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2011-05-11

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<http://hdl.handle.net/10945/33627>

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Unintended Consequences of Advocating Use of

Fixed-Price Contracts in Defense Acquisition Practice

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## Road Map

- Research Question
- Motivation
- The Uniqueness of the DoD Contracting Environment
- Unintended Consequences of Advocating Wider Use of Fixed-Price Contracts in DoD Context
- Cost-Plus Contracts: Problems and Remedies
- Conclusion

## Research Question

- Is the current policy makers' preference for fixed-price contracts as opposed to cost-plus contracts in DoD acquisition practice justifiable? What are the potential negative consequences of advocating use of fixed-price contracts?

## Motivation

- Large cost overruns in Major Defense Acquisition Programs (MDAP)
  - *According to GAO report, in 2008 approximately 70% of 96 MDAP experienced huge cost overruns, reaching over \$295 billion (a 26% overrun) over the life of the projects.*
- Widespread criticisms from various sources in Congress, the Administration, and taxpayers.
  - *A major critique is that the increasing use of cost-plus contracts is a key contributing factor to large and frequent cost overruns.*

- *In a briefing on his acquisition reform on March 4, 2009, the President stated that “The days of giving defense contractors a blank check are over,” and pledged that his reforms would end unnecessary no bid, cost-plus contracts.*
- A clear preference toward fixed-price contracts
  - *“There shall be a preference for fixed-price type contracts”–“Memorandum on Government Contracting”, President Barack Obama, March 4, 2009.*
  - *Ashton Carter, the Pentagon’s top weapons buyer, in his interview with Bloomberg’s Peter Cook on September 14, 2010, echoed his support of “increasing the use of fixed-price contracts”.*

– *Ashton Carter asked the Defense Business Board (DBB) to form a Task Group to “consider the use of fixed-price contracting across the full spectrum of the acquisition life cycle and provide recommendations based on best business practices, on when and how fixed-price contracting might provide savings and reduce risk.” Mr. Carter also requested the Task Group to “develop a rule set for using fixed-price contracts over other contract types.”*

- Is this ongoing policy push toward fixed-price contracts beneficial to tax-payers? Are cost-plus contracts justifiably out of favor? Any potential unintended consequences from wide use of fixed-price contracts?

## The Uniqueness of the DoD Contracting Environment

- DoD is both the biggest and the most unique federal contracting agency.
- What is special about MDAP?
  - Significant uncertainty exists in terms of technological development, DoD requirements (often a moving rather than static target), and the integration process between the development and manufacturing as well as between the prime contractor and the sub-contractors.
  - The compliance costs associated with federal acquisition policies and the scrutiny from federal agencies.



- Economy of scale, usually achieved through a large base of demand, is less likely to materialize.
- The business risk associated with non-transferable technological investments and capital expenditures within defense industry is significant.
- Due to the extreme complexity and uncertainty inherent in MDAPs, the long evolution and competition often result in a sole-source contractor situation
- Other contributing factors to the sole-source situation include the DoD's need for secrecy, expediency, and/or

safeguarding human resources.

- To summarize, 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 problem prevail.
- On the contractor side, the business risk, if not shared by the government, could be prohibitively high.
- On the government side, the major concern is the potential abuse of the system which stems from the agency problem due to information asymmetry.

## Unintended Consequences of Advocating

### Wider Use of Fixed-Price Contracts in DoD Context

- Fixed-price contracts may work efficiently in normal circumstances where sufficient competition and complete certainty on technological applications exist, however, defense contracts rarely offer such confidence.
- Consequence 1: *Fixed-price contracts do not provide risk-sharing benefits*
  - Without risk-sharing by the government, it's unavoidable that certain important but risky projects would be forgone by the contractors because the uncertainty is too high to be borne by contractors themselves.

- Consequence 2: *Fixed-price contracts may lead to higher government payments.*

- The proponents of fixed-price contracts normally assume that a reasonable cost estimate is available in most DoD contracting scenarios, but this assumption rarely holds in MDAP situations.
- Ex ante, neither the government nor the contractor possesses the necessary information to form a good cost estimate. However, the contractor has an informational advantage on cost estimation.
- The impact on the contractors' incentives in the case of fixed-price contracts is twofold:

- \* First, to ensure against great downstream uncertainty, the contractor will tend to provide the government with a high cost estimate to obtain a higher fixed-price contract. This is a typical “risk-premium” story.
  - \* Second, due to information asymmetry, the contractor has both motive and ability to artificially inflate the cost estimate to command additional “information rents”.
  - \* The combined demand for “risk premium” and the desire to extract “information rents” determine that there is no guarantee that taxpayers will be better-off in a fixed-price contract as opposed to a cost-plus contract.
- In addition, the cost of extracting “information rents” in a fixed-price contract is smaller than that for a cost-plus

contract.

- In conclusion, a fixed price contract in the absence of a market established price and information symmetry will lead to a higher payment from the government than under a cost-plus contract.
- Consequence 3: *Fixed-price contracts may promote inefficient industry structure.*
  - Motivated by the preference toward fixed-price contracts and the worry about frequent no-bid defense contracts, policy makers are eager to promote a more competitive defense industry structure. For instance, concerning acquisition process changes, WSARA encourages competition. Specifically, 202 requires the Secretary of

Defense to take measures to ensure competition at both the prime contract level and the subcontract level throughout the life-cycle of a program “as a means to improve contractor performance.” Prime contractors are also required to ensure their “make or buy” decisions give “full and fair consideration” to qualified sources other than themselves for major subsystems and components.

- Moreover, WSARA legislation tries to nurture competition through more tightly controlling Organizational Conflict of Interest (OCI). OCI exists when a contractor can unduly benefit from its existing relationship in competitions for future work.
- Critique: “The pool of expertise in sophisticated system engineering and technical analysis for complex, often highly

classified defense areas is quite limited. There is only one Skunk works for example. But if a company such as Lockheed Martin is barred from working on the next stealth fighter or SR-71 because it has helped in the initial research and development effort, the nation will be the loser.”—Dr. Daniel Goure.

- Critique: Conventional economic wisdom that a competitive industry structure is better than a more concentrated one may simply be untrue in the special defense industry. Policy makers need to be reminded that the “single-source” contracting environment is a natural result of long-term competition among contractors and evolution of the free market economy. It is an optimal response to the unique features of the DoD major weapon systems acquisition environment. Specifically, extreme complex and difficulty of



the projects eliminate most competitions over time; the lack of economy scale mechanism from demand side makes industry consolidation the only option to achieve cost efficiency from supply side; and the abnormally high business risks require higher rate of return which can be partly realized from a monopoly or oligopoly industry structure.

- Conclusion: The present industry structure is an outcome of economic Darwinism and perhaps the best choice we have given the one-of-a-kind DoD contracting setting. An artificial effort to change the status quo and the policy push to reverse the industry consolidation trend are likely to be counter-productive and fail.

## Cost-Plus Contracts: Problems

- The benefits of risk sharing associated with cost-plus contracts come with a price. Since cost-plus contracts are most often applied to the projects with high uncertainty and information asymmetry, they are subject to the contractor's manipulation of cost reporting.
- Critics basically argue that the contractor has a blank check from the government and hence they have little incentive to contain cost.
- Even when the profit is a pre-specified fixed dollar amount, the contracting firm as well as the management of the firm may be able to derive some private benefits from incurring a larger

cost. One possible example is the “empire building” behavior that rewards managers by growing a firm beyond the optimal level (Jensen (1986, 1989)).

- Therefore it is vital to address the agency problem that arises from the information asymmetry. We argue that this can be done within the framework of cost-plus contracts so that we can achieve better cost efficiency while in the meantime retain the benefit of risk sharing as well.

## Cost-Plus Contracts: Remedies

- A traditional cost-plus incentive contract can be refined such that the new form of contract not only keeps the conventional risk-sharing benefits, but also aligns the contractor's incentive with the incentive of the government.
- “Budget-based cost-plus scheme” offers policy makers a better choice than fixed-price contracts to improve traditional cost-plus contracts.
- A traditional cost-plus incentive contract takes the form as follows:

$$P = c + \pi(c) \tag{1}$$

$$\pi(c) = \alpha + \beta * (TC - c) \tag{2}$$

where  $P$  is the price paid by the government to the contractor;  $c$  is the actual reported cost as agreed by the auditor; and  $\pi(c)$  is the contractor's profit, which includes a target profit  $\alpha$ , and an incentive term for cost overruns (or underruns) above (below) a pre-specified target cost  $TC$ . The parameter  $\beta$  (a positive coefficient between 0 and 1) is the cost share parameter. Since the profit is penalized (rewarded) when there exists a cost overrun (underrun), the contractor is motivated to be more cost efficient.

- The primary drawback of the traditional cost-plus-incentive contract is that the government frequently does not possess necessary information to form a basis for estimating target cost due to significant information asymmetry. If  $\beta$  is set too high, the contractor receives windfall bonuses at the expense of taxpayers. On the other hand, if  $\beta$  is set too low such that the cost overrun is unavoidable, the contractor will be unfairly

penalized.

- Contractors (firms) usually have superior information concerning the expected cost of the project, yet the government cannot rely on the firms' estimates since contractors, as agents, may not truthfully reveal their beliefs due to the conflict of interests.
- One possible remedy to this dilemma is to introduce an optimal design of incentive contracts to ensure that the contractors (who have an information advantage) voluntarily and truthfully reveal their beliefs about the project's estimated cost.
- The theoretical setting is the classical principal-agent contracting model where the principal (i.e., the government) carefully designs the contract format, such that the agents (i.e., the contractors), in maximizing their own benefits, behave in the way that the principal desires.

- Consider a refinement of the traditional cost-plus incentive contract where the task of estimating target cost shifts from the government to the better informed contractor. Thus, equation (2) is modified as follows:

$$\pi(c, \overline{TC}) = \alpha(\overline{TC}) + \beta(\overline{TC}) * (\overline{TC} - c) \quad (3)$$

Where,  $\overline{TC}$  is the estimate of  $TC$  submitted by the contractor. Another important modification is that both  $\alpha$  (target profit) and  $\beta$  (cost share parameter), are no longer constants. Instead, they vary with  $\overline{TC}$  to provide the correct incentives for the contractors to truthfully reveal their unbiased cost estimate.

It is necessary to impose the following restrictions to the functional forms of  $\alpha(\overline{TC})$  and  $\beta(\overline{TC})$  such that:

$$\alpha'(\overline{TC}) < 0, \alpha''(\overline{TC}) > 0, \beta(\overline{TC}) = -\alpha'(\overline{TC}) \quad (4)$$

Insert Figure 1 for the curvature of  $\alpha(\overline{TC})$

- It can be demonstrated that the contracts characterized by equations (1), (3) and (4) will, as desired by the government, induce contractors to voluntarily submit their unbiased project cost estimate while maximizing their own benefits.
- To illustrate, insert Figure 2
- In summary, a menu of contracts characterized by equations (1), (3) and (4) would effectively induce the truth-telling behavior that is desirable under information asymmetry.
- A specific example is given in the paper (p14-15).
- A search of the DAMIR database shows that, out of the 69 active MDAPs for which we can identify their contract types, none of them uses “budget-based cost-plus scheme”. Thus, the potential improvement to cost-plus contracts is very high.



## Conclusion

- The mindset that fixed-price contracts are better than cost-plus contracts in limiting cost overruns may be misleading and could potentially do more harm than good to acquisition reform.
- Cost-plus contracts should remain as the major contracting tool in MDAPs to facilitate the implementation of major weapon systems projects that are otherwise too risky to be undertaken by defense contractors.
- The contractors' opportunistic cost misbehavior under traditional cost-plus contracts can be mitigated by using the "budget-based cost-plus scheme".