Incentives, Capital Budgeting, and Organizational Structure

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Divisional managers compete for financial resources in what is often referred to as an internal capital market. They also have a common interest in maximizing corporate profits, as this determines the resources available to the firm as a whole. Both goals are powerful motivators but can at times conflict: while the amount of resources available to the firm depends on corporate performance, divisional funding depends upon the division's performance relative to the rest. We propose a model in which organizational form is endogenous, divisions compete for corporate resources, and managers have implicit incentives. We show that organizational design can help companies influence their divisional managers' potentially conflicting goals. Our analysis relates the firm's organizational structure to the source of incentives (external vs. internal), the nature of the incentives (competition vs. cooperation), the level of corporate diversification, the development of the capital market, and to industry and firm characteristics.

1. Introduction

In large corporations one of headquarters' main functions, and arguably the most important one, is the allocation of resources across different lines of business—this determines how corporations grow and evolve over time. Divisional managers compete for resources in what is often referred to as an internal capital market. Yet, managers have also a common interest in increasing corporate profits so that the firm attains more resources, which can then be channeled to all divisions. Both types of incentives motivate managers but can sometimes conflict. For example, actively participating in a project launched by another division can increase corporate profits but may not help one's position when competing for internal resources. In fact, engaging in less profitable projects might be more rewarding from the divisional managers' perspective if they can more convincingly claim credit for them. In order to prevent divisions' particular interests from harming firm performance, companies need to find ways to channel those interests

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toward corporate goals. This article shows how an appropriate organizational structure can help.

We use a career concerns model (Holmström, 1982) to formalize the dynamic nature of incentives: investors and corporate headquarters draw inferences from current profits about the productivities of different lines of business, which are *ex ante* unknown, and use those inferences for capital budgeting. Divisional managers have incentives to influence this learning process, and hence future investments, by taking costly unobserved actions that increase profits. In this set up, we study how a multi-product firm fares under different organizational structures, paying special attention to the most common types of structure, the so-called unitary and multidivisional forms (U-form and M-form). In a U-form organization, each divisional manager has responsibilities over all products or business lines, but her responsibilities are limited to a single function, for example, marketing or production; whereas in an M-form each divisional manager is responsible for a single product and controls all functions related to that particular product.

Irrespective of the organizational form, in the model, headquarters are free to decide how funds are allocated across products, but must allocate functional resources in fixed proportions. The fixed proportions assumption is made for simplicity, the main idea being that there is a greater degree of substitutability across products than across functions. That is, firms can generally do without a particular line of business if it is not profitable but need to invest in all functional areas for the lines of business in which they operate.[1] Empirically, large corporations tend to operate in more than one SIC code, and, more importantly, they are often involved in acquisitions, alliances, and divestitures (e.g., 86 Fortune-100 firms were involved in a total of 9,276 acquisitions, alliances, and divestitures during the 1990s—see Villalonga and McGahan, 2005), which suggests that reallocations of resources indeed occur primarily across products.

To understand the logic of the model, consider first a U-form organization. Given that each division manages a number of functions across *all* products, the internal allocation of resources by corporate headquarters does not induce competition among divisional managers.[2] In these organizations, a division's funding is mainly determined by the total amount of funds available for the whole corporation, which depends on how investors perceive the firm. Divisional managers have incentives to improve this perception by increasing current profits as this translates into more financing for the corporation and hence, for their respective divisions.

Incentives work differently in an M-form organization. Because each division is responsible for one product or line of business, a division's funding depends not only on the total funds available for the whole corporation, but also on the share of those funds that are channeled to each product by corporate headquarters. In this case divisional managers have incentives to improve both the external perception of the corporation (to increase total funding) and the internal perception of their divisions (to increase their own division's internal funding). More importantly, these two objectives can conflict: while internal competition for resources provides divisional managers with incentives

1. Even if a firm decides to outsource some functional processes, outsourcing is limited by informational and hold-up problems (e.g., Grossman and Hart, 1986) and these processes still need to be funded (i.e., outsourced goods and services have to be paid for and firms must keep a minimum amount of in-house resources to ensure proper coordination with suppliers).

2. In general, as long as headquarters' reallocation of resources across products or business lines is more important than across functions, a U-form organization will tend to induce less internal competition for corporate resources than an M-form organization.

to improve their respective divisions' performance, it may come at the expense of cooperation with other divisions, and lead to lower overall profitability.

We show that the choice of organizational structure hinges on the size of the corporation, the development of the capital market, the value of cross-divisional cooperation, and the industry's and firm's age. As corporations grow and diversify, the incentives to increase total funding, which will be shared by all divisions, decrease, while competition for internal resources intensifies. This makes M-forms more desirable than U-forms. In contrast, when the capital market is well developed the benefits from internal competition are small relative to the cost of interdivisional conflicts of interest that arise in M-forms, and thus U-forms are superior. This suggests that M-form organizations are more valuable in less developed countries where capital markets play a weaker monitoring role and are not capable of providing managers with strong incentives. In addition, in corporations where cooperation is important (e.g., because of a strong brand name that all products benefit from) conflicts of interest caused by M-forms are especially harmful and, all else equal, U-forms are more desirable. Finally, firms in younger industries, as well as younger firms within an industry, are more likely to adopt a U-form organization. In those industries and firms, there is more uncertainty about the profitability of different lines of business, which gives rise to stronger implicit incentives (both external and internal) and, as we show, raises the relative value of cooperation.

As this paper links organizational form and capital budgeting decisions, it bridges and contributes to two research areas. First, it relates to the organizational design literature, and in particular, to Williamson's (1975) analysis of informational asymmetries and incentives, which has inspired much of the recent research on incentives within organizations (see, for instance, Crémer, 1986; Itoh, 1991, 1993, 1994; Aghion and Tirole, 1995; Maskin et al., 2000; Harris and Raviv, 2002; Ortega, 2003; Besanko et al., 2005; Hart and Moore, 2005; Qian et al., 2006; Harstad, 2007; Friebel and Raith, 2010). Our model departs from this literature in one important aspect: its focus on the allocation of financial resources which we model as a two-tier capital budgeting process—investors and headquarters.[3] We also differ from most of the literature on organizational design in the nature on the incentives that we consider, that is, implicit incentives, as this literature, with a few exceptions such as Ortega (2003) and Harstad (2007), has mainly focused on explicit incentives. Moreover, while these two papers, and the literature on explicit incentives and organizations (e.g., Maskin et al., 2000, Besanko et al., 2005), assume that differences in incentives come from differences in observability across organizational forms, we do not make such an assumption. Hence, the analysis shows that even if the different organizational forms were to have the same informational structure, there are other issues (in our case the allocation of responsibility across divisional managers) that lead to differences in incentives and performance across organizational forms.

The second research area that we contribute to is the literature on internal capital markets (see Stein, 2003, and the references therein for a review on this literature). Our main contribution to this literature is to endogenize the organizational structure and to analyze how organizational design, allocation of resources and divisional manager's incentives interact. For that purpose we build on Stein (1997) and consider corporate

3. Although the allocation of financial resources is key to corporate development, the organizational design literature has, by and large, ignored it. For example, the models of hierarchies by Calvo and Wellisz (1978) and others (Keren and Levhari, 1979; Qian, 1994) do not consider the allocation of financial resources. Other models of organizations that focus on coordination or cooperation problems (Crémer, 1986; Itoh, 1991, 1993, 1994; Harris and Raviv, 2002; Hart and Moore, 2005; Qian et al., 2006; Dessein et al., 2010) also abstract from capital budgeting.

headquarters as an intermediary between investors and divisional managers whose role is to create value by allocating resources across business lines. Other papers have previously studied the relationship between managerial incentives and internal capital markets (see, for instance, Gertner et al., 1994; Stein, 2002; de Motta, 2003; Bernardo, Cai and Luo, 2004; Goel et al., 2004; Marino and Zábojník, 2004; Brusco and Panunzi, 2005; Ozbas, 2005; Fulghieri and Hodrick, 2006). Like de Motta (2003) and Ozbas (2005), we also analyze the implicit incentives of divisional managers in an internal capital market.[4] The main difference is that de Motta (2003) and Ozbas (2005) assume that companies are organized along product lines—M-form—whereas we treat this organizational choice as an endogenous variable. In addition, our paper studies divisional managers' incentives to maximize shareholder value—exert effort—whereas Ozbas (2005) focuses on their incentives to disclose information to headquarters. We share with Bernardo et al. (2004) the interest in divisional managers' incentives, in particular their incentives to cooperate. We find conditions under which such managers cooperate, but we depart from Bernardo et al. (2004) in two important aspects: the nature of the incentives (i.e., our emphasis is on implicit rather than explicit incentives), and the fact that organizational form is endogenous in our model.

The rest of the paper is structured as follows. Section 2 presents the model, Section 3 solves the model, and Section 4 offers concluding remarks.

2. Model

We consider a company with $N \geq 1$ different lines of business or products each requiring a continuum of tasks or functions of size 1 to be undertaken. The company's problem is to choose the organizational form that maximizes its profits given these constraints. An organizational form is simply a choice of N divisions which may be defined along product lines, functional lines, or a combination of both. In order to abstract from the fact that the relative importance of different products or functions may bias the choice of organizational form, we assume that all products and functions are a priori identical. More special cases where some products or functions are more important than others can then be better understood as departures from the symmetric case.

Production requires managerial work and financial resources. As far as managerial work is concerned, we assume that there are N a priori identical divisional managers. Divisional managers can take unobserved actions that are costly to them (i.e., they require effort, time, and attention) but increase profits. In particular, manager j can take two types of actions, some of which (denoted by $e_j \geq 0$) are aimed at directly increasing the productivity of her division, while others (denoted by $c_j \geq 0$) are aimed at increasing the overall productivity of the company. We can think of the latter type of actions as helping managers of other divisions (cooperation). (See Itoh (1991) for a paper that makes a similar assumption in an otherwise different set-up.) To focus on the benefits that these types of actions provide, we assume that e_j and c_j are perfect substitutes in the manager's cost function, and, for simplicity, that this cost function is quadratic, that is, $\frac{\tau}{2}(e_j + c_j)^2$ where $\tau > 0$.

4. We also share with Goel et al. (2004) the emphasis on implicit incentives but depart from their model in many other respects. We are mainly interested in divisional managers' rather than headquarters' incentives. Moreover Goel et al. (2004) are concerned with internal distortions such as cross-subsidization that may occur in M-form organizations. In contrast, following Stein (1997) we assume that, given the information available to headquarters, internal resources are efficiently allocated across divisions and, more importantly, we endogenize the choice of organizational form.

Financial resources are obtained from investors and are then allocated by corporate headquarters across the different products or lines of business. We use F_t to denote the total amount of funds raised by the company at time t, and I_{it} to denote the part of these funds allocated to product i, with $\sum_{i=1}^{N} I_{it} \leq F_t$. Investors, corporate headquarters, and divisional managers are all assumed to be risk neutral and have different objectives: whereas investors own the corporation and hence seek to maximize profits, corporate headquarters and divisional managers are "empire builders." In particular, headquarters seek to maximize the firm's total investment, F_t, and provided that total investment is maximized, choose the allocation of resources $\{I_{it}\}$ that maximizes expected profits. Divisional managers are also empire builders but, unlike corporate headquarters, are only concerned with maximizing investment in their *own* divisions. These assumptions are similar to Stein (1997) and Hart and Holmström (2010) and capture the fact that while corporate headquarters are subject to agency problems—in this case they are empire builders—they have more balanced incentives than divisional managers. Notice that the nature of the conflict between investors and headquarters is that the latter will have an incentive to overstate the financial needs of the corporation, but ultimately investors, who own the corporation, decide about the payout policy and total amount invested in each period. Hence, the assumption that investors decide about the funds F_t available for investment in each period t is consistent with the fact that all or part of the financing may come from retained earnings.

The empire-building hypothesis dates back (at least) to Schumpeter (1934). Managers may have several motivations for growing their firms which include a desire for status, power, and increased compensation (e.g., Baumol, 1959; Williamson, 1974; Jensen, 1986). Lang et al. (1991) provided one of the first empirical tests of Jensen's free-cash flow hypothesis, that is, of the idea that managers realize personal gains from empire-building and that firms with abundant cash-flows are likely to engage in value-destroying acquisitions. Their results support the free-cash flow hypothesis and suggest that empire-building behavior is indeed economically significant.[5] More recent studies have also documented a link between firms' corporate governance and managers' empire-building behavior: for instance, Masulis et al. (2007) show that managers at firms protected by more anti-takeover provisions, and hence less subject to the disciplinary power of the market for corporate control, are more likely to indulge in acquisitions that destroy shareholder value.

A division is defined by the set of tasks that are carried out by a single manager. Divisional managers have limited capabilities that make it impossible for them to manage an unlimited number of products or functions. Specifically, there is a continuum of tasks or functions of size N to be carried out (i.e., N products each requiring a continuum of tasks of size 1) and we assume that a divisional manager cannot manage more than a continuum of size 1 of those tasks. This assumption is in line with Williamson's (1975) emphasis on bounded rationality as a key to understanding organizational design problems.

This set up allows for different types of departmentation. For example, one possibility is product departmentation, whereby each divisional manager has responsibilities

5. Lang et al. (1991) show that an increase in free cash-flow equal to one percent of a bidder's total assets is associated with a decrease in the bidder's gain from the takeover equal to approximately one percent of the value of the bidder's common stock. Another influential paper, Morck et al. (1990), documents that returns to bidding shareholders are lower when their firm diversifies and when the performance of its managers has been poor before the acquisition. They argue that these results are consistent with the idea that managerial rather than shareholders' objectives drive bad acquisitions.

over all tasks of a single product (an M-form). Alternatively, functional departmentation makes each divisional manager responsible for a proportion $1/N$ of the tasks in each of the N products (a U-form). Assuming all divisional managers are identical, let $\beta \in [1/N, 1]$ be the proportion of product i's tasks performed by manager i—the remaining tasks, $(1-\beta)$, being performed by the remaining $(N-1)$ managers. Thus, manager i undertakes β tasks concerning product i, and $\frac{(1-\beta)}{N-1}$ tasks concerning each of the other $(N-1)$ products.[6] β represents the extent of product departmentation: its lowest value, $\beta = 1/N$, corresponds to the U-form, and its highest value, $\beta = 1$, corresponds to the M-form. The intermediate values $(1/N < \beta < 1)$ correspond to hybrid forms where a manager is responsible for most of the tasks concerning a product but there are a few functions that are shared across products.

Notice that in the U-Form as the number of products increases so does the number of functional divisions. Intuitively, as a firm grows, even if the number of broad functional areas (e.g., marketing, finance, and operations) remains the same, each area becomes more complex and requires more tasks and hence more managers. For instance, in a small firm with just a few products a single manager may be able to handle all the necessary marketing-related tasks. However, if the number of products increases more managers will be needed, each of them specialized in one aspect of marketing (e.g., strategic vs. operational marketing).

Using a_i to denote the total amount of effort devoted to directly increase the productivity of product i, we have

$$a_i = \beta e_i + (1-\beta) \sum_{j \neq i} \frac{e_j}{N-1}. \tag{1}$$

In the above expression, the subscript in a_i stands for a product, whereas the subscript in e_i refers to a manager:[7] thus, according to equation (1), manager i is responsible for a proportion β of the functions in product i and devotes effort e_i to increase the productivity of her division; and manager $j \neq i$, is responsible for a proportion $\frac{1-\beta}{N-1}$ of the functions in product i and devotes effort e_j to increase the productivity of her division. Notice that $\Sigma_{i=1}^{N} a_i = \Sigma_{j=1}^{N} e_j$, which is independent of β: this implies that the only role of β is to capture how effort is divided across managers and divisions for a given level of total effort; and it guarantees that our modeling choices do not bias the choice of organizational form.[8]

There are two periods in the model ($t = 1, 2$) and no discounting. Each period t consists of three stages: at stage 1, investors determine the total amount of funds F_t; at stage 2, corporate headquarters invest these funds across the different products; and at stage 3 profits are realized.[9] Divisional managers choose their actions in period 1,

6. Note that each manager undertakes a continuum of tasks of size 1 in total, that is, $\beta + (N-1)\frac{(1-\beta)}{N-1} = 1$.

7. This is a slight abuse of notation but will avoid unnecessary cumbersome expressions. Note that there is no loss of generality because all managers, products and functions are assumed to be *ex ante* identical throughout the paper.

8. Note also that according to equation (1), if all managers provide the same effort level (i.e., if $e_i = e$ for every i) the total amount of effort devoted to directly increase the productivity of product i does not depend on β (i.e., $a_i = e$). This implies that in any symmetric solution, if effort choices were perfectly observable and contractible, β would be irrelevant. As we show in the next section, when effort is not observable managers' effort choices do depend on β, and hence there is an optimal organizational form for each set of parameters. This implies that in our model all differences among organizational forms are exclusively due to the way in which those organizational structures influence managerial incentives.

9. Notice that headquarters are free to decide how funds are allocated across products, but must allocate functional resources in fixed proportions. As noted in the Introduction, this is a simplifying assumption which

between stages 2 and 3, that is, after the funds have been allocated but before profits are realized.[10]

The marginal return of investment in each product i depends upon a parameter η_i, which is constant and unknown. This parameter captures stable, long term factors that affect profits but are not perfectly known by management. More precisely, η_i determines the long-run marginal return of investment in product i. Although each η_i is unknown, all the parties (investors, headquarters and divisional managers) have some prior belief about $\{\eta_j\}$, which can be described by a set of independent and identically distributed (i.i.d.) random variables characterized by a normal distribution of mean μ_η and precision h_η. Profits are affected not only by long-term factors, but also by transitory shocks. We model the latter as a set of i.i.d. random variables $\{\varepsilon_{it}\}$ (for $i = 1, ...N$ and $t = 1, 2$). These variables are assumed to be independent from the long-term variables $\{\eta_j\}$ and are normally distributed with zero mean and precision h_ε. Therefore, for each product i profits depend upon the managers' actions, $\{e_j\}$ and $\{c_j\}$, the level of investment, I_{it}, the long-term factor represented by η_i, and the transitory shock, ε_{it}. Specifically, product i's profits in period t are denoted by π_{it} and are given by:

$$\pi_{i1} = \left(\eta_i + a_i + \psi \sum_{h=1}^{N} \frac{c_h}{N} + \varepsilon_{i1}\right) I_{i1} - \frac{1}{2} I_{i1}^2 \tag{2}$$

$$\pi_{i2} = (\eta_i + \varepsilon_{i2}) I_{i2} - \frac{1}{2} I_{i2}^2, \tag{3}$$

where a_i is determined by equation (1) above. In equations (2) and (3), the first right-hand side term represents the return of the investment and the second term represents the cost. Parameter ψ measures the extent of complementarity among product lines and determines the marginal return of interdivisional cooperation.[11] For example, marginal returns from cooperation will be high in the presence of economies of scope, when product lines share a valuable tangible or intangible asset (e.g., a production plant, a commercial network, or a well-reputed brand name), or in cases in which the company is undertaking related rather than unrelated investments. We assume that $\psi > 1$, which implies that cooperation is desirable, and within this scenario we analyze under what circumstances managers will have incentives to cooperate.[12]

Each divisional manager is concerned with the investments in her own division, defined by the sets of tasks that she is responsible for. For instance, in the M-form a divisional manager cares only about the investment made in her product, while in the U-Form she cares about the part of the investment in each product that is assigned to

captures the fact that there is greater substitutability across products than across functions and is consistent with the empirical evidence that documents the importance of firms' acquisition and divestiture activities (see for instance, Mulherin and Boone, 2000; Villalonga and McGahan, 2005).

10. Note that at $t = 2$, divisional managers will not have incentives to take privately costly actions because at that time all the investment decisions will have already been made.

11. Notice that interdivisional cooperation is modeled in such a way that the number of divisions N does not exogenously affect the effectiveness of cooperation: the level of cooperation is determined by the average cooperative effort among divisional managers, $\sum_{h=1}^{N} c_h/N$. In fact, neither the organizational form, β, nor the number of divisions, N, affect the effectiveness of cooperation.

12. The management literature (e.g., Williamson, 1975) stresses that interdivisional cooperation is desirable, but is often not achieved because managers behave opportunistically. If $\psi < 1$ cooperation (i.e., $c_j > 0$) would never be optimal.

her function, that is $1/N$ of the total investment, $\Sigma_{i=1}^{N}(I_{i1} + I_{i2})$. Thus divisional manager j's utility function can be defined as

$$u_j = \beta(I_{j1} + I_{j2}) + \frac{(1-\beta)}{N-1}\sum_{i\neq j}(I_{i1} + I_{i2}) - \frac{\tau}{2}(e_j + c_j)^2. \tag{4}$$

This utility function captures the fact that managers derive private benefits from the resources linked to their respective divisions.[13] Thus, manager j carries out a proportion β of tasks related to product j, and therefore derives private benefits $\beta(I_{j1} + I_{j2})$ from the investment in that product. In addition, manager j is responsible for a proportion $\frac{(1-\beta)}{N-1}$ of the tasks in each of the other $i \neq j$ products, and therefore derives private benefits from the investment in those products (proportionally to her participation in those products or lines of business). We assume that managers' participation constraints are not binding, that is, while different organizational structures will be associated to different levels of investment and effort—different utility—the utility that managers obtain working for the firm is higher than the utility in their best outside option.[14] Note that in the divisional manager's utility function (4) there is no scope for monetary pay-for-performance compensation schemes, which is in the spirit of the paper that focuses on implicit rather than on explicit incentives. Implicit incentives are particularly important for divisional managers because, among other things, they are at an earlier career stage than CEOs. Furthermore, to the extent that providing explicit incentives is costly to the firm (e.g., because of risk aversion, lack of congruity, or multitask problems) implicit incentives would remain valuable even in the presence of explicit incentives.[15]

Throughout the two periods, the parties involved learn about the profitability of the N lines of business or products in which the company is active. Specifically, headquarters and investors will update their prior beliefs about $\{\eta_j\}$ as they receive more information about the various lines of business. We model investors' and headquarters' learning process by assuming that both investors and headquarters observe period 1 profits and investments, $\{I_{i1}\}$ and $\{\pi_{i1}\}$, and in addition, that they can sort out part of the transitory shocks that affect profits in period 1, $\{\varepsilon_{i1}\}$. This assumption is equivalent to assuming that investors and headquarters extract a set of signals, $\{s_{i1}^{Inv}\}$ and $\{s_{i1}^{HQ}\}$ respectively, about product i's marginal return of investment based on period 1 profits,

$$s_{i1}^{k} = \eta_i + a_i + \psi\sum_{h=1}^{N}\frac{c_h}{N} + \varepsilon_{i1}^{k}, \tag{5}$$

where $k \in \{Inv,\ HQ\}$ and ε_{i1}^{k} are i.i.d. random variables normally distributed with zero mean and precision $h_{\varepsilon}^{k} \geq h_{\varepsilon}$.

13. Empirical evidence on managerial compensation shows that there is a high correlation between the level of compensation and firm size. To the extent that managers perceive this relationship, they may try to augment the size of their corporation by increasing the level of investment. Managers also derive private benefits (e.g., social status) from running a large organization.

14. This is typically the case in moral hazard models in which managers have limited wealth (e.g., when divisional managers obtain future benefits—getting a job as a CEO in another firm—that they cannot pay for up-front).

15. Gibbons and Murphy (1992) and Chevalier and Ellison (1999) document the importance of implicit incentives. Furthermore, Dittmann and Maugh (2007) calibrate the standard explicit pay-for-performance principal-agent model and show that this model has a hard time rationalizing the compensation contracts observed in practice.

We also assume that headquarters have an informational advantage over investors, $h_{\varepsilon}^{HQ} \geq h_{\varepsilon}^{Inv}$, and hence that headquarters can add value in the allocation of resources. For instance, if ε_{i1} were to have three independent components, $\varepsilon_{i1} = \varepsilon_{i1a} + \varepsilon_{i1b} + \varepsilon_{i1c}$, we can think of investors observing $\{\{I_{i1}\},\{\pi_{i1}\},\{\varepsilon_{i1c}\}\}$ and headquarters observing $\{\{I_{i1}\},\{\pi_{i1}\},\{\varepsilon_{i1b}\},\{\varepsilon_{i1c}\}\}$ so, in equation (5), investors' and headquarters' residual noises would be $\varepsilon_{i1}^{Inv} = \varepsilon_{i1a} + \varepsilon_{i1b}$ and $\varepsilon_{i1}^{HQ} = \varepsilon_{i1a}$, respectively.[16] In practice, headquarters can acquire such informational advantage through day-to-day contact with other managers, employees, clients, or suppliers and can use their advantage to improve the allocation of resources inside the corporation. Notice that the information available to headquarters and investors does not depend on the organizational form chosen by the corporation. Hence, our results are not going to be driven by differences in observability across organizational structures.[17]

Finally, we assume that investors and corporate headquarters cannot commit to financing decisions that are *ex post* inefficient. In practice, an important part of the information that determines the optimal level of investment (e.g., industry prospects, firm characteristics, etc.) cannot be fully contracted upon; and ignoring this information and contracting *ex ante* is likely to be prohibitively expensive.

3. Organizational Structure and Incentives

This section solves the model and derives the main results.

3.1 Managers' Behavior

3.1.1 Second Period

Consider stage 2 first. As headquarters are empire builders, they maximize corporate profits *subject to* investing all available funds, that is, $\sum_{i=1}^{N} I_{i2} = F_2$.

$$\max_{\{I_{i2}\} \text{ s.t. } \sum_{i=1}^{N} I_{i2}=F_2} E\left[\sum_{i=1}^{N}\left[(\eta_i + \varepsilon_{i2})I_{i2} - \frac{1}{2}I_{i2}^2\right]\middle| s_{i1}^{HQ}\right]. \tag{6}$$

Assuming an interior solution, the level of investment in product i is given by:

$$I_{i2}^{*}\left(s_{\cdot 1}^{HQ}\right) = \frac{F_2}{N} + \left\{E\left(\eta_i \middle| s_{i1}^{HQ}\right) - \frac{1}{N}\sum_{h=1}^{N} E\left(\eta_h \middle| s_{h1}^{HQ}\right)\right\}, \tag{7}$$

where $s_{\cdot 1}^{HQ} \equiv \{s_{h1}^{HQ}\}$. Note that each product i receives an equal share of the total funds (first term in equation (7)) plus some additional funding that depends on whether

16. As will become clear below, this information structure implies that headquarters have both an informational advantage and provide stronger incentives than investors. However, our results are robust to an alternative specification in which headquarters would still have an informational advantage yet investors would provide stronger incentives than headquarters. For instance, this could be the case if headquarters were to observe another signal on η_i which is not related to profits. (See for instance Crémer (1995) and de Motta (2003), for examples in which information reduces implicit incentives.) We choose this particular specification for expositional clarity but our results do not depend on whether investors provide stronger or weaker incentives than headquarters.

17. In this sense, our paper is complementary to a large body of literature that relates organizational design and incentives to differences in observability across organizational forms (e.g., Maskin et al., 2000; Ortega, 2003; Besanko et al., 2005; Harstad, 2007).

headquarters perceive that the marginal return of investment for that product is above or below the average marginal return for the whole corporation (second term in equation (7)).

At stage 1, investors provide the level of funding F_2 that maximizes expected profits, taking into account how corporate headquarters are subsequently going to allocate those funds across the different products, that is, $\{I_{i2}^*\}$. Thus investors solve

$$\max_{F_2} E\left[\sum_{i=1}^{N}\left[(\eta_i+\varepsilon_{i2})I_{i2}^*\left(s_{\cdot 1}^{HQ}\right)-\frac{1}{2}I_{i2}^{*2}\left(s_{\cdot 1}^{HQ}\right)\right]\middle| s_{i1}^{Inv}\right]. \tag{8}$$

The first-order condition gives the amount of funds received by the firm at $t=2$:

$$F_2^*\left(s_{\cdot 1}^{Inv}\right)=\sum_{i=1}^{N}E\left(\eta_i\middle|s_{i1}^{Inv}\right), \tag{9}$$

where $s_{\cdot 1}^{Inv}\equiv\{s_{h1}^{Inv}\}$. Equation (9) shows that the total amount of funds equals the sum of the expected marginal return of the different lines of business (*or* products) in which the corporation operates. Replacing (9) in (7), we obtain the optimal investment in product i at $t=2$:

$$I_{i2}^*\left(s_{\cdot 1}^{HQ},s_{\cdot 1}^{Inv}\right)=\frac{\sum_{h=1}^{N}E\left(\eta_h\middle|s_{h1}^{Inv}\right)}{N}+\left\{E\left(\eta_i\middle|s_{i1}^{HQ}\right)-\frac{1}{N}\sum_{h=1}^{N}E\left(\eta_h\middle|s_{h1}^{HQ}\right)\right\}. \tag{10}$$

3.1.2 First Period

Equation (10) characterizes the investment in product i at $t=2$ given investors' and headquarters' assessments of the different products. Such assessments are based on all the information available to them at the beginning of period 2 and, more specifically, upon period 1 profits. All else equal, products that generate greater profits at $t=1$ will be considered more profitable than the rest and will therefore receive more generous funding at $t=2$. As divisional managers are empire builders and seek to attract the maximum amount of funds to their respective divisions, they will have an incentive to take actions that increase period 1 profits.[18] In particular, in period 1 divisional manager j will choose the combination of actions, e_j and c_j, that maximizes her expected utility given by equation (4), taking into account how headquarters will make her investment decisions at $t=2$, which is given by equation (10).[19] The program

$$\max_{e_j,c_j} E\left\{I_{i2}^*\left(s_{\cdot 1}^{HQ},s_{\cdot 1}^{Inv}\right)\middle|\, e_j,c_j\right\}-\frac{\tau}{2}(e_j+c_j)^2, \tag{11}$$

18. As there is no private information when these actions (e_j,c_j) are taken, investors and headquarters are able to infer them equilibrium (see Holmström, 1982 for the seminal paper on career concerns).

19. Note that at the time of choosing the actions (e_j,c_j) the investment decision at $t=1$ has already been made.

where second-period investment $I^*_{i2}(s^{HQ}_{\cdot 1}, s^{Inv}_{\cdot 1})$ is given by equation (10), yields the following two first order conditions (for $x_j \in \{e_j, c_j\}$):

$$\tau(e^*_j + c^*_j) = \underbrace{\frac{1}{N}\sum_{i=1}^{N} \frac{\partial E\left[E\left(\eta_i \middle| s^{Inv}_{i1}\right)\middle| e_j, c_j\right]}{\partial x_j}}_{\text{External Incentives}} \tag{12}$$

$$+ \underbrace{\left(\beta - \frac{1}{N}\right)\left[\frac{\partial E\left[E\left(\eta_j \middle| s^{HQ}_{j1}\right)\middle| e_j, c_j\right]}{\partial x_j} - \frac{1}{N-1}\sum_{i\neq j}\frac{\partial E\left[E\left(\eta_i \middle| s^{HQ}_{i1}\right)\middle| e_j, c_j\right]}{\partial x_j}\right]}_{\text{Internal Incentives}} + \lambda_{x_j},$$

where λ_{x_j} is the Kuhn–Tucker multiplier associated to the nonnegativity constraint (i.e., $x_j \geq 0$). Notice that the normality assumption implies that $\frac{\partial E[E(\eta_i|s^k_{i1})|e_j,c_j]}{\partial x_j}$ is a constant, that is, does not depend on the actions $\{e_j, c_j\}$ or the conjectured actions $\{e^*_j, c^*_j\}$.

According to equation (12) divisional managers have incentives to influence investors' assessment of the whole corporation, as well as headquarters' assessment of their divisions. On the one hand, investors' assessment of the corporation determines the total amount of funds available for investment. On the other hand, headquarters' assessment of the divisions determines the share of those funds channeled to each division by corporate headquarters. Thus, divisional managers' incentives come from two different sources: an external one—making a good impression on investors—and an internal one—making a good impression on headquarters. From now on we refer to these two sources of incentives as "external" and "internal" incentives.

3.2 External and Internal Incentives

Next we show that the two most common types of organizational structure, U-form and M-form, lead to different combinations of external and internal incentives.

Consider *external* incentives first, that is, the first term on the right-hand side of equation (12). In both U-form and M-form organizations divisional managers have an incentive to increase profits in their respective divisions because the whole corporation will then be perceived by the capital market as more profitable and investors will in turn provide more funding. At the same time, however, managers are subject to a free-riding problem: when a manager improves her division's performance, she helps the firm obtain more funding, but benefits only partially from the additional funding because such extra funds will be distributed across all divisions in the corporation. This distribution means that the assessment of the whole corporation is a public good for divisional managers, who are consequently tempted to free-ride. Notice that the free-riding problem is common to the U-form and the M-form: in both cases divisional managers are aware that any extra funding will be distributed across all divisions.

Consider *internal* incentives now, that is, the second term on the right hand side in equation (12). In a U-form, every division is responsible for a proportion $1/N$ of the functions in *each* of the N products. Therefore, each divisional manager always controls a proportion $1/N$ of the total funds available, which means that the internal allocation of resources across products is a zero-sum game for divisional managers. In fact, notice that in equation (12), when $\beta = 1/N$, incentives are entirely determined by

the capital market. In the M-form ($\beta = 1$), however, managers have to internally compete for resources: managers whose divisions, which in the M-form correspond to different products, are perceived to perform better than the average receive more funding from headquarters. Hence, in the M-form the internal capital market is a source of incentives for divisional managers, whereas in the U-form it plays no incentive role.

Notice that this result hinges on the assumption that the allocation of resources takes place across products or business lines rather than across functions (or more generally, that headquarters' reallocation of resources across products is relatively more important than across functions). This assumption is consistent with the fact that in the medium and long-run there is much more re-allocation of financial resources across product lines than across functions. For example, the 1980s wave of corporate restructuring in the United States involved a move from a diversification strategy to a focus on core businesses (Donaldson, 1994). Intuitively, while each product always requires a number of functions, the firm can decide which and how many products or business lines to pursue.

Finally, consider the comparative statics as the number of products N increases. The free-riding problem becomes more severe because total resources have to be shared by an increasing number of divisions. As a consequence, external incentives decrease in both U-form and M-form organizations. In the U-form, because all divisional managers' incentives are external, total incentives also decrease.[20] However, in the M-form, as the number of products increases managers have to compete with more divisions for a limited amount of internal resources, which increases internal incentives. Mathematically, in equation (12), if $\beta = 1$ (i.e., M-form) total incentives are a weighted average of the incentives provided by the capital market and corporate headquarters, with the weights depending on the number of products. In the limit, as $N \to \infty$, incentives are entirely determined by corporate headquarters. The following proposition summarizes the above discussion.

Proposition 1: *(a) In the U-form, managerial incentives are entirely determined by the capital market, and decrease as the number of products N increases. (b) In the M-form, managerial incentives are determined by both the capital market and headquarters; moreover, as N increases, headquarters replace the capital market in the provision of managerial incentives.*

To understand the reach of this proposition it must be noted that it is not driven by differences in observability across organizational forms, that is, the precision with which performance is observed is assumed to be the same in U-forms and M-forms. The result instead highlights that the stakes and consequently the interests of divisional managers differ across organizational forms. This is an important difference with respect to previous literature, which posits that managerial incentives vary across organizational forms because of variation in the costs of providing explicit monetary incentives (Maskin et al., 2000; Besanko et al., 2005). Proposition 1 points out that the problem is a more fundamental one: even in the absence of explicit incentive schemes, divisional managers will behave differently across organizational forms, because different organizational structures imply different allocations of responsibility.

20. The fact that incentives in the U-form decrease as the number of divisions increases does not necessarily mean that in U-forms it is optimal to have only one product ($N = 1$). Corporate headquarters, due to their information advantage, can improve the investors' allocation of resources and, hence, there is a benefit from being diversified ($N > 1$).

3.3 Incentives to Cooperate

In the previous section we have examined the level of incentives without discussing which specific actions managers would be motivated to take. But in fact, divisional managers may direct their efforts toward very different (and potentially conflicting) goals, as the above discussion on internal and external incentives already suggests. Interdivisional cooperation, for example, can be of great importance to the firm, but divisional managers are not always ready to cooperate, particularly when they perceive cooperation to be detrimental to their own individual goals. In such cases, the relevant question is not how to increase managers' incentives, but rather how to make sure that managers will cooperate with one another. In this section we analyze how the organizational form affects divisional managers' incentives to cooperate.

Considering equation (1) and using the assumption in equation (5) it follows that

$$\frac{\partial E\left(\eta_i \middle| s_{i1}^k\right)}{\partial e_i} = \beta \frac{E\left(\eta_i \middle| s_{i1}^k\right)}{\partial s_{i1}^k} \tag{13}$$

$$\frac{\partial E\left(\eta_i \middle| s_{i1}^k\right)}{\partial e_j} = \frac{1-\beta}{N-1} \frac{E\left(\eta_i \middle| s_{i1}^k\right)}{\partial s_{i1}^k} \quad \text{for } i \neq j \tag{14}$$

and that

$$\frac{\partial E\left(\eta_i \middle| s_{i1}^k\right)}{\partial c_j^k} = \frac{\psi}{N} \frac{\partial E\left(\eta_i \middle| s_{i1}^k\right)}{\partial s_{i1}^k}. \tag{15}$$

Using the three equations above and given the symmetry across managers, functions and products the two first order conditions in equation (12) can be rewritten as

$$\tau(e^* + c^*) = \frac{1}{N}\Delta^{Inv} + \frac{(N\beta - 1)^2}{N(N-1)}\Delta^{HQ} + \lambda_e \tag{16}$$

and

$$\tau\left(e^* + c^*\right) = \frac{\psi}{N}\Delta^{Inv} + \lambda_c, \tag{17}$$

where $\Delta^k \equiv \frac{\partial E[E(\eta|s_{i1}^k)|e^*,c^*]}{\partial s_{i1}^k}$ for $k \in \{Inv,\ HQ\}$. Thus Δ^{Inv} and Δ^{HQ} determine external and internal incentives. For instance, in the case in which $c^* = 0$ (i.e., $\lambda_e = 0$ and $\lambda_c > 0$) external incentives would be $\frac{\Delta^{Inv}}{N}$ and internal incentives would be $\frac{(N\beta-1)^2}{N(N-1)}\Delta^{HQ}$.

Note that given the informational structure and the distributional assumptions (i.i.d. and normality for all $i,\ j$) $\Delta^k = \frac{h_\varepsilon^k}{h_\eta + h_\varepsilon^k}$ for $k = Inv$ and $k = HQ$, respectively. Under alternative informational structures, the specific relation between Δ^k and the precisions would change, but as long as i.i.d. and normality hold, first-order conditions would still be given by equations (16) and (17). In this sense, the model is robust to certain changes in the informational structure.[21]

21. For example, if for each division i headquarters were to observe (in addition to s_{i1}^{HQ}) another signal about η_i nonrelated to current profits, Δ^{HQ} would tend to be smaller than in the current set-up as part of the weight in the posterior would be shifted toward this additional signal. However, assuming i.i.d. and normality (and appropriately redefining Δ^k) the first-order conditions would still be given by equations (16) and (17).

Equations (16) and (17) imply that there is a threshold $\widehat{\beta}$ (as defined by equation (18)) such that if $\beta > \widehat{\beta}$ then $e^* > 0 = c^*$, and if $\beta \leq \widehat{\beta}$ then $c^* > 0 = e^*$:[22]

$$\frac{\psi}{N}\Delta^{Inv} = \frac{1}{N}\Delta^{Inv} + \frac{(N\widehat{\beta}-1)^2}{N(N-1)}\Delta^{HQ}. \tag{18}$$

From this discussion the next proposition follows:

Proposition 2: *(a) If $\beta \leq \widehat{\beta}$ the unique equilibrium is cooperative, that is, $c^* > 0 = e^*$; if $\beta > \widehat{\beta}$ the unique equilibrium is noncooperative, that is, $e^* > 0 = c^*$. (b) Total managerial incentives $e^* + c^*$ are increasing in β, the extent of product-based departmentation.*

The intuition behind (a) relies on the very different nature of external and internal incentives: external incentives depend on the investors' perceived efficiency of the whole corporation, while internal incentives depend on headquarters' perceived efficiency of each product *relative* to the perceived efficiency of all other products within the corporation. As the corporation shifts toward a product-based form of organization—as β increases—internal competition for resources intensifies and managers have lower incentives to cooperate.

It is also apparent from equations (16) and (17) that as β increases total managerial incentives $e^* + c^*$ increase for any number of products $N > 1$.[23] Intuitively, as β increases the equilibrium switches from cooperative to noncooperative, and once a noncooperative equilibrium is reached, further increases in β intensify the internal competition for resources, thus inducing higher managerial effort e^*.

As β increases from $1/N$ to 1 the organization evolves from a U-form to an M-form, the next corollary follows (using the superscripts U and M for U-form and M-form, respectively):

Corollary 1: *Total incentives are always stronger in an M-form than in a U-form: $e^U + c^U \leq e^M + c^M$.*

Proposition 2 and Corollary 1 are interesting in the context of the internal capital markets literature, where multidivisional firms are often considered to be plagued with internal power struggles and influence activities (e.g., Rajan et al., 2000). The proposition points out that such lack of cooperation among managers is not intrinsically linked to headquarters' ability to re-allocate resources across the different lines of business or products. Instead, it has to do with the internal competition for corporate resources that some organizational structures—notably the M-form—generate. This only becomes apparent when the choice of organizational structure is allowed to be endogenous.

The next proposition considers the comparative statics from equations (16) and (17) and characterizes the incentives to cooperate:

Proposition 3: *(a) In the U-form managers always cooperate. (b) In the M-form managers are more likely to cooperate the stronger the incentives provided by the capital market, Δ^{Inv}; the weaker the incentives provided by corporate headquarters, Δ^{HQ}; the smaller the number of products, N; and the larger the complementarities across products, ψ.*

22. To simplify the exposition, we assume that in the knife-edge case in which $\beta = \widehat{\beta}$ managers cooperate, that is, $c^* > 0 = e^*$.

23. From equations (16) and (17), it follows that $\partial(e^* + c^*)/\partial\beta = 0$ for $\beta \leq \widehat{\beta}$ and $\partial(e^* + c^*)/\partial\beta > 0$ for $\beta > \widehat{\beta}$.

Consider the U-form first ($\beta = 1/N$). The first-order conditions—equations (16) and (17)—can be rewritten as:

$$\tau(e^U + c^U) = \frac{1}{N}\Delta^{Inv} + \lambda_e \tag{19}$$

$$\tau(e^U + c^U) = \frac{\psi}{N}\Delta^{Inv} + \lambda_c. \tag{20}$$

As $\lambda_c \geq 0$ and $\psi > 1$, it must be the case that $\lambda_e > 0$ and therefore $e^U = 0$, which implies that $c^U > 0$, that is, the U-form equilibrium is always one in which divisional managers cooperate. Intuitively, because $\psi > 1$, the marginal return of cooperation (c) given by equation (20), is greater than the marginal return of noncooperation (e) given by equation (19). Therefore $c^U > 0 = e^U$, where c^U is given by

$$c^U = \frac{\psi}{\tau N}\Delta^{Inv}. \tag{21}$$

Consider now the M-form ($\beta = 1$). Two alternative scenarios may arise: if $\widehat{\beta} \geq 1$, that is, if

$$\frac{1}{N}\Delta^{Inv} + \frac{N-1}{N}\Delta^{HQ} \leq \frac{\psi}{N}\Delta^{Inv}, \tag{22}$$

the unique equilibrium is cooperative and managerial incentives are the same as in the U-form ($c^M = c^U > 0$ and $e^M = e^U = 0$). Alternatively, if $\widehat{\beta} < 1$ the unique equilibrium is noncooperative ($c^M = 0$ and $e^M > 0$) and managerial incentives are a weighted average of external and internal incentives:

$$e^M = \frac{1}{\tau N}\Delta^{Inv} + \frac{N-1}{\tau N}\Delta^{HQ}. \tag{23}$$

Figure 1 provides a graphical illustration for the case in which $\widehat{\beta} < 1$. When $\beta \leq \widehat{\beta}$ the equilibrium is such that managers cooperate, whereas if $\beta > \widehat{\beta}$ managers choose not to cooperate. The figure also illustrates that total incentives increase as β increases.[24]

When do M-form managers cooperate? As stated in Proposition 3, and according to the above condition (22), the M-form is more likely to have a cooperative equilibrium as ψ increases: if complementarities among product lines are sufficiently strong, divisional managers are more likely to cooperate in an attempt to increase the total funding that the corporation receives. In addition, managers also cooperate more when there are fewer lines of business (a low N) and hence internal competition for resources is less intense. Finally, cooperation becomes more likely if the incentives provided by the capital market (Δ^{Inv}) strengthen, or the incentives provided by corporate headquarters (Δ^{HQ}) weaken. For instance, stronger internal incentives imply that divisional managers are more concerned with headquarters' perceived efficiency of their divisions relative to the perceived efficiency of all the other divisions, and are therefore less willing to cooperate with other divisions.[25]

24. In the alternative case in which $\widehat{\beta} \geq 1$, for any organizational form $\beta \in [1/N, 1]$ the equilibrium would be one of cooperation, (i.e., only the left part of the graph would be applicable, so that for all $\beta \in [1/N, 1]$ we would have $c^* = c^M = c^U > 0 = e^*$).

25. Under our informational structure and distributional assumptions, $\Delta^k = \frac{h_\varepsilon^k}{h_\eta + h_\varepsilon^k}$. Therefore comparative statics with respect to the precisions could also be easily obtained.

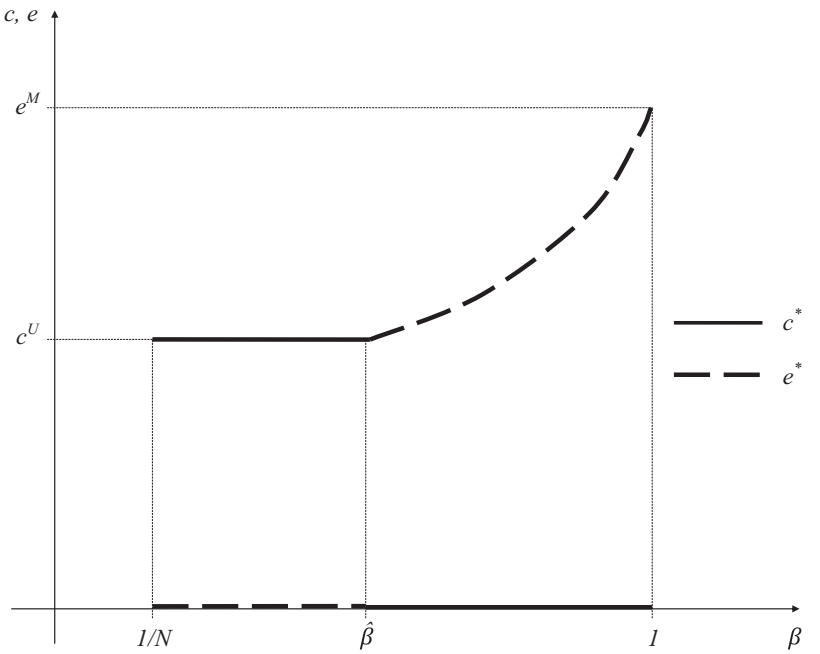

FIGURE 1. DIVISIONAL MANAGERS' EFFORT AND ORGANIZATIONAL FORM

The fact that the M-form equilibrium is cooperative for some parameters of the model and noncooperative for others is consistent with Hill et al.'s (1992) observation that in practice some M-forms are "cooperative"and some are "competitive." Their research shows that cooperative M-forms are designed to exploit economies of scope, whereas competitive M-forms are meant to efficiently allocate financial resources across divisions. Both dimensions are taken into account in our model: economies of scope are parameterized by ψ, and the allocation of financial resources is endogenously built in the model. Thus in our model financial resources are always efficiently allocated across divisions, and cooperation arises endogenously when complementarities across lines of business are high enough.

3.4 Organizational Structure

We can now characterize the choice of organizational structure and derive the main results of the paper. Note that the M-form generates stronger incentives than the U-form, but does not necessarily produce larger profits. As a matter of fact, the U-form generates more profits than the M-form if and only if $\psi c^U > e^M$. In other words, while the M-form provides stronger incentives, it might be more profitable to produce with lower incentives and greater inter-divisional cooperation (i.e., if $e^M < \psi c^U$ the extra incentives the M-form generates do not compensate for the lack of cooperation).

Proposition 4: *Let $\underline{\psi}$ be the level of complementarity across product lines such that $\underline{\psi} = e^M/c^U$ then the M-form is strictly more profitable than the U-form if and only if $\psi < \underline{\psi}$.*

As Proposition 4 points out, for low levels of complementarity the M-form strictly dominates the U-form. According to this result, if a firm grows by expanding into related

areas of business, complementarities will be high and a U-form will be more appropriate than an M-form; but if lines of business are unrelated or loosely related, an M-form will be more adequate. In some cases of course the organizational form will be too costly to change and the relevant question will be how the firm must grow given its current organizational form. For those cases, Proposition 4 suggests that U-forms are more likely to expand into related businesses than M-forms.[26]

Notice also that there is a range of values $[\underline{\psi}, \overline{\psi}]$ for which the U-form will strictly dominate the M-form. Above that range ($\psi > \overline{\psi}$) the M-form will elicit cooperative effort and the two organizational forms will be equivalent,[27] and below that range ($\psi < \underline{\psi}$) the M-form will strictly dominate the U-form. The following comparative statics on $\underline{\psi}$ can be derived from equations (21) and (23):

Proposition 5: *The M-form is more likely to yield higher profits than the U-form (i.e., $\underline{\psi}$ increases) (i) the larger the number of products, N; (ii) the weaker the incentives from the capital market, Δ^{Inv}; (iii) the stronger the incentives from corporate headquarters, Δ^{HQ}; and (iv) the weaker the total incentives (i.e., a simultaneous decrease in both Δ^{Inv} and Δ^{HQ}, increases $\underline{\psi}$).*

Consider first the relationship between organizational structure and firm size (part (i) of the proposition). The model shows that firm growth aggravates the free-rider problem and therefore reduces external incentives in both M-form and U-form organizations. In M-forms, however, this is partly compensated by the fact that internal competition increases, which leads to greater internal incentives. As a consequence of that, M-forms become relatively more attractive than U-forms. This result relates to Williamson's (1975) classical "M-form hypothesis," that is, the claim that M-forms outperform U-forms when firm size is large. Williamson (1975) based this hypothesis on the argument that M-forms would have lower information costs than U-forms, for several reasons: M-forms are generally more decentralized, the cost of providing explicit incentives is smaller in M-forms, and the M-form allows the firm to make better capital budgeting decisions. Proposition 5 points out that even if the two organizational structures are equally decentralized, capital budgeting decisions are equally well made, and explicit incentives are not present, M-forms will still outperform U-forms because, as the firm grows, M-forms benefit from greater competition for internal resources.

Part (ii) links the optimal organizational form to the power of external incentives. The extent to which investors provide strong incentives depends very much on the development of capital markets. For instance, according to Ghemawat and Khana (1998), in India domestic institutional investors do not have adequate skills to monitor investments and foreign institutional investors are too unfamiliar with the economy, which results in poor external incentives.[28] Part (ii) of Proposition 4 implies that in such cases firms are more likely to adopt an M-form organization. The reason is that M-forms'

26. As we discuss below (see Proposition 5) an increase in the number of business lines (N) makes the M-form more likely to strictly dominate the U-form. Hence Proposition 4 implies that whether this transition toward an M-form indeed occurs depends on the complementarity between old and new lines of business.

27. Such equivalence is largely due to our conservative way of modeling the benefits from cooperation. We are assuming that the marginal benefits from cooperation are exactly identical in the two organizational forms in order to highlight that cooperation arises solely as a consequence of organizational form. However, in the U-form all managers share responsibilities across all products, which arguably provides them with greater opportunities (in addition to greater incentives) to cooperate.

28. In terms of our model, we can think that as the capital market develops it is able to sort out a greater part of the transitory noise that affects profits, ε_{it}, which would be associated with an increase in implicit incentives.

internal competition counteracts the negative influence of poor external monitoring on divisional managers' incentives.[29]

Part (iii) indicates that M-forms tend to dominate U-forms when headquarters play an important monitoring role. Empirical evidence indeed shows that headquarters can have a very active monitoring role: for example, McNeil et al. (2004) compare the probabilities of turnover following bad performance for heads of subsidiaries within conglomerate firms versus CEOs of stand-alone firms with similar characteristics. They find that turnover is much more sensitive to bad performance for the former than for the latter, which suggests that incentives coming from headquarters are stronger than those coming from investors. They also show that the sensitivity of turnover to performance is greater for subsidiaries that operate in the same industry as the parent firm, which suggests that headquarters' monitoring capacity depends very much on their informational advantage, as hypothesized in the model.

Part (iv) refers to the intensity of total incentives. The strength of total incentives will be determined by investors' and headquarters' learning processes and, more particularly, by the precision of their priors about the profitability of different lines of business. Weaker priors imply that investors and headquarters are more ready to update their beliefs (i.e., that Δ^{Inv} and Δ^{HQ} are larger). In those cases divisional managers understand that their behavior will have stronger consequences on future funding and will, therefore, exert more effort in *both* U-forms and M-forms. However, if both internal and external incentives increase by the same intensity, their relative importance will remain constant, but the larger marginal return of cooperative effort, that is, $\psi > 1$, will play in favor of the U-form. Because prior beliefs about profitability will be particularly weak in young industries and/or relatively young firms, part (iv) suggests that firms in younger industries, and younger firms within an industry are more likely to exhibit a U-form organization.

In a previous version of the paper, we also considered a three-layer M-form in which capital budgeting was done in two stages instead of one: funds were first divided across multiproduct divisions and then across products. We found that product managers' incentives to cooperate were analogous to the two-layer incentives characterized in Proposition 3. Our analysis also indicated that delegation (i.e., multiple layers) does not necessarily reduce competition for internal resources, it just changes the hierarchical level at which competition takes place.

4. Conclusions

Our analysis of divisional managers' incentives has focused on the issues of internal versus external incentives and competition versus cooperation. In both cases, we have argued that organizational structure is a determinant to divisional managers' incentives. First, different organizational forms provide different combinations of internal and external incentives. In U-forms, managerial incentives are entirely determined by the capital market, whereas in M-forms they are influenced by both the capital market and corporate headquarters. Second, organizational forms affect managers' incentives to cooperate. Divisional managers are more prone to cooperate in U-forms than in M-forms because the latter give rise to internal competition for financial resources. Building on

29. Notice that in both types of organizations, U-forms and M-forms, headquarters have the same ability to internally allocate resources across products or lines of business and hence, our results are solely driven by managerial incentive effects.

these two results we have shown that M-forms are preferable to U-forms when implicit incentives are weaker (e.g., in older industries and in older firms within an industry), the capital market is not well developed, the number of products is greater, and when the benefits from cooperation are smaller.

While in this paper we argue about the importance of managers' implicit incentives within corporations, an even stronger case can be made for nonprofit and government organizations. In fact, in many of these organizations explicit incentives play a minor role and implicit incentives considerations become even more important. We think that future research should pay closer attention to the way in which organizational choices affect implicit incentives in these nonprofit organizations.

Appendix

Proof of Proposition 1. Part (a). In the case of the U-form (i.e., $\beta = 1/N$) the two first order conditions (see equation (12)) are

$$\tau\left(e_j^U + c_j^U\right) = \frac{1}{N}\frac{\partial \sum_{i=1}^{N} E\left[E\left(\eta_i \middle| s_{i1}^{Inv}\right) \middle| e_j^U, c_j^U\right]}{\partial x_j} + \lambda_{x_j} \quad \text{for } x_j \in \{e_j, c_j\}, \tag{A1}$$

which means that managerial incentives are entirely determined by the assessment of the capital market, and decrease as the number of products, N, increases.

Part (b) In the case of the M-form (i.e., $\beta = 1$), the two first order conditions (see equation (12)) are

$$\begin{aligned}\tau\left(e_j^M + c_j^M\right) &= \frac{1}{N}\frac{\partial \sum_{i=1}^{N} E\left[E\left(\eta_i \middle| s_{i1}^{Inv}\right) \middle| e_j^M, c_j^M\right]}{\partial x_j} \\ &+ \frac{N-1}{N}\left(\frac{\partial E\left[E(\eta_j \mid s_{j1}^{HQ}) \middle| e_j^M, c_j^M\right]}{\partial x_j} - \frac{1}{N-1}\sum_{i\neq j}\frac{\partial E\left[E\left(\eta_i \middle| s_{i1}^{HQ}\right) \middle| e_j^M, c_j^M\right]}{\partial x_j}\right) + \lambda_{x_j}\end{aligned} \tag{A2}$$

for $x_j \in \{e_j, c_j\}$, which implies that managerial incentives depend on both the headquarters' assessment of the divisions (first term) and the investors' assessment of the corporation (second term), with the relative importance being determined by the number of products, N. □

Proof of Proposition 5 Part (iv). As shown in Section 4.4, $\underline{\psi}$ is given by

$$\underline{\psi} c^U = e^M, \tag{A3}$$

where the superscripts U and M refer to the U-form and the (noncooperative) M-form, respectively. The first-order conditions (21) and (23) imply that

$$c^U = \frac{\psi}{N}\Delta^{Inv} \tag{A4}$$

$$e^M = \frac{1}{N}\Delta^{Inv} + \frac{N-1}{N}\Delta^{HQ}. \tag{A5}$$

Replacing c^U and e^M in (A3), we can write

$$\underline{\psi}\frac{\underline{\psi}}{N}\Delta^{Inv} = \frac{1}{N}\Delta^{Inv} + \frac{N-1}{N}\Delta^{HQ} \tag{A6}$$

and therefore

$$\underline{\psi}^2 = 1 + (N-1)\frac{\Delta^{HQ}}{\Delta^{Inv}}. \tag{A7}$$

Differentiating with respect to Δ^{HQ} and Δ^{Inv},

$$d\underline{\psi}^2 = (N-1)\left[\frac{1}{\Delta^{Inv}}d\Delta^{HQ} - \frac{\Delta^{HQ}}{(\Delta^{Inv})^2}d\Delta^{Inv}\right]. \tag{A8}$$

If $d\Delta^{Inv} = d\Delta^{HQ} \equiv d\Delta$, then

$$d\underline{\psi}^2 = (N-1)\frac{\Delta^{Inv} - \Delta^{HQ}}{(\Delta^{Inv})^2}d\Delta. \tag{A9}$$

Now notice that, from equation (A3), at $\psi = \underline{\psi}$ we have $\Delta^{Inv} < \Delta^{HQ}$. Therefore

$$\frac{d\underline{\psi}}{d\Delta} < 0. \tag{A10}$$

□

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