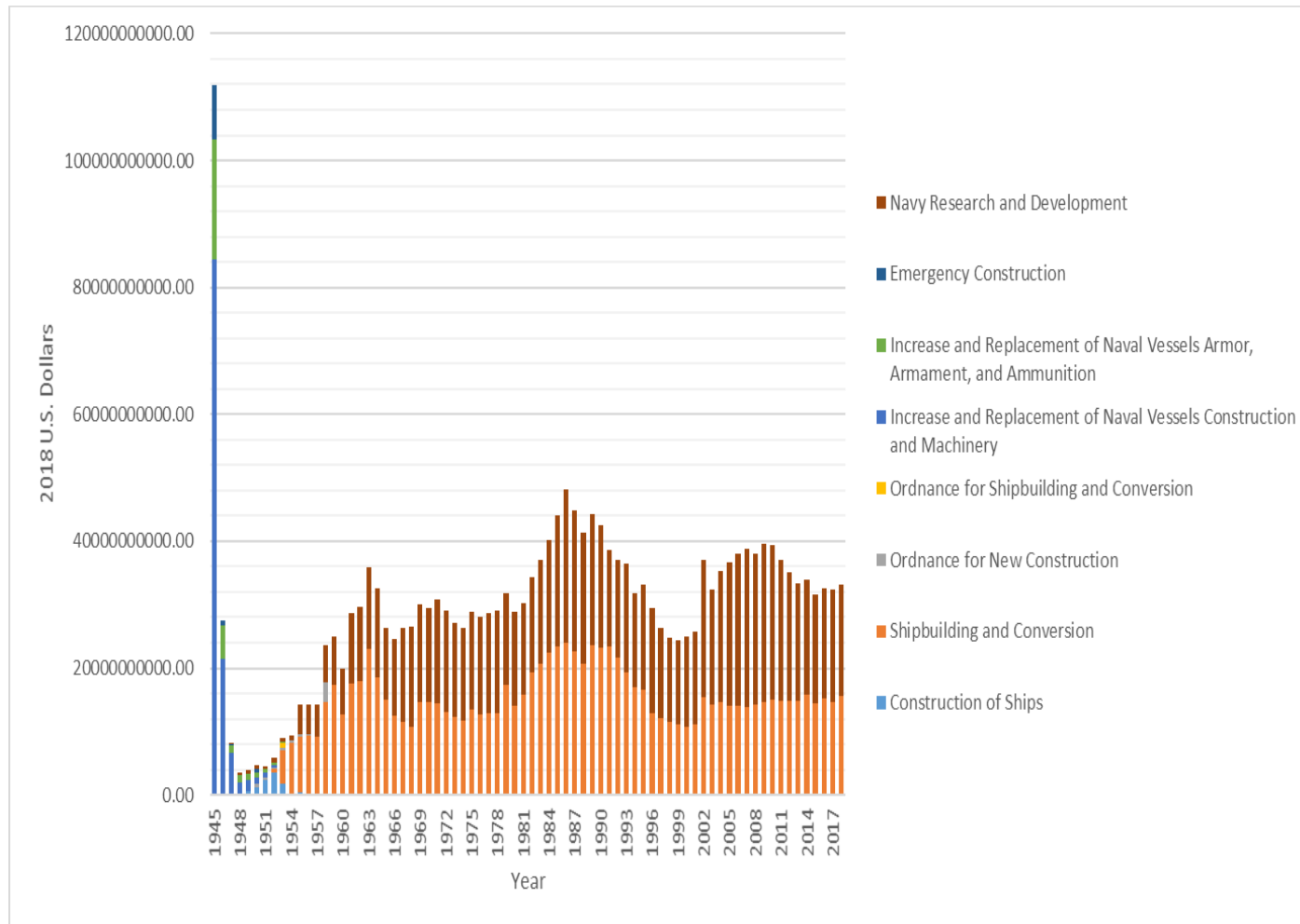


Figure 11. U.S. Spending on Shipbuilding and Research and Development in 2018 U.S. Dollars¹¹⁹

¹¹⁹ See Appendix A for citation information.

2. Boom-and-Bust in U.S. Shipbuilding Confirmed: Findings

Figure 11 seems to confirm that there has been a boom-and-bust cycle in the U.S. Navy's demand for ships. By looking at the Shipbuilding and Conversion account, along with its predecessors, we can see distinct peaks at 1945, 1963, 1971, 1986. Even combined with the Research and Development account the peaks at these years still stand, and another peak can be added in 2009. Each of these peaks is followed by a subsequent trough which confirms that the boom-and-bust cycle applies to the U.S. naval shipbuilding expenditures. Like Figure 10, which shows the overall DoD spending, the peaks in Figure 11 correspond with World War II, Korea, Vietnam, Reagan's arms race with the Soviet Union, and military buildup for wars in Iraq and Afghanistan.

D. THE BOOM-AND-BUST CYCLE AND SHIPBUILDING INDUSTRY CONSOLIDATION

With a confirmation that the boom-and-bust cycle applies to naval shipbuilding expenditures, we can determine if there is correlation between the cycle and industrial base consolidation. In this section we analyze the cases of consolidation from Chapter II to determine if the boom-and-bust theory of failure exists. Based on the theory we should expect companies to fail during bust periods, however, this does not always hold true.

1. Ingalls Shipbuilding (1961)

Ingalls Shipbuilding, which was acquired by Litton Industries in 1961, did not meet the expected criteria for boom-and-bust theory failure. Figure 11 shows that, leading up to 1961 a buildup of both the Shipbuilding and Conversion and Navy Research and Development expenditures was in process. Figure 1 on the other hand shows that leading up to and at the 1961 point of failure the number of keels produced by the industry was at an all-time high since the end of World War II. Taking an even closer look at the keels laid dynamic, Figure 3 reveals that Ingalls Shipbuilding was able to maintain contracts for production of ships right up until the consolidation even in 1961.

The acquisition of Ingalls Shipbuilding was appealing to Litton because of its potential as a shipbuilder and due to Litton's ability to vertically integrate its own product

lines. Encyclopedia.com's short history of Litton Industries describes the acquisition of Ingalls Shipbuilding as attractive due to Ingalls' production capacity, the ability to incorporate Litton technology, and the price tag.¹²⁰ The website describes that Ingalls Shipbuilding was "the country's third largest private shipbuilder," and was purchased for "eight million dollars in cash and the assumption of nine million dollars in debt."¹²¹ Finally, the website notes that Litton's electronic control equipment, which was its production base, could be incorporated into the ships and submarines that were produced at the Newport News shipyard. Thus, Ingalls Shipbuilding was acquired because of its potential for profits not due to failures in maintaining production and need for liquidation.

2. Bethlehem Quincy (1963)

The next company that would face a consolidation event was Bethlehem Steel Corporation. As stated in Chapter II, the company would sell off its Quincy Shipyard assets to General Dynamics in 1963, however, the market dynamics do not fit the boom-and-bust theory of failure. This consolidation event also came at a relative highpoint in Shipbuilding and Conversion dollars, as shown in Figure 11, and an overall highpoint of number of keels laid, as shown in Figure 1. A closer look at Figure 2, however, shows that Bethlehem Steel Corporation continued to lay keels up until the sale of the Quincy site in 1963. Further investigation reveals that the last keel laid was laid at the Quincy Shipyard in 1959 under Bethlehem Steel Corporation management. The two keels, laid in 1962 and 1963, were actually laid at the Bethlehem San Francisco shipyard. This means that although there was a relative peak in available funds and an overall peak in keels laid in the industry, other issues faced by the Bethlehem Steel Corporation made it necessary for the Quincy shipyard to be sold.

3. New York Shipbuilding (1967)

New York Shipbuilding's sale of assets in 1967 closed the door on an otherwise successful run in the naval shipbuilding industry. The closure of Camden, NJ shipyard

¹²⁰ Encyclopedia.com, "Litton Industries Inc."

¹²¹ Encyclopedia.com.

came during a trough in naval shipbuilding spending as shown in Figure 11 and after a continued downward trend of keels laid by the industry. A closer look at New York Shipbuilding's build record, displayed in Figure 7, shows that the shipyard had been unable to obtain additional contracts after its final keel was laid in 1963. Although Chapter II does show that New York Shipbuilding was able to shift some of its production to commercial contracts, the company's continuation was unsustainable without continued government contracts. New York Shipbuilding as a case of failure fits into the theory of the boom-and-bust. In this case the boom-and-bust cycle theory would have predicted failure at this time. The argument that excess capacity that was generated during times of peak defense spending and peak production would then be turned into a liability during relative lows in defense spending and production seems to ring true in this case.

4. Chesapeake Drydock and Construction Company (1968)

The Litton Industries acquisition of the Chesapeake Drydock and Construction Company, like New York Shipbuilding's failure, also fits the expected boom-and-bust theory course of failure. The Chesapeake Drydock and Construction Company consolidation event occurred only one-year after New York Shipbuilding's failure, which means that much of the market forces were the same. Like the New York Shipbuilding case, there was a relative reduction in the amount of keels laid by the industry leading up to the failure, depicted in Figure 1. The consolidation event also happened at during a trough in spending on shipbuilding. Although the combined dollar amount spent on the shipbuilding industry was slightly higher than the previous year's case, the government expenditure on the Shipbuilding and Conversion account was slightly lower than the previous year. One way in which the Chesapeake Drydock and Construction Company differs, however, is it continued production. As depicted by Figure 3, the Chesapeake Drydock and Construction company was able to maintain laying keels until it was taken over by Litton Industries. This fact, however, does not break from the boom-and-bust theory of failure. The Chesapeake Drydock and Construction Company had reached a peak in production in 1963, which coincided with the industries peak in keels laid. After this peak, production began to slow until the company was bought out in 1968.

5. Defoe Shipbuilding Company (1976)

Defoe Shipbuilding Company's 1976 closure time period of failure fits the boom-and-bust theory of failure. Figure 11 shows that leading up to Defoe's failure in 1976 funds spent by the DoD on shipbuilding had gone through a relative low with slight fluctuations after the end of Vietnam. Specifically, Shipbuilding and Conversion account expenditures had reached a relative low two years prior to company failure. These effects were also transferred to the number of keels laid by the industry. In 1974, three years before Defoe failure, the shipbuilding industry would lay only seven keels for the Navy, the lowest number of keels laid in a single year since 1953. However, looking at Figure 6 reveals more about Defoe's situation. The company had not laid a warship keel for the Navy since 1964 and had only limited success even when it was able to acquire production contracts from the Navy. Other companies were able to continue production during the period of limited production, while Defoe was unable to attain additional contracts. The last keel laid in 1964 came the year after a relative peak in shipbuilding spending, as depicted in Figure 11, and during an overall peak in keels laid by the industry. After this period, however, there was a significant reduction in keels laid by the industry and shipbuilding spending. This would have left Defoe with excess capacity as a liability and without additional contracts to stimulate revenues Defoe was unable to continue operations.

6. Todd San Pedro (1989)

Todd San Pedro's closure in 1989 came at a time in which market forces fell outside the boom-and-bust theory of failure. The naval shipbuilding industry as was at a relative minimum in 1989, as shown in Figure 1. On the other hand, the DoD's naval shipbuilding expenditures had reached a relative peak due to Reagan era defense spending increases, as displayed in Figure 11. Looking at Figure 8 we can see that the Todd Shipyards had benefited from the Reagan era increases in defense spending. The company would lay its peak number of keels in 1982 and its last keel in 1987. To reiterate the findings of Chapter II, Vartabedian and Stolberg describes that the Todd Pacific Shipyards had operated under

bankruptcy during the last two years of operation of the San Pedro Shipyard.¹²² Thus, the boom-and-bust cycle theory of failure does not apply to this case and other causal factors are responsible for company failure.

7. Bath Iron Works (1995)

Bath Iron Works merger with General Dynamics in 1995 fits the boom-and-bust cycle theory of failure. Although Bath Iron Works continued production through the year of its merger, as shown in Figure 2, the market was in a bust. Figure 1 displays that after a peak of 14 keels laid in 1991 there was a sharp drop and by 1995 the industry had reached a relative minimum of 4 keels laid. Figure 11 also confirms that the Bath Iron Works consolidation event happened during a bust in the cycle. After a DoD shipbuilding expenditure peak in the late 1980s the industry was experiencing successive reductions in funding until a minimum was reached in 1998.

8. Avondale Industries (1999)

Avondale Industry's sale to Litton Industries in 1999 mirrored that of Bath Iron Works merger a few years earlier and also fits into the boom-and-bust theory of failure. The same trends that existed for Bath Iron Works were still present in 1999 when Avondale was sold. Figure 11 shows that the year prior to Avondale's sale the DoD's shipbuilding expenditure had gone through a relative minimum and there had been little recovery in 1999. This means that Avondale failed during a bust period. Figure 1 and Figure 3 reinforce this claim. Like Bath analysis of Figure 1 shows that the shipbuilding industry was going through a relative slump in number of keels laid. Figure 3 on the other hand shows that the Avondale site was unable to maintain contracts due to its last keel being laid in 1995 prior to its sale to Litton. This meant that the company would have had excess capacity that would have turned into a liability, just as the boom-and-bust theory of failure suggests.

¹²² Vartabedian and Stolberg, "Todd, the Last Shipyard in L.A. Harbor, to Shut Down."

9. Tenneco Industries and Litton Industries (2001)

Tenneco Industries and Litton Industries would respectively merge or sell their shipbuilding assets to Northrup Grumman in 2001. Each of these company failures fit the boom-and-bust cycle theory of failure. The naval shipbuilding industry had gone through a relative minimum of DoD expenditures in 1998, as displayed in Figure 11. Although there was a slight increase in overall shipbuilding expenditure and a relative stagnation of the Shipbuilding and Conversion account in 1999 and 2000, there was little indication that this bust trend would change. For keels laid, shown in Figure 1, the industry had seen a trend of roughly 3 to 5 keels being laid per year, which had been a sharp contrast from the 14 keels that the industry laid in 1987 and 1992 during the previous boom. A closer look at each companies shipbuilding record also confirms that these companies fit into the boom-and-bust theory of failure. Figure 3 shows that the number of keels laid by Litton and Tenneco follow the trends in DoD shipbuilding expenditure. Both companies, Tenneco in dark blue and Litton in light red on Figure 3, would reach a relative peak in keel production around 1991. This peak crested and then diminished as DoD shipbuilding expenditure shrank. Tenneco Industries and Litton Industries, as consolidation events, failed during a bust period which we would expect based on the boom-and-bust cycle theory of failure.

10. The Boom-and-Bust Cycle and Shipbuilding Industry Consolidation: Summary

Based on the boom-and-bust theory of failure, we would expect that company failure to happen during busts in the cycle. During these busts companies are left with excess capacity which turns into a liability when production is abated. Review of this section's findings holds that there is a strong correlation between the boom-and-bust theory of failure and cases of consolidation in the naval shipbuilding industry. Out of the ten cases of consolidation that are studied, seven (New York Shipbuilding, Chesapeake Drydock and Construction Company, Defoe Shipbuilding, Todd San Pedro, Avondale Industries, Bath Iron Works, Litton Industries, and Tenneco Industries) occur during busts in DoD shipbuilding expenditures. The other three cases of consolidation either happen at the beginning of a boom (Ingalls Shipbuilding) or at the peak of a boom in expenditures

(Bethlehem Quincy and Todd San Pedro). With a majority of cases fitting into the boom-and-bust theory of failure we can conclude that the boom-and-bust cycle has a negative effect on the naval shipbuilding industry, however, it is not the only causal factor that causes shipbuilding industrial base weakness.

**E. BOOM-AND-BUST CYCLE IN U.S. NAVAL SHIPBUILDING:
CONCLUSIONS**

Overall, this chapter finds that the boom-and-bust cycle theory of failure applies to the naval shipbuilding industry and has played a role in industry's consolidation. In accomplishing this, the chapter is split into four parts. The first section gave the reader a basic understanding of the boom-and-bust cycle. With this better understanding, we recognize that the most likely time period for company failure is during a bust in the cycle. Next, the chapter presented the reader with some of the underlying causes for the boom-and-bust cycle and the potential actors that are responsible. Then, the chapter went a step further and proved the boom-and-bust cycle exists in the naval shipbuilding industry by compiling DoD shipbuilding expenditures from 1945 to present. Finally, using the compiled expenditures and case studies from Chapter II as analytical framework, events of shipbuilding company failure are compared to the cycles in DoD shipbuilding expenditures. The findings show that a majority of the cases of industry consolidation happened during busts in the cycle, which suggests that the boom-and-bust cycle theory of failure plays a role in the naval shipbuilding industry consolidation. With these cases of consolidation that fall outside a cycle bust we know that the boom-and-bust cycle is not the only factor which causes failure. This chapter's findings have major implications for Congress, the President, and the DoD. In order to stabilize, protect, and even grow the naval shipbuilding industrial base a stable demand signal and shipbuilding expenditures must be established. With only four companies in the industry today vigilance from all involved parties is required to ensure success in meeting the 355 ship goal.

IV. CONGRESSIONAL DISTRIBUTION THEORY AND NAVAL SHIPBUILDING

The U.S. Congress has a pivotal role in maintaining the naval shipbuilding industrial base through its powers of appropriation and oversight. This chapter has applied the overall lessons learned from the Boom-and-Bust: Congressional Distribution Theory section of the previous chapter and attempted to apply it to the cases of consolidation in the naval shipbuilding industrial base. Rundquist, Lee, and Rhee writing about the Congressional Distribution Theory argue that greater percentage and seniority of defense committee membership from a given state or district leads to a subsequent increase in military contracts for the home state or district. They continue by stating that a loss of leadership or membership from the defense committees causes a reduction of the defense contracts. Based on this argument, we should expect that increased membership and leadership from shipbuilding districts or states on the Committees on Appropriations or the Committee on Armed Services would result in increases in shipbuilding expenditures over the base budget. In the attempt to confirm the Congressional Distribution Theory, the House and Senate Committee on Appropriations membership from states with active shipyards is compared to the difference between amount requested for Shipbuilding and Conversion in presidential budget requests and the amount that Congress appropriated, but no apparent correlation is found. In conduct of researching the phenomenon, analysis of NDAA's indicates that Congress through the years has attempted to maintain certain shipyards and funnel contracts to shipyards to sustain production. Although these congressional distributions could not be applied to the cases of consolidation that are observed in Chapter II, they prove Congress's willingness to intervene in the naval shipbuilding industry. A more expansive search is necessary to determine the effect that congressional distribution has on naval shipbuilding industrial base consolidation.

A. CONGRESSIONAL DISTRIBUTION IN NAVAL SHIPBUILDING: METHODS

Much like Chapter III, the focus of the analysis for this chapter started with budget data. First, the Shipbuilding and Conversion account data from the president's yearly

budget request is compared to the amount appropriated by congress for the same account. From this data comparison we are able to determine the direction and magnitude in which Congress deviates from the president's budget request. In order to collect congressional appropriation data each year's NDAA is reviewed and analyzed for Shipbuilding and Conversion account appropriations along with specific shipbuilding program stipulations.¹²³ To make an appropriate comparison, the Presidential Budget requests are also reviewed to determine each year's Shipbuilding and Conversion account budget request using the future year's Budget Authority (net).¹²⁴ The compiled budget and appropriations data is then analyzed to determine the difference between the appropriation and budget request for the overall Shipbuilding and Conversion account. The Shipbuilding and Conversion dollar amounts pulled from the NDAA's and the Budgets along with the percent difference between the two is shown in Tables 3 in Appendix B.

The yearly percent difference is then compared to congressional committee membership for specific shipbuilding districts. The scope of the committee membership

¹²³ Note: Unlike the previous chapter appropriation and budget request figures, this chapter's figures have not been corrected for inflation.

Note: We must acknowledge that the collected appropriations data does not include additional appropriations that may have been made in other intermediate appropriations or due to emergent situations. This comparison's aim is to determine the difference between the initial request and the initial appropriation. Due to time constraints these additional data points are not accounted for, however, future studies may find it beneficial to include this data for determining how emergent situations and mid period appropriations effect long term congressional budget appropriations.

Note: The 1988 and 1989, 1990 and 1991, and 1992 and 1993 NDAA's included the following years appropriations as part of the appropriations bill, however, the appropriations for the following year are only available through the first session of the Congress that was in session, which would have allowed appropriations to be carried over into the next fiscal year. These carryover appropriations would then be cancelled at the end of the first session and the subsequent NDAA would then supersede the previous year's NDAA. Thus, for the 1989, 1991, and 1993 Shipbuilding and Conversion appropriations the dollar amounts are taken from the 1989, 1991, and 1993 NDAA's respectively instead of the 1988 and 1989, 1990 and 1991, and 1992 and 1993 NDAA's. See: "National Defense Authorization Act for Fiscal Years 1988 and 1989," Pub. L. No. 100-180, 101 Stat. 1019 (1987), 1020, https://congressional.proquest.com/congressional/result/congresultpage:pdfevent?rsId=16DA7170AF6&pdf=/app-bin/gis-publiclaw/5/5/6/3/pl100-180.pdf&uri=/app-gis/publiclaw/100_pl_180; "National Defense Authorization Act for Fiscal Years 1990 and 1991," Pub. L. No. 101-189, 103 Stat. 1352 (1989), 1364, https://congressional.proquest.com/congressional/result/congresultpage:pdfevent?rsId=16DA7170AF6&pdf=/app-bin/gis-publiclaw/5/f/3/9/pl101-189.pdf&uri=/app-gis/publiclaw/101_pl_189; "National Defense Authorization Act for Fiscal Year 1992 and 1993," Pub. L. No. 102-190, 105 Stat. 1290 (1991), 1301, https://congressional.proquest.com/congressional/result/congresultpage:pdfevent?rsId=16DA7170AF6&pdf=/app-bin/gis-publiclaw/2/b/4/8/pl102-190.pdf&uri=/app-gis/publiclaw/102_pl_190.

¹²⁴ The analysis of specific programs is limited to warships as defined in Chapter I, Section B.

review is limited to the House and Senate Appropriations Committees for two reasons. First, these committees have appropriations and oversight functions for the DoD, along with the House and Senate Armed Services Committees. Members of the Subcommittee on Defense for each of the House and Senate Appropriations Committees also provides additional insights. Individuals on these committees specialize in DoD appropriations and have the potential power to make changes to appropriations laws that would affect the Shipbuilding and Conversion account. Second, the House and Senate Armed Services Committees are not included in the analysis in order to limit the scope of the study, but is an area for further research.

House and Senate Appropriations Committee membership data that is collected is cross referenced with states containing shipbuilding facilities. Membership is documented by year, the percentage of members on the committee from shipyard states, the position that each held, and the level of seniority for the committee member (congressional membership data is shown in Table 5 of Appendix C). This data is then compared to the percent difference between the NDAA and the Budget request and is compared to each NDAA to determine if preference is given to a specific districts based on level of funding to a specific acquisition programs or wording that required specific shipyards to be used for acquisition.

B. CONGRESSIONAL DISTRIBUTION IN NAVAL SHIPBUILDING: FINDINGS

As summarized previously, the Congressional Distribution Theory postulates that members of Congress adjust defense appropriations in order to create jobs for their own districts. The correlation between congressional membership on the Appropriation and Armed Services committee and increased level of military contracts for home districts may be true in overall defense spending as detailed in the Chapter III. However, an analysis of the compiled data in Table 5 in Appendix C shows no correlation between Committee on Appropriations membership and congressional increases in Shipbuilding and Conversion appropriations over the Presidents' budget requests. Based on the Congressional Distribution Theory, we would expect that when a higher percentage of members on the committees are from states with shipbuilding facilities we would see increases in

Shipbuilding and Conversion appropriations over the budget request, but this is not the case. Additional study of congressional hearings and the budget request revisions may reveal that congressional committee membership and bargaining power accounts for changes in the budget prior to final submission by the President.

The lack of correlation between Committee on Appropriations membership and congressional increases in appropriations over the budget request does not mean that congressional distribution is absent in the naval shipbuilding industry. In recent years concerns over national security and the importance of maintaining the naval shipbuilding industrial base have been key factors for congressional distribution to certain shipyards. David Sorenson writes that, “Shipyards generate considerable employment, and thus members of Congress continually work to keep them in production.”¹²⁵ In fact, there have been multiple cases in the history of the NDAA that show that Congress has distributed funds to home shipyards. Congress has either stipulated directly that vessels would be built in certain shipyards or has done so indirectly through funding to certain programs.

Congress on one specific occasion has mandated that ships should be built at specific shipyards. With the last of the Los Angeles Class SSNs being completed in 1994 and the one Sea Wolf class SSN built in 1999, the two shipyards Electric Boat and Newport News Shipbuilding, the only certified builders of nuclear vessels, went through a low demand period. In 1996 contracts began to be awarded for the new Virginia Class SSNs. Congress, in an effort to ensure continuity of operation of both shipyards, stipulated certain contract requirements. The FY 1996 NDAA Section 131 in regard to the future Virginia Class SSNs stipulated that,

(B) in order to ensure flexibility for innovation, the fiscal year 1998 and fiscal year 2000 submarine are to be constructed by the Electric Boat Division and the fiscal year 1999 and the fiscal year 2001 submarines are to be constructed by Newport News Shipbuilding.¹²⁶

¹²⁵ Sorenson, *The Process and Politics of Defense Acquisition: A Reference Handbook*, 109.

¹²⁶ Strom Thurmond, “National Defense Authorization Act for Fiscal Year 1996,” Pub. L. No. 104–106, 110 Stat. 186 (1996), 208, <https://www.congress.gov/104/plaws/publ106/PLAW-104publ106.pdf>.

As a follow on requirement, FY 1998 NDAA Section 121 made the “New Attack Submarine Team Agreement” into law, which designated that either Electric Boat Corporation or Newport News Shipbuilding and Drydock Company as the lead contracted yard with the other as a part of the created team of builders.¹²⁷ The Virginia Class SSN program is the most intrusive congressional mandated distribution to shipyards. Other legislation to maintain demand to other shipbuilders has been subtler.

In order to maintain the naval shipbuilding industrial base Congress has also stipulated that certain programs should be built in multiple shipyards. In the case of the DDG-1000 and the LCS programs, Congress stipulated that each program had to be contracted to more than one shipbuilder during the design and build phase of the appropriation program. The FY2006 NDAA Section 125 specified that “The Secretary of the Navy may not obligate or expend any funds to prepare for, or conduct, or implement a strategy for acquisition of vessels under the next-generation destroyer program through a winner-take all acquisition strategy.”¹²⁸ Sorenson comments on DDG-1000 program that by shifting the production to two shipyards the Navy estimated a cost increase of “\$300 million in construction costs.”¹²⁹ For the LCS program, the 2010 NDAA Section 121 allowed the procurement of 10 LCSs and allowed the Secretary of the Navy to reserve the right to “conduct a competition for a second shipyard as soon as practicable.”¹³⁰ Although Congress is not explicit in which shipyards can be contracted for the DDG-1000 and LCS programs these measures ensure demand is spread to multiple shipyards. By specifying that more than one shipyard can or must be contracted for multiple programs and with a limited number of viable shipbuilders, demand is spread across the viable shipbuilders.

¹²⁷ Floyd Spence, “National Defense Authorization Act for Fiscal Year 1997,” Pub. L. No. 104–563, 110 Stat. 2422 (1996), 1648–49, <https://www.congress.gov/104/plaws/publ201/PLAW-104publ201.pdf>.

¹²⁸ The 2006 NDAA defines the winner-take-all acquisition strategy as the “acquisition (including design and construction) of such vessels through a single shipyard. Duncan Hunter, “National Defense Authorization Act for Fiscal Year 2006,” Pub. L. No. 109–89, 119 Stat. 3136 (2006), 3158, <https://www.congress.gov/109/plaws/publ163/PLAW-109publ163.pdf>.

¹²⁹ Sorenson, *The Process and Politics of Defense Acquisition: A Reference Handbook*, 110.

¹³⁰ Ike Skelton, “National Defense Authorization Act for Fiscal Year 2010,” Pub. L. No. 111–166, 123 Stat. 2190 (2009), 2211, <https://www.congress.gov/111/plaws/publ84/PLAW-111publ84.pdf>.

Congress has also distributed funds to shipyards via other means. Sorenson writes of the current aircraft carrier program that, “since there are very few shipyards capable of building carriers, the Virginia delegation was able to argue that it was preserving a national asset,” by including \$87 million of additional funding into the 2006 NDAA to avoid construction delays.¹³¹ Thus, through continued funding of the aircraft carrier program, Congress is essentially earmarking dollars for the Huntington Ingalls Industries shipyard in Newport News Virginia. Once initial contracts are awarded mandates to buy additional ships of the class do much of the same for shipyards. The 1996 NDAA section 135, which authorized six additional Arleigh Burke class destroyers, is another example congressional distribution of funds.¹³² This particular class of ship had been built by Ingalls Shipbuilding in Mississippi and Bath Iron Works in Maine since 1985. congressional approval of six more ensured that demand was distributed to these shipyards. Overall, Congress has used measures in order to distribute demand throughout the shipbuilding industry.

C. CONGRESSIONAL DISTRIBUTION IN NAVAL SHIPBUILDING: CONCLUSION

Analysis of the congressional appropriations of Shipbuilding and Conversion account compared to the corresponding budget request amount yielded a mixed result. There is no correlation between House and Senate Committee on Appropriations membership and increases in Shipbuilding and Conversion account. However, analysis of the NDAAs shows that Congress has acted to distribute funds to specific shipyards. Congress has designated specific shipyards for shipbuilding programs and funded programs that either continue contracts at certain shipyards or initiate new contracts for programs that can only be built at specific shipyards. These measures, although not linked to a certain member of Congress or districts, are prime examples of Congress directing where Shipbuilding and Conversion dollars can be spent. Although knowing that these practice exists is useful to our understanding of the dynamic nature of naval shipbuilding

¹³¹ Sorenson, *The Process and Politics of Defense Acquisition: A Reference Handbook*, 110.

¹³² Thurmond, National Defense Authorization Act for Fiscal Year 1996, 211–12.

budgeting, the specific cases of congressional distribution found in the NDAAAs cannot be applied to our cases of consolidation.

Additional research that focuses on the topic of Congressional Distribution Theory is required to have a full understanding of how the theory affects the naval shipbuilding industrial base. Based on limited data found and time constraints of this thesis, research is limited to the Committee on Appropriations. Future research that expands into the House and Senate Committees on Armed Services and their Seapower Subcommittee may reveal additional data that would link the Congressional Distribution Theory to the naval shipbuilding industrial base.

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V. PREFERENCE FOR FIXED PRICE CONTRACTS A LIMITED FACTOR IN NAVAL SHIPBUILDING INDUSTRIAL BASE CONSOLIDATION

As one of the possible causal factors for naval shipbuilding industrial base consolidation, improper contract implementation is one that can potentially be corrected through government regulation. Over the years Congress and the President have limited the use of, or given preference to, certain contract types. However, selecting or mandating the wrong contract type for a specific stage of the acquisitions process has the potential to leave the contractor with reduced profits, or losses, that effect the strength of the company. Specifically, using a fixed price contract for Milestone A of the acquisitions process, also known as the technological maturation and risk reduction phase, has the potential to cause failure. Although analysis has been done to determine how these preferences affect the overall military industrial base, a more detailed look at the how contract preferences affect the naval shipbuilding industrial base is performed in this chapter.

In order to validate the claim that use of fixed price contracts during the Milestone A of the acquisitions program is a causal factor for the naval shipbuilding industrial base's consolidation, this chapter performs three distinct tasks. First, the chapter sets the analytical framework, by giving the reader a basic understanding of federal acquisition contract types and how each divides risk and cost between the government and the contractor. This is accomplished by reviewing current doctrine, regulations, and major federal acquisitions study findings. With an understanding of how certain contract types distribute risk and cost we can then recognize why some argue that fixed price contract used indiscriminately can cut into company profits and potentially cause failure. Second, this chapter establishes a rough timeline for U.S. DoD and Federal acquisitions contract type preferences based on public laws, acquisitions histories, and executive orders. With an understanding of contracting type and historical contracting preferences established in this chapter as analytical framework, the third section compares the historical preferences to the naval shipbuilding company failures in Chapter II, "Naval Shipbuilding Companies Since 1945." By making this comparison it is found that there is limited correlation between contracting

preference and naval shipbuilding industrial base consolidation. However, when administrations mandated the use of fixed price contracts for all phases of acquisitions cycle there is a higher rate of consolidation.

A. CONTRACT TYPES AND THE IMPLICATIONS OF IMPLEMENTATION

Contracts are an agreement between the buyer, the U.S. government, and the seller, the defense contractors. These contracts can be used by the U.S. government to minimize cost to the government or supply incentives to the supplier/contractors for meeting or exceeding goals. The Federal Acquisition Regulation (FAR) Volume I lists four basic types of U.S. acquisitions contracts: fixed-price, cost-reimbursement, incentive, and indefinite-delivery, time-and-materials, labor-hour, and letter contracts.¹³³ These contract types can be mixed to create the best outcome depending on the needs of the Program Officer and the Contracting Officer.¹³⁴ The FAR states that, “There are many factors that the contracting officer should consider in selecting and negotiating the contract type” to include price competition, price analysis, cost analysis, type and complexity of the requirement, combining contract types, urgency of requirement, period of performance or length of production run, contractor’s technical capability and financial responsibility, adequacy of the contractor’s accounting system, concurrent contracts, extent and nature of proposed subcontracting, and acquisition history.¹³⁵ In choosing the type of contract the Contracting Officer needs to consider the type of contract and the strengths and weaknesses that come with each. fixed-price contracts, as described by the FAR,

provide for a firm price or in appropriate cases, an adjustable price. Fixed-price contracts providing for an adjustable price may include a ceiling price, a target price (including target cost), or both. Unless otherwise specified in

¹³³ Federal Acquisition Regulation, “Federal Acquisition Regulation: Volume I,” 16–1.

¹³⁴ The Program Officer is overall in charge of the specific acquisitions program and set the required specifications and timeline for the product acquisition (i.e., the Program Officer in charge of Virginia Class submarine program). The Contracting Officer is the individual in charge of developing the contractual agreements between the federal government and contractors during the different phases of the acquisition life-cycle. The Program Officer and the Contracting Officer work closely together to attain the required product, while adhering to laws, regulations, and executive orders. Federal Acquisition Regulation, “Federal Acquisition Regulation: Volume I.”

¹³⁵ Federal Acquisition Regulation, 16.1-2-16.1-3.

the contract the ceiling price or target price is subject to adjustment only by operations of contract clauses providing for equitable adjustment or other revision of the contract price under stated circumstances. The contracting officer shall use firm-fixed price or fixed-price with economic price adjustment contracts when acquiring commercial items...¹³⁶

Cost-Reimbursement Contracts are described by the FAR as,

cost-reimbursement contracts provide for payment of allowable incurred costs, to the extent prescribed in the contract. These contracts establish an estimate of total cost for the purpose of obligating funds and establishing a ceiling that the contractor may not exceed (except at its own risk) without the approval of the contracting officer.¹³⁷

Incentive Contracts are described by the FAR as,

appropriate when a firm-fixed price contract is not appropriate and the required supplies or services can be acquired at lower costs and, in certain instances with improved delivery or technical performance, by relating the amount of profit or fee payable under the contract to the contractor's performance.¹³⁸

Incentive contracts can be mixed with fixed-price or cost-reimbursement contracts to give the contractor an incentive for performance or to meet specified delivery dates. Thus, the FAR stipulates that Contracting Officers can make contracts so that they are fixed-price-incentive or cost-reimbursement-incentive depending on what the case requires. Indefinite-delivery, and time-and-materials, labor-hour, and letter contracts type contracts would be used for materials or items with low specialization and in larger quantity.¹³⁹ Because the indefinite-delivery, and time-and-materials, labor-hour, and letter contracts type contracts are for low specialization products not really applicable to the naval shipbuilding industrial base, the focus from here forward is on the use of cost-type and fixed-type contracts.

¹³⁶ Federal Acquisition Regulation, 16.2-1.

¹³⁷ Federal Acquisition Regulation, 16.3-1.

¹³⁸ Federal Acquisition Regulation, 16.4-1.

¹³⁹ For more information on the contract types that are not applicable to the naval shipbuilding industry see Federal Acquisition Regulation, 16.5-1-16.6-3.

Based on the FAR, contract types should be chosen to match the stage of project maturation, level of technological advancement, and based on the project milestone that has been reached. The FAR gives specific cases in which each contract type should be used. The FAR requires that for contracts where production has been verified to be reliable fixed-price contracts are preferred. On the other hand, the FAR delineates that for programs still under initial technological development cost-reimbursement-type contracts are preferred. Frank Kendall, former Under Secretary of Defense for Acquisition, Technology and Logistics, mirrored the FAR saying that contract type and incentive structures should be used to both spur innovation and reduce cost but contract selection should be based on the stage of project development, the goals of the project team, and the type of product being acquired.¹⁴⁰

By using firm-fixed-price contracts during the development stages of projects the government is essentially transferring the risk and cost to the defense contractors at the highest risk stage of development. Kendall states that use of fixed price contracts during development has the potential to cause companies to go into debt and ultimately fail.¹⁴¹

The Packard Commission, established to study and report on defense management in the wake of allegations of fraud, waste, and abuse by the Department of Defense, was skeptical of the government's use of the firm fixed price contract as a way to protect the government from cost overages and increased risks.¹⁴² The findings argue that,

Today, however, most production and many development contracts are negotiated on a firm, fix-price basis. For the government, the advantages of a fixed-price arrangement, particularly the incentives it creates for realistic bidding, are obvious... Fixed-price contracts [however,] effectively can enshrine overstated requirements and understated costs in a legal arrangement that allows little or no flexibility for needed trade-offs between

¹⁴⁰ Kendall, "Getting Defense Acquisition Right," 19–20.

¹⁴¹ Kendall, 104–7.

¹⁴² Steven V. Roberts, "Congress; the Provocative Saga of the \$400 Hammer," *The New York Times*, June 13, 1984, sec. U.S., <https://www.nytimes.com/1984/06/13/us/congress-the-provocative-saga-of-the-400-hammer.html>; J. Ronald Fox, *Defense Acquisition Reform 1960–2009 an Elusive Goal* (Washington, DC: Center of Military History, 2011); David Packard, "A Quest for Excellence: Final Report to the President by the President's Blue Ribbon Commission on Defense Management" (Washington, DC: Department of Defense, June 30, 1986), <https://www.documentcloud.org/documents/2695411-Packard-Commission.html>.

cost and performance. This contractual arrangement, intended to protect the government, may cause both sides to lose.¹⁴³

Effectively the report is stating that in acquisition-program phases when there is higher level of risk, and cost analysis for a program are uncertain (i.e., the Milestone A technological development phase), firm-fixed-price contracts protect the government but burden companies with the risk and potential loss. Instead, in line with FAR guidelines, the Commission recommended the use of the cost-type contracts during the development stages of a program.

Overall, each contract type must be chosen based on the level of risk inherent in the program and selecting the wrong contract has negative implications for companies that perform the work. Specifically, selection of a fixed price contract during the Milestone A phase of a program, if done repeatedly, has the potential to lead to company failure. The next section further explores how Congress and the Executive have shaped contract type selection and establish an overall timeline for preferences in contract type.

B. CONGRESSIONAL AND EXECUTIVE CONTRACT PREFERENCES

Arguments over which contract type should be primarily used has ping-ponged back and forth between Fixed Price and Cost Reimbursement over the years. Kendall notes that throughout his thirty-plus years in the defense acquisitions industry, administrations have used firm fixed price contracts as a cost savings mechanism; however, this practice ebbs and flows over time. He notes that,

In 1971, David Packard supported the use of cost-plus contracts for development. About 20 years later in the late 1980s, we tried a policy or [sic] requiring firm fixed-price contracts for development... Fast forward another 20 years, and we are seeing suggestions of using this approach again.¹⁴⁴

¹⁴³ Packard, “A Quest for Excellence,” 46.

¹⁴⁴ Kendall, “Getting Defense Acquisition Right,” 19–20.

Based on Kendall's relative timeline, NDAAs since 1962, Presidential Executive Orders, and a review of other acquisitions laws passed by Congress, the following subsections establish a rough timeline for contract type preferences for federal contracts.

1. Post–World War II Contracting: Truman and Eisenhower

Our first point of reference after the end of World War II is the Federal Property and Administrative Services Act of 1949. This law passed in under a Democratic Congress, and Democratic President Harry S. Truman favored the use of Fixed Price contracts.¹⁴⁵ The law also outlawed the use of a cost-plus-a-percentage-of-cost type contract, which has continued to today, and required agency-head approval of other cost type contracts. There were also additional stipulations for when a cost-plus-a-fixed fee contract could be used. The act stated that, “Neither a cost nor a cost-plus-a-fixed fee contract nor an incentive-type-contract shall be used unless the agency head determines that such method of contracting is likely to be less costly than other methods or that it is impractical to secure supplies or services of the kind or quality required without the use of a cost or cost-plus-a-fixed fee contract or an incentive-type contract.”¹⁴⁶

Between 1949 and 1970 the Truman and Eisenhower administrations established Executive Orders that would affect how contracting officers awarded contracts, but made no real changes on how contract types were implemented. Truman and Eisenhower would sign Executive Orders clarifying nondiscrimination in contracting and

¹⁴⁵ “Federal Property and Administrative Services Act of 1949,” Pub. L. No. 81–288, 63 Stat. 377 (1949), 395, [https://congressional.proquest.com/congressional/result/pqpresultpage.gispdfhitspanel.pdflink/\\$2fapp-bin\\$2fgis-statute\\$2f0\\$2f7\\$2fb\\$2f1\\$2f00063_stat_0377_100288.pdf/entitlementkeys=1234%7Capp-gis%7Cstatute%7C00063-stat-0377-100288](https://congressional.proquest.com/congressional/result/pqpresultpage.gispdfhitspanel.pdflink/$2fapp-bin$2fgis-statute$2f0$2f7$2fb$2f1$2f00063_stat_0377_100288.pdf/entitlementkeys=1234%7Capp-gis%7Cstatute%7C00063-stat-0377-100288).

¹⁴⁶ Federal Property and Administrative Services Act of 1949, 395.

the measure for compliance.¹⁴⁷ Eisenhower would also issue an executive order that clarified provisions in the Buy American Act of 1933, which had mandated that all goods used by the DoD, with some exceptions, should be bought from U.S. sources.¹⁴⁸ These laws and Executive orders, however, do not provide a detailed account of the administrations' preferences for contract type.

Although law had been passed by the Truman administration requiring higher level of scrutiny for cost type contracts, this type of contract would dominate under both the Truman and Eisenhower administrations. Walter Poole suggests that during the late 1940s and through the 1950s “the type of contract most frequently employed, cost-plus-fixed-fee, reimbursed firms for their legitimate contract costs.”¹⁴⁹ He emphasizes that the cost type contract was preferred because of the need for equipment during the Korean War. Effectively, efforts to control cost were sidelined for speed of production. This preference for cost type contracts, which had endured through the Eisenhower administration, would end as the Kennedy administration took over the presidency.

¹⁴⁷ Harry Truman, “Executive Order 10308 of December 3, 1951 Improving the Means for Obtaining Compliance with the Nondiscrimination Provision of Federal Contracts” (The White House, December 3, 1951), [https://congressional.proquest.com/congressional/result/pqpresultpage.gispdfhitspanel.pdflink/\\$2fapp-s3\\$2fjlh-content\\$2fPT1-1951-EO-10308\\$2fPT1-1951-EO-10308.pdf/entitlementkeys=1234%7Capp-gis%7Cexecutive-orders%7C1951-eo-10308](https://congressional.proquest.com/congressional/result/pqpresultpage.gispdfhitspanel.pdflink/$2fapp-s3$2fjlh-content$2fPT1-1951-EO-10308$2fPT1-1951-EO-10308.pdf/entitlementkeys=1234%7Capp-gis%7Cexecutive-orders%7C1951-eo-10308); Dwight Eisenhower, “Executive Order 10557 of September 3, 1954 Approving the Revised Provision in Government Contracting Relating to Nondiscrimination in Employment” (The White House, November 3, 1954), [https://congressional.proquest.com/congressional/result/pqpresultpage.gispdfhitspanel.pdflink/\\$2fapp-s3\\$2fjlh-content\\$2fPT1-1954-EO-10557\\$2fPT1-1954-EO-10557.pdf/entitlementkeys=1234%7Capp-gis%7Cexecutive-orders%7C1954-eo-10557](https://congressional.proquest.com/congressional/result/pqpresultpage.gispdfhitspanel.pdflink/$2fapp-s3$2fjlh-content$2fPT1-1954-EO-10557$2fPT1-1954-EO-10557.pdf/entitlementkeys=1234%7Capp-gis%7Cexecutive-orders%7C1954-eo-10557).

¹⁴⁸ Dwight Eisenhower, “Executive Order 10582 of December 17, 1954 Prescribing Uniform Procedures for Certain Determinations Under the Buy-American Act” (The White House, December 17, 1954), [https://congressional.proquest.com/congressional/result/pqpresultpage.gispdfhitspanel.pdflink/\\$2fapp-s3\\$2fjlh-content\\$2fPT1-1954-EO-10582\\$2fPT1-1954-EO-10582.pdf/entitlementkeys=1234%7Capp-gis%7Cexecutive-orders%7C1954-eo-10582](https://congressional.proquest.com/congressional/result/pqpresultpage.gispdfhitspanel.pdflink/$2fapp-s3$2fjlh-content$2fPT1-1954-EO-10582$2fPT1-1954-EO-10582.pdf/entitlementkeys=1234%7Capp-gis%7Cexecutive-orders%7C1954-eo-10582); “Buy American Act of 1933,” Pub. L. No. 72–212, 1489 (1947), 1520, [https://congressional.proquest.com/congressional/result/pqpresultpage.gispdfhitspanel.pdflink/\\$2fapp-bin\\$2fgis-statute\\$2fb\\$2f2\\$2f9\\$2ff\\$2f00047_stat_1489_100212.pdf/entitlementkeys=1234%7Capp-gis%7Cstatute%7C00047-stat-1489-100212](https://congressional.proquest.com/congressional/result/pqpresultpage.gispdfhitspanel.pdflink/$2fapp-bin$2fgis-statute$2fb$2f2$2f9$2ff$2f00047_stat_1489_100212.pdf/entitlementkeys=1234%7Capp-gis%7Cstatute%7C00047-stat-1489-100212).

¹⁴⁹ Glen R Asner and Walter S. Poole, *Adapting to Flexible Response 1960–1968*, vol. II, History of Acquisition in the Department of Defense (Washington, DC: Historical Office, Office of the Secretary of Defense, 2013), 49.

2. Post–Korean War Contracting: Kennedy and Johnson

The Kennedy and Johnson administrations under the watchful eyes of Secretary of Defense McNamara would push fixed price contracts, but at the detriment of defense contractors. Poole notes that the cost type contract implementation practice that had held under the Truman and Eisenhower administrations drove up costs to the government. However, he observes that in 1961, when McNamara took over as Secretary of Defense, contracting type priorities would be directed from the OSD level. Phil Rosenzweig notes that before becoming the Secretary of Defense, Robert McNamara had been a Ford Motor Company executive that revitalized the company through safety and efficiency initiatives.¹⁵⁰ Poole writes that, “Secretary McNamara shifted emphasis to fixed-price incentive contracts, which were designed to hold down costs by rewarding contractors for efficiency.”¹⁵¹ Running contrary to current FAR guidelines, McNamara’s fixation of fixed price contracts also applied to the technological development and risk reduction phase of the acquisitions process. Poole notes that McNamara and his subordinates believed that cost plus fixed fee contracts for research and development could transition to fixed-price under better cost accounting and management efforts. During the same time a seemingly innovative contracting initiative was also being tested, the total package procurement (TPP). Poole notes that this was another version of fixed price contracting, that “would cover the acquisition cycle from prototype development to series production.” The shift and focus to fixed-price contracts and the TPP system were both efforts to reduce price, however, they would both fall short of expectations.

Under Secretary McNamara efforts to enact cost saving regulations failed to produce cost savings and hobbled many of the defense contractors. Poole emphasizes that when fixed price contracts were used during the McNamara years many defense contractors would severely underbid to win the contract, however, when actual costs were

¹⁵⁰ Phil Rosenzweig, “Robert S. McNamara and the Evolution of Modern Management,” *Harvard Business Review*, December 1, 2010, <https://hbr.org/2010/12/robert-s-mcnamara-and-the-evolution-of-modern-management>.

¹⁵¹ Asner and Poole, *Adapting to Flexible Response*, II:49.

totaled the DoD was not seeing a significant cost savings. With regards to the contractors, Poole references a study by Donald Pattillo that finds that

smaller production runs, contract cancellations, and heavy development expenses for commercial jets created grave financial troubles for the industry. The Douglas Aircraft Company in 1959, the Lockheed Corporation in 1960, and General Dynamics in 1961 led the list of money losers among *Fortune* magazine's list of top 500 industrial firms. Rising R&D expenses and heightened financial risk eliminated all but the largest and strongest firms and even those became increasingly vulnerable.¹⁵²

The Kennedy and Johnson administrations under the direction of Secretary McNamara, in an effort to save costs, would rely heavily on the fixed price contract. The two administrations' unwavering preference for the fixed price contract would be unlike other administrations. As shown throughout the rest of this section, other administrations would increase or decrease the threshold for use of specific contract types, which shows slight preference for cost type or fixed type. The Kennedy and Johnson administrations, however, are the only confirmed case where there is a hard preference for a specific contract type.

For perspective it is important to note that the first event of naval shipbuilding industrial base consolidation happens during this period. Ingalls Shipbuilding would be acquired by Litton Industries in 1961 during an overall peak in production and approaching a relative peak in defense shipbuilding expenditures as shown in Figure 1 and Figure 11. Ingalls Shipbuilding's consolidation event occurred during the early stages of the Kennedy administration when the administration had little time to enact reforms and contracts would have been holdovers from the Eisenhower administration. Thus, as a first data point Ingalls Shipbuilding weakens the argument that preference for fixed price contracts cause naval shipbuilding industrial base consolidation.

3. Nixon: Return to the Cost Type Contract

Although Nixon would turn away from the fixation on fixed type contracts, it is unclear what contract preference was used by the Ford and Carter Administrations. With

¹⁵² Asner and Poole, II:70.

questions regarding the effectiveness of fixed priced contracts and the seemingly limited cost savings that had been achieved under McNamara, the Nixon administration would resume the employment of cost type contracts. Nixon would also continue the use of fixed price contracts for the technological development phase of the acquisitions cycle. Poole describes that, “The Nixon administration would turn from fixed-price back to cost reimbursable contracts, discard total package procurement, and launch major efforts to improve acquisition management and education.”¹⁵³

Although Poole notes that there was a major shift away from the fixed price contract type during Nixon years, Nixon and the Congress would pass acts that limited the use of cost type and multi-year contracts, which temper Poole’s claims.¹⁵⁴ The Armed Forces Appropriations Act of 1970 required that 93 percent of funds appropriated for research and development that year would not be payable unless the contract was either: “(1) formally advertised contracts, (2) other firmly fixed contracts competitively awarded, or (3) contracts under \$100,000.”¹⁵⁵ Although this stipulation was repealed the following year, it would strictly control the number of cost type contracts that could be awarded for technological development during FY1970.¹⁵⁶

4. Ford and Carter: Unknown Contracting Preferences

During the Ford and Carter administrations there are limited changes to contract law, however, Carter focused on using federal procurement policy to benefit constituents. Under the Ford administration Congress would pass the DoD Appropriations Act of 1976

¹⁵³ Asner and Poole, II:85.

¹⁵⁴ A multi-year contract as defined by the FAR is a “contract for the purchase of supplies or service for more than 1, but not more than 5, program years.” See: Federal Acquisition Regulation, “Federal Acquisition Regulation: Volume I,” 17.1-1.

¹⁵⁵ “Armed Forces Appropriation Authorization, 1970,” Pub. L. No. 91–121, 83 Stat. 204 (1969), 207, https://congressional.proquest.com/congressional/result/congresultpage:pdfevent?rsId=16DA74323A0&pdf=/app-bin/gis-publiclaw/3/8/7/b/pl91-121.pdf&uri=/app-gis/publiclaw/91_pl_121.

¹⁵⁶ “Armed Forces Appropriation Authorization, 1971,” Pub. L. No. 91–441, 84 Stat. 905 (1970), 908, https://congressional.proquest.com/congressional/result/congresultpage:pdfevent?rsId=16DA74323A0&pdf=/app-bin/gis-publiclaw/8/7/f/4/pl91-441.pdf&uri=/app-gis/publiclaw/91_pl_441.

that reinstated a multi-year contract cancellation ceiling of \$5 million for FY1976, which had been put in place during Nixon's tenure. In effect this stipulation limited the payout of contracted cancellation fees to companies if the government needed to cancel a multi-year contract prior to contract completion. Since multi-year contracts spanned up to five years and appropriations are only made for one year there was potential for contracts to go unfunded by Congress. By limiting the payout Congress was protecting the tax-payers and placing extra burden on the defense industry. However, these changes to multi-year contract law would have had little effect on how cost type and fixed type contracts were awarded. The Carter administration on the other hand focused on federal procurement programs that would boost the economy. Although not applied directly to naval shipbuilding Carter's Executive Order 12073, *Federal Procurement in Labor Surplus Areas*, required federal agencies to "emphasize procurement set-asides in labor surplus areas in order to strengthen our Nation's economy."¹⁵⁷ This policy would also have little effect on how contract types were chosen. Though it is not known the specific preferences that the Ford and Carter administrations had for contract type, evidence shows that no major reforms governing contract type were put into law during their time in office.

5. Reagan Era Shifts in Preference

Ronald Reagan, who assumed the Office of the President in 1981, would sign and execute a series of federal contracting reforms during his tenure as president. These reforms would define allowable costs, restrict the use of multi-year contracts, and required the use of firm fixed price contracts for certain conditions.

The first term of the Reagan administration came with a slew of changes to contract administration law. The DoD Appropriations Act of 1982 promoted the use of any kind of contract, including multi-year contracts.¹⁵⁸ The act maintained the 1949 policy, which

¹⁵⁷ Jimmy Carter, "Executive Order 12073 of August 16, 1978 Federal Procurement in Labor Surplus Areas" (The White House, August 16, 1978), 216, [https://congressional.proquest.com/congressional/result/pqpresultpage.gispdfhitspanel.pdf?link/\\$2fapp-s3\\$2fjlh-content\\$2fPT1-1978-EO-12073\\$2fPT1-1978-EO-12073.pdf/entitlementkeys=1234%7Capp-gis%7Cexecutive-orders%7C1978-eo-12073](https://congressional.proquest.com/congressional/result/pqpresultpage.gispdfhitspanel.pdf?link/$2fapp-s3$2fjlh-content$2fPT1-1978-EO-12073$2fPT1-1978-EO-12073.pdf/entitlementkeys=1234%7Capp-gis%7Cexecutive-orders%7C1978-eo-12073).

¹⁵⁸ "Department of Defense Appropriations Authorization Act, 1982," Pub. L. No. 97-86, 95 Stat. 1099 (1981), 1118-20, <https://uscode.house.gov/statutes/pl/97/86.pdf>.

outlawed the price-plus-a-percentage-of-cost contract, but allowed all other contract types that promoted national security and were in the best interest of the U.S. government. One year later, however, the 1983 act of the same name added additional stipulations restricting multi-year contract use, required additional oversight for cost growth exceeding certain limits, and established the Defense Contract Audit Authority to monitor for “waste, fraud, and abuse.”¹⁵⁹ The DoD Appropriations Act of 1986 continued with these reform efforts by defining allowable costs for the cost type contracts, but it is the first Defense Appropriations Act that required the use of firm fixed price for specific programs.¹⁶⁰ In accordance with the Act, the Secretary of the Navy was required to enter into firm fixed price contracts for Navy’s A6 Aircraft and Rolling Airframe Missile Program production. Although not during the technological development phase or for a Navy shipbuilding program, these firm fixed price mandates are an example of explicit intervention by Congress into Navy contracting.

In an effort to correct deficiencies in the Defense Acquisitions System President Reagan established the Blue Ribbon Commission on Defense Management, also known as the Packard Commission. Ronald Fox notes that in 1985 formal investigations into major defense contractors began in earnest due to “charges of fraud, waste, and mismanagement in the Department of Defense [that] had been circulating in the media for several years.”¹⁶¹ Steven V. Roberts of the New York Times detailed that these waste and mismanagement offenses included a \$400 hammer, overages for spare parts, and a hardware kit that cost \$10,168.56, which added to the ballooning defense budget.¹⁶² The media attention and subsequent congressional investigations would be the catalyst for creating the Packard Commission. Fox cites that the creation of the position of assistant secretary of defense for acquisition and logistics was an effort to keep Congress and the media at bay while the

¹⁵⁹ “Department of Defense Appropriations Authorization Act, 1983,” Pub. L. No. 97–252, 96 Stat. 718 (1982), <https://uscode.house.gov/statutes/pl/97/252.pdf>.

¹⁶⁰ “Department of Defense Authorization Act, 1986,” Pub. L. No. 99–145, 99 Stat. 583 (1985), <https://uscode.house.gov/statutes/pl/99/145.pdf>.

¹⁶¹ Fox, *Defense Acquisition Reform 1960–2009 an Elusive Goal*, 120.

¹⁶² Roberts, “Congress; the Provocative Saga of the \$400 Hammer.”

Packard Commission and subsequent reforms could make necessary modifications to the acquisition system. Created out of Executive Order 12526, the Packard Commission was given a wide mandate to “study the issues surrounding defense management and organization, and report its findings and recommendations.”¹⁶³

The Packard Commission’s findings, differing from earlier Reagan era laws and executive orders, would set the tone for contract type preferences for the rest of Reagan’s tenure as president. The Commission report released in 1986 recommended the use of cost type contracts and warned that blanket use of fixed type contracts was not producing the expected returns.¹⁶⁴ The Commission acknowledges that although it was inherently in the government’s interest to reduce costs to the taxpayer, previous use of fixed price contracts, as a cost saving mechanism, in all situations had adverse effects on the defense industrial base. With the Packard Commission’s recommendations in hand, the Reagan administration would update United States Code Title 10 regulations regarding the use of fixed price development contracts. The National Defense Authorization Act for Fiscal Year 1989 updated Title 10 regulations to allow the use of fixed price contracts for development contracts.¹⁶⁵ However, the law stipulated that fixed price contracts could only be used in development if: “risk permits realistic pricing,” “use of a fixed-price contract permits an equitable and sensible allocation of program risk between the United States and the contractor,” and for a major system the contract cannot be firm fixed unless contract cost was \$10 million or higher.¹⁶⁶

Based on the language of the Packard Commissions report and the 1989 law regulating the use of fixed price contracts we can conclude that during the Reagan administration a shift in contract type preference happened. Prior to the Packard Commission report there was most likely a preference for fixed priced contracts, to include

¹⁶³ Packard, “A Quest for Excellence,” xi.

¹⁶⁴ Packard, 46.

¹⁶⁵ “National Defense Authorization Act for Fiscal Year 1989,” Pub. L. No. 100–456, 102 Stat. 1908 (1988), 2011, https://congressional.proquest.com/congressional/result/congresultpage:pdfevent?rsId=16DA7170AF6&pdf=/app-bin/gis-publiclaw/0/a/3/7/pl100-456.pdf&uri=/app-gis/publiclaw/100_pl_456.

¹⁶⁶ National Defense Authorization Act for Fiscal Year 1989, 2011.

those for Milestone A technological development. After the Packard Commission report preference shifted to cost type for development contracts.

6. Clinton Era: Opening the Way for Cost Type Contracts

After Reagan stepped down as president in 1989 there would be no large shifts in federal contract type policy until Clinton took office in 1993. Clinton's first attempt at procurement reform came October 13, 1994. Two important documents were put into action on this date, the Federal Acquisition Streamlining Act of 1994 (FASA) and Executive Order 12931, *Federal Procurement Reform*. FASA is revolutionary for the federal acquisitions field in general and it also updated some regulations regarding contract type. Section 1021 repealed the 1949 requirement that required agency head approval to award cost type or incentive type contracts, while section 1022 updated and consolidated the requirements for multi-year contracts.¹⁶⁷ These contract reforms would have been helpful for lowering the threshold for approval and making it easier for Contracting Officers to issue cost type contracts. *Federal Procurement Reform*, on the other hand, was a mandated review of acquisitions regulations looking to spur innovation in the acquisitions process and also sought to establish "clear lines of contracting authority and accountability."¹⁶⁸

Even with the lowered threshold to cost type contracts that had been established by FASA, the Clinton administration and Congress looked for ways to reduce fraud and extend what could be reimbursed by the cost type contract. The 1996 NDAA Section 808 extended what costs could be reimbursed to defense contractors.¹⁶⁹ With the addition of this law, "indirect private sector costs of performing a defense contract" would be allowed

¹⁶⁷ "Federal Acquisition Streamlining Act of 1994," Pub. L. No. 103-355, 103 Stat. 3243 (1994), 3257, [https://congressional.proquest.com/congressional/result/pqpresultpage.gispdfhitspanel.pdflink/\\$2fapp-bin\\$2fgis-statute\\$2fe\\$2f8\\$2f8\\$2f00108_stat_3243_103355.pdf/entitlementkeys=1234%7Capp-gis%7Cstatute%7C00108-stat-3243-103355](https://congressional.proquest.com/congressional/result/pqpresultpage.gispdfhitspanel.pdflink/$2fapp-bin$2fgis-statute$2fe$2f8$2f8$2f00108_stat_3243_103355.pdf/entitlementkeys=1234%7Capp-gis%7Cstatute%7C00108-stat-3243-103355).,

¹⁶⁸ William Clinton, "Executive Order 12931 of October 13, 1994 Federal Procurement Reform" (The White House, October 13, 1994), [https://congressional.proquest.com/congressional/result/pqpresultpage.gispdfhitspanel.pdflink/\\$2fapp-s3\\$2fjlh-content\\$2fPT1-1994-EO-12931\\$2fPT1-1994-EO-12931.pdf/entitlementkeys=1234%7Capp-gis%7Cexecutive-orders%7C1994-eo-12931](https://congressional.proquest.com/congressional/result/pqpresultpage.gispdfhitspanel.pdflink/$2fapp-s3$2fjlh-content$2fPT1-1994-EO-12931$2fPT1-1994-EO-12931.pdf/entitlementkeys=1234%7Capp-gis%7Cexecutive-orders%7C1994-eo-12931).

¹⁶⁹ Thurmond, National Defense Authorization Act for Fiscal Year 1996, 393-94.

to be reimbursed under cost type contracts.¹⁷⁰ This can be seen as an effort to strengthen the defense industry with an influx of capital by increasing the range of allowable costs for cost type contracts.

Two years later the Clinton administration and Congress would apply these same fundamental practice of extending covered costs in a cost type contract to the naval shipbuilding industry. Section 1027 of the 1998 NDAA added section 7315 to Title 10 United States Code.¹⁷¹ The updated code called for the preservation of Navy shipbuilding capability through the use of cost reimbursement of indirect private sector costs of performing a defense contract. As an effort to promote stability of the naval shipbuilding industrial base the Clinton administration displayed its preference for the cost type contract. In all, the Clinton administration and Congress took federal regulations one step closer to what we now see as current FAR guidelines.

7. Twenty-First Century: Slight Changes Create Current Contract Regulations

After the Clinton administration's liberation of cost type contracts, following administrations would make slight changes to contract laws that would bring about current regulations. However, there are some examples where fixed price contracts were mandated during the Milestone A phase of the acquisitions process. The George W. Bush and Obama administrations have each made slight changes to contract law, however, contract type preference have shifted from fixed type to cost and back again.

The George W. Bush administration would seek small changes in contract law, but would only briefly revert to using fixed price contracts for the Milestone A phase of the acquisitions process. The Bush administration, through the 2004 NDAA, would enact a pilot program for follow on contracts and subcontracts at the production stage, Milestone C, of the acquisitions process.¹⁷² Although the program did mandate the use of fixed-price contracts,

¹⁷⁰ Thurmond, National Defense Authorization Act for Fiscal Year 1996.

¹⁷¹ Floyd Spence, "National Defense Authorization Act for Fiscal Year 1998," Pub. L. No. 105-132, 111 Stat. 1629 (1997), 1878-79, <https://www.congress.gov/105/plaws/publ85/PLAW-105publ85.pdf>.

¹⁷² Duncan Hunter, "National Defense Authorization Act for Fiscal Year 2004," Pub. L. No. 108-106, 117 Stat. 1392 (2003), 1554, <https://www.congress.gov/108/plaws/publ136/PLAW-108publ136.pdf>.

it only applied to production contracts. Three years later Congress and the Bush administration would pass laws that limit the use of incentive fee type contracts and mandated the use of fixed price contracts under certain conditions.

Under the 2007 NDAA Section 818 “Determination of Contract Type for Development Programs” the Bush administration repealed the Reagan era regulations on fixed price development contracts. With this removal the administration was effectively lowering the decision threshold for fixed price contracts during development stages of the acquisitions process. The repeal also removed the stipulation that fix priced contracts could only be used with due regard to pricing, level of risk, and allocation of that risk spread between the government and the contractor. This could be seen as a step toward a fixed price contract type preference. Limitations that had been put in place to protect contractors from risks associated with implementation of the fixed contract in the Milestone A phase of acquisitions were now gone. During the rest of George Bush’s tenure as president the administration and Congress would update requirements that linked incentive type contract award fees to specific outcomes like schedule and performance but did not make large shifts in contract type preferences by law or otherwise.¹⁷³

When President Obama came into office, a lot of the Bush-era decisions on contract-type law were maintained. By the end of his first term, however, preferences began to change and the administration along with Congress updated contract law to consider risk when awarding a certain type of contract. The 2013 NDAA is a prime example of this shift. Section 811 of the law prohibited the use of cost type contracts for Milestone C production phase of all Major Defense Acquisition Programs.¹⁷⁴ This change adheres to the Kendall’s belief that

¹⁷³ Duncan Hunter, “John Warner National Defense Authorization Act for Fiscal Year 2007,” Pub. L. No. 109–364, 120 Stat. 2083 (2006), 2321–22, <https://www.congress.gov/109/plaws/publ364/PLAW-109publ364.pdf>; Carl Levin, “Duncan Hunter National Defense Authorization Act for Fiscal Year 2009,” Pub. L. No. 110–417, 122 Stat. 4356 (2008), 4551–52, <https://www.congress.gov/110/plaws/publ417/PLAW-110publ417.pdf>.

¹⁷⁴Note: A Major Defense Acquisition Program is defined by Section 2430 of Title 10 U.S. Code as a program for acquisition that exceeds \$300 million for research and development or total expenditure that exceeds \$1.8 billion. Howard McKeon, “National Defense Authorization Act for Fiscal Year 2013,” Pub. L. No. 112–479, 126 Stat. 1632 (2013), 1828, <https://www.congress.gov/112/plaws/publ239/PLAW-112publ239.pdf>; “Major Defense Acquisition Program Defined,” 10 U.S.C. § 2430, accessed January 24, 2020, <https://www.law.cornell.edu/uscode/text/10/2430>.

fixed type contracts should be used for low risk phases of the acquisitions process, like Milestone C, and cost type contracts for high risk phases, like Milestone A. The 2016 NDAA would go further to codify current regulations by requiring Major Defense Acquisitions Programs to have customized acquisitions strategies approved by the milestone decision authority.¹⁷⁵ Sections 821 and 822 of this act required risk to be examined, weighed, and mitigated through a strategy tailored to the specific program. When considering contracting strategy, the NDAA required,

- (i) contract type and how the type selected relates to level of program risk in each acquisitions phase; (ii) how the plans for the program or system to reduce risk enable the use of fixed-price elements in subsequent contracts and timing of the use of those fixed price elements; (iii) market research; and (iv) consideration of small business participation.¹⁷⁶

Obama and Congress had essentially reestablished the Reagan era risk mitigation provision that had been removed by the George W. Bush administration. Once again, there was an increased threshold for the use of fixed type contracts during the Milestone A phase of Major Defense Acquisitions programs.

Although the 2016 NDAA brought regulations closer to FAR guidelines, the 2017 NDAA passed by the Obama administration took a large step in the opposite direction. Section 829 of the 2017 NDAA required the Defense Federal Acquisitions Regulation Supplement (DFARS), which is a DoD supplement to the FAR, to be updated to increase the threshold of cost type contracts and “establish a preference for fixed price contracts.”¹⁷⁷ This act brings us to the current DFARS revision for contract type regulations. The DFARS mirrors the 2017 NDAA which stipulates that, “approval of the head of the contracting activity is required prior to awarding cost-reimbursement contracts in excess of 25 million dollars.”¹⁷⁸ The DFARS also mirrors the 2017 NDAA fixed price stipulation by stating “the

¹⁷⁵ Ron Johnson, “National Defense Authorization Act for Fiscal Year 2016,” Pub. L. No. 114–92, 129 Stat. 726 (2015), 897–902, <https://www.congress.gov/114/plaws/publ92/PLAW-114publ92.pdf>.

¹⁷⁶ Johnson, 898.

¹⁷⁷ John McCain, “National Defense Authorization Act for Fiscal Year 2017,” Pub. L. No. 114–328, 130 Stat. 2000 (2016), 2281–82, <https://www.congress.gov/114/plaws/publ328/PLAW-114publ328.pdf>.

¹⁷⁸ “Defense Federal Acquisition Regulation Supplement,” Acquisition.gov, January 24, 2020, <https://www.acquisition.gov/dfars/part-216-types-contracts>.

contracting officers shall first consider the use of fixed-price contracts, including fixed-price incentive contracts, in determination of contract type.”¹⁷⁹ With this in mind, the current regulations seem to give preference to the fixed type contracts under all situations of risk.

Overall, the Executive and Congressional preferences have ping-ponged from fixed type to cost type and back again. Unless there are changes in contract regulation it seems that this trend will be perpetuated and fixed type contracts will continue to be used without due regard to risk or how they affect company stability. The rough timeline outlined in this section will be used in the next section to analyze naval shipbuilding industrial base company failure and the weight of fixed price contract type preference as a causal mechanism.

C. PREFERENCE FOR FIXED PRICE CONTRACTS COMPARED TO SHIPBUILDING INDUSTRY CONSOLIDATION

To determine if there is correlation between fixed type contract preferences and naval shipbuilding industrial base consolidation a comparison of the timeline that is formulated in the previous section and data from Chapter II of this thesis, “Naval Shipbuilding Companies Since 1945,” is performed. For the purposes of this thesis naval shipbuilding industry consolidation is measured using three factors: mergers, shipyards being sold, and company failure. The year of each consolidation is then compared to the contract type preference during the time of consolidation as shown in Table 1.

The table’s contract type preference section is determined from the rough timeline presented in Section B of this chapter and grouped by four categories. The fixed price and cost type categories are used to qualitatively describe an administration’s preference only if there is an explicit account of the administration’s preference. Slight fixed price or slight cost type is used when there is a higher threshold for the use of a certain contract type. For example, if the administrations contract preference is listed as fixed price, then there was by law or by executive order a higher threshold for issuing the cost type contract. This means that it would have been harder for a Contracting Officer to issue a cost type contract, therefore the use of fixed price contracts would be more prominent.

¹⁷⁹ Acquisition.gov.

Table 1. Naval Shipbuilding Industrial Base Consolidation Compared to Administration Contract Type Preferences

Shipbuilding Company	Year of Consolidation	Presidential Administration	Contract Type Preference
Ingalls Shipbuilding	1961	Kennedy	Fixed Price
Bethlehem Quincy	1963	Kennedy	Fixed Price
New York Shipbuilding	1967	Johnson	Fixed Price
Chesapeake Dry Dock and Construction Company	1968	Johnson	Fixed Price
Defoe Shipbuilding	1976	Ford	Unknown
Todd San Pedro	1989	Reagan	Slight Cost Type
Bath Iron Works	1995	Clinton	Slight Cost Type
Avondale Industries	1999	Clinton	Slight Cost Type
Tenneco Industries	2001	Bush	Slight Cost Type
Litton Industries	2001	Bush	Slight Cost Type

From a quick study of Table 1 it is apparent that there is limited correlation between naval shipbuilding industrial base consolidation and an administration's preference for the fixed price contract type. Four out of the ten consolidation events happened during periods when presidential administrations had a documented preference for fixed price contracts. While the other six consolidation events happen during periods when the administration had a slight preference for cost type contracts or the preference for contract type is unknown. It is interesting, however, that the Kennedy and Johnson administrations had the highest rate of consolidation compared to the other administrations. These two administrations with McNamara as Secretary of Defense almost exclusively used fixed price contracts and employed the underperforming Total Package procurement program. Compared to other administrations the Kennedy and Johnson almost exclusive use of fixed price contracts is distinct. It must be acknowledged, however, that Ingalls Shipbuilding's merger in 1961 may not have been due to Kennedy and McNamara's policies. Kennedy only a few months into

his term would have had little time to make sweeping changes and multiple contracts from the Eisenhower administration would have been holdover at the time of Ingalls Shipbuilding's merger. With a bulk of consolidation happening during these two administrations we can see that there is a correlation between naval shipbuilding industrial base consolidation and hardline preference or the fixed price contract.

D. CONTRACT TYPE PREFERENCES: CONCLUSION

In conclusion, analysis of naval shipbuilding industrial base consolidation compared to contract type preferences over the years has reveals limited correlation between the two factors. To give the reader an understanding of how contracts are issued and what each contract type is used for, a review of current contracting doctrine is performed. Then, a rough timeline for contract preference is presented based on Executive Orders, Contracting Laws, and accounts of administration preferences. This timeline is compared to naval shipbuilding industrial base consolidations to determine if there is a correlation between the two.

The analysis reveals that the correlation between naval shipbuilding industrial base consolidation and preference for fixed price contracts is limited. When there is an explicit preference for fixed contracts, as under Secretary McNamara, there is a higher likelihood for consolidation. But the other administrations that are studied do not adhere to McNamara's explicit use of fixed contracts as a preference. When there is not an explicit preference for one contract or the other, slight preferences can be found based on contracting law, Executive Orders, or acquisitions histories. However, with these slight preferences there seems to be no correlation with naval shipbuilding industry consolidation. To clarify the relative weight that the fixed price contract preference factor has on naval shipbuilding industry consolidation, future research is required. A possible avenue for future research would be an in depth analysis of Milestone A contracts in the naval shipbuilding industry. Study of the contracts should reveal the prevailing contract type prior to company failure and help to analyze the preference of fixed price contracts as a mechanism of consolidation.

VI. CONCLUSION

Even as this thesis was being written there seemed to be another shift in shipbuilding priorities. David Larter of *Defense News* reveals a memo from the Office of Management and Budget to the OSD proposing potential cuts to the Navy's shipbuilding plan.¹⁸⁰ The memo indicates a potential shift away from the mandated 355 ship Navy by the Executive. Larter also notes that the memo was met by opposition from the two senators from Maine, whose constituents would see the majority of the proposed cuts. The memo and the subsequent response by the senators are perfect examples of the dynamics that are studied in this thesis.

This chapter serves three purposes for concluding the analysis performed in this thesis. First, the three hypotheses that are studied are compared to determine which causal factor had the largest impact on the naval shipbuilding industry consolidation. Second, we briefly discuss the implications for Congress, the Executive Branch, including the DoD and the Navy, and the shipbuilding industry. Finally, the chapter makes recommendations for potential avenues of research of importance to the naval shipbuilding industrial base.

A. CHANGING WEIGHT OF CAUSAL FACTORS

Overall, this thesis explores three potential causal factors for the naval shipbuilding industrial base's decline.¹⁸¹ The consolidation of the naval shipbuilding industrial base is illustrated in Chapter II, "Naval Shipbuilding Companies Since 1945," and is used as an empirical framework for testing the hypotheses in the following chapters.

Chapter III, "Boom-and-Bust Cycle: Basics, Potential Causes, and Proving It Extends to Navy Ship Acquisitions," explores the boom-and-bust cycle's effects on the naval shipbuilding industrial base. Initial study of the boom-and-bust phenomenon

¹⁸⁰ David Larter, "US Lawmakers Protest Proposed Cuts to Shipbuilding," *Defense News*, January 8, 2020, <https://www.defensenews.com/naval/2020/01/07/lawmakers-protest-proposed-cuts-to-shipbuilding/>.

¹⁸¹As explained in Chapter I Section B this thesis uses naval shipbuilding industrial base decline and consolidation of the industrial base synonymously based the number of shipbuilders in the industry being an accumulation metric.

suggests that companies are prone to failure during busts in the cycle. A comparison of DoD expenditure data and cases of consolidation from Chapter II, verified this hypothesis. The chapter finds that a correlation exists between busts in the cycle and events of naval shipbuilder failure, with seven of the ten cases of failure occurring during a bust in the cycle. The other three cases of failure either happened during peaks in the cycle or during buildups just prior to the peak. Thus, the chapter proposes that the boom-and-bust, as a causal factor, has had a negative effect on the naval shipbuilding industrial base, but it is not the only factor behind failures in the industry.

Chapter IV, “Congressional Distribution in Naval Shipbuilding,” takes a granular look at one of the factors that perpetuates that boom-and-bust cycle. The core hypothesis proposed by the Congressional Distribution Theory asserts that members of Congress use government appropriations to direct contracts to their home districts. Based on this theory we should expect that when a higher number of delegates from shipyard states/districts on specific congressional committees should result in increases in DoD shipbuilding appropriations compared to initial presidential budget requests. To evaluate this dynamic, the chapter compared the Committee on Appropriations and its Defense Subcommittee membership and leadership to the difference between congressional appropriations and presidential budget requests. Although the findings are inconclusive, during the course of the investigation it was found that Congress has at times distributed funds to shipyards in their states/districts. These efforts to sustain the shipbuilding industrial base did not correlate with any of the cases from Chapter II, thus, we are unable to determine their effects on naval shipbuilding industrial base consolidation.

Chapter V, “Preference for Fixed Price Contracts a Limited Factor in Naval Shipbuilding Industrial Base Consolidation,” studied the hypothesis that overuse of specific contract types could contribute to company weakness and eventual failure. A review of current doctrine and past commission reports reveals that overuse of the fixed price contract type during technology development stages of the acquisitions process could potentially lead to company failure. The fixed price contract, which requires the contractor to cover cost overages, used during an acquisitions phase with high levels of risk could leave the contractor with reduced profits or even losses. To test this theory on the naval

shipbuilding industrial base, a rough timeline of government contract type preferences is constructed based on Presidential Executive Orders, National Defense Authorization Acts, and other pertinent acquisitions laws. The timeline preferences are then compared to the cases of consolidation that are found in Chapter II. The comparison suggests that there is a limited correlation between fixed price contract type preferences and naval industrial base consolidation. Although only four companies out of ten failed during a period of fixed price contract preference, three all shared a common denominator. Each of these three failures happened during the Kennedy and Johnson administrations, which under the leadership of Secretary of Defense McNamara used fixed price and TPP contracts explicitly. The last of the four failures under fixed price preference happened early during the Kennedy administration and would have had hold over contracts from the Eisenhower administration. All the other failures spanned across different administrations and happened during administrations that either had unknown preference or only slight preferences for cost type contracts.

Based on a review of the chapters as a whole, this thesis finds that the dominant cause of naval shipbuilding industrial base consolidation is the continuation of the boom-and-bust cycle of military spending. Although the boom-and-bust cycle is the dominant cause for industrial base consolidation, it does not correlate with all cases. Other causal factors are needed to explain the other points of failure. The hypothesis that use of fixed price contracts during the technological development of the acquisitions process causes company failure does well to explain the closure of Ingalls Shipbuilding and Bethlehem Quincy during the Johnson and Kennedy administrations, which cannot be explained by the boom-and-bust cycle. There are also cases in which these two hypothesis overlap. Chesapeake Drydock and Construction Company and New York Shipbuilding failures happen during a bust in the cycle and during an administration that explicitly preferred fixed price contracts. The intersection of these hypotheses means that they both have a part to play in company failure. On the other hand, Todd San Pedro is a case of consolidation in which none of the hypotheses studied in this thesis can explain failure. Because of this we know that additional internal or external factors also play a role in company failure.

B. STUDY IMPLICATIONS

There are three main implications that can be drawn from this thesis' findings. First, in order to stabilize and strengthen the naval shipbuilding industrial base the Navy, Congress, and the Executive need to work together in order to smooth DoD shipbuilding expenditures and demand for ships. Although this sounds easy to do, it is a herculean task. Long range planning, communicating the plan with industry, and building for the future's strategic threat are all ways that can reduce peaks and valleys in shipbuilding demand, but there will always be challenges. Changes in the economy, strategic threat, and other factors can cause long range plans to shift. Mitigating these changes and providing continuity requires a whole of government approach. Congress through its appropriations powers, the President and the Executive through long range planning and industry engagement all have a part to play.

Second, additional steps should be taken to match the DFARS and the FAR. Right now there is a mismatch between doctrine laid out in the FAR and the implementation regulations the DFARS that applies to the DoD. The FAR acknowledges that there is a right place and time for the fixed price contracts, but the DFARS requires the Contracting Officer to give preference to fixed price contracts. The language in the DFARS sends a message to the DoD that cost savings should be a higher priority, rather than the shared risk approach that has been laid out by previous Commission reports and Undersecretaries of Defense.

Third, Congress holds the appropriations powers, and for good or for bad congressional distribution is a part of American politics. In order to protect and grow the U.S. naval shipbuilding industrial base Congress will need to make hard choices about how to sustain home shipyards, while still allowing contracts to cultivate newcomers to the industry. It is important for members of Congress to fight for their home districts/states, but it is also important to look at the big picture. We must ask ourselves how does a public law that sustains one shipyard effect the entire industry?

C. FUTURE ANALYSIS

Based on the research conducted for this thesis the following is a recommendation for future research into this topic. Each chapter of this thesis has specific holes that can be filled by future research and there are additional hypotheses that can be tested to further our understanding of the naval shipbuilding industrial base.

Research into the boom-and-bust cycle and the causal factors behind it reveals that although authors discuss the peace dividend as something that drove changes in defense spending after the fall of the Soviet Union, a study of the actual effects has not been undertaken. There is a clear shift in spending away from defense and toward social welfare programs. However, authors predicted that there would be a subsequent increase in economic productivity which was never fully studied after the fact. Additional research is required to determine if this was actually the case.

During the research for Chapter IV on congressional distribution this thesis is severely limited. The two main committees that deal with defense appropriations Committee on Appropriations and Committee on Armed Forces are both considered for study of the Congressional Distribution Theory. With available resources and time this thesis is able to compare congressional distribution and committee membership for the Committee on Appropriations, however, the Committee on Armed Forces is omitted. Data for the Committee on Armed Forces membership was not found, thus, there is a hole in the research.

Although this thesis is able to make broad conclusions about naval shipbuilding industrial base consolidations there are still events that could not be explained. In order to get a complete picture of what causes industrial base failure additional internal and external factors of failure must be studied. Other potential areas of study that were discovered during the process of writing this thesis are Continuing Resolutions, relationships between shipbuilding companies and program managers, company ability to innovate, and company internal financial management. These additional causal factors may be able to bridge the gap in determining what causes failures in the naval shipbuilding industrial base.

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APPENDIX A. FOOTNOTE REFERENCES FOR FIGURES 1 THROUGH 11

Figures 1 through 9 adapted from

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Colton, "Electric Boat, EB, GD/EB"
Colton, "Guided-Missile Frigates FFG"
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Colton, "Newport News Shipbuilding, NGSB Newport News"
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Figure 10

Korb, Conley, and Rothman, “A Return to Responsibility: What President Obama and Congress Can Learn About Defense Budgets from Past Presidents.”

Figure 11

Figure 11 is a visual representation of Table 2. See Table 2 and Table 3 for source data.

APPENDIX B. CHAPTER IV DATA TABLES

Table 2. Shipbuilding Boom-and-Bust Source Data in Uncorrected U.S. Dollars.

FY of Expense	Navy Research	Construction of Ships	Shipbuilding and Conversion	Ordnance for New Construction	Ordnance for Shipbuilding and Conversion	Increase and Replacement of Naval Vessels Construction and Machinery	Increase and Replacement of Naval Vessels Armor, Armament, and Ammunition	Increase and Replacement of Naval Vessels Emergency Construction
1945 ¹⁸⁵	0	0	0	0	0	5486059071	1227384094	561200912.2
1946 ¹⁸⁶	0	0	0	0	0	1515764606	377991238	52803298
1947 ¹⁸⁷	12055023	0	0	0	0	544009323	96508057	10345761
1948 ¹⁸⁸	35035362	5280840	0	1485877	0	167948692	103938377	1528964
1949 ¹⁸⁹	44535902	47617980	0	10915086	0	141833713	93585111	0
1950 ¹⁹⁰	44000000	112600000	0	34800000	0	93062635	74116817	44000000

¹⁸⁵ U.S. Government Printing Office, *Budget of the United States Government for Fiscal Year Ending June 30 1947* (Washington, DC: U.S. GPO, 1946), A7, https://fraser.stlouisfed.org/files/docs/publications/usbudget/bus_1947.pdf.

¹⁸⁶ U.S. Government Printing Office, *Budget of the United States Government for Fiscal Year Ending June 20 1948* (Washington, DC: U.S. GPO, 1947), A88, https://fraser.stlouisfed.org/files/docs/publications/usbudget/bus_1948.pdf.

¹⁸⁷ U.S. Government Printing Office, *Budget of the United States Government for Fiscal Year Ending June 30 1949* (Washington, DC: U.S. GPO, 1948), A85, https://fraser.stlouisfed.org/files/docs/publications/usbudget/bus_1949.pdf.

¹⁸⁸ U.S. Government Printing Office, *Budget of the United States Government for Fiscal Year Ending June 30 1950* (Washington, DC: U.S. GPO, 1949), A104, https://fraser.stlouisfed.org/files/docs/publications/usbudget/bus_1950.pdf.

¹⁸⁹ U.S. Government Printing Office, *The Budget of the United States Government for Fiscal Year Ending June 30 1951* (Washington, DC: U.S. GPO, 1950), A68, https://fraser.stlouisfed.org/files/docs/publications/usbudget/bus_1951.pdf.

¹⁹⁰ U.S. Government Printing Office, A68.

FY of Expense	Navy Research	Construction of Ships	Shipbuilding and Conversion	Ordnance for New Construction	Ordnance for Shipbuilding and Conversion	Increase and Replacement of Naval Vessels Construction and Machinery	Increase and Replacement of Naval Vessels Armor, Armament, and Ammunition	Increase and Replacement of Naval Vessels Emergency Construction
1951 ¹⁹¹	49785693	217905427	0	43545481	0	72840268	48213503	0
1952 ¹⁹²	67114447	336789049	65164049	4158910	4082361	49959874	36880499	0
1953 ¹⁹³	63428089	177624182	511235744	27983798	77268142	1991663	12940699	0
1954 ¹⁹⁴	69481607	0	795126221	42093477	0	0	0	0
1955 ¹⁹⁵	455068436	49148901	849830778	23837983	0	0	0	0
1956 ¹⁹⁶	449074707	28868560	904144613	19517550	0	0	0	0
1957 ¹⁹⁷	522588685	16929704	916909024	3697227	0	162379	155360	0

¹⁹¹ U.S. Government Printing Office, *The Budget of the United States Government for the Fiscal Year Ending June 20 1953* (Washington, DC: U.S. GPO, 1952), 598–99, https://fraser.stlouisfed.org/files/docs/publications/usbudget/bus_1953.pdf.

¹⁹² U.S. Government Printing Office, *The Budget of the United States Government for the Fiscal Year Ending June 30 1954* (Washington, DC: U.S. GPO, 1953), 556–57, https://fraser.stlouisfed.org/files/docs/publications/usbudget/bus_1954.pdf.

¹⁹³ U.S. Government Printing Office, *The Budget of the United States Government for the Fiscal Year Ending June 20 1955* (Washington, DC: U.S. GPO, 1954), 482–83, https://fraser.stlouisfed.org/files/docs/publications/usbudget/bus_1955.pdf.

¹⁹⁴ U.S. Government Printing Office, *The Budget of the United States Government for the Fiscal Year Ending June 30 1956* (Washington, DC: U.S. GPO, 1955), 506–7, https://fraser.stlouisfed.org/files/docs/publications/usbudget/bus_1956.pdf.

¹⁹⁵ U.S. Government Printing Office, *The Budget of the United States Government for the Fiscal Year Ending June 30 1957* (Washington, DC: U.S. GPO, 1956), 508, https://fraser.stlouisfed.org/files/docs/publications/usbudget/bus_1957.pdf.

¹⁹⁶ U.S. Government Printing Office, *The Budget of the United States Government for the Fiscal Year Ending June 30 1958* (Washington, DC: U.S. GPO, 1957), 487–88, https://fraser.stlouisfed.org/files/docs/publications/usbudget/bus_1958.pdf.

¹⁹⁷ U.S. Government Printing Office, *The Budget of the United States Government for the Fiscal Year Ending June 30 1959* (Washington, DC: U.S. GPO, 1958), 436, https://fraser.stlouisfed.org/files/docs/publications/usbudget/bus_1959.pdf.

FY of Expense	Navy Research	Construction of Ships	Shipbuilding and Conversion	Ordnance for New Construction	Ordnance for Shipbuilding and Conversion	Increase and Replacement of Naval Vessels Construction and Machinery	Increase and Replacement of Naval Vessels Armor, Armament, and Ammunition	Increase and Replacement of Naval Vessels Emergency Construction
1958 ¹⁹⁸	618302000	15173000	1514691000	328259000	0	0	0	0
1959 ¹⁹⁹	797800000	2894000	1837199000	0	0	0	0	0
1960 ²⁰⁰	766532000	0	1362953000	0	0	0	0	0
1961 ²⁰¹	1191813000	0	1908255000	0	0	0	0	0
1962 ²⁰²	1298749000	0	1962020000	0	0	0	0	0
1963 ²⁰³	1429341000	0	2550881000	0	0	0	0	0
1964 ²⁰⁴	1577846000	0	2087603000	0	0	0	0	0

¹⁹⁸ U.S. Government Printing Office, *The Budget of the United States Government for the Fiscal Year Ending June 30 1960* (Washington, DC: U.S. GPO, 1959), 451–53, https://fraser.stlouisfed.org/files/docs/publications/usbudget/bus_1960.pdf.

¹⁹⁹ U.S. Government Printing Office, *The Budget of the United States Government for the Fiscal Year Ending June 30 1961* (Washington, DC: U.S. GPO, 1960), 441–43, https://fraser.stlouisfed.org/files/docs/publications/usbudget/bus_1961.pdf.

²⁰⁰ U.S. Government Printing Office, *The Budget of the United States Government for the Fiscal Year Ending June 30 1962* (Washington, DC: U.S. GPO, 1961), 477–79, https://fraser.stlouisfed.org/files/docs/publications/usbudget/bus_1962.pdf.

²⁰¹ U.S. Government Printing Office, *The Budget of the United States Government for the Fiscal Year Ending June 30 1963 Appendix* (Washington, DC: U.S. GPO, 1962), 225–334, https://fraser.stlouisfed.org/files/docs/publications/usbapp/bus_app_1963.pdf.

²⁰² U.S. Government Printing Office, *The Budget of the United States Government for the Fiscal Year Ending June 30 1964 Appendix* (Washington, DC: U.S. GPO, 1963), 245–356, https://fraser.stlouisfed.org/files/docs/publications/usbapp/bus_app_1964.pdf.

²⁰³ U.S. Government Printing Office, *The Budget of the United States Government for the Fiscal Year Ending June 30 1965 Appendix* (Washington, DC: U.S. GPO, 1964), 241–344, https://fraser.stlouisfed.org/files/docs/publications/usbapp/bus_app_1965.pdf.

²⁰⁴ U.S. Government Printing Office, *The Budget of the United States Government for the Fiscal Year Ending June 30 1966 Appendix* (Washington, DC: U.S. GPO, 1965), 271–370, https://fraser.stlouisfed.org/files/docs/publications/usbapp/bus_app_1966.pdf.

FY of Expense	Navy Research	Construction of Ships	Shipbuilding and Conversion	Ordnance for New Construction	Ordnance for Shipbuilding and Conversion	Increase and Replacement of Naval Vessels Construction and Machinery	Increase and Replacement of Naval Vessels Armor, Armament, and Ammunition	Increase and Replacement of Naval Vessels Emergency Construction
1965 ²⁰⁵	1293639000	0	1716540000	0	0	0	0	0
1966 ²⁰⁶	1406832000	0	1479881000	0	0	0	0	0
1967 ²⁰⁷	1791101000	0	1398415000	0	0	0	0	0
1968 ²⁰⁸	2002627000	0	1355851000	0	0	0	0	0
1969 ²⁰⁹	2045479000	0	1948758000	0	0	0	0	0
1970 ²¹⁰	2084248000	0	2065660000	0	0	0	0	0
1971 ²¹¹	2404606000	0	2113573000	0	0	0	0	0

²⁰⁵ U.S. Government Printing Office, *The Budget of the United States Government for the Fiscal Year Ending June 30 1967 Appendix* (Washington, DC: U.S. GPO, 1966), 281–382, https://fraser.stlouisfed.org/files/docs/publications/usbapp/bus_app_1967.pdf.

²⁰⁶ U.S. Government Printing Office, *The Budget of the United States Government for the Fiscal Year Ending June 30 1968 Appendix* (Washington, DC: U.S. GPO, 1967), 265–366, https://fraser.stlouisfed.org/files/docs/publications/usbapp/bus_app_1968.pdf.

²⁰⁷ U.S. Government Printing Office, *The Budget of the United States Government for the Fiscal Year Ending June 30 1969 Appendix* (Washington, DC: U.S. GPO, 1968), 273–358, https://fraser.stlouisfed.org/files/docs/publications/usbapp/bus_app_1969.pdf.

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²¹⁰ U.S. Government Printing Office, *The Budget of the United States Government for the Fiscal Year 1972 Appendix* (Washington, DC: U.S. GPO, 1971), 281–352, https://fraser.stlouisfed.org/files/docs/publications/usbapp/bus_app_1972.pdf.

²¹¹ U.S. Government Printing Office, *The Budget of the United States Government for the Fiscal Year 1973 Appendix* (Washington, DC: U.S. GPO, 1972), 279–354, https://fraser.stlouisfed.org/files/docs/publications/usbapp/bus_app_1973.pdf.

FY of Expense	Navy Research	Construction of Ships	Shipbuilding and Conversion	Ordnance for New Construction	Ordnance for Shipbuilding and Conversion	Increase and Replacement of Naval Vessels Construction and Machinery	Increase and Replacement of Naval Vessels Armor, Armament, and Ammunition	Increase and Replacement of Naval Vessels Emergency Construction
1972 ²¹²	2426633000	0	1977649000	0	0	0	0	0
1973 ²¹³	2404199000	0	1981647000	0	0	0	0	0
1974 ²¹⁴	2623433000	0	2104419000	0	0	0	0	0
1975 ²¹⁵	3020979000	0	2626530000	0	0	0	0	0
1976 ²¹⁶	3214937000	0	2606141000	0	0	0	0	0
1977 ²¹⁷	3480513000	0	2840524000	0	0	0	0	0
1978 ²¹⁸	3824871000	0	3047606000	0	0	0	0	0

²¹² U.S. Government Printing Office, *The Budget of the United States Government for the Fiscal Year 1974 Appendix* (Washington, DC: U.S. GPO, 1973), 223–66, https://fraser.stlouisfed.org/files/docs/publications/usbapp/bus_app_1974.pdf.

²¹³ U.S. Government Printing Office, *The Budget of the United States Government for the Fiscal Year 1975 Appendix* (Washington, DC: U.S. GPO, 1974), 265–356, https://fraser.stlouisfed.org/files/docs/publications/usbapp/bus_app_1975.pdf.

²¹⁴ U.S. Government Printing Office, *The Budget of the United States Government for the Fiscal Year 1976 Appendix* (Washington, DC: U.S. GPO, 1975), 267–346, https://fraser.stlouisfed.org/files/docs/publications/usbapp/bus_app_1976.pdf.

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²¹⁶ U.S. Government Printing Office, *The Budget of the United States Government for the Fiscal Year 1978 Appendix* (Washington, DC: U.S. GPO, 1977), 221–84, https://fraser.stlouisfed.org/files/docs/publications/usbapp/bus_app_1978.pdf.

²¹⁷ U.S. Government Printing Office, *The Budget of the United States Government for the Fiscal Year 1979 Appendix* (Washington, DC: U.S. GPO, 1978), 261–334, https://fraser.stlouisfed.org/files/docs/publications/usbapp/bus_app_1979.pdf.

²¹⁸ U.S. Government Printing Office, *The Budget of the United States Government for the Fiscal Year 1980 Appendix* (Washington, DC: U.S. GPO, 1979), 269–346, https://fraser.stlouisfed.org/files/docs/publications/usbapp/bus_app_1980.pdf.

FY of Expense	Navy Research	Construction of Ships	Shipbuilding and Conversion	Ordnance for New Construction	Ordnance for Shipbuilding and Conversion	Increase and Replacement of Naval Vessels Construction and Machinery	Increase and Replacement of Naval Vessels Armor, Armament, and Ammunition	Increase and Replacement of Naval Vessels Emergency Construction
1979 ²¹⁹	3826449000	0	4553451000	0	0	0	0	0
1980 ²²⁰	4381458000	0	4221833000	0	0	0	0	0
1981 ²²¹	4782911000	0	5217724000	0	0	0	0	0
1982 ²²²	5240315000	0	6738627000	0	0	0	0	0
1983 ²²³	5853891000	0	7503719000	0	0	0	0	0
1984 ²²⁴	6661712000	0	8487196000	0	0	0	0	0
1985 ²²⁵	8053596000	0	9145166000	0	0	0	0	0

²¹⁹ U.S. Government Printing Office, *The Budget of the United States Government for the Fiscal Year 1981 Appendix* (Washington, DC: U.S. GPO, 1980), 257–337, https://fraser.stlouisfed.org/files/docs/publications/usbapp/bus_app_1981.pdf.

²²⁰ U.S. Government Printing Office, *Budget of the United States Government Fiscal Year 1982 Appendix* (Washington, DC: U.S. GPO, 1981), I-G1-I-G80, https://fraser.stlouisfed.org/files/docs/publications/usbapp/bus_app_1982.pdf.

²²¹ U.S. Government Printing Office, *Budget of the United States Government Fiscal Year 1983 Appendix* (Washington, DC: U.S. GPO, 1982), I-G1-I-G80, https://fraser.stlouisfed.org/files/docs/publications/usbapp/bus_app_1983.pdf.

²²² U.S. Government Printing Office, *Budget of the United States Government Fiscal Year 1984 Appendix* (Washington, DC: U.S. GPO, 1983), I-G1-I-G73, https://fraser.stlouisfed.org/files/docs/publications/usbapp/bus_app_1984.pdf.

²²³ U.S. Government Printing Office, *Budget of the United States Government Fiscal Year 1985 Appendix* (Washington, DC: U.S. GPO, 1984), I-G1-I-G74, https://fraser.stlouisfed.org/files/docs/publications/usbapp/bus_app_1985.pdf.

²²⁴ U.S. Government Printing Office, *Budget of the United States Government Fiscal Year 1986 Appendix* (Washington, DC: U.S. GPO, 1985), I-G1-I-G65, https://fraser.stlouisfed.org/files/docs/publications/usbapp/bus_app_1986.pdf.

²²⁵ U.S. Government Printing Office, *Budget of the United States Government Fiscal Year 1987 Appendix* (Washington, DC: U.S. GPO, 1986), I-G1-I-G86, https://fraser.stlouisfed.org/files/docs/publications/usbapp/bus_app_1987.pdf.

FY of Expense	Navy Research	Construction of Ships	Shipbuilding and Conversion	Ordnance for New Construction	Ordnance for Shipbuilding and Conversion	Increase and Replacement of Naval Vessels Construction and Machinery	Increase and Replacement of Naval Vessels Armor, Armament, and Ammunition	Increase and Replacement of Naval Vessels Emergency Construction
1986 ²²⁶	9666769000	0	9500868000	0	0	0	0	0
1987 ²²⁷	9176346000	0	9315640000	0	0	0	0	0
1988 ²²⁸	8827956000	0	8877739000	0	0	0	0	0
1989 ²²⁹	9290780000	0	10586858000	0	0	0	0	0
1990 ²³⁰	9160393000	0	11016086000	0	0	0	0	0
1991 ²³¹	7586000000	0	11512000000	0	0	0	0	0
1992 ²³²	7826199000	0	11035402000	0	0	0	0	0

²²⁶ U.S. Government Printing Office, *Budget of the United States Government Fiscal Year 1988 Appendix* (Washington, DC: U.S. GPO, 1987), I-G1-I-G76, https://fraser.stlouisfed.org/files/docs/publications/usbapp/bus_app_1988.pdf.

²²⁷ U.S. Government Printing Office, *Budget of the United States Government Fiscal Year 1989 Appendix* (Washington, DC: U.S. GPO, 1988), I-G1-I-G68, https://fraser.stlouisfed.org/files/docs/publications/usbapp/bus_app_1989.pdf.

²²⁸ U.S. Government Printing Office, *Budget of the United States Government Fiscal Year 1990 Appendix* (Washington, DC: U.S. GPO, 1989), I-G1-I-G72, https://fraser.stlouisfed.org/files/docs/publications/usbapp/bus_app_1990.pdf.

²²⁹ “Budget of the United States Government for Fiscal Year 1991 Notes and Appendices” (Washington, DC: United States Publishing Office, 1990), A-186-A-194.

²³⁰ FRASER, “Budget of the United States Government for Fiscal Year 1992 Section XII,” govinfo, 1991, Part Four-59-Part Four-73, https://fraser.stlouisfed.org/files/docs/publications/usbudget/bus_1992_sec5.pdf.

²³¹ U.S. Government Printing Office, *Budget of the United States Government Fiscal Year 1993 Supplement* (Washington, DC: U.S. GPO, 1992), Part Two-19-Part Two-90, https://fraser.stlouisfed.org/files/docs/publications/bus_supp_1993/bus_supp_1993.pdf.

²³² U.S. Government Printing Office, *Budget of the United States Government Fiscal Year 1994 Appendix* (Washington, DC: U.S. GPO, 1993), Appendix-441-Appendix-509, https://fraser.stlouisfed.org/files/docs/publications/usbudget/bus_1994_sec2.pdf.

FY of Expense	Navy Research	Construction of Ships	Shipbuilding and Conversion	Ordnance for New Construction	Ordnance for Shipbuilding and Conversion	Increase and Replacement of Naval Vessels Construction and Machinery	Increase and Replacement of Naval Vessels Armor, Armament, and Ammunition	Increase and Replacement of Naval Vessels Emergency Construction
1993 ²³³	8944299000	0	10135552000	0	0	0	0	0
1994 ²³⁴	7990232000	0	9132097000	0	0	0	0	0
1995 ²³⁵	9229000000	0	8780000000	0	0	0	0	0
1996 ²³⁶	9404000000	0	7348000000	0	0	0	0	0
1997 ²³⁷	8220000000	0	7085000000	0	0	0	0	0
1998 ²³⁸	7837000000	0	6781000000	0	0	0	0	0
1999 ²³⁹	8052000000	0	6698000000	0	0	0	0	0

²³³ U.S. Government Printing Office, *Budget of the United States Government Fiscal Year 1995 Appendix* (Washington, DC: U.S. GPO, 1994), 277–342, https://fraser.stlouisfed.org/files/docs/publications/usbapp/bus_app_1995.pdf.

²³⁴ Department of Defense, “Budget of the United States Government for Fiscal Year 1996 Department of Defense-Military Appendix,” govinfo, February 1, 1995, <https://www.govinfo.gov/content/pkg/BUDGET-1996-APP/pdf/BUDGET-1996-APP-2-9.pdf>.

²³⁵ Department of Defense, “Budget of the United States Government for Fiscal Year 1997 Department of Defense-Military Appendix,” govinfo, March 1, 1996, <https://www.govinfo.gov/content/pkg/BUDGET-1997-APP/pdf/BUDGET-1997-APP-1-7.pdf>.

²³⁶ Department of Defense, “Budget of the United States Government for Fiscal Year 1998 Department of Defense-Military Appendix,” govinfo, February 1, 1997, <https://www.govinfo.gov/content/pkg/BUDGET-1998-APP/pdf/BUDGET-1998-APP-1-7.pdf>.

²³⁷ Department of Defense, “Budget of the United States Government for Fiscal Year 1999 Department of Defense-Military Appendix,” govinfo, February 2, 1998, <https://www.govinfo.gov/content/pkg/BUDGET-1999-APP/pdf/BUDGET-1999-APP.pdf>.

²³⁸ Department of Defense, “Budget of the United States Government for Fiscal Year 2000 Department of Defense-Military Appendix,” govinfo, February 1, 1999, <https://www.govinfo.gov/content/pkg/BUDGET-2000-APP/pdf/BUDGET-2000-APP-1-7.pdf>.

²³⁹ Department of Defense, “Budget of the United States Government for Fiscal Year 2001 Department of Defense-Military Appendix,” govinfo, February 7, 2000, <https://www.govinfo.gov/content/pkg/BUDGET-2001-APP/pdf/BUDGET-2001-APP-1-7.pdf>.

FY of Expense	Navy Research	Construction of Ships	Shipbuilding and Conversion	Ordnance for New Construction	Ordnance for Shipbuilding and Conversion	Increase and Replacement of Naval Vessels Construction and Machinery	Increase and Replacement of Naval Vessels Armor, Armament, and Ammunition	Increase and Replacement of Naval Vessels Emergency Construction
2000 ²⁴⁰	8857000000	0	6679000000	0	0	0	0	0
2001 ²⁴¹	9462000000	0	7115000000	0	0	0	0	0
2002 ²⁴²	10359000000	0	8286000000	0	0	0	0	0
2003 ²⁴³	12193000000	0	9455000000	0	0	0	0	0
2004 ²⁴⁴	14136000000	0	10021000000	0	0	0	0	0
2005 ²⁴⁵	16039000000	0	9949000000	0	0	0	0	0
2006 ²⁴⁶	17423000000	0	10345000000	0	0	0	0	0

²⁴⁰ Department of Defense, “Budget of the United States Government for Fiscal Year 2002 Department of Defense-Military Appendix,” govinfo, April 9, 2001, <https://www.govinfo.gov/content/pkg/BUDGET-2002-APP/pdf/BUDGET-2002-APP-1-7.pdf>.

²⁴¹ Department of Defense, “Budget of the United States Government for Fiscal Year 2003 Department of Defense-Military Appendix,” govinfo, February 4, 2002, <https://www.govinfo.gov/content/pkg/BUDGET-2003-APP/pdf/BUDGET-2003-APP-1-7.pdf>.

²⁴² Department of Defense, “Budget of the United States Government for Fiscal Year 2004 Department of Defense-Military Appendix,” govinfo, February 3, 2003, <https://www.govinfo.gov/content/pkg/BUDGET-2004-APP/pdf/BUDGET-2004-APP-1-7.pdf>.

²⁴³ Department of Defense, “Budget of the United States Government for Fiscal Year 2005 Department of Defense-Military Appendix,” govinfo, February 2, 2004, <https://www.govinfo.gov/content/pkg/BUDGET-2005-APP/pdf/BUDGET-2005-APP-1-7.pdf>.

²⁴⁴ Department of Defense, “Budget of the United States Government for Fiscal Year 2006 Department of Defense-Military Appendix,” govinfo, February 7, 2005, <https://www.govinfo.gov/content/pkg/BUDGET-2006-APP/pdf/BUDGET-2006-APP-1-7.pdf>.

²⁴⁵ Department of Defense, “Budget of the United States Government for Fiscal Year 2007 Department of Defense-Military Appendix,” govinfo, February 6, 2006, <https://www.govinfo.gov/content/pkg/BUDGET-2007-APP/pdf/BUDGET-2007-APP-1-7.pdf>.

²⁴⁶ Department of Defense, “Budget of the United States Government for Fiscal Year 2008 Department of Defense-Military Appendix,” govinfo, February 5, 2007, <https://www.govinfo.gov/content/pkg/BUDGET-2008-APP/pdf/BUDGET-2008-APP-1-7.pdf>.

FY of Expense	Navy Research	Construction of Ships	Shipbuilding and Conversion	Ordnance for New Construction	Ordnance for Shipbuilding and Conversion	Increase and Replacement of Naval Vessels Construction and Machinery	Increase and Replacement of Naval Vessels Armor, Armament, and Ammunition	Increase and Replacement of Naval Vessels Emergency Construction
2007 ²⁴⁷	18752000000	0	10485000000	0	0	0	0	0
2008 ²⁴⁸	18563000000	0	11185000000	0	0	0	0	0
2009 ²⁴⁹	19411000000	0	11312000000	0	0	0	0	0
2010 ²⁵⁰	19201000000	0	11893000000	0	0	0	0	0
2011 ²⁵¹	18196000000	0	12052000000	0	0	0	0	0
2012 ²⁵²	16805000000	0	12353000000	0	0	0	0	0
2013 ²⁵³	15555000000	0	12558000000	0	0	0	0	0

²⁴⁷ Department of Defense, “Budget of the United States Government for Fiscal Year 2009 Department of Defense-Military Appendix,” govinfo, February 4, 2008, <https://www.govinfo.gov/content/pkg/BUDGET-2009-APP/pdf/BUDGET-2009-APP-1-7.pdf>.

²⁴⁸ Department of Defense, “Budget of the United States Government for Fiscal Year 2010 Department of Defense-Military Appendix,” govinfo, February 26, 2009, <https://www.govinfo.gov/content/pkg/BUDGET-2010-APP/pdf/BUDGET-2010-APP-1-7.pdf>.

²⁴⁹ Department of Defense, “Budget of the United States Government for Fiscal Year 2011 Department of Defense-Military Appendix,” govinfo, February 1, 2010, <https://www.govinfo.gov/content/pkg/BUDGET-2011-APP/pdf/BUDGET-2011-APP-1-7.pdf>.

²⁵⁰ Department of Defense, “Budget of the United States Government for Fiscal Year 2012 Department of Defense-Military Appendix,” Department of Defense, February 14, 2011, <https://www.govinfo.gov/content/pkg/BUDGET-2012-APP/pdf/BUDGET-2012-APP-1-7.pdf>.

²⁵¹ Department of Defense, “Budget of the United States Government for Fiscal Year 2013 Department of Defense-Military Appendix,” govinfo, February 13, 2012, <https://www.govinfo.gov/content/pkg/BUDGET-2013-APP/pdf/BUDGET-2013-APP-1-7.pdf>.

²⁵² Department of Defense, “Budget of the United States Government for Fiscal Year 2014 Department of Defense-Military Appendix,” govinfo, April 10, 2013, <https://www.govinfo.gov/content/pkg/BUDGET-2014-APP/pdf/BUDGET-2014-APP-1-7.pdf>.

²⁵³ Department of Defense, “Budget of the United States Government for Fiscal Year 2015 Department of Defense-Military Appendix,” govinfo, April 4, 2014, <https://www.govinfo.gov/content/pkg/BUDGET-2015-APP/pdf/BUDGET-2015-APP-1-7.pdf>.

FY of Expense	Navy Research	Construction of Ships	Shipbuilding and Conversion	Ordnance for New Construction	Ordnance for Shipbuilding and Conversion	Increase and Replacement of Naval Vessels Construction and Machinery	Increase and Replacement of Naval Vessels Armor, Armament, and Ammunition	Increase and Replacement of Naval Vessels Emergency Construction
2014 ²⁵⁴	15496000000	0	13597000000	0	0	0	0	0
2015 ²⁵⁵	16160000000	0	13715000000	0	0	0	0	0
2016 ²⁵⁶	16755000000	0	14480000000	0	0	0	0	0
2017 ²⁵⁷	17315000000	0	14240000000	0	0	0	0	0
2018 ²⁵⁸	17502000000	0	15709000000	0	0	0	0	0

NOTES:

1) To give a true representation of dollars spent, the actual or enacted amount from the previous year's accounting balance is used instead of estimated current or future year amounts. For example, the 1956 actual, or enacted, data is taken from The Budget of the United States Government for Fiscal Year Ending June 30 1958.

2) Each column is represented by expenditures or outlays (net) applicable to column title heading.

3) The data collected for 1950 used the account estimate from The Budget of the United States Government for Fiscal Year Ending June 30 1951. This exception is made because the Military Budget in The Budget of the United States Government for Fiscal Year Ending June 30 1952 was not released to Congress with the original Budget request. It was supposed to be released later in that year, but the archives that were searched did not have a corresponding record or the Military Budget. Thus, in order to give the best estimate of the accounts the 1951 budget request is used because a portion of the 1950 budget cycle had already occurred when the 1951 budget was released reducing the forecasting error.

²⁵⁴ Department of Defense, "Budget of the United States Government for Fiscal Year 2016 Department of Defense-Military Appendix," govinfo, February 2, 2015, <https://www.govinfo.gov/content/pkg/BUDGET-2016-APP/pdf/BUDGET-2016-APP-1-7.pdf>.

²⁵⁵ Department of Defense, "Budget of the United States Government for Fiscal Year 2017 Department of Defense-Military Appendix," govinfo, February 9, 2016, <https://www.govinfo.gov/content/pkg/BUDGET-2017-APP/pdf/BUDGET-2017-APP-1-7.pdf>.

²⁵⁶ Department of Defense, "Budget of the United States Government for Fiscal Year 2018 Department of Defense-Military Appendix," govinfo, May 23, 2017, <https://www.govinfo.gov/content/pkg/BUDGET-2018-APP/pdf/BUDGET-2018-APP-1-7.pdf>.

²⁵⁷ Department of Defense, "Budget of the United States Government for Fiscal Year 2019 Department of Defense-Military Appendix," govinfo, February 12, 2018, <https://www.govinfo.gov/content/pkg/BUDGET-2019-APP/pdf/BUDGET-2019-APP-1-7.pdf>.

²⁵⁸ Department of Defense, "Budget of the United States Government for Fiscal Year 2020 Department of Defense-Military Appendix," govinfo, 2019, <https://www.govinfo.gov/content/pkg/BUDGET-2020-APP/pdf/BUDGET-2020-APP-1-7.pdf>.

Table 3. Total U.S. Research and Development and Shipbuilding
Expenditure in 2018 Dollars²⁵⁹

Date	Navy Research And Development	Total for Shipbuilding Accounts
1945	0.00	111857730785.01
1946	0.00	27510150293.20
1947	148924921.05	8040610282.22
1948	401874306.74	3213845725.85
1949	516010679.46	3405843548.17
1950	504254703.94	4109440350.14
1951	528786542.34	4062679746.89
1952	696812959.89	5160442575.70
1953	653312997.01	8333202491.89
1954	713524011.62	8597618611.89
1955	4687273480.87	9505161010.06
1956	4557179476.62	9666216765.37
1957	5133779581.73	9213238409.30
1958	5914355476.64	17773838579.41
1959	7549802160.26	17413309233.49
1960	7146703866.06	12707390525.59
1961	10990879836.19	17597896147.97
1962	11835021605.83	17879166098.35
1963	12870611101.55	22969604396.25
1964	14025504254.44	18556744294.49
1965	11318093128.65	15018068857.74
1966	11949924920.81	12570418388.08
1967	14799597361.48	11554892183.22
1968	15865201140.11	10741315697.34
1969	15359889128.22	14633592824.83
1970	14793017854.67	14661088921.13
1971	16363153558.55	14382697022.38
1972	15985523282.28	13027826677.41
1973	14913124842.30	12292056150.25
1974	14647184752.46	11749419135.00
1975	15459916292.72	13441316189.33
1976	15565279063.23	12617762632.09
1977	15822609027.85	12913182822.83
1978	16159925631.85	12876012371.44

²⁵⁹ Table 3 column Total for Shipbuilding Accounts is the sum of Table 2 Construction of Ships; Shipbuilding and Conversion; Ordnance for New Construction; Ordnance for Shipbuilding and Conversion; Increase and Replacement of Naval Vessels Construction and Machinery; Increase and Replacement of Naval Vessels Armor, Armament, and Ammunition; and Increase and Replacement of Naval Vessels Emergency Construction that has been adjusted for inflation to 2018 dollars. Table 3 column Navy Research and Development is the Table 2 Navy Research column adjusted for inflation to 2018 dollars. The inflation rate and the inflation adjustment equation are adopted from Federal Reserve Bank of Minneapolis, “Consumer Price Index, 1913-”; “CPI Calculator Information,” Federal Reserve Bank of Minneapolis, 2019, <https://www.minneapolisfed.org/community/financial-and-economic-education/cpi-calculator-information>. The equation is shown in the Table 3 Notes section.

Date	Navy Research And Development	Total for Shipbuilding Accounts
1979	14525240447.59	17284947647.63
1980	14653797726.64	14119931497.15
1981	14502682079.65	15821116544.16
1982	14976076048.89	19258038957.03
1983	16210842168.42	20779615538.66
1984	17687338634.80	22534133825.05
1985	20659800694.29	23459993135.52
1986	24335677663.53	23918028988.98
1987	22276816517.48	22614971473.71
1988	20586986401.07	20703081445.49
1989	20673952374.02	23558000305.95
1990	19339481684.88	23257232897.77
1991	15370069936.64	23324577525.79
1992	15394892733.94	21707706393.10
1993	17081848458.69	19356906931.35
1994	14873068717.70	16998543498.82
1995	16711011050.58	16535548150.61
1996	16547992908.19	12930099095.00
1997	14139331914.80	12187003238.00
1998	13268236706.17	11480402335.66
1999	13338783830.89	11095774229.92
2000	14189875143.07	10700482791.08
2001	14746255638.52	11088523448.33
2002	21683612787.89	15371497152.48
2003	18282687956.48	14177217635.41
2004	20638853390.41	14630867984.25
2005	22647265848.04	14048110725.24
2006	23838653992.52	14154329079.53
2007	24933945911.65	13941575452.41
2008	23779035205.19	14327883896.46
2009	24965176244.92	14548764807.71
2010	24306188769.02	15055127494.92
2011	22319746086.85	14783335889.13
2012	20189524760.72	14840892553.95
2013	18411600913.58	14864216282.40
2014	18052919141.17	15840574442.60
2015	17114984120.32	14525495495.68
2016	17517419520.00	15138897920.00
2017	17730560000.00	14581760000.00
2018	17502000000.00	15709000000.00

NOTES

1) Using the basic formula $Value_{T+1} = Value_T \left(\frac{CPI - U_{T+1}}{CPI - U_T} \right)$, where $\left(\frac{CPI - U_{T+1}}{CPI - U_T} \right)$ is the average annual inflation rate and T is defined by year, each year's Shipbuilding and Conversion and Navy Research and Development account data is converted into 2018 constant dollars.

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APPENDIX C. CHAPTER V DATA TABLES

Table 4. Shipbuilding and Conversion Congressional Account
Appropriations and Presidential Budget Request Comparison

Year	Shipbuilding and Conversion NDAA Appropriation	Shipbuilding and Conversion Requested (net BA)	Percent Difference
1962	41600000 ²⁶⁰	182500000 ²⁶¹	-97.72
1963	2979200000 ²⁶²	2982000000 ²⁶³	-0.09
1964	2159600000 ²⁶⁴	2310000000 ²⁶⁵	-6.51
1965	1966000000 ²⁶⁶	1966000000 ²⁶⁷	0.00
1966	1721000000 ²⁶⁸	1501100000 ²⁶⁹	14.65
1967	1921800000 ²⁷⁰	1751300000 ²⁷¹	9.74
1968	1605900000 ²⁷²	1824000000 ²⁷³	-11.96

²⁶⁰ “Armed Forces Appropriation Authorization, 1962,” Pub. L. No. 87–53, 75 Stat. 94 (1961), [https://congressional.proquest.com/congressional/result/pqpresultpage.gispdfhitspanel.pdflink/\\$2fapp-bin\\$2fgis-publiclaw\\$2f5\\$2fb\\$2fa\\$2fc\\$2fpl87-53.pdf/entitlementkeys=1234%7Capp-gis%7Cpubliclaw%7C87_pl_53](https://congressional.proquest.com/congressional/result/pqpresultpage.gispdfhitspanel.pdflink/$2fapp-bin$2fgis-publiclaw$2f5$2fb$2fa$2fc$2fpl87-53.pdf/entitlementkeys=1234%7Capp-gis%7Cpubliclaw%7C87_pl_53).

²⁶¹ U.S. Government Printing Office, *USG Budget FY Ending June 30, 1962*, 477–79.

²⁶² “Armed Forces Appropriation Authorization, 1963,” Pub. L. No. 87–436, 76 Stat. 55 (1962), [https://congressional.proquest.com/congressional/result/pqpresultpage.gispdfhitspanel.pdflink/\\$2fapp-bin\\$2fgis-publiclaw\\$2fc\\$2fd\\$2f3\\$2fe\\$2fpl87-436.pdf/entitlementkeys=1234%7Capp-gis%7Cpubliclaw%7C87_pl_436](https://congressional.proquest.com/congressional/result/pqpresultpage.gispdfhitspanel.pdflink/$2fapp-bin$2fgis-publiclaw$2fc$2fd$2f3$2fe$2fpl87-436.pdf/entitlementkeys=1234%7Capp-gis%7Cpubliclaw%7C87_pl_436).

²⁶³ U.S. Government Printing Office, *USG Budget FY Ending June 30, 1963, Appendix*, 225–334.

²⁶⁴ “Armed Forces Appropriation Authorization, 1964,” Pub. L. No. 88–28, 77 Stat. 48 (1963), [https://congressional.proquest.com/congressional/result/pqpresultpage.gispdfhitspanel.pdflink/\\$2fapp-bin\\$2fgis-publiclaw\\$2f7\\$2ff\\$2fd\\$2f1\\$2fpl88-28.pdf/entitlementkeys=1234%7Capp-gis%7Cpubliclaw%7C88_pl_28](https://congressional.proquest.com/congressional/result/pqpresultpage.gispdfhitspanel.pdflink/$2fapp-bin$2fgis-publiclaw$2f7$2ff$2fd$2f1$2fpl88-28.pdf/entitlementkeys=1234%7Capp-gis%7Cpubliclaw%7C88_pl_28).

²⁶⁵ U.S. Government Printing Office, *USG Budget FY Ending June 30, 1964, Appendix*, 245–366.

²⁶⁶ “Armed Forces Appropriation Authorization, 1965,” Pub. L. No. 88–288, 78 Stat. 167 (1964), https://congressional.proquest.com/congressional/result/congresultpage.pdfevent?rsId=16DA74323A0&pdf=/app-bin/gis-publiclaw/8/6/1/0/pl88-288.pdf&uri=/app-gis/publiclaw/88_pl_288.

²⁶⁷ U.S. Government Printing Office, *USG Budget FY Ending June 30, 1965, Appendix*, 241–344.

²⁶⁸ “Armed Forces Appropriation Authorization, 1966,” Pub. L. No. 89–37, 79 Stat. 127 (1965), <https://uscode.house.gov/statutes/pl/89/37.pdf>.

²⁶⁹ U.S. Government Printing Office, *USG Budget FY Ending June 30, 1966, Appendix*, 271–370.

²⁷⁰ “Armed Forces Appropriation Authorization, 1967,” Pub. L. No. 89–501, 80 Stat. 275 (1966), [https://congressional.proquest.com/congressional/result/pqpresultpage.gispdfhitspanel.pdflink/\\$2fapp-bin\\$2fgis-publiclaw\\$2f9\\$2f0\\$2f1\\$2f3\\$2fpl89-501.pdf/entitlementkeys=1234%7Capp-gis%7Cpubliclaw%7C89_pl_501](https://congressional.proquest.com/congressional/result/pqpresultpage.gispdfhitspanel.pdflink/$2fapp-bin$2fgis-publiclaw$2f9$2f0$2f1$2f3$2fpl89-501.pdf/entitlementkeys=1234%7Capp-gis%7Cpubliclaw%7C89_pl_501).

²⁷¹ U.S. Government Printing Office, *USG Budget FY Ending June 30, 1967, Appendix*, 281–382.

²⁷² “Armed Forces Appropriation Authorization, 1968,” Pub. L. No. 90–22, 81 Stat. 52 (1967), https://congressional.proquest.com/congressional/result/congresultpage.pdfevent?rsId=16DA74323A0&pdf=/app-bin/gis-publiclaw/9/0/8/7/pl90-22.pdf&uri=/app-gis/publiclaw/90_pl_22.

²⁷³ U.S. Government Printing Office, *USG Budget FY Ending June 30, 1968, Appendix*, 265–366.

Year	Shipbuilding and Conversion NDAA Appropriation	Shipbuilding and Conversion Requested (net BA)	Percent Difference
1969	160400000 ²⁷⁴	171230000 ²⁷⁵	-6.32
1970	298320000 ²⁷⁶	269830000 ²⁷⁷	10.56
1971	271190000 ²⁷⁸	257890000 ²⁷⁹	5.16
1972	306710000 ²⁸⁰	332890000 ²⁸¹	-7.86
1973	317920000 ²⁸²	356430000 ²⁸³	-10.80
1974	373700000 ²⁸⁴	390180000 ²⁸⁵	-4.22
1975	315640000 ²⁸⁶	356260000 ²⁸⁶	-11.40
1976	389940000 ²⁸⁷	544600000 ²⁸⁸	-28.40
1977	665500000 ²⁸⁹	628950000 ²⁹⁰	5.81
1978	619120000 ²⁹¹	649320000 ²⁹²	-4.65

²⁷⁴ “Armed Forces Appropriation Authorization 1969,” Pub. L. No. 90–500, 82 Stat. 849 (1968), https://congressional.proquest.com/congressional/result/congresultpage:pdfevent?rsId=16DA74323A0&pdf=/app-bin/gis-publiclaw/9/4/9/7/pl90-500.pdf&uri=/app-gis/publiclaw/90_pl_500.

²⁷⁵ U.S. Government Printing Office, *USG Budget FY Ending 1969, Appendix*, 273–358.

²⁷⁶ Armed Forces Appropriation Authorization, 1970.

²⁷⁷ U.S. Government Printing Office, *USG Budget FY 1970, Appendix*, 257–340.

²⁷⁸ Armed Forces Appropriation Authorization, 1971.

²⁷⁹ U.S. Government Printing Office, *USG Budget FY 1971, Appendix*, 265–336.

²⁸⁰ “Armed Forces Appropriation Authorization, 1972,” Pub. L. No. 92–156, 85 Stat. 423 (1971), [https://congressional.proquest.com/congressional/result/pqpresultpage.gispdfhitspanel.pdfink/\\$2fapp-bin\\$2fgis-publiclaw\\$2ff\\$2f2\\$2ff\\$2f6\\$2fpl92-156.pdf/entitlementkeys=1234%7Capp-gis%7Cpubliclaw%7C92_pl_156](https://congressional.proquest.com/congressional/result/pqpresultpage.gispdfhitspanel.pdfink/$2fapp-bin$2fgis-publiclaw$2ff$2f2$2ff$2f6$2fpl92-156.pdf/entitlementkeys=1234%7Capp-gis%7Cpubliclaw%7C92_pl_156).

²⁸¹ U.S. Government Printing Office, *USG Budget FY 1972, Appendix*, 281–352.

²⁸² “Armed Forces Appropriations Authorization, 1973,” Pub. L. No. 92–436, 86 Stat. 734 (1972), <https://uscode.house.gov/statutes/pl/92/436.pdf>.

²⁸³ U.S. Government Printing Office, *USG Budget FY 1973, Appendix*, 279–354.

²⁸⁴ “Department of Defense Appropriations Authorization Act, 1974,” Pub. L. No. 93–155, 87 Stat. 605 (1973), <https://www.govinfo.gov/content/pkg/STATUTE-87/pdf/STATUTE-87-Pg605.pdf>.

²⁸⁵ U.S. Government Printing Office, *USG Budget FY 1974, Appendix*, 223–66.

²⁸⁶ U.S. Government Printing Office, *USG Budget FY 1975, Appendix*, 265–356.

²⁸⁷ “Department of Defense Appropriations Authorization Act, 1976,” Pub. L. No. 94–106, 89 Stat. 531 (1975), <https://www.govinfo.gov/content/pkg/STATUTE-89/pdf/STATUTE-89-Pg531.pdf>.

²⁸⁸ U.S. Government Printing Office, *USG Budget FY 1976, Appendix*, 267–346.

²⁸⁹ “Department of Defense Appropriations Authorization Act, 1977,” Pub. L. No. 94–361, 90 Stat. 923 (1976), <https://uscode.house.gov/statutes/pl/94/361.pdf>.

²⁹⁰ U.S. Government Printing Office, *USG Budget FY 1977, Appendix*, 231–98.

²⁹¹ “Department of Defense Appropriations Authorization Act, 1978,” Pub. L. No. 95–79, 91 Stat. 323 (1977), <https://uscode.house.gov/statutes/pl/95/79.pdf>.

²⁹² U.S. Government Printing Office, *USG Budget FY 1978, Appendix*, 221–84.

Year	Shipbuilding and Conversion NDAA Appropriation	Shipbuilding and Conversion Requested (net BA)	Percent Difference
1979	4470500000 ²⁹³	4712400000 ²⁹⁴	-5.13
1980	6706800000 ²⁹⁵	6173800000 ²⁹⁶	8.63
1981	8363200000 ²⁹⁷	6118400000 ²⁹⁸	36.69
1982	8795900000 ²⁹⁹	6639600000 ³⁰⁰	32.48
1983	14393000000 ³⁰¹	18648300000 ³⁰²	-22.82
1984	12045400000 ³⁰³	12698800000 ³⁰⁴	-5.15
1985	12153400000 ³⁰⁵	13141900000 ³⁰⁶	-7.52
1986	10001200000 ³⁰⁷	11411600000 ³⁰⁸	-12.36
1987	10607100000 ³⁰⁹	11046200000 ³¹⁰	-3.98
1988	9530427000 ³¹¹	11065355000 ³¹²	-13.87

²⁹³ “Department of Defense Appropriation Authorization Act, 1979,” Pub. L. No. 95–485, 92 Stat. 1611 (1978), <https://uscode.house.gov/statutes/pl/95/485.pdf>.

²⁹⁴ U.S. Government Printing Office, *USG Budget FY 1979, Appendix*, 261–334.

²⁹⁵ “Department of Defense Authorization Act, 1980,” Pub. L. No. 96–107, 93 Stat. 803 (1979), <https://uscode.house.gov/statutes/pl/96/107.pdf>.

²⁹⁶ U.S. Government Printing Office, *USG Budget FY 1980, Appendix*, 269–346.

²⁹⁷ “Department of Defense Appropriations Authorization Act, 1981,” Pub. L. No. 96–342, 94 Stat. 1077 (1980), <https://uscode.house.gov/statutes/pl/96/342.pdf>.

²⁹⁸ U.S. Government Printing Office, *USG Budget FY 1981, Appendix*, 257–337.

²⁹⁹ Department of Defense Appropriations Authorization Act, 1982.

³⁰⁰ U.S. Government Printing Office, *USG Budget FY 1982, Appendix*, I-G1-I-G80.

³⁰¹ Department of Defense Appropriations Authorization Act, 1983.

³⁰² U.S. Government Printing Office, *USG Budget FY 1983, Appendix*, I-G1-I-G80.

³⁰³ “Department of Defense Appropriations Authorization Act, 1984,” Pub. L. No. 98–94, 97 Stat. 614 (1983), <https://www.govinfo.gov/content/pkg/STATUTE-97/pdf/STATUTE-97-Pg614.pdf>.

³⁰⁴ U.S. Government Printing Office, *USG Budget FY 1985, Appendix*, I-G1-I-G73.

³⁰⁵ “Department of Defense Appropriations Authorization Act, 1985,” Pub. L. No. 98–525, 98 Stat. 2492 (1984), <https://www.govinfo.gov/content/pkg/STATUTE-98/pdf/STATUTE-98-Pg2492.pdf>.

³⁰⁶ U.S. Government Printing Office, *USG Budget FY 1985, Appendix*, I-G1-I-G74.

³⁰⁷ Department of Defense Authorization Act, 1986.

³⁰⁸ U.S. Government Printing Office, *USG Budget FY 1986, Appendix*, I-G1-I-G65.

³⁰⁹ “National Defense Authorization Act for Fiscal Year 1987,” Pub. L. No. 99–661, 100 Stat. 3816 (1986), https://congressional.proquest.com/congressional/result/congresultpage:pdfevent?rsId=16DA7170AF6&pdf=/app-bin/gis-publiclaw/8/a/5/4/pl99-661.pdf&uri=/app-gis/publiclaw/99_pl_661.

³¹⁰ U.S. Government Printing Office, *USG Budget FY 1987, Appendix*, I-G1-I-G86.

³¹¹ National Defense Authorization Act for Fiscal Years 1988 and 1989.

³¹² U.S. Government Printing Office, *USG Budget FY 1988, Appendix*, I-G1-I-G76.

Year	Shipbuilding and Conversion NDAA Appropriation	Shipbuilding and Conversion Requested (net BA)	Percent Difference
1989	9056100000 ³¹³	9130100000 ³¹⁴	-0.81
1990	10958400000 ³¹⁵	10419600000 ³¹⁶	5.17
1991	9414800000 ³¹⁷	10602802000 ³¹⁸	-11.20
1992	8365790000 ³¹⁹	8297900000 ³²⁰	0.82
1993	5958663000 ³²¹	3444000000 ³²²	73.02
1994	4265102000 ³²³	4294742000 ³²⁴	-0.69
1995	5619897000 ³²⁵	5585397000 ³²⁶	0.62
1996	6643958000 ³²⁷	5051935000 ³²⁸	31.51
1997	6193330000 ³²⁹	4912000000 ³³⁰	26.09

³¹³ National Defense Authorization Act for Fiscal Year 1989.

³¹⁴ U.S. Government Printing Office, *USG Budget FY 1989, Appendix*, I-G1-I-G68.

³¹⁵ National Defense Authorization Act for Fiscal Years 1990 and 1991.

³¹⁶ U.S. Government Printing Office, *USG Budget FY 1990, Appendix*, I-G1-I-G72.

³¹⁷ “National Defense Authorization Act for Fiscal Year 1991,” Pub. L. No. 101–510, 104 Stat. 1485 (1990), https://congressional.proquest.com/congressional/result/congresultpage:pdfevent?rsId=16DA7170AF6&pdf=/app-bin/gis-publiclaw/6/c/d/a/pl101-510.pdf&uri=/app-gis/publiclaw/101_pl_510.

³¹⁸ United States Publishing Office, “Budget of the United States Government for Fiscal Year 1991 Notes and Appendices,” A-186-A-194.

³¹⁹ National Defense Authorization Act for Fiscal Year 1992 and 1993.

³²⁰ FRASER, “Budget of the United States Government for Fiscal Year 1992 Section XII,” PART FOUR-59-PART FOUR-73.

³²¹ “National Defense Authorization Act for Fiscal Year 1993,” Pub. L. No. 102–484, 106 Stat. 2315 (1992), [https://congressional.proquest.com/congressional/result/pqpresultpage.gispdfhitspanel.pdfink/\\$2fapp-bin\\$2fgis-publiclaw\\$2f7\\$2fd\\$2fe\\$2f8\\$2fpl102-484.pdf/entitlementkeys=1234%7Capp-gis%7Cpubliclaw%7C102_pl_484](https://congressional.proquest.com/congressional/result/pqpresultpage.gispdfhitspanel.pdfink/$2fapp-bin$2fgis-publiclaw$2f7$2fd$2fe$2f8$2fpl102-484.pdf/entitlementkeys=1234%7Capp-gis%7Cpubliclaw%7C102_pl_484).

³²² U.S. Government Printing Office, *USG Budget FY 1993 Supplement*, PART TWO-19-PART TWO-90.

³²³ Ronald Dellums, “National Defense Authorization Act for Fiscal Year 1994,” Pub. L. No. 103–357, 1 (1993), <https://www.congress.gov/103/bills/hr2401/BILLS-103hr2401enr.pdf>.

³²⁴ U.S. Government Printing Office, *USG Budget FY 1994, Appendix*, APPENDIX-441-APPENDIX-509.

³²⁵ Sam Nunn, “National Defense Authorization Act for Fiscal Year 1995,” Pub. L. No. 103–337, 1 (1994), <https://www.congress.gov/103/bills/s2182/BILLS-103s2182enr.pdf>.

³²⁶ U.S. Government Printing Office, *USG Budget FY 1995, Appendix*, 277–342.

³²⁷ Thurmond, National Defense Authorization Act for Fiscal Year 1996.

³²⁸ Department of Defense, “Budget of the United States Government for Fiscal Year 1996 Department of Defense-Military Appendix.”

³²⁹ Spence, National Defense Authorization Act for Fiscal Year 1997.

³³⁰ Department of Defense, “Budget of the United States Government for Fiscal Year 1997 Department of Defense-Military Appendix.”

Year	Shipbuilding and Conversion NDAA Appropriation	Shipbuilding and Conversion Requested (net BA)	Percent Difference
1998	8195269000 ³³¹	7438000000 ³³²	10.18
1999	6033480000 ³³³	6253000000 ³³⁴	-3.51
2000	7016454000 ³³⁵	6678000000 ³³⁶	5.07
2001	12826919000 ³³⁷	12297000000 ³³⁸	4.31
2002	9370972000 ³³⁹	7817000000 ³⁴⁰	19.88
2003	9111023000 ³⁴¹	8191000000 ³⁴²	11.23
2004	11729984000 ³⁴³	11439000000 ³⁴⁴	2.54
2005	10116827000 ³⁴⁵	9962000000 ³⁴⁶	1.55

³³¹ Spence, National Defense Authorization Act for Fiscal Year 1998.

³³² Department of Defense, “Budget of the United States Government for Fiscal Year 1998 Department of Defense-Military Appendix.”

³³³ Floyd Spence, “Strom Thurmond National Defense Authorization Act for Fiscal Year 1999,” Pub. L. No. 105–532, 112 Stat. 1920 (1998), <https://www.congress.gov/105/plaws/publ261/PLAW-105publ261.pdf>.

³³⁴ Department of Defense, “Budget of the United States Government for Fiscal Year 1999 Department of Defense-Military Appendix.”

³³⁵ John Warner, “National Defense Authorization Act for Fiscal Year 2000,” Pub. L. No. 106–50, 113 Stat. 512 (1999), <https://www.congress.gov/106/plaws/publ65/PLAW-106publ65.pdf>.

³³⁶ Department of Defense, “Budget of the United States Government for Fiscal Year 2000 Department of Defense-Military Appendix.”

³³⁷ Floyd Spence, “National Defense Authorization Act for Fiscal Year 2001,” Pub. L. No. 106–616, 114 Stat. 1654 (2000), <https://www.congress.gov/106/plaws/publ398/PLAW-106publ398.pdf>.

³³⁸ Department of Defense, “Budget of the United States Government for Fiscal Year 2001 Department of Defense-Military Appendix.”

³³⁹ Carl Levin, “National Defense Authorization Act for Fiscal Year 2002,” Pub. L. No. 107–333, 115 Stat. 1012 (2001), <https://www.congress.gov/107/plaws/publ107/PLAW-107publ107.pdf>.

³⁴⁰ Department of Defense, “Budget of the United States Government for Fiscal Year 2002 Department of Defense-Military Appendix.”

³⁴¹ Bob Stump, “Bob Stump National Defense Authorization Act for Fiscal Year 2003,” Pub. L. No. 107–436, 116 Stat. 2458 (2002), <https://www.congress.gov/107/plaws/publ314/PLAW-107publ314.pdf>.

³⁴² Department of Defense, “Budget of the United States Government for Fiscal Year 2003 Department of Defense-Military Appendix.”

³⁴³ Hunter, National Defense Authorization Act for Fiscal Year 2004.

³⁴⁴ Department of Defense, “Budget of the United States Government for Fiscal Year 2004 Department of Defense-Military Appendix.”

³⁴⁵ Hunter Duncan, “Ronald W. Reagan National Defense Authorization Act for Fiscal Year 2005,” Pub. L. No. 108–491, 118 Stat. 1811 (2004), <https://www.congress.gov/108/plaws/publ375/PLAW-108publ375.pdf>.

³⁴⁶ Department of Defense, “Budget of the United States Government for Fiscal Year 2005 Department of Defense-Military Appendix.”

Year	Shipbuilding and Conversion NDAA Appropriation	Shipbuilding and Conversion Requested (net BA)	Percent Difference
2006	8880623000 ³⁴⁷	8721000000 ³⁴⁸	1.83
2007	11021553000 ³⁴⁹	10579000000 ³⁵⁰	4.18
2008	13596120000 ³⁵¹	13656000000 ³⁵²	-0.44
2009	14057022000 ³⁵³	12733000000 ³⁵⁴	10.40
2010	13776867000 ³⁵⁵	13777000000 ³⁵⁶	0.00
2011	15724520000 ³⁵⁷	15725000000 ³⁵⁸	0.00
2012	14919114000 ³⁵⁹	14929000000 ³⁶⁰	-0.07
2013	14258524000 ³⁶¹	13580000000 ³⁶²	5.00

³⁴⁷ Hunter, National Defense Authorization Act for Fiscal Year 2006.

³⁴⁸ Department of Defense, “Budget of the United States Government for Fiscal Year 2006 Department of Defense-Military Appendix.”

³⁴⁹ Hunter, John Warner National Defense Authorization Act for Fiscal Year 2007.

³⁵⁰ Department of Defense, “Budget of the United States Government for Fiscal Year 2007 Department of Defense-Military Appendix.”

³⁵¹ Ike Skelton, “National Defense Authorization Act for Fiscal Year 2008,” Pub. L. No. 110–181, 122 Stat. 3 (2008), <https://www.congress.gov/110/plaws/publ181/PLAW-110publ181.pdf>.

³⁵² Department of Defense, “Budget of the United States Government for Fiscal Year 2008 Department of Defense-Military Appendix.”

³⁵³ Levin, Duncan Hunter National Defense Authorization Act for Fiscal Year 2009.

³⁵⁴ Department of Defense, “Budget of the United States Government for Fiscal Year 2009 Department of Defense-Military Appendix.”

³⁵⁵ Skelton, National Defense Authorization Act for Fiscal Year 2010.

³⁵⁶ Department of Defense, “Budget of the United States Government for Fiscal Year 2010 Department of Defense-Military Appendix.”

³⁵⁷ Ike Skelton, “Ike Skelton National Defense Authorization Act for Fiscal Year 2011,” Pub. L. No. 111–383, 124 Stat. 4137 (2011), <https://www.congress.gov/111/plaws/publ383/PLAW-111publ383.pdf>.

³⁵⁸ Department of Defense, “Budget of the United States Government for Fiscal Year 2011 Department of Defense-Military Appendix.”

³⁵⁹ Howard McKeon, “National Defense Authorization Act for Fiscal Year 2012,” Pub. L. No. 112–78, 126 Stat. 1298 (2011), <https://www.congress.gov/112/plaws/publ81/PLAW-112publ81.pdf>.

³⁶⁰ Department of Defense, “Budget of the United States Government for Fiscal Year 2012 Department of Defense-Military Appendix.”

³⁶¹ McKeon, National Defense Authorization Act for Fiscal Year 2013.

³⁶² Department of Defense, “Budget of the United States Government for Fiscal Year 2013 Department of Defense-Military Appendix.”

Year	Shipbuilding and Conversion NDAA Appropriation	Shipbuilding and Conversion Requested (net BA)	Percent Difference
2014	14734033000 ³⁶³	14078000000 ³⁶⁴	4.66
2015	15654635000 ³⁶⁵	14401000000 ³⁶⁶	8.71
2016	17449550000 ³⁶⁷	16597000000 ³⁶⁸	5.14
2017	18880570000 ³⁶⁹	18355000000 ³⁷⁰	2.86
2018	26180384000 ³⁷¹	19904000000 ³⁷²	31.53
2019	24051698000 ³⁷³	21871000000 ³⁷⁴	9.97

³⁶³ Theodore Deutch, “National Defense Authorization Act for Fiscal Year 2014,” Pub. L. No. 113–66, 127 Stat. 672 (2013), <https://www.congress.gov/113/plaws/publ66/PLAW-113publ66.pdf>.

³⁶⁴ Department of Defense, “Budget of the United States Government for Fiscal Year 2014 Department of Defense-Military Appendix.”

³⁶⁵ Lou Barletta, “Carl Levin and Howard P. ‘Buck’ McKeon National Defense Authorization Act for Fiscal Year 2015,” Pub. L. No. 113–291, 128 Stat. 3292 (2014), <https://www.congress.gov/113/plaws/publ291/PLAW-113publ291.pdf>.

³⁶⁶ Department of Defense, “Budget of the United States Government for Fiscal Year 2015 Department of Defense-Military Appendix.”

³⁶⁷ Johnson, National Defense Authorization Act for Fiscal Year 2016.

³⁶⁸ Department of Defense, “Budget of the United States Government for Fiscal Year 2016 Department of Defense-Military Appendix.”

³⁶⁹ McCain, National Defense Authorization Act for Fiscal Year 2017.

³⁷⁰ Department of Defense, “Budget of the United States Government for Fiscal Year 2017 Department of Defense-Military Appendix.”

³⁷¹ Mac Thornberry, “National Defense Authorization Act for Fiscal Year 2018,” Pub. L. No. 115–91, 128 Stat. 3292 (2017), <https://www.congress.gov/115/plaws/publ91/PLAW-115publ91.pdf>.

³⁷² Department of Defense, “Budget of the United States Government for Fiscal Year 2018 Department of Defense-Military Appendix.”

³⁷³ Thornberry, John S. McCain National Defense Authorization Act for Fiscal Year 2019.

³⁷⁴ Department of Defense, “Budget of the United States Government for Fiscal Year 2019 Department of Defense-Military Appendix.”

Table 5. Comparing Congressional Party Majority and Appropriations Committee Membership to Changes to the Proposed Budget by Congress³⁷⁵

Year	Majority Party		Percentage of Members of the Appropriations Committee from States with Active Shipbuilding Facilities		Percentage of Members of the Appropriations Subcommittee of Defense from States with Active Shipbuilding Facilities		Chair of the Appropriations Committee from a State with Active Shipbuilding Facilities		Ranking Member of the Appropriations Committee from a State with Active Shipbuilding Facilities		Chair of the Appropriations Subcommittee of Defense from a State with Active Shipbuilding Facilities		Percent Difference Between Appropriation and Budget Request
	House	Senate	House	Senate	House	Senate	House	Senate	House	Senate	House	Senate	
1961	D	D	22	22	21	13	No	No	No	No	No	No	-97.72
1962	D	D	22	24	21	27	No	No	No	No	No	No	-0.09
1963	D	D	26	24	33	29	No	No	No	No	No	No	-6.51
1964	D	D	26	26	33	29	No	No	No	No	No	No	0.00
1965	D	D	23	22	22	29	No	No	No	No	No	No	14.65
1966	D	D	23	22	22	29	No	No	No	No	No	No	9.74
1967	D	D	25	22	18	27	No	No	No	No	No	No	-11.96
1698	D	D	25	22	18	27	No	No	No	No	No	No	-6.32
1969	D	D	21	15	18	25	No	No	No	No	No	No	10.56
1970	D	D	21	15	18	25	No	No	No	No	No	No	5.16
1971	D	D	21	14	18	23	No	No	No	No	No	No	-7.86
1972	D	D	21	11	18	23	No	No	No	No	No	No	-10.80
1973	D	D	19	7	25	15	No	No	No	No	No	No	-4.22
1974	D	D	19	7	25	15	No	No	No	No	No	No	-11.40
1975	D	D	20	7	25	13	No	No	Yes	No	No	No	-28.40
1976	D	D	20	7	25	13	No	No	Yes	No	No	No	5.81
1977	D	D	18	11	25	15	No	No	No	No	No	No	-4.65
1978	D	D	18	16	25	15	No	Yes	No	No	No	No	-5.13
1979	D	D	18	14	30	22	Yes	Yes	No	No	No	Yes	8.63
1980	D	D	18	14	30	22	Yes	Yes	No	No	No	Yes	36.69
1981	D	R	22	14	18	18	Yes	No	No	No	No	No	32.48
1982	D	R	22	14	18	18	Yes	No	No	No	No	No	-22.82
1983	D	R	21	14	18	24	Yes	No	No	Yes	No	No	-5.15
1984	D	R	21	14	18	24	Yes	No	No	Yes	No	No	-7.52

Year	Majority Party		Percentage of Members of the Appropriations Committee from States with Active Shipbuilding Facilities		Percentage of Members of the Appropriations Subcommittee of Defense from States with Active Shipbuilding Facilities		Chair of the Appropriations Committee from a State with Active Shipbuilding Facilities		Ranking Member of the Appropriations Committee from a State with Active Shipbuilding Facilities		Chair of the Appropriations Subcommittee of Defense from a State with Active Shipbuilding Facilities		Percent Difference Between Appropriation and Budget Request
	House	Senate	House	Senate	House	Senate	House	Senate	House	Senate	House	Senate	
1985	D	R	19	14	20	24	Yes	No	No	Yes	No	No	-12.36
1986	D	R	19	14	20	24	Yes	No	No	Yes	No	No	-3.98

³⁷⁵ Adapted from Table 4 and U.S. Government Printing Office, *Committee On Appropriations United States Senate: 1867–2008* (Washington, DC: U.S. GPO, 2008), <https://www.govinfo.gov/content/pkg/CDOC-110sdoc14/pdf/CDOC-110sdoc14.pdf>; U.S. Government Printing Office, *A Concise History of the House of Representatives Committee on Appropriations* (Washington, DC: U.S. GPO, 2010), https://permanent.access.gpo.gov/gpo13071/House_Approps_Concise_History.pdf; “House Committee on Appropriations Defense Subcommittee Roster Session 111–2,” ProQuest Congressional, 2011, <https://congressional.proquest.com/congressional/result/congressional/congdocumentview?accountid=12702&groupid=100340&parmId=16E75680BBF&rsId=16E7560AA3A>; “House Committee on Appropriations Defense Subcommittee Roster Session 112–1,” ProQuest Congressional, 2011, <https://congressional.proquest.com/congressional/result/congressional/congdocumentview?accountid=12702&groupid=100340&parmId=16E756A0EEE&rsId=16E7560AA3A>; “Senate Committee on Appropriations Defense Subcommittee Roster Session 111–2,” ProQuest Congressional, 2011, <https://congressional.proquest.com/congressional/result/congressional/congdocumentview?accountid=12702&groupid=100340&parmId=16E7568B301&rsId=16E7560AA3A>; “Senate Committee on Appropriations Roster Session 111–2,” ProQuest Congressional, 2011, <https://congressional.proquest.com/congressional/result/congressional/congdocumentview?accountid=12702&groupid=100340&parmId=16E756D43E2&rsId=16E7560AA3A>; “Senate Committee on Appropriations Defense Subcommittee Roster Session 112–2,” ProQuest Congressional, 2012, <https://congressional.proquest.com/congressional/result/congressional/congdocumentview?accountid=12702&groupid=100340&parmId=16ED1DAACF5&rsId=16ED1D8BECA>; “House Committee on Appropriations Defense Subcommittee Roster Session 113–1,” ProQuest Congressional, 2013, <https://congressional.proquest.com/congressional/result/congressional/congdocumentview?accountid=12702&groupid=100340&parmId=16ED1DB66E1&rsId=16ED1D8BECA>; “Senate Committee on Appropriations Defense Subcommittee Roster Session 113–1,” ProQuest Congressional, 2013, <https://congressional.proquest.com/congressional/result/congressional/congdocumentview?accountid=12702&groupid=100340&parmId=16E7564EDCC&rsId=16E7560AA3A>; “House Committee on Appropriations Defense Subcommittee Roster Session 115–1,” ProQuest Congressional, 2017, <https://congressional.proquest.com/congressional/result/congressional/congdocumentview?accountid=12702&groupid=100340&parmId=16E75638CEF&rsId=16E7560AA3A>; “Senate Committee on Appropriations Defense Subcommittee Roster Session 115–2,” ProQuest Congressional, 2018, <https://congressional.proquest.com/congressional/result/congressional/congdocumentview?accountid=12702&groupid=100340&parmId=16ED1DC7123&rsId=16ED1D8BECA>; “United States House of Representatives Committee on Appropriations,” Ballotpedia, accessed December 11, 2019, https://ballotpedia.org/United_States_House_of_Representatives_Committee_on_Appropriations; “United States Senate Committee on Appropriations,” Ballotpedia, accessed December 11, 2019, https://ballotpedia.org/United_States_Senate_Committee_on_Appropriations.

Year	Majority Party		Percentage of Members of the Appropriations Committee from States with Active Shipbuilding Facilities		Percentage of Members of the Appropriations Subcommittee of Defense from States with Active Shipbuilding Facilities		Chair of the Appropriations Committee from a State with Active Shipbuilding Facilities		Ranking Member of the Appropriations Committee from a State with Active Shipbuilding Facilities		Chair of the Appropriations Subcommittee of Defense from a State with Active Shipbuilding Facilities		Percent Difference Between Appropriation and Budget Request
	House	Senate	House	Senate	House	Senate	House	Senate	House	Senate	House	Senate	
1987	D	D	19	14	18	22	Yes	Yes	No	No	No	Yes	-13.87
1988	D	D	19	14	18	22	Yes	Yes	No	No	No	Yes	-0.81
1989	D	D	17	11	18	10	Yes	No	No	No	No	No	5.17
1990	D	D	17	11	18	10	Yes	No	No	No	No	No	-11.20
1991	D	D	7	13	8	11	Yes	No	No	No	No	No	0.82
1992	D	D	7	13	8	11	Yes	No	No	No	No	No	73.02
1993	D	D	8	14	8	11	Yes	No	Yes	No	No	No	-0.69
1994	D	D	8	14	8	11	Yes	No	Yes	No	No	No	0.62
1995	R	R	7	17	8	18	Yes	No	No	No	No	No	31.51
1996	R	R	7	17	8	18	Yes	No	No	No	No	No	26.09
1997	R	R	10	14	0	12	Yes	No	No	No	No	No	10.18
1998	R	R	10	14	0	12	Yes	No	No	No	No	No	-3.51
1999	R	R	14	18	6	12	No	No	Yes	No	No	No	5.07
2000	R	R	14	18	6	12	No	No	Yes	No	No	No	4.31
2001	R	D	15	17	7	16	No	No	Yes	No	No	No	19.88
2002	R	D	15	17	7	16	No	No	Yes	No	No	No	11.23
2003	R	R	14	17	7	11	No	No	Yes	No	No	No	2.54
2004	R	R	14	17	7	11	No	No	Yes	No	No	No	1.55
2005	R	R	13	18	13	11	No	Yes	Yes	No	No	No	1.83
2006	R	R	13	18	13	11	No	Yes	Yes	No	No	No	4.18
2007	D	D	15	18	19	21	Yes	No	No	Yes	No	No	-0.44
2008	D	D	15	18	19	21	Yes	No	No	Yes	No	No	10.40
2009	D	D	11	19	6	22	Yes	No	No	Yes	No	No	0.00
2010	D	D	11	19	6	22	Yes	No	No	Yes	No	No	0.00
2011	R	D	14	22	7	28	No	No	No	Yes	No	No	-0.07
2012	R	D	14	22	7	28	No	No	No	Yes	No	No	5.00
2013	R	D	14	17	8	26	No	No	No	Yes	No	No	4.66

Year	Majority Party		Percentage of Members of the Appropriations Committee from States with Active Shipbuilding Facilities		Percentage of Members of the Appropriations Subcommittee of Defense from States with Active Shipbuilding Facilities		Chair of the Appropriations Committee from a State with Active Shipbuilding Facilities		Ranking Member of the Appropriations Committee from a State with Active Shipbuilding Facilities		Chair of the Appropriations Subcommittee of Defense from a State with Active Shipbuilding Facilities		Percent Difference Between Appropriation and Budget Request
	House	Senate	House	Senate	House	Senate	House	Senate	House	Senate	House	Senate	
2014	R	D	14	17	8	26	No	No	No	Yes	No	No	8.71
2015	R	R	12	19	ND	ND	No	Yes	No	No	ND	ND	5.14
2016	R	R	12	19	ND	ND	No	Yes	No	No	ND	ND	2.86
2017	R	R	13	23	11	21	No	Yes	No	No	No	Yes	31.53
2018	R	R	13	23	11	21	No	Yes	No	No	No	Yes	9.97

Notes:

1) R = Republican, D = Democrat, ND = No Data

2) No Data delineates that subcommittee membership data was not found during the search and the respective year are not used for analysis.

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