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October 1987

MIT-EL-018WP

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Incomplete and very
preliminary draft.
October 26, 1987

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* Research support from the Pew Charitable Trust, the Center for Energy Policy Research at MIT, and the National Science Foundation is gratefully acknowledged. This paper was prepared for the conference on "Optimal Incentive Mechanisms for Cost-Efficiency and Risk-Sharing in Regulated Industries," held on November 13, 1987 at Columbia University's Center for Telecommunications and Information Studies. Part of the paper is a non-technical version of Laffont-Tirole [1987a]. We refer to the original paper for a more rigorous analysis. We thank An-Jen Tai for able research assistance.

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1. Introduction.

Many agency relationships have features of a natural monopoly. That is, increasing returns to scale or indivisibilities require that the principal entrust a given task to a single agent (firm, manager, worker, or team thereof). Examples include the regulation of the electric utility, railroad and cable TV industries. In military procurement a single source is most frequent. And, in the realm of internal organization, jobs (such as the chief executive position) are often assigned to a single employee.

How should the agent (cable TV franchisee, defense contractor, CEO) be selected to perform the task (supply cable services, build a new jet, run the firm)? The economist's natural answer to this question is the auctioning of the agency position. After accounting for the observable differences in quality among the various bidders, the principal (regulator, department of defense, shareholders) should choose the agent who minimizes agency costs or creates the maximum value. In particular, in the regulatory context, Demsetz [1968] has forcefully argued in favor of franchise bidding and his view has been endorsed by Posner [1972] and Stigler [1968].

However, guaranteeing the winner a long-run monopoly position may not be optimal. The arrival of new trading opportunities or the franchisor's inadequate performance may make agent switching desirable. Instances of agent switching abound. In the context of regulation or procurement, the regulator sometimes turns to (breaks out for) a second source. In the context of internal organization, the employment of a CEO can be terminated by the board of directors (turnover), or, more frequently, by a raider (hostile takeover). And employee switching results from the demotion, promotion or firing of the employee. That is, a natural monopoly situation at each point of time need

not result in intertemporal natural monopoly.

A simple way of assigning the task to the best agent at each point of time is to repeat the auctioning process over time. However, Williamson in his 1976 study of cable TV franchising has warned us against an excessive resort to repeated franchise bidding. Minimizing short-run agency costs at each point of time may not minimize long-run agency costs, because the absence of commitment to a long-term relationship may impair the franchisee(s)' incentives to invest in relationship-specific capital.

Two of Williamson's observations, both relative to investment, are of particular interest for this paper. First, some of the incumbent's investments in human or non-tangible capital may not be transferable to a second-source (some forms of such capital may be transferable: the incumbent's personnel can be hired by the second source; also, the principal may possess property rights on technological data, as is sometimes the case in military procurement, so that he may be able to transfer the technology to a second source at a low cost). With non-transferable investment, the incumbent is likely to be more efficient than its rivals at the reprocurement stage. Incumbency advantages do not imply that there is anything wrong with anonymous auctions, simply that entrants are unlikely to win. Non-transferable investments shield the incumbent from entry. This suggests that the study of second-sourcing is of more interest under transferable than non-transferable investment. Second, when investment is transferable, it is hard to determine the right transfer price to be paid by the second-source to the incumbent supplier. Both the monetary cost and the quality of investment are subject to controversy. One might believe that the investment cost can readily be read from accounting data. However, records can be manipulated and depreciation charges distorted. Furthermore, the incumbent can integrate into the

production of capital goods or else arrange kickbacks from his own suppliers (who can inflate the price of capital goods, and pay the incumbent back through side contracts). It is also difficult to measure the quality of investment. How can the outside parties know how much time and energy the incumbent managers have spent picking the appropriate technology? For these two reasons, it is clear that the incumbent is unlikely to recover the full value of his investment in case of second sourcing. [An alternative method of encouraging the incumbent to invest is to give him -- and force him to keep over the payback period of investment -- substantial stock options in the second-source in case of breakout. Laffont and Tirole [1987a] argue in detail that such stock options are at most a limited instrument both on theoretical grounds and as a practical matter.]

These two observations form the building blocks for our analysis of repeated auctioning and bidding parity. We analyze both transferable and non-transferable investments, with an emphasis on the transferable ones. And we will assume that investment is not perfectly observable; that is, the principal is unable to recover the investment undertaken by the agent from the observation of the aggregate accounting data (cost or profit), which also reflects other imperfectly observable variables such as the environment (the state of demand or of technology, the agent's ability), the agent's effort to reduce cost or increase profit, and possibly accounting errors. [To simplify the analysis while keeping the flavor of the argument, all variables labelled "imperfectly observable" will be assumed utterly "unobservable"].

The goal of our research is to develop a model that reflects Williamson's concerns and sheds light on his debate with the Chicago School (Demsetz, Posner and Stigler). First, we analyze the desirability of second sourcing when investment matters. Should bidding be biased at the procurement stage?

If so, should the principal favor the second source or encourage the persistence of monopoly? Second, if investment is of concern, how can the principal encourage an adequate level? We will view managerial contracts as a package of performance-related incentives and switching incentives.

Performance-related incentives include cost-sharing rules (in a procurement or regulatory context) and stock or stock options (in an internal organization context). Switching incentives directly bias the auctioning process. On the incumbent side, cancellation fees (or golden parachutes) make the incumbent less eager to resist second-sourcing. Similarly an entry fee (or, in the context of takeovers, poison pills) make a second source less eager to replace the incumbent. We will show that both performance-related incentives and switching incentives must be structured in a simple way so as to obtain appropriate incentives to invest. Third, we obtain clear and testable relationships between the incumbent's performance, the probability of second sourcing, performance-related incentives, and switching incentives.

The paper is organized as follows. Section 2 recalls the main incentive tradeoffs in a static (and therefore investment-free) context. Section 3 takes a dynamic perspective and introduces the possibility of second sourcing. Assuming that investment is transferable to the second source, it derives the normative recommendations and testable implications mentioned earlier. Section 4 discusses how the theory might be applied or tested in specific instances. For reasons developed there, it emphasizes the takeover interpretation. Section 5 discusses extensions of the model to non-transferable as well as to non-monetary investment.

2. Basic incentive trade-offs in the absence of agent switching.

This section assumes that the principal bargains with a single agent to perform a given, single-period task. The agent will be interpreted as the manager of a firm regulated or owned by the principal. Ex-post, the principal can observe the agent's performance, which is taken to be realized cost C (in the takeover application of the theory, this aggregate accounting data is profit or stock value). A typical contract in such a situation has the principal reward the agent as a linear function of his performance. After payment of the cost by the principal (this is but an accounting convention), the agent is paid a fixed fee F and then bears a fraction K of "cost overruns." Mathematically, the net transfer t to the agent is given by the equation:

$$(1) \quad t = F - K(C - C^a)$$

where C^a is the anticipated (expected) cost and $C - C^a$ denotes the cost overrun (or underrun). The fraction K of cost born by the agent generally lies between 0 and 1.

Similarly, if the relevant accounting data is profit or stock value, the agent is rewarded according to

$$(1') \quad t = F + K(\pi - \pi^a),$$

where F is a fixed wage and $\pi - \pi^a$ is the difference between the firm's profit and the anticipated profit, or else the increase in the firm's stock value (possibly adjusted for dividends).

Two polar cases are of particular interest:

- Cost-plus contract ($K=0$): The agent is not responsible for any cost overrun or increase in profit.
- Fixed-price contract ($K=1$): The agent is made residual claimant for his performance.

More generally, an incentive contract will denote a contract linear in the agent's performance, with a coefficient of proportionality K in $[0,1]$.

Economists have identified two basic issues in principal-agent relationships: adverse selection and moral hazard. Adverse selection refers to the possibility that the agent has private information about his environment (the technology of production or the state of demand) or about his own ability to run the firm. In the jargon of agency theory, a good manager is a manager who knows that the cost is naturally low or the profit naturally high. Because such a manager can always pretend to be or mimic a bad manager's performance, he necessarily enjoys an informational rent in the agency relationship. Moral hazard stems from the principal's inability to monitor managerial effort. Effort unobservability implies that the manager may not be trusted to supply the adequate level of effort to reduce cost or boost profit.

Extracting the agent's rent and inducing an adequate level of effort are two conflicting tasks of incentive design. Adverse selection is best tackled by a cost-plus contract, which makes the principal the residual claimant for variations in performance. That is, a good manager does not enjoy a rent, as he does not appropriate any of the benefits associated with his superior ability or the firm's superior technology. In contrast, a fixed-price contract leaves full rent to the agent. Any exogenous cost reduction of cost by \$1 increases the agent's reward by \$1.

Cost-plus contracts, however, have perverse incentive effects. Because the agent does not bear any cost increase, he has no incentive to reduce cost and therefore shirks. In contrast, a fixed-price contract makes the agent the residual claimant for his cost savings, and therefore induces him to exert the socially optimal level of effort.

We thus see that increasing K both raises incentives for cost reduction (alleviates the moral hazard problem) and increases the agent's rent associated with private information (aggravates the adverse selection problem). It is therefore unsurprising that optimal contracts trade these two effects off and pick K between 0 and 1.

Because the agent has several potential "types" or "states of information" (understand: his private information about his ability or the firm's technology can take several values), a single incentive contract is generally inappropriate. The contract must be tailored to the agent's type. This implies that the principal must offer a menu of contracts, in which the agent selects the most appropriate one given his information. This raises two questions. First, when are optimal contracts indeed simple incentive contracts? Second, what are the practical characteristics of these contracts?

Optimal contracts are generally fairly complex. However, it can be shown that if the two parties are risk-neutral, and under some (reasonable) conditions, the optimal policy for the principal is indeed to offer a menu of incentive contracts (Laffont-Tirole [1986]).

Risk neutrality is of course a very strong assumption, as we would expect managers to exhibit at least some risk aversion. The above result on the optimality of linear contracts under risk neutrality suggests two comments. First, there is little cost to using incentive contracts when the agent is not very risk averse. Second, linear contracts may no longer be adequate for

large risk aversion. However, (i) their simplicity, (ii) their pervasive use in real agency situations, and (iii) the absence of clear positive results for more general contracts in the theoretical literature still make them an interesting subject of analysis. It can be shown that the characterization of optimal incentive contracts obtained in the risk neutral case (see Fact 1 below) extends to the risk averse case (Laffont-Tirole [1986] and especially Baron-Besanko [1988]). The only difference is a quantitative one. Risk aversion drives the contracts toward the cost-plus contract (i.e., induces lower values of K). From now on, we will assume risk neutrality.

Second, the fixed fee and the fraction of cost sharing in (1) must depend on the level of announced (anticipated) cost. Otherwise, the agent would inflate C^a without bound to increase his reward. Suppose we build the incentive scheme so that it is in the agent's interest to announce truthfully his expected cost (it can be shown that this requirement imposes no extra cost on the principal). Note that the agent's expected reward is then equal to fixed fee F in (1). The following two observations suggest how F and K should vary with C^a . Both make use of the fact that a good manager ends up with (and therefore announces) a lower expected cost than a bad manager (this property is easily demonstrated). First, steeper incentives are more attractive to a more efficient agent, so that a good agent always chooses an incentive contract with a higher slope than does a bad agent. This implies that, in the menu of incentive schemes, the slope K must be negatively related to the announced cost. A confident manager (who announces a low cost) should bear a high fraction of cost overruns. A by-product of this is that a good agent has more incentives to exert effort than a bad agent does. Second, the fixed fee F must also be negatively related to the announced cost. Suppose not. This would imply that a good agent gets less from the agency relationship than a

bad one, as he works harder and obtains a lower expected reward. But a good manager can always duplicate the bad manager's cost, and therefore reward, by exerting less effort than the bad manager, which means that the good manager's rent is necessarily higher, a contradiction. The fact that both F and K are decreasing functions of C^a leads to our first testable implication:

Fact 1: In the menu of incentive contracts to be (optimally) offered by the principal, the agent's expected reward and the slope of the incentive scheme are positively related.

Remark on auctions: We assumed a single potential agent. The above reasoning, and in particular Fact 1, can be extended to the case in which the task is auctioned off among several agents, due to a simple dichotomy property. It can be shown that everything is as if the winner of the auction had been facing no competition, but the uncertainty about his type had been reduced by the auctioning process. More precisely, the winner's most inefficient potential type is not taken to be the upper bound on the principal's prior distribution over his inefficiency, but the second bidder (best loser)'s type. [Technically, competition amounts to an upward truncation of the principal's prior probability distribution over the winner's type.] Except for the fact that the winner's informational rent is reduced by the existence of competition, the qualitative insights obtained for the absence of competition thus carry over to the auctioning case (Laffont-Tirole [1987b], McAfee-McMillan [1987]) (a related dichotomy property is obtained in a different auctioning context by Riordan and Sappington [1987]).

3. Second sourcing.

First consider the two-period version of the single firm model of section 2 and introduce investment. The firm has cost

$$C_1 = \beta - e_1 + I + \varepsilon_1 \quad \text{in period 1,}$$

and

$$C_2 = \beta - e_2 - g(I) + \varepsilon_2 \quad \text{in period 2.}$$

C_t is the period- t aggregate cost (accounting data) for $t = 1, 2$, and is commonly observable. All other variables are assumed unobservable by the principal. The variable β is a measure of the agent's ability and is known to the agent only (β is the adverse selection parameter of section 2). A low β corresponds to a good agent. The variable e_t represents the agent's effort to reduce cost in period t (it is the moral hazard variable of section 2). Exerting effort imposes a non-monetary cost or disutility of effort on the agent, which does not enter the firm's accounts (C_t). The agent commits a monetary investment I in the first period, which reduces the second-period cost by $g(I)$, where $g(\cdot)$ is an increasing function. Last, the period- t cost may be affected by an exogenous zero-mean random variable ε_t , which stands for forecast and accounting errors.

Remark on non-monetary investment. Recall from the introduction that investment may be unobserved by the principal for two reasons. First it may be monetary, but the number of dollars spent on it may be distorted through accounting manipulations. Second, it may be non-monetary (a quality parameter) and therefore hard to observe. Our model admits both interpretations. The above formalization directly depicts the case of a monetary investment. But a change of variables yields the quality

interpretation as well. For, suppose that in the first period, the monetary investment is fixed (zero, say), and that the agent exerts effort e to reduce first-period cost (so that $C_1 = \beta - e + \varepsilon_1$) and \tilde{e} to choose the "right investment." The second-period cost reduction equals a constant plus $g(\tilde{e})$. Assuming that the manager's first-period disutility of effort depends on total first-period effort $e + \tilde{e}$, a relabeling of variables $\{e_1 \equiv e + \tilde{e} \text{ and } I \equiv \tilde{e}\}$ makes the non-monetary investment formally equivalent to a monetary one.

Let δ denote the discount factor between the two periods (δ is equal to one over one plus the rate of interest). The socially optimal investment maximizes the difference between the cost reduction and the investment:

$$\text{Max}_I \{\delta g(I) - I\}.$$

But the actual level of investment is picked by the agent, so that it may *a priori* differ from the socially optimal one. However, we know from Baron and Besanko [1984] that the optimal incentive scheme is generally time invariant. In our context, this implies that the slope K_t of the incentive scheme is the same in both periods, and coincides with the single-period one. That is, for any efficiency parameter β ,

$$K_1 = K_2 = K.$$

But, this time invariance of the slope of the incentive scheme implies convergence of the principal's and agent's interests as far as investment is concerned (even though their interests diverge as to the choice of efforts, because K is lower than 1). This can be easily seen from the agent's optimal choice of investment:

$$\text{Max}_I \{ \delta K_2 g(I) - K_1 I \} = K \text{ max}_I \{ \delta g(I) - I \}.$$

Second, the impossibility of monitoring the agent's investment becomes a problem once the possibility of second sourcing is introduced. Suppose now that a potential second source (an entrant, a raider) comes in at the beginning of period 2, that can produce at cost

$$C' = \beta' - e' + g(I) + \varepsilon'$$

if it is chosen to produce in period 2. The second source is identical to the incumbent in all respects but his efficiency (β' can differ from β). In particular, we make the assumption that the incumbent's investment is transferred to the second source (it is also assumed that ε' is a zero-mean random variable, and that the function of disutility of effort is the same for both managers).

An omniscient principal would select the second source if and only if the latter is more efficient than the incumbent ($\beta' < \beta$). So would an auction between the two potential agents in the second period.

However, it is easily seen that the previous incentive scheme (with time-invariant slope) leads to underinvestment. In the first period, the incumbent chooses I so as to

$$(2) \quad \text{Max}_I \{ \delta K_2 g(I) p - K_1 I \},$$

where p (in $[0,1]$) is the probability that second sourcing does not occur (the probability refers to the fact that the incumbent does not know β' when choosing investment). From (2), a constant slope ($K_1 = K_2 = K$) induces a suboptimal investment unless second sourcing is banned ($p = 1$).

In general, second sourcing is desirable, as the second source may be more efficient than the incumbent. The investment problem can then be analyzed in terms of a straightforward externality. In a sense, the incumbent captures only a fraction p of his investment. With probability $1-p$, the cost reduction is enjoyed without compensation by the second source. The performance-related and switching incentives must optimally be designed so as to make the incumbent internalize some of this positive externality (invest more). The way to do so is apparent in (2):

- Performance-related incentives: By lowering K_1 below K (the static slope), the incumbent is given more incentives to invest, as he bears a lower fraction of first-period cost. In contrast, raising K_2 above K allows him to cash in a higher fraction of the proceeds of his investment. The intertemporal structure of incentives should thus be tilted toward time-increasing incentives:

Fact 2: The slope of the incumbent's incentive scheme should grow over time (in the event that second sourcing does not occur).

Obviously, such a policy has its limits. Moving K_1 toward 0 (the cost-plus contract) destroys incentives to reduce the first-period cost. Similarly, raising K_2 toward 1 (the fixed-price contract) increases the rent enjoyed by the incumbent.

- Switching incentives: A complementary way of encouraging investment is to raise the probability p that the incumbent's contract is renewed in period 2. This yields:

Fact 3: The incumbent should be favored at the reprocurement stage (that is, the principal may keep the incumbent even when the second source is more efficient).

Thus, the second source's inefficiency parameter β' must be much lower (and not simply lower) than the incumbent's β for second sourcing to occur.

Two other useful facts can be obtained along these lines. We saw that the scale of the externality is proportional to the probability of second sourcing. An incumbent with a high probability of being replaced internalizes a lower fraction of his cost reduction. This implies that his investment must be encouraged more when the probability of second sourcing is high:

Fact 4: The slope of the incumbent's incentive scheme grows more over time, the higher the ex-ante probability of second sourcing.

Fact 5: The incumbent should be favored more at the reprocurement stage, the higher the ex-ante probability of second sourcing.

Fact 5 has straightforward consequences for the real-world design of switching incentives. To raise the probability that the incumbent's contract is renewed, the principal can give a low cancellation fee (golden parachute in the takeover interpretation) to the incumbent, making him less eager to be replaced ex-post. And he can impose an entry fee (poison pills in the takeover context) so as to make the second source less eager to replace the incumbent.

Last, recall from section 2 that a good manager (low β) (1) bears a higher fraction of cost or profit (Fact 1) and (2) reaches a better performance (lower cost, higher profit) than a bad manager (high β). Combining these facts with Facts 2 through 5, we can use variations in

managerial ability (3) to trace some interesting statistical relationships (we give both the procurement and takeover interpretations here):

Fact 6: The following variables are positively correlated:

- the firm's performance (low cost; high profit)
- the slopes of the incumbent's incentive scheme (fraction of cost sharing; level of stock or stock options)
- the cancellation fee (golden parachute)

They are negatively correlated with:

- the probability of second sourcing (takeover)
- the entry fee (poison pills)
- the intertemporal increase in the slope of the incumbent's incentive scheme.

Fact 6 yields a rich set of normative recommendations and testable implications. For a more rigorous derivation of these facts and a proof that optimal contracts are indeed linear, see Laffont-Tirole [1987a].

4. Empirical implications.

The model is general enough to encompass a wide variety of agency relationships. Our original motivation when starting this research was to analyze second sourcing in regulated industries. Second sourcing is actually fairly infrequent in such industries. For instance, of the over 3,000 refranchising decisions made by cities on cable TV franchises as of late 1986, few have involved serious competition and only five cities have expelled an incumbent operator (Zupan [1987]). Similarly, breakouts in defense contracting occur, but are still relatively unlikely. Of course, this may be consistent with the generally pessimistic view of this paper concerning agent switching: Agent switching is unlikely to be feasible if the incumbent commits large non-transferable investments. On the other hand, when

investment is transferable, the procurement process must be rigged against the second source, and this all the more that the breakout is likely, as we saw in section 3.

An application in which agent switching does occur frequently is the market for corporate control (for instance, of the 454 firms in the Mork et. al [1987] sample, 66 had been acquired by third parties during the period 1981-1985. To this number must be added turnovers by the board of directors not motivated by retirement or (voluntary) resignation). Several reasons for this may be offered. First, although investments may be sizeable, most of them are likely to be transferable to the new managerial team (although we do not deny that some human capital is lost in the process of replacing the CEO and some of his close collaborators. Second, adverse selection may play a non-negligible role in the firm's performance, as emphasized by Jensen and Murphy [1987]. Managers with fresh ideas or simply superior ability may make quite a difference, judging from the average 40 to 50% takeover premia. [Of course, there are other explanations for these high premia. Some of the gains may stem from simple transfers from stakeholders to shareholders (Shleifer-Summers [1987]). There may also exist synergy and tax gains. But there is little doubt that the managers' general ability and ideas on how to run the firm in question play a major in takeover contests.]

The market for corporate control thus provides an interesting area for testing the statistical relationships summarized in Fact 6. Before mentioning a few studies that examine such correlations, we ought to make the point that the empirical results are not direct tests of the above structural theory. Rather, we consider them to be encouraging signs that our theory is not off the mark. Furthermore, the theoretical variables are gross oversimplifications of the real-world strategic choices. For instance,

Walking and Long [1984]'s managerial resistance variable is an indicator variable set equal to 1 if the target management resists the offer, 0 otherwise. Obviously, resistance depends on the level of the offer (influenced, e.g., by poison pills), the managerial golden parachute, the structure of voting rights (existence of super-majority provisions, of staggered board elections and of dual class recapitalizations), and the possibility of post-offer takeover defenses (standstill agreements, litigation, greenmail, etc.). Identifying resistance with the levels of golden parachutes and poison pills as we do below grossly reduces the set of relevant variables.

Also, we should reemphasize that the relationships in Fact 6 are not causal. They are best interpreted as correlations between jointly determined variables. For instance, an empirical result such as "managers with higher stock options perform better on average" should not be interpreted as causal, as tempting as it may be. [For one thing, if high stock options induce better performance, why don't the managers with low stock options buy more stock options to reach the level of other managers? The differences must be explained over the sample. Our theory is that good managers self-select and choose contracts (or go to firms) with large stock options.]

Mork et. al [1988] show that there is a positive relationship between managerial ownership and Tobin's q (taken to be a measure of the firm's performance) when ownership does not exceed 5%. [The relationship becomes less clear beyond 5%; so does the theory, as high ownership levels may confer significant voting power on management.] They also show that Tobin's q is negatively correlated with the probability of a takeover. Walking and Long [1984] show that an increase in managerial ownership reduces the probability of resistance to a takeover. This is, for instance, consistent with the

prediction in the model that high managerial ownership is positively correlated with high golden parachutes.

Malatesta and Walking [1986] show that firms with a poor performance have higher levels of poison pills. It is also known that poorly performing managers oppose more resistance to takeovers (Smiley [1973], Kummer and Hoffmeister [1978]). Last, in the context of turnovers rather than takeovers, Weisbach [1988] shows that a poor performance raises the probability of turnover (although this probability remains small).

Brickley et. al [1985] and Tehranian and Waegelian [1985] show that stock prices rise on announcements of introduction of performance-based incentive schemes (in the context of our model, this corresponds to the principal's welfare increasing when the manager signals he is good by taking large stock options).

All these empirical findings are consistent with the theoretical view presented above.

5. Extensions of the theory.

■ Non-monetary investment. In section 3, we gave a reinterpretation of the model in which investment is non-monetary. The manager exerts an effort to pick the right investment. More effort today means a higher cost reduction tomorrow. But it does not reduce today's cost. We call this a disembodied cost reduction. In contrast, suppose that the very process of reducing tomorrow's cost also reduces today's cost. For instance, the manager may find tricks today that save money both today and tomorrow. We call this type of effort embodied cost reduction or learning by doing. [Mathematically, the first-period cost is $C_1 = \beta - e_1 + \varepsilon_1$ and the second-period cost $C_2 = \beta - e_2 - g(e_1) + \varepsilon_2$.]

Encouraging first-period investment is even more important under learning-by-doing. Not only does the incumbent's investment exert a positive externality on the second source (as it did in section 3), but it also exerts a positive externality on the principal: Because K_1 is less than 1, some of the incumbent's first-period cost reductions benefit the principal. Learning by doing reinforces our conclusions on switching incentives. In particular, the principal should favor the incumbent at the reprocurement stage. The conclusion on performance-related incentives may be altered. In particular, first period incentives become so important that the intertemporal structure of incentives may be tilted the opposite way relative to Fact 2 ($K_1 > K_2$).

■ Non-transferable investment. When investment cannot be transferred to a second source (as seems to have been the case in the "great engine war," in which the second source, General Electric, nearly eliminated the incumbent Pratt and Whitney out of competition), the positive externality on the second source disappears. A new -- and fairly subtle -- effect appears, that says that at equal ex-post efficiencies (once the difference in efficiency due to the non-transferable part of investment is taken account of), the second source is ex-ante (pre-investment) more efficient. In case the distributions of the types of the two agents are ex-ante identical, it can be shown that everything is as if the second-sourcing were regulated under a lower asymmetry of information and therefore should be favored at the reprocurement stage.

■ Observable investment. We assumed all along that the incumbent's investment is unobservable. In the procurement context, it would suffice that it be not verifiable by a court. That is, even if outsiders can assess the extent or quality of the investment, no rigorous measure of it can be provided

as evidence in court. In the corporate context, unobservability, and not only non-verifiability, is crucial. For, an investment that is observable by the market makes its way into the stock valuation of the firm even if it is not verifiable by a court. Thus, a manager who owns stock options has an incentive to choose those projects with positive net present value. [If the realized quality of the investment is observable just after the investment is picked, but the effort to raise this quality is not, then the effort exerted to increase the quality of this investment is formally identical to the effort to reduce first-period cost in section 3, as the stocks react immediately to the investment.]

An interesting question is whether the incumbent has an incentive to distort the degree of non-transferability of his investments if he can do so. If investment is not observable, he has no incentive to distort transferability. If investment is observable by the market, however, it may be in the incumbent's interest to make investments non-transferable, even if it is costly to do, because this increases the probability that the incumbent later keeps his informational rent (is not replaced). This may explain why some managers engage in negative net present value projects that make them indispensable.

REFERENCES

- Baron, D. and Besanko [1984] "Regulation and Information in a Continuing Relationship," *Information, Economics and Policy*, 1, 267-302.
- Baron, D. and D. Besanko [1988] "Monitoring of Performance in Organizational Contracting," forthcoming in *Scandinavian Journal of Economics*.
- Brickley, J., S. Bhagat and R. Lease [1985] "The Impact of Long-Range Managerial Compensation Plans on Shareholder Wealth," *Journal of Accounting and Research*, 7, 115-130.
- Demsetz, H. [1968] "Why Regulate Utilities?" *Journal of Law and Economics*, 11, 55-66.
- Jensen, M. and K.J. Murphy [1987] "Are Executive Contracts Structured Properly?" Mimeo, Harvard Business School.
- Kummer, D. and J. Hoffmeister [1978] "Valuation Consequences of Cash Tender Offers," *Journal of Finance*, 33, 505-516.
- Laffont, J.-J. and J. Tirole [1986]. "Using Cost Observation to Regulate Firms," *Journal of Political Economy*, 94, 614-641.
- Laffont, J.-J. and J. Tirole [1987a] "Repeated Auctions of Incentive Contracts, Investment and Bidding Parity, with an Application to Takeovers," MIT DP 463.
- Laffont, J.-J. and J. Tirole [1987b] "Auctioning Incentive Contracts," *Journal of Political Economy*, 95, 921-937.
- Malatesta, P. and R. Walking [1986] "Poison Pill Securities: Stockholder Wealth, Profitability, and Ownership Structure," Mimeo, University of Washington and Ohio State University.
- McAfee, P. and J. McMillan [1987] "Competition for Agency Contracts," *Rand Journal of Economics*, 18, 296-307.
- Mork, R., A. Shleifer, and R. Vishny [1987] "Characteristics of Hostile and Friendly Takeover Targets," Mimeo, University of Chicago Graduate School of Business.
- Mork, R., A. Shleifer, and R. Vishny [1988] "Management Ownership and Market Valuation: An Empirical Analysis," forthcoming in *Journal of Financial Economics*.
- Posner, R. [1972] "The Appropriate Scope of Regulation in the Cable Television Industry," *Bell Journal of Economics*, 3, 98-129.
- Shleifer, A. and L. Summers [1987] "Breach of Trust in Hostile Takeovers," NBER WP 2342.
- Smiley, R. [1973] The Economics of Tender Offers, Ph.D. Dissertation, Stanford University.

- Stigler, G. [1968] The Organization of Industry, Homewood, IL: Richard D. Irwin.
- Tehranian, H. and J. Waegelian [1985] "Market Reaction to Short-Term Executive Compensation Plan Adoption," *Journal of Accounting and Economics*, 7, 131-144.
- Walking, R. and M. Long [1984] "Agency Theory, Managerial Welfare, and Takeover Bid Resistance," *Rand Journal of Economics*, 15, 54-68.
- Weisbach, M. [1988] "Outside Directors and CEO Turnovers," forthcoming in *Journal of Financial Economics*.
- Williamson, O. [1976] "Franchise Bidding for Natural Monopolies -- in General and with Respect to CATV," *Bell Journal of Economics*, 7, 73-104.
- Zupan, M. [1987] "Cable Franchise Renewals: Do Incumbent Firms Behave Opportunistically?" Mimeo, USC School of Business.