Strategy and Structure: Explaining The Diversification Discount

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Abstract

In this paper we provide an explanation based on the conflict of interest between top management, middle management and shareholders of why firms adopt different diversification strategies and how they structure themselves to manage those diversification strategies.

It is shown that when objectives are fully aligned, a decentralization organizational structure coupled with a related diversification strategy is adopted. Whereas when objectives are not fully aligned, firms tend to be more centralized and more focused than when incentives are aligned.

We use these results to suggest an explanation for the existence of a diversification discount; *i.e.,* the empirical observation that conglomerate firms trade at a discount relative to a portfolio of stand-alone firms in the same business segments that do not depend on inefficient internal capital allocations.

1 Introduction

The multidivisional form of organization has become the cornerstone of organizational architecture around the world to manage diversification. For instance, Flingstein (1985) examines the spread of the multidivisional firm among the 100 largest nonfinancial corporations (in terms of assets) during 1919-1979. He documents that although only 1.5 % of the firms had adopted the multidivisional form in 1929, the proportion has risen to 84.2 % by 1979.[1] Although the multidivisional firm has been the predominant organizational structure to manage diversification, it is not without problem. The American corporate world has witnessed during the 1990s a movement from unrelated diversification to related diversification and away from conglomerates.[2] Fan and Lang (2000) documents that both vertical relatedness as well as complementarity of firm's segments have increased over time and that multi-segment firms have decreased in number. In 1979, the proportion of multi-segment firms was 46 %, while this was only 20 % in 1996. Furthermore, empirical research in finance has documented the existence of a diversification discount; *i.e.,* the empirical observation that conglomerate firms trade at a discount relative to a portfolio of stand-alone firms in the same business segments (Berger and Ofek, 1995; Lang and Stultz,1996; and Servaes, 1996) and that internal capital markets are inefficient (Lamont, 1997; Shin and Stulz, 1998; Scharfstein, 1997; and Rajan, Servaes and Zingales, 1999). Thereby, the decline of conglomerate firms, the presence of a diversification discount and the inefficiency of internal capital markets have lead researchers to question both, theoretically and empirically, the efficiency of conglomerates and focus on what Sharfstein and Stein (1999) have called *the dark side of internal capital markets*, which is, the possibility that internal capital markets can reduce value.

The goal of this paper is to provide an explanation, based on the conflict of interest between top management, middle management and shareholders, of why firms adopt different diversification strategies and how they structure themselves to manage those diversification strategies. Agency theory as developed by Jensen and Meckling (1976).suggests that managers make decisions that

[1] Kagono (1985) reports that out of 220 randomly selected Fortune 1000 firms, the proportion of multidivisional firms was 94.4 % in the U. S. and 59.8 % in Japan, during year 1980. Whittington and Meyer (2000) argue in their book that the multidivisional firm triumphed in German, France and the U.K. They sum up their evidence on the death of the idiosyncratic European forms of organization as "American-style weasels would chase quaint kiwis out" (p.17).

[2] Here, we use the term multidivisional firm and conglomerate as if they were the same.

increase their utility while potentially decreasing the firm's value because they are not full residual claimants. There are two different types of agency problems that provide explanations for why managers diversify their firms. The first is based on the idea that managers diversify their idiosyncratic risk resulting from having undiversified positions in their own firms.[3] The second type of explanation is based on the idea that managers derive private benefits from managing more diversified firms (Jensen, 1986; Stulz, 1990). Reasons for this given in the literature go from prestige from managing larger firms to the idea that larger firms provide larger pay.

There is also a literature emphasizing the efficiency of conglomerates that has as is main precursor to. Williamson (1975, 1985). He, building on Chandler's (1962) work, suggests that a multidivisional firm offers a number of advantages in managing different line of business as separate divisions.[4] Specifically, he argues that this organizational form has as its main advantage the *efficiency* of internal capital markets; that is, the allocation of cash flows to high yield uses.

In this paper we put together in the same model the agency problems arising from the existence of managerial private benefits of control, the existence of agency problems not only between top managers and shareholders, but also between top managers and divisional managers and the benefits emphasized by Williamson with Aghion and Tirole's (1997) idea that delegation of decision rights increases managerial initiative. In order to do so, we take the view that a defining feature of different organizational structures is the allocation of real decision power and assume that the owners of the firm have ultimate the decision power over firm decisions, but they have limited time, information or capacity to exercise their decision power. Thus, they have to delegate most decision to a CEO. Specifically, we assume that shareholders hire a CEO to: (i) investigate and implement projects; (ii) exploit synergies;[5] (iii) hire and design divisional managers' incentive contracts; (iv) choose an

[3] The evidence on this is mixed. Some authors find that managers with more stock ownership acquire divisions in business that allow to lower the risk, while other find evidence of less diversification in firms with more managerial stock ownership. Furtherore, nothing prevents a manager from diversifying using the stock market.

[4] In his 1975 paper, Williamson argues that the benefits of a multidivisional firm are more likely to take place when the line of business are related. But, in his 1985 paper, he argues that there are no reason why the same benefits cannot take place when the line of business are unrelated.

[5] For instance, potential sources of coordination benefit are the existence of inputs that are shared by different divisions; that is, economies of scope (Teece, 1980; Willig, 1982), policies for joint procurement, joint development of shared technology, joint sale forces, and joint physical distribution systems and know-how or capabilities that are learned in one situation but applied to another (Porter, 1985).

organizational structure and a diversification strategy; and (v) allocate resources across divisions. Whereas the CEO hires divisional managers to only investigate and implement projects.

It is shown that when shareholders, the CEO and divisional managers' objectives are fully aligned, the CEO chooses a decentralized structure coupled with a related diversification strategy. That is, divisional managers proposed projects are always implemented and the CEO fully specializes on exploiting the potential synergies. Whereas when objectives are not fully aligned, firms tend to be more centralized, more focused and less related than when objectives are fully aligned. Thus, when objectives are not fully aligned, agency problems on the choice of strategy and structure arise that may give rise to inefficient choices of organizational structure and diversification strategy. We use these results to show that diversification may effectively destroy value, and when it does not and no control for the endogeneity of the diversification decision is made, the empirical measures of diversification may still show a diversification discount.

Most analysis of the strength of the conglomerate form of organization are based on the efficiency of internal capital markets. In fact, Williamsom (1975) writes "...cash flows in the M-form firm are not automatically returned to their sources, but instead are exposed to an internal competition.... In many respects, this assignment of cash flows to high yield uses is the most fundamental attribute of the M-form enterprise..." (pp. 147-148). Donaldson (1984) also writes "the most critical choices top management makes are those that allocate resources among competing strategic investment opportunities." (p. 45).[6]

When an internal capital market is introduced, we show that there is not only a *bright-side* to internal capital market given by the winner-picking effect, but also a *dark-side* given by a negative incentive effect created by cash-flow reallocation. In fact we show that under an efficient internal capital market, a diversified firm's profits may be lower than profits from a pool of stand-alone firms in the same business segments, while the CEO's payoff may be larger. For the re-allocation of cash-flows toward the more productive division increases firm's value, but it reduces divisional managers' incentives since the less productive division ex-post, gets no funding, and therefore, ex-ante divisional managers' private benefits are lower relative to the case in which no reallocation takes place. We use this to show that despite the fact that capital is allocated efficiently across divisions a diversification discount may still arise.

[6] See Stein (1997) for a formal model of Williamson's efficient internal capital markets argument.

Finally, when divisional managers' incentive contracts are allowed, it is shown that firms tend to be more centralizated and less diversified than when only fixed-wage contracts are allowed. The reason being that the CEO designs divisional managers' compensation contracts to compensate for the lack (excess) of initiative that a centralized (decentralized) structure may show. It is also shown that under centralization monitoring and pay-for-performance are complementary instruments; that is, divisional managers are paid more for better divisional performance and the CEO investigates projects himself., while under decentralization these are strategic substitutes; that is, divisional managers are paid more for better divisional performance and the CEO does not investigates projects himself.

The next section, section 2 presents the model. Section 3 derives the CEO's and divisional managers' optimal allocation of effort under different organizational structures and diversification strategies. In the next section, section 4, we derive the optimal strategy and structure when incentives are fully aligned, while in section 5, we derive the chosen strategy and structure when incentives are not fully aligned. In section 5.3, we suggest an explanation for the controversy on the existence of a diversification discount different from the ones based on the inefficiency of internal capital markets. In the next section, section 6, we study how the choice of strategy and structure is affected by: (i) an internal capital markets; and (ii) the posibility that divisional managers may be compensated according to their performance. Finally, in section 7, concluding remarks are presented.

2 The Basic Model

We consider a firm composed of shareholders, a risk-neutral CEO and n risk-neutral agents or divisional managers. Shareholders design the CEO's incentive contract and hire him to: (i) investigate and implement projects; (ii) coordinate divisions or exploit the potential synergies across divisions; (iii) hire and design divisional managers' incentive contracts; (iv) choose an organizational structure and diversification strategy; and (v) allocate resources across divisions. Whereas divisional managers' are hired to investigate and implement projects only.[7]

Each divisional manager investigates a potential project and makes a recommendation to the

[7] We assume that there is no conflict of interest within a division; that is, a divisional manager's preference fully captures the preferences of the members belonging to his division.

CEO, who either accepts or rejects the recommended project. Potential projects yield non-contractible benefits to the CEO and divisional manager of $\phi\pi$ and $\varphi\pi$, respectively, and contractible benefits to shareholders of π.[8] For simplicity, we assume that the benefits can take only two values, positive and negative: $\phi\pi^H > 0 > \phi\pi^L$, $\varphi\pi^H > 0 > \varphi\pi^L$ and $\pi^H > 0 > \pi^L$. Thus, it is in the interest of a divisional manager to recommend projects yielding $\varphi\pi^H$ and recommend the status-quo project, which is known and guarantees a private benefit of zero to everyone when $\varphi\pi^L$ is discovered. The CEO's private interest is to accept projects yielding $\phi\pi^H$ and reject projects yielding $\phi\pi^L$. Furthermore, when there are two or more divisions there are potential synergies s that when exploited yield non-contractible benefits to the CEO of ϕs and to shareholders of s.

A divisional manager discovers a project's payoff by mean of researching projects. His effort allocated to investigate projects, denoted by q_i, affects the probability of discovering a project yielding $\varphi\pi_i^H$. In particular, we assume that the probability of discovering a project he likes is given by $q_i \equiv Prob(\varphi\pi^H)$ and his disutility of effort q_i is $\frac{1}{2}q_i^2$.

The conditional probability that the CEO's payoff from division i is $\phi\pi_i^H$ when divisional manager i's payoff is $\varphi\pi_i^H$, is $\lambda_i \equiv \Pr ob(\phi\pi_i^H \mid \varphi\pi_i^H)$, and the conditional probability that the CEO's payoff from division i is $\phi\pi_i^H$ when divisional manager i's payoff is π_i^L, is $\eta_i \equiv Prob(\phi\pi_i^H \mid \varphi\pi_i^L)$. Similarly for shareholders' payoff; that is, $\lambda_i \equiv Prob(\pi_i^H \mid \varphi\pi_i^H)$ and $\eta_i \equiv Prob(\pi_i^H \mid \varphi\pi_i^L)$. Thus, given divisional manager i's effort allocated to investigate projects, the probability of each state is given by

State	$\phi\pi_i^H$	$\phi\pi_i^L$	π_i^H	π_i^L
$\varphi\pi_i^H$	$\lambda_i q_i$	$(1-\lambda_i)\, q_i$	$\lambda_i q_i$	$(1-\lambda_i)\, q_i$
$\varphi\pi_i^L$	$\eta_i\,(1-q_i)$	$(1-\eta_i)\,(1-q_i)$	$\eta_i\,(1-q_i)$	$(1-\eta_i)\,(1-q_i)$.

Thus λ_i and η_i measure the congruence of interests between shareholders, the CEO and divisional manager i. When $\lambda_i = 1$ and $\eta_i = 0$, there is perfect congruence of interests because a project that yields $\varphi\pi_i^H$ to divisional manager i, it also yields $\phi\pi_i^H$ to the CEO and π_i^H to shareholders with probability 1 and a project that yields $\varphi\pi_i^L$ to divisional manager i, yields $\phi\pi_i^L$ to the CEO and π_i^L to shareholders also with probability 1.

- Assumption 1: $\pi_i^H + \pi_i^L \geq 0$, $\phi \in [0,1]$ and $\varphi \in [0,1]$.

[8] The structure of the model is very similar to Becker et al. (1999).

If the CEO allocates p units of effort to investigate projects, he learns each of the proposed project's payoff with probability 1, otherwise he learns nothing. Furthermore, when the CEO allocates r units of effort to exploit synergies, with probability r benefits from synergies are realized and with probability $1-r$ no benefits from synergies are obtained. The CEO's disutility of efforts p and r is given by $\frac{1}{2}\left(\theta\left(n\right)p+r\right)^2$, with $\theta\left(n\right)\geq n$.

Finally, it is assumed that the CEO and divisional managers' reservation utility is zero and both have limited liability that it is also normalized to zero.

For the sake of simplicity, we focus on two different organizational structures and two diversification strategies. When a divisional manager's proposals are always implemented then we say the structure is decentralized, otherwise is centralized. Within a centralized structure, we distinguish between informed and uninformed centralization. Under informed centralization, the CEO becomes informed and accepts only proposals he likes while under uninformed centralization he remains uninformed and rejects all proposals. When the CEO chooses to operate in more than one line of business, then we say the firm adopts a conglomeration strategy, otherwise we say the firm follows a focused diversification strategy. Within the conglomeration strategy, firms may pursue either a related or an unrelated diversification. Firms pursue related diversification when synergies are exploited, otherwise firms pursue an unrelated diversification strategy.

The timing of decision is as follows: At stage 1, shareholders hire the CEO to undertake the tasks mentioned above and offer him a compensation contract. At stage 2, the CEO offers to each divisional manager an incentive contract. At stage 3, the CEO and manager i decide how hard to investigate projects and the CEO also chooses how much effort to devote to coordination. At stage 4, divisional managers recommend a project to the CEO, who in turn decides to either accept or reject the recommendation. When the CEO is informed, this recommendation reveals the CEO's payoff to him, $\phi\pi_i^H$ and $\phi\pi_i^L$, while when uninformed, the CEO lacks the information to learn his payoff from a divisional manager's recommendation. At the final stage, returns are realized, projects observed and compensation, if any, takes place.

3 Divisional Managers and the CEO's Effort Allocations.

The CEO, whenever informed, accepts a recommendation only when it yields $\phi\pi_i^H$; that is, he rejects any proposal yielding $\phi\pi_i^L$ independent of how much this proposal yields to either divisional manager i or shareholders.[9] Divisional manager i, anticipating this situation, chooses effort to maximize his expected utility given by $q_i\lambda_i\varphi\pi_i^H - \frac{1}{2}q_i^2$. Thus, his optimal effort when the CEO is informed, denoted by q_i^c, is given by $\lambda_i\varphi\pi_i^H$. In what follows we call this case *informed centralization* because the CEO is informed and accepts only recommendations he likes.

When the CEO is uninformed he accepts a recommendation when $\lambda_i\pi_i^H + (1-\lambda_i)\,\pi_i^L \geq 0$ and rejects one when $\lambda_i\pi_i^H + (1-\lambda_i)\,\pi_i^L < 0$. Divisional manager i, anticipating this situation, chooses effort to maximize his expected utility given by $q_i\varphi\pi_i^H - \frac{1}{2}q_i^2$, when $\lambda_i\pi_i^H + (1-\lambda_i)\,\pi_i^L \geq 0$ and by $0 - \frac{1}{2}q_i^2$, when $\lambda_i\pi_i^H + (1-\lambda_i)\,\pi_i^L < 0$. Thus, his effort, denoted by q_i^d, when the CEO accepts every recommendation is $\varphi\pi_i^H$, while when the CEO rejects every recommendation, the effort, denoted by q_i^{uc}, is 0. In what follows, we call the case in which the CEO is uninformed and accepts every recommendation *decentralization*, while the case in which the CEO is uninformed and rejects every recommendation *uninformed centralization.*

The CEO's expected payoff, denoted by $U_c(n)$, is given by

$$\begin{array}{ll} \sum_i \phi q_i^c\lambda_i\pi_i^H + r\phi s - \frac{1}{2}\left(\theta(n)\,p + r\right)^2 & \text{if } I = 1, \\ \sum_i \phi\left(\Upsilon_i q_i^d + (1-\Upsilon_i)\,q_i^{uc}\right)\left(\lambda_i\pi_i^H + (1-\lambda_i)\,\pi_i^L\right) + r\phi s - \frac{1}{2}r^2 & \text{if } I = 0, \end{array} \tag{1}$$

where I is an indicator function that takes the value 1 when the CEO is informed and 0 otherwise; and Υ_i is another indicator function that takes the value 1 when $\lambda_i\pi_i^H + (1-\lambda_i)\,\pi_i^L > 0$ and 0 otherwise.

The first-order condition for r is given by

$$\phi s - (\theta(n)\,pI + r) \leq 0.$$

It readily follows from this that when the CEO is informed and $\phi s > \theta(n)\,p$, $r = \phi s - \theta(n)\,p$, otherwise $r = 0$. Whereas when the CEO is uninformed, $r = \phi s$ for all s. Thus, the CEO and shareholders' benefits from synergies are larger when the CEO is uninformed; that is, under either decentralization or uninformed centralization.

[9] Here, we are assuming that $\eta_i\pi_i^H + (1-\eta_i)\,\pi_i^L < 0$ or that a divisional manager does not disclose a project's information when it yields $\varphi\pi_i^L$.

There are some important difference between the optimal time allocation under either *informed centralization*, *uninformed centralization* and *decentralization*. First, notice that independent of the CEO's span of control, n, a divisional manager allocates at least as much time to investigate projects under decentralization. This implies that decentralization, as shown by Aghion and Tirole (1997), increases divisional managers' initiative. The cost of decentralization for the CEO is his loss of control since he is more likely to end-up working in a project other than one he likes, while the benefits of it are: (i) more initiative by divisional managers, which increases the probability to find a project that the CEO likes, and (ii) a lower opportunity cost of effort allocated to exploit synergies. Thus, a decentralized structure induces the CEO to spend more effort exploiting the synergies across divisions and increases divisional managers' initiative, but allows, sometimes, the implementation of projects that CEO does not like.

4 The Benchmark: Strategy and Structure When Incentives Are Fully Aligned

In this section the organizational structure and diversification strategy chosen by the CEO when objectives are fully aligned is derived; that is, when $\lambda_i = 1$ and $\eta_i = 0$.

For the sake of simplicity, it is assumed from now on that divisions are symmetric in every dimension unless otherwise noticed and that there are at most two divisions. Furthermore, it is assume with some abuse of notation that $\theta(1) = 1$ and $\theta(2) = \theta \geq 2$.

The difference in the CEO's expected utility under informed centralization and his utility under decentralization, denoted by $\triangle U_d^c(n)$, is given by

$$\begin{array}{ll} n\phi\left[\lambda\pi^H\left(q^c - q^d\right) - q^d(1-\lambda)\pi^L\right] - \frac{1}{2}\left(\theta(n)p\right)^2 - \frac{1}{2}\left(\phi s\right)^2 & \text{if } p \geq \frac{\phi s}{\theta(n)}, \\ n\phi\left[\lambda\pi^H\left(q^c - q^d\right) - q^d(1-\lambda)\pi^L\right] - \theta(n)p\phi s & \text{if } p < \frac{\phi s}{\theta(n)}, \end{array} \tag{2}$$

while the difference between the CEO's utility under uninformed centralization and decentralization, denoted by $\triangle U_d^{uc}(n)$, is given by

$$n\phi\left(\lambda\pi^H + (1-\lambda)\pi^L\right)\left(q^{uc} - q^d\right). \tag{3}$$

The difference in the CEO's expected utility under informed centralization and his utility under

uninformed centralization, denoted by $\triangle U_{uc}^{c}(n)$, is given by

$$\begin{array}{ll} n\phi\lambda\pi^{H}\left(q^{c}-q^{uc}\right)-\frac{1}{2}\left(\theta\left(n\right)p\right)^{2}-\frac{1}{2}\left(\phi s\right)^{2} & \text{if } p\geq\frac{\phi s}{\theta(n)}, \\ n\phi\lambda\pi^{H}\left(q^{c}-q^{uc}\right)-\theta\left(n\right)p\phi s & \text{if } p<\frac{\phi s}{\theta(n)}. \end{array} \tag{4}$$

For $\lambda=1$, it readily follows from divisional managers' optimal effort that $q^{c}=q^{d}>q^{uc}=0$. This plus the fact that $\lambda\pi^{H}+(1-\lambda)\pi^{L}>0$ at $\lambda=1$, results in that $\triangle U_{d}^{c}(n)<0$ and $\triangle U_{d}^{uc}(n)<0$ for all p, n and s; that is, the CEO prefers decentralization to both, informed and uninformed centralization.

The intuition is straightforward. When incentives are fully aligned divisional managers propose only projects that the CEO likes thereby there is no benefit from becoming informed. Furthermore, becoming informed increases the CEO's opportunity cost of the effort spent exploiting the synergies, which results in lower private benefits from synergies.

Given that the optimal organizational structure is decentralization, the CEO chooses to diversify when his expected payoff from a diversified firm, denoted by $U_{c}^{d}(2)$, is larger than his payoff from a stand-alone firm in the same business segment, denoted by $U_{c}^{d}(1)$; that is, when

$$\phi\varphi\left(\pi^{H}\right)^{2}+\frac{\left(\phi s\right)^{2}}{2}$$

is positive.

It readily follows from this that related diversification is the optimal diversification strategy. The intuition is as follows. Under both, a diversified and a focused firm, the CEO chooses not to become informed thereby he faces no overload. Furthermore, in a diversified firm he gets larger private benefits at no extra cost and he can fully specialize on reaping the benefits from synergies. So, as long as the synergies are positive, the CEO benefits from allocating some effort to this task without any loss of control.

The discussion above can be summarized in the following proposition.

Proposition 1 *When incentives are fully aligned;* i.e., $\lambda=1$*, the optimal organizational structure is decentralization and the optimal diversification strategy is related diversification.*[10]

[10] It is easy to show that in this case decentralization coupled with related diversification is also profit maximizing. That is, if shareholders could choose the strategy and structure, they would choose the same strategy-structure pair that CEO.

5 Strategy and Structure When Incentives Are Not Fully Aligned

In this section, the CEO chosen organizational structure and diversification strategy is obtained when objectives are not fully aligned; *i.e.,* $\lambda < 1$. We show that In this section, we analyze the CEO's decision to diversify into different line of business or remain focused in one business; *i.e.,* as a stand-alone firm. We show, contrary to the case in which incentives are fully aligned, that the CEO may choose sometimes a centralized organizational structure, sometimes to remain focused and sometimes to pursue unrelated diversification.

5.1 To Decentralize or Not to Decentralize.

We consider first the choice between informed centralization and uninformed centralization. It readily follows from divisional managers' optimal efforts and equation 4 that $\triangle U_{uc}^{c}(n)$ is given by

$$\begin{array}{ll} n\phi\varphi\left(\lambda\pi^{H}\right)^{2}-\frac{1}{2}\left(\theta\left(n\right)p\right)^{2}-\frac{\left(\phi s\right)^{2}}{2} & \text{if } p\geq\frac{\phi s}{\theta(n)}, \\ n\phi\varphi\left(\lambda\pi^{H}\right)^{2}-\theta\left(n\right)p\phi s & \text{if } p<\frac{\phi s}{\theta(n)}. \end{array} \tag{5}$$

It readily follows from this that informed centralization is preferred to uninformed centralization; that is, $\triangle U_{uc}^{c}(n)\geq 0$, when $p\geq\frac{\phi s}{\theta(n)}$ if and only if $p\leq\tilde{p}_{1}(s,n)$, where

$$\tilde{p}_{1}(s,n)\equiv\begin{cases} \frac{1}{\theta(n)}\left[2n\phi\varphi\left(\lambda\pi^{H}\right)^{2}-\left(\phi s\right)^{2}\right]^{\frac{1}{2}} & \text{if } s<\tilde{s}, \\ \frac{\phi s}{\theta(n)} & \text{if } s\geq\tilde{s}, \end{cases} \tag{6}$$

and $\tilde{s}\equiv\left(\frac{n\varphi}{\phi}\right)^{\frac{1}{2}}\lambda\pi^{H}$.

Whereas when $p<\frac{\phi s}{\theta(n)}$, the CEO prefers informed centralization to uninformed centralization if and only if $p\leq\tilde{p}_{2}(s,n)$, where

$$\tilde{p}_{2}(s,n)\equiv\begin{cases} \frac{\phi s}{\theta(n)} & \text{if } s<\tilde{s}, \\ \frac{n\varphi\left(\lambda\pi^{H}\right)^{2}}{\theta(n)s} & \text{if } s\geq\tilde{s}. \end{cases} \tag{7}$$

Consider next the choice between uninformed centralization and decentralization. It readily follows from that $q^{d}>q^{uc}=0$ and equation 3 that $\triangle U_{d}^{uc}(n)$ is positive as long as $\lambda\pi^{H}+(1-\lambda)\pi^{L}<$

0 independent of the private benefits from the synergies involved. Notice that $\lambda\pi^H + (1-\lambda)\pi^L < 0$ for all $\lambda < \frac{-\pi^L}{\triangle\pi}$, where $\triangle\pi = \pi^H - \pi^L$. Thus, we can conclude that decentralization is preferred to uninformed centralization as long as $\lambda \geq \frac{-\pi^L}{\triangle\pi}$. The reason being that in either case the CEO remains uninformed and specializes on exploiting the benefits from synergies, but under decentralization the CEO gets positive private benefits from divisional managers' initiative, which is not the case under uninformed centralization.

Lastly, consider the choice between informed centralization and decentralization. It follows divisional managers' optimal efforts and equation 2 that $\triangle U_d^c(n)$ is equal to

$$\begin{array}{ll} -n\phi\varphi(1-\lambda)\pi^H\left(\lambda\pi^H+\pi^L\right) - \frac{1}{2}\left(\theta(n)p\right)^2 - \frac{1}{2}\left(\phi s\right)^2 & \text{if } p \geq \frac{\phi s}{\theta(n)}, \\ -n\phi\varphi(1-\lambda)\pi^H\left(\lambda\pi^H+\pi^L\right) - \theta(n)p\phi s & \text{if } p < \frac{\phi s}{\theta(n)}. \end{array} \tag{8}$$

It readily follows from this that decentralization is preferred to informed centralization for all $\lambda \geq \frac{-\pi^L}{\pi^H}$ because $\lambda\pi^H\left(q^c - q^d\right) - q^d(1-\lambda)\pi^L$ is negative. The intuition being that when incentives are aligned the CEO's loss of control is outweighed by divisional managers' gain on initiative and that under decentralization the CEO's opportunity cost of the effort allocated to exploit synergies is lower.

When $\lambda < \frac{-\pi^L}{\pi^H}$, $\lambda\pi^H\left(q^c - q^d\right) - q^d(1-\lambda)\pi^L$ is positive thereby things are slightly more complicated. It readily follows from $\triangle U_d^c(n)$ that the CEO prefers informed centralization over decentralization when $p \geq \frac{\phi s}{\theta(n)}$ if and only if $p < \hat{p}_1(s,n)$, where

$$\hat{p}_1(s,n) \equiv \begin{cases} \frac{1}{\theta(n)}\left[-2n\phi\varphi(1-\lambda)\pi^H\left(\lambda\pi^H+\pi^L\right) - \left(\phi s\right)^2\right]^{\frac{1}{2}} & \text{if } s < \hat{s}, \\ \frac{\phi s}{\theta(n)} & \text{if } s \geq \hat{s}, \end{cases} \tag{9}$$

and $\hat{s} \equiv \left(-\frac{n\varphi(1-\lambda)\pi^H\left(\lambda\pi^H+\pi^L\right)}{\phi}\right)^{\frac{1}{2}}$. Whereas when $p < \frac{\phi s}{\theta(n)}$, informed centralization is chosen when $p < \hat{p}_2(s,n)$, where

$$\hat{p}_2(s,n) \equiv \begin{cases} \frac{\phi s}{\theta(n)} & \text{if } s < \hat{s}, \\ -\frac{n\varphi(1-\lambda)\pi^H\left(\lambda\pi^H+\pi^L\right)}{\theta(n)s} & \text{if } s \geq \hat{s}. \end{cases} \tag{10}$$

The intuition in both cases is simple. When the effort required to become informed is sufficiently small, the benefits of keeping control over which projects are implemented outweighed the loss in divisional managers' initiative and the extra opportunity cost from effort spent on exploiting synergies resulting from spending effort on investigating projects.

So far we have shown that decentralization is preferred to both, informed and uninformed centralization when $\lambda \geq \frac{-\pi^L}{\pi^H}$. Thus, we can conclude that for all $\lambda \geq \frac{-\pi^L}{\pi^H}$, the CEO chooses a decentralized organizational structure.

We also know that informed centralization is preferred to decentralization and uninformed centralization when the effort required to learn proposed projects' private benefits is sufficiently small. So, if p is lower than the minimum between $\tilde{p}_j(s,n)$ and $\hat{p}_j(s,n)$, centralization is the chosen structure. This suggests that is important to know under what conditions $\tilde{p}_j(s,n)$ is larger (smaller) than $\hat{p}_j(s,n)$.

It is easy to show that $\hat{p}_j(s,n) \leq \tilde{p}_j(s,n)$ for all $\lambda \geq \frac{-\pi^L}{\triangle\pi}$, otherwise $\hat{p}_j(s,n) > \tilde{p}_j(s,n)$ for $j = 1, 2$. This suggests that in order to know which is the CEO's preferred organizational structure we need to analyze each case separately.

Consider first the case in which $\lambda < \frac{-\pi^L}{\triangle\pi}$. In this case we already showed that $\triangle U_d^{uc}(n)$ is positive and that $\hat{p}_j(s,n) > \tilde{p}_j(s,n)$.This, plus the fact that for all $p > \tilde{p}_j(s,n)$, uninformed centralization is preferred to decentralization; *i.e.,* $\triangle U_{uc}^{c}(n) < 0$, implies that uninformed centralization is the chosen structure for all $p > \tilde{p}_j(s,n)$. Whereas for $p \leq \tilde{p}_j(s,n)$, informed centralization is preferred to decentralization and uninformed centralization thereby centralization is the chosen structure. For when objectives are dis-aligned, $\lambda < \frac{-\pi^L}{\triangle\pi}$, divisional managers' initiative yields a negative expected payoff to the CEO since $\lambda\pi^H + (1-\lambda)\pi^L \leq 0$ –outcome that can be avoided by mean of imposing the status-quo project. This plus the fact that becoming informed is very costly, $p \geq \tilde{p}_j(s,n)$, makes the CEO better-off by not becoming informed and specializing on exploiting synergies. Whereas when informed $p < \tilde{p}_j(s,n)$ centralization is preferred to uninformed centralization because the benefits of imposing only projects he likes outweigh the costs of becoming informed and the increased opportunity cost of the effort allocated to exploit synergies.

Consider now the case in which $\lambda \geq \frac{-\pi^L}{\triangle\pi}$. In this case we already showed that $\triangle U_d^{uc}(n)$ is negative and that $\hat{p}_j(s,n) \leq \tilde{p}_j(s,n)$. This, plus the fact that for all $p > \hat{p}_j(s,n)$, decentralization is preferred to centralization; *i.e.,* $\triangle U_d^{c}(n) < 0$, implies that decentralization is the chosen structure for all $p > \hat{p}_j(s,n)$. Whereas for $p \leq \hat{p}_j(s,n)$, informed centralization is preferred to decentralization and uninformed centralization thereby centralization is the chosen structure. Notice that in this case divisional managers' initiative yields positive expected payoff to the CEO since $\lambda\pi^H + (1-\lambda)\pi^L > 0$. This plus the fact that becoming informed is very costly, $p \geq \hat{p}_j(s,n)$, makes the CEO better-

off by not becoming informed and specializing on exploiting synergies. Whereas when informed $p < \hat{p}_j(s,n)$ centralization is preferred to decentralization because the benefits of imposing only projects he likes outweigh the costs of becoming informed and the increased the opportunity cost of the effort allocated to exploit synergies.

These results are summarized in the next proposition.

Proposition 2 *(i) If* $\lambda < \frac{-\pi^L}{\triangle\pi}$*, uninformed centralization is the chosen structure for all* $p \geq \tilde{p}_j(s,n)$*, otherwise informed centralization is chosen; (ii) if* $\frac{-\pi^L}{\triangle\pi} \leq \lambda < \frac{-\pi^L}{\pi^H}$*, informed centralization is the chosen structure for all* $p \leq \hat{p}_j(s,n)$ *for* $j = 1,2$*, otherwise decentralization is the chosen structure; and (iii) if* $\lambda \geq \frac{-\pi^L}{\pi^H}$*, decentralization is the chosen structure for all* p*.*

The results from this proposition plus the ones from proposition 1 establishes that when incentives are dis-aligned, $\lambda < \frac{-\pi^L}{\pi^H}$ and the CEO's cost from becoming informed is large, the CEO chooses either informed or uninformed centralization in opposition to decentralization, which is the structure chosen when incentives are perfectly aligned. The reason for this is to stop divisional managers from implementing projects that the CEO does not like.[11]

In the next proposition, we see how changes on the different parameters affect $\hat{p}_j(s,n)$ and $\tilde{p}_j(s,n)$ in the relevant range.

Proposition 3 *(i)* $\frac{\partial \hat{p}_j(s,n)}{\partial \varphi} < 0$, $\frac{\partial \hat{p}_j(s,n)}{\partial \phi} > 0$, $\frac{\partial \hat{p}_j(s,n)}{\partial \theta} < 0$, $\frac{\partial \hat{p}_j(s,n)}{\partial s} \leq 0$, $\frac{\partial \hat{p}_j(s,n)}{\partial \lambda} < 0$*, and* $\hat{p}_j(s,1) > \hat{p}_j(s,2)$*; and (ii)* $\frac{\partial \tilde{p}_j(s,n)}{\partial \varphi} < 0$, $\frac{\partial \tilde{p}_j(s,n)}{\partial \phi} > 0$, $\frac{\partial \tilde{p}_j(s,n)}{\partial \theta} < 0$, $\frac{\partial \tilde{p}_j(s,n)}{\partial s} \leq 0$, $\frac{\partial \tilde{p}_j(s,n)}{\partial \lambda} < 0$*, and* $\tilde{p}_j(s,1) > \tilde{p}_j(s,2)$

As expected, centralization is more likely to be the CEO's preferred organizational structure as: (i) divisional managers' private benefits decrease; (ii) the overload cost decreases; and (iii) the CEO's private benefits increase. All of these have straightforward rationales.

Notice also that the thresholds $\hat{p}_j(s,2)$ and $\tilde{p}_j(s,2)$ decrease with s. So, as synergies increase decentralization is more likely to be the CEO's preferred organizational structure when $\frac{-\pi^L}{\triangle\pi} \leq \lambda < \frac{-\pi^L}{\pi^H}$, while uninformed centralization is more likely to be chosen when $\lambda < \frac{-\pi^L}{\triangle\pi}$. The reason being that becoming informed increases the cost of the effort allocated to coordination and an increase in

[11] It is worthwhile to mention that sometimes the CEO's choice of organizational structure may be profit maximizing. That is, given the degree of alignment on incentives, the profit maximizing structure is the one that maximizes the CEO's expected private benefits.

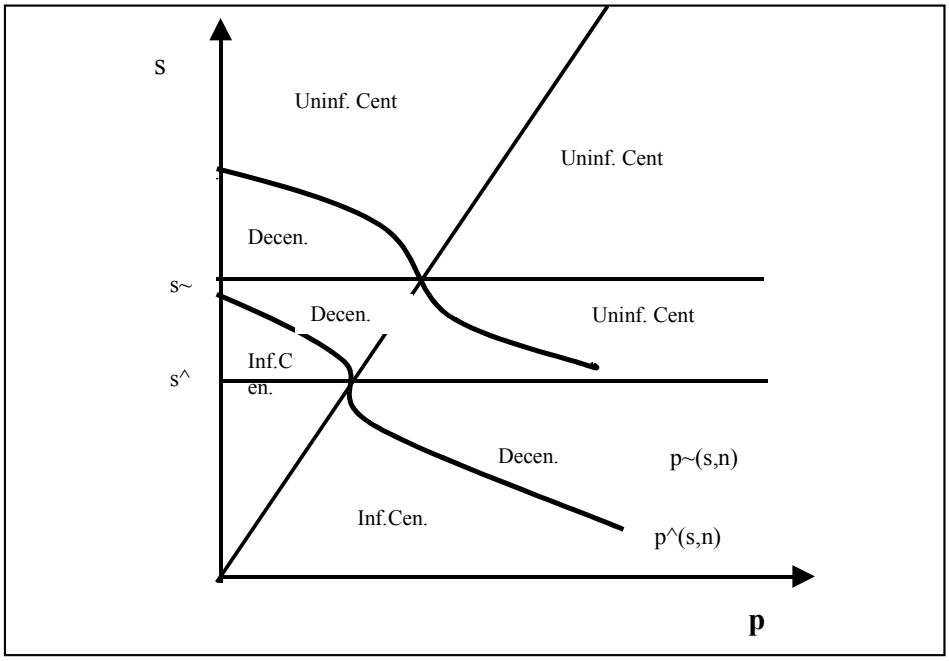

Figure 1: Case in which $\lambda \geq \frac{-\pi^L}{\triangle \pi}$; i.e., $\hat{p}_j(s,n) \leq \tilde{p}_j(s,n)$

s increases the opportunity cost of the effort allocated to investigate projects. An increase on the congruence of interest parameter, λ, makes decentralization more likely to be the optimal structure. The reason being that the CEO's loss of control from remaining uninformed and accepting any recommendation decreases as the incentives become more aligned. Lastly, informed centralization is more likely to be the chosen structure when a focused strategy is pursued. For there are two factors that make project investigation more expensive when a diversified strategy is pursued. One is the overload from managing more divisions and the other one is the increased opportunity cost of the effort allocated to investigate projects resulting from the private benefits from synergies.

5.2 To Diversify or Not to Diversify

The CEO chooses to diversify when $U_c^{l(2)}(2) - U_c^{l(1)}(1)$, denoted by $\triangle U(l(2), l(1))$, is positive, where $l(n)$ is given by proposition 2

In deciding whether to diversify or not the CEO trades-off the following benefits: (i) larger private benefits from a large firm's size; (ii) potential private benefits from synergies; and (iii) more initiative because centralization is less likely in a conglomerate against the overload cost. Which of these benefits and costs is present depends on what structure the CEO chooses under a focused strategy relative to the one chosen under a diversified strategy. So, we consider each case in turn.

Consider first the case in which the CEO chooses decentralization under both a focused and a diversified strategy; that is, either $\lambda \geq \frac{-\pi^L}{\pi^H}$ or $\frac{-\pi^L}{\triangle\pi} \leq \lambda < \frac{-\pi^L}{\pi^H}$ and $p > \hat{p}_j(s,1)$ for $j = 1,2$. In this case, it is easy to show that $\triangle U(d,d)$ is given by

$$\phi\varphi\pi^H\left(\lambda\pi^H + (1-\lambda)\pi^L\right) + \frac{(\phi s)^2}{2}.$$

So the CEO chooses related diversification.

Consider next the case in which $\frac{-\pi^L}{\triangle\pi} \leq \lambda < \frac{-\pi^L}{\pi^H}$ and $\hat{p}_j(s,2) < p \leq \hat{p}_j(s,1)$ for $j = 1,2$; that is, the CEO chooses informed-centralization under a focused strategy and decentralization under a diversified strategy. In this case, $\triangle U(d,c)$ is given by

$$\phi\varphi\left[2(1-\lambda)\pi^H\left(\lambda\pi^H + \pi^L\right) + \left(\lambda\pi^H\right)^2\right] + \frac{(\phi s)^2}{2} - \frac{1}{2}p^2.$$

So, in this case related diversification is chosen when the effort required to become informed is not too large; that is, $s > s_d^c(p) \equiv \frac{1}{\phi}\left\{p^2 - 2\phi\varphi\left[2(1-\lambda)\pi^H\left(\lambda\pi^H + \pi^L\right) + \left(\lambda\pi^H\right)^2\right]\right\}^{\frac{1}{2}}$, otherwise the CEO chooses to remain focused.

Suppose now that $\frac{-\pi^L}{\triangle\pi} < \lambda \leq \frac{-\pi^L}{\pi^H}$ and $p \leq \hat{p}_j(s,2)$ for $j = 1,2$; that is, the CEO chooses informed centralization under both, a focused and a diversified strategy. In this case, $\triangle U(c,c)$ is given by

$$\begin{array}{ll} \phi\varphi\left(\lambda\pi^H\right)^2 + \frac{1}{2}\left(1-\theta^2\right)p^2 & \text{if } p \leq \hat{p}_1(s,2), \\ \phi\varphi\left(\lambda\pi^H\right)^2 + \frac{1}{2}p^2 + \frac{(\phi s)^2}{2} - \theta p\phi s & \text{if } p \leq \hat{p}_2(s,2). \end{array}$$

It is easy to show that $\triangle U(c,c) > 0$ for $j = 1,2$; that is, a related diversification is the chosen strategy.[12]

Finally, consider the case in which $\lambda < \frac{-\pi^L}{\triangle\pi}$. Suppose first $p > \tilde{p}_j(s,1)$; that is, uninformed centralization is the chosen structure under both, a focused and diversified firm. In this case, $\triangle U(uc,uc)$ is given by

$$\phi 0 + \frac{(\phi s)^2}{2}.$$

Thus, related diversification is the chosen structure.

Suppose next that $\tilde{p}_j(s,2) < p \leq \tilde{p}_j(s,1)$; that is, uninformed centralization is the chosen structure under a diversified firm while informed centralization is the chosen structure under a focused firm. In this case, $\triangle U(uc,c)$ is given by

$$-\phi\varphi\left(\lambda\pi^H\right)^2 + \frac{(\phi s)^2}{2} + \frac{1}{2}p^2.$$

Thus, related diversification is the chosen structure for all $s > s_c^{uc}(p) \equiv \frac{1}{\phi}\left(2\varphi\phi\left(\lambda\pi^H\right)^2 - p^2\right)^{\frac{1}{2}} > 0$, otherwise a focused strategy is adopted.

Lastly, suppose that $p \leq \tilde{p}_j(s,2)$; that is, informed centralization is the chosen structure under both, a focused and a diversified firm. In this case $\triangle U(c,c)$ is given by

[12] This follows from that $\triangle U(c,c)$ is decreasing in p and that $p \leq \hat{p}_j(s,2)$ for $j = 1,2$.

$$\begin{array}{ll} \phi\varphi\left(\lambda\pi^H\right)^2+\frac{1}{2}\left(1-\theta^2\right)p^2 & \text{if } p\leq\hat{p}_1\left(s,2\right), \\ \phi\varphi\left(\lambda\pi^H\right)^2+\frac{1}{2}p^2+\frac{(\phi s)^2}{2}-\theta p\phi s & \text{if } p\leq\hat{p}_2\left(s,2\right). \end{array}$$

For the same reasons given above in this case related diversification is the chosen strategy.

These results lead to the following proposition.

Proposition 4 *If either* $\frac{-\pi^L}{\triangle\pi}\leq\lambda<\frac{-\pi^L}{\pi^H}$, $\hat{p}_j\left(s,2\right)<p\leq\hat{p}_j\left(s,1\right)$ *and* $s\leq s_d^c\left(p\right)$ *or* $\lambda<\frac{-\pi^L}{\triangle\pi}$, $\tilde{p}_j\left(s,2\right)<p\leq\tilde{p}_j\left(s,1\right)$ *and* $s\leq s_c^{uc}\left(p\right)$*, then a focused strategy is adopted, otherwise a related diversification strategy is adopted.*

Clearly when either decentralization or uninformed centralization is chosen under both, a focused and a diversified strategy, related diversification is the preferred strategy. The reason being that in these two cases, the CEO remains uninformed in both, a diversified and a focused firm. This implies that in a diversified firm the CEO faces no overload costs, but his private benefits are at least as large because of firm's size and the private benefits from synergies. Whereas when a more centralized structure is chosen under a focused strategy; that is, p is neither too large nor too small. A focused strategy is chosen when the synergies are small and informed-centralization is adopted under a focused strategy, while either decentralization or uninformed centralization is chosen under a diversified strategy. For the CEO is better-off specializing in researching projects and avoiding the loss of control that decentralization and uninformed centralization imply when the synergies are not sufficiently large.

5.3 The Diversification Discount

The American corporate world has witnessed during the 1990s a movement from unrelated diversification to related diversification and away from conglomerates. Fan and Lang (2000) documents that both vertical relatedness as well as complementarity of firm's segments have increased over time and that multi-segment firms have decreased in number. In 1979, the proportion of multi-segment was 46 %, while this was only 20 % in 1996. Using the IO tables they find that the mean vertical relatedness and complementarity measures have shown a substantial and robust increase. Furthermore, in the empirical finance literature has documented the existence of a diversification discount; *i.e.,* the empirical observation that conglomerate firms trade at a discount relative to a portfolio of

stand-alone firms in the same business segments. Evidence shows that diversified firms trade at a discount relative to single business firms on average, but around 40 % of them trade at a premium (Rajan et al., 1999).

The controversy in this literature revolves around the question of whether diversification destroy value or not?. There are two potential answers to this controversy. One, is that, effectively, diversification destroys value and the other one is that the sample of diversified firms is self-selected or endogenous. This would imply that the existence of a diversification discount is not the result of value destroyed by diversification. Berger and Ofek (1995), Lang and Stultz (1996), and Servaes (1996), among others, report that diversified firms trade on average at a discount relative to a portfolio of stand-alone firms. Whereas, Campa and Kedia (1999), Hyland (1999), Whited (2001) and Chevalier (2000) find, after controlling for the endogeneity of the decision to divest or acquire a new division, that there is neither a diversification discount nor a premium.

In our model that diversification may destroy value is a fact. The reason being that the CEO may choose to diversify, while remain focused is profit maximizing. To see how this may occur, it is worthwhile to notice that $\triangle U\left(l\left(2\right),l\left(1\right)\right)$ can be written as follows

$$\phi\left[\Pi\left(2\right)-2\Pi\left(1\right)\right]+\phi\Pi\left(1\right)-\left[\frac{\theta}{2}\left(\mu pI\left(2\right)+r\right)^{2}-\frac{1}{2}\left(\mu pI\left(1\right)\right)^{2}\right], \tag{11}$$

where $I\left(\cdot\right)$ takes the value 1 when the CEO becomes informed and 0 otherwise.

Notice that the term $\Pi\left(2\right)-2\Pi\left(1\right)$ corresponds to difference between the firm's value under a diversified strategy and the value of a pool of focused firms in the same business segments. This suggests that $\triangle U\left(l\left(2\right),l\left(1\right)\right)$ may be positive (negative), while $\Pi\left(2\right)-2\Pi\left(1\right)$ may be negative (positive).

We are most interested in the case in which diversification destroys value. So, consider the following parametrization. Suppose that $\frac{-\pi^{L}}{\triangle\pi}\leq\lambda<\frac{-\pi^{L}}{\pi^{H}}$, $\hat{p}_{j}\left(s,2\right)<p\leq\hat{p}_{j}\left(s,1\right)$ and $s>s_{d}^{c}\left(p\right)$; that is, the CEO chooses a decentralized structure coupled with a related diversification strategy. In this case, the difference between the value of a firm that adopts a decentralized structure coupled with a related strategy and the value of a pool of centralized focused firms, which is the CEO chosen structure in a focused firm, is given by

$$2\varphi\pi^{H}\left(1-\lambda\right)\left(\lambda\pi^{H}+\pi^{L}\right)+\frac{\phi s^{2}}{2} \tag{12}$$

Notice that $\lambda\pi^H+\pi^L<0$. Therefore, diversification destroys value as long as $s\leq\left[-4\varphi\left(1-\lambda\right)\pi^H\left(\lambda\pi^H+\pi^L\right)\right]^{\frac{1}{2}}$. So, as long as there exists an s such that $\left[\frac{-4\varphi\pi^H(1-\lambda)\pi^H\left(\lambda\pi^H+\pi^L\right)}{\phi}\right]^{\frac{1}{2}}\geq s>s_d^c\left(p\right)$, diversification destroys value. This condition holds as long as $p^2<\phi\varphi\left(\lambda\pi^H\right)^2$; that is, when the CEO's expected payoff under informed-centralization in a focused firm is positive, which holds because under the parametrization chosen the CEO's preferred structure under a focused strategy is informed centralization. Thus, diversification destroys value because the CEO chooses an strategy-structure combination that is not profit-maximizing.

It also follows from our model that even if diversification does not destroy value, when no controls for the diversification decision are made, conglomerate firms may show-up empirically as being traded at a discount. To see how this may occur, suppose that there is a group of firms for which $\frac{-\pi^L}{\triangle\pi}\leq\lambda<\frac{-\pi^L}{\pi^H}$, $\hat{p}_j\left(s,2\right)<p\leq\hat{p}_j\left(s,1\right)$ and $s\leq s_d^c\left(p\right)$; that is, the CEOs from these firms choose centralized focused firms, while there is another group of firms for which the CEOs choose related diversification. Given this we can calculate the Excess Value Measure (EVM) as done empirically; that is, the ratio of a diversified firm actual value to its imputed value, where the imputed value is constructed from the value of the observed focused firms in the same line of business. That is, $EVM=\frac{\Pi^{I(2)}(2)}{2\Pi^c(1)}$. Thus, an EVM larger than 1 reflects that a diversified firm is traded at a premium, an EVM less than 1 means that the firm is traded at a discount, and an EVM of 1 means that a diversified firm is neither traded at a premium nor at a discount.

In the table below we report whether EVM is either larger or smaller than 1 for the chosen parametrization when we assume that $s\leq\min\left\{\tilde{s},\hat{s}\right\}$.

EVM	$p>\hat{p}_j\left(s,1\right)$	$\hat{p}_j\left(s,2\right)<p\leq\hat{p}_j\left(s,1\right)$	$p\leq\hat{p}_j\left(s,2\right)$
$\lambda>\frac{-\pi^L}{\pi^H}$	>1	>1	>1
$\frac{-\pi^L}{\triangle\pi}<\lambda\leq\frac{-\pi^L}{\pi^H}$	<1	$n.a.$	>1
$\lambda\leq\frac{-\pi^L}{\triangle\pi}$	<1	<1	<1

Thus, there are firms that trade at a premium while others trade at a discount. The reason being that one observe stand-alone firms only where these maximize the CEOs' expected private benefits. It also worthwhile to notice that as s increases is harder to find firms that are traded at a discount.

6 Extensions

So far we have a theory of conglomeration that ignores two crucial issues. One is the creation of an internal capital markets and the other one is the use of incentives contracts that we have ignored so far. In this section, we consider these two issues in turn. First, the role of an internal capital market and second, the role of incentive contracts.

6.1 Internal Capital Markets.

In recent years, it has become a folk that the strategy of corporate diversification is value-reducing. The evidence shows that conglomerate are traded at a discount relative to a portfolio of stand-alone firms and during the 1980s a trend toward refocusing has been highly documented.[13] While it may be clear to most people that diversification destroys value, it is much less clear why. The standard arguments for this is that conglomerates allocate capital inefficiently across divisions.[14] Here, we argue that even when capital is allocated efficiently across divisions, the reallocation of capital across divisions creates negative incentive effects on divisional managers that may result in that conglomeration is value-reducing, yet the CEO still pursues a conglomeration strategy.

To understand the working of an internal capital market (ICM, hereafter), we assume that the internal capital allocation is non-contractible and that is the CEO, not shareholders, who chooses the capital allocation across divisions.[15] Thus, the CEO's control rights allow him to reallocate resources across divisions as he sees fit.[16]

We assume then that each firm starts with an initial endowment of resources or cash-flow, denoted by k, that comes from either an external financier or from past years cash-flows or both and that a project's return depends on the amount of capital allocated to it.

The timing is as follows. Right after the CEO and divisional managers have chosen their efforts and before divisional managers propose projects, the CEO observes which division is more productive. It is assumed that with probability α, $\pi_i^H(k_i) = \pi^H(k_i) + \triangle(k_i)$ and $\pi_j^H(k_j) = \pi^H(k_j)$, while

[13] See, Stein (2001) for a review of this literature.

[14] There is plenty of evidence on this, yet that evidence has been recently challenged.

[15] This is perhapas, as argued by Sharfstein and Stein (1998), one of the most defining characteristic of an integrated firm and it is this authority or decision right that distinguishes a CEO from, for instance, a well-informed banker.

[16] This assumption is common in the literature, see, for instance, Matsusaka and Nanda (1999), Rajan, Servaes and Zingales (1999), Stein (1997) and Scharfstein and Stein (2000).

with probability $1-\alpha$, $\pi_i^H(k_i) = \pi^H(k_i)$ and $\pi_j^H(k_j) = \pi^H(k_j) + \triangle(k_j)$. After learning which division is more productive, the CEO decides the capital allocation.[17] Then the timing follows as in the basic model.

To simplify matters, we assume that $\pi^H(k) = \pi^H k$, $\triangle(k) = \triangle k$, and $\pi_i^L(k) = \pi_i^L k$. Furthermore, it is assumed that $s(\mathbf{k}) = sk$ and $\pi_1^L = \pi_2^L$ and focus on the case in which $\lambda_i\left(\pi_i^H + \alpha_i\triangle\right) + (1-\lambda_i)\pi_i^L \geq 0$ for all i; that is, we focus on informed-centralization and decentralization only and ignored uninformed centralization mainly because the capital allocation is irrelevant in this case.

6.1.1 Stand-Alone Firms

Because the CEO's private benefits are proportional to a project's return, his investment decision is to invest all the cash-flow available, denoted by k_i, independently of the realized state. Given this investment policy, divisional manager i's expected payoff under centralization is $q_i\lambda\varphi\left(\pi^H + \alpha_i\triangle\right)k_i - \frac{1}{2}q_i^2$, while his payoff under decentralization is $q_i\varphi\left(\pi^H + \alpha_i\triangle\right)k_i - \frac{1}{2}q_i^2$. Thus, his research effort under centralization, denoted by $q_i^c(1,k_i)$, is $\lambda\varphi\left(\pi^H + \alpha_i\triangle\right)k_i$, while his effort under decentralization, denoted by $q_i^d(1,k_i)$, is $\varphi\left(\pi^H + \alpha_i\triangle\right)k_i$.

The firm's expected profits under centralization, denoted by $\Pi^c(1,k_i)$ in what follows, are given by $q_i^c(1,k_i)\lambda\left(\pi^H + \alpha_i\triangle\right)k_i$, while profits under decentralization , denoted by $\Pi^d(1,k_i)$ in what follows, are given by $q_i^d(1,k_i)\left[\lambda\left(\pi^H + \alpha_i\triangle\right) + (1-\lambda)\pi^L\right]k_i^2$.

6.1.2 Multidivisional Firm

The investment policy in a multidivisional firm is different because the CEO chooses to invest all the capital available to the division that yields the larger expected private benefits.[18] It readily follows from this that divisional manager i's expected utility under centralization is $\varphi q_i\alpha_i\lambda\left(\pi^H + \triangle\right)k_m - \frac{1}{2}q_i^2$, while his expected utility under decentralization is $\varphi q_i\alpha_i\left(\pi^H + \triangle\right)k_m - \frac{1}{2}q_i^2$, where k_m is the total cash-flow available. Thus, his effort in a centralized structure, denoted by $q_i^c(2,k_m)$, is

$$q_i^c(2,k_m) = \varphi\alpha_i\lambda\left(\pi^H + \triangle\right)k_m, \tag{13}$$

[17] We could have chosen the timing in which the CEO learns which division is more productive right after projects are implemented. That timing, however, yields qualitatively the same predictions, but is much more cumbersome.

[18] The results in this section do not hinge on the assumption that returns are linear on investment, but the calculations are greatly simplified by this assumption.

whereas his effort in a decentralized structure, denoted by $q_i^d(2,k_m)$, is

$$q_i^d(2,k_m) = \varphi\alpha_i\left(\pi^H + \triangle\right)k_m. \tag{14}$$

It readily follows from 13 and 14 that the difference $q_i^d(2,k_m) - q_i^c(2,k_m)$ is given by

$$\varphi\alpha_i\left(\pi^H + \triangle\right)k_m(1-\lambda) > 0.$$

Notice that is still the case that divisional managers exert more effort under a decentralized structure than in a centralized one and that this difference increases in $\triangle$ and k_m. The reason being that a divisional manager looses more from getting no funds under a decentralized structure and benefits more for each unit of capital the larger is the productivity differential.

Given the optimal efforts, the CEO's expected payoff when he adopts a centralized structure, denoted by $U^c(2,k_m)$, is given by

$$\begin{array}{ll} \sum_i \phi\alpha_i\lambda\left(\pi^H + \triangle\right)q_i^c(2,k_m)k_m - \frac{\theta}{2}(\theta p)^2 & \text{if } p \geq \frac{\phi s k_m}{\theta}, \\ \sum_i \phi\alpha_i\lambda\left(\pi^H + \triangle\right)q_i^c(2,k_m)k_m - \theta p\phi s k_m + \frac{(\phi s k_m)^2}{2} & \text{if } p < \frac{\phi s k_m}{\theta}, \end{array}$$

while when he adopts a decentralized structure, denoted by $U^d(2,k_m)$, is given by

$$\sum\nolimits_i \phi\alpha_i\left[\lambda\left(\pi^H + \triangle\right) + (1-\lambda)\pi^L\right]q_i^d(2,k_m)k_m - \frac{(\phi s k_m)^2}{2\theta}.$$

6.1.3 The Value of an Internal Capital Market

Notice that the difference between divisional manager i's effort in multidivisional firm and his effort in stand-alone firm, $q_i^c(1,k_i) - q_i^c(2,k_m)$, when a centralized structure is adopted is given by

$$\lambda\varphi\left[\pi^H(k_i - \alpha_i k_m) + \triangle\alpha_i(k_i - k_m)\right], \tag{15}$$

while this difference, $q_i^d(1,k_i) - q_i^d(2,k_m)$, when a decentralized structure is adopted is given by

$$\varphi\left[\pi^H(k_i - \alpha_i k_m) + \triangle\alpha_i(k_i - k_m)\right]. \tag{16}$$

It readily follows from 15 and 16, that there exists a k_i, denoted by $\tilde{k}_i$, such that divisional managers exert more effort under a stand-alone firm than a diversified firm.[19] The intuition is as

[19] Notice that at $k_i = k_m$, $q_i(1) - q_i(2) > 0$, while at $k_i = \alpha_i k_m$, $q_i(1) - q_i(2) < 0$. Thus, the continuity of $q_i(1) - q_i(2)$ guarantees the existence of $\tilde{k}_i$.

follows. On the one hand, the reallocation of resources across divisions decreases divisional manager i's probability of getting funds for his division, thereby his expected private benefits are lower. On the other hand, it is likely that when his division gets funds, he gets more funds in a multidivisional firm than in a stand-alone firm. The first effect dominates when the difference in cash-flows between a multidivisional and stand-alone firm, $k_i - k_m$, is small, while the second effect dominates when this difference is large.

Given that the goal of this section is to show that there exists a *dark side* to ICM, which is given by the negative incentive effect of capital reallocation on divisional managers' incentives we will focus on two cases: (i) decentralization is adopted under both, a diversified and a focused strategy; and (ii) centralization is adopted under both strategies.

The difference in firm's profits under a multidivisional firm and profits from a pool of stand-alone firm assuming that divisions are symmetric; that is, $\alpha_i = \alpha_j = \frac{1}{2}$ and $k_i = k_j = k$, and that a decentralized structure, denoted by $\Pi^d(2, k_m) - 2\Pi^d(1, k)$, is adopted is given by

$$\begin{array}{c} 2\left(\lambda\pi^H + (1-\lambda)\pi^L\right)\left(\frac{1}{2}q^d(2,k_m)k_m - q^d(2,k)k\right) + \triangle\lambda\left(q^d(2,k_m)k_m - q^d(2,k)k\right) + \\ 2\lambda\left(\lambda\pi^H + (1-\lambda)\pi^L + \frac{1}{2}\triangle\right)\left(q^d(2,k) - q^d(1,k)\right)k + r^d s k_m \end{array} \tag{17}$$

while when a centralized structure is adopted $\Pi^c(2, k_m) - 2\Pi^c(1, k)$ is

$$\begin{array}{c} 2\lambda\pi^H\left(\frac{1}{2}q^c(2,k_m)k_m - q^c(2,k)k\right) + \triangle\lambda\left(q^c(2,k_m)k_m - q^c(2,k)k\right) \\ +2\lambda\left(\pi^H + \frac{1}{2}\triangle\right)\left(q^c(2,k) - q^c(1,k)\right)k + r^c s k_m \end{array} \tag{18}$$

Notice that the first term accounts for the difference on funding. If there are more funds in a multidivisional firm than in a pool of stand-alone firms; *i.e.,* $k_m > \sqrt{2}k$, then this term is positive, otherwise is non-positive. The second term accounts for the *winner-picking* effect; that is, the benefit from reallocating the cash-flow to the more productive division, and is positive as long as $k_m > k$. This is the benefit of an ICM emphasized by Williamson (1975) and formalized by Stein (1997). The third term accounts for the negative incentive effect of cash-flow reallocation that we want to emphasize. Notice that this term is negative because when the same amount is invested in a multidivisional firm and in a stand-alone firm, divisional managers exert more effort under a stand-alone firm. Thus, despite the fact that the capital allocation is efficient, an ICM may decreased the value of a diversified firm relative to a pool of stand-alone firms in the same business segments. This depends on the magnitude of $\triangle$ and the difference in the cash-flows across divisions, $k_m - k$.

Notice that if $k_m = k$, then $\Pi(2, k_m) - 2\Pi(1, k) < 0$ for s small enough, while for $k_m = 2k$, $\Pi(2, k_m) - 2\Pi(1, k) > 0$ for all s.[20] This plus continuity of the profit functions lead to the following proposition

Proposition 5 *(i) There exists a level of cash-flows* $\tilde{k}_m(\triangle)$ *such that* $\Pi(2, k_m) - 2\Pi(1, k) < 0$ *for all* $k_m < \tilde{k}_m(\triangle)$, *and* $\Pi(2, k_m) - 2\Pi(1, k) \geq 0$ *for all* $k_m \geq \tilde{k}_m(\triangle)$*; (ii)* $\tilde{k}_m(\triangle)$ *decreases in* $\triangle$ *for* $k_m < \hat{k}_m$ *and increases for* $k_m \geq \hat{k}_m$.[21]

The first part of this proposition states that when cash-flows under a multidivisional firm are abundant relative to a focused firm, diversified firms' value is larger than the value of a pool of stand-alone firm, while when cash-flows are scarce, the opposite occurs. The second part states that a diversified firm is more likely to be more valuable as $\triangle$ increases for small values of k_m, while it is more likely to be less valuable for larger values of k_m. For an increase in $\triangle$ increases both, the *winner-picking* benefit and the negative incentive effect on divisional managers' effort. The increase in the first dominates for small k_m, while the second dominates for large values of k_m.

Notice that one could ask why there is no spin-off a division when a diversified firm is valued less than the sum of its parts. The reason in our model is simple, diversification may be sub-optimal for shareholders, but it may be optimal for the CEO as was shown before. To see how this may occur, it is worthwhile to notice that $U(2, k_m) - U(1, k_m)$ can be written as follows

$$\phi\left[\Pi(2, k_m) - 2\Pi(1, k)\right] + \phi\Pi(1, k) - \left[\frac{\theta}{2}\left(\mu p I(2) + r\right)^2 - \frac{1}{2}\left(\mu p I(1)\right)^2\right], \tag{19}$$

where $I(\cdot)$ takes the value 1 when the CEO becomes informed and 0 otherwise.

Notice that the first term corresponds to the difference between the value of a diversified firm and the value of a pool of stand-alone firms. If this term is negative, as it can be according to proposition 5, then conglomerates are traded at a discount, but if the sum of the second and third term is positive, the CEO may choose conglomeration despite the fact that this strategy may be value reducing.

[20] $\Pi^c(2, 2k) - 2\Pi^c(1, k) = 4\pi^H \triangle + r^c s k_m$ and $\Pi^d(2, 2k) - 2\Pi^d(1, k) = 4\left(\lambda\pi^H + (1-\lambda)\pi^L\right)\triangle + r^d s k_m$.

[21] Under centralization $\hat{k}_m = \left(\frac{\frac{3}{2}\pi^H + \triangle\left(1 + \frac{1}{2}\pi^H\right)}{\pi^H + \triangle}k\right)^{\frac{1}{2}}$, while under decentralization $\hat{k}_m = \left(\frac{\frac{3}{2}\left(\lambda\pi^H + (1-\lambda)\pi^L\right) + \triangle\left(1 + \frac{1}{2}\left(\lambda\pi^H + (1-\lambda)\pi^L\right)\right)}{\lambda\pi^H + (1-\lambda)\pi^L + \triangle}k\right)^{\frac{1}{2}}$.

Most authors have argued that the diversification discount is due to inefficient capital markets. The empirical evidence on this is mixed (see, Stein 2001 for a review). Thus is interesting to see how the diversification discount is affected in our setting when we incorporate an internal capital market. Recall that in our model the internal capital allocation is efficient, so not only the capital allocation per-se cannot be blamed for the diversification discount, but also it increases diversified firms' value. However, in our model there is a cost from reallocating capital across divisions, which is given by the negative incentive effect that this reallocation creates when the cash-flows available in a diversified firm are not much larger than those in a focused firm.[22]

It follows from **??** and proposition 5 that as long as $k_m < \tilde{k}_m(\triangle)$, $\Pi(2, k_m) - 2\Pi(1, k)$ is negative, while $U(2, k_m) - U(1, k_m)$ may still be positive. Thus, an ICM not only may destroy value despite the gains from an efficient internal capital allocation, but also can make things worse than when capital is allocates inefficiently.

6.2 Divisional Manager's Incentive Contracts

Given that the CEO chooses divisional managers' compensation contracts, he will choose compensation so as to maximize his expected utility and not shareholders' wealth.[23] Because project choice is non-contractible, the CEO cannot design divisional managers' compensation so that they propose only projects that the CEO likes. The only contractible variable is shareholders' return. Thus, contracts can only be based on a project's return.

In our particular case, divisional manager i's compensation can take on two values, $w\left(\pi^H\right)$ and $w\left(\pi^L\right)$. Due to the manager's and the CEO's limited liability constraint, it is easy to show that it is optimal to set $w\left(\pi^L\right) = 0$. Hence, we will focus only on the value of $w\left(\pi^H\right)$, which is denoted by w in what follows.

[22] Berger and Ofek (1995) and Comment and Jarrel (1995) documet, empirically, that conglomerates borrow only a trivial amount more than their counter-parts. Thus, it most funding comes from debt, it is likely to expect that $2k > k_m \geq k$.

[23] A similar assumption is made by McAfee and McMillan (1995) in their analysis of multi-tier hierarchy and by Sharfstein and Stein (1999) in his analysis of internal capital allocations. There are a number of ways to motivate this assumption. One of them is to assume that all contracting between shareholders and the CEO occurs at an initial date before any specific candidates for divisional manager positions have been identified by the CEO. After this contract has been signed, shareholders are not able to coordinate to change the contract on an ongoing basis.

To simplify the analysis we assume that $\lambda\pi^H + (1-\lambda)\,\pi^L \geq 0$ and $\eta\pi^H + (1-\eta)\,\pi^L \geq 0$. That is, we assume that when uninformed, the CEO accepts divisional managers' proposals.

Notice that when the CEO offers a pay-for-performance contract that pays w when π^H is realized that satisfies the following condition

$$w > -\varphi\pi^L,$$

divisional manager i's incentives become perfectly aligned with shareholders' incentives; *i.e.,* divisional managers recommend all projects yielding π^H. Otherwise, divisional managers recommend only projects yielding $\varphi\pi^H$. Given this, the CEO's expected payoff under informed-centralization is given by

$$U^c(n) = \begin{cases} n\phi\left[q^c(w)\,\lambda + \Gamma(1-q^c(w))\eta\right]\pi^H - \frac{1}{2}\left(\theta(n)\,p\right)^2 & \text{if } p \geq \frac{\phi s}{\theta}, \\ n\phi\left[q^c(w)\,\lambda + \Gamma(1-q^c(w))\eta\right]\pi^H + \frac{(\phi s)^2}{2} - \theta(n)\,\phi s p & \text{if } p < \frac{\phi s}{\theta}, \end{cases}$$

where Γ is an indicator function that takes the value 1 when $w_m > -\varphi\pi^L$ and 0, otherwise; and $q^c(w)$ is the optimal effort under a centralized structure when the incentive contract pays w for a π^H realization.

Whereas under decentralization, the CEO's expected payoff is given by

$$U_c^d(n) = n\phi\left[q^d(w)\left(\lambda\pi^H + (1-\lambda)\,\pi^L\right) + \Gamma(1-q^d(w))\left(\eta\pi^H + (1-\eta)\,\pi^L\right)\right] + \frac{(\phi s)^2}{2},$$

where $q^d(w)$ is the optimal effort under a decentralized structure when the incentive contract pays w for a π^H realization.

Notice first that when $w_m \leq -\varphi\pi^L$; *i.e.,* $\Gamma = 0$, the CEO's expected payoff increases as q increases, while when $w_m > -\varphi\pi^L$ this holds only when $\lambda > \eta$. The reason being that the when w is so that a divisional manager and shareholders' incentives are perfectly aligned, a divisional manager may propose a project that the CEO likes more often when he does not discover a project he likes; that is, when $\lambda \leq \eta$.

Divisional manager i's expected payoff under centralization when faced with a bonus w is given by

$$U_m^c = q\lambda\left(\varphi\pi^H + \lambda w\right) + \Gamma(1-q)\,\eta^2\left(\varphi\pi^L + w\right) - \frac{1}{2}q^2,$$

while under decentralization his expected payoff is given by

$$U_m^d = q\left(\varphi\pi^H + \lambda w\right) + \Gamma\left(1-q\right)\eta\left(\varphi\pi^L + w\right) - \frac{1}{2}q^2.$$

The first-order conditions are given, respectively, by

$$\varphi\left(\lambda\pi^H - \Gamma\eta^2\pi^L\right) + w^c\left(\lambda^2 - \Gamma\eta^2\right) - q^c \leq 0,$$

$$\varphi\left(\pi^H - \Gamma\eta\pi^L\right) + w^d\left(\lambda - \Gamma\eta\right) - q^d \leq 0.$$

Notice that when $w \leq -\varphi\pi^L$, a divisional manager's effort is increasing in w. While, when $w > -\varphi\pi^L$, q increases with w if and only if $\lambda > \eta$; that is, when the probability that the project he likes results in π^H is larger than that probability from a project he does not like. The reason being that a divisional manager may choose to recommend a project that have a negative private benefit for him since this negative private benefit is outweighed by w.

Notice that for all $w \leq -\varphi\pi^L$ the CEO's expected payoff increases with q and q increases with w thereby, the CEO's expected payoff increases with w. This implies that the CEO will choose w so as divisional managers choose an investigation effort equal to 1. Whereas when $w > -\varphi\pi^L$ there are two cases to distinguish. First, if $\lambda > \eta$, the CEO's expected payoff increases with q and q increases with w thereby the CEO's expected payoff increases with w. This implies that the CEO will choose w so as divisional managers choose an investigation effort equal to 1. Second, if $\lambda \leq \eta$, the CEO's expected payoff decreases with q and q decreases with w thereby the CEO's expected payoff increases with w. This implies that the CEO will choose w so as divisional managers choose an investigation effort equal to 0. Given this it is straightforward to show the following.[24]

[24] Here, we are assuming that under the chosen incentive contracts, the individualy rationality constraints are satisfied.

Proposition 6 *(1) Suppose a centralized structure, then* $(w^c, q^c(w^c))$ *is given by*

w^c	$q^c(w^c)$	
$\frac{1-\varphi\lambda\pi^H}{\lambda^2}$	1	*if* $\lambda \geq \max\left\{\eta, \tilde{\lambda}\right\}$,
$\frac{1-\varphi\left(\lambda\pi^H-\eta^2\pi^L\right)}{\lambda^2-\eta^2}$	1	*if* $\eta < \lambda \leq \tilde{\lambda}$,
$\frac{-\varphi\left(\lambda\pi^H-\eta^2\pi^L\right)}{\lambda^2-\eta^2}$	0	*if* $\lambda \leq \eta$,

(20)

where $\tilde{\lambda}$ *is the solution* $1-\lambda\varphi\pi^H+\lambda^2\varphi\pi^L=0$.

(2) suppose a decentralized structure, then $\left(w^d, q^d\left(w^d\right)\right)$ *is given by*

w^d	$q^d\left(w^d\right)$	
$\frac{1-\varphi\pi^H}{\lambda}$	1	*if* $\lambda \geq \max\left\{\eta, \frac{1-\varphi\pi^H}{-\varphi\pi^L}\right\}$,
$\frac{1-\varphi\left(\pi^H-\eta\pi^L\right)}{\lambda-\eta}$	1	*if* $\eta < \lambda < \frac{1-\varphi\pi^H}{-\varphi\pi^L}$,
$\frac{-\varphi\left(\pi^H-\eta\pi^L\right)}{\lambda-\eta}$	0	*if* $\lambda \leq \eta$.

(21)

A striking feature of the result in this proposition is that it is no longer true that decentralization induces more divisional managers' initiative; that is, $q^d\left(w^d\right)$ is no longer larger than $q^c(w^c)$. In fact, $q^d\left(w^d\right) = q^c(w^c)$ for all λ. For the CEO can use his right to design divisional managers' compensation contracts to induce them to investigate projects with the intensity he wants. Thus, one of the benefits of decentralization vanishes.

The results in proposition 6 lead naturally to ask how the CEO's choice of strategy and structure is modified when compensation contracts are allowed.

It readily follows from proposition 6 that the difference in the CEO's expected payoff under informed-centralization and his payoff under decentralization, denoted by $\triangle U(n, w)$, is given by

$$\begin{array}{ll} -n\phi\left[\Psi(1-\lambda)\left(\lambda\pi^H+\pi^L\right)+(1-\Psi)(1-\eta)\left(\eta\pi^H+\pi^L\right)\right]-\frac{1}{2}\left(\theta(n)p\right)^2-\frac{(\phi s)^2}{2} & \text{if } p \geq \frac{\phi s}{\theta(n)}, \\ -n\phi\left[\Psi(1-\lambda)\left(\lambda\pi^H+\pi^L\right)+(1-\Psi)(1-\eta)\left(\eta\pi^H+\pi^L\right)\right]-\theta(n)p\phi s & \text{if } p < \frac{\phi s}{\theta(n)}, \end{array} \tag{22}$$

where Ψ is an indicator function that takes the value 1 when $q^d\left(w^d\right) = q^c(w^c) = 1$, and the value 0 otherwise.

The first to notice is that when either $\lambda > \eta$ and $\lambda\pi^H + \pi^L > 0$ or $\lambda \leq \eta$ and $\eta\pi^H + \pi^L > 0$, decentralization is the CEO's preferred structures under both, a focused and diversified firm. Oth-

erwise there exist $\hat{p}_1(n,s,w)$ and $\hat{p}_2(n,s,w)$ so that informed centralization is the CEO's preferred structure for all $p < \hat{p}_j(n,s,w)$, $j = 1,2$, where

$$\hat{p}_1(n,s,w) \equiv \begin{cases} \frac{1}{\theta(n)}\left[-2n\phi\varphi\left[\Psi(1-\lambda)\left(\lambda\pi^H+\pi^L\right)+(1-\Psi)(1-\eta)\left(\eta\pi^H+\pi^L\right)\right]-(\phi s)^2\right]^{\frac{1}{2}} & \text{if } s<\hat{s}, \\ \frac{\phi s}{\theta(n)} & \text{if } s\geq\hat{s}, \end{cases} \tag{23}$$

$$\hat{p}_2(n,s,w) \equiv \begin{cases} \frac{\phi s}{\theta(n)} & \text{if } s<\hat{s}, \\ -\frac{n\varphi\left[\Psi(1-\lambda)\left(\lambda\pi^H+\pi^L\right)+(1-\Psi)(1-\eta)\left(\eta\pi^H+\pi^L\right)\right]}{\theta(n)s} & \text{if } s\geq\hat{s}, \end{cases} \tag{24}$$

and $\hat{s} \equiv \left(-\frac{n\varphi\left[\Psi(1-\lambda)\left(\lambda\pi^H+\pi^L\right)+(1-\Psi)(1-\eta)\left(\eta\pi^H+\pi^L\right)\right]}{\phi}\right)^{\frac{1}{2}}$.

It is easy to show that $\hat{p}_1(n,s,w) > \hat{p}_1(n,s)$ and $\hat{p}_2(n,s,w) > \hat{p}_2(n,s)$.[25] That is, informed centralization is more likely to be implemented when the CEO has the decision rights to design divisional managers' incentive contracts. The intuition is simple. Given that the CEO have discretion on the choice of divisional managers' incentive contracts, he designs their contracts so that to compensate the lack of initiative that they show when their recommendations are not always accepted. This increased initiative by divisional managers under informed centralization, increases the CEO's return to becoming informed since he can ensure that his preferred project is implemented more often. This implies that one of the benefits from decentralization, which is increased initiative, vanishes.

Given that informed centralization is more likely to be adopted under both a diversified and focused firm, it follows from proposition **??** that the CEO is less likely to adopt a related diversification strategy and more likely to adopt a focused strategy. The reason being that under informed centralization is the opportunity cost of the effort spent exploiting synergies is larger thereby large synergies are required to induce the CEO to benefit from synergies. This makes the CEO less likely to take advantage of the private benefits from synergies which is one of the benefits from conglomeration.

Finally, notice that under informed-centralization monitoring and pay-for-performance are complementary instruments to achieve the CEO's goal; that is, divisional managers are paid more for

[25] This readily follows from the fact that the only difference between $\hat{p}_j(n,s,w)$ and $\hat{p}_j(n,s)$ is that under $\hat{p}_j(n,s)$ the term $(1-\lambda)\left(\lambda\pi^H+\pi^L\right)$ is multiplies by $\pi^H < 1$ and that in $\hat{p}_j(n,s,w)$, $(1-\lambda)\left(\lambda\pi^H+\pi^L\right)$ is replaced by $(1-\eta)\left(\eta\pi^H+\pi^L\right)$ when this term is larger than $(1-\lambda)\left(\lambda\pi^H+\pi^L\right)$.

better divisional performance and the CEO investigates projects himself. Whereas under decentralization monitoring and pay-for-performance are strategic substitutes; that is, divisional managers are paid more for better divisional performance and the CEO does not investigates projects himself. Furthermore, $w^c > w^d$ for $\lambda > \eta$, while the opposite occurs when $\lambda \leq \eta$. So, in those cases in which the CEO wishes to induce more divisional managers' initiative, compensation is larger under informed centralization, while in those cases in which the CEO wishes to induce less initiative, compensation is larger under decentralization. Lastly, notice that since informed centralization and a focused strategy are more likely to be adopted, incentive contracts at divisional level do not help the organization to move toward the profit maximizing organizational structure and diversification strategy. Thus, this result cast some doubts on the benefits of incentive contracts when these are designed by an agent and not by the residual claimant as is common in practice.

7 Conclusions

Although we have couched our model in terms of the CEO making several important firm decisions, we believe that the lesson is a more general one that is applicable to all kinds of organizations. Our main point is that when a non-residual claimant is endowed with decision rights, he tends to make decisions that help him to keep control. That is, the individual in charge will allocate any resources over which he has decision rights to induce other individuals in the organization to do what is best for him at the same time that he does not loose much control. This is why when objectives are not fully aligned, the individual in charge have a tendency to keep the organization more centralized and focused than is optimally.

A second lesson of our model is that, contrary to the conventional wisdom (see, Hill, 1988) in strategy, a decentralized organizational structure may help to exploit the synergies across different units. The reason basically being specialization. For under decentralization the lower ranks provide the necessary information to make decisions about the individual units, while the top manager can specialize on exploiting the interrelationship across those units.

A third and last lesson of our model is that the use of incentive contracts to alleviate agency problems is less likely to achieve that goal when the ones that design those contracts are not the residual claimants. In the extreme if a non-residual claimant has the right to design the incentive

contract of other non-residual claimants, then it might be optimal to ban the use of these contracts since they may worsen the agency problems between the residual claimant and the non-residual claimants.

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8 Appendix: Proofs of Main Results

Proof. of proposition 6: (ii) Suppose informed centralization. Notice that $\frac{\partial U_c^c}{\partial q^c} = \phi\pi^H(\lambda - \Gamma\eta)$ and $\frac{\partial q^c}{\partial w} = \lambda - \Gamma\eta$. Thus, for all $w < -\varphi\pi^L$, $\frac{\partial U_c^c}{\partial w} > 0$, while for $w \geq -\varphi\pi^L$, $\frac{\partial U^c}{\partial w} \gtreqless 0$ for all $\lambda \gtreqless \eta$. This implies that $q^c = \varphi\left(\lambda\pi^H - \Gamma\eta^2\pi^L\right) + w^c\left(\lambda^2 - \Gamma\eta^2\right) = 1$ for either $w < -\varphi\pi^L$ or $w \geq -\varphi\pi^L$ and $\lambda > \eta$. Solving this for w, if we assume that $w < -\varphi\pi^L$ we obtain that $w = \frac{1-\varphi\lambda\pi^H}{\lambda^2}$, while if we assume that $w \geq -\varphi\pi^L$, $w = \frac{1-\varphi\left(\lambda\pi^H - \eta^2\pi^L\right)}{\lambda^2-\eta^2}$. So, if $\frac{1-\varphi\lambda\pi^H}{\lambda^2} < -\varphi\pi^L$; that is, $1-\lambda\varphi\pi^H+\lambda^2\varphi\pi^L < 0$, the optimal wage is $\frac{1-\varphi\lambda\pi^H}{\lambda^2}$, otherwise is $\frac{1-\varphi\left(\lambda\pi^H - \eta^2\pi^L\right)}{\lambda^2-\eta^2}$.

Next consider that case in which $\lambda \leq \eta$; that is, $\frac{\partial U_c^c}{\partial w} \leq 0$. Thus, the CEO chooses w to make $q^c = \varphi\left(\lambda\pi^H - \Gamma\eta^2\pi^L\right) + w^c\left(\lambda^2 - \Gamma\eta^2\right) = 0$. It follows from this that $w = \frac{-\varphi\left(\lambda\pi^H - \eta^2\pi^L\right)}{\lambda^2-\eta^2}$.

(ii) Suppose decentralization. Notice that $\frac{\partial U_c^d}{\partial q^d} = \phi\left[\left(\lambda\pi^H + (1-\lambda)\pi^L\right) - \Gamma\left(\eta\pi^H + (1-\eta)\pi^L\right)\right]$ and $\frac{\partial q^d}{\partial w} = \lambda^2 - \Gamma\eta^2$. Thus, for all $w < -\varphi\pi^L$, $\frac{\partial U_c^d}{\partial w} > 0$, while for $w \geq -\varphi\pi^L$, $\frac{\partial U_c^d}{\partial w} \gtreqless 0$ for all $\lambda \gtreqless \eta$. This implies that $q^d = \varphi\left(\pi^H - \Gamma\eta\pi^L\right) + w^d(\lambda - \Gamma\eta) = 1$ for either $w < -\varphi\pi^L$ or $w \geq -\varphi\pi^L$ and $\lambda > \eta$. Solving this for w, if we assume that $w < -\varphi\pi^L$ we obtain that $w = \frac{1-\varphi\pi^H}{\lambda}$, while if we assume that $w \geq -\varphi\pi^L$, $w = \frac{1-\varphi\left(\pi^H - \eta\pi^L\right)}{\lambda-\eta}$. So, if $\frac{1-\varphi\pi^H}{\lambda} < -\varphi\pi^L$; that is, $1 - \varphi\pi^H + \lambda\varphi\pi^L < 0$, the optimal wage is $\frac{1-\varphi\pi^H}{\lambda}$, otherwise is $\frac{1-\varphi\left(\pi^H - \eta\pi^L\right)}{\lambda-\eta}$.

Next consider that case in which $\lambda \leq \eta$; that is, $\frac{\partial U_c^d}{\partial w} \leq 0$. Thus, the CEO chooses w to make $q^d = \varphi\left(\pi^H - \Gamma\eta\pi^L\right) + w^d(\lambda - \Gamma\eta) = 0$. It follows from this that $w = \frac{-\varphi\left(\pi^H - \eta\pi^L\right)}{\lambda-\eta}$. ■