

Active agents, passive principals: the role of the chief executive in corporate strategy formulation and implementation*

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Abstract

In this paper we use agency theory to study the active role of the chief executive in the formulation of corporate strategy. Unlike traditional applications of agency theory, we allow the agent (CEO) to play a role in defining the parameters of the agency problem. We argue that CEOs will have an incentive to propose difficult, ambitious and opaque strategies. The effect arises because in equilibrium, the agent may be overcompensated in the sense that the participation constraint is not binding in determining his compensation. The agent can exploit this by proposing ambitious corporate strategies, thereby influencing the parameters of the constraints in the agency problem. The principal (the owners of the company) can mitigate this by precommitting to pay high compensation regardless of the manager's chosen strategy, but may optimally prefer not to do so. *JEL numbers: G30, G34, J33, D82.* *Keywords:* agency theory, executive compensation, free-cash-flow theory, strategic complexity

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“We have created a cult of leadership that far exceeds anything that existed decades ago... What we are getting now, very dangerously, is what I call a dramatic style of managing; the great merger, the great downsizing, the massive brilliant new strategy... So we get all these massive mergers, fire, brimstone and drama, because you can’t say to the stock analysts, ‘we’re getting our logistics all straightened out, we’re going to be much more efficient at throughput to the customer.’ They start to yawn” (Mintzberg, 2000).

1 Introduction

In this paper we study the role of a manager who runs a firm on behalf of shareholders, and who is rewarded according to a compensation plan designed to align his or her interests with theirs. Although nominally responsible to shareholders, in practical terms the manager has the initiative in defining the framework in which the firm’s strategy is set and implemented, and therefore has an input into the design of his compensation package.

One of the main tasks of a chief executive is to analyse the organisation’s environment, opportunities, and culture and to formulate corporate strategy. The CEO then has to work with people in the organisation to implement the chosen strategy. Our goal in this paper is to gain insight into the kinds of strategies a chief executive will choose. We view this as a qualitative comparison, rather than a one-dimensional quantitative description of the effort variable. For example, many companies today face opportunities and challenges from the new information technologies. Should they expand ambitiously into e-business? Other companies might choose to focus on procurement and stringent cost-cutting in the face of intensified competition and consolidation. These are the kinds of choices we wish to model. Given the increased emphasis over the past decade on the chief executive’s role in creating shareholder value and the significantly increased executive compensation packages that have resulted, one can question whether this could direct management towards particular kinds of strategies.

In a seminal paper, Jensen and Murphy (1990) pointed out that managers of large corporations typically have small stakes in the financial success of their firms, on average receiving less than $\frac{1}{2}\%$ of any increase in shareholder

value. Of course, the observation that the separation of ownership and management may have adverse incentive effects has been made by many others, including Berle and Means (1932), Marris (1967), and Baran and Sweezy (1966). The conclusion that Jensen and Murphy suggested is that compensation contracts should be used to provide a tighter link between performance and reward and hence solve these adverse incentive effects. In fact, compensation contracts have changed to provide more high-powered incentives.

In this paper we question the assumption, underlying these new practices in executive compensation, that explicit incentive contracting can be used to solve the managerial incentive problem. Of course, managerial incentives can always be cured if the managers are simply given a large enough equity stake, but this is very expensive. In practice, optimal compensation design must balance cost against the benefits of better motivation. Agency theory, as formalized in Mirrlees (1975), has been widely used to model managerial motivation (Grossman and Hart (1983), Eisenhardt (1989), Holmstrom and Milgrom (1991), Milgrom and Roberts (1992), Murphy (1998), Salanié (1998)). In a nutshell, what we argue in this paper is that agency theory takes the agency problem as given and treats the manager as a *passive* player in the game, while in reality, managers have control over the structure of the agency problem. Because of managers' informational advantage that effectively allow them to control the firm's agenda, explicit performance contracting may be less effective at aligning managerial incentives and may distort corporate strategy choices. This statement needs to be qualified by acknowledging that standard principal-agent theory does, of course, distinguish between first-best and second-best. Only in special cases will the optimal incentive scheme implement first-best. The point we make in this paper is that there may be an extra layer of incentive problems in addition to those normally studied. The conclusion we reach is that incentive contracts will tend to encourage managers to develop expensive, high-effort and opaque strategies.

In a standard moral hazard model, a principal hires an agent to perform a task that requires costly effort. The task is well-defined to both principal and agent because it is described by a model they both know. There may be unknown parameters, but both players know the probability distributions of those parameters and the information structure describing who learns them when. They sign the contract at the outset before any of the uncertainty is realised. This gives a somewhat *passive* role to the agent; he certainly

doesn't have a role in defining the problem.

Schama (1987) describes an incentive system used in prisons in 17C Holland. The hapless prisoner was chained to the handle of a pump in a room that slowly filled up with water flowing from a pipe. This situation can be accurately modelled using the standard agency techniques. In equilibrium, the incentive-compatibility constraint was satisfied and the agent exerted effort by turning the handle and surviving by continuously pumping the water out of the room. The prisoner example illustrates an agent whose role in the relationship is completely *passive*. The principal controls the relationship by designing an incentive system to determine the agent's behaviour, and the agent reacts in response to those incentives.

In contrast, the top management of a publicly-owned company play an *active* role in their relationships with the board and the shareholders. They set the agenda for the company. Although ultimately the shareholders can control the management, the managers have much more information about the company and have great discretion over the kinds of information and topics that form the basis for discussion with the board. We model this active role for the manager by splitting the agency problem into two processes: first, the manager searches for information, resulting in an evaluation of the task to be carried out (strategy formulation); secondly, he is given an incentive scheme by the board and carries out the agreed task (strategy implementation). This second part is the part normally studied in agency theory. Although the flavour of our analysis differs from most applications of agency theory because we give an active role to the agent, rather than the principal, the techniques we use are standard. Analytically, this is not a new model of moral hazard but an application of existing methods to a specific setting. The active role for the manager results from our assumptions on the informational structure.

The broad outline of our model, and the main ideas of our analysis, are as follows.

The chief executive frames the discussion with the company's owners (represented by the board) over strategy and compensation, by exploring potential strategic options for the company and presenting his analysis of those options to the board. They agree on a strategy to implement and the board approve a compensation contract that induces the manager to choose that strategy and to work hard to implement it successfully. Neither the effort nor the description of the strategy itself are contractible, so the contract

specifies pay contingent on the financial performance of the firm. We assume that managers' financial resources are small; hence there is a limited liability element to the compensation package. This plays an important role in our analysis because, if the manager had large personal wealth, he would be willing to align his incentives very closely with shareholders' by buying a large share of the firm.

The key to deriving our results is the possibility of overcompensation. By this we mean an equilibrium in which the manager's expected remuneration gives him higher utility than if he pursued an alternative occupation. The possibility of overcompensation is a property that arises in various agency models in the literature. For example, several effort levels in the simplest form of moral hazard problem (with limited liability for the agent) will tend to lead to overcompensation through the incentive compatibility conditions (e.g., in the standard model given in Salanié (1997), chapter 5). Another example is Milgrom's (1988) analysis of influence activities. In a setting where the job contract allows the worker the option of quitting after the contract is signed, when new information arrives, workers may be overcompensated in some outcomes. In our setting overcompensation results from incentive-compatibility conditions relating to the manager's choice of strategy. What we do is to allow the manager to exploit this possibility of overcompensation by choosing the incentive compatibility constraints he will face.

For a given strategy (where financial performance is given as a function of effort and a random variable), the optimal contract specifies zero payment for failure and a positive payment for good performance, such that the manager's expected payment equals his disutility of effort. He is therefore not overcompensated for his effort. When we consider two possible strategies, however, he may end up being overcompensated. The reason is that the strategy preferred by the board may involve higher effort and hence higher compensation. This may not be incentive compatible, however, once we consider that the agent has the possibility to gain his higher compensation (albeit with somewhat reduced probability) as a result of implementing the other, much easier, strategy. Recall that strategies, we argue, are not sufficiently verifiable to be written into the contract: only "hard" variables such as financial performance can be. To overcome this incentive-compatibility constraint, the board will have to set a yet higher payment for the preferred strategy. Hence: in the presence of a simple, business-as-usual *status quo*, encouraging the manager to undertake a difficult yet more profitable alternative

will require overcompensation.

Another way for overcompensation to arise is when the principal-agent environment is *opaque*, in that the relationship between effort and performance is not understood as precisely by the board as by the manager. This may arise when the manager creates an innovative, ambitious strategy that involves taking the firm in new directions. Suppose that the probability of success, given high managerial effort, can take a range of possible values. When he chooses his effort, the manager knows this probability but when setting the contract the board regards it as uncertain. In order to induce managerial effort, the contract must specify a big enough payment to induce effort for a range of different probabilities, so in all but the worst-case realisation the manager must be overcompensated. Hence: encouraging the manager to implement ambitious, innovative strategies will strengthen the tendency towards overcompensation.

What kinds of strategies, then, will CEO's tend to develop? The reader is invited to guess: (a) *status quo*, boring strategies; or (b) exciting new strategies? The answer is given below.

Clearly, one difference between the analysis sketched above and the standard agency model is the timing of the setting of the compensation contract. Hence, we also need to investigate how the above results may be altered if the contract were fixed at the start of the model, before the manager has investigated possible strategies. We call this possibility "*ex ante* contracting." In fact, the shareholders can correct the distortion in strategy choice by precommitting to a minimum level for the compensation bonus (we allow for the possibility of renegotiation to revise this level upwards later, if both parties prefer). However, they face a trade-off because this precommitment may turn out to be expensive. In equilibrium they will optimally choose between *ex ante*, or *ex post* contracting, depending on the parameters of the model.

One of the most successful formulations of agency theory has been free-cash-flow theory (Jensen (1986)). Jensen argues that managers have a chronic tendency to overinvest rather than focus on shareholder value. Precursors of free-cash-flow theory may be found in influential sources as diverse as Marris (1967) and Baran and Sweezy (1966). Empirical evidence supporting the theory has been presented by Lamont (1997), Kaplan and Zingales (1997), and Blanchard, Lopez-de-Silanes, and Shleifer (1994), among others. At a practical level, EVA and other value enhancing management systems

have been implemented in an attempt to control the inertia that can lead to overinvestment rather than efficient investment policies (Garvey and Milbourn (2000)). They do this by attempting to link managerial compensation more tightly to shareholder value creation. Although free-cash-flow theory is widely accepted, together with the underlying hypothesis that firms tend to overinvest, agency theory has not been used to provide an explicit description of how principal-agent conflicts can lead to overinvestment. Instead, most agency models have focused on the manager's incentives to minimise effort. If anything, many managers arguably exert too much effort and are overactive! In this paper, we aim to provide an explanation of why moral hazard may lead managers to be over-ambitious rather than simply trying to minimise their workload. We view this as being broadly compatible with free-cash-flow theory and providing a theoretical foundation for the overinvestment hypothesis.

Hambrick and Finkelstein (1987) and Finkelstein and Boyd (1998) discuss the role of CEO discretion in firm performance and its relationship with executive compensation. Like theirs our analysis stresses “the idea – central to the managerial discretion concept – that strategic leadership, especially as embodied in the role of the CEO, is pivotal to the success or failure of a firm” (Finkelstein and Boyd (1998)). One difference is that we explicitly focus on the incentives for managers to create complex environments with the resulting high compensation. Also, as will be seen below, we associate complex environments with *overcompensation* (equilibrium expected utility of pay above the disutility of effort) while Finkelstein and Boyd (1998) regard high compensation as offsetting greater risk for the manager.

We have suggested a motive for overly ambitious strategies based on the standard financial incentives considered in agency theory and in economics more generally. However, other writers have noted a tendency towards ambitious or expansionary strategies, and attributed this to non-financial motives. Buffett (1981), commenting on the tendency for value reducing takeovers, remarks that “leaders, business or otherwise, seldom are deficient in animal spirits and often relish increased activity and challenge.” He also suggests that “Many managements apparently were over-exposed in impressionable childhood years to the story in which the imprisoned handsome prince is released from the toad's body by a kiss from a beautiful princess. Consequently they are certain their managerial kiss will do wonders.” As Eisenhardt (1989) has pointed out in her critical survey of the applicability of agency theory, the

extent to which managerial behaviour can be explained by purely financial, rather than psychological, motives is open to debate. Bénabou and Tirole (2000) is a recent extension of agency theory to describe psychological, rather than financial motivation. We do not deny the validity of non-economic interpretations, but in this paper we argue that economic theory can be a useful tool in analysing strategy formulation.

The structure of the paper is as follows. We first start with a simplified version of the model that, however, illustrates most of our arguments (section 2). A more general treatment is given in section 3, that also includes a diagrammatic exposition of the manager's preferences over different strategies. The analysis is completed in section 4 by our discussion of *ex ante* contracting. We set out the conditions under which the owners will or will not choose to correct the distortion in strategy choice by pre-committing to a minimum size for the CEO's bonus payment. In Section 5, we discuss several questions that may arise concerning the robustness of our analysis to alternative assumptions. Section 6 presents brief concluding remarks.

2 A Simple Example

We start by presenting a simplified version of our model that introduces the key elements of our analysis.

A company has a range of conceivable strategies that may or may not turn out to be applicable to its business situation. We assume that there is an initial stage of strategy formulation in which the chief executive narrows the range of possibilities by selecting a subset of these, investigates whether or not they are applicable, and if so formulates a plan whereby these might be implemented. Next, the CEO presents these strategic options to the board and a decision is reached on which one to implement. The CEO is given a compensation contract that is designed to provide the optimal incentives for him to pursue the agreed strategy and to work hard to implement it. However, success depends on his effort as well as on uncontrollable, random influences. The compensation contract can only specify a payment as a function of the financial outcome.

To make our argument using the simplest possible model, we start by assuming in this section of the paper that there are only three potential strategies. We also assume simple functional forms for all the other param-

eters and features of the model.

Strategy B is “business-as-usual.” It is always applicable and does not require explicit formulation of a strategic plan: it is boring. In return for managerial effort e there is a probability of success π_B in which the firm is worth V . If managerial effort is less than this, or if the effort is e but the strategy fails anyway (probability $1 - \pi_B$), the firm is worth nothing.

Strategy C is somewhat more ambitious. It is a “cost-cutting” plan. To work out whether the strategy is actually feasible, the manager has to investigate this alternative and try to construct a plan for implementing it that he could present to the board. If the manager investigates C, there is a probability p_C that it will turn out to be applicable. (If not, it cannot be implemented at all.) If it is applicable, in return for effort $e + e_C$, with $e_C > 0$, there is a probability of success π_C in which the firm is worth V . We assume that C is significantly higher effort, but also creates value in the sense that the firm is more likely to succeed than with B. However, we assume the increase in effort is proportionately larger than the increase in the chance of success, so that:

$$\frac{e + e_C}{\pi_C} > \frac{e}{\pi_B} \quad (1)$$

We will also assume that V is large enough relative to the effort levels that C is more productive than strategy B: $\pi_C V - e - e_C > \pi_B V - e$.

Finally, **strategy A is an ambitious adventure** into new territory — perhaps e-business or a merger. Because it is innovative, the probability of success is rather uncertain. A is ambitious, but it is also ambiguous. If the manager investigates A to formulate a strategic plan, there is a probability p_A that the strategy can be implemented. If applicable, it requires managerial effort $e + e_A$, with $e_A > 0$, to give a discrete distribution of probability of success $\tilde{\pi}_A$ in which the firm is worth V . The probability of success $\tilde{\pi}_A$ is distributed with support $\{\pi_{A1}, \dots, \pi_{AN}\}$, with $\pi_{Ak} > \pi_{Ak-1}$ (for $k = 2, \dots, N$); q_{Ak} denotes the probability of π_{Ak} . We assume that at the time of implementation, the manager knows the realized value of $\tilde{\pi}_A$, but the board does not. Note that the assumptions on $\tilde{\pi}_A$ do not mean that A is riskier than C ex-ante; they mean that there is an extra layer of asymmetry of information between the manager and the board.

We assume that $\pi_{A1} < \pi_C$, however we do not necessarily assume that the NPV of strategy A, $E\tilde{\pi}_A V - e - e_A$ is larger or smaller than for strategy C: we shall explore both cases. However, we do assume that A is better

than the status quo: $\pi_{A1}V - e - e_A > \pi_B V - e$. Paralleling our assumptions for strategy C, we also assume that A always has higher effort and higher success probability than B ($\pi_{A1} > \pi_B$), and also that $\frac{e+e_A}{\pi_{A1}} > \frac{e}{\pi_B}$.

The manager is risk-neutral and has zero initial wealth. Therefore, the compensation contract involves a limited liability constraint: the payments to the manager must be non-negative. The participation constraint for the manager is simplified by assuming that his utility in another occupation is zero.

We assume that the process of investigating a potential strategy is time-consuming: hence the manager can either invest his time in working up a plan to carry out strategy C, or strategy A (but not both).

The **main question** we ask in our paper relates to this choice: can there be a bias in the strategy formulation process that leads the CEO to focus on the ambiguous strategy A rather than the less exciting cost-cutting exercise C?

To summarise the **timing of the model**, first the manager investigates strategy A or strategy C. Then he presents the feasible alternatives to the board, who give him an incentive contract to implement the chosen strategy. He then makes his strategy and effort level choice. Finally the firm's value is realised and he is compensated according to the agreement.

2.1 Optimal Contracts

2.1.1 The single-strategy case

To solve the model, we start by finding the optimal contracts that will be given to the manager. We consider first the simplest case, when he investigates a potential alternative strategy to “business-as-usual” (B) but this alternative turns out not to be workable in practice. Hence he presents only B to the board. In order to induce him to work hard to implement B successfully, he will be given a payment m_B in the event of success (firm value V) and nothing in the event of failure (firm value 0). Incentive compatibility requires that:

$$m_B \pi_B - e \geq 0 \tag{2}$$

The optimal contract for the shareholders sets the payment at the small-

est level to satisfy this constraint:

$$m_B = \frac{e}{\pi_B} \quad (3)$$

Note that there is no overcompensation in this case. The shareholders will choose to offer this contract so long as $V > m_B$ (we assume this to hold).

2.1.2 The case of a superior, but more onerous, alternative strategy

We now pass to the case where the manager investigates C, finds out that it is applicable, and so presents both strategies B and C to the board. Since $\pi_C > \pi_B$ the shareholders will prefer strategy C, so long as the cost of inducing that choice is not too high. The optimal contract to induce choice of C specifies a monetary payment m_{BC} that is the smallest amount satisfying incentive-compatibility constraints whereby the manager chooses C over B and exerts enough effort in implementing C:

$$m_{BC}\pi_C - e - e_C \geq m_{BC}\pi_B - e \quad (4)$$

$$m_{BC}\pi_C - e - e_C \geq 0 \quad (5)$$

Under our assumption (1) that C is significantly higher effort, but somewhat more likely to succeed than B, it follows that the former constraint will bind and the latter will be slack. This implies that:

$$\frac{e_C}{\pi_C - \pi_B} > \frac{e + e_C}{\pi_C} \quad (6)$$

which shows that the optimal payment is given by $m_{BC} = \frac{e_C}{\pi_C - \pi_B}$, while disutility of effort in implementing strategy C could simply be compensated for by the smaller amount $\frac{e + e_C}{\pi_C}$. This shows that:

Proposition 1 *When the board agrees on the cost-cutting strategy C over the business-as-usual alternative B, the optimal contract overcompensates the manager.*

Note that for the board to choose to pay this compensation and have strategy C chosen rather than B, it must be that shareholder value is greater, net of the extra compensation:

$$\pi_C \left(V - \frac{e_C}{\pi_C - \pi_B} \right) \geq \pi_B \left(V - \frac{e}{\pi_B} \right) \quad (7)$$

From now on, we will suppose this to be the case.

As we noted in the introduction, overcompensation is not an unusual feature in an agency model. For example, the standard model presented in Salanié (1997), chapter 5, typically has this property.

2.1.3 The case of an innovative alternative strategy

Now consider the case where the manager investigates A, finds it is applicable, and so proposes this strategy as an alternative to B. Since the chance of success of strategy A is assumed larger than the status quo (strategy B), the board will agree to A. Recall that the probability of success $\tilde{\pi}_A$ of this strategy is uncertain. The manager knows the realised value of $\tilde{\pi}_A$ when he makes his strategy choice and effort decision, but the board do not know this value.

To induce the manager to implement strategy A at all realizations of $\tilde{\pi}_A$, the optimal contract sets the smallest payment m_{AB} satisfying the following incentive-compatibility constraints:

$$m_{AB}\pi_{A1} - e - e_A \geq m_{AB}\pi_B - e \quad (8)$$

$$m_{AB}\pi_{A1} - e - e_A \geq 0 \quad (9)$$

Note that these constraints must hold for all values of $\tilde{\pi}_A$, but we have written them only for the smallest possible realisation since this implies the constraints hold also for any larger values. By the assumption that $\frac{e+e_A}{\pi_{A1}} > \frac{e}{\pi_B}$, the former constraint only is binding and the optimal contract sets:

$$m_{AB} = \frac{e_A}{\pi_{A1} - \pi_B} \quad (10)$$

Note that for the board to choose to pay this compensation and have strategy A chosen rather than B, it must be that shareholder value is greater, net of the extra compensation:

$$E\tilde{\pi}_A\left(V - \frac{e_A}{\pi_{A1} - \pi_B}\right) \geq \pi_B\left(V - \frac{e}{\pi_B}\right) \quad (11)$$

For the above contract to be optimal, some further similar conditions must also hold. By cutting the payment appropriately, the shareholders

could induce the manager to select A when $\tilde{\pi}_A$ takes a high value, and B otherwise (they would do so if the extra effort e_A is large enough relative to the chance of success). In section 3 below we give the precise conditions for m_{AB} as defined above to be optimal and we cover the general case when it may not be. For now we shall simply assume those conditions are satisfied.

Proposition 2 *When the board agrees on an innovative strategy with an uncertain probability of success $\tilde{\pi}_A$, the degree of overcompensation is increased relative to the case where the chance of success equals its ex-ante expectation $E\tilde{\pi}_A$.*

Proof: Since $E\tilde{\pi}_A > \pi_{A1}$, it follows that $m_{AB} = \frac{e_A}{\pi_{A1} - \pi_B} > \frac{e_A}{E\tilde{\pi}_A - \pi_B}$. \square

2.2 Strategy choice in equilibrium

Since he is aware of the optimal compensation contracts for strategies C and A, the manager will take this into account when formulating his corporate strategy. If he chooses to investigate strategy C, it will turn out to be applicable with probability p_C . In that case he will obtain compensation $m_{BC} = \frac{e_C}{\pi_C - \pi_B}$ in the event of the firm succeeding (probability π_C) and exert effort $e + e_C$. On the other hand with probability $1 - p_C$ he will still have to implement B and will receive expected compensation m_B that exactly offsets his effort. His expected utility from investigating C is therefore:

$$p_C(\pi_C \frac{e_C}{\pi_C - \pi_B} - e - e_C) \quad (12)$$

The shareholders get a payoff of:

$$p_C \pi_C (V - \frac{e_C}{\pi_C - \pi_B}) + (1 - p_C) \pi_B (V - \frac{e}{\pi_B}) \quad (13)$$

If the manager chooses to investigate A, he will obtain expected payoff:

$$p_A (E\tilde{\pi}_A \frac{e_A}{\pi_{A1} - \pi_B} - e - e_A) \quad (14)$$

and the shareholders will get:

$$p_A E\tilde{\pi}_A (V - \frac{e_A}{\pi_{A1} - \pi_B}) + (1 - p_A) \pi_B (V - \frac{e}{\pi_B}) \quad (15)$$

We have already assumed that both C and A are positive-NPV projects, in the second-best sense that the shareholders prefer them to B even given the degree of overcompensation required. We now ask whether the choice between A and C that is optimal for the manager is also optimal for the shareholders. The answer is no: their interests may diverge. Since there are many parameters in the model that could vary, one could find examples where the manager prefers A while the shareholders prefer C as well as vice versa. To put some structure on the comparison, suppose that $p_C = p_A$ and $e_C = e_A$. Then there is a systematic direction to this divergence: the manager tends to choose A. If the shareholders would prefer A over C, then so does the manager. But the converse is false: the manager may prefer A while the shareholders prefer C.

Proposition 3 *Suppose that $p_C = p_A$ and $e_C = e_A$. (i) The manager may prefer an ambitious strategy over cost-cutting, even if this is not in the shareholders' interests. (ii) But he will never choose cost-cutting when the shareholders would prefer the ambitious strategy.*

Proof: see Appendix A.

3 A General Model

We now turn to a more general treatment of the simplified example presented above. At the start, the manager perceives a set of K strategies that he might investigate (he can only choose one). Each one is uncertain *ex ante* and drawn from a probability distribution. \tilde{S}_i represents the i 'th strategy ($i = 1, \dots, K$) whose realization $S_i = \langle p_i, e_i, \boldsymbol{\pi}_i, \mathbf{q}_i \rangle$ is characterized by:

- p_i : the probability that, if investigated, it will be applicable
- e_i : the extra effort required to implement it ($e_i > 0$)
- $\boldsymbol{\pi}_i = (\pi_{i1}, \dots, \pi_{in_i})$: the vector of possible values of $\tilde{\pi}_i$
- $\mathbf{q}_i = (q_{i1}, \dots, q_{in_i})$: the vector of probabilities of possible values of $\tilde{\pi}_i$

As in our previous example, the firm will either succeed (and be worth V) or fail (worth 0). $\tilde{\pi}_i$ is the probability that the strategy will be successful if implemented, which is not known by the board at the time compensation is set, but is known by the manager when he eventually decides on strategy

choice of S_i versus B (business-as-usual) and on his effort level. $\tilde{\pi}_i$ is drawn from a probability distribution with n_i possible values each with probability q_i . Without loss of generality, assume the values are indexed so that $\pi_{ik} > \pi_{i(k-1)}$ for all i and for all $k = 2, \dots, n_i$. We assume that $\pi_{in_i} > \pi_B$, for all realizations S_i , since the manager would obviously never choose to investigate a strategy with higher effort and uniformly lower success probability.

We assume that the \tilde{S}_i are i.i.d.. Before he chooses one of the \tilde{S}_i to investigate, the manager knows the realizations S_i . However, the shareholders know only the distribution. Note that all the strategies we consider involve higher effort than business-as-usual.

We can now define the payments m_i that are optimal for each strategy S_i , if presented at the board meeting. This will then allow us to characterize the manager's choice of strategy.

At the board meeting, the CEO presents the available strategy choices. If the strategy he investigated turned out not to be applicable, the only available strategy is B , otherwise he can also present \tilde{S}_i as an alternative to B . We assume that the manager can conceal an applicable alternative to B if he wishes, but cannot present an alternative unless it is applicable. The board then offer a contract in reponse. The effort choice and strategy choice are not contractible, but the contract can condition on the financial performance (i.e. whether the firm succeeds and is worth V). Hence the contract is characterized by a monetary payment in case of success.

Starting with the case where only B is presented, the board will offer compensation m_B . If B is the only option, the optimal contract specifies payment $m_B = \frac{e}{\pi_B}$. The manager will get no surplus and the shareholders' payoff is $\pi_B(V - m_B)$.

If two available options \tilde{S}_i and B are presented, the manager is offered a contract m_i . Obviously $m_i \geq m_B$, otherwise the manager would conceal the alternative \tilde{S}_i . Because $\tilde{\pi}_i$ can take a range of possible values and the manager knows the realization π_{ij} before making the final choice of strategy, he will choose S_i if π_{ij} is large enough that $\frac{\pi_{ij}}{e+e_i} \geq \frac{\pi_B}{e}$ (given that $m_i \geq m_B$). If $\pi_{ij} \leq \pi_B$, he will choose B . For intermediate values of π_{ij} , his decision will depend on the value of m_i : he will choose S_i if $\pi_{ij}m_i - (e + e_i) \geq \pi_B m_i - e$.

If there are values of π_{ij} within the interval $[\pi_B, \pi_B \frac{e+e_i}{e}]$, the shareholders face a trade-off: by raising m_i sufficiently, they can induce the manager to choose S_i at some or all of the values of π_{ij} within this region (recall that S_i

involves higher effort than B).

For $\pi_{ij} \in [\pi_B, \pi_B \frac{e+e_i}{e}]$, the shareholders can induce the manager to choose S_i at probability π_{ij} (and all higher values of $\tilde{\pi}_i$), and choose B at lower values of $\tilde{\pi}_i$, by making a payment of:

$$m_{ij} = \frac{e_i}{\pi_{ij} - \pi_B} \quad (16)$$

The shareholders' payoff if they choose this compensation m_{ij} is:

$$[V - m_{ij}] \left[\sum_{k \geq j} \pi_{ik} q_{ik} + \sum_{k < j} \pi_B q_{ik} \right] \quad (17)$$

and the profits if they choose payment m_B are defined as follows, where j is now defined such that $\pi_{ij} = \min_k \{ \pi_{ik} \geq \pi_B \frac{e+e_i}{e} \}$:

$$[V - m_B] \left[\sum_{k \geq j} \pi_{ik} q_{ik} + \sum_{k < j} \pi_B q_{ik} \right] \quad (18)$$

We can now state:

Proposition 4 *The optimal payment m_i is chosen by the shareholders in order to maximize their payoffs as defined above from the set $\{m_B\} \cup \{m_{ij}\}_{\pi_{ij} \in [\pi_B, \pi_B \frac{e+e_i}{e}]}$.*

We can now define the conditions on the exogenous parameters so that strategy S_i will be implemented by the CEO for all realisations of $\tilde{\pi}_i$:

$$E \tilde{\pi}_i \left[V - \frac{e_i}{\pi_{i1} - \pi_B} \right] \geq [V - m_B] \left[\sum_{k \geq j} \pi_{ik} q_{ik} + \sum_{k < j} \pi_B q_{ik} \right] \quad (19)$$

$$E \tilde{\pi}_i \left[V - \frac{e_i}{\pi_{i1} - \pi_B} \right] \geq [V - m_{il}] \left[\sum_{k \geq l} \pi_{il} q_{il} + \sum_{k < l} \pi_B q_{il} \right] \quad (20)$$

where the second constraint holds for $l = 2, \dots, N_i$, s.t. $\pi_{il} \in [\pi_B, \pi_B \frac{e+e_i}{e}]$. Obviously this will only happen if $\pi_{i1} > \pi_B$.

For each strategy S_i we can now compute the manager's expected payoff if he finds the strategy to be applicable:

$$\phi(S_i) = \left[\sum_{k \geq j} \pi_{ik} q_{ik} + \sum_{k < j} q_{ik} \pi_B \right] m_i - (1 - \sum_{k \geq j} q_{ik}) e_i - e \quad (21)$$

where \hat{j} is the index where the manager shifts from B to S_i , as defined above.

Proposition 5 *The manager chooses to investigate strategy S_i so as to maximize $p_i\phi(S_i)$.*

3.1 A Graphical Exposition

To give a more intuitive characterization of the optimal contract and strategy choice, consider Figure 2. It shows the possible values of $\tilde{\pi}_i$ associated with strategy S_i , graphed in relation to the effort level e and success probability π_B associated with strategy B . Consider first the probabilities below π_B . The manager will never choose strategy S_i when these probabilities are realised, regardless of the level of remuneration. He would always prefer B .

Next, consider the probabilities that lie above the diagonal line through the point (e, π_B) . Since these offer a better success/effort relationship, he will always prefer S_i to B in this region. Finally consider the probabilities in the shaded triangular region, which contains intermediate values of $\tilde{\pi}_i$. The manager will or will not choose strategy S_i at each of these probabilities, depending on the compensation offered. If m is high enough the extra effort in choosing strategy S_i will be compensated for by the higher reward in the event of success. The manager's indifference curves on this diagram are given by upward sloping straight lines with slope $\frac{1}{m}$. For each of these π_{ij} the minimum necessary compensation is defined by the reciprocal of the slope of the line through (e, π_B) and $(e + e_i, \pi_{ij})$. This is equivalent to m_{ij} as we defined above.

To maximize the probability of success, when the manager presents strategy S_i as an alternative to B , the shareholders would have to pay him enough to make him choose S_i for all probabilities $\pi_{ij} > \pi_B$. In general, they may choose a lower m_i because they may be willing to trade off a slightly lower chance of success against a lower level of compensation. As π_{ij} approaches π_B from above, the compensation required becomes very large.

Nevertheless, assuming V is rather large in relation to the other parameters, including the π_{ij} 's, the shareholders will choose $m_i = m_{i1}$ (the precise conditions for this were given in the previous subsection).

Now consider the manager's preferences over different combinations of e_i and distributions of $\tilde{\pi}_i$ (i.e., q_{ij} and π_{ij}). What kind of strategies will he prefer? Other things being equal, he prefers low effort, high chance of success

and high compensation. However, we have just shown that these variables are linked. The question is how to trade them off against each other.

To obtain high compensation, the manager would like to propose a strategy S_i for which the worst π_{ij} is as close to π_B as possible (without getting so close that it drives m_{i1} beyond the point where shareholders switch to $m_i = m_{i2}$). In other words, he would like to propose a “hard” strategy that has a poor success/effort trade-off. If he could keep the expected value of $\tilde{\pi}_i$ constant, while increasing the variability of the conditional distribution (in the sense that the lowest value falls), he would prefer this as it would increase his payment without changing the probability of success.

Alternatively, the manager might like to have available a very “easy” strategy where $\tilde{\pi}_i$ always lies above the diagonal line. He would not disclose it to the board, however, so as to keep his payment at m_B . Although it costs higher effort than B , such a strategy offers a better ratio of success probability to effort. For analytical completeness, we have studied “easy” strategies but, since they are not the main concern of our analysis, this material is relegated to appendix B. **Defining hard strategies as those for which $m_i > m_B$,** and easy strategies as those for which the reverse is true, from now on we shall only consider hard strategies in the main part of the paper.

To summarize, the graphical analysis confirms the results of the simple model presented in section 2 above. As in proposition 1, the manager prefers a strategy with somewhat higher effort, but slightly higher success probability. This corresponds to a probability π_{ij} in the area above the line $\pi_{ij} = \pi_B$ and below the line $\pi_{ij} = \pi_B \frac{e+e_i}{e}$ (a “hard” strategy with a poor success/effort ratio, such as cost-cutting). Also, among hard strategies, he prefers greater dispersion among the π_{ij} ’s. This corresponds to an ambitious strategy, as in our result of proposition 2.

3.2 Characterization of Manager’s Strategy Choice

In parallel to the examples discussed above, we can investigate the manager’s preferences for high-effort strategies and for innovative, ambiguous strategies. We do this by considering a change to the appropriate parameters of the strategy. The first proposition shows that the manager will tend to prefer more demanding strategies, even when this is not in the shareholders’ interests.

Proposition 6 *Given two hard strategies characterized by slightly different effort levels but otherwise identical characteristics p_i, π_i, q_i , such that the shareholders always choose to pay m_{i1} and induce choice of S_i rather than B , the manager will prefer to investigate the one with higher effort. The shareholders have the opposite preference.*

Proof: $\frac{\partial}{\partial e_i} \{p_i[(\frac{e_i}{\pi_{i1}-\pi_B})E\tilde{\pi}_i - e - e_i]\} = p_i[\frac{E\pi_i}{\pi_{i1}-\pi_B} - 1] = p_i[\frac{E\pi_i - \pi_{i1} + \pi_B}{\pi_{i1}-\pi_B}] > 0$; This shows the manager's preference. Higher effort implies lower total surplus, hence, since the manager's surplus is increased, the shareholder must be worse off. \square

The second proposition shows that the manager will systematically tend to prefer more innovative, ambiguous strategies where the probability of success is more uncertain.

Proposition 7 *Given two hard strategies, one with a distribution of $\tilde{\pi}_i$ that second-order stochastically dominates the other, but otherwise identical characteristics p_i, e_i , such that the shareholders always choose to pay m_{i1} and induce choice of S_i rather than B , the manager will prefer the one with the more dispersed distribution of $\tilde{\pi}_i$ while the shareholders will have the opposite preference.*

Proof: A mean-preserving-spread of the distribution of $\tilde{\pi}_i$ will either reduce π_{i1} or leave it unchanged, while leaving all other variables unchanged in the expression of the manager's surplus: $p_i[(\frac{e_i}{\pi_{i1}-\pi_B})E\tilde{\pi}_i - e - e_i]$.

In the former case (π_{i1} reduced) the manager will be strictly better off; in the latter case he will only have a weak preference. Since the total surplus is unchanged in either case, shareholders will have the opposite preference to the manager. \square

Note that we have assumed the distribution of $\tilde{\pi}$ is discrete and hence the shareholder faces an integer-programming problem. We could alternatively consider a continuous distribution in which we could express the trade-offs in terms of first-order conditions. If the density were strictly positive everywhere, then for the manager, a small increase in effort would always have an undesirable effect on the point at which the shareholders induce him to switch to B from S_i , as well as having the desirable effect of increasing compensation for implementing S_i . We did not assume a continuous distribution, however, because the first-order conditions would not give a transparent characterization of the optima of the model and, without further assumptions on the

overall shape of the distribution, the first-order conditions would only give local, not global characterizations and thus would not remove the need for considering the global conditions we have given here.

4 Ex-ante contracting

A key element of our analysis is the assumption that when managers contract with firm owners, the managers have an informational advantage over the owners. They have already learnt about possible strategies and how to implement them before the compensation contract is decided. This raises the question of whether a contract could be written at an earlier stage, before this asymmetry of information has developed.

In fact, we believe that this assumption captures an important aspect of manager-shareholder relationships in large public companies. It is inherent to the nature of the managerial labour market that CEO's will typically be better informed about the company than shareholders and non-executive directors. If this is the case, then there is no way to write ex-ante contracts at all. This is similar to the "Hirshleifer effect" (Hirshleifer 1971): if precise information about an (otherwise) insurable event is known to one party before an insurance contract can be entered into, the insurance market will not be able to re-allocate risk.

Nevertheless, one can investigate how our analysis would be modified if *ex ante* contracts were feasible. Since the CEO's choice of strategy is not contractible in our model, such a contract would still have to consist of an amount of money to be paid contingent on success at the final stage. However, by precommitting to a given amount of compensation, the shareholders could certainly improve the manager's incentives. The problem is that would mean committing to a *high* level of compensation. It would improve incentives in strategy formulation, which is of benefit to the shareholders, but it would have direct costs to the shareholders. After all, in any company the shareholders can always improve the CEO's incentives greatly by simply giving him or her a large equity stake. But this is very costly.

To briefly sketch the trade-offs involved, let us consider the different effects at work. First note that if the board commit to paying a high compensation level *ex ante*, one effect will be that when the investigated strategy turns out not to be applicable, they will have to pay high compensation sim-

ply for the manager to implement the status quo B. Clearly this will be quite a drawback if the probabilities p_i are low. Furthermore, if different strategies have different probabilities of being applicable, the introduction of overcompensation for B may bias the manager's choice towards strategies with low chances of being applicable. Offsetting these effects is the fact that *ex ante* contracts can allow the shareholders to direct the CEO towards the most productive strategies (i.e., highest $E\tilde{\pi}_i$).

To illustrate the trade-offs, we return to our ABC example from section 2 above, supposing that the parameter values are such that with *ex post* contracting A is chosen over C, even though $E\tilde{\pi}_A < \pi_C$. Let the *ex ante* contract specify compensation m^* . Clearly the only purpose of *ex ante* contracting would be to induce the manager to choose to investigate C rather than A. Notice that m^* can be less than m_{AB} , and that if the manager chooses to investigate A and this turns out to be applicable he can, of course, renegotiate to obtain m_{AB} . In other words *ex ante* contracting is a pre-commitment by the shareholders to offer at least m^* , but they cannot commit not to renegotiate with the CEO *ex post* if that is mutually desirable.

For the manager investigating strategy A with *ex ante* contracting would, therefore, yield payoff:

$$p_A (E\tilde{\pi}_A m_{AB} - e - e_A) + (1 - p_A) (\pi_B m^* - e) \quad (22)$$

while investigating strategy C gives:

$$p_C (\pi_C m^* - e - e_C) + (1 - p_C) (\pi_B m^* - e) \quad (23)$$

To solve the shareholders' optimisation problem, let us suppose that they use *ex ante* contracting to induce choice of C. They will obviously set m^* to be the smallest amount for which the manager will investigate C. In other words, they will equate the two payoffs above:

$$\begin{aligned} p_A (E\tilde{\pi}_A m_{AB} - e - e_A) + (1 - p_A) (\pi_B m^* - e) = \\ p_C (\pi_C m^* - e - e_C) + (1 - p_C) (\pi_B m^* - e) \end{aligned} \quad (24)$$

The shareholder with *ex ante* contracting will get a payoff:

$$[p_C \pi_C + (1 - p_C) \pi_B] (V - m^*) \quad (25)$$

whereas the *ex post* contract would give them a payoff:

$$p_A E\tilde{\pi}_A (V - m_{AB}) + (1 - p_A) \pi_B (V - m_B) \quad (26)$$

Notice that the trade-off faced by the shareholders is that *ex ante* contracting gives a higher chance of financial success ($E\tilde{\pi}_A < \pi_C$), but it is costly because they have to pay more, even when business-as-usual is implemented ($m^* > m_B$). The trade-off also is influenced by the relative sizes of p_A , p_C , e_A and e_C . Obviously if these are very different, this could determine the shareholders' preference between *ex ante* and *ex post* contracting. To isolate the influence of the other factors, let us fix $p_A = p_C = p^*$ and similarly $e_A = e_C = e^*$. Solving this equation for the optimal m^* gives:

$$m^* = \frac{E\tilde{\pi}_A}{\pi_C} m_{AB} \quad (27)$$

Proposition 8 *Under the assumption that $p^* = p_A = p_C$ and $e^* = e_A = e_C$, the shareholders will prefer *ex post* contracting if $p^* < \frac{\pi_B \frac{E\pi_A}{\pi_C} \frac{e^*}{\pi_{A1-\pi_B}} - e}{\pi_B \frac{E\pi_A}{\pi_C} \frac{e^*}{\pi_{A1-\pi_B}} - e + (\pi_C - E\pi_A)}$.*

Proof: from the above, the shareholder will prefer *ex post* contracting if:

$$[p^* \pi_C + (1 - p^*) \pi_B] \left(V - \frac{E\tilde{\pi}_A}{\pi_C} \frac{e^*}{\pi_{A1} - \pi_B} \right) < p^* E\tilde{\pi}_A \left(V - \frac{e^*}{\pi_{A1} - \pi_B} \right) + (1 - p^*) \pi_B \left(V - \frac{e}{\pi_B} \right) \quad (28)$$

or, equivalently

$$p^* < \frac{\pi_B \frac{E\pi_A}{\pi_C} \frac{e^*}{\pi_{A1-\pi_B}} - e}{\pi_B \frac{E\pi_A}{\pi_C} \frac{e^*}{\pi_{A1-\pi_B}} - e + (\pi_C - E\pi_A)}. \square$$

Note that the right hand side of this inequality is positive and less than one because the numerator is positive, as is $(\pi_C - E\tilde{\pi}_A)$.

Clearly if p^* is close to zero, then *ex post* contracting will be superior to *ex ante* contracting. In general, *ex post* contracting may also be preferred for a range of different parameter values.

Notice that if *ex ante* contracting is preferred, the manager ends up implementing C (if applicable), but being paid $m^* > m_{BC}$. In other words, there is an incentive for the manager to “suggest” the existence of extra scenarios of *possible* strategies that he *might* investigate - just to get bribed *ex ante* not to investigate them. Although this cannot be shown within our

mathematical model (because it would necessitate the introduction of an even earlier time period with another round of choice from another, enlarged, set of possible strategies) it is in the spirit of our earlier remark that *ex ante* contracting may be impossible anyway, because managers may be intrinsically better informed than shareholders. It reinforces our conclusion that incentive contracting may give managers an incentive to create ambiguity and opaqueness.

5 Comments on assumptions and results

We now comment briefly on several aspects of the assumptions that may be questioned by the reader, and their role in generating the results.

Why is the manager allowed to investigate only one strategy?

The assumption that the manager can only investigate one, rather than some other limited number, of strategies is a simplifying assumption that does not play a crucial role. What is important for our analysis is the idea that the choice among the set of potential strategies is a meaningful and relevant managerial decision. Hence, we assume that only a limited number can be investigated.

What is the role of the probability of applicability?

If all strategies were always applicable, there would be no role for the manager to formulate strategy. Everybody would always know that all the strategies were applicable. For example, in the ABC example above it can be verified that if all three strategies were available, but the choice of strategy was not contractible, the optimal contract would have payment m_{BC} in the event of success and the manager would be induced to choose cost-cutting. The key issues studied in this paper would not arise.

Are the results similar to existing insights on asset substitution?

Yes and no. It is well-known that a highly levered or financially distressed firm will tend to choose risky projects. This distortion arises from a conflict of interest between shareholders and creditors and, generally, it seems likely that managers' interests will tend to identify with those of shareholders in this kind of situation. Hence, managers will tend to choose risky projects that exploit the optionality of limited liability.

The difficult and ambitious strategies in our model may well be risky compared to the *status quo*. In this respect, there is a similarity between

our results and standard results on asset substitution. One difference is that the effects we study are not limited to situations of high leverage or distress. In our model, the bias towards ambitious strategies is a systematic feature of public companies. Another difference is that our high-effort and ambitious strategies are not necessarily particularly risky. One bias we identify is towards high-effort strategies and clearly, high-effort strategies need not be risky. The other bias is towards ambiguous strategies and here we emphasize that the manager's incentive is not to create risky strategies *per se*, but to create strategies where there is a high degree of informational asymmetry about the parameters of the agency problem (in our case, the chance of success). Finally, the effects we study arise from a conflict of interest between managers and shareholders while asset substitution is caused by a conflict of interest between shareholders and debtholders.

Aren't the results driven by the option-like property of the contract that results from the manager's limited wealth, and aren't the adverse effects of option-like contracts already understood? What about risk aversion of the manager?

Since the firm value takes only two possible values, one cannot describe the optimal contract as being either concave or convex (i.e. option-like). Nevertheless, the limited wealth of the manager does play a role. If he had unlimited wealth he could simply buy the company (being risk-neutral) and solve the problem, achieving first-best. This would be a world without public companies and without managerial incentive problems.

We could generalize the analysis somewhat to allow the manager to have some outside wealth, rather than zero as we have assumed. In other words the transfer payment to the manager could be negative in some states of the world, but still bounded by this limited wealth. When the manager's initial wealth is quite small relative to the size of the company, as is reasonable to assume, the effects studied here will remain.

As well as allowing the manager to have initial wealth, one could also model the manager as risk-averse. If he were risk-averse, the agency problem would remain (although the details of the modelling would differ). The effects studied in this paper would still be there. However, there would also be an extra complication to the extent that ambitious strategies are also risky – this would tend to offset the incentive to seek out ambitious strategies. See, however, our comments in the preceding subsection where we pointed out that an ambiguous strategy is not always a more risky strategy – it is a

strategy with more asymmetry of information about the chance of success.

Why is it that managers can develop strategies, but outsiders (such as the board) cannot?

One could imagine hiring one agent (perhaps a team of management consultants) to develop the strategy and another to implement the strategy. To the extent that these tasks can be separated, this would mitigate the problems studied here. The common practice of splitting positions between Chairman and Chief Executive can be viewed as an attempt to do this. In practice, however, we do not believe that strategy formulation can be completely separated from implementation. Strategic options need to be continually re-evaluated and reviewed so that the two tasks cannot be split intertemporally. People carrying out these separate tasks would tend to communicate and work together and their relative contribution to performance would end up being hard to disentangle.

Surely, at the time he is hired, there is no informational advantage of the manager over the board and the problem can all be solved by appropriate contracting at that point?

This is the *ex ante* contracting we study in section 4. We showed there that *ex ante* contracting is not always desirable because it may be too expensive. It can be more cost-effective to wait and see what strategy is proposed and tailor the compensation package to that situation.

Isn't it an oversimplification to split the manager's role into two consecutive stages, strategy formulation and implementation?

In reality, there is an ongoing process of strategy design and implementation so that new strategies may be developed at different times and they may also evolve over time. The incentive effects we study here will operate in this more complex environment. This increased complexity of the environment will reinforce the manager's incentives to shape the agency problem.

Why is the choice of strategy non-contractible?

In line with much of the recent literature on contract theory, we assume that contracts can be made conditional on "hard" variables but that there are many "soft" variables that are difficult to write explicitly into contracts. The principal may well be able to observe the realizations of these variables but they are not capable of being written into a legal document that is verifiable by a third-party enforcing authority. For an up-to-date textbook treatment of this literature, see Salanié (1997), chapter 7. We would argue that the choice of strategy is, in practice, especially hard to contract on because firms

typically operate in a highly complex, changing environment.

In the model there are no penalties for failure. In reality loss of reputation can serve as a significant penalty. How would this affect the results?

Typically in agency problems, a penalty for failure can be used to improve incentives. Indeed in the situation studied by Mirrlees (1975), an infinitely large disutility penalty can be used to achieve first-best. In our setting, a finite penalty could partially mitigate the problems studied here. On the other hand, by creating a complex environment the manager will also make it difficult to identify whether or not he has failed. This could be an interesting area for further research.

Is there a link with empirical evidence on mergers and value creation?

There is evidence that many takeovers do not create value for the shareholders of the bidding firm. For example, Jarrell and Poulsen (1989) study the share price reaction to a large number of takeovers and find that, upon announcement of a takeover, abnormal returns to bidding shareholders are close to zero or negative. Similar results are found in other studies, e.g. Jensen and Ruback (1983), Berger and Ofek (1995) and Servaes (1996). While some studies find small positive gains for bidders in some periods and for some classes of takeover, the predominant conclusion is that takeovers fail to create value for bidders, especially when the purpose is diversification.

These findings seem to agree with our result that managers will undertake ambitious strategies even if they are not value maximizing. However, in our model all of the strategies undertaken are positive NPV – it is simply that the strategy chosen does not necessarily have the largest NPV among the available options. Hence in our model the effect on the share price of a strategy announcement is ambiguous depending on the market's expectations (which we do not explicitly model).

What are the empirical implications of the model?

Murphy (1999) is a comprehensive survey of empirical research on executive compensation. One of the main results that emerges from this research is the systematic divergence between compensation practices in regulated utilities and in other firms. Both the level and the sensitivity to performance are much higher for non-regulated firms. This is consistent with our result that firms where there is more scope to develop ambitious and innovative strategies will also have managerial compensation that is higher and more sensitive to performance (we could alternatively imagine that regulated firms are subject to political pressure, although Murphy himself does not pursue

this direction). In contrast, traditional agency theory would suggest higher performance sensitivity for regulated firms, since with a less complex environment the relationship between managerial effort and financial performance is more precise.

One possible avenue to explore empirically is to use share price volatility as a proxy for strategic complexity, and investigate whether this is related to the level and the performance sensitivity of CEO compensation. We intend to pursue this question in related work.

The model assumes that the board and the shareholders are effectively identical but, in reality, does not the CEO also tend to control the board?

To simplify, we do not distinguish between the board and the shareholders although in reality, this distinction is itself a fruitful area for research. To the extent that the CEO can control the board, incentive problems may be exacerbated, particularly when the board also sets remuneration. This might also reinforce the incentive for the manager to create an opaque environment from the shareholders' point of view.

Adams (2000) is a recent interesting analysis of the role of boards in corporate governance. She studies the dual aspects of the relationship between CEO and board: on the one hand, the board can help provide input into manager's decisions; on the other hand, it must monitor the manager's performance and potentially decide whether to replace him.

6 Concluding Remarks

Unlike traditional agency theory we emphasise the active role of top managers in defining the nature of the agency relationship. The CEO's compensation contract is determined by the strategies he develops, and this can cause conflicting interests. The CEO will have an incentive to favour strategies that are either high-effort or opaque and that may add less value compared to other more conservative strategies.

We allow for the possibility of avoiding this problem by shifting the contracting to an earlier stage, but show that this may be excessively expensive. Cost is an important issue because, in any managerial incentive problem, it is always possible to align incentives by simply giving the manager a large equity stake, but this is very expensive. Hence optimal contracts must be designed to deliver good incentives at low cost.

In terms of practical implications, our analysis underlines that imperfectly designed incentive schemes may create incentive problems as well as solving them. One practical element that is absent from our analysis, as from all standard principal-agent theory, is the possibility that explicit contracting may also alter the agent's tendency to behave in an opportunistic way (this would further reinforce our basic results). Evidence on this is surveyed in Ghoshal and Moran (1996), who argue: "the assumption of opportunism can become a self-fulfilling prophecy whereby opportunistic behavior will increase with sanctions and incentives imposed to curtail it, thus creating the need for even stronger and more elaborate sanctions and incentives."

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Appendix A - Proof of Proposition 3

Proof of Proposition 3. For (ii), we need to show that if the shareholders prefer A, then the manager will too:

$$p_C \pi_C \left(V - \frac{e_C}{\pi_C - \pi_B} \right) + (1 - p_C) \pi_B \left(V - \frac{e}{\pi_B} \right) \leq p_A E \tilde{\pi}_A \left(V - \frac{e_A}{\pi_{A1} - \pi_B} \right) +$$

$$(1 - p_A)\pi_B(V - \frac{e}{\pi_B}) \quad (29)$$

$$\Rightarrow p_A(E\tilde{\pi}_A \frac{e_A}{\pi_{A1} - \pi_B} - e - e_A) \geq p_C(\pi_C \frac{e_C}{\pi_C - \pi_B} - e - e_C) \quad (30)$$

The first inequality can also be expressed as:

$$\begin{aligned} & p_C\pi_C(V - \frac{e_C}{\pi_C - \pi_B}) + (1 - p_C)\pi_B(V - \frac{e}{\pi_B}) \\ \leq & p_A E\tilde{\pi}_A(V - \frac{e_A}{\pi_{A1} - \pi_B}) + (1 - p_A)\pi_B(V - \frac{e}{\pi_B}) \\ \Leftrightarrow & \\ & p_C\pi_C(V - \frac{e_C}{\pi_C - \pi_B}) + (1 - p_C)\pi_B(V - \frac{e}{\pi_B}) \\ \leq & p_C E\tilde{\pi}_A(V - \frac{e_C}{\pi_{A1} - \pi_B}) + (1 - p_C)\pi_B(V - \frac{e}{\pi_B}) \\ \Leftrightarrow & \pi_C(V - \frac{e_C}{\pi_C - \pi_B}) \leq E\tilde{\pi}_A(V - \frac{e_C}{\pi_{A1} - \pi_B})(*) \end{aligned}$$

Next, the second inequality can also be written as:

$$\begin{aligned} p_A(E\tilde{\pi}_A \frac{e_A}{\pi_{A1} - \pi_B} - e - e_A) \geq p_C(\pi_C \frac{e_C}{\pi_C - \pi_B} - e - e_C) \\ \Leftrightarrow E\tilde{\pi}_A \frac{1}{\pi_{A1} - \pi_B} \geq \pi_C \frac{1}{\pi_C - \pi_B} (**) \end{aligned}$$

To show statement (ii) in the proposition, we now show that the reverse of inequality (**) implies the reverse of (*):

If $E\tilde{\pi}_A \frac{1}{\pi_{A1} - \pi_B} < \pi_C \frac{1}{\pi_C - \pi_B}$, then $E\tilde{\pi}_A \frac{\pi_C - \pi_B}{\pi_{A1} - \pi_B} < \pi_C$. So:

$$\pi_C(V - \frac{e_C}{\pi_C - \pi_B}) > E\tilde{\pi}_A \frac{\pi_C - \pi_B}{\pi_{A1} - \pi_B} (V - \frac{e_C}{\pi_C - \pi_B}) > E\tilde{\pi}_A (V - \frac{e_C}{\pi_{A1} - \pi_B}) \quad (31)$$

where the last inequality follows from the assumption $\pi_C \geq \pi_{A1}$.

To show statement (i), we need to show that (**) can hold (manager prefers A) as well as (*) being reversed (shareholders prefer C):

$$E\tilde{\pi}_A \frac{1}{\pi_{A1} - \pi_B} \geq \pi_C \frac{1}{\pi_C - \pi_B},$$

or equivalently:

$$E\tilde{\pi}_A \geq \pi_C \frac{\pi_{A1} - \pi_B}{\pi_C - \pi_B}$$

and

$$\pi_C \left(V - \frac{e_C}{\pi_C - \pi_B} \right) > E\tilde{\pi}_A \left(V - \frac{e_C}{\pi_{A1} - \pi_B} \right)$$

i.e.,

$$\frac{V - \frac{e_C}{\pi_C - \pi_B}}{V - \frac{e_C}{\pi_{A1} - \pi_B}} \pi_C > E\tilde{\pi}_A$$

For both inequalities to hold, we need:

$$\begin{aligned} \frac{V - \frac{e_C}{\pi_C - \pi_B}}{V - \frac{e_C}{\pi_{A1} - \pi_B}} \pi_C &> \pi_C \frac{\pi_{A1} - \pi_B}{\pi_C - \pi_B} \\ \frac{V - \frac{e_C}{\pi_C - \pi_B}}{V - \frac{e_C}{\pi_{A1} - \pi_B}} &> \frac{\pi_{A1} - \pi_B}{\pi_C - \pi_B} \\ \frac{V(\pi_C - \pi_B) - e_C}{V(\pi_{A1} - \pi_B) - e_C} &> 1 \end{aligned}$$

which holds since $\pi_C \geq \pi_{A1}$, proving (i). \square

Appendix B - Easy Strategies

Above we have considered strategies with $m_i > m_B$, which arise when the effort/success ratio is high. The other possibility is when the strategy S_i is characterized by slightly higher effort than B , but much improved probability of success (“better” distribution of $\tilde{\pi}_i$). If presented to the board, this will result in a lower payment than m_B , and we now turn to the analysis of this case (“easy” strategies). He can, however, conceal it, and implement it to obtain the reward m_B with higher probability. Thus, the manager may prefer to investigate a strategy that has a superior success/effort relationship, even though he cannot use it to increase his compensation.

The results depend on whether the manager is able to conceal from the board the fact that he has investigated the strategy S_i and found it to be applicable to the company. In fact, we believe that it is more plausible to assume that this can be concealed, and that the manager can simply report that he investigated an alternative to B which unfortunately turned out not to be applicable.

To remark on the opposite case, however, suppose hypothetically that the manager cannot conceal S_i . Then, he will never investigate it if S_i is

characterized by a known probability of success π_i (i.e., a degenerate distribution of $\tilde{\pi}_i$). This is because he would simply receive remuneration $\frac{e_i}{\pi_i}$ for his effort, which gives him no surplus. On the other hand, if S_i has a rather variable distribution of $\tilde{\pi}_i$, the resulting overcompensation may be enough to make S_i a better prospect for investigation than some other strategies with larger monetary payments.

As argued above, however, we believe that it is more appropriate to study the case where the manager can investigate strategy S_i , find it to be applicable, and then report to the board that he did not find any applicable alternative to B . Of course, he will then implement S_i nevertheless and receive a compensation contract with reward m_B . The question is whether this is a more desirable prospect for the manager than choosing a hard strategy.

When we consider what kinds of easy strategy are best for the manager, it is clear that, unlike hard strategies, he prefers low effort strategies among the easy ones, and is indifferent to uncertainty in the probability of success. Also note that, if the CEO does formulate an easy strategy (without revealing it), the shareholders are better off than if he really did have no feasible alternative to B , since, with S_i , they pay the same compensation but have a bigger chance of the firm being successful.

The appeal of an “easy” strategy is limited by the fact that probabilities are bounded above by 1. There are many “hard” strategies that dominate any “easy” strategy. A “hard” strategy S_i is better than any “easy” strategy if:

$$\phi(S_i) > m_B - e \tag{32}$$

While the above analysis of easy strategies was given to provide an analytically complete treatment of the model, we do not believe that managers actually have large numbers of easy, highly productive, strategies at their disposal. In fact, if there is a very high probability that the manager will choose an easy strategy, it may no longer even be optimal for the shareholders to offer m_B when the manager presents B as the only feasible plan of action. The conditions to rule this possibility out are as follows: Let us suppose that when the manager presents strategy B to the board they react by offering compensation $m < m_B$ rather than m_B . By cutting m below m_B , they therefore lose the entire firm value in case B was in fact the only available strategy. This is the cost of cutting m_B . Note that this cost is bounded below by $\hat{p}E$ [value of the firm], where \hat{p} is the largest p_i among all

the easy strategies S_i . On the other hand, the benefit of cutting m below m_B is simply the reduction in expected compensation - a saving that is bounded above by m_B itself. Hence, so long as V is much bigger than m_B , it is clearly sub-optimal for the board to offer less than m_B . Even if m_B is large compared to V , it is still sub-optimal, unless the manager is very likely to choose this strategy and this strategy is very likely to be implemented.

Appendix C - List of Symbols

Table 1: Possible values of the firm

V	Value of firm in case of success
0	Value of firm in case of insuccess

Table 2: Strategy B – Business as usual

e	Effort level required
π_B	Probability of success if effort put in
m_B	Optimal compensation in the event of success

Table 3: Strategy C – Cost Cutting

p_C	Probability of strategy being applicable
e_C	Extra effort required (compared to B)
π_C	Probability of success if effort put in
m_{BC}	Optimal compensation in the event of success

Table 4: Strategy A – Ambitious

p_A	Probability of strategy being applicable
e_A	Extra effort required (compared to B)
$\tilde{\pi}_A$	Random probability of success if effort put in
$(\pi_{A1}, \dots, \pi_{AN})$	Possible realizations of $\tilde{\pi}_A$
(q_{A1}, \dots, q_{AN})	Probabilities of possible realizations of $\tilde{\pi}_A$
m_{AB}	Optimal compensation in the event of success

Table 5: General Model - Strategy S_i

p_i	Probability of applicability of strategy
e_i	Extra effort required (compared to B)
$\tilde{\pi}_i$	Probability of success if effort put in
π_{ij}	Possible realization of $\tilde{\pi}_i$
q_{ij}	Probability of π_{ij}
m_i	Optimal compensation in the event of success
m_{ij}	Variables used in derivation of m_i (see page 17)

Appendix D: Figures

Figure 1: Time Line of Events

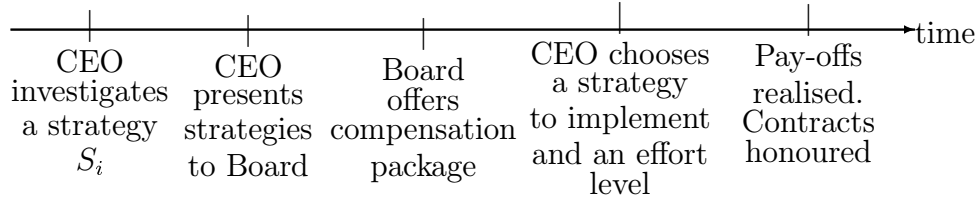


Figure 2: CEO Preferences

