Corporate Diversification: Good for Some Bad for Others

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Abstract

The conventional intuition suggests that in the absence of synergies, diversification should bring neither gains nor loses to the owners and the gains from diversification should increase with the size of synergies. That is, as the expected security benefits from merging two or more stand-alone firms increase, the value of a diversified firm should increase. In this paper I show that this conventional argument fails to take into account that synergies, managerial incentives and agency conflicts are interwined in complex ways that may result in a non-monotonic relationship between synergies and firm's value.

In particular, a non-monotonic relationship arises when the conflicts of interest between owners and the CEO are sufficiently severe. In this case and assuming away empire-building preferences, it is shown that value-decreasing diversification occurs for synergies that go from moderate to large and that value-decreasing focus may occur for small synergies. Thus, diversified firms traded at a discount is the result of synergies being sufficiently large and not of being sufficiently small as it is usually believed.

1 Introduction

A large empirical literature–and casual observation–suggests that diversification is value-maximizing for some firms and value-destroying for others, but on average there is a diversification discount; *i.e.,* on average diversified firms trade at a discount relative to a portfolio of stand-alone firms in the same business segments.[1] The existing theoretical literature has had a difficult time dealing with this fact because for the most part the models either imply that diversification is always value-maximizing (Stein, 1997) or always value-destroying (Shleifer and Vishny, 1989; Scharfstein and Stein, 2000). The two models that can accommodate variation are Matsusaka (2001) and Matsusaka and Nanda (2001), the first of which depends on a matching/search process by which firms seek businesses that are good matches for their capabilities and the second of which focuses on internal capital markets. This paper develops a model based on the interaction between synergies, managerial incentives and agency conflicts that neither relies on a matching/search process nor on internal capital markets, in which diversification can either create or destroy value.

The standard intuition suggests that in the absence of synergies, diversification should bring neither gains nor loses to the owners and the gains from diversification should increase monotonically with synergies. That is, as the expected security benefits from merging two or more stand-alone firms increase, the value of a diversified firm should increase. This paper challenges this notion and argues that synergies, managerial incentives and agency conflicts are interwined in complex ways that result under certain conditions in a non-monotonic relationship between synergies and firm's value. I use this non-monotonicity result to show that some firms adopt value-decreasing diversification while others adopt value-increasing diversification.

In the model developed here a firm is composed by owners, a CEO and one or two division managers depending on whether a focused or a diversified strategy is pursued. Owners empower the CEO with decision rights to choose between a diversified and a focused strategy, research, select and implement projects, and design division managers' incentive contracts. I make the following key

[1] For instance, Berger and Ofek (1995) find that diversified firms are valued 13 % to 15 % below the sum of the imputed values of their segments. Rajan, Servaes and Zingales (2000) reports that around 40 % of the firms they study trade at a premium but on average they are traded at a discount. Similar evidence can be found on Lang and Stultz (1994), Servaes (1996), Wernerfelt and Montgomery (1988) and Comment and Jarrell (1995). However, a number of recent papers (Campa and Kedia, 1999; Hyland, 1999; Whited, 2001; and Chevalier, 2000) have shown that the discount is the result of uncontrolled endogeneity because firms with poor returns as stand-alone firms are the ones most likely to diversify. Yet, Lamont and Pollak (2002) in the most complete and detailed treatment of endogeneity find that diversification is on average value-decreasing.

assumptions: (i) diversification on the one hand results in synergies that increase projects' private as well as verifiable security benefits and, on the other hand, dilutes divisional managers' marginal productivity of effort (hereafter, the productivity diluting effect);[2] (ii) projects are non-contractible and ex-ante indistinguishable from each other without further investigation; and (iii) the CEO and the owners' preferences over projects differ–the CEO's preferred project is different from the project that maximizes firm's value.[3]

When the CEO's research is successful, his discretion over project choice allow him to implement the project that yields the larger private benefits, which is different from the project that maximizes firm's value. This implies that as synergies increase, the CEO researches projects more intensely and his expected utility from pursuing a diversified strategy increases. Thus, when synergies are sufficiently large to compensate for the productivity diluting effect, the CEO adopts a diversified strategy.

Expected firm's value however does not always increase with synergies. On the one hand, as synergies increase the CEO's research intensity increases and thereby he is less likely to implement the projects that maximizes firm's value (the loss in control effect) and, on the other hand, as synergies increase projects' security benefits increase. Consequently, synergies increase firm's value when the gains in security benefits outweigh both, the loss in control and the productivity diluting effects. In fact, it is shown that when preferences over projects are sufficiently aligned, the gains in security benefits outweigh the loss in control and the productivity diluting effects when synergies are sufficiently large. Whereas when preferences are sufficiently disaligned, the gains in security benefits outweigh the loss in control and the productivity diluting effects when either synergies go from small to moderate or they are large while the opposite occurs when synergies go from moderate to large. The reason being that the loss in control effect is maximal when synergies go from moderate to large since the difference in security benefits between the project that maximizes firm's value and the CEO's preferred project is larger the larger the synergies. Whereas when synergies are sufficiently large the CEO implements his preferred project always and therefore an increase in synergies does not result in a larger loss of control effect.

Thus, when preferences are sufficiently disaligned the CEO chooses to pursue value-increasing focus for small synergies, value-decreasing diversification for synergies that go from moderate to large, value-increasing diversification for large synergies and synergies that go from small to moderate.

[2] See Stein (1997) for the same assumption and section 5 for two rationales within the framework here that explains a negative productivity effect.

[3] See Aghion and Tirole (1997) for a similar assumption.

Whereas when preferences are sufficiently aligned the CEO chooses to pursue value-increasing focus for small synergies and value-increasing diversification for large synergies.

As regards the result that value-decreasing diversification is pursued for synergies that go from moderate to large, some robustness issues arise. I show that that this result is robust to owners' monitoring and CEO's monetary incentives. Nonetheless, these two incentive devices may help to align the CEO and the owners' preferences, in most cases they either cannot stop the CEO from pursuing value-decreasing diversification or it is not optimal from an ex-ante point of view to tune-up these devices so as to induce the CEO to never pursue value-decreasing diversification.

Lastly I turn to the question of Why diversification comes at the cost of diluting divisional managers' productivity? First, I show that when diversification makes division managers' performance measures coarser and there are no synergies, a division manager exerts less effort when he is part of a diversified firm. Also predictions concerning division managers' incentive contracts that may help us to identify this effect are derived. Second, I show that as the span of control increases, a division manager exerts less effort when he is part of a diversified when there is no synergies. The reason being that the limited organizational capabilities thought of as marketing skills, distribution skills, product development skills, and so on must be allocated to more units.

The most common explanations of why firms pursue value-decreasing diversification have their roots on agency theory as developed by Jensen and Meckling (1976), who suggest that managers make decisions that increase their utility while potentially decreasing firm's value because they are not full residual claimants. In this context, there are three different types of agency problems that provide explanations for why a conglomeration strategy is adopted or 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 (see, Amihud and Lev, 1981). The evidence on this however is mixed; some authors find that managers with more stock ownership acquire divisions in business that allow to lower the risk, while others find evidence of less diversification in firms with more managerial stock ownership. But, more importantly, nothing prevents a manager from diversifying using the stock market. The second type of explanation is based on the idea that managers derive private benefits of control from managing more diversified firms (Jensen, 1986; Stulz, 1990). Reasons for this range from prestige for managing larger firms, entrenchment through specific human capital investments (see Shleifer and Vishny, 1989) to the idea that larger firms provide larger pay. The third one is based on rent-seeking by divisional managers causing investment distortions (see, Scharfstein and Stein, 2000) or influence costs that may lead to inefficient transfers from divisions with high-growth opportunities to those with lower ones (see, Rajan et al., 2000 and Meyer et al., 1992).

The first two types of explanations, as developed so far, fail to explain why diversification is good for some firms and bad others. In fact, they can only explain why diversification is value-reducing for all firms. The third type of explanation fails to explain when diversification takes place and in most cases it predicts that diversification is always value-reducing. In addition, the explanation proposed here suggests that unrealized synergies are not necessarily to be blamed for value-decreasing diversification, but it is the interaction of synergies with agency conflicts that matters. In fact, value-decreasing diversification occurs more often in our model for synergies that go from moderate to large and not for small synergies.

There are few papers, however, that can accommodate variation in outcomes and explain when diversification takes place. Matsusaka and Nanda (2001) develop a model based on the costs and benefits of internal capital markets where the key assumptions are that the transaction cost of raising external funds is larger than the cost of raising them internally and managers have empire-building preferences. Rotemberg and Saloner (1994) argue that firms may wish to avoid being too broad in scope. For if there are either credit or any other type of constraints at the firm level that allow to implement one project at the time only, being focused helps the CEO to keep the promise to implement any good ideas that workers may have, thereby increasing their ex-ante research incentives. These two papers rely on the existence of credit or resource constraints while my paper explains variation in outcomes even in the absence of these type of constraints. In addition, neither paper can explain the existence of a diversification discount. Finally, the paper by Matsusaka (2001) also explains variation on performance but this relies neither on internal capital markets nor on agency conflicts. He develops a model that revolves around the notion of organizational capabilities and that diversification is a matching/search process. He shows that diversified firms may trade at a discount despite that diversification is value-maximizing. The reason being that a poor match between organizational capabilities and units generates a discount at the same time that induces firms to diversify in search for better matches. This suggests that the diversification discount may cause diversification and not the other way around. This paper is complementary to ours because it is not based on agency conflicts and predicts the causality in the other direction.

The rest of the article is as follows. In section 2 the basic model is presented, the CEO's expected utility as well as firm's expected value under each strategy are derived, the CEO's preferred diversification strategy is obtained and the value-maximizing diversification strategy is derived.

In section ??, I explain why diversification is sometimes value-increasing while others is value-decreasing. In section ?? monetary incentives and monitoring are considered. In section 5, we provide rationales for why diversification comes at the cost of decreasing divisional managers' productivity. In the last section concluding remarks are presented.

2 The Model

2.1 Basic Structure

I consider two divisions or units i and j that can be operated either as stand-alone firms or as an integrated firm. Each unit or division is run by a risk neutral divisional manager and each firm is run by a risk-neutral CEO. Within each division there is the need to implement a project. Each division manager derives private benefits from the implemented project of his division only, whereas the CEO gets private benefits from the implemented projects of all divisions.

The CEO plays two important roles. First, the owners empower him with the right to choose between a diversified and a focused strategy–each of which is non-contractible. This can be justified in several ways.[4] For instance, there is no major shareholder or block-holder that have the power to oppose to the CEO's decision,[5] the property is so diluted that the owners have no incentives to monitor the CEO's decisions, or as in Shleifer and Vishny (1989), owners have no knowledge of all the bolts and nuts of the new business and thereby they cannot evaluate ex-ante whether it is optimal to pursue a given diversification strategy. Second, the CEO investigates projects and is empowered with the right to implement a non-contractible project in each division. Again, this can be justified by the fact that is unlikely that the owners can have better information than the CEO about the particular characteristics of each project. The CEO also plays a less important role for our goal, which is to design division managers' incentive contracts.

Each division faces several projects of which only two of them are relevant: project α and project β. Project α yields a fully and costlessly verifiable security benefit of αR_i when successful and yields 0 otherwise. Whereas project β yields a fully and costlessly verifiable security benefit of R_i when

[4] It could as well be assumed that diversification is determined by bargaining between the CEO and the owners. Yet, for the sake of simplicity I have chosen the extreme case in which the CEO by himself chooses the diversification strategy, but the results are qualitatively unchanged when a general bargaining game in which the CEO has a positive bargaining power is assumed.

[5] There is plenty of evidence showing that usually is the CEO who chooses directly or indirectly who is in the Board and that many board members are CEO's yes man.

successful and yields 0 otherwise. In addition to these verifiable security benefit, there are also non-contractible private benefits. In particular, the CEO reaps a private benefit of ϕR_i from division i when project α is implemented and successful, a private benefit of $\phi\beta R_i$ from division i when project β is implemented and successful and 0 from each project otherwise. Division manager i reaps a private benefit of ϕR_i from division i when either project α or β is implemented and successful and 0 from each project otherwise. All other projects yield non-positive private and verifiable security benefits. The private benefits are assumed to be small relative to the security benefits–that is, ϕ is much less than one.

In order to capture the existence of conflict of interest between the CEO and the owners, it is assumed that the congruence of interest parameters α and β belong to $[0,1]$.[6] Thus, when α and β are close to 0, all else equal, the CEO and the owners rank projects very differently while when they are close to 1 they rank them in a similar way.

In addition it is assumed that $R_i = R_j = R$, $R \in \left[0, \overline{R}\right]$ and when a firm is operated as a focused I make the harmless normalization $R = 1$. Thus, when $R < 1$ there are negative synergies while when $R > 1$ there are positive synergies.

To make the CEO's project choice interesting, it is assumed that the CEO can distinguish project β from the rest at no cost for him but he cannot distinguish project α from the rest without further investigation. When the CEO chooses the research intensity r at a private cost of $\frac{nr^2}{2}$ he can distinguish project α from the rest with probability r, where $n = 1, 2$ is the number of units. Notice that the private cost function shows neither economies nor des-economies of scope on research.

Division manager i makes an effort decision $e_i \geq 0$ at a private cost of $c(e_i)$, $c_e(\bullet) > 0$ and $c_{ee}(\bullet) > 0$. When a focused strategy is adopted, the implemented project succeeds with probability $q(e_i)$ when division manager i picks an effort level e_i, where $q_e(\bullet) > 0$ and $q_{ee}(\bullet) \leq 0$. Whereas when a diversified strategy is adopted the probability of success is given by $kp(e_i, e_j)$, where $p(e_i, e_j) = p(e_j, e_i)$, $p_{e_i}(\bullet) > 0$ and $p_{e_i e_i}(\bullet) \leq 0$ and $k \in [0,1]$. The parameter k is meant to capture the idea that diversification comes at the cost of diluting divisional managers' productivity. This factor can be justified in several ways. For instance, by any kind of ex-post opportunism with ex-ante consequences of the kind considered by Grossman and Hart (1986). In section 5, I provide several rationales for the assumption that diversification comes at the cost of diluting divisional managers' productivity

[6] See, Aghion and Tirole (1997) for the same assumption.

I also assume that $p(e_i, e_j)$ is (weakly) supermodular in (e_i, e_j):

$$\frac{\partial}{\partial e_i \partial e_j} p(e_i, e_j) \geq 0. \tag{SUP}$$

This supermodularity condition means that a division manager's effort increases (weakly) the other division manager's productivity from effort. Before continuing it is useful to understand certain properties of this technology. If $kp(e_i, e_j) > q(e_i)$, then the team production is more productive than individual production, assuming that divisional manager i chooses e_i in both cases. Whereas when $p(e, e) < q(e)$, each divisional manager choosing e has a negative externality on his partner's productivity, so this case can be interpreted as a kind of costless "*sabotage*".

It is also assumed that diversifying is not costless for the CEO. In particular, the CEO either has to spend time and effort searching for a business to acquire or he has to spend time and effort setting up a new division from the scratch. To capture this in the simplest way possible, I assume that the CEO has to incur in a fixed private cost F for each new division acquired or set-up from the scratch.[7] In section **??**, I model the CEO's decision to search for synergies and model owners' incentives to monitor the CEO's diversification decision.

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.

The timing of decision is as follows. At stage 1, owners hire the CEO and offer him a compensation package. At stage 2, the CEO chooses whether to diversify or not. At stage 3, the CEO chooses the research intensity and then at stage 4, he chooses the project to be implemented. At stage 5, division managers choose effort and at the final stage, returns are realized and compensation, if any, takes place.

2.2 Project Implementation and Effort Allocations

In this section the optimal efforts and the implemented projects when monetary incentives are ignored are derived.

Consider first the case of a focused firm. Division manager i's utility when the CEO implements either project α or β is equal to $\phi q(e_i)$. Thus, division manager i will chose the effort level that solves the following first-order condition $\phi q_e(e_i) - c_e(e_i) = 0$. Because of the concavity of $q(e_i)$ and convexity of $c(e_i)$, the first-order condition is necessary and sufficient condition and there exists a unique solution denoted by e_i^f. Thus, the probability of success when a focused strategy is pursued

[7] See, also, Aghion and Tirole (1997) for the same assumption.

is $q\left(e_i^f\right)$. In what follows this is denoted by q and assumed lower than 1 for all ϕ. Thus, the CEO's utility when he implements project α is $U_\alpha^f \equiv \phi q$ while when he implements project β is $U_\beta^f \equiv \phi q \beta$, where f stands for a focused firm.

Consider next the case of a diversified firm. Division manager i's utility when either project is implemented is equal to $\phi k p\left(e_i, e_j\right) R_i$.Thus, given that division manager j chooses effort level e_j, division manager i will chose the effort level that solves the following first-order condition $\phi k p_{e_i}\left(e_i, e_j\right) R - c_e\left(e_i\right) = 0$. Because of supermodularity a Nash equilibrium in efforts exists and the concavity of $p\left(e_i, e_j\right)$ and convexity of $c\left(e_i\right)$ ensure a unique equilibrium, denoted by $\left\{e^d\left(R,k\right), e^d\left(R,k\right)\right\}$. Thus, the probability of success in each divisions is $kp\left(e^d\left(R,k\right), e^d\left(R,k\right)\right)$ and to save on notation is denoted in what follows by $p\left(R,k\right)$. Thus, the CEO's utility when he implements project α in each division is $U_\alpha^d \equiv n\phi S\left(R,k\right)$ while when he implements project β in each division is $U_\beta^d \equiv n\phi\beta S\left(R,k\right)$, where $S\left(R,k\right) \equiv p\left(R,k\right) R$ and d stands for a diversified strategy. From hereafter, I call the term $S\left(R,k\right)$ the expected synergy.

It readily follows from supermodularity that both e_i and e_j are both strictly increasing in the synergy level R and the productivity-diluting factor k. In addition $\lim_{R\to 0} p\left(R,k\right) = 0$ and it is assumed that $\lim_{R\to\overline{R}} p\left(R,k\right) \to 1$ for all k. This implies that $S\left(0,k\right) = 0$, $S\left(1,k\right) < 1$ for all k and that the expected synergy $S\left(R,k\right)$ is strictly increasing in the synergy level R and the productivity diluting factor k. The reason being that the security benefits and divisional managers' effort increase with the synergy level R and the probability of success and divisional managers' effort increase with k. Let define $\overline{S}$ as $S\left(\overline{R},k\right)$ and note that this is finite since $\overline{R}$ is finite.

Lastly but not least, the CEO implements project α whenever he can distinguish this from project β. The reason being that each division manager exerts the same amount of effort when either project is implemented, but the CEO's private benefits are larger when project α is implemented; that is, $U_\alpha^d > U_\beta^d$ and $U_\alpha^f > U_\beta^f$.

2.3 A Focused Firm

The first–and simplest–organizational form to be considered is a focused or stand-alone firm. Because when the CEO is able to distinguish project α from the rest project α is implemented, he chooses the research intensity r that maximizes $rU_\alpha^f + (1-r)\,U_\beta^f - \frac{1}{2}r^2 - F$. Thus, the CEO's optimal research intensity is given by

$$r^f\left(q\right) = \phi\left(1-\beta\right)q.$$

Given that $r^f(q) < 1$, the CEO's expected utility when a focused strategy is adopted is given by:

$$U^f(q) \equiv \phi \left[\frac{1}{2} r^f(q)(1-\beta) + \beta \right] q. \quad (1)$$

Firm's value when the CEO implements project α is $\pi_\alpha^f \equiv \alpha q$ while when he implements project β is $\pi_\beta^f \equiv q$. Thus, a focused firm's expected value is given by:

$$\pi^f(\alpha, q) = \left[r^f(q)(\alpha - 1) + 1 \right] q \quad (2)$$

It is worthwhile to notice that an increase in the CEO's research intensity $r^f(q)$ increases the CEO's expected utility while it decreases firm's value. The reason being that project α is implemented more often and project α's security benefits are lower than project β's security benefits. An increases in q–the division manager's productivity–increases firm's value if and only if $q < \frac{1}{2\phi(1-\alpha)(1-\beta)}$ since an increase on it, on the one hand, increases the probability that project α is implemented and, on the other, increases the return of the implemented project. Also notice that the larger the congruence of interest parameters α and β–that is, the more aligned the interests, the larger the firm's value.

2.4 A Diversified Firm

The next organizational form is the one in which the two divisions are combined under the same roof. Because when the CEO is able to distinguish project α from the rest project α is implemented, he chooses the research intensity r that maximizes $rU_\alpha^d + (1-r)U_\beta^d - r^2 - F$. Thus, the optimal research intensity is given by

$$r^d(S(R,k)) = \min\{\phi(1-\beta)S(R,k), 1\}.$$

Notice that $r^d(S(R,k))$ is strictly increasing in $S(R,k)$ because the expected private benefits from project α increase relatively more with the expected synergy than expected private benefits from project β since $\beta < 1$. It readily follows from this that $\lim_{S(R,k)\to 0} r^d(S(R,k)) = 0$. In addition, it is assumed in what follows that $\lim_{S(R,k)\to \overline{S}} r^d(S(R,k)) > 1$ and thereby there is an expected synergy cutoff, denoted by $\hat{S}$ and equal to $\frac{1}{\phi(1-\beta)}$, such that $r^d(S(R,k)) = 1$ for all $S(R,k) > \hat{S}$.

The CEO's expected utility when a diversified strategy is adopted is given by:

$$U^d(S(R,k), F) = \begin{cases} 2\phi\left[\frac{1}{2}r^d(\theta)(1-\beta) + \beta\right] S(R,k) - F & \text{for } S(R,k) \leq \hat{S}, \\ 2\phi S(R,k) - 1 - F & \text{for } S(R,k) > \hat{S}. \end{cases} \quad (3)$$

It readily follows that the CEO's expected utility increases with the expected synergy level $S(R,k)$ since project α and β's private benefits and the optimal research intensity increase with it.

Given the definition of expected synergy, firm's value when the CEO implements project α is $\pi_\alpha^d \equiv 2\alpha S(R,k)$ while when he implements project β is $\pi_\beta^d \equiv 2S(R,k)$. Thus, a diversified firm's expected value is given by:

$$\pi^d(\alpha, S(R,k)) = 2\left[r^d(S(R,k))(\alpha-1)+1\right] S(R,k). \tag{4}$$

Note first that firm's value increases in α and β. The former is due to that an increase in α makes project α more profitable for the owners and the latter is due to an increase in β decreases the CEO's research intensity.

Consider next the effect of an increase in the expected synergy level $S(R,k)$ over firm's value. Suppose first that $r^d(S(R,k)) < 1$. An increase in the expected synergy, on the one hand, decreases firm's value because the CEO implements the project that maximizes firm's value less often–increases the CEO's research intensity–and, on the other hand, increase firm's value because projects' expected security benefits increase. Consequently, an increase in the expected synergy increases firm's value when the increase in expected security benefits outweighs the loss from the less frequent implementation of project β, which is the project that maximizes firm's value.

In fact, it readily follows from (4) that firm's expected value increases with the expected synergy when the following is positive:

$$\frac{\partial}{\partial S(R,k)}\pi^d(\alpha, S(R,k)) = 2\left[2r^d(S(R,k))(\alpha-1)+1\right]. \tag{5}$$

Notice that as the research intensity goes to zero this derivative is positive while as the research intensity goes to one this is negative only if $\alpha < \frac{1}{2}$. Thus, there exists an expected synergy level denoted by $\tilde{S}$ such that firm's value increases with the expected synergy for all $S(R,k) \le \tilde{S}$ and decreases otherwise, where $\tilde{S} \equiv \frac{1}{2\phi(1-\alpha)(1-\beta)}$ for $\alpha \le \frac{1}{2}$ and $\tilde{S} \equiv \overline{S}$ for $\alpha > \frac{1}{2}$.

Suppose next that $r^d(S(R,k)) = 1$. Then firm's expected value increases with the expected synergy for any congruence of interest parameter α since project α is always implemented.

In figure 1 firm's expected value $\pi^d(\alpha, S(R,k))$ is depicted against the expected synergy $S(R,k)$ for two different levels of α. We can see from this figure that when $\alpha \le \frac{1}{2}$ firm's expected value is non-monotonic in $S(R,k)$. In fact, firm's expected value is monotonically increasing with the expected synergy when $S(R,k) \le \tilde{S}$, monotonically decreasing with it when $\hat{S} \ge S(R,k) > \tilde{S}$, and monotonically increasing with it when $S(R,k) > \hat{S}$.[8] While when $\alpha > \frac{1}{2}$ firm's expected value

[8] It is straightforward to check that $\hat{S} \ge \tilde{S}$ for all $\alpha \le \frac{1}{2}$.

increases monotonically with the expected synergy for all $S(R,k)$.

[Insert figure 1 around here]

Thus, the main conclusion of this section is that an increase in the expected synergy level $S(R,k)$ increases the CEO's expected utility regardless of the expected synergy level, it decreases firm's expected value for an expected synergy level that goes from moderate to large when $\alpha \leq \frac{1}{2}$.

2.5 The Diversification Decision

In this section conditions under which the CEO chooses to pursue diversification and conditions under which diversification is value-maximizing are derived.

The CEO pursues diversification when a diversified strategy yields a larger expected utility than a focused strategy; that is, when $U^d(S(R,k),F) - U^f(q)$, denoted by $\triangle U(F, S(R,k), q)$ in what follows, is positive while diversification is value-maximizing when it yields a larger expected value than a *pool* of two focused firms; that is, when $\pi^d(\alpha, S(R,k)) - 2\pi^f(\alpha, q)$, denoted by $\triangle\pi(\alpha, S(R,k), q)$ in what follows, is positive. The reason for considering a pool of focused firms instead of one focused firm only is that when a new division is acquired by a diversifying firm, this one has to pay that unit its opportunity cost as a focused firm. This opportunity cost however is not internalized by the CEO since the money to pay for the new acquired unit comes from the owners' pockets.[9]

Consider first the CEO's decision to diversify. It readily follows from equations 1 and 3 that $\triangle U(F, S(R,k), q)$ is given by:

$$\begin{cases} \frac{\phi^2}{2}(1-\beta)^2\left(2S^2(R,k) - q^2\right) + \phi\beta(2S(R,k) - q) - F & \text{for } S(R,k) \leq \hat{S}, \\ \phi\left[2S(R,k) - \frac{1}{2}\phi(1-\beta)^2 q^2 - \beta q\right] - 1 - F & \text{for } S(R,k) > \hat{S}. \end{cases}$$

Because the CEO's expected utility derived from a diversified strategy increases monotonically and continuously with the expected synergy level $S(R,k)$ while his expected utility derived from a focused strategy does not vary with it, the CEO chooses to pursue diversification when the expected synergy level is larger than the following cutoff

$$S_c(F,q) \equiv \begin{cases} \frac{-\beta + \left(\beta^2 + (1-\beta)^2\left(F + U^f(q)\right)\right)^{\frac{1}{2}}}{\phi(1-\beta)^2} & \text{for } S(R,k) \leq \hat{S}, \\ \frac{1}{4}\frac{\phi^2(1-\beta)^2 q + 2\phi\beta q + 2 + 2F}{\phi} & \text{for } S(R,k) > \hat{S}. \end{cases}$$

This leads to the following result.

[9] As I discuss later this results in empire-building preferences.

Proposition 1 *The CEO adopts a diversified strategy for all $S(k,R) \geq S_c(F,q)$ and a focused strategy otherwise.*[10]

The intuition being simple. Large expected synergies result in sufficiently large projects' private benefits to compensate for the private fixed cost F. In term of the primitives parameters k and R this implies that the CEO chooses to diversify when the synergy level R is sufficiently large to compensate for the private fixed cost F and the productivity diluting factor k.

In addition notice that $S_c(F,q)$ increases with q and F. The reason being that an increase in q increases the CEO's utility from a focused strategy and an increase in F increases the CEO's private costs of running a diversified firm.

Consider next the optimality of diversification from the owners' perspective. It readily follows from equations 2 and 4 that $\triangle\pi(\alpha, S(R,k), q)$ is given by:

$$2\left[(\alpha-1)\left(r^d(S(R,k))\,S(k,R) - r^f(q)\,q\right) + S(k,R) - q\right].$$

It has been shown already that a diversified firm's expected value may either increase or decrease depending on the magnitude of the congruence of interest parameter α and the expected synergy level $S(R,k)$. Suppose first that the expected synergy is such that the CEO's research intensity is equal to one; that is, $S(R,k) > \hat{S}$. In this case a diversified firm's value increases monotonically and continuously with the expected synergy level $S(R,k)$ while a focused firm's value does not vary with it and therefore diversification is value maximizing for all $S(R,k)$ larger than the cutoff $S_f^2(\alpha,q) \equiv \frac{1-(1-\alpha)r^f(q)}{\alpha}q > q$.

Suppose next that expected synergy is such that the CEO's research intensity is less than one; that is, $S(R,k) \leq \hat{S}$. Here there are two cases to consider: the first of which has $\alpha > \frac{1}{2}$ and thereby firm's expected value increases monotonically with the expected synergy level and second of which has $\alpha \leq \frac{1}{2}$ and thereby firm's expected value increases monotonically with the expected synergy level for $S(R,k) \leq \tilde{S}$ and decreases monotonically for all $S(k,R)$ belonging to $\left(\tilde{S}, \hat{S}\right]$. In the former case diversification is value-maximizing for all $S(k,R)$ larger than the cutoff $S_f(q)$. In the latter case $\triangle\pi(\alpha, S(R,k), q)$ is strictly concave and thereby diversification is value-maximizing when the expected synergy level is larger than the cutoff $S_f(q) \equiv \min\left\{q, \frac{1-(1-\alpha)r^f(q)}{(1-\alpha)r^f(q)}q\right\}$ and smaller than the cutoff $S_f^1(\alpha,q) \equiv \max\left\{q, \frac{1-(1-\alpha)r^f(q)}{(1-\alpha)r^f(q)}q\right\}$. These cutoffs levels are of any interest only if they are smaller than $\hat{S}$, which is the maximum synergy level before the CEO's research intensity becomes equal to one.

[10] It is easy to check that $S_c(F,q) = q$ when $F = U^f(q)$.

Note that $S_f(q)$ is lower than $\hat{S}$ since q is assumed to be lower than one and that for any expected synergy level belonging to $\left(\tilde{S}, \hat{S}\right]$ a diversified firm's value reaches its minimum at $S(k, R) = \hat{S}$. If $\triangle\pi(\alpha, S(R, k), q)$ is evaluated at this point, then it can be easily demonstrated that it is negative if and only if $\alpha \leq \alpha(q) \equiv \frac{r^f(q)}{1+r^f(q)} \leq \frac{1}{2}$.[11] Thus, $S_f^1(\alpha, q)$ is larger than $\hat{S}$ for all $\alpha > \alpha(q)$ and $S_f^1(\alpha, q)$ is smaller than or equal to $\hat{S}$ for all $\alpha \leq \alpha(q)$. Lastly notice that $\frac{1-(1-\alpha)r^f(q)}{(1-\alpha)r^f(q)}q > q$ for all $\alpha > \tilde{\alpha}(q) \equiv \frac{2r^f(q)-1}{2r^f(q)}$ and that $\tilde{\alpha}(q) < \alpha(q)$ for all $r^f(q) < 1$. Thus, $S_f(q) = q$ for all $\alpha > \tilde{\alpha}(q)$ and $S_f(q) = \frac{1-(1-\alpha)r^f(q)}{(1-\alpha)r^f(q)}q$ otherwise.

This discussion leads to the following proposition.

Proposition 2 *(i) Suppose that $\alpha > \alpha(q)$, then a diversified strategy is value-maximizing for all $S(R, k) > S_f(q) \equiv q$; (ii) suppose that $\alpha \leq \alpha(q)$. Then (i) a diversified strategy is value-maximizing for all $S_f^1(\alpha, q) \geq S(R, k) > S_f(q)$ and $S(R, k) > S_f^2(\alpha, q)$ while a focused strategy is value-maximizing for all $S(R, k) < S_f(q)$ and $S_f^2(\alpha, q) \geq S(R, k) > S_f^1(\alpha, q)$.*

The intuition being straightforward. Larger synergies increase the implemented project expected security benefit as well as the probability that the CEO implements his preferred project instead of the owners' preferred project. Consequently, when the owners' congruence of interest parameter is sufficiently large, the increase in expected security benefits outweighs the increased probability that the owners' less preferred project is implemented more often while when the owners' congruence of interest parameter is small the opposite occurs.

3 Diversification and Firm's Value

As I mentioned in the introduction the answer to the question of What are the consequences of diversification for a firm's value? is, for the most part, unfavorable to diversification, especially if one focuses on unrelated diversification and data after around, say, 1980s. In this section it is shown that there are parametrizations under which there is a negative causal relationship from diversification to value and others under which there is a positive causal relationship. That is, some firms pursue diversification despite of that being value-decreasing while other pursue value-increasing diversification. In order to do so two assumptions are made: (i) $\hat{S} \geq S_c(F, q) > S(1, k)$ and (ii) $F = U^f(q)$.

[11] $\triangle\pi\left(\alpha, \hat{S}, q\right) = \frac{2\left[1-r^f(q)\right]}{\phi(1-\beta)}\left[(\alpha-1)\left[r^f(q)\right]^2 + \alpha\right]$.

The first inequality in assumption (i) means that the CEO adopts a diversified strategy when the expected synergy is smaller than the one inducing the CEO to choose a research intensity equal to one. The second inequality means that the CEO chooses to diversify only if there are positive expected synergies. This requires either a sufficiently large F or q and/or a sufficiently small k. The second assumption is meant to control for the empire-building preferences. Because the CEO pays for the acquired division with the owners' money there is a bias towards empire building or diversification but this is attenuated by the presence of a fixed cost F. In fact, when $F = U^f(q)$, there is neither a bias toward diversification nor a bias toward focus since the fixed cost of running a two division firm is exactly the CEO's private benefit derived from the acquired unit. Thus, the explanation for value-decreasing diversification advanced below is different from explanations based on empire-building preferences.[12] Yet, once the results in the absence of empire-building preferences are obtained, the consequences of having F different from $U^f(q)$ are discussed.

The adoption of a diversified strategy by the CEO is value reducing when diversification yields a lower firm's value than a pool of focused firms in the same business segments while the adoption of focused strategy is value reducing when the opposite occurs. The next result, which readily follows from propositions 1 and 2, states conditions under which the CEO's choice of strategy is value-decreasing and conditions under which is value-increasing.

Proposition 3 *(i) Suppose that $\alpha > \alpha(q)$. Then the CEO pursues value-increasing diversification for all $S(R,k) > q$ and value-increasing focus otherwise; (ii) suppose that $\tilde{\alpha}(q) < \alpha \leq \alpha(q)$. Then the CEO pursues value-increasing focus for all $S(R,k) \leq q$, value-increasing diversification for all $\frac{1-(1-\alpha)r^f(q)}{(1-\alpha)r^f(q)}q \geq S(R,k) > q$, value-decreasing diversification for all $S_f^2(\alpha,q) \geq S(R,k) > \frac{1-(1-\alpha)r^f(q)}{(1-\alpha)r^f(q)}q$ and value-increasing diversification for all $S(R,k) > S_f^2(\alpha,q)$; and (iii) suppose that $\alpha \leq \tilde{\alpha}(q)$. Then the CEO pursues value-increasing focus for all $S(R,k) \leq \frac{1-(1-\alpha)r^f(q)}{(1-\alpha)r^f(q)}q$, value-decreasing focus for all $q \geq S(R,k) > \frac{1-(1-\alpha)r^f(q)}{(1-\alpha)r^f(q)}q$, value-decreasing diversification for all $S_f^2(\alpha,q) \geq S(R,k) > q$ and value-increasing diversification for all $S(R,k) > S_f^2(\alpha,q)$.*

This proposition tells us that for $\alpha \leq \alpha(q)$ there is a set for the synergy levels given by $DD(\alpha,q) \equiv \left\{S(R,k) : S_f^2(\alpha,q) \geq S(R,k) > S_f^1(\alpha,q)\right\}$ where value-decreasing diversification takes place and $S_f^1(\alpha,q) = \frac{1-(1-\alpha)r^f(q)}{(1-\alpha)r^f(q)}q$ for all $\alpha > \tilde{\alpha}(q)$ and $S_f^1(\alpha,q) = q$ otherwise. In addition, it tells us that for $\alpha > \tilde{\alpha}(q)$ there is a set for the synergy levels given by $DF(\alpha,q) \equiv$

[12] Because at $F = U^f$, $\triangle U(F, S(R,k), q)$ is positive if and only if $S(R,k) > q$, then if $S_c(1,k) < q$, $\triangle U(F, S(R,k), q) > 0$ only if $S(R,k) > S_c(1,k)$.

$\left\{S(R,k) : q \geq S(R,k) > \frac{1-(1-\alpha)r^f(q)}{(1-\alpha)r^f(q)}q\right\}$ where value-decreasing focus takes place. The former occurs because the CEO's expected utility increases with the expected synergy while firm's value increases with it for small synergy levels and decreases with it for synergy levels that go from moderate to large when the owners' congruence of interest parameter is smaller than $\frac{1}{2}$. When synergies are large the CEO chooses to diversify and to implement project α more frequently. This decreases firm's value when the congruence of interest parameter is small because the CEO implements the project that maximizes firm's value less often. The latter arises when the owners' congruence of interest parameter and the expected synergy $S(R,k)$ are both small because the security benefit of project α and the probability that this project is implemented are both small. Thus, despite that project β's return when a diversified strategy is adopted is smaller than that when a focused strategy is adopted, firm's expected value is larger when a diversified strategy is adopted because project α is implemented less often than it is implemented in a focused firm.

This can be better seen in figures 2, 3 and 4 below. Figure 2 shows a case in which $\alpha \geq \alpha(q)$; that is, $\triangle\pi(\alpha, S(R,k), q)$ is positive for all $S(R,k) > q$.

Insert Figure 2 around here

In this case two different regions can be distinguished: the first one in which $S(R,k) \leq q$ and thereby the CEO pursues value-increasing focus and the second one in which $S(R,k) > q$ and thereby the CEO pursues value-increasing diversification. This case captures well the standard intuition since a merger is value-increasing only when two plus two is more than four. Nonetheless, if $\alpha(q) < \alpha < \frac{1}{2}$ a diversified firm's value does not increase monotonically with the expected synergies. Thus, larger synergies are not always better despite that diversification value-increasing. when expected synergies are sufficiently large.

Insert Figure 3 around here

Figure 3 shows a case in which $\tilde{\alpha}(q) < \alpha \leq \alpha(q)$. It is easy to see from the figure that there are four regions: the first one where $S(R,k) \leq q$ and thereby value-increasing focus is pursued; the second one where the CEO pursues value-increasing diversification for all $\frac{1-(1-\alpha)r^f(q)}{(1-\alpha)r^f(q)}q \geq S(R,k) > q$, the third one where he pursues value-decreasing diversification for all $S_f^2(\alpha, q) \geq S(R,k) > \frac{1-(1-\alpha)r^f(q)}{(1-\alpha)r^f(q)}q$ and the fourth one where the CEO pursues value-increasing diversification for all

$S(R,k) > S_f^2(\alpha,q)$. In this case when diversification is value-decreasing is not for the standard reason that two plus two is four and not five, in fact the reason is that two plus two is much more than four.

Insert Figure 4 around here

Figure 4 shows a case in which $\alpha \leq \tilde{\alpha}(q)$. It is easy to see from the figure that there are four regions: the first one where $S(R,k) \leq \frac{1-(1-\alpha)r^f(q)}{(1-\alpha)r^f(q)}q$ and thereby value-increasing focus is pursued; the second one where the CEO pursues value-decreasing focus for all $q \geq S(R,k) > \frac{1-(1-\alpha)r^f(q)}{(1-\alpha)r^f(q)}q$, the third one where he pursues value-decreasing diversification for all $S_f^2(\alpha,q) \geq S(R,k) > q$ and the fourth one where the CEO pursues value-increasing diversification for all $S(R,k) > S_f^2(\alpha,q)$. In this case diversification is value-maximizing only for large synergies and diversification destroys value for synergies that go from moderate to large, while being focus destroys value for synergies that go from small to moderate.

So far I have shown that the value-decreasing diversification as well as value-decreasing focus may take place depending on the congruence of interest parameter α. In the next proposition conditions for an increase in the set where value-decreasing diversification takes place and an increase in the set where value-decreasing focus takes place are derived.

Proposition 4 *(i) Suppose that $\tilde{\alpha}(q) < \alpha \leq \alpha(q)$. Then, $DD(\alpha,q)$ decreases with α, increases with q and increases with β for all $\beta > 1 - \frac{\sqrt{\alpha}}{\phi(1-\alpha)q}$;*[13] *and (ii) suppose that $\alpha \leq \tilde{\alpha}(q)$. Then, $DD(\alpha,q)$ decreases with α and q and increases with β and $DF(\alpha,q)$ decreases with α and β and increases with q.*

The intuition being as follows. The set $DF(\alpha,q)$ increases with α and β since an increase in β makes project α less likely to be implemented while an increase in α makes project α more attractive for the owners. Set $DD(\alpha,q)$ increases with α because project α becomes more attractive for the owners and therefore a larger probability of implementing project α is less harmful for the owners. Set $DD(\alpha,q)$ may either increase or decrease with β depending on the size of q since an increase in β decreases the probability that project α is implemented and the benefit of this is larger the larger q, thus for a small q an increase in β decreases the set $DD(\alpha,q)$. Lastly but not least, set $DD(\alpha,q)$ increases with q for $\tilde{\alpha}(q) < \alpha \leq \alpha(q)$ and decreases with it for $\alpha \leq \tilde{\alpha}(q)$ while set $DF(\alpha,q)$

[13] Note that for $\alpha > \tilde{\alpha}(q)$ $\triangle S \equiv S_f^2(\alpha,q) - S_f^1(\alpha,q) = \left(1 - r^f(q)(1-\alpha)\right) q \frac{(1-\alpha)r^f(q)-\alpha}{\alpha(1-\alpha)r^f(q)}$. Thus, $\frac{\partial \triangle S}{\partial r} = \frac{q}{\alpha(1-\alpha)\left[r^f(q)\right]^2}\left(\alpha - \left[r^f(q)(1-\alpha)\right]^2\right)$ and $\frac{\partial \triangle S}{\partial q} = \frac{1}{\alpha}\left[1+\alpha-2r^f(q)(1-\alpha)\right]$. The latter is always positive when $\alpha > \tilde{\alpha}(q)$ if and only if $q < \frac{1}{2\phi(1-\alpha)(1-\beta)}$.

increases with q. The reason for the former case being that for the values of α considered a focused firm's expected value increases with q while the reason for the latter case is that for the values of α considered a focused firm's expected value decreases with q.

This implies the following. Merged firms that were productive as focused firms and yield synergies that go from moderate to large are more likely to to be traded at a discount while they are more likely to be traded at a premium when they yield either large synergies or synergies that go from moderate to small. Consequently, study whether diversification is value-increasing without controlling for the synergies created by merging it is bound to produce downward-biased estimators of diversified firms' value relative to a pool of focused firms in the same business segments.

The analysis so far has been done assuming that there are no empire-building preferences; *i.e.,* $F = U^f(q)$. The consequences of an increase or decrease in F on the size of the set where value-decreasing diversification takes place and the set where value-decreasing focus occurs depend on the value of α. Suppose first that $\alpha > \tilde{\alpha}(q)$. Because $S_c(F,q)$ increases with F and $S_c\left(U^f(q),q\right) = S_f(q) = q$, an increase in F results in a set for the synergy levels where value-decreasing focus occurs while a decrease in F results in a new set for the synergy levels–different from $DD(\alpha,q)$–where value-decreasing diversification takes place. This new set includes low expected synergies and therefore value-decreasing diversification in this set occurs because of the interaction between low synergies and empire-building preferences. Thus, the standard view that value-decreasing diversification takes place because the realized synergies are low and acquisitive managers paid for a new unit with shareholders' money is consistent with the model when empire-building preferences are allowed.

Suppose next that $\alpha \leq \tilde{\alpha}(q)$. Then $S_c\left(U^f(q),q\right) > S_f(q)$ and thereby a moderate increase in F reduces the set $DD(\alpha,q)$ where value-decreasing diversification takes place while a large increase in F, where large means that $S_c(F,q)$ becomes larger than $S_f^2(\alpha,q)$, creates a set for the synergy level where value-decreasing focus takes place. A moderate decrease in F–that is, moderate empire-building preferences–decreases the set $DF(\alpha,q)$ where value-decreasing focus takes place while a large decrease in F, where large means that $S_c(F,q)$ becomes smaller than $S_f(q)$, creates a set different from $DD(\alpha,q)$ for the synergy levels where value-decreasing diversification takes place. This set again includes low expected synergies and thereby value-decreasing diversification in this set is consistent with standard view.

Thus, the consequences of empire-building preferences are also interwined with synergies and the severity of agency conflicts measured by the CEO's congruence of interest parameter. But large empire-building preferences lead in general to larger sets for the synergy levels where value-decreasing diversification takes place.

4 The CEO's Monetary Incentives and Owners' Monitoring

In this section I analyze the effect of monitoring and monetary incentive contracts on the CEO's decision to pursue a given strategy. The model so far has assigned a very passive role to the owners since they delegate to the CEO the right to choose a diversification strategy but they do not make use of any incentive device to move the CEO's preferences closer to theirs. In this section, I consider then monitoring and monetary incentives each in turn.

Goold and Campbell (1998) in their famous article Desperately Seeking Synergy argue that one of the costs of synergies that usually go unnoticed is that the creation of synergies usually requires sharing resources and cooperation among units that many times result in weaker or coarser divisional performance measures.

Consider first monitoring. So far it has been assumed that owners rubber-stamp the CEO's diversification decision and the synergy created by merging is exogenous. However, as boldly described by Goold and Campbell seeking synergies is not as easy as it might seem and usually managers underestimate the effort that synergies require. In order to capture this insight suppose that there is a distribution of focused firm each creating different synergy levels, but the CEO cannot distinguish one focused firm from another without further investigation. The CEO however can exert a non-verifiable effort t at a private cost $\theta\frac{t^2}{2}$ that enables him to find a match that creates an expected synergy $S(R,k)$ larger than $S_c(F,q)$ with probability t. That is, with probability t the CEO randomly draws a firm that merged with the current unit creates an expected synergy level $S(R,k)$ larger than $S_c(F,q)$ while with probability $1-t$ he randomly draws a firm that merged with the current unit creates an expected synergy $S(R,k)$ smaller than $S_c(F,q)$. More generally, the CEO's effort t could be thought of as any non-contractible firm specific investment, which increases firms' value. At the same time the owners can exert a non-verifiable monitoring effort m at a private cost $\mu\frac{m^2}{2}$ that allows them to learn the expected synergy created by merging with the firm proposed by the CEO with probability m. In addition, when the CEO fails to propose a unit to acquire the owners are not able by themselves to distinguish one unit from another. That is, I posit that the CEO have at least as much information about potential units as the owners have.[14]

[14]The results are robust to monitoring technologies in which the majority owner can learn the expected synergies of some firms despite the CEO's failure to do so.

When the owners learn the synergy level created by merging, they may stop the CEO from acquiring that firm while when they are uninformed, they rubber-stamp the CEO's proposal. Thus, in Aghion and Tirole's (1997) words, the CEO may have formal decision rights over the diversification decision but he does not always have real decision rights. In fact, the CEO has real decision rights only when the owners are uninformed or the CEO's decision is value-maximizing.

In what follows the focus is on the case in which $\alpha \leq \alpha(q)$ and $F = U^f(q)$. The former is adopted because for all $\alpha > \alpha(q)$ the CEO's decision to diversify is always value-maximizing and the latter to avoid empire-building preferences.

Given the CEO's effort, the owners choose the monitoring intensity that maximizes the following:

$$t\left\{\begin{array}{l} m\left[E_{S(R,k)\in D_c/DD(\alpha,q)}\pi^d\left(\alpha, S\left(R,k\right)\right) + E_{S(R,k)\in DD(\alpha,q)}2\pi^f\left(\alpha\right)\right] + \\ \left(1-m\right)E_{S(R,k)\in D_c}\pi^d\left(\alpha, S\left(R,k\right)\right) \end{array}\right\} + (1-t)2\pi^f\left(\alpha\right) - \mu\frac{m^2}{2},$$

where $D_c \equiv \{S(R,k) : S(R,k) > S_c(F,q)\}$ and E denotes the expected value conditional on $S(R,k) \in D_c$.

With probability t the CEO proposes to acquire a unit that yields an expected synergy $S(R,k) > S_c(F,q)$ and with probability tm the owners learn the synergy level $S(R,k)$. It readily follows from 2 that the owners accept the CEO's proposal if $S(R,k) \notin DD(\alpha,q)$ and rejects it otherwise. With probability $t(1-m)$ only the CEO is informed and therefore he pursues diversification, while with probability $(1-t)$ the CEO fails to come up with a proposal and thereby the firm remains focused.

Given the owners' effort, the CEO's chooses t to maximize

$$t\left\{\begin{array}{l} m\left[E_{S(R,k)\in D_c/DD(\alpha,q)}U^d\left(S\left(R,k\right),F\right) + E_{S(R,k)\in DD(\alpha,q)}U^f\left(q\right)\right] + \\ \left(1-m\right)E_{S(R,k)\in D_c}U^d\left(S\left(R,k\right),F\right) \end{array}\right\} + (1-t)U^f\left(q\right) - \theta\frac{t^2}{2}.$$

The first-order condition for the owners gives

$$m = \min\left\{-\frac{t}{\mu}E_{S(R,k)\in DD(\alpha,q)}\triangle\pi\left(\alpha, S\left(R,k\right), q\right), 1\right\}$$

while the first-order condition for the CEO gives

$$t = \min\left\{-\frac{m}{\theta}E_{S(R,k)\in DD(\alpha,q)}\triangle U\left(F, S\left(R,k\right), q\right) + \frac{1}{\theta}E_{S(R,k)\in D_c}\triangle U\left(F, S\left(R,k\right), q\right), 1\right\}.$$

Notice that the optimal monitoring effort is always positive[15] and monitoring inhibits the CEO's initiative to search for synergies because ex-post he knows that there is a positive probability that he will not be allowed to acquired his proposed unit. Assuming an interior solution, the CEO's search for synergy intensity t and the owners' optimal monitoring effort m are given by

$$\begin{aligned} m^* &= \frac{-E_{S(R,k)\in DD(\alpha,q)}\triangle\pi\left(\alpha,S\left(R,k\right),q\right)E_{S(R,k)\in D_c}\triangle U\left(F,S\left(R,k\right),q\right)}{\mu\theta-E_{S(R,k)\in DD(\alpha,q)}\triangle U\left(F,S\left(R,k\right),q\right)E_{S(R,k)\in D(\alpha,q)}\triangle\pi\left(\alpha,S\left(R,k\right),q\right)}, \\ t^* &= \frac{\mu E_{S(R,k)\in D_c}\triangle U\left(F,S\left(R,k\right),q\right)}{\mu\theta-E_{S(R,k)\in DD(\alpha,q)}\triangle U\left(F,S\left(R,k\right),q\right)E_{S(R,k)\in D(\alpha,q)}\triangle\pi\left(\alpha,S\left(R,k\right),q\right)}. \end{aligned}$$

Thus, when an interior solution is assumed, the CEO pursues value-decreasing diversification with probability $t^*(1-m^*)$ despite positive monitoring. This probability increases with μ and decreases with θ. The intuition being that the costlier is the owners' monitoring, the less monitoring and the costlier is the CEO's effort, the less he seek synergies.

This result shows that it is ex-ante efficient to let the CEO to pursue sometimes value-decreasing diversification since this induces the CEO to seek synergies. In addition, this delegation model shows that diversification comes at a private cost for the CEO given by $\frac{\theta}{2}t\left(\alpha,S\left(R,k\right),\mu,q\right)^2$.

Next consider monetary incentives. The goal is not to derive the optimal monetary incentive contract, but to understand how monetary incentives affect the CEO's decision to pursue value-decreasing diversification. In order to do so in a simple and straightforward manner, it is assumed that the CEO is paid a share b of the realized security benefits.

When a focused strategy is adopted the CEO's expected payoff when he implements project α is $U_\alpha^f(b)=(\phi+b\alpha)q$ while when he implements project β is $U_\beta^f(b)=(\phi\beta+b)q$. In addition, firm's value when project α is implemented is $\pi_\alpha^f(b)=(1-b)\alpha q$ while firm's value when project β is implemented is $\pi_\beta^f(b)=(1-b)q$.

Notice that $U_\alpha^f(b)-U_\beta^f(b)$ decreases with b and it is positive at $b=0$. Thus, it is positive for all $b<\tilde{b}$ and negative otherwise, where $\tilde{b}\equiv\min\left\{\phi\frac{1-\beta}{1-\alpha},1\right\}$.

In what follows, I assume that $\tilde{b}<1$–otherwise there is no contract that yields positive expected security benefits and induces the CEO to implement the owners' preferred project.

It is also easy to show that $\pi_\alpha^f(b)-\pi_\beta^f(b)$ is negative for all $b\leq 1$. This implies that if owners offer the CEO a contract with a share parameter $b\geq\tilde{b}$, the CEO chooses to always implement the owners' preferred project (project β). Thus, for $b>\tilde{b}$ the CEO has no incentive to research projects since he can distinguish project β from the rest at no cost for him.

[15] Suppose that the optimal monitoring effort $m=0$, then t is positive and therefore the optimal monitoring effort cannot be zero since $E_{S(R,k)\in DD(\alpha,q)}\triangle\pi\left(\alpha,S\left(R,k\right),q\right)<0$.

The CEO's expected payoff when a diversified strategy is adopted and project α is implemented is $U_{\alpha}^{d}(b) = 2(\phi + b\alpha) S(R,k)$ while when project β is implemented is $U_{\beta}^{d}(b) = 2(\phi\beta + b) S(R,k)$. In addition, firm's value when project α is implemented is $\pi_{\alpha}^{d}(b) \equiv 2(1-b)\alpha S(R,k)$ while when project β is implemented is $\pi_{\beta}^{d}(b) \equiv 2(1-b) S(R,k)$. It readily follows from this that $U_{\alpha}^{d}(b) - U_{\beta}^{d}(b)$ decreases with b, it is positive at $b = 0$ and therefore it is positive for all $b \leq \tilde{b}$ and negative otherwise. It is also follows from this that $\pi_{\alpha}^{d}(b) - \pi_{\beta}^{d}(b)$ is negative for all $b \leq 1$. Consequently, if owners offer the CEO a contract with a share parameter $b > \tilde{b}$, the CEO chooses to always implement the owners' preferred project. Thus, for $b > \tilde{b}$ the CEO has no incentive to research projects since he can distinguish project β from the rest at no cost for him.

The analysis so far shows that there are two cases to be considered depending on the magnitude of $\tilde{b}$. These are: (i) the share parameter is such the CEO does not do any research regardless of the diversification strategy adopted; and (ii) the share parameter is such that the CEO investigates projects regardless of the diversification strategy adopted.

Suppose first that $b > \tilde{b}$. Then the CEO implements project β and pursues diversification when $U_{\beta}^{d}(b) - F > U_{\beta}^{f}(b)$ while diversification is value-maximizing when $\pi_{\beta}^{d}(b) > 2\pi_{\beta}^{f}(b)$. Assuming that there are no empire-building preferences; *i.e.,* $F = U^{f}(q)$, the first condition implies that $S(R,k) \geq q$ while the second one implies that $S(R,k) \geq q$. Thus when there is neither a bias towards focus nor one towards diversification and $b > \tilde{b}$, the CEO never chooses to pursue a value-decreasing strategy.

Suppose next that $b \leq \tilde{b}$. Then the CEO investigates projects regardless of the diversification strategy adopted and thereby the congruence of interest parameter α influences the decision to diversify. In this case $r^{f}(q,b) \equiv (\phi(1-\beta) - b(1-\alpha))\, q$ and $r^{d}(S(R,k), b) \equiv \min\{(\phi(1-\beta) - b(1-\alpha)) S(R,k), 1\}$. Thus, the CEO's incentives to investigate projects decrease with the share parameter b and thereby as b increases the CEO is more likely to implement the owners' preferred project.

Assuming that there are no empire-building preferences, it can easily be demonstrated that $s_{c}(F,q,b) = q$, $S_{f}(q) = \min\left\{\frac{1-(1-\alpha)r^{f}(q,b)}{(1-\alpha)r^{f}(q,b)} q, q\right\}$, $S_{f}^{1}(\alpha,q,b) \equiv \max\left\{\frac{1-(1-\alpha)r^{f}(q,b)}{(1-\alpha)r^{f}(q,b)} q, q\right\}$ and $S_{f}^{2}(\alpha,q,b) \equiv \frac{1-(1-\alpha)r^{f}(q,b)}{\alpha} q$. Therefore, a proposition equal to proposition 3 where $r^{f}(q)$ is replaced by $r^{f}(q,b)$ can be shown. Instead of doing so, I will focus on how $DD(\alpha,q,b) \equiv \left\{S(R,k) : S_{f}^{2}(\alpha,q,b) \geq S(R,k) > S_{f}^{1}(\alpha,q,b)\right\}$ and $DF(\alpha,q,b) \equiv \left\{S(R,k) : q \geq S(R,k) > \frac{1-(1-\alpha)r^{f}(q,b)}{(1-\alpha)r^{f}(q,b)} q\right\}$ change with the share parameter b.

An increase in the share parameter b decreases $DF(\alpha,q,b)$, increases $DD(\alpha,q,b)$ for $\alpha \leq \tilde{\alpha}(q,b) \equiv \frac{2r^{f}(q,b)-1}{2r^{f}(q,b)}$ and decreases $DD(\alpha,q,b)$ for $\alpha > \tilde{\alpha}(q,b)$ when $\frac{q}{\alpha(1-\alpha)[r^{f}(q,b)]^{2}}\left(\alpha - \left[r^{f}(q,b)(1-\alpha)\right]^{2}\right)\frac{\partial r^{f}(q,b)}{\partial b}$ is negative. It readily follows from this that the set $DD(\alpha,q,b)$ decreases with the share parameter

b if and only if $b > \tilde{b} - \frac{\sqrt{\alpha}}{(1-\alpha)q}$.

The analysis so far leads to the following: monetary incentives do not affect the decision to pursue diversification but they affect the optimality of the adopted strategy. For $\tilde{\alpha}(q,b) < \alpha \leq \alpha(q,b)$, the CEO chooses value-decreasing diversification for all $S(R,k) \in DD(\alpha,q,b)$ and this set may be either larger or smaller than when there is no monetary incentives. For $\alpha \leq \tilde{\alpha}(q,b)$,value-decreasing diversification occurs for all $S(R,k) \in DD(\alpha,q,b)$ and value-decreasing focus occurs for all $S(R,k) \in DF(\alpha,q,b)$. The latter set decreases with the share parameter b while the former increases. In addition $\alpha(q,b)$ and $\tilde{\alpha}(q,b)$ decrease with the share parameter b. Thus, by choosing a share parameter larger than $\tilde{b} - \frac{\sqrt{\alpha}}{(1-\alpha)q}$, the owners may induce the CEO to adopt a value-decreasing strategy less often. The reason being that when the CEO is paid a fraction b of the realized security benefits, he partially internalizes the existence of disaligned interests and thereby he is less likely to pursue value-decreasing diversification when b is sufficiently large.

Lastly, given that when there is neither a bias towards diversification nor one towards focus, the share parameter does not affect the CEO's decision to diversify. The optimal share parameter is chosen so as to maximize $\pi^d(\alpha, S(R,k), b) \equiv (1-b)\,2\left[r^d(S(R,k),b)(\alpha-1)+1\right]S(R,k)$ when $S(R,k) > q$ and to maximize $\pi^f(\alpha,q,b) \equiv (1-b)\left[r^d(q,b)(\alpha-1)+1\right]q$ otherwise, where $r^d(S(R,k),b) = r^d(q,b) = 0$ for $b \geq \tilde{b}$. Thus, for $S(R,k) > q$ the share parameter that maximizes firm's expected value subject to $b \leq \tilde{b}$, denoted by b^d, is given by $\min\left\{\frac{1}{2}\tilde{b} + \frac{1}{2}\left(1 - \frac{1}{(1-\alpha)^2 S(R,k)}\right), \tilde{b}\right\}$ while for $S(R,k) \leq q$ this parameter, denoted by b^f, is given by $\min\left\{\frac{1}{2}\tilde{b} + \frac{1}{2}\left(1 - \frac{1}{(1-\alpha)^2 q}\right), \tilde{b}\right\}$. It is straightfoward to check that $b^d = \tilde{b}$ for all $S(R,k) > \frac{1}{(1-\alpha)[(1-\alpha)-\phi(1-\beta)]}$ and that $b^f = \frac{1}{2}\tilde{b} + \frac{1}{2}\left(1 - \frac{1}{(1-\alpha)^2 q}\right)$ for all $q \leq 1$.

Furthermore, $\pi^d\left(\alpha, S(R,k), b^d\right) > \pi^d\left(\alpha, S(R,k), \tilde{b}\right)$ for all $S(R,k)$ and $\pi^f\left(\alpha, q, b^f\right) > \pi^f\left(\alpha, q, \tilde{b}\right)$ for all q.[16] Thus, when there are no empire-building preferences the optimal share parameter when $S(R,k) \leq q$ is $\frac{1}{2}\tilde{b} + \frac{1}{2}\left(1 - \frac{1}{(1-\alpha)^2 q}\right)$, when $\frac{1}{(1-\alpha)[(1-\alpha)-\phi(1-\beta)]} \geq S(R,k) > q$ is $\frac{1}{2}\tilde{b} + \frac{1}{2}\left(1 - \frac{1}{(1-\alpha)^2 S(R,k)}\right)$ and when $S(R,k) > \frac{1}{(1-\alpha)[(1-\alpha)-\phi(1-\beta)]}$ is $\tilde{b}$. Thus, for all $S(R,k) \leq \frac{1}{(1-\alpha)[(1-\alpha)-\phi(1-\beta)]}$ the optimal share parameter is not chosen to to induce the CEO to always adopt a value-increasing strategy. Notice also that the CEO's post merger pay-for-performance sensitivity and the post-merger expected compensation are larger and the pay-for-performance sensitivity increases with the synergy level.[17]

[16] $\pi^d\left(\alpha, S(R,k), b^d\right) - \pi^d\left(\alpha, S(R,k), \tilde{b}\right) = \frac{1}{4(1-\alpha)^2 S(R,k)}\left[(1-\alpha)\left[(1-\alpha)-\phi(1-\beta)\right]S(R,k) - 1\right]^2 \geq 0$ and $\pi^f\left(\alpha, q, b^f\right) - \pi^f\left(\alpha, q, \tilde{b}\right) = \frac{1}{4(1-\alpha)^2 q}\left[(1-\alpha)\left[(1-\alpha)-\phi(1-\beta)\right]q - 1\right]^2 \geq 0$.

[17] This is consistent with the evidence presented by Rose and Shepard (1997).

5 Diversification and Divisional Managers' Productivity

In this section I provide two simple rationales for why diversification may result in a productivity-diluting factor k and briefly discuss two others from the literature on internal capital markets.

The first rationale has to do with the effect of diversification on the accuracy of divisional performance measures; mainly that diversification makes harder to observe divisional managers' performance. The idea that either the performance of individual business units or divisions is harder to observe in a diversified firm is not new. Hermalin and Katz (1996) argue that the value of diversification in an agency setting derives from its effects on the CEO's information concerning divisional manager's actions. They show that diversification can either increase or decrease the CEO's information about division managers' actions and thereby can raise or lower agency costs. In addition, Goold and Campbell (1998) in his article Desperately Seeking Synergy argue that one of the costs of synergies that usually go unnoticed is that the pursuit of them sometimes harms an effort to instill division managers with greater accountability for his business performance. The reason being that the creation of synergies usually requires sharing resources and cooperation among units which many times result in weaker or coarser divisional performance measures with the potential consequences on divisional managers' incentives.

Here, I do not intend to provide a full blown model of this phenomena but only show that if diversification makes divisional performance measures coarser, a productivity-diluting factor arises. In order capture this in a simple form, it is assumed that when a diversified strategy is adopted, outcomes $(0, 0)$, $(R, 0)$ and $(0, R)$ are indistinguishable from each other and thereby non-contractible as separate outcomes and outcome (R, R) is distinguishable from the rest and contractible as a separate outcome. Whereas when a focused strategy is adopted, outcomes 1 and 0 are distinguishable from each other and contractible as separate outcomes.[18] Because when either strategy is adopted there are only two possible outcome and division managers have limited liability normalized to zero, it is easy to show that it is optimal to set the compensation equal to zero when the low performance measure is realized. Thus, the following contract can be offered when a diversified strategy is pursued

[18] This assumption is equivalent to assume that when a diversified strategy is adopted there is only one performance measure that takes for instance the value S with probability $p(e_i, e_j)\, p(e_j, e_i)$ and 0 with probability $1 - p(e_i, e_j)\, p(e_j, e_i)$.

Possible Outcomes	Compensation
(R, R)	w^d,
$(0, R)$, $(0, 0)$ or $(0, R)$	0,

where $w^d \geq 0$ while when a focused strategy is pursued the following contract can be offered

Possible Outcomes	Compensation
1	w^f,
0	0,

where $w^f \geq 0$.

To simplify the analysis and abstract from complementarities between division managers' efforts, it is assumed that $p(e_i, e_j) = q(e_i) = \frac{1}{\overline{R}} e_i$ and $c(e_i) = \frac{1}{2} e_i^2$.

When a focused strategy is adopted division manager i chooses e_i to maximize the following:

$$q(e_i)\left(\phi + w^f\right) + (1 - q(e_i))\, 0 - \frac{1}{2} e_i^2.$$

It readily follows from this that division manager i chooses to exert an effort level, denoted by $e_i\left(w^f\right)$, equal to $\frac{1}{\overline{R}}\left(\phi + w^f\right)$.

When a diversified strategy is adopted, division manager i chooses e_i to maximize the following:

$$q(e_i)\, \phi R + q(e_i)\, q(e_j)\, w^d + [1 - q(e_i)\, q(e_j)]\, 0 - \frac{1}{2} e_i^2.$$

It readily follows that in a symmetric equilibrium each division manager chooses to exert an effort level, denoted by $e_i\left(w^d\right)$, equal to $\frac{\phi R \overline{R}}{\overline{R}^2 - w^d}$. Because division managers' efforts are strategic complements, an increase in either w^d or R increases division managers' efforts.

The optimal compensation for a division manager depends on the CEO's goal. If the CEO cares only about gross returns, then he will choose w to maximize effort only, while if he cares about net (of wages) private benefits, then he will internalize the cost of providing incentives. In what follows, I assume that the CEO cares about net private benefits and not about gross private benefits. Thus, the CEO's expected utility when he works in a focused firm and project h is implemented is given by:

$$q(e_i)\, \phi h \left(1 - w^f\right),$$

where $h = 1$ when project α is implemented and $h = \beta$ when project β is implemented, while the CEO's expected utility from working in a diversified firm is given by:

$$2q(e_i)\,q(e_j)\,\phi h\left(R - w^d\right) + \left[q(e_i) + q(e_j) - 2q(e_i)\,q(e_j)\right]\phi h R.$$

Using the envelope theorem, the first-order condition for the optimal wage in each case is given by:

$$\begin{array}{ll} w^f: & \phi h\left[\frac{\partial q\left(e\left(w^f\right)\right)}{\partial e\left(w^f\right)}\frac{\partial e^f}{\partial w^f}\left[1-w^f\right] - q\left(e\left(w^f\right)\right)\right] \leq 0, \\ w^d: & \phi h\left[\frac{\partial q\left(e^d\left(w^d\right)\right)}{\partial e^d\left(w^d\right)}\frac{\partial e^d}{\partial w^d}\left[R - 2q\left(e\left(w^d\right)\right)w^d\right] - 2q\left(e^d\left(w^d\right)\right)^2\right] \leq 0. \end{array}$$

It follows from these first-order conditions and few steps of simple algebra that when a focused strategy is adopted: $w^f = \frac{1-\phi}{2}$ and thereby $e\left(w^f\right) = \frac{1+\phi}{2\overline{R}}$ and $q\left(e\left(w^f\right)\right) = \frac{1+\phi}{2\overline{R}^2}$ while when a diversified strategy is adopted: $w^d = (1-2\phi)\,\overline{R}^2$ and thereby $e\left(w^d\right) = \frac{R}{2\overline{R}}$ and $q\left(e\left(w^d\right)\right) = \frac{R}{2\overline{R}^2}$.

Notice that the difference between $q\left(e\left(w^d\right)\right)$ and $q\left(e\left(w^f\right)\right)$ is equal to $\frac{(R-1-\phi)}{2\overline{R}^2}$, which is negative when there is no synergy $R = 1$ and positive when the synergy level is larger than ϕ. Thus, when the observability problem is coupled with synergies, each project's probability of success is lower when a diversified strategy is adopted for a synergy level lower than ϕ and larger otherwise. Consequently, the observability problem results in a productivity-diluting factor k equal to $\frac{1}{1+\phi}$.

This rationale for the productivity dilutining factor k also yields a prediction concerning the difference in expected compensation and pay-for-performance sensitivity between the two strategies. The pay-for-performance sensitivity is defined as the incremental compensation paid for a success divided for the incremental return. That is, the pay-for-performance sensitivity when a focused strategy is adopted is $b^f \equiv \frac{1-\phi}{2}$ while that when a diversified strategy is adopted is $b^d \equiv \frac{(1-2\phi)\overline{R}^2}{R}$. Assuming that $\phi \leq \frac{1}{2}$, notice that $b^d - b^f$ is decreasing in the synergy level R and positive for all $\phi < \frac{2\overline{R}^2 - R}{4\overline{R}^2 - R}$. In addition, the expected compensation in a diversified firm is larger than in a focused firm for all R larger than $\frac{1-\phi^2}{2\overline{R}^2(1-2\phi)}$. Thus, when the post-merger expected compensation is larger than the pre-merger one and the post-merger pay-for-performance decreases it is likely that synergies are large enough to overcome the observability problem.

The next rationale concerns the relationship between the span of control and organizational capabilities. It has been argued that the allocation process of large conglomerates that were formed in the 1960s became inefficient and bureaucratized because the CEOs were responsible for too many different units–each requiring a different strategy. This called for a refocus movements to focus only on the core business .

In what follows I assume that a project's expected return depends not only on division managers' effort but also on organizational capabilities, where this can be though of as marketing skills, distribution skills, product development skills, and so on. A common feature of these capabilities is that they can be applied to different businesses. For the purpose here, organizational capabilities are modeled as firm's specific inputs or resources that are allocated across the different units by the CEO. They must be specific in order to avoid to be paid out as other factor payments and transferable across different businesses within a firm. Formally, denote the firm's organizational capabilities as a quantity T of a firm-specific productive resource that can be allocated across the different units. It is useful to think of T as the total time that the CEO, whose skills are specific to the firm, has available to allocate among n identical units over which he has authority. The amount allocated to unit i is denoted by t_i and $\sum_i t_i = T$.[19]

The probability of success in each unit regardless of the strategy adopted is now given by $q\left(e_i, t_i\right)$, with $q_{e_i}\left(\cdot\right) > 0$, $q_{e_i e_i}\left(\cdot\right) \leq 0$, $q_{t_i}\left(\cdot\right) > 0$ and $q_{t_i t_i}\left(\cdot\right) > 0$. In addition, $q\left(e_i, t_i\right)$ is supermodular in $\left(e_i, t_i\right)$; that is, $\frac{\partial}{\partial e_i \partial t_i} q\left(e_i, t_i\right) > 0$ and $q\left(e_i, 0\right) = 0$. Notice that the specification chosen implies that for any given effortt e $q\left(e, T\right) + q\left(e, 0\right) > q\left(e, T - t\right) + q\left(e, t\right)$ for any $t \in \left(0, T\right)$. This is meant to capture the benefits from specialization. In addition, lets assume that the creation of synergies require to allocate a positive amount of the specific resource in each unit. For the sake of simplicity, it will be assumed that it is required to allocate T equally across all divisions. Thus, $R_i = R \geq 1$ for all i when $t_i = \frac{T}{n}$ and $R_i = 1$ otherwise.

Division manager i's payoff is $\phi q\left(e_i, t_i\right) R_i - c\left(e_i\right)$ regardless of the implemented project. Thus, division manager i's first-order condition is given $\phi q_{e_i}\left(e_i, t_i\right) R_i - c_{e_i}\left(e_i\right) = 0$. In what follows, let denote by q the solution to $\phi q_{e_i}\left(e_i, T\right) - c_{e_i}\left(e_i\right) = 0$ and by $p\left(R, n\right)$ the solution to $\phi q_{e_i}\left(e_i, \frac{T}{n}\right) R - c_{e_i}\left(e_i\right) = 0$. Notice that $p\left(R, n\right)$ is increasing in R and decreasing in n and that at $R = 1$, $q > p\left(R, n\right)$ for all $n > 1$. In addition, lets assume that $p\left(\overline{R}, n\right) > q$ for any n finite. Thus, there exists a synergy level, denoted by $\breve{R}$, such that $p\left(R, n\right) > q$ for all synergy level greater than $\breve{R}$. This explains a productivity diluting factor equal to $k\left(n\right) = \frac{p(1,n)}{q}$, which is decreasing in the span of control. Thus, if there are specific resources in a limited amount that have to be allocated across different units and there are no synergies, division managers' marginal product of effort is at least as large in focused firm than in a diversified firm.

The CEO's goal is to maximize $\sum_i \phi q\left(e_i, t_i\right) h R_i$ subject to $\sum_i t_i \leq T$, where $h = 1$ when project α is implemented and $h = \beta$ when project β is implemented. Thus, in a focused firm the CEO uses the

[19] See, Matsusaka (2001) for an interesting dynamic model of organizational capabilities allocation.

T units of the specific resource and in a diversified firm, he chooses $t_i = \frac{T}{n}$ when $\phi np(R,n) hR > \phi qh$, where the left-hand side is the CEO's utility when the specific resource is allocated equally across all units and the right-hand side is the CEO's utility when the specific resource is allocated in its totality to one unit only. Because $p(R,n)$ is increasing in R and $p\left(\overline{R},n\right) > q$, there exists an synergy level denoted by $R(n)$ such that the optimal allocation is to divide T equally across divisions for all synergy levels larger than $R(n)$.

The CEO's expected utility is given by $[r(n)(1-\beta)+\beta] nS(R,n) - n\frac{r^2}{2} - (n-1)F$, where $S(R,n) \equiv p(R,n)R$ is the expected synergy when the firm-specific productive resource is allocated equally across units. Thus, the CEO's optimal research intensity is given by $r(n) \equiv \phi(1-\beta)S(R,n)$.

When the envelope theorem is used and n is treated as real number, the optimal span of control is obtained from

$$\left\{\phi[r(n)(1-\beta)+\beta]S(R,n) - F - \frac{r(n)^2}{2}\right\} + n\phi[r(n)(1-\beta)+\beta]R\frac{\partial p(R,n)}{\partial e}\frac{de}{dn} = 0. \qquad (6)$$

The expression in curly brackets in (6) is the expected marginal net private benefit associated with a unit increase in the span of control. An extra unit brings expected private benefits by $\phi[r(n)(1-\beta)+\beta]S(R,n)$ but it needs attention $F + \frac{r^2}{2}$. The second term, called the disincentive effect, measures the decrease in a division manager's effort associated with a unit increase in the span of control. Because this term is negative, it is never optimal for the CEO to be overloaded–that is, the expected marginal net private benefit with a unit increase in the span of control is always positive. This result shows that despite that the CEO may have empire-building preferences; *i.e.,* $F < U^f(q)$, he never chooses to be overloaded because that decreases division managers' incentives.

There are two other rationales that could be easily incorporated in the model but since their results are known I, for the sake of brevity, briefly describe them. The first rationale comes from the literature on influence activities where division managers are portrayed as rent-seeking agents who try to persuade the CEO to provide them with extra capital. Following this literature, Rajan, Servaes and Zingales (2000) and Scharfstein and Stein (2002) show that an internal capital market can do a worse job of allocating funds to individual divisions as a result of influence or rent-seeking activities and divisional managers' incentives to rent seek decrease their incentives to exert effort on a productive task. The second rationale is provided by Brusco and Pannunzi (2001) and Inderst and Laux (2000) who show that an internal capital market results in an effort-dilution effect because an efficient capital allocation ex-post takes resources away from one division and gives them to the other division. The intuition being that ex-ante each divisional manager faces a positive probability of ex-post expropriation of the cash-flow generated by his division that decreases the marginal productivity of effort.

Thus, there are internal agency problems resulting in lower division managers' productivities that arise only when a diversified strategy is adopted.

6 Conclusions

In this paper I have proposed an agency model that provides a rationale for the evidence showing, after carefully controlling for the endogeneity of the diversification decision, that some firms are traded at a discount relative to a pool of focused firms in the same business segments while others are traded at a premium (see Lamont and Pollak, 2002).

The conventional intuition suggests that in the absence of synergies, diversification should bring neither gains nor loses to the owners and the gains from diversification should increase with the size of synergies. That is, as the expected security benefits from merging two or more stand-alone firms increase, the value of a diversified firm should increase. I have shown that this conventional argument fails to take into account that synergies, managerial incentives and agency conflicts are interwined in complex ways that may result in a non-monotonic relationship between synergies and firm's value.

In particular, a non-monotonic relationship arises when the congruence of interest parameter is sufficiently small. In this case and assuming away empire-building preferences, it is shown that value-decreasing diversification occurs for synergies that go from moderate to large and that value-decreasing focus may occur for small synergies. Thus, diversified firms traded at a discount is the result of synergies being sufficiently large and not of being sufficiently small as it is usually believed. The reason being that synergies provide the CEO with incentives to implement projects that are different from the projects that maximize firm's value. Thus, synergies on the one hand increase a firm's value because they make units more profitable, but on the other hand, decrease firm's value because the CEO is more likely to take actions that increase his utility but not firm's value.

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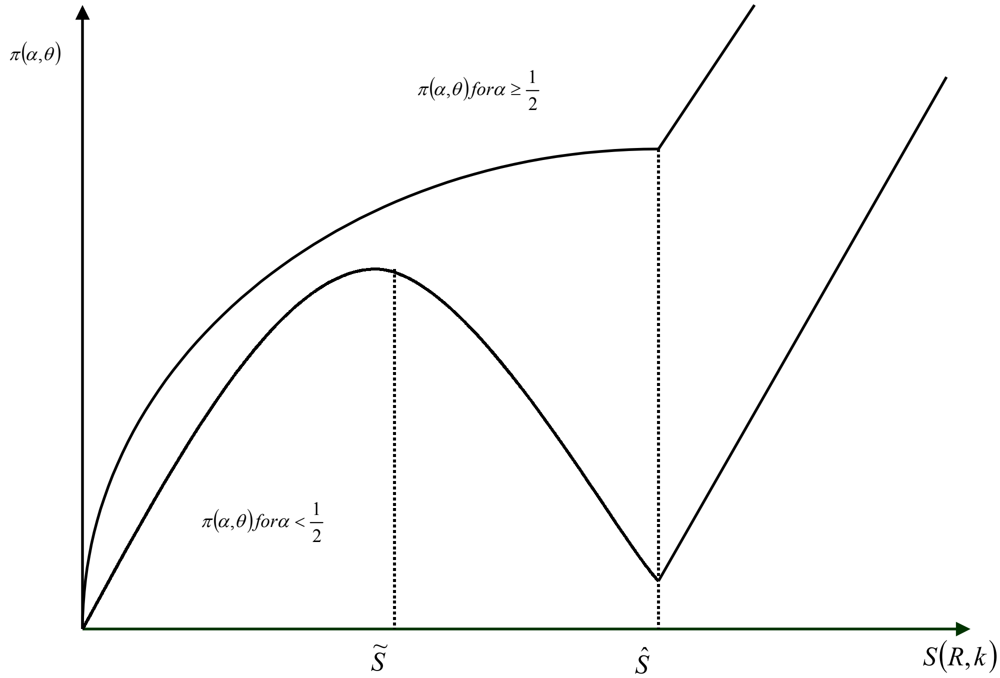

$\pi(\alpha,\theta)$
$\pi(\alpha,\theta) for \alpha \geq \frac{1}{2}$
$\pi(\alpha,\theta) for \alpha < \frac{1}{2}$
$\tilde{S}$
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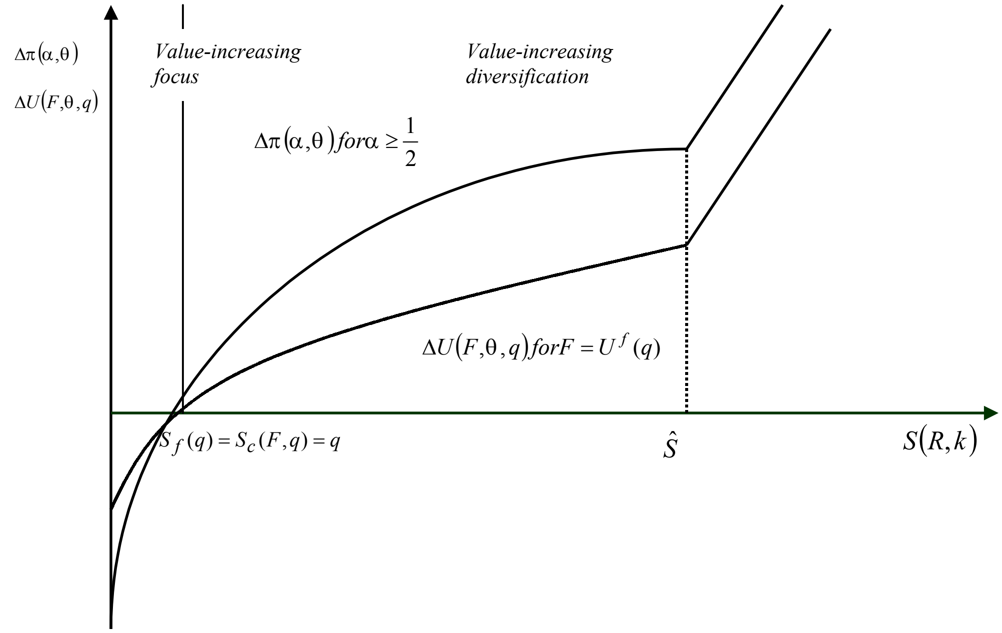
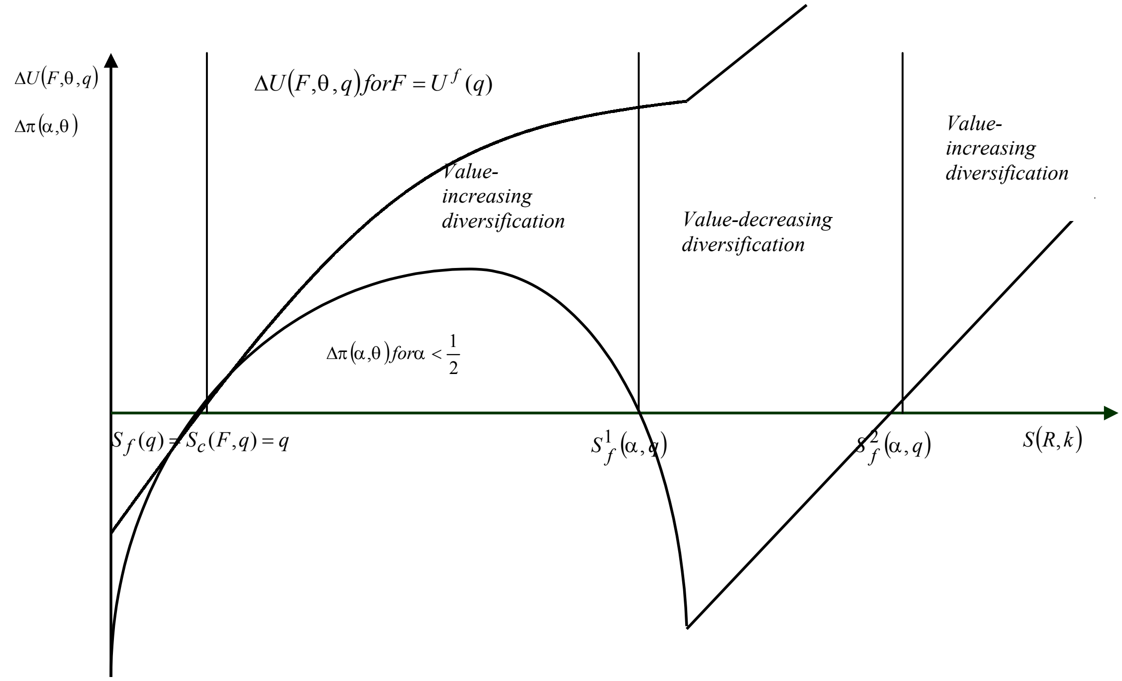
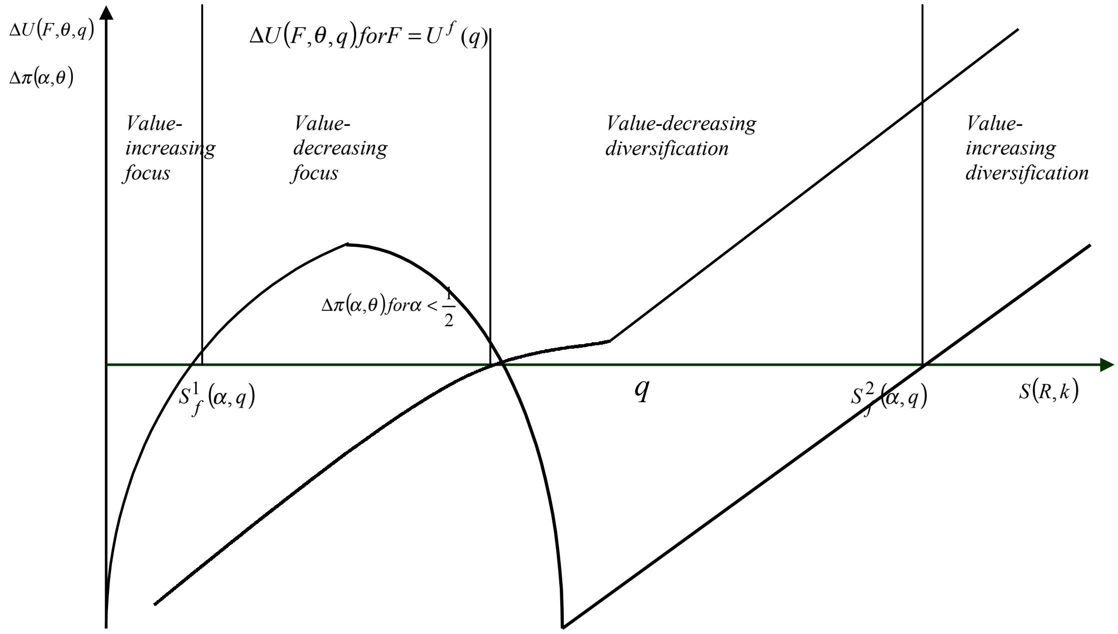
$S(R,k)$



$\Delta\pi(\alpha,\theta)$
$\Delta U(F,\theta,q)$
Value-increasing focus
Value-increasing diversification
$\Delta\pi(\alpha,\theta)\, for\, \alpha \geq \frac{1}{2}$
$\Delta U(F,\theta,q)\, for\, F = U^f(q)$
$S_f(q) = S_c(F,q) = q$
$\hat{S}$
$S(R,k)$



$\Delta U(F,\theta,q)$
$\Delta\pi(\alpha,\theta)$
$\Delta U(F,\theta,q)\, for F = U^f(q)$
Value-increasing diversification
Value-decreasing diversification
Value-increasing diversification
$\Delta\pi(\alpha,\theta)\, for \alpha < \frac{1}{2}$
$S_f(q) = S_c(F,q) = q$
$S_f^1(\alpha,q)$
$S_f^2(\alpha,q)$
$S(R,k)$



$\Delta U(F,\theta,q)$
$\Delta\pi(\alpha,\theta)$
$\Delta U(F,\theta,q) for F = U^f(q)$
Value-increasing focus
Value-decreasing focus
Value-decreasing diversification
Value-increasing diversification
$\Delta\pi(\alpha,\theta) for \alpha < \frac{1}{2}$
$S_f^1(\alpha,q)$
q
$S_f^2(\alpha,q)$
$S(R,k)$