



ACQUISITION RESEARCH PROGRAM SPONSORED REPORT SERIES

An Economic Analysis of the Truth in Negotiations Act

27 January 2016

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ACQUISITION RESEARCH PROGRAM
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Abstract

It has been more than 50 years since TINA was first enacted in 1962. In a nutshell, TINA requires contractors (often sole-source) to submit “cost or pricing data” when they negotiate the price of a contract with the federal government. The contractors must certify that the information they provide is “current, complete, and accurate.” Failing to disclose truthful information could lead to civil or criminal investigation. The intention of TINA is to protect the government and taxpayers from being ripped off by better informed contractors. We argue that the current TINA practice, despite its good intention, is subject to many unintended negative consequences that arise from contractors’ bad incentives. Such bad incentives are inherently associated with the current TINA framework. We employ an incentive-centric approach to perform an economic analysis of TINA. Our analysis indicates that the main flaw of TINA is its failure to address moral hazard problem, that is, contractors lack proper incentives to exert their best efforts to achieve cost efficiency. In some cases, such as cost-plus contracts, where moral hazard is an inherent concern to begin with, TINA fails to provide remedies. More detrimentally, in other cases such as fixed-price contracts, where moral hazard is otherwise appropriately addressed, use of TINA undesirably removes contractors’ incentives to exert effort. Therefore, TINA, in the context of fixed-price contracts, is the problem rather than solution. The policy implication of this report is that a lax use of TINA in the context of FFP contracts should be preferred to a strict use. Moreover, in a repeated game situation where a continuous long-term demand for the product from the DoD is expected, TINA waiver should be considered for the early period contracts so contractors can truthfully reveal their best-effort cost information.



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Disclaimer: The views represented in this report are those of the author and do not reflect the official policy position of the Navy, the Department of Defense, or the federal government.



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Introduction

The federal government obligates approximately \$500 billion in contracts every year for supplies and services needed for executing its mission (Federal Procurement Data System–Next Generation, 2015). The majority of procured supplies and services are of a commercial nature, although some are defense-unique projects for research and development as well as major weapon systems acquisition. Regardless of whether the government is procuring commercial-type supplies and services or defense-unique systems, the government aims to negotiate a fair and reasonable price—fair to both parties and reasonable considering the quality and timeliness of contract performance (Federal Acquisition Regulation [FAR], 2015). When procuring supplies and services readily available in the commercial marketplace, the government relies on the forces of market competition to obtain fair and reasonable prices. However, when the government procures defense-unique supplies and services in markets where there may be limited competition or only one seller, the government relies on statutory requirements to ensure a level playing field in negotiating fair and reasonable prices with contractors. One such statute is the Truth in Negotiations Act (TINA), promulgated in Public Law 87-653. TINA was enacted to enhance the government's ability to negotiate fair and reasonable prices by ensuring that the government contracting officer has the same factual information that is available to the contractor at the time of price negotiations (Nash, Schooner, O'Brien-DeBakey, & Edwards, 2007). Advocates of TINA argue that the statute effectively levels the playing field between the government and contractor in non-competitive procurements, but opponents argue that TINA is not only administratively burdensome, but also results in negative unintended consequences.

The purpose of this research is to analyze the Truth in Negotiations Act from an economic theory perspective focusing on contractor incentives under different contract types. Our research question asks whether TINA provides the right economic incentive to contractors to induce their best efforts under different



contract types. This research report is organized into five sections. This background section is followed by a discussion on agency theory as it is applied to the contract management process, as well as a discussion of the Truth in Negotiations Act requirements. Our third section reviews economic literature that is relevant to our research question. Our fourth section presents the analysis and makes policy recommendations. We conclude in the final section.



Agency Theory and the Contract Management Process

Academic research in contract management is founded on several economic and management theories; the most often referred to is agency theory (Eisenhardt, 1989; Jensen & Meckling, 1976; Ross, 1973). Agency theory is focused on the relationship between one party (principal) that delegates work to another party (agent). Two problems can occur in this relationship: goal conflict and risk sharing (Eisenhardt, 1989). Goal conflict occurs when the goals of the principal are not aligned with the goals of the agent, and it is difficult for the principal to verify the activity of the agent during the performance of the work. The problem of risk sharing occurs when the principal and the agent have different attitudes toward risk, thus preferring to take different actions during the performance of the work. The focus of agency theory is on determining the most efficient contract governing the relationships between the principal and the agent (Eisenhardt, 1989).

A contract between the government and a contractor reflects a principal agent relationship. The principal (government) contracts with the agent (contractor) to perform a level of effort, such as developing or manufacturing a product or providing a service. In this relationship, the government's objectives include obtaining the product or service at the right quality, right quantity, right source, right time, and right price (Lee & Dobler, 1971). The federal government also has the additional objective of ensuring that the product or service is procured in accordance with public policy and statutory requirements (FAR, 2015). Contractors, on the other hand, pursue the objectives of earning profit, insuring company growth, maintaining or increasing market share, and improving cash flow, just to name a few. Because of the different and conflicting objectives between the principal and agent, each party is motivated and incentivized to behave in a specific manner. This behavior includes either withholding or sharing information.

In principal-agent relationships that involve higher levels of uncertainty,



which result in higher risk (such as developing an advanced technology weapon system), the information available to the government and contractor is typically asymmetrical. Agency theory is concerned with the conflicting goals between the principal and agent in obtaining their respective objectives and is focused on mechanisms related to obtaining information (e.g., about the marketplace, the supply or service, or the contractor—to counter the information asymmetry problem); selecting the agent (to counter the problem of adverse selection); and monitoring the agent’s performance (to counter the effects of moral hazard).

Thus, how contracts are planned (competitive or sole source), structured (fixed price or cost reimbursement, with or without incentives), awarded (based on the lowest priced, technically acceptable offer, or the highest technically rated offer), and administered (centralized or decentralized, level and type of surveillance, use of project teams, etc.) has its basis in agency theory and the principal–agent problem. This is reflected in Figure 1.

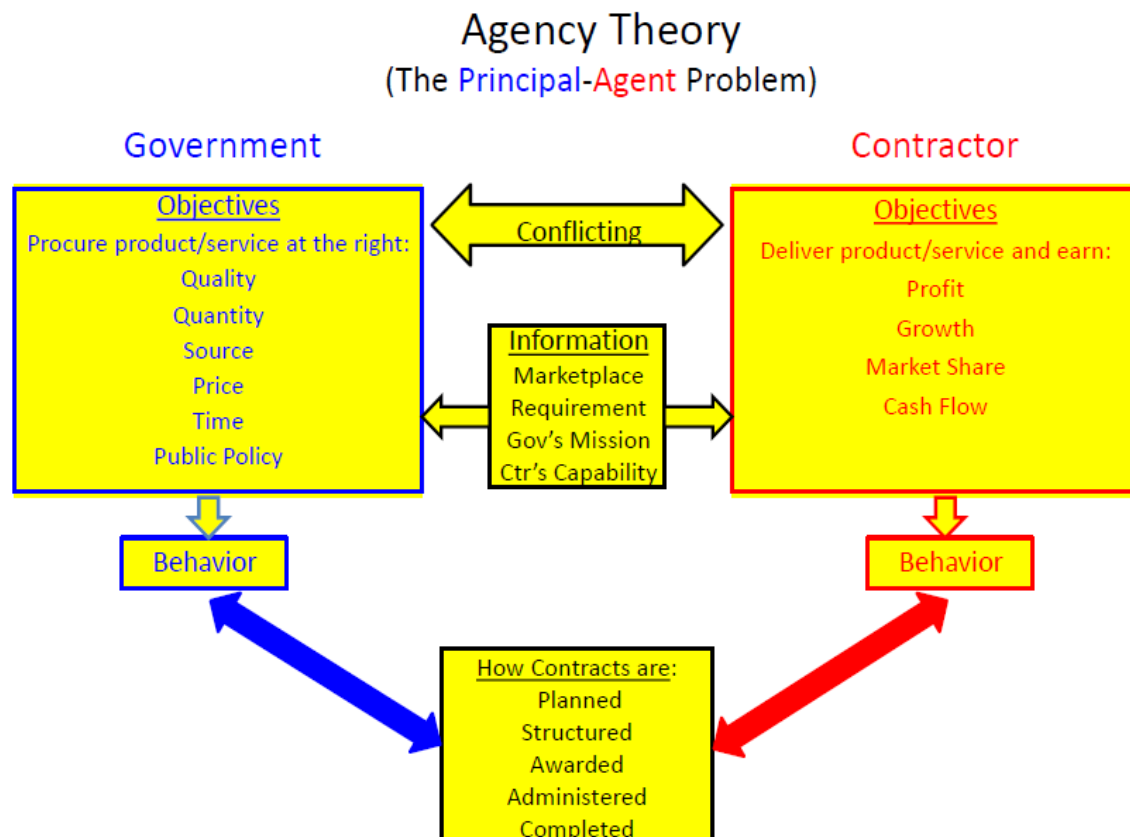


Figure 1. Agency Theory and the Contract Management Process (Rendon, 2011, p. 6)

Typically, contract management is discussed from the perspective of the buyer, with a focus on the procurement (buying) side of contracting. The six contract management key process areas (from the buyer's perspective) consist of procurement planning, solicitation planning, solicitation, source selection, contract administration, and contract closeout/termination (Rendon & Snider, 2008). In addition, since government contractors (sellers) also manage contracts, the contract management process reflects the key process areas from the seller's perspective. These phases include Pre-Sales Activities, Bid/No-Bid Decision-Making, Bid/Proposal Preparation, Contract Formation, Contract Administration, and Contract Closeout/Termination (Garrett & Rendon, 2005). Since this research is about the Truth in Negotiations Act (TINA), a government procurement statute, only the buying side of contract management is discussed. The following is a brief discussion of the contract management buying processes.

1. Procurement Planning involves the process of identifying the supply or service that is needed by the requiring organization. This process involves determining whether to procure, how to procure, what to procure, how much to procure, and when to procure. The procurement planning process includes determining and defining the requirement (the supply or service to procure), conducting market research, and developing preliminary requirements documents such as statements of work, budgets, and schedules (Rendon & Snider, 2008).

2. Solicitation Planning as the procurement planning decisions are finalized. This process involves formalizing the documents needed to support the solicitation of the procurement. It also involves documenting programs. The solicitation planning process includes the following: determining the procurement method (sealed bids, negotiated proposals, etc.), selecting the contract type (fixed price versus cost); developing the solicitation document (IFB, RFQ, or RFP); and determining proposal evaluation criteria and contract-award strategy (Rendon & Snider, 2008).



3. Solicitation is the process of issuing the solicitation documents and requesting bids or proposals from interested offerors. The solicitation process includes conducting advertising of the procurement opportunity and holding a pre-proposal conference, if needed (Rendon & Snider, 2008).

4. Source Selection occurs after the bids or proposals are received by the buyer. During this process, the proposal evaluation criteria is applied to the proposals to select a supplier and award the contract. The source selection process includes evaluating proposals and conducting contract negotiations with the seller in an attempt to come to an agreement on all aspects of the contract—including cost, schedule, performance, terms and conditions, and anything else related to the contracted effort (Rendon & Snider, 2008).

5. Contract Administration is the process of administering the contract once awarded. The activities involved in contract administration will depend on the contract statement of work, contract type, and contract performance period. This contract administration process includes monitoring the contractor's work effort, measuring the contractor's performance, and managing the contract changes process (Rendon & Snider, 2008).

6. Contract Closeout/Termination is the process of completing the contract and verifying that all administrative matters are concluded on a contract that is otherwise physically complete. A government contract can end in one of three ways. First, the contract can be successfully completed, allowed to run its full period of performance, and then closed out. Second, the contract can be terminated for the convenience of the government. Finally, the contract can be terminated for default. Regardless of how the contract ends, all contracts must be closed out. This contract closeout/termination process includes the final acceptance of products or services, processing the final contractor payments, and documenting the contractor's past-performance assessment report (Rendon & Snider, 2008).

Given this backdrop of agency theory and the contract management process, in the next section, we discuss the Truth in Negotiations Act



requirement and how the act is integrated in the contract management processes. The major focus of this section is to show how the application of TINA within the contract management process addresses the agency theory problems related to goal conflict, risk sharing, information asymmetry, moral hazard, and adverse selection.



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Truth in Negotiations Act

Federal acquisition policy requires that contracting officers procure supplies and services from responsible sources at fair and reasonable prices (FAR, 2015). Fair and reasonable prices can be assured through the use of competitive proposals providing price competition, commercial or catalog prices, or prices set by law or regulation (FAR, 2015). If these approaches are not available in procurement, then the government may request the offeror to provide cost or pricing data to be used in negotiating fair and reasonable prices. Additionally, the offeror may be required to certify that the cost or pricing data provided to the government are current, accurate, and complete as of the date of negotiations.

During the procurement planning process, the government will conduct requirements analysis and market research to determine the availability of supplies and services that exist to meet the government's requirements, as well as the capability of the market to provide those supplies and services. The results of procurement planning will determine if there is a competitive market for the required supply or service. Based on the results of the procurement planning process, the government will conduct solicitation planning and develop the solicitation (e.g., a request for proposal) and advertise the procurement opportunity by posting the solicitation on the government-wide electronic portal.

During the source selection process, the government will conduct a review of the proposals and determine the existence of adequate price competition, commercial or catalog prices, or prices set by law or regulation. If these are in existence, then the government will be able to conduct a price analysis on the proposals and there will be no need for requiring cost or pricing data. In this case, the TINA requirements will not apply.

If adequate price competition, commercial or catalog prices, or prices set by law or regulation are not in existence, for example, if only one proposal is received, then the government may need to conduct cost analysis as part of the evaluation of the proposals. This cost analysis may require the offeror to provide



cost and pricing data to the government. The FAR defines cost and pricing data as follows:

Cost or pricing data (10 U.S.C. 2306a (h) (1) and 41 U.S.C. chapter 35) means all facts that, as of the date of price agreement, or, if applicable, an earlier date agreed upon between the parties that is as close as practicable to the date of agreement on price, prudent buyers and sellers would reasonably expect to affect price negotiations significantly. Cost or pricing data are factual, not judgmental; and are verifiable. While they do not indicate the accuracy of the prospective contractor's judgment about estimated future costs or projections, they do include the data forming the basis for that judgment. Cost or pricing data are more than historical accounting data; they are all the facts that can be reasonably expected to contribute to the soundness of estimates of future costs and to the validity of determinations of costs already incurred. They also include, but are not limited to, such factors as—

- (1) Vendor quotations;
- (2) Nonrecurring costs;
- (3) Information on changes in production methods and in production or purchasing volume;
- (4) Data supporting projections of business prospects and objectives and related operations costs;
- (5) Unit-cost trends such as those associated with labor efficiency;
- (6) Make-or-buy decisions;
- (7) Estimated resources to attain business goals; and
- (8) Information on management decisions that could have a significant bearing on costs.

(FAR, 2015)

Additionally, if the value of the procurement exceeds the TINA threshold (currently established at \$700,000), the offerors will be required to certify that the cost or pricing data are current, accurate, and complete at the time of negotiations. This is the essence of the TINA requirement. TINA (10 U.S.C. 2306a and 41 U.S.C. chapter 35) requires offerors to submit certified cost or pricing data if a procurement exceeds the TINA threshold and none of the exceptions to certified cost or pricing data requirements applies (see FAR 15.403). Under TINA, the contracting officer obtains accurate, complete, and current data from offerors to establish a fair and reasonable price (see FAR



15.403). TINA also allows for a price adjustment remedy if it is later found that a contractor did not provide accurate, complete, and current data.

The FAR defines certified cost or pricing data as follows:

Certified cost or pricing data means “cost or pricing data” that were required to be submitted in accordance with FAR 15.403-4 and 15.403-5 and have been certified, or are required to be certified, in accordance with 15.406-2. This certification states that, to the best of the person’s knowledge and belief, the cost or pricing data are accurate, complete, and current as of a date certain before contract award. Cost or pricing data are required to be certified in certain procurements (10 U.S.C. 2306a and 41 U.S.C. chapter 35).

(FAR, 2015)

Thus, during the source selection phase of contract management, in situations where the government does not have adequate price competition, commercial or catalog prices, or prices set by law or regulation, the government relies on the contractor’s certified cost or pricing data to negotiate a fair and reasonable price. Once negotiations are complete, the contract is awarded. The contract may be awarded using a fixed price contract or a cost reimbursement contract. Fixed-price types of contracts 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 the contract, the ceiling price or target price is subject to adjustment only by operation of contract clauses providing for equitable adjustment or other revision of the contract price under stated circumstances. Cost-reimbursement types of 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 (FAR, 2015). If, during contract performance, or even after the contract is complete, the government determines that the contractor’s cost or pricing data was not current, accurate, or complete, TINA allows for a price adjustment remedy and can recoup any excess costs.



During the contract administration phase of the contract, there may be instances when the government must modify the requirements of the contract. Through the contract changes process, the government may make changes within the general scope of the contract to drawings, designs, or specifications; method of shipment or packing; or place of delivery (FAR, 2015). Additionally, if any such change causes an increase or decrease in the cost of any part of the work under the contract, the government will negotiate an equitable adjustment in the contract price and modify the contract. Since this contract change will occur after the award of the basic contract, the government will not have the benefits of adequate price competition in determining a fair and reasonable price. Thus the government will need to rely on the contractor to submit cost and pricing data to the government, and, if the value of the contract change exceeds the TINA threshold (currently established at \$700,000), the contractor will be required to certify that the cost or pricing data are current, accurate, and complete at the time of the contract change negotiation.

When the contract period of performance is over and the completed contract is being closed out, the contractor's final actual costs may be audited by the government. If the government has reason to believe that the contractor's certified cost or pricing data was not current, accurate, or complete, TINA allows for a price adjustment remedy and the government can recoup any excess costs.

As can be seen in the previous discussion, the TINA statute is integrated throughout the contract management process and provides the government a level playing field with the contractor in negotiating a fair and reasonable price without the benefit of price of competition. In these situations, the government and contractor may be negotiating either a fixed price contract or a cost reimbursement contract. In the next section, we discuss the application of economic theories when the TINA statute is used in each of these contract type categories.



Economic Literature Review

In this section, we review academic literature that is relevant to Department of Defense (DoD) acquisition and set the foundation for the subsequent analyses. We first start with a general description of the unique characteristics that underlie the DoD major weapon system acquisitions, and then introduce adverse selection and moral hazard concepts. We further elaborate on why DoD contracting is subject to both Adverse Selection and Moral Hazard problems, and why, consequently, limiting information rents and inducing the best effort naturally become the two objectives for policy makers. We also introduce the concept of the “power of incentive schemes” and how it applies to various contract types. Finally, non-commitment and the ratchet effect in DoD contracting are discussed, along with a brief introduction to the cost padding behavior of DoD contractors.

Unique Characteristics of Major Weapon System Acquisitions

Major weapon system purchases are very complicated and unique. Wang and San Miguel (2013) argue that “the Major Defense Acquisition Programs (MDAP) contracting environment is unique in the sense that an MDAP contract is typically a sole-buyer-and-sole-seller case, in which market competitive forces rarely exist and significant information asymmetry and potential agency problems prevail” (p. 6). The major contributing factor to the “sole source” or “near sole source” contracting scenario is “the complexity, uncertainty, and long-term commitment in major weapon systems” (Wang & San Miguel, 2013, p. 6. Other reasons are “the DoD’s need for secrecy, expediency, and/or safeguarding human resources” (Wang & San Miguel, 2013, p. 6).

The sole-source scenario puts the DoD at an informational disadvantageous position relative to the contractor in the contracting process. Due to the significant information gap between the contractor and the government, the contractor has the intent and ability to extract information rents from the government. Moreover, since the effort level of the only capable contractor is not observable, contractors’ shirking becomes a legitimate concern.



Adverse Selection and Moral Hazard

An *adverse selection* (i.e., hidden information) problem arises when contractors have superior information relative to the government. Many times, the government is at a loss when it comes to how much a product or a new system should cost. The company that provides the quote is at a high advantage when it negotiates with the less-informed government. The government usually has to take the contractor's word on price and quality, especially for a first-time-purchased product or system.

Laffont and Tirole (1993) provide a footnote from Robert Keller, the former assistant comptroller general of the United States, in regards to adverse selection:

The government negotiator generally is at a disadvantage in trying to negotiate, since the contractor knows not only all the facts and the assumptions underlying his estimates, the alternatives available to him, and the contingent areas, but he also knows the price at which he will be willing to accept the contract. (p. 2)

Laffont and Tirole (1993) define *moral hazard* (i.e., hidden effort) as “endogenous variables that are not observed by the regulator. The firm takes discretionary actions that affect its cost or the quality of its products. The generic label for such discretionary actions is effort“(p. 1). Effort is hard to observe and hence cannot be contracted upon. As a whole, society is lazy and hence contractors tend to shirk unless incentives are provided to induce more effort. With moral hazard, the information provided by the contractors on their past performance and quality of work can be manipulated to make it seem as though the company is making its best effort, and some very well might be, but in reality, the contractors are shirking.

In general, DoD contracts are subject to both Adverse Selection and Moral Hazard problems, given that significant information asymmetry is the norm, and the effort level of contractors is generally not observable. Hence, a benevolent government that aims to maximize the whole society's welfare has two policy objectives in mind: limiting undue information rents and inducing cost-saving effort.



Various Contract Types And Power Incentive Schemes

Fixed Price, Cost-Plus, and Incentive Contracts

There are two major types of contracts: fixed-price and cost-plus contracts. The two polar cases are firm-fixed price (FFP) and cost-plus fixed-fee contracts (CPFF).

According to FAR 16.202-1,

A firm-fixed-price contract provides for a price that is not subject to any adjustment on the basis of the contractor's cost experience in performing the contract. This contract type places upon the contractor maximum risk and full responsibility for all costs and resulting profit or loss. It provides maximum incentive for the contractor to control costs and perform effectively and imposes a minimum administrative burden upon the contracting parties.

FAR 16.306 states:

A cost-plus-fixed-fee contract is a cost-reimbursement contract that provides for payment to the contractor of a negotiated fee that is fixed at the inception of the contract. The fixed fee does not vary with actual cost, but may be adjusted as a result of changes in the work to be performed under the contract. This contract type permits contracting for efforts that might otherwise present too great a risk to contractors, but it provides the contractor only a minimum incentive to control costs.

An FFP contract without TINA addresses the moral hazard problem but still suffers from adverse selection. In this type of contract, the contractor is motivated to exert the best effort to save on cost and maximize profit. Adverse selection, on the other hand, is still a major problem due to contractors' strong incentives to withhold their proprietary information as well as extract information rents. Even with market research completed by contracting officers, the Adverse Selection problem remains a significant issue.

A CPFF contract, in contrast, addresses the adverse selection problem better because the reimbursement is based on incurred rather than projected cost. However, Moral Hazard becomes the main worry since contractors have no



incentive to curb costs. The lack of incentive to curb cost is because that contractor's profit is fixed and any cost savings will be passed on to the government as opposed to the contractor.

In addition to the FFP and CPFF, there are various incentive contracts that lie between the two extreme cases. They are fixed-price-incentive-fee (FPIF) contracts, cost-plus-incentive-fee (CPIF) contracts, and cost-plus-award-fee (CPAF) contracts. These incentive contracts are intermediate contracting arrangements between the two polar types and they typically address both Adverse Selection and Moral Hazard, yet neither effectively enough.

Power of Incentive Schemes

Various types of contracts introduced in the first section possess different power of incentive schemes. *Power*, in relation to incentive schemes, means the extent to which the scheme can motivate effort (see Table 1, reproduced from Laffont & Tirole [1993]).

Table 1. Power of commonly used incentive schemes
(Laffont & Tirole, 1993, p. 11)

Power	Transfer Allowed?	
	Yes (procurement, most public enterprises)	No (most private regulated firms)
Very High (firm residual claimant)	Fixed price contracts	Price caps
Intermediate (cost or profit sharing)	Incentive contracts	Incentive regulation
Very Low (government or consumers residual claimants)	Cost-plus contracts	Cost-of-service regulation

Note. We added highlighting for emphasis.

Laffont and Tirole (1993) explain that a cost-plus contract has the government pay the contractor its realized price, while the fixed-price contract has a set limit that the government will pay no matter what performance or effort



is executed. They also explain that incentive contracts have the government and the contractors share the realized costs.

With a fixed-price contract, contractors usually put forth the most effort. Although the contractor knows they will receive a fixed fee for their product, the more they save on the cost, the more profit they will receive. Thus, fixed price contracts are called *high power* incentive schemes.

Cost-plus contracts give few incentives to contractors to exert effort and hence are labeled as *low power* incentive schemes. Incentive contracts, as intermediate arrangements between fixed-price and cost-plus contracts, are *intermediate power* incentive schemes.

Table 2 in *A Theory of Incentives in Procurement and Regulation*, shows that if a contract is fixed-price, the effort is induced 100%. If the contract is cost-plus, the effort is induced at 0% (Laffont & Tirole, 1993, p. 40).

Non-Commitment and the Ratchet Effect

In DoD contracting, contracts are awarded for one basic year with priced options for additional years. This is known as multiple-year contracting. Another approach is multi-year contracting. Multi-year contracting is the term describing an annual contract that is awarded each year, consecutively. In cost based requirements, multiple-year contracts may be used to provide long-term incentives to contractors while providing a reliable contract vehicle for recurring needs. Awarding multiple-year contracts ensures that the short-term contract is guaranteed, and option years are written in the contract for long-term commitment. The risk of exercising options is still present, but at a lesser extent so as to incentivize the contractor to perform well in order to guarantee an additional year. Multiple-year contracts do not require congressional approval or guarantee of funds stability, and they can be used for cost reimbursement type contracts and fixed price type contracts. The following table shows an example of the difference between multiple-year contracting and multi-year contracting.



Table 2. Multi-Year vs. Multiple Year Contracting
(O'Rourke & Schwartz, 2014)

Multi-year	Multiple year
<p>Issue one or more contracts for each year's procurement of four aircraft. After Congress funds the procurement of the first four aircraft in FY2015, DoD would issue one or more contracts for those four aircraft. The next year, after Congress funds the procurement of the next four aircraft in FY2015, DoD would issue one or more contracts for those four aircraft.</p>	<p>Issue one contract covering all 20 aircraft to be procured during the five-year period of FY2015–FY2019. Contract award in FY2015, at the beginning of the five-year period, following congressional approval to use MYP for the program, and congressional appropriation of the FY2015 funding for the program. Implementation of the contract over the next four years would be completed by obtaining funding for each additional FY.</p>

Laffont and Tirole (1993) state:

If the firm performs well (produces at a low cost) early in the relationship, the regulator infers that the technological parameter is favorable and tries to extract the firm's rents by being more demanding during the regulatory review. The firm has thus an incentive to keep a low profile by not engaging in much cost-reducing activity. To induce the firm to produce at a low cost when efficient, the regulator must offer it a generous reward for good performance. (p. 45)

Stated equivalently, the lack of commitment from the government naturally leads to contractors' fears of being "ratcheted up" if they reveal their lowest possible cost. Being efficient one time would eliminate their future rents. Therefore, unless the profit from a one-year contract is sufficiently sizable, contractors would choose not to engage in cost-saving activities whenever possible.

The cure to the problem above is straightforward. Laffont and Tirole (1993) state:



To put the ratchet effect in perspective, recall that, if the two parties can commit to a long-term contract at the beginning of their relationship, the regulator optimally commits to use each period the optimal static contract. That is, it is optimal for the regulator to commit not to exploit the information acquired from observing the firm's performance. Commitment is crucial for this outcome because the regulator would want to fully extract the firm's rents from the second period on after the firm reveals its efficiency in the first period. (p. 376)

Cost Padding

Cost padding, if not detected and controlled by the government, adds unnecessary cost to the government. An example of cost padding includes, but is not limited to, incurring excessive costs to the government, such as leisurely meetings, first class travel, and business lunches. Other examples are shifting overhead costs from commercial business to government contracts and engaging in various bookkeeping tricks to manipulate costs. The government counters contractor cost padding by requiring certain contractors to be audited.

The Defense Contract Management Agency (DCMA) has a systemic operational cycle that allows monitoring contractor cost driving contractor performance. In the Defense Contract Audit Agency (DCAA) *Contract Audit Manual* (CAM), Chapter 9 discusses the audit of cost estimates and cost proposals. Cost padding is a factor in labor cost data. The CAM states:

The auditor should examine, on a selective basis and in cooperation with Government technicians...for the new product. When appropriate, contractor personnel should be interviewed to ascertain probable significant changes in engineering production methods and the effect those changes might have on current cost data. When an evaluation indicates that significant technological changes have occurred since the cost data was accumulated, adjustment of experienced costs is necessary before projecting the experience cost pattern. (DCAA, 2014a)

The manual further explains the contractors' variances of direct labor cost and illustrates how a "guesstimate" is made and then a "padding" is added to protect



from any unexplained cost. Because of the bookkeeping manipulations, resulting guesstimates, and subsequent padding, it becomes a significant challenge for the contractor audit to accurately appraise the extraneous cost. Cost padding is viewed as being more prevalent in cost-plus contracts, though as we elaborate later, the incentives for cost padding still exist under a fixed-price contract.



Analysis and Policy Implications

As pointed out in the literature review section of this report, defense procurement is subject to both adverse selection and moral hazard problems; consequently, limiting information rents and promoting contractors' cost-saving effort become the two main policy objectives for the government.

This section argues that TINA, to some extent, mitigates the adverse selection problem by mandating that contractors provide certified cost and pricing data that are "current, complete, and accurate" and legally holding them accountable. Hence, it is fair to say that TINA helps policy makers achieve one of their two policy goals: limiting information rents.

The fourth section of this report, however, emphasizes the ineffectiveness of TINA. In particular, building on an economic-based, incentive-centric approach that investigates contractors' incentives, we argue that the main flaw of TINA is its failure to address the moral hazard problem. In some cases, such as cost-plus contracts, where moral hazards are an inherent concern to begin with, TINA fails to provide remedies. More detrimentally, in other cases such as fixed-price contracts, where moral hazards are otherwise appropriately addressed, the use of TINA undesirably removes contractors' incentives to exert effort. Therefore, TINA, in the context of fixed-price contracts, is the problem rather than the solution.

Based on our arguments, we accordingly make policy recommendations at the end of this section.

Distorted Incentives: Use of Tina with Firm Fixed Price (FFP) Contracts

In this subsection, we express our greatest concern with TINA. That is, ill-fated incentives are created if TINA is used with an FFP contract. In the following, we use a step-by-step approach to illustrate the problem.



1. Background: there is a current policy push toward more use of FFP contracts.

Since 2009, support for firm fixed price contracts has been steadily increasing in order to limit government risk, reduce cost overruns, and improve contract effectiveness (Wang & Miguel, 2013). As such, there has also been a strong policy push towards regulation in support of fixed price contracts to be a fix-all to the cost overruns faced by the DoD in previous years. Top leaders, including President Obama; Robert Gates, former secretary of defense; and Ashton Carter, former Under Secretary of Defense for Acquisition, Technology, and Logistics, all expressed their favor for more use of FFP contracts in DoD acquisition. The presidential memorandum issued in April 2009 (Obama, 2009) explicitly stated that “there shall be a preference for fixed-price type contracts.” Consequently, more and more DoD contracts prescribe FFP.

Given the more frequent use of FFP in DoD procurement, it has become increasingly more important to understand how contractors’ incentives change with respect to the enforcement of TINA within FFP contracts. In particular, we use a “without and with” approach to demonstrate the unintended negative consequences of bundling TINA with FFP contracts.

2. FFP contracts *without TINA*, despite many weaknesses, are free of the moral hazard problem.

Wang and San Miguel (2013) challenge the wisdom behind policy makers’ favor toward FFP contracts. In particular, they state, “the notion that fixed price contracts are better than cost-plus contracts for limiting cost overruns is misleading.” The article further explains that FFP contracts may in fact have three negative consequences: (1) fixed-price contracts provide few risk-sharing benefits; (2) fixed-price contracts lead to higher government payments; (3) unjustified favor toward fixed-price contracts promotes inefficient industry structure.



Nevertheless, despite the problems pointed out by Wang and San Miguel (2013), FFP contracts do have one appeal: that is, an FFP contract is a high power incentive scheme that effectively motivates contractors' maximum efforts. Once an FFP contract is awarded, the contractor relentlessly seeks to reduce cost because every dollar saved on cost will directly translate into profit. Stated equivalently, contractors under FFP contracts without TINA voluntarily abstain themselves from shirking, that is, Moral Hazard is not a problem at all.

3. FFP contracts, *with TINA*, lose the last benefit of being a high power incentive scheme.

Since most of the DoD weapon procurement FFP contracts exceed the TINA threshold value, unless a TINA waiver is widely applied, FFP contracts without TINA are exceptions rather than norms. Hence, it is important to understand what incentives or disincentives are created or removed if TINA is bundled with an FFP contract.

One astute observation by Rogerson (1994) is that "TINA cannot force defense contractors to reveal the lowest possible cost that they could produce at if they exerted an optimal effort. Rather, it essentially tells them that the price they negotiate must be close to the cost they actually incur" (p. 68).

Therefore, a contractor under an FFP contract that is subject to TINA has the following ill incentive: the fear of being held accountable for any significant unfavorable cost discrepancy (i.e., the actual incurred cost is significantly below the ex-ante cost estimate submitted to the DoD as the basis for contract fixed-price) would strongly motivate the contractor to shirk (i.e., reduce cost-saving effort) or even engage in cost padding (e.g., by opportunistically incurring or allocating more costs to the government contracts), especially when the natural state turns out to be favorable.

In the situation above, shirking becomes a dominant strategy because working hard introduces disutility to the contractor with the additional risk of being penalized by TINA. In the case of a very favorable natural state (i.e., if every exogenous factor turns out to be good), if shirking is not sufficient to bring the



cost close enough to the ex-ante cost estimate, the contractor will engage in opportunistic and hard-to-detect cost padding to ensure the reported cost is trouble-free.

To recap, TINA, in the context of FFP contracts, removes the last benefit of FFP contracts and literally turns a high power incentive scheme into a low power one. Here, the Moral Hazard problem is reintroduced by the misuse of TINA.

4. A Numerical Example

We use the theoretical framework in Laffont and Tirole (1993) to set up a numerical example to illustrate the point made in previous sections. A contractor's cost function is specified as follows:

$$c = c(\beta, e) \quad (1)$$

where β is a state parameter (e.g., technology) and e is the effort. One can interpret that β is the adverse selection parameter and represents a contractor's private information, and e is the moral hazard parameter.

Without losing generality, assume the state parameter β has three possible outcomes: good, neutral, or bad, with equal probability of occurring. Moreover, the contractor can choose either work hard ($e=10$) or shirk ($e=1$).

Imagine the cost function takes the following form:

$$c = \beta + \frac{\beta}{e}$$

Note that the cost increases with β (so β is an inverse indicator of state parameter) and decreases with e (effort reduces cost).

Case 1) Good situation: ($\beta=10$), with probability 1/3.

$$c = 10 + \frac{10}{e} \quad (2)$$



Case 2) Neutral situation: ($\beta=20$), with probability 1/3.

$$c = 20 + \frac{10}{e} \quad (3)$$

Case 3) Bad situation: ($\beta=30$), with probability 1/3.

$$c = 30 + \frac{10}{e} \quad (4)$$

It is reasonable to assume that the contractor knows the probability distribution of the natural state, whereas the government does not know. We also assume that the contractor's negotiation strategy is to ensure breakeven even in the bad situation, and he or she can still shirk. So the contractor will submit \$40 as the cost estimate by equation (4), and the less informed government would most likely accept, with TINA's strings attached, stating that if the incurred cost is more than 25% lower than \$40 (i.e., below \$30), then the contractor is subject to a TINA audit.

Let's also assume that this is a one-time static game in which no further contract is possible. The contractor tries to maximize its profit.

The sequence of actions is as follows: the contractor submits the bidding price, accepted by the government, who attaches TINA to the FFP contract. Then the natural state reveals, the contractor chooses effort, and finally, the cost is incurred.

If a bad situation happens, the contractor will choose to work hard ($e=10$), so the cost is \$31 by equation (4), a TINA audit is not triggered, and the contractor earned a profit of \$9. There is no moral hazard problem in this situation.

In the case of a neutral situation, if the contractor works hard ($e=10$), his or her cost would be \$21 by equation (3), which is good in the absence of TINA, yet not good when TINA is in place; this is because any cost below \$30 would trigger a TINA audit. The contractor, knowing this risk, would choose to shirk ($e=1$), so the cost will be \$30 by equation (3), which successfully hides the contractor

under the radar of TINA. In this scenario, the moral hazard problem is *created* by



TINA.

What if the most favorable natural state emerges? In that case, if the contractor works hard, he or she will incur a cost of \$11 by equation (2), which is going to raise a big red flag to the government. Therefore, the contractor is going to shirk; however, because the natural state turns out to be so favorable, even shirking is not enough to mute the alarm of TINA. (Note that shirking in case 1 would yield a cost of \$20, which is below the audit threshold value of \$30, and hence will trigger the TINA audit.) So what would the contractor do to evade the TINA investigation? The contractor will engage in cost padding and artificially increase the reported cost to at least \$30, so he or she will not get into trouble. Now in this scenario, TINA not only created a Moral Hazard problem, but also generated bad incentives for defense contractors to engage in unethical and opportunistic cost padding.

Fixing Incentives: from Static to Dynamic Perspective

1. One-shot Static Game

A good starting point is a static situation where no further contract is possible. Using the numerical example, the government already paid \$40; because the contractor can avoid a TINA audit in all three possible scenarios by either shirking or cost padding or both, the government payment becomes fixed. Therefore, any higher profit of a contractor will lead to a higher social welfare. The implication is straightforward: In order to correct the ill incentives created by TINA in the context of FFP, policy makers need to undo the bundling, that is, remove TINA from FFP, so the FFP is back to a high power incentive scheme.

2. Repeated game with non-commitment

In the one-shot static game, when TINA is removed from an FFP contract, the contractor is fully motivated to exert the best effort to maximize profit. Since no future contract is possible, the contractor is not afraid to reveal private information (i.e., the minimum cost that can be achieved through the best effort), because there is no possibility for the government to exploit the private information revealed against the contractor in the future.



However, in reality, the relationship between a typical contractor and the government is rarely a one-shot game. Rather, it is better characterized as a repeated game with non-commitment from the government. Typically when multiple-year contracts are awarded, the government is agreeing to a single-year-term contract with the option of additional years. Nearing the end of the current fiscal year, the government will begin the process of exercising the next option year. This decision is a unilateral process that a contractor may consider as non-commitment and, in return, the contractor may be apprehensive to share true cost or pricing data for fear of being “ratcheted up” in future years.

Stated equivalently, in a repeated game where contracts have one base year and option years which can be exercised by the government, a simple removal of TINA from a one-year FFP contract may not be sufficient to induce the contractor’s best effort. The contractor is in a very vulnerable position in the sense that if he or she chooses to reveal private information at the early stage of the game, that information may be used against him or her later so no future information rents would be possible. As discussed in the literature review section, contractors’ fears of being ratcheted up by the government motivates contractors to withhold their private information so they can still extract information rents from the government in later periods. To recap, a simple removal of TINA from a one-year FFP contract tends to be ineffective in addressing the Moral Hazard problem.

So what is the fix for the lack of incentives? If a one-year FFP contract without TINA is not enough to motivate, the government should consider multiple-year FFP contracts without TINA. This is especially useful if the product is demanded on a continuous basis. The idea is this: Make the reward of revealing the best-effort cost big enough that the contractor voluntarily tells the government the lowest achievable cost. It is wise to let the contractor win early, win big, but win only once. The government, and hence the taxpayers, win in the long run and win even bigger.



3. Multiple-years contracts: Numerical example continued

In this subsection, we extend the static, one-shot numerical example to a repeated game case. Under some reasonable assumptions, we show that government savings can be achieved by fixing contractors' incentives.

Without losing generality, assume the government needs to order this product every year for 15 years. If each year, TINA is attached for 15 annual contracts, the contractor will always choose to shirk¹ or “shirk and cost padding” in order to avoid the TINA audit, as well as keep the information rents for the future. Hence, the government will end up paying \$600. Alternatively, if TINA is removed for every annual contract on a yearly basis, concerns about TINA are removed for that year; however, the contractor still worries about the consequence of revealing the lowest possible cost under the maximum effort due to the non-commitment nature of government contracts. One-year increased profit due to effort is too meager to entice contractors to give up their future information rents. Thus, a contractor will still withhold effort and choose to shirk.

Without losing generality, assume that a five-year FFP contract is sufficient to induce the contractor to exert his or her best effort. Therefore, the government commits to pay \$40 each year for five years with no TINA strings attached. With this commitment, the contractor is fully motivated to work as hard as possible, and the lowest possible cost is revealed to the government. The government, who observes that the true expected lowest possible cost is \$21 (i.e., $\frac{1}{3} * 11 + \frac{1}{3} * 21 + \frac{1}{3} * 31$), will use that information to price the future 10-year contracts. Under the assumption that a 10% profit is allowable, the government will offer a \$23.1 ($\$21 * 1.1$) annual FFP contract for the remaining 10 years. So the total government payment now becomes $\$40 * 5 + \$23.1 * 10 = \$431$, a savings of \$169 relative to the original situation. Note that if the time span is longer—say, 25 years as opposed to 15 years—then the government savings will be even larger.

¹ Note that in contrast to the one-shot game, the contractor chooses to shirk even in the bad situation, due to the concern of being “ratcheted up” if the lowest possible cost is revealed.



4. TINA waivers: A useful policy tool

TINA is effective in deterring outright fraud and “defective pricing,” especially on the part of the cost that is verifiable. Hence, we should give TINA credit for doing that part right. However, TINA is much less effective at addressing the Moral Hazard problem, where one key determinant of the cost, namely effort, is unobservable, unverifiable, and not contractible. TINA could even become very destructive when it is applied to an FFP contract setting, as shown earlier.

Fortunately, lawmakers do allow TINA waivers, and a shrewd utilization of that tool is essential for making better use of TINA. One of the justifications for TINA waivers is that “there are demonstrated benefits to granting the waiver.” Our analysis in this section detailed the reasoning for the use of TINA waivers. Based on our analyses, we recommend the following policy options:

If an FFP contract is negotiated with a contractor who is unlikely to have a continuous contracting relationship with the government for the same or similar products and services, then a waiver of TINA should be applied. However, it can sometimes be difficult to predict the future of non-continuous relationships until after the first year of performance. Additionally, the FAR allows for certain TINA waivers under HCA approval.²

If an FFP contract is negotiated with a contractor who is likely to continue to provide the same or similar product to the government for years to come, then a multiple-year FFP contract, without TINA provisions on defective pricing data, should be offered to motivate the contractor’s best effort. Note that in this setting, a multiple-year contract is needed.

² Increasing the use of TINA waivers may be a plausible solution if reasonable expectations exist that fair and reasonable pricing is already established. For example, per FAR 14.403-1(c)(4), the HCA may waive the requirement for contractors (and lower tiered subcontractors) to provide certified cost or pricing data if such data was previously submitted and updated. Allowing for more waivers is an “easy fix” to lowering defective pricing cases, but it may not be the most effective in reducing disincentives attached to TINA. Waiving TINA may also subject the government to information rents that were previously mitigated. Simply waiving policy when a need for it still exists is, in and of itself, an ineffective policy solution.



Tina and Cost-Plus and Incentive Contracts

TINA is less damaging when it is bundled with cost-plus contracts. In such contracts, the moral hazard is an inherent concern to start with, and TINA does not introduce or solve the problem. Under a cost-plus contract, the contractor shirks anyway, regardless of the presence of TINA. To the extent that total realized cost is auditable while the various components of total cost are not (Lafond & Tirole, 1993), “cost padding” would still be possible. That said, TINA does make the verifiable part of the cost more credible and also provides disincentives for contractors to engage in outright fraud and defective pricing behavior.

Incentive contracts are basically intermediate arrangements between fixed-price and cost-plus contracts. Hence, similar to an FFP setting, but to a lesser degree, any cost-saving incentives under incentive contracts would be weakened by TINA. The government may change contract vehicles depending on the lifecycle of the acquisition program, and it is important to know how TINA will affect contracts within each milestone of a program. Throughout the lifecycle of the acquisition, a requirement may move along the contract vehicle spectrum to take into account new discoveries and established requirements. Because of this, TINA should also be a living, breathing provision that takes into account the different contract vehicles used in major acquisitions rather than an end-all to pricing uncertainty. Because there are certain adverse selection issues and moral hazards that are unique to different contract types, acquisition personnel need to be aware of which disincentives may be occurring at each contracting stage. We leave this to our future research.



Conclusions

It has been more than 50 years since TINA was first enacted in 1962. In a nutshell, TINA requires contractors (often sole-source) to submit “cost or pricing data” when they negotiate the price of a contract with the federal government. The contractors must certify that the information they provide is “current, complete, and accurate.” Failing to disclose truthful information could lead to a civil or criminal investigation. The intention of TINA is to protect the government and taxpayers from being ripped off by better informed contractors.

We hopefully have convinced our readers that current TINA practices, despite the good intentions of the act, are subject to unintended negative consequences that arise from contractors’ bad incentives. Such bad incentives are inherently associated with the current TINA framework. We document both strengths and weaknesses of current TINA practices, with an emphasis on the latter and in turn generate corrective policy implications.

One major contribution of our study is to introduce an economics-based, incentive-centric approach that focuses on the investigation of agents’ (i.e., DoD contractors’) various incentives generated by TINA. This approach, in our opinion, can be widely applied to many issues in the DoD acquisition environment. The importance of agents’ (in our case, DoD contractors’) incentive issues can never be overstated in a DoD procurement setting, as testified by Rogerson (1994):

Defense procurement is unique among regulated industries in the United States in that economists have played virtually no role in helping shape its regulatory practices and institutions. Perhaps this is due to the barrier to entry created by the need to first learn about procurement practices or to a lingering distaste for military matters among academics. Whatever the reason, this lack of economic input is unfortunate, because many of the regulatory and policy issues in defense procurement involve the types of *incentive issues* that economists are very good at analyzing. My own hope is that economists are on their way to colonizing this new policy frontier and that some of the ideas discussed in this article will play a role in shaping policy debates over the next decade. (pp.#-#)



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References

- Defense Contract Audit Agency (DCAA). (n.d). About DCAA. Retrieved from http://www.dcaa.mil/about_dcaa.html
- Defense Contract Audit Agency (DCAA). (2014a). *DCAA contract audit manual*. Retrieved from <http://www.dcaa.mil/cam.html>
- Defense Contract Audit Agency (DCAA). (2014b). DP sustention on reports issued since 10-01-2008 (Redacted version).
- Eisenhardt, K. M. (1989). Agency theory: An assessment and review. *Academy of Management Review*, 14(1), 57-74.
- Federal Acquisition Regulation (FAR), 48 C.F.R. ch. 1 (2015). Retrieved from <http://farsite.hill.af.mil/vffara.htm>
- Federal Procurement Data System-Next Generation. (2015). Retrieved from https://www.fpds.gov/fpdsng_cms/index.php/en/
- Garrett, G. A., & Rendon, R. G. (2005). *Contract management: Organizational assessment tools*. Ashburn, VA: National Contract Management Association.
- Jensen, M., & Meckling, W. (1976) Theory of the firm: Managerial behavior, agency costs, and ownership structure. *Journal of Financial Economics*, 3, 305-360.
- Laffont, J., & Tirole, J. (1993). *A theory of incentives in procurement and regulation*. Cambridge, MA: MIT Press.
- Lee, L., & Dobler, D. W. (1971). *Purchasing and materials management*. New York, NY: McGraw-Hill.
- Nash, R. C., Schooner, S. L., & O'Brien, K. R. (1998). *The government contracts reference book: A comprehensive guide to the language of procurement*. Washington, DC: George Washington University.
- Nash, Schooner, O'Brien-DeBakey, & Edwards. (2007).
- Obama, B. (2009). *Government contracting* [Memorandum for the heads of executive departments and agencies]. Retrieved from http://www.whitehouse.gov/the_press_office/Memorandum-for-the-Heads-of-Executive-Departments-and-Agencies-Subject-Government
- O'Rourke, R., & Schwartz, M. (2014). *Multiyear procurement (MYP) and block buy contracting in defense acquisition: Background and issues for Congress*. Washington, DC: Congressional Research Service. Retrieved from <http://www.fas.org/sgp/crs/natsec/R41909.pdf>



Rendon, R. G. (2011). *Assessment of Army Contracting Command's contract management processes*. Monterey, CA: Naval Postgraduate School. Retrieved from <http://www.dtic.mil/dtic/tr/fulltext/u2/a556157.pdf>

Rendon, R. G., & Snider, K. F. (Eds.). (2008). *Management of defense acquisition projects*. Reston, VA: American Institute of Aeronautics and Astronautics.

Rogerson, W. P. (1994). Economic incentives and the defense procurement process. *Journal of Economic Perspectives*, 8(4): 65–90. Retrieved from <https://www.aeaweb.org/articles.php?doi=10.1257/jep.8.4.65>

Ross, S. (1973). The economic theory of agency: The principal's problem. *American Economic Review*, 63, 134–139.

Snider, K. F., & Rendon, R. G. (2008). Public procurement policy: Implications for theory and practice. *Journal of Public Procurement*, 8(3), 310–333.

Truth in Negotiations Act (TINA), 10 U.S.C. §2306a (Year).

Government Accountability Office (GAO). (2011, August 25). Sygnetics, Inc. decision (File B-404535.5). Retrieved from <http://www.gao.gov/assets/400/392871.pdf>

Wang, C., & San Miguel, J. G. (2013). Are cost-plus defense contracts (justifiably) out of favor? *Journal of Governmental & Nonprofit Accounting*, 2(1), 1–15.





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