# FORMING A NEW PARTNERSHIP VIA MANAGEMENT BUYOUTS

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#### Abstract

This paper considers the optimal move of the executives and managers of a firm to form a new partnership of their own. Such management buyouts are unique and deserve special attention because they cannot be explained by synergistic gains. Instead, gains realized in these buyouts must come either from a better exploitation of the firm's own resources including its managerial talents or from a better alignment of interests between managers and shareholders under the existing operating strategy. Although the management buyouts are believed to increase values and to provide real benefits, there are numerous defaults. One possible justification for the failure is the wrong timing. It is our objective to have a basic understanding of the market conditions and the work incentives under different corporate structures.

To represent the changes that both product and capital markets impose on management, we build a model based on four elements: a stochastic demand, a risk-averse behavior, risk-neutral outside investors and the influential work effort. Taking an insider's perspective, this paper focuses on the management performance to the survival of the company and how the effort levels and uncertainty affect the profitability of the firm. Precisely, we analyze how the insider ownership will be modified within a market setting and outline the circumstances under which management buyouts are favorable. Our results demonstrate that a company can either organized with owners who arrange their own funding (i.e., a possibly leveraged buyout partnership) or it is run by managers working as wage earners (i.e., a traditional principal-based hierarchy) is equally attractive in specific economic environments.

### 1. INTRODUCTION

Management buyouts occur when a company is taken over by its former executives and managers. These deals are unique forms of acquisition and deserve special attention because they cannot be motivated by synergistic gains. Instead, gains realized in management buyouts must come either from a better exploitation of the firm's own resources including its managerial talents as argued by Kaplan (1989) or from a better alignment of interests between managers and shareholders as suggested by Jensen & Meckling (1976) under the existing operating strategy. Whatever the sources of gains, the management buyout benefits cannot be denied. Indeed, management buyouts whether or not there is any apparent outside threat, represent the restructuring changes that both product and capital markets imposed on corporate managers as shown by Demsetz & Lehn (1985).

There are many issues related to a management buyout. They include, for example, financing issues studied by numerous authors such as Bygrave & Timmons (1992), Wright, Thompson & Robbie (1992) and Fried & Hisrich (1994), organizational/functional structure changes examined by Shleifer & Vishny (1989), and Robbie & Wright (1996), types of the targets analyzed by Morch, Shleifer & Vishny (1988) and even taking-over process considered by Grossman & Hart (1981). This research, taking an insider's perspective, focuses on the performance of management is to the survival of the company and how the levels of effort and uncertainty affect profitability and success of the firm. Although DeFraja (1996) has done similar work based on the work-leisure choice, the model does not appear to explain the possibilities of defaults. While our focus is the incentives in corporate structure, we explicitly analyze how the ownership will be modified and imbedded in a market setting. Before any sophisticated proposals are examined, however, a basic understanding of the market conditions is needed. That is one of the objectives in our paper. More importantly, we hope to identify a new testable causality between firm performance and insider ownership.

We construct a theoretical model containing four key features, namely a stochastic product market, risk-averse managements, risk-neutral outside principals and the influential work effort. Based on these assumptions, the paper shows that either the company is run by owners who have their own financing (i.e. a leveraged buyout partnership) or it is run by managers working for a fixed salary (i.e. a principal-based hierarchy) is attractive in specific economic environments. Our conclusions are similar to those of Bajaj, Chan & Dasgupta (1998) who use a signaling approach.

The paper is organized as follows. Section 2 introduces the basic framework of analysis. Section 3 presents the two ownerships structure available to undertake the project. Results are derived in terms of when one structure is preferred to the next and whether the management chooses to apply high versus low corporate effort. Section 4 contains a few concluding remarks.

## 2. MODEL

Consider a company who owns the franchise rights for a project. The income, W, of the firm is determined by revenue and costs. Revenue depends on output, q and the inverse demand curve, P = a - bq.

$$R(q) = Pq = (a - bq)q \tag{1}$$

Total cost is given by:

$$C(q,e) = c_1 q^2 + c_2 q - c_3 eq + K + e$$
<sup>(2)</sup>

The parameter e - effort is assumed to be one of two discrete levels either  $e_L$  or  $e_H$ , corresponding to low or high effort respectively, K > 0 is the fixed capital investment in the project, and  $c_1$ ,  $c_2$  and  $c_3$  are parameters of the cost function. To ensure the firm's cost is always an increasing function of output, we need  $c_2 > c_3e$ . The parameter  $c_3$  reflects how much marginal and average cost can be reduced per unit of effect.

However, income level, W is uncertain.

$$W = u[R(q) - c(q, e)]$$
(3)

The parameter u is a two-state random variable which takes the values  $u_2 > u_1$ . The probability of which state occurs is influenced by the effort exerted by the managing operators under different ownership structure. For low effort, probability is denoted by  $\alpha = (u = u_1 | e_L)$  and for high effort the probability is  $\phi \alpha = (u = u_1 | e_L)$  where  $0 \le \phi \le 1$ .

If  $\phi = 1$ , then high effort has no impact on the risk level of the project. At the other extreme,  $\phi = 0$ , high effort can eliminate the risk from the project. The low level of effort characterizes an effort that can be contracted for and verified by a principal who is an external investor. The high level of effort includes the low level of effort plus an effort that is only internally monitored by the existing management. The incremental effort cannot be contracted for and verified by external investors. When the current management chooses to work as an agent, high effort may not be feasible because there is no direct

external enforcement mechanism. As a result, the management does not have any incentive to work hard if it only receives a fixed fee.

Conventionally, effort might be put into many categories. Effort can be directed towards reducing risk or cost reduction. For simplicity, effort is only assumed to reflect managerial competence and attentiveness.<sup>1</sup> Since activities such as taking skilled managers from other areas and using up valuable senior management time involving the firm higher effort levels are costly and difficult for an external investor to verify or contract for, this closely matches our earlier definition that higher effort cannot be easily contracted for by the external investor.

The firm's utility function is assumed to exhibit Arrow-Pratt constant relative risk aversion. R will be the relevant measure of the risk attitude. The management is assumed to be risk averse, 0 < R < 1, maximizing the expected utility of corporate income from the new capital project. Then, the utility of income is

$$U(W) = W^{1-R} \tag{4}$$

## **3. OWNERSHIP CHOICES**

Two different ownership structures are considered. The first one is self-financing buyout and forming new partnership by the current management. The income of the firm will then tie to the market outcome. With the assumptions of the model, we show that under self-managed and self-financing the group of agents deciding to break away will always provide high levels of effort if take-over is at all desirable. The second alternative for the risk aversive management is to sell the business opportunity and its management services to outside investors in return for a fixed reward that is independent of the market outcome. Unfortunately in this case, since the high level of effort cannot be contracted for, the management will only supply low effort. However, in some cases, the managing group receives a reduction in risk that more than compensates for the lower income.

<u>Case 1</u>: Management self-finance becoming an entrepreneur For a low level of effort, the expected utility of profit is

$$EU(W|e_L) = \alpha u_1^{1-R} \left[ (a - bq)^* q - (c_1q^2 + c_2q - c_3e_Lq + K) - e_L \right]^{1-R} + (1-\alpha) u_2^{1-R} \left[ (a - bq)^* q - (c_1q^2 + c_2q - c_3e_Lq + K) - e_L \right]^{1-R}$$
(5)

Correspondingly, a high level of effort yields

$$EU(W|e_{H}) = \phi \alpha u_{1}^{1-R} \left[ (a-bq) * q - (c_{1}q^{2} + c_{2}q - c_{3}e_{H}q + K) - e_{H} \right]^{1-R} + (1-\phi\alpha) u_{2}^{1-R} \left[ (a-bq) * q - (c_{1}q^{2} + c_{2}q - c_{3}e_{L}q + K) - e_{H} \right]^{1-R}$$

$$\tag{6}$$

In general, the firm must choose both effort and output before the state of the world is known. To choose the optimal level of effort, the firm must calculate the maximum expected utility under a high effort level and under a low level of effort and compare the two results.

For low effort, maximizing equation (5) with respect to q yields the optimal output  $q^* = \frac{a - c_2 + c_3 e_L}{2(b + c_1)}$ .

With the specification of the model, it does not matter whether the firm chooses output before or after the random variable, u is observed. The same level of output will be chosen. Substituting optimal output,  $q^*$  in the equation (5) yields

$$EU * (W|e_L) = \left[\alpha u_1^{1-R} + (1-\alpha)u_2^{1-R}\right] * \left[\frac{(a-c_2+c_3e_L)^2}{4(b+c_1)} - (K+e_L)\right]^{1-R}$$
(7)

To simplify our notations, it is convenient to replace  $(a-c_2) = B$  and  $(b+c_1) = A$  for the remaining analysis.

$$EU^{*}(W|e_{L}) = \left[\alpha u_{1}^{1-R} + (1-\alpha)u_{2}^{1-R}\right]^{*} \left[\frac{(B+c_{3}e_{L})^{2}}{4A} - (K+e_{L})\right]^{1-R}$$
(8)

Similarly, high effort will have an optimal output and expected utility as given below.

$$q^* = \frac{a - c_2 + c_3 e_H}{2(b + c_1)} = \frac{B + c_3 e_H}{2A}$$
(9)

$$EU * (W|e_{H}) = \left[\phi \alpha u_{1}^{1-R} + (1-\phi \alpha) u_{2}^{1-R}\right] * \left[\frac{(B+c_{3}e_{H})^{2}}{4A} - (K+e_{H})\right]^{1-R}$$
(10)

<sup>&</sup>lt;sup>1</sup> Effort is not necessarily directed towards a specific management role. For example, low level of effort corresponds to putting someone who meets the basic credentials of managing the project. A high level one may involve putting a more skilled person in charge of the new project.

Under some specific simple conditions, it can be shown unambiguously that the firm will choose a high level of effort or a low level of effort. These are demonstrated in theorems 1 and 2 below.

**Proposition 1:** A firm will always choose a high level of effort if  $e_L \ge \frac{(2A-Bc_3)}{c_3^2}$ . Otherwise, a high level of effort may only be desirable depending on more complicated conditions.

Proof: Since there are only two levels of effort are considered, we can predict the possible impact on either expected utility once the effort levels have been determined. The expected utility associated with any effort levels can be characterized as

$$EU(W|e) = \left[\phi\alpha u_1^{1-R} + (1-\phi\alpha)u_2^{1-R}\right] * \left[\frac{(B+c_3e)^2}{4A} - (K+e)\right]^{1-R}$$
(11)

Define the effort component that drives the utility level as  $T(e) = \frac{(B+c_3e)^2}{4A} - e$  with  $\frac{\partial T}{\partial e} = \frac{(Bc_3+c_3^2e)}{2A} - 1$  and  $\frac{\partial^2 T}{\partial^2 e} = \frac{c_3^2}{2A} > 0$ . Solving for the critical effort level, e\* that gives a minimum expected utility, we have  $e^* = \frac{(2A-Bc_3)}{c_3^2}$ .

If  $e_L > e^*$ , then  $\partial T/\partial e \ge 0$ , since  $\partial^2 T/\partial^2 e > 0$  then  $\partial T(e_H) /\partial e \ge 0$ , high level of effort increases the expected utility above that of low level of effort.

Corollary: If  $2A-Bc_3 < 0$ , then high effort will always be preferred.

Proof. When  $e_L>0$ , the conditions of Proposition 1 are always satisfied.

The above circumstance is favored by A being small or  $Bc_3$  being large. The term  $A = b+c_1$  is small if the market is more competitive (i.e. b is small) or diseconomies of scale,  $c_1$  is small. The term  $Bc_3 = (a-c_2)c_3$  is large if the maximum willingness to pay, a is large, or the unit variable cost,  $c_2$  is small or the impact of effort on reducing unit variable cost,  $c_3$  is large.

**Proposition 2:** If high effort has no impact on the likelihood of high or low income,  $\phi = 1$  then low effort will yield higher expected utility whenever  $e_H \le e^* = (2A - Bc_3) / c_3^2$ .

Proof. From Proposition 1, since  $\partial^2 T/\partial^2 e > 0$ ,  $\partial T(e_H) / \partial e \le 0$  if  $e_H \le (2A-Bc_3) / c_3^2$ . The expected utility is increased as effort is reduced thus  $EU(e_H) < EU(e_L)$ . The condition,  $\phi = 1$  is necessary because otherwise, the benefits that higher effort provides in increasing the likelihood of the favorable outcome may compensate for the negative impact that high effort has on expected income.

Sufficiently high effort if available, ultimately leads to greater income than lower effort because there are no diminishing returns to effort. Each additional amount of effort contributes a constant reduction in marginal and average cost. The reduction in cost encourages greater output that magnifies the rewards of greater effort. For all possible effort levels, constant improvement in average cost for effort is unrealistic. However, by assumption, our analysis will focus on considering only two discrete effort levels whose range is characterized by effort making a constant improvement in average cost due to additional effort.

#### Case 2: Management giving up ownership becomes a wage earner

The agents can contract out the project to risk-neutral external investors who pay a fixed management fee. The fixed fee will include economic rent that the management would expect to receive if self-financing is taken. The market for external investors is assumed to be competitive and the expected return of external investors need only be K, the cost of capital. While making a fixed payment to the management, external investors assume all the risk. For the poor outcome, the investors will earn less than K and they will earn more than K when the outcome is favorable to compensate.

As argued earlier, the investor cannot monitor whether or not the managing operator puts in high effort. As a result, the management fee that the investors make is based on the belief that the agent will expend low effort. The expected wage, E(W) will be the amount received by the management regardless of the state of the world, net of its effort cost.

$$E(W) = \left[\alpha u_1 + (1 - \alpha)u_2\right] * \left[\frac{(B + c_3 e_L)^2}{4A} - (K + e_L)\right]$$
(12)

$$U(EW, e_L) = \left\{ \left[ (\alpha u_1 + (1 - \alpha) u_2) \right] * \left[ \frac{(B + c_3 e_L)^2}{4A} - (K + e_L) \right] \right\}^{1 - R}$$
(13)

Generally, less wealth is created when there is no ownership is involved, but the management avoids risk and has a more certainty return.

Normalizing equation (13) by setting  $u_1 = 1$  and  $e_L = 1$  yields

$$U(EW, e_L) = \left[\alpha + (1 - \alpha)u_2\right]^{1 - R} * \left[\frac{(B + c_3)^2}{4A} - (K + 1)\right]^{1 - R}$$
(14)

Define  $G(\alpha, R, \phi, u_2) = \frac{\left[\alpha + (1 - \alpha)u_2\right]^{1-R}}{\left[\phi\alpha + (1 - \phi\alpha)u_2^{1-R}\right]}$  and  $H(a, c_2, c_3, A, K, e_H) = \frac{(B^2 + 2Bc_3e_H + c_3^2e_H^2 - 4AK - 4Ae_H)^{1-R}}{(B^2 + 2Bc_3 + c_3^2 - 4AK - 4A)^{1-R}}$ 

<u>Lemma 1</u>: The management prefers to be a wage earner if  $G(\alpha, R, \phi, u_2) > H(a, c_2, c_3, A, K, e_H)$ .

Proof. By definition, the management prefers working as an agent to self-financing and -managed if  $U(EW|e_{i}) > EU(W|e_{i}) > 0$ , substituting the parameterized functions for these two relationships yields the requirement

 $\left[\alpha u_{1} + (1-\alpha)u_{2}\right]^{1-R} \left[\frac{(B+c_{3}e_{L})^{2}}{4A} - (K+e_{L})\right]^{1-R} > \left[\phi\alpha u_{1}^{1-R} + (1-\phi\alpha)u_{2}^{1-R}\right] * \left[\frac{(B+c_{3}e_{H})^{2}}{4A} - (K+e_{H})\right]^{1-R} \text{Re-arranging the above equation and}$ setting  $\mathbf{e}_{L} = 1$  and  $\mathbf{u}_{I} = 1$  yields  $G(\bullet) = \frac{\left[\alpha + (1-\alpha)u_{2}\right]^{1-R}}{\phi\alpha + (1-\phi\alpha)u_{2}^{1-R}} > \frac{(B^{2} + 2Bc_{3}e_{H} + c_{3}^{2}e_{H}^{2} - 4AK - 4Ae_{H})^{1-R}}{(B^{2} + 2Bc_{3} + c_{3}^{2} - 4AK - 4A)^{1-R}} = H(\bullet)$ 

Lemma 2: The management prefers to give up ownership if it chooses low effort as the optimal action when self-financing and self-managed.

Proof. The net value created for the management is the same whether being a wage earner or self-financing is undertaken. The difference is that the external investor adsorbs all the risk. Comparing the expected utility associated with different ownership structures yields the following claim

 $[\alpha + (1 - \alpha)u_2^{1 - R}] * (B^2 + 2Bc_3 + c_3^2 - 4AK - 4A)^{1 - R} > [\alpha + (1 - \alpha)u_2]^{1 - R} * (B^2 + 2Bc_3 + c_3^2 - 4AK - 4A)^{1 - R}$ It follows  $\alpha + (1-\alpha)u_2^{1-R} > [\alpha + (1-\alpha)u_2]^{1-R}$ . Taking both sides to 1/(1-R) power yields  $[\alpha^{1/(1-R)} + \dots$  some other positive terms +  $(1-\alpha)u_2$ ]  $> \alpha + (1-\alpha)u_2$  implying  $[\alpha^{1/(1-R)} + \dots$  remaining positive terms]  $> \alpha$  which must be true since 0 < R < 1.

<u>Lemma 3</u>: With  $e_L \ge \frac{(2A - Bc_3)}{c_3^2}$ , the management will only give up ownership to work as a wage earner if  $\frac{[\alpha + (1 - \alpha)u_2]^{1-R}}{\phi \alpha + (1 - \phi \alpha)u_3^{1-R}} > 1$ 

and this term will always be less than  $u_2$ .

Proof. Obviously, the low effort case must earn positive utility if it is worth considering. Given this is the case, from Proposition 1 since  $e_H > e_L$ , then  $\partial EU(W, e_H)/\partial e > 0$  which implies

 $(B^{2} + Bc_{3}e_{H} + c_{3}^{2}e_{H}^{2} - 4AK - 4Ae_{H})^{1-R} > (B^{2} + 2Bc_{3} + c_{3}^{2} - 4AK - 4A)^{1-R}.$  It follows from Lemma 1 that  $\frac{[\alpha + (1-\alpha)u_{2}]^{1-R}}{\phi\alpha + (1-\phi\alpha)u_{2}^{1-R}} > 1.$ 

Define  $u_2 = \frac{\max\{[\alpha + (1 - \alpha)u_2]^{1-R}\}}{\min\{\phi\alpha + (1 - \phi\alpha)u_2^{1-R}\}}$ 

Since max  $\{[\alpha+(1-\alpha)u_2]^{1-R}\} = u_2$  with  $\alpha = 0$  & R = 1 and min  $\{\phi\alpha+(1-\phi\alpha)u_2^{1-R}\} = 1$  with  $\alpha = 1$  &  $\phi = 1$ , furthermore since the numerator cannot be at a maximum while the denominator is at a minimum.  $\frac{[\alpha + (1 - \alpha)u_2]^{1 - R}}{\phi \alpha + (1 - \phi \alpha)u_2^{1 - R}} < \frac{\max\{[\alpha + (1 - \alpha)u_2]^{1 - R}\}}{\min\{\phi \alpha + (1 - \phi \alpha)u_2^{1 - R}\}} = u_2$ 

Lemma 1 and Lemma 3 together imply certain restrictions on situations where a firm will be organized with a principalagent hierarchy.

**Proposition 3:** For  $e_L \ge \frac{(2A - Bc_3)}{c_3^2}$ , if  $G(\alpha, R, \phi, u_2) = \frac{[(\alpha + (1 - \alpha)u_2]^{1-R}}{\phi\alpha + (1 - \phi\alpha)u_2^{1-R}} > 1$ , then a critical  $e_H^*$  exists such that for all levels  $e_H < \frac{1}{2}$ 

 $e_{H}^{*}$ , the hierarchy-based firm structure will be favored

Proof. Let  $G(\alpha, R, \phi, u_2) = 1 + \gamma$  with  $\gamma > 0$ , principal-based structure is preferred for all  $e_H$  that satisfy  $H(a,c_2,c_3,A,K,e_H) = \frac{(B^2 + 2Bc_3e_H + c_3^2e_H^2 - 4AK - 4Ae_H)^{1-R}}{(B^2 + 2Bc_3 + c_3^2 - 4AK - 4A)^{1-R}} \le 1 + \gamma$ 

From Lemma 2,  $1+\gamma < u_2$ , so a finite value exists for  $H(\bullet)$ . If  $e_H = e_L$ , then the above expression must be satisfied since the right hand side will be equal to one. From Proposition 1,  $\partial EU(W,e)/\partial e > 0$  so that as  $e_H$  is increased, the numerator increases so that an  $e_H = e_L + \lambda$  exists where H(a, c<sub>2</sub>, c<sub>3</sub>, A, K, e<sub>L</sub>+ $\lambda$ ) = 1+ $\gamma$ .

**Proposition 4:** If  $e_L \ge (2A-Bc_3)/c_3^2$  and low effort yields positive utility then hierarchical structure is favored by

- increasing  $\phi$ , the smaller the impact that effort has on increasing the likelihood of favorable outcomes i) ii) increasing u<sub>2</sub>, the larger the favorable outcome
- increasing B, if  $B < \frac{4A c_3^2(e_H + 1) + [c_3^2(c_3^2e_H^2 8e_HA 2c_3^2e_H 8A + c_3^2 16AK) + 16A^2]^{1/2}}{2c}$  and decreasing B, if ii)

$$B > \frac{4A - c_3^2(e_H + 1) + \sqrt{c_3^2(c_3^2 e_H^2 - 8e_H A - 2c_3^2 e_H - 8A + c_3^2 - 16AK) + 16A^2}}{2c_2}$$

increasing A, if  $B > c_3(K + \sqrt{K^2 + e_H K + e_H + K})$  and decreasing A, if  $B < c_3(K + \sqrt{K^2 + e_H K + e_H + K})$  where iii) increasing A represents reducing market competition, b or enlarging diseconomies of scale, c1

decreasing c<sub>3</sub>, if  

$$c_{3} > \frac{\sqrt{(1+e_{H})(4AK-B^{2})+4Ae_{H}+[16(e_{H}^{2}K^{2}+2e_{H}K+K^{2}+e_{H}^{2}+2e_{H}^{2}K-2e_{H}K^{2})A^{2}+(e_{H}^{2}-2e_{H}+1)B^{4}-8A(e_{H}+e_{H}^{2}K+K+e_{H}^{2})B^{2}}{2e_{H}B}$$

increasing c<sub>3</sub>, if

 $c_3$ 

iv)

$$<\frac{\sqrt{(1+e_{_H})(4AK-B^2)+4Ae_{_H}+[16(e_{_H}^2K^2+2e_{_H}K+K^2+e_{_H}^2+2e_{_H}^2K-2e_{_H}K^2)A^2+(e_{_H}^2-2e_{_H}+1)B^4-8A(e_{_H}+e_{_H}^2K+K+e_{_H}^2)B^2}{2e_{_H}B}$$

where increasing c3 represents an increasing reduction in average cost per unit of effort

- increasing K, the cost of investment capital in the project v)
- vi) decreasing  $e_{H}$ , the high level of effort

Proof. Suppose that  $e_H = e_H^*$ , so the firm is just indifferent between investing itself and using outside investors. From Lemma 3 such an effort level must exist. This implies

 $G(\alpha, R, \phi, u_2) = \frac{[\alpha + (1 - \alpha)u_2]^{1-R}}{\phi\alpha + (1 - \phi\alpha)u_2^{1-R}} = H(A, B, c_3, K, e_H) = \frac{(B^2 + 2Bc_3e_H + c_3^2e_H^2 - 4AK - 4Ae_H)^{1-R}}{(B^2 + 2Bc_3 + c_3^2 - 4AK - 4A)^{1-R}}$ i) G(•) always gets larger when  $\phi$  increases since  $\frac{\partial G(\alpha, R, \phi, u_2)}{\partial \phi} = \frac{[\alpha + (1 - \alpha)u_2]^{1-R}(\alpha u_2^{1-R} - \alpha)}{[\phi\alpha + (1 - \phi\alpha)u_2^{1-R}]^2} > 0$  since  $u_2 > u_1 = 1, \alpha \le 1$  and 0 < 1

R <1. H(•) remains constant since  $\partial H/\partial \phi = 0$ . This favors using hierarchy structure.

ii) G(•) always gets larger when  $u_2$  increases since  $\frac{\partial G(\alpha, R, \phi, u_2)}{\partial u_2} = \frac{\left[(1-\alpha)u_2 - (1-\phi\alpha)u_2^{1-R}\right]\left[\alpha + (1-\phi\alpha)u_2\right]^{1-R}(1-R)}{\left[\phi\alpha + (1-\phi\alpha)u_2^{1-R}\right]^2\left[\alpha + (1-\alpha)u_2\right]u_2} > 0 \text{ with } 0 < R$ 

 $< 1, \phi \le 1, \alpha \le 1$  and  $u_2 > u_1 = 1$ . H(•) remains constant since  $\partial H/\partial u_2 = 0$ . Therefore, increasing  $u_2$  will favor using hierarchy structure.

iii) To prove this claim, we must determine how  $H(\bullet)$  changes when B increases. To do this, it is useful to find a function,  $Y(\bullet) = H(\bullet)^{1/1-R}$ . The sign of  $\partial H/\partial B$  is preserved for the function  $Y(\bullet)$  because  $H(\bullet) > 1$ . Define  $(B^2 + 2Bc_3e_H + c_3^2e_H^2 - 4AK - 4Ae_H)$ 

$$Y(\bullet) = \frac{1}{B^2 + 2Bc_3 + c_3^2 - 4AK - 4A}$$
  
with  $\frac{\partial Y(\bullet)}{\partial B} = \frac{-2(e_H - 1)[c_3^2e_H + Bc_3^2(e_H + 1) + B^2c_3 + 4AKc_3 - 4AB]}{(B^2 + 2Bc_3 + c_3^2 - 4AK - 4A)^2}$ 

The following condition signs the above derivative. Two possibilities occur, namely

$$if_{B>} \frac{4A - c_{3}^{2}(e_{H} + 1) + \sqrt{c_{3}^{2}(c_{3}^{2}e_{H}^{2} - 8e_{H}A - 2c_{3}^{2}e_{H} - 8A + c_{3}^{2} - 16AK) + 16A^{2}}}{2c_{3}}, \text{ then } \partial Y/\partial B < 0. \quad G(\bullet) \text{ remains constant since } \partial G/\partial B = 0.$$

The term  $\partial Y/\partial B < 0$  implies  $\partial H/\partial B < 0$ . Increasing B favors using hierarchy structure since the relative utility to stay as a wage earner is increased. Since  $B = a - c_2$ , a larger B can achieved with increases in the maximum willingness to pay, a or with decreases in the unit variable cost of output,  $c_2$ .

Otherwise, if  $_{B < \frac{4A - c_3^2(e_H + 1) + \sqrt{c_3^2(c_3^2e_H^2 - 8e_HA - 2c_3^2e_H - 8A + c_3^2 - 16AK) + 16A^2}}{2c_3}$ , then  $\partial Y / \partial B > 0$ . G(•) remains constant since

 $\partial G/\partial B = 0$ . The term  $\partial Y/\partial B > 0$  implies  $\partial H/\partial B > 0$ . Decreasing B favors using hierarchy structure since the relative utility to stay as a wage earner is increased. A similar interpretation can be obtained and same previous conditions apply.

iv) Again use the Y(•) function to determine the impact on H(•), with  $\frac{\partial Y}{\partial A} = \frac{4(e_H - 1)[(e_H K + e_H + K)c_3^2 + 2KBc_3 - B^2]}{(B^2 + Bc_3 + c_3^2 - 4AK - 4A)^2}$ .

Two cases exist, if  $B > c_3(K + \sqrt{K^2 + e_H K + e_H + K})$ , then  $\partial Y/\partial A < 0$  implying  $\partial H/\partial A < 0$ . Given  $\partial G/\partial A = 0$ , an increase in A raises the possibility of a firm running on a principal-agent structure. Since  $A = b + c_1$ , a larger A can be found with decreasing market size, b or increasing diseconomies of scale,  $c_1$ . Similar results are obtained. This time, if  $B < c_3(K + \sqrt{K^2 + e_H K + e_H + K})$ , then  $\partial Y/\partial A > 0$  implying  $\partial H/\partial A > 0$ .

v) The impact of  $c_3$  can again be traced out through its impact on Y.

 $\frac{\partial Y}{\partial c_3} = \frac{-2(1-e_H)\{c_3^2e_HB - c_3[e_H(4AK + 4A - B^2) + 4AK - B^2] + B^3 - 4BAK\}}{[4A(K+1) - (B + c_3)^2]^2}.$  The following condition signs the above derivative.

If 
$$c_3 > \frac{\sqrt{(1+e_H)(4AK-B^2) + 4Ae_H + [16(e_H^2K^2 + 2e_HK + K^2 + e_H^2 + 2e_H^2K - 2e_HK^2)A^2 + (e_H^2 - 2e_H + 1)B^4 - 8A(e_H + e_H^2K + K + e_H^2)]B^2}{2e_HB}$$
 then  $\partial Y/\partial c_3 > 0$ .  $G(\bullet)$ 

remains constant since  $\partial G/\partial c_3 = 0$ . The term  $\partial Y/\partial c_3 > 0$  implies  $\partial H/\partial c_3 > 0$ . Decreasing  $c_3$  favors hierarchical structure since the relative utility of being a wage earner is increased. Decreases in  $c_3$  lower the reduction in cost per unit of effort, e. In this case, there is less of penalty for low levels of effort. If  $c_3$  has a value smaller than the above one, we have  $\partial Y/\partial c_3 < 0$ . It implies  $\partial H/\partial c_3 < 0$ . In this case increasing  $c_3$ , reduction in cost per unit of effort favors outside investors. The reason is quite subtle. The "profit" for high effort is increased more than for low effort but in relative terms, low effort benefits more in this case that is indicated by a decline in  $H(\bullet)$ .

vi) As with the claims iv) and v), it is useful to focus on how  $Y(\bullet)$  is effected by changes in K.

 $\frac{\partial Y}{\partial K} = \frac{4A[(B^2 + 2Bc_3 + c_3^2 - 4AK - 4A) - (B^2 + Bc_3e_H + c_3^2e_H^2 - 4AK - 4Ae_H)]}{(B^2 + 2Bc_3 + c_3^2 - 4AK - 4A)^2} < 0 \text{ because of Proposition 1 and the assumption of } e_{L \ge} (2A - Bc_3)/\frac{2}{3}^2.$ 

 $G(\bullet)$  remains constant since  $\partial G/\partial K = 0$ . With  $\partial Y/\partial K < 0$ ,  $\partial H/\partial K_3 < 0$ . Over this range increasing capital investment, K deters management buyout and favors using outside investors. High capital costs raise the risk to self-financing and self-managed and increase the relative benefits of being a wage earner for the current management.

vii)  $\frac{\partial Y}{\partial e_{_H}} = \frac{2Bc_3 + 2e_{_H}c_3^2 - 4A}{B^2 + 2Bc_3 + c_3^2 - 4AK - 4A} > 0$  since the denominator, the "utility" of low effort is positive by assumption and the

numerator is also positive because  $e_H > e_L \ge (2A-Bc_3) / c_3^2$ .  $\partial Y / \partial e_H > 0$  also implies  $\partial H / \partial e_H > 0$ . As the possible high effort,  $e_H$  is reduced, it lowers the benefits of self-financing buyout and increases the relative benefit of keeping the principal-agent hierarchy.

Note that Proposition 4 is focused on circumstances where the choice is at the borderline between self-managing and working under a principal. The results do not necessarily indicate over a broad range whether profits from one type of firm structure or another are increased or decreased by a particular parameter. Specifically, the important concern is the additional gain in utility from a principal-based hierarchy. Either G increases or H decreases alone it is not necessarily true that utility from a hierarchical firm structure rises.

## 4. CONCLUSION

The model highlights the conditions under which a particular ownership structure is best suited for carrying out a capital project. The choice between being an entrepreneur and a wage earner is influenced by two major factors, namely the extent and nature of the uncertainty and the required amount of investment.

The results derived for the management staying as an agent are similar to the standard principal-agency relationship.<sup>2</sup> However, there are two main differences. First, the assumption of a large number of potential investors implies that all the negotiating power goes to the management in question and the outside investor only earns a competitive rate of return.

 $<sup>^{2}</sup>$  The discussion here ignores the possibility of selling the idea of project for money. This assumption simplifies the firm's willingness to exert effort for a given contractual earnings.

Second, the on-going relationship with other business suggests the management has strategic consideration in its involvement.<sup>3</sup>

Given the project is valuable, the management chooses not to retain the complete claim on profits due to its concerns over risk. The need of insurance is clear. The contract to be worthwhile must provide at least some reduction in risk that management faces. Since the managing operator becomes the claimant of the residual return or profit, the contract also may require some incentive to induce the management to provide managerial effort. Ideally, optimal contracts should balance the costs of risk bearing against the incentive gains that result from tying rewards to actual outcomes.

<sup>&</sup>lt;sup>3</sup> That is the management cannot or prefers not to sell its idea or knowledge to the investors and have nothing to with the management of the new enterprise.

#### References

- [1] Bajaj, M., Y.S. Chan, and S. Dasgupta, "The Relationship Between Ownership, Financing Decisions and Firm Performance: A Signaling Model", *Internal Economic Review*, Vol.39 (3), pp.723-44, 1998.
- [2] Bygrave, W.D., and J.A. Timmons, *Venture Capital at the Crossroads*, Boston MA: Harvard Business School Press, 1992.
- [3] DeFraja, G., "Enterpreneur or Manager: Who Runs the Firm?", *Journal of Industrial Economics*, Vol.1, pp.89-98, March 1996.
- [4] Demsetz, H., and K. Lehn, "The Structure of Corporate Ownership: Causes and Consequences", *Journal of Political Economy*, Vol.93, pp.1155-77, 1985.
- [5] Fried, V., and R. Hisrich, "Towards A Model of Venture Capital Investment Decision Making", *Financial Management*, Vol. 23 (3), pp.28-37, 1994.
- [6] Grossman, S.J., and O.D. Hart, "The Allocational Role of Takeover Bids in Situations of Asymmetric Information", *Journal of Finance*, Vol.36, pp.253-270, 1981.
- [7] Jensen, M.C., and W.H. Meckling, "Theory of the Firm: Managerial Behavior, Agency Costs and Ownership Structure", *Journal of Financial Economics*, Vol.3, pp.305-360, 1976.
- [8] Kaplan, S., "The Effects of Management Buyouts on Operating Performance and Value", *Journal of Financial Economics*, Vol.24 (2), pp.217-54, 1989.
- [9] Morck, R., A. Shleifer and R.W. Vishny, "Managerial Ownership and Market Valuation: An Empirical Analysis", *Journal of Financial Economics*, Vol.20, pp.293-315, 1988.
- [10] Robbie, K., and M. Wright, *Management Buy-ins: Entrepreneurship, Active Investors and Corporate Restructuring*, Manchester: Manchester University Press, 1996.
- [11] Shleifer, A. and R.W. Vishny, "Management Entrenchment", *Journal of Financial Economics*, Vol.25, pp.123-139, 1989.
- [12] Wright, M., S. Thompson, and K. Robbie, "Venture Capital and Management-led Leveraged Buyouts: European Evidence", *Journal of Business Venturing*, Vol.7 (1), pp.47-71, 1992.