An Agency Theory of the Division of Managerial Labor

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Should responsibility for strategic planning and execution be assigned to the same manager? Should a firm have a chief operating officer with responsibilities distinct from those of the chief executive officer? How does the division of labor affect managerial opportunism? This paper uses a formal agency-theoretic model to address these questions and present a new theory of the division of managerial labor. Building on Penrose's typology [Penrose E (2009) *The Theory of the Growth of the Firm*, 4th ed. (Blackwell, Oxford, UK)], the theory identifies when to assign (i) entrepreneurial services, which relate to strategic planning and the acquisition of resources, and (ii) managerial services, which relate to execution, to the same generalist manager rather than to different specialists. The analysis reveals the critical importance of separability, i.e., whether a supervisor can separately observe the outcomes of entrepreneurial and managerial services. If managers and their supervisor have symmetric information about separability, hiring a generalist dominates because managerial services, which are easier to assess, reduce the scope for opportunism associated with entrepreneurial services, which are harder to assess. Conversely, if managers have better information regarding separability and the probability of separability is low, hiring specialists dominates because hiring a generalist allows the potential for opportunism associated with entrepreneurial services to contaminate the provision of managerial services. Even so, the benefits of hiring a generalist may be restored if the services are sequenced appropriately. An implication of such sequencing is that a firm will grow in fits and starts, giving rise to a "Penrose effect" even if labor market frictions do not impede the assimilation of new managers.

Keywords: division of labor; Penrose; planning and execution; strategy formulation and implementation; entrepreneurial and managerial services; agency theory; mathematical models

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1. Introduction

The division of labor is a fundamental attribute of organizations and a central concern of strategic management. The literature has advanced two main theories of the division of labor. One theory, dating from Smith (1776), relates to economizing on effort, and the other theory, dating from Babbage (1835), relates to minimizing the use of skilled labor. These theories may apply to the division of managerial labor, but they were created to explain the division of manual labor where expert decision making is not required. In contrast, a manager frequently makes strategic decisions on behalf of a firm's owners or more senior managers. This decision-making authority expands a manager's scope for opportunistic "agency behavior" (Berle and Means 1932, Jensen and Meckling 1976, Williamson 1975), because managers are often more informed about their environments than those who monitor them (Argyres and Silverman 2004), and cognitive effort is difficult to observe (Zenger 1994, Zenger and Lazzarini 2004).

A literature in management and economics shows how incentive-based contracts can be used to control the opportunism of managers with authority to make strategic decisions (e.g., Lambert 1986, Makadok 2003, Manso 2011). The present paper builds on this literature by developing a new agency-based theory specifically for the division of *managerial* labor. Similar to

the contracting literature on which it builds, this paper uses a formal model to study how to motivate a manager to exert costly effort toward evaluating a strategic decision.[1] A point of departure from the existing literature is that, in addition to this evaluative task, there is a nonevaluative task, which is easier to assess because it lacks the decision-making element. The key issue for the organizational designer is whether to assign each task to different specialist managers or to a single generalist who does both.

The evaluative and nonevaluative task can be likened to strategic planning and execution. To fix ideas, this paper focuses on the application proposed by Penrose (2009, Chapter III), where the evaluative task represents an "entrepreneurial service" such as the evaluation of a strategic resource in a factor market or a new strategy or plan, and the nonevaluative task represents a "managerial service" such as day-to-day management, execution, and implementation. However, the analysis could apply to other organizational contexts where there are two tasks, one of which is easier to assess than the other. It is also acknowledged that because the model is simple and stylized, it may not capture some manifestations of entrepreneurial and managerial services. For example, cumulative changes from day-to-day management may have important strategic implications (blurring the distinction with entrepreneurial

services), and entrepreneurial services may involve dynamic aspects such as transforming inputs across time to create profitable business opportunities. Nonetheless, the model adds precision that may be lacking in verbal analysis (Dushnitsky 2010) and helps us understand how the division of managerial labor affects the scope for opportunism associated with strategic decision making. Moreover, practitioners seem to be aware of the dimension of organizational design studied herein and consider it important. In the words of the chairman of Schindler, "I believe that the people who make the business plan should have to realize it" (quoted in Fagan et al. 2006, p. 4). This paper offers an analysis of this statement.

The analysis reveals the critical importance of separability. In general, separability means the joint production function of a firm's employees can be decomposed into the sum of one or more production functions whose outputs can be separately observed (Alchian and Demsetz 1972, p. 779). In the context of this paper, separability boils down to whether a supervising agent can separately observe the outcomes of entrepreneurial and managerial services. We consider two contrasting cases. In a high information environment, managers and their supervisor are symmetrically informed about separability. In this case, the incentive contract for a generalist uses the performance of managerial services to reduce the potential for opportunism associated with entrepreneurial services. In consequence, hiring a generalist tends to dominate hiring specialists, especially if the private costs of effort for entrepreneurial and managerial services are of similar magnitude. In fact, under a wide range of conditions, hiring a generalist gives rise to a *supersynergy*, wherein the generalist performs *both* entrepreneurial and managerial services at a cost lower than or equal to the cost of hiring a specialist in entrepreneurial services alone.

In contrast, in a low information environment, managers, through their efforts, become better informed than their supervisor about separability. In this case, hiring specialists tends to dominate hiring a generalist, because a generalist's asymmetric information allows the potential for opportunism associated with entrepreneurial services to contaminate the provision of managerial services, leading to a more expensive incentive contract to curb that opportunism. This effect is aggravated if the relative private cost of effort for managerial services is high, and, as may be the case for many management teams (Rasmusen and Zenger 1990), the ex ante probability is low that entrepreneurial and managerial services will later prove to be separable. Yet, even then, the organizational designer may have a response: sequence the entrepreneurial service before the managerial service. Although sequencing generates cost savings regardless of the division of managerial labor and in no way affects separability per se, the savings are much larger with a generalist, because they limit the potential for opportunism to which hiring a generalist would otherwise give

rise in a low information environment. The result is that hiring a generalist again tends to dominate hiring specialists. The trade-off from sequencing is a delay in execution, with two important theoretical implications. The first is that there is a microfoundation in agency theory for time compression diseconomies (Dierickx and Cool 1989, Scherer 1967). The second is that a firm may grow in fits and starts as per the "Penrose effect," not only as a result of frictions in the assimilation of new managers (Penrose 2009, Chapter IV) and other important factors related to sequencing but also due to limit managerial opportunism.

2. Background and Motivation

2.1. On the Nature of Managerial Labor

This paper follows Penrose (2009, Chapter III) by classifying a manager's tasks into two categories: (i) entrepreneurial services and (ii) managerial services. Entrepreneurial services involve delegated strategic decision making on behalf of the firm's owners or a more senior manager. Penrose (2009, pp. 28–29, Footnote 33) offers examples such as the introduction of new ideas, retention of new managerial personnel, plans for expansion, and implementation of fundamental changes to organizational structure. Other examples include the evaluation of resources in strategic factor markets, such as a potential acquisition target (Barney 1986, p. 1231) as well as a patented technology or a valuable tract of land (Makadok 2001, p. 391), and investments in customer acquisition, such as in banking, in which these investments often take the form of making a loan to a customer in order to generate the sale of other financial services (Ross 2012). Entrepreneurial services thereby encompass much of strategy formulation and strategic planning. We know from agency theory that such responsibilities create a particularly challenging agency problem for those who monitor the manager (e.g., a board of directors). Managerial services, in contrast, involve overseeing a firm's day-to-day operations (Penrose 2009, pp. 28–29, Footnote 33), including strategy implementation and execution. Without the decision-making element, a manager's scope for opportunism more closely matches that of a regular worker.

At the senior management level, responsibility for entrepreneurial services would often fall to a chief executive officer (CEO) as well as to a chief technology officer, chief concept officer, or head of business planning and development, depending on the organization and context. Managerial services would frequently fall to a chief operating officer (COO) or president (Bass 1990, Bennett and Miles 2006, Hambrick and Cannella 2004). There is considerable debate among practitioners about whether it is desirable to have a distinct COO or president to perform managerial services, leaving the CEO to focus on entrepreneurial services, or whether the

CEO should do both (Bennett and Miles 2006, Murray 2000).[2] Empirical work has found that a CEO's prior experience influences the likelihood of having a separate COO and that having a COO influences firm behavior (Hambrick and Cannella 2004, Marcel 2009, Zhang 2006), but the implications for firm performance are not clear, and the agency-theoretic issues treated herein have not been analyzed.

We also observe considerable variation within and across firms in whether entrepreneurial and managerial services are assigned to a single generalist or whether these services are divided between different specialists. Consider PepsiCo's old restaurant businesses. In the 1970s and 1980s, each of PepsiCo's restaurants (KFC, Taco Bell, and Pizza Hut) was run by a dynamic division CEO with overall management responsibility. Growth in revenue and profits was strong throughout the period due in large part to significant innovations (e.g., the K-minus program, whereby Taco Bell started purchasing partially prepared food to reduce restaurant kitchen space and standardize quality). But by the latter half of the 1990s, growth had stagnated, and the acquisitions of California Pizza Kitchen and Carts of Colorado had ended in failure. In response, PepsiCo spun off its restaurant businesses. Interestingly, the newly independent food service company, now called Yum! Brands, would later establish a separate chief concept officer and COO for each fast-food chain, thereby dividing responsibility for the generation of entrepreneurial ideas from that of day-to-day management.[3] Thus, within each of these restaurant businesses, entrepreneurial and managerial services were once entrusted to the same generalist and then subsequently assigned to different specialists.

The dichotomy between entrepreneurial and managerial services also exists, mutatis mutandis, at lower levels, wherever employees have decision-making authority (e.g., loan officers, store or shop-floor managers). One notable example is the entrepreneurial service of developing a customer relationship versus the managerial service of monetizing that relationship through the delivery of products and services. This occurs in financial services when a bank extends a loan to a corporate borrower and thereby gains not only a risky financial claim on that borrower but also insight into the borrower's need for additional commercial and investment banking services, which may be necessary for the relationship to be profitable (Koch and MacDonald 2010, Office of the Comptroller of the Currency 2003). We observe considerable variation within and among banks in terms of whether the same bankers who make loans also provide these other intermediation services, according to conversations with senior professionals at a number of leading banks. Compensation practices also changed as commercial and investment banks entered each other's industry to become universal banks over the course of the 1990s. As an illustration, as recently as 1998, bankers at HSBC were reportedly surprised and perturbed that their bonuses included a significant portion of restricted HSBC stock; previously, bonuses had been all cash (Hart 1998). By 2002, it had become typical for senior bankers to receive 80% of their compensation in deferred stock awards vesting over three years (*Financial News* 2002). These empirical phenomena await a theoretical explanation.

2.2. Antecedents in the Literature

The present work is at the intersection of the research on managing opportunism and the division of labor.

2.2.1. Managing Opportunism. In the transactions cost tradition, opportunism is particularly associated with asset specificity and the bargaining problems to which it gives rise; these are in turn a key theoretic variable in determining the boundaries of the firm (Klein et al. 1978, Williamson 1975). Recent work has used transactions cost reasoning to explore intrafirm organizational issues such as the impact of improved information technology on coordination (Argyres 1999) and the effect of divisionalization on the development of new capabilities (Argyres 1996, Argyres and Silverman 2004).

Agency theory focuses on opportunism in employer–employee relations (Jensen and Meckling 1976). The principal–agent tradition examines how contracts can be used to mitigate this opportunism or "agency behavior." Two strands of literature are of particular relevance. First, the delegated-expertise literature studies how to motivate an agent not only to exert costly effort but also to make a good decision on the principal's behalf (e.g., Lambert 1986, Makadok 2003, Manso 2011), as is required in the provision of entrepreneurial services. A general lesson from this literature is that the decision-making element substantially increases a manager's scope for opportunism, for example, by appropriating rents ex ante in the acquisition of resources (Castanias and Helfat 1991, Makadok 2003) as distinct from the ex post threat analyzed by Coff (1997, 1999a, b), which relates to resources already-generating rents.

Second, a manager frequently has multiple responsibilities. The formal multitasking literature has studied the problem of inducing managers to allocate effort appropriately among these tasks and not "game" the compensation system by allocating effort to the task that offers the greatest private benefits (Dewatripont et al. 2000, Prendergast 1999). Other scholars have studied multitasking where some of the tasks relate to coordinating with other managers (Gulati and Puranam 2009, Kretschmer and Puranam 2008, Makadok and Coff 2009). This paper considers the antecedent question of whether managerial labor should be divided at all and does not use the term "multitasking," to avoid confusion with prior work. In formal theoretical economics,

delegated expertise with multiple tasks, as in this paper, is a largely unexplored problem. The closest paper is Gromb and Martimort (2007), who study collusion and competition where one or two experts evaluate a project.

2.2.2. Division of Labor. Although the study of the division of labor dates from antiquity, the first efficiency-based theory is usually attributed to Smith (1776). He uses his famous pin factory example to argue that workers who specialize in a given task develop greater skill, avoid downtime between tasks, and are more apt to invent better ways of performing that task. The second theory of the division of labor focuses on the bargaining power of workers. Highly skilled workers require higher wages than unskilled workers. Using Smith's pin factory and other examples, Babbage (1835) demonstrates that if a complex task is divided into subtasks, highly skilled labor need be hired only to perform the most complex subtasks, whereas unskilled labor may do the rest. In this way, the overall skill level of a workforce, and thus its cost to employ, declines.

These theories do not consider the important decision-making element of managerial labor and seem to imply that labor should always be divided to the full extent of what the laws of physics and engineering allow; we do not observe this. The management literature has identified two countervailing factors limiting the division of labor, possible improvement in worker motivation from task variety (Pierce and Dunham 1976) and the difficulties of coordinating independent specialists (Mintzberg 1980).

Coordination of decision-making knowledge workers is of particular relevance to strategic management and is the subject of a growing literature. Becker and Murphy (1992) and Bolton and Dewatripont (1994) consider the optimal degree of knowledge specialization in the presence of communication costs. Another strand of literature studies how the task of organizational learning should be subdivided among groups of managers who engage in different forms of search (e.g., Ethiraj and Levinthal 2004, Fang et al. 2010, Siggelkow and Levinthal 2003). Related work on collaboration shows that a manager's ability is a substitute for understanding the needs and capabilities of other managers (Postrel 2002) and analyzes the causes of wasted effort (Postrel 2009). Other work shows how hierarchy can improve how organizational actors frame problems (Jacobides 2007) and lead to a better match between the manager and problem (Garicano 2000, Garicano and Rossi-Hansberg 2006). Finally, the information processing tradition analyzes configurations of agents that vet decisions in a prescribed order (e.g., Christensen and Knudsen 2010; Csaszar 2012, 2013; Sah and Stiglitz 1986). This literature has generally abstracted from opportunism, in contradistinction to the present paper.

In summary, the literature on organizational design has studied opportunism among business units and among managers where task assignments are taken as given, as well as how to generate, process, and recombine knowledge among managers who do not behave opportunistically. This paper contributes to the literature by showing how the division of managerial labor itself affects the scope for managerial opportunism under different circumstances and how an organizational designer can respond.

3. A Model of Managerial Labor

The model considers a firm with a principal and one or two managers. The principal maximizes the profitability of the firm, as would the firm's shareholders. A manager maximizes a utility function of the form $w - e$, where w are wages and e is a private cost of effort. The principal hires one or two managers to perform an entrepreneurial service and a managerial service, which are described below. The principal may retain two managers, one as a specialist in entrepreneurial services and the other as a specialist in managerial services, or a single generalist to perform both services. For now, we assume that entrepreneurial and managerial services are performed simultaneously, since a firm typically needs both to prosper. We follow Dushnitsky (2010) in assuming that managers have limited liability.

The entrepreneurial service represents the evaluation of an entrepreneurial opportunity, such as a potential acquisition in the mergers and acquisitions market, a new way of organizing the firm's existing operations, or an investment in retaining a new customer. Entrepreneurial opportunities come in two types: a good type, which arises with frequency λ, and a bad type, which arises with frequency $1 - \lambda$. Good opportunities "succeed," and bad opportunities "fail." If and only if a manager evaluates the opportunity at a private cost of effort $e^e > 0$, the manager acquires a signal about whether the opportunity is good or bad. The signal is correct with probability $q > 1/2$. We denote the probability of receiving a favorable signal by $\gamma = \lambda q + (1 - \lambda)(1 - q)$. We denote the probability that the opportunity is the good type, conditional on receiving a favorable and unfavorable signal, by $\overline{p}$ and $\underline{p}$, respectively. We then have, from Bayes' rule,

$$0 \le \underline{p} = \frac{\lambda(1 - q)}{\lambda(1 - q) + (1 - \lambda)q}$$

$$< \frac{\lambda q}{\lambda q + (1 - \lambda)(1 - q)} = \overline{p} \le 1. \tag{1}$$

The managerial service represents execution and implementation; examples include administrative oversight of the firm's operations and the provision of services

to a customer. To perform managerial services effectively, a manager must exert a private cost of effort $e^m > 0$.

Costs of effort e^e and e^m apply to managers who perform *one* of the two services. A single manager may perform *both* the entrepreneurial and managerial service at a *combined* cost of effort e^{em}. Specialization may give rise to economies in effort by eliminating downtime between tasks (Smith 1776) and allowing for a better match between skill and job (Bennett and Miles 2006). Conversely, entrepreneurial and managerial services may be entangled such that separating them creates the need for effort toward coordination (e.g., Kretschmer and Puranam 2008, Postrel 2009) and prevents the easy reuse of information that a manager acquires in, say, strategic decision making when overseeing day-to-day operations, and vice versa (Bennett and Miles 2006). Since there is no clear theoretical prior, we follow Makadok and Coff (2009) in allowing for both diseconomies of effort, $e^{em} > e^e + e^m$, and economies of effort, $e^{em} < e^e + e^m$.

This paper follows the literature in delegated decision making by focusing on the form of managerial opportunism that arises when the principal cannot directly observe a manager's effort to evaluate an entrepreneurial opportunity but can observe the tangible evidence that arises from the actual pursuit of the opportunity like an acquisition of a strategic resource or making significant changes to a firm's operations (e.g., Lambert 1986, Makadok 2003, Manso 2011, Ross 2012). This is not to suggest that managers are inherently lazy, but only that, at the margin, managers respond to incentives to work harder and direct their efforts toward activities that are rewarded by their employment contracts. The fact that senior managers receive such high-powered incentive contracts, particularly in public companies, suggests that the problem studied in this paper is of practical importance. In addition, the cost of effort in this model could be reinterpreted as an opportunity cost of redirecting effort or firm resources away from the manager's preferred activity, so the model applies even to situations where the manager derives pleasure from working, provided that the manager and principal do not have perfectly aligned preferences. For contracting purposes, the implication is that the wages of a manager who performs entrepreneurial services can be conditioned on whether the opportunity succeeds, fails, or is not pursued.

Another important aspect of the information environment is separability, i.e., whether the principal may separately observe the outcomes of entrepreneurial and managerial services. In the spirit of Penrose (2009), this paper adopts the perspective that both services are necessary for firm prosperity and enable each other. So if a firm is doing well, the principal may infer both that the entrepreneurial opportunity was pursued

successfully and that managerial services have been performed properly. It may sometimes be possible to determine whether managerial services have been performed properly even if the entrepreneurial opportunity fails or is not pursued—for example, if a firm clearly has efficient operations but failure to properly perform entrepreneurial services has allowed the firm's products to lapse into obsolescence. We denote the probability that the proper performance of managerial services is separately observable by β.

Whereas full separability ($\beta = 1$) and full nonseparability ($\beta = 0$) are clearly defined, intermediate values of β can manifest themselves in different ways. We analyze two contrasting cases and discuss intermediate cases later. A high information environment captures the situation where the principal and managers have symmetric information about the work environment. In particular, the principal and generalist manager share a common estimate β of separability, which is definitively determined after the manager has decided whether to pursue the opportunity. A low information environment captures the situation where managers are asymmetrically better informed about work conditions than the principal. The principal and generalist manager initially share a common estimate β of separability, but separability is contingent on the manager's effort, and the manager learns the truth of separability after exerting effort but before deciding whether to pursue the opportunity. (An alternative interpretation is that in a high information environment, β represents the probability that an audit by the principal will reveal whether a generalist properly performed the managerial service, whereas in a low information environment, β represents the probability that a generalist can successfully demonstrate proper performance of the managerial service to the principal.)

3.1. Specialization

3.1.1. Specialist in Managerial Services. The principal can overcome managerial opportunism without any extra cost by paying the manager a positive wage, w_m, conditional on observing that the managerial service has been properly performed, while scaling this wage by the probability it is paid such that the manager's wages in expectation equal the private cost of effort, e^m. A contract that overcomes managerial opportunism in all information environments is

$$w_m = \frac{e^m}{\gamma \overline{p}}, \quad w_n = 0, \quad (2)$$

where w_m is paid if and only if the entrepreneurial opportunity is pursued and succeeds (which happens with probability $\gamma \overline{p}$), and w_n represents a reservation wage for all other outcomes.

3.1.2. Specialist in Entrepreneurial Services. Define $w_s(w_f)$ as the wage paid if the opportunity is pursued and succeeds (fails). Here, w_n represents the reservation

wage if the manager does not pursue the entrepreneurial opportunity. The appendix derives the optimal wage payments, which are as follows regardless of the information environment:

$$w_s = \frac{e^e}{(\overline{p} - \underline{p})\gamma(1 - \gamma)}, \quad w_n = \frac{e^e(\underline{p} + (\overline{p} - \underline{p})\gamma)}{(\overline{p} - \underline{p})\gamma(1 - \gamma)}, \quad (3)$$
$$w_f = 0.$$

To understand this contract, observe that the manager's expected wages from exerting effort and pursing the opportunity if and only if the manager receives a favorable signal about it must exceed both (a) the manager's reservation wage from rejecting the opportunity without evaluating it and (b) the manager's expected wages from pursuing the opportunity without evaluating it. Meeting these constraints requires that $w_s > w_n > w_f$, as in (3). If w_f could be negative, the wages in (3) could be set such that the manager's expected wages exactly equaled the manager's private cost of effort e^e. However, the lowest wage the manager can receive is 0, so $w_f = 0$, and w_s and w_n must be accordingly higher as well, yielding expected wages of

$$e^e \left(1 + \frac{\underline{p}}{(\overline{p} - \underline{p})\gamma(1 - \gamma)}\right). \quad (4)$$

The term on the right inside the parentheses represents the additional wage cost over and above the cost of the manager's effort. This is the ex ante cost of opportunism associated with entrepreneurial services. The total cost of specialization is accordingly the sum of the wages of a specialist in entrepreneurial services and the wages of a specialist in managerial services:

$$e^e \left(1 + \frac{\underline{p}}{(\overline{p} - \underline{p})\gamma(1 - \gamma)}\right) + e^m. \quad (5)$$

3.2. Generalist—High Information Environment
Define $w_{sm}(w_{fm})$ as the wage paid if the manager performs the managerial service and the entrepreneurial opportunity succeeds (fails). The appendix derives the optimal wage payments. We have $w_n = 0$ in all cases. If $e^{em} \le e^m$, then $w_{sm} = w_{fm} = e^{em}$, $w_m = e^{em}/\beta$. Otherwise, we have two cases:

$$\text{If } e^m - \frac{(e^{em} - e^m)(\underline{p} + (\overline{p} - \underline{p})\gamma)}{(\overline{p} - \underline{p})\gamma(1 - \gamma)} \ge 0,$$
$$w_{sm} = e^m + \frac{(e^{em} - e^m)(1 - \underline{p} - (\overline{p} - \underline{p})\gamma)}{(\overline{p} - \underline{p})\gamma(1 - \gamma)},$$
$$w_m = \frac{e^m}{\beta}, \quad (6a)$$
$$w_{fm} = e^m - \frac{(e^{em} - e^m)(\underline{p} + (\overline{p} - \underline{p})\gamma)}{(\overline{p} - \underline{p})\gamma(1 - \gamma)};$$

$$\text{if } e^m - \frac{(e^{em} - e^m)(\underline{p} + (\overline{p} - \underline{p})\gamma)}{(\overline{p} - \underline{p})\gamma(1 - \gamma)} \le 0,$$
$$w_{sm} = \frac{e^{em} - e^m}{(\overline{p} - \underline{p})\gamma(1 - \gamma)},$$
$$w_m = \frac{(e^{em} - e^m)(\underline{p} + (\overline{p} - \underline{p})\gamma)}{\beta(\overline{p} - \underline{p})\gamma(1 - \gamma)}, \quad (6b)$$
$$w_{fm} = 0.$$

In the case of extreme economies of scope in effort where $e^{em} \le e^m$, the manager effectively receives a flat wage if the manager pursues the entrepreneurial opportunity; otherwise, $w_{sm} > w_{fm}$, akin to the contract for the specialist in entrepreneurial services. The crucial difference between this wage contract and the one for the specialist in entrepreneurial services is that, here, with probability β, the principal observes whether the manager properly performed the managerial service even if the entrepreneurial opportunity is not pursued or is pursued but fails. In other words, the managerial service acts like a monitoring technology, helping the principal overcome the manager's opportunism using both a carrot and a stick. The "stick" is that the manager caught "shirking" by not exerting the costly effort to perform the managerial service can be penalized with the lowest possible wage of 0; the "carrot" is w_m, which the manager receives if (a) the manager rejects the opportunity but (b) the manager's performance of the managerial service is verifiable by the principal because of separability.

These effects relax the constraints of the principal's problem, making it less costly to hire a generalist in a high information environment than to hire two specialists, unless the diseconomies in effort are very large. The vertical axis in Figure 1, panel A depicts the cost of each organizational design. The horizontal axis holds $e^{em} = e^m + e^e$ fixed but varies the relative cost of effort required for managerial and entrepreneurial services. The cost of effort for the managerial service is relatively high on the left ($e^m \gg e^e$) and relatively low on the right ($e^m \ll e^e$).

The wages of a specialist in managerial services equal the cost of the manager's effort, which increases from right to left. The wages of a specialist in entrepreneurial services also increase as the relative cost of effort for entrepreneurial services increases from left to right, but at a steeper rate, because the cost of overcoming managerial opportunism is proportional to e^e. Thus, the total cost of specialization (dark solid line in figure) increases with the relative cost of effort for entrepreneurial services.

Where the relative cost of effort for managerial services is high (on left in figure), the cost of hiring a generalist in a high information environment is just the cost of the manager's effort, e^{em}. Note that this is the theoretic minimum cost for any principal–agent contract;

Figure 1   Cost of Generalist and Specialists in Different Information Environments, Where $e^{em} = e^m + e^e$ (No Economies in Effort)
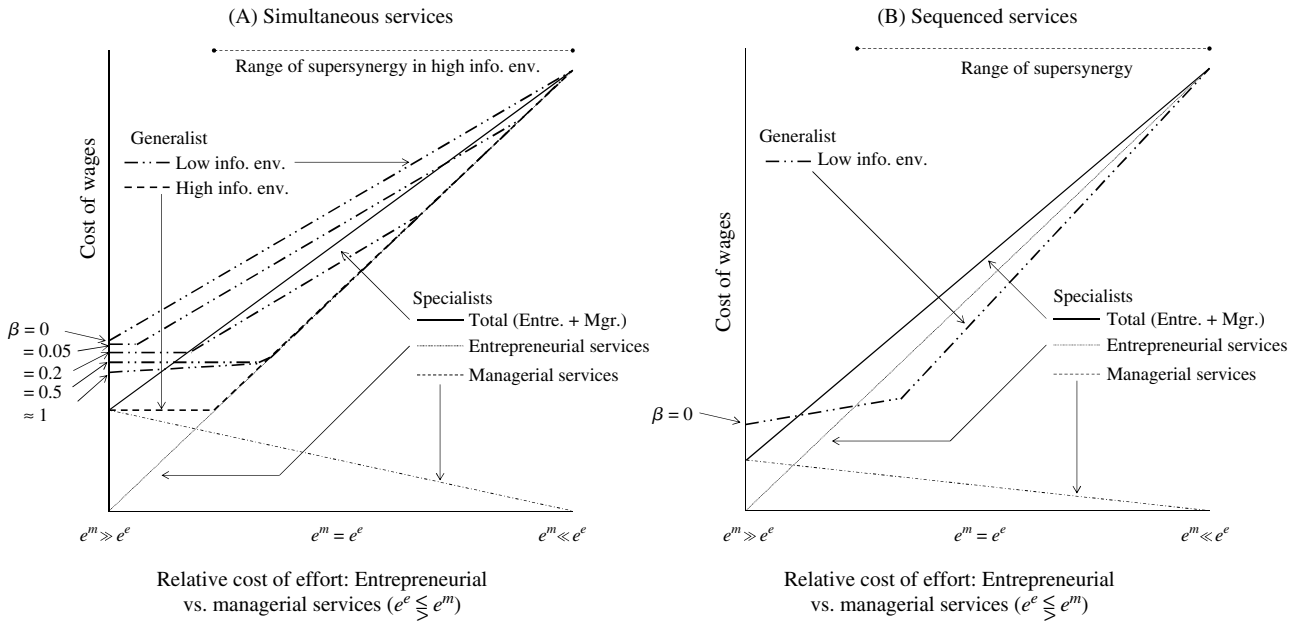
i.e., in this region, managerial opportunism is fully overcome. Once the relative cost of effort for entrepreneurial services rises above a critical threshold, the cost of a generalist is equal to the cost of hiring a specialist in entrepreneurial services. This is the region of the supersynergy (roughly, the right 3/4ths of the figure), where a generalist performs *two* services for the same cost as a specialist in entrepreneurial services performs *one*. Hiring a generalist in a high information environment is everywhere optimal in the figure, with the greatest benefits in the interior, where the relative costs of effort for managerial and entrepreneurial services are similar. This makes sense. Intuitively, the benefits of hiring a generalist come from using the provision of managerial services to reduce the manager's scope for opportunism in providing entrepreneurial services. Where the relative cost of effort for entrepreneurial services is low, the manager has little incentive to behave opportunistically. Where the relative cost of effort for managerial services is low, incorporating the effort for these services does not materially reduce the manager's scope for opportunism.

Figure 2, panel A is a contour map for general values of e^{em}. The gray region is where hiring a generalist is optimal; the dark region is where hiring two specialists is optimal. As we move from top to bottom in the figure, we move from economies in effort to diseconomies. The figure shows that the reduction in opportunism from hiring a generalist overcomes even relatively large diseconomies of effort, especially if the costs of effort for managerial and entrepreneurial services are similar (interior of figure).

PROPOSITION 1. *In a high information environment, a generalist has lower scope for opportunism than a*

specialist in entrepreneurial services. As a result, hiring a generalist will tend to be less costly than hiring two specialists, especially where the costs of effort for the entrepreneurial service and the managerial service are similar.

Another interesting feature of the generalist contract is that w_m is inversely proportional to β. As separability declines ($\beta \to 0$), w_m steadily increases to compensate the manager for receiving it less often. For a wide range of parameter values, a generalist receives a larger wage for rejecting the entrepreneurial opportunity than for successfully pursuing the entrepreneurial opportunity.
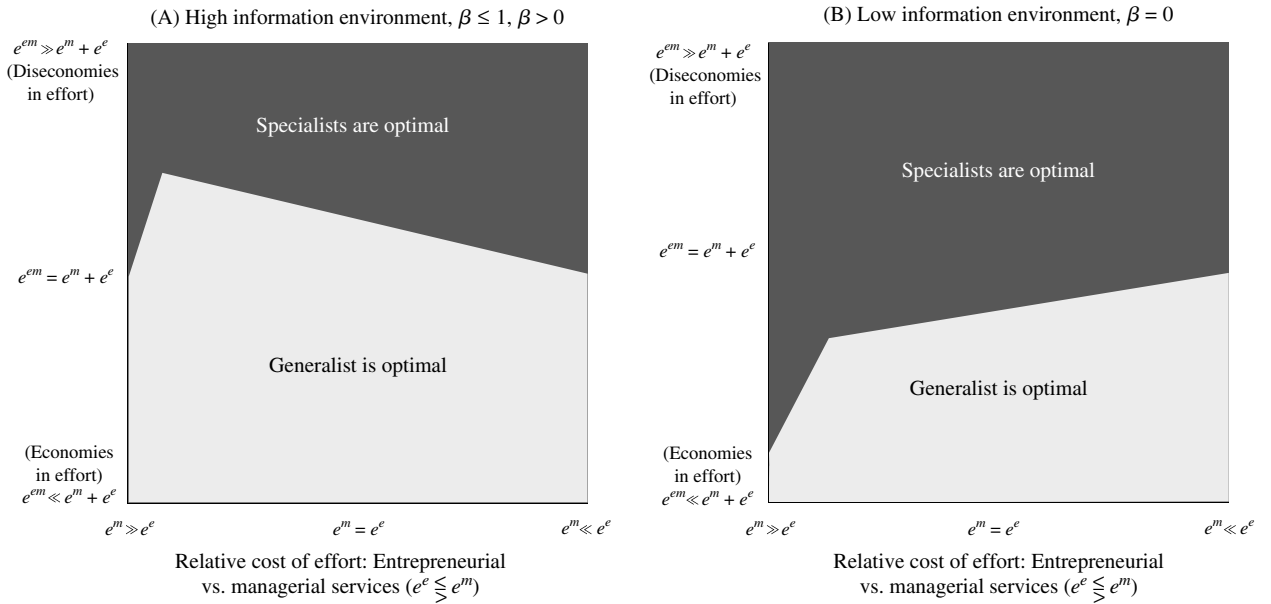
3.3. Generalist—Low Information Environment
The appendix derives the optimal wage payments. We have $w_{fm} = 0$, and we have four cases for the other wages:

If $e^{em} \leq e^m \dfrac{\gamma + \beta - \gamma\beta}{\beta}$ and $e^{em} \leq e^m \dfrac{\gamma + \beta - \gamma\beta}{\gamma}$,

$$w_{sm} = \frac{e^{em}}{(\overline{p} - \underline{p})(\gamma + \beta - \gamma\beta)},$$

$$w_m = \frac{\overline{p}e^{em}}{(\overline{p} - \underline{p})(\gamma + \beta - \gamma\beta)},$$

$$w_n = \frac{\underline{p}e^{em}}{(\overline{p} - \underline{p})(\gamma + \beta - \gamma\beta)}; \tag{7a}$$

if $e^{em} \leq e^m \dfrac{\gamma + \beta - \gamma\beta}{\beta}$ and $e^{em} \geq e^m \dfrac{\gamma + \beta - \gamma\beta}{\gamma}$,

Figure 2   Contour Map—Optimality of Generalist vs. Specialists

(A) High information environment, $\beta \leq 1$, $\beta > 0$

$e^{em} \gg e^m + e^e$
(Diseconomies in effort)

Specialists are optimal

$e^{em} = e^m + e^e$

Generalist is optimal

(Economies in effort)
$e^{em} \ll e^m + e^e$

$e^m \gg e^e$ $e^m = e^e$ $e^m \ll e^e$

Relative cost of effort: Entrepreneurial
vs. managerial services ($e^e \lessgtr e^m$)

(B) Low information environment, $\beta = 0$

$e^{em} \gg e^m + e^e$
(Diseconomies in effort)

Specialists are optimal

$e^{em} = e^m + e^e$

Generalist is optimal

(Economies in effort)
$e^{em} \ll e^m + e^e$

$e^m \gg e^e$ $e^m = e^e$ $e^m \ll e^e$

Relative cost of effort: Entrepreneurial
vs. managerial services ($e^e \lessgtr e^m$)

$$w_{sm} = \frac{e^{em} - e^m(\gamma + \beta - \gamma\beta)}{(\overline{p} - \underline{p})(\gamma + \beta - \gamma\beta)(1 - \gamma)},$$

$$w_m = \overline{p}\,\frac{e^{em} - e^m(\gamma + \beta - \gamma\beta)}{(\overline{p} - \underline{p})(\gamma + \beta - \gamma\beta)(1 - \gamma)},$$

$$w_n = \frac{e^{em}(\underline{p} + (\overline{p} - \underline{p})\gamma) - e^m\overline{p}(\gamma + \beta - \gamma\beta)}{(\overline{p} - \underline{p})(\gamma + \beta - \gamma\beta)(1 - \gamma)}; \quad (7b)$$

if $e^{em} \geq e^m \dfrac{\gamma + \beta - \gamma\beta}{\beta}$ and $e^{em} \leq e^m(2 - \gamma)$,

$$w_{sm} = \frac{e^{em} - e^m(1 - \gamma)}{(\overline{p} - \underline{p})\gamma},$$

$$w_m = \underline{p}\,\frac{e^{em} - e^m(1 - \gamma)}{(\overline{p} - \underline{p})\gamma} + \frac{e^m}{\beta},$$

$$w_n = \underline{p}\,\frac{e^{em} - e^m(1 - \gamma)}{(\overline{p} - \underline{p})\gamma}; \quad (7c)$$

if $e^{em} \geq e^m \dfrac{\gamma + \beta - \gamma\beta}{\beta}$ and $e^{em} \geq e^m(2 - \gamma)$,

$$w_{sm} = \frac{e^{em} - e^m}{(\overline{p} - \underline{p})\gamma(1 - \gamma)},$$

$$w_m = \frac{(e^{em} - e^m)(\underline{p} + (\overline{p} - \underline{p})\gamma)}{(\overline{p} - \underline{p})\gamma(1 - \gamma)} + \frac{(1 - \beta)e^m}{\beta},$$

$$w_n = \frac{(e^{em} - e^m)(\underline{p} + (\overline{p} - \underline{p})\gamma)}{(\overline{p} - \underline{p})\gamma(1 - \gamma)} - e^m. \quad (7d)$$

Unless the economies of scope in effort are very large, the effort expected of a generalist is more than

that expected of a specialist in entrepreneurial services, creating a greater temptation to shirk. In a sense the "extra" effort arising from the need for a generalist to perform the managerial service becomes contaminated by, and subject to, the potential for opportunism associated with the entrepreneurial service. In a high information environment, using the managerial service as a monitoring technology overcomes this problem. In a low information environment, this does not work as well because of the manager's greater knowledge of, and influence over, separability. First, the manager can shirk by doing nothing in a nonobservable way to the principal, receiving w_n instead of $(1 - \beta)w_n$, as in a high information environment. Second, the manager knows the truth of separability after exerting effort. So, for instance, although the expected wages from pursuing the opportunity after receiving a favorable signal are $w_{sm}\overline{p} + w_{fm}(1 - \overline{p})$ regardless of the information environment, in a high information environment, the manager only knows that expected wages from rejecting the opportunity are $\beta w_m + (1 - \beta)w_n$, whereas in a low information environment, the manager has already learned whether the wage will be w_m or w_n.

Because of the resulting greater potential for opportunism, hiring a generalist is only optimal if the probability of separability is high or the economies of scope in effort are large. In fact, with full nonseparability ($\beta = 0$), the generalist is everywhere more costly than two specialists in Figure 1.[4] Figure 2, panel B shows that, in a low information environment with $\beta = 0$, two specialists are less costly than a generalist unless the economies in effort are very large, particularly if the relative cost of effort for managerial services is high (left of figure), and

the cost of subjecting this effort to a greater potential for opportunism is accordingly high as well.

PROPOSITION 2. *In a low information environment, a generalist has greater scope for opportunism than in a high information environment, especially where the managerial service has a high relative cost of effort and where the probability of separability is low. As a result, hiring a generalist will tend to be more costly than hiring two specialists where the managerial service has a high relative cost of effort and the probability of separability is low.*

It is also worth noting that as the probability of separability increases ($\beta \to 1$), the generalist contract in a low information environment does *not* converge to the contract with full separability (which would imply a high information environment) if the relative cost of effort for managerial services is sufficiently high. Nor as the probability of separability decreases ($\beta \to 0$) does the generalist contract for a high information environment converge to the contract with full nonseparability (which would imply a low information environment).

3.4. Sequencing Services

For a firm to prosper, managerial and entrepreneurial services would normally be needed on an ongoing basis, especially managerial services, since these are necessary to keep the operations running. However, some managerial services relate specifically to the execution of an entrepreneurial idea. If so, the entrepreneurial service could be performed first and the managerial service begun only once it is decided to proceed with the idea. For brevity of exposition, we will focus on the case of full nonseparability ($\beta = 0$), since this is the case with the greatest relative cost of hiring a generalist. Note that sequencing only affects the decision process of the managers, not the information available to the principal.

With sequencing, a specialist in managerial services can be paid wages of $w_m = e^m$ if the opportunity is pursued and wages of $w_n = 0$ otherwise. The wages for a specialist in entrepreneurial services do not change. It follows that the total cost of specialization is

$$e^e \left(1 + \frac{\underline{p}}{(\overline{p} - \underline{p})\gamma(1 - \gamma)} \right) + \gamma e^m. \tag{8}$$

A generalist's wages are derived in the appendix as follows:

$$\text{If } \gamma e^{em} + (1 - \gamma)e^e \leq e^m,$$
$$w_{sm} = \frac{\gamma e^{em} + (1 - \gamma)e^e}{(\overline{p} - \underline{p})\gamma},$$
$$w_n = \frac{(\gamma e^{em} + (1 - \gamma)e^e)\,\underline{p}}{(\overline{p} - \underline{p})\gamma}, \tag{9a}$$
$$w_{fm} = 0;$$

$$\text{if } \gamma e^{em} + (1 - \gamma)e^e \geq e^m,$$
$$w_{sm} = \frac{\gamma e^{em} + (1 - \gamma)e^e - e^m\gamma}{(\overline{p} - \underline{p})\gamma(1 - \gamma)},$$
$$w_n = \frac{(\gamma e^{em} + (1 - \gamma)e^e)(\underline{p} + (\overline{p} - \underline{p})\gamma) - e^m\overline{p}\gamma}{(\overline{p} - \underline{p})\gamma(1 - \gamma)}, \tag{9b}$$
$$w_{fm} = 0.$$

Intuitively, sequencing should lower the cost of hiring both specialists and a generalist by making the managerial service contingent on pursuing the opportunity. What is less intuitive is that sequencing has a greater effect on the cost of hiring a generalist than on the cost of hiring specialists because it reduces the benefits of shirking to the generalist. To see why, observe that a generalist must exert e^m to only perform managerial services without evaluating the entrepreneurial opportunity; without sequencing, the generalist compares this effort to e^{em}, the effort to properly provide both services, whereas with sequencing the generalist compares this effort to $\gamma e^{em} + (1 - \gamma)e^e$, which is generally lower. Thus, as in a high information environment, managerial services tend to limit the potential for opportunism associated with entrepreneurial services unless the relative cost of effort for managerial services is large. Figure 1, panel B replicates Figure 1, panel A, but with sequencing. Where the relative cost of effort for managerial services is very high, on the left of the figure, hiring specialists is still less costly. Otherwise, hiring a generalist is less costly and may give rise to a supersynergy, where the wages of a generalist are actually *lower* than the wages of a specialist in entrepreneurial services alone.

PROPOSITION 3. *In a low information environment with sequenced services, a generalist has lower scope for opportunism than a specialist in entrepreneurial services unless the managerial service has a relatively high cost of effort. As a result, hiring a generalist will tend to be less costly than hiring two specialists unless the managerial service has a relatively high cost of effort.*

4. Discussion

This paper has used a formal model to provide a new agency-based theory of the division of managerial labor. An important distinguishing feature of some managerial tasks is the responsibility to make strategic decisions on behalf of others. This paper's model identifies the conditions under which responsibility for such decision making (entrepreneurial services) and responsibility for day-to-day management (managerial services) should be assigned to different specialists or to a single generalist manager.

The analysis highlights the importance of the information environment. In a high information environment,

where the principal and managers have symmetric information about work conditions, hiring a generalist dominates unless there are large *diseconomies* in effort. The reason is that the generalist's effort toward managerial services may be used to reduce the scope for opportunism in the performance of entrepreneurial services. Hiring a generalist is especially beneficial if the costs of effort for entrepreneurial and managerial services are similar. In a low information environment, where managers are better informed about work conditions than the principal, hiring specialists dominates unless there are large *economies* in effort, because the potential for opportunism associated with entrepreneurial services contaminates the generalist's performance of managerial services. The agency costs of hiring a generalist are especially large if the managerial service has a relatively high cost of effort and the probability of separability is low. In this case, the organizational designer may respond by sequencing the entrepreneurial service before the managerial service, thereby reducing the generalist's incentive to shirk. As a result, hiring a generalist again dominates unless the relative cost of effort for managerial services is very high. An implication is that firms may grow in fits and starts not only because of the labor market frictions identified by Penrose (2009, Chapter IV) but also to mitigate managerial opportunism. This result thereby offers an explanation for the empirical evidence for a "Penrose effect" (Shen 1970, Tan and Mahoney 2005) without contradicting the literature showing that external recruitment of managers is viable (Rao and Drazin 2002) and that human capital can be highly mobile (Coff 1997, 1999a; Wezel et al. 2006) (although it is acknowledged that the assimilation of managers and other factors may nonetheless be critical drivers of sequencing services and the Penrose effect).

We note that the analysis makes no equilibrium assumption invalidating the expectation that firms may have different competences at governance and contracting (Argyres and Mayer 2007, Mayer and Argyres 2004, Mayer and Nickerson 2005, Nickerson and Silverman 2003). The results thus offer insights into how firms can use organizational design to create a competitive advantage.

PepsiCo's management of its restaurant businesses was characterized by rapid growth and significant, episodic reformations of the restaurant concepts; in other words, growth followed the pattern of deciding on and then executing entrepreneurial ideas, which corresponds to sequenced services. Concocting and evaluating these entrepreneurial ideas was also a major focus of management time; that is, the relative effort for entrepreneurial services was high. Our analysis suggests that hiring a generalist is optimal under these circumstances, and each restaurant chain in fact had a generalist CEO during its high-growth years. In the words of one company executive, it was a period of "big guys doing big things" (Blanchard et al. 2004, p. 46). As the restaurant businesses matured, entrepreneurial services turned to concept updating, which was performed concomitant to the management of day-to-day operations, which were in turn now of primary importance. "Execute, execute, execute" became one of the critical success factors for the restaurant businesses (Blanchard et al. 2004, pp. 182–185).[5] Our analysis would suggest that the growing relative effort for managerial services and the reduction in opportunities for sequencing would make specialization optimal. In fact, after being spun off, each restaurant concept of Yum! Brands would establish a separate chief concept officer and chief operating officer, effectively dividing entrepreneurial and managerial services. Although undoubtedly many factors contributed to the organizational changes of these restaurant businesses, it is encouraging that the predictions of the model are in conformity with these changes.

Making a loan to a client firm requires managerial effort for marketing, credit assessment, and perhaps syndication of the loan to other lenders. These efforts overlap considerably with those required to provide other fee-based intermediation services for the same client firm, suggesting economies in effort between these latter managerial-like services and the entrepreneurial-like service of lending. Traditional commercial banking services such as cash management and foreign exchange hedging are also relatively straightforward and rarely contingent on the bank making a concomitant loan. These services thus correspond to an environment with a high ex ante probability of separability (perhaps even a high information environment) with a relatively modest cost of effort for the managerial service, precisely when hiring a generalist would be optimal. It therefore makes sense that these services traditionally have been, and continue to be, provided by the same relationship bankers who originate loans. Conversely, many investment banking transactions are either contingent on a concomitant loan (e.g., a cash acquisition requiring a bridge loan) or are awarded to banks willing to "pay to play" by lending (e.g., a large equity offering). The mutual contingency of the loan and the complex investment banking transaction, as well as the banker's superior knowledge of this relationship, correspond to a low information environment with a relatively high cost of effort for the managerial service, precisely when dividing tasks among specialists is optimal. It therefore makes sense that, despite the economies in effort, these services are frequently separated from lending either within the same large bank or, at the middle-market level, through specialization by banks themselves. The analysis herein would also suggest that as the regulatory barriers separating commercial and investment banking were gradually lifted over the 1990s, compensation contracts for investment bankers now with influence over lending would move from cash bonuses contingent only

on business as it is brought in (akin to a specialist contract for managerial services) to contracts with payment schedules stretching several years into the future, if not directly linked to specific loans and investments, then at least generally coinciding with their tenor (akin to a generalist contract). That is what happened. Although many causes may underlie these industry trends, it is comforting that the model's predictions are in conformity with them.

The analysis also leads to empirical predictions that, to my knowledge, have not been tested and are often counterintuitive. A high information environment could be associated with environments exhibiting low turbulence and velocity, stricter financial reporting, and better corporate governance; under these conditions, we would expect to see more generalist CEOs with responsibility for both entrepreneurial services and day-to-day management. Where these conditions do not obtain and managers tend to have a better understanding of, and control over, information about conditions on the ground (i.e., in a low information environment with low separability), a separate COO will be more commonly observed, especially where the speed of execution is important—making sequencing impractical—and where the relative importance and complexity of day-to-day management are high. Note that this last prediction runs counter to the intuition that the importance of these activities would make them more likely to be assigned to the CEO, who is a higher-profile figure. In low information environments, we would expect a firm to grow more slowly and for the desirability of this slower growth to be reflected in senior managers' compensation contracts, for example, in the vesting schedules of executive options. Another counterintuitive prediction is that in a high information environment where the probability of separability is low, a generalist will receive a higher wage for the proper performance of managerial services than for both performing these services and pursuing an ultimately successful entrepreneurial opportunity.

A CEO's compensation relative to other executives has been used as a measure of self-importance or actual importance (Bebchuk et al. 2011, Hayward and Hambrick 1997). This paper's analysis suggests that a CEO's relative compensation may be driven by the division of managerial labor and the need to manage the CEO's opportunism. Where agency considerations militate in favor of hiring a generalist CEO, the CEO's pay will, ceteris paribus, tend to be higher in a low than in a high information environment. Where there is a separate COO, inspection of (3) shows that the CEO's pay will tend to be higher if good entrepreneurial opportunities are common or rare (γ is close to 1 or 0) or the signal the CEO generates about the quality of opportunities is not very informative (the difference $\bar{p} - \underline{p}$ is small).

The more entangled are entrepreneurial and managerial services, the greater may be not only economies

in effort but also the causal ambiguity related to performance (Lippman and Rumelt 1982, Peteraf 1993), suggesting that the nature of the information environment and the probability of separability are related. As an example, we can adapt Thompson's (1967) terminology to acquisitions. Acquisitions resulting in "pooled" interdependence require little integration; an example would be a retailer purchasing outlets from another retailer. We would expect small economies in effort between the entrepreneurial service of evaluating the acquisition and the managerial service of subsequently managing the outlets, and the information environment would make it straightforward to separately observe the performance of both services. Acquisitions that result in "reciprocal" independence require tight integration with existing operations. In this case, economies in effort would likely be high, but the information environment would likely be low. "Sequential" interdependence may arise when the target is in the acquirer's value chain; this is an intermediate case, since it may be necessary to reorganize the target's operations somewhat. In this example, economies in effort are inversely correlated with the quality of the information environment, so these two factors militate in opposite directions with regard to the optimality of hiring a generalist. In general, the worse a supervisor's understanding of the work environment, the less likely the supervisor would be able to separately observe the outputs of the manager's tasks, suggesting that the probability of separability would be low precisely when it would be most useful, i.e., in a low information environment. One might also expect that anything that created more administrative distance between senior and junior managers could jointly decrease the probability of separability and give rise to a low information environment. Examples include unrelated and geographic diversification and a less integrated organizational structure. One way of calibrating the relative importance of managerial opportunism and economies of effort would be to compare public companies to owner-managed firms, where agency issues are less salient.

In a high information environment, β can be interpreted as the probability the principal receives a fully accurate signal about whether the managerial service is properly performed. If we allow for the possibility of error, then we move closer to a low information environment, because the manager's ability to shirk is greater. Likewise, a low information environment could be changed to make separability contingent on the principal's actions, for example, by allowing the principal to discover with probability β that the manager had rejected the opportunity without evaluating it. This would relax the constraints of the principal's problem, because, ex ante, a manager would receive $(1 - \beta)w_n$ in expectation for shirking by doing nothing instead of w_n, as we assumed. This should not affect our results

much, however, since the interesting part of the parameter space in a low information environment is when β is close to zero.

The division between CEO and COO is clearly in part hierarchical. In our model, this distinction does not matter, since a CEO's contract could be expanded to include the supervision of a specialist COO by making the CEO's wage payments contingent on the proper performance of managerial services while mandating that the CEO not perform those services directly. The CEO would then write the same managerial services wage contract we derived, creating an equivalent form of specialization. A similar conclusion applies if the board of directors can directly observe the COO's wage contract. In other settings, however, the ability of the CEO to direct the COO may have important implications.

The results also suggest a number of avenues for future research. This paper considers only a single entrepreneurial opportunity, but a manager may sometimes seek out opportunities for which the manager's skills are better suited. For instance, a CEO hired externally may pursue acquisitions that are less closely related to existing operations, leading to pooled interdependence. As the CEO acclimates to the firm's operations, the CEO may reorient toward acquisitions that give rise to sequential or reciprocal interdependence. In this way, a firm's strategy is endogenous to the CEO's abilities, with carry-on implications for how a firm organizes the division of managerial labor. A generalist manager has an incentive to reduce the quality of the information environment because it leads to higher wages, so a firm may wish to impose separability to improve the information environment, even if doing so is costly, by monitoring how managers allocate their time. Managers have higher bargaining power when their efforts are more valuable, for example, because their ability is more suited to the ideal contract. This bargaining power may require sharing more rents with the manager, offsetting the value of the manager's ability. One source of diseconomies in hiring a generalist is that a jack-of-all-trades is a master of none. If we measure managerial competency in terms of the cost of effort, the analysis suggests that in high information environments, the reduction in managerial opportunism from hiring a generalist may make doing so advantageous even if a generalist is less competent than specialists would be. This could be true in new ventures, where the entrepreneurial service of structuring the launch comes before the managerial service of managing the launch. Finally, as noted, this paper models entrepreneurial and managerial services in a stylized way. A finer-grained characterization of these activities, particularly in a dynamic setting, could yield new insights.

Acknowledgments

Appendix. Derivation of Optimal Contracts

Program for a Specialist in Entrepreneurial Services

$$\min_{w_s,\, w_n,\, w_f} \left\{ \gamma[w_s\bar{p} + w_f(1-\bar{p})] + (1-\gamma)w_n \right\}$$

$$\text{s.t.} \quad \gamma[w_s\bar{p} + w_f(1-\bar{p})]$$
$$+ (1-\gamma)w_n - e^e \geq 0, \tag{IR}$$

$$\gamma[w_s\bar{p} + w_f(1-\bar{p})]$$
$$+ (1-\gamma)w_n - e^e \geq w_n, \tag{IC1}$$

$$\gamma[w_s\bar{p} + w_f(1-\bar{p})] + (1-\gamma)w_n - e^e$$
$$\geq \gamma[w_s\bar{p} + w_f(1-\bar{p})]$$
$$+ (1-\gamma)[w_s\underline{p} + w_f(1-\underline{p})], \tag{IC2}$$

$$w_s\bar{p} + w_f(1-\bar{p}) \geq w_n, \tag{IC3}$$

$$w_s\underline{p} + w_f(1-\underline{p}) \leq w_n, \tag{IC4}$$

$$w_s, w_n, w_f \geq 0. \tag{10}$$

The IR constraint reflects the manager's option to refuse the wage contract. IC1 (IC2) means the manager does not reject (pursue) the opportunity without evaluating it. IC3 and IC4 ensure the manager makes the correct decision about whether to pursue the opportunity or not. IC1 makes IC3 redundant, and IC2 makes IC4 redundant. Rewriting IC1 and IC2 yields

$$w_s\bar{p} + w_f(1-\bar{p}) \geq w_n + \frac{e^e}{\gamma},$$
$$w_n - \frac{e^e}{1-\gamma} \geq w_s\underline{p} + w_f(1-\underline{p}). \tag{11}$$

If the IR constraint binds, IC1 must also bind. This implies $w_n = 0$, which violates IC2. Thus, the IR constraint must be slack. Moreover, if $w_s = 0$, IC1 and IC2 cannot both be satisfied. So IC1, IC2, and the nonnegativity constraint on w_f must bind, yielding the solution in the text.

Program for a Generalist—High Information Environment

$$\min_{w_{sm},w_m,w_n,w_{fm}} \left\{ \gamma[w_{sm}\overline{p}+w_{fm}(1-\overline{p})] \right.$$
$$\left. + (1-\gamma)[\beta w_m + (1-\beta)w_n] \right\}$$

s.t. $\gamma[w_{sm}\overline{p}+w_{fm}(1-\overline{p})]$
$$+ (1-\gamma)[\beta w_m + (1-\beta)w_n] - e^{em} \geq 0, \qquad \text{(IR)}$$

$\gamma[w_{sm}\overline{p}+w_{fm}(1-\overline{p})]$
$$+ (1-\gamma)[\beta w_m + (1-\beta)w_n] - e^{em}$$
$$\geq (1-\beta)w_n, \qquad \text{(IC1)}$$

$\gamma[w_{sm}\overline{p}+w_{fm}(1-\overline{p})]$
$$+ (1-\gamma)[\beta w_m + (1-\beta)w_n] - e^{em}$$
$$\geq \beta w_m + (1-\beta)w_n - e^{m}, \qquad \text{(IC2)}$$

$\gamma[w_{sm}\overline{p}+w_{fm}(1-\overline{p})]$
$$+ (1-\gamma)[\beta w_m + (1-\beta)w_n] - e^{em}$$
$$\geq \gamma[w_{sm}\overline{p}+w_{fm}(1-\overline{p})]$$
$$+ (1-\gamma)[w_{sm}\underline{p}+w_{fm}(1-\underline{p})] - e^{m}, \qquad \text{(IC3)}$$

$$w_m \geq w_n, \qquad \text{(IC4)}$$

$$w_{sm}\overline{p}+w_{fm}(1-\overline{p}) \geq \beta w_m + (1-\beta)w_n, \qquad \text{(IC5)}$$

$$w_{sm}\underline{p}+w_{fm}(1-\underline{p}) \leq \beta w_m + (1-\beta)w_n, \qquad \text{(IC6)}$$

$$w_{sm},w_m,w_n,w_{fm} \geq 0. \qquad (12)$$

It is weakly optimal that $w_n = 0$, because lowering w_n while raising w_m to compensate relaxes IC1 without tightening any other constraint. If $e^{em} \leq e^{m}$, then IC5 makes IC2 redundant, and IC6 makes IC3 redundant. It is then easy to see that setting $w_{sm} = w_m = w_{fm} = e^{em}/\beta$ satisfies all the constraints at minimum cost. If $e^{em} \geq e^{m}$, then IC2 and IC5 make IC3 and IC6 redundant and must bind. If the IR constraint does not bind, the principal could profitably lower all three wage payments, unless this violated the nonnegativity constraint on w_{fm}. We thus have two mutually exclusive cases. Either IR, IC2, and IC3 bind or IC2, IC3, and the nonnegativity constraint on w_{fm} bind.

Program for a Generalist—Low Information Environment

$$\min_{w_{sm},w_m,w_n,w_{fm}} \left\{ \gamma[w_{sm}\overline{p}+w_{fm}(1-\overline{p})] \right.$$
$$\left. + (1-\gamma)[\beta w_m + (1-\beta)w_n] \right\}$$

s.t. $\gamma[w_{sm}\overline{p}+w_{fm}(1-\overline{p})]$
$$+ (1-\gamma)[\beta w_m + (1-\beta)w_n] - e^{em} \geq 0, \qquad \text{(IR)}$$

$\gamma[w_{sm}\overline{p}+w_{fm}(1-\overline{p})]$
$$+ (1-\gamma)[\beta w_m + (1-\beta)w_n] - e^{em} \geq w_n, \qquad \text{(IC1)}$$

$\gamma[w_{sm}\overline{p}+w_{fm}(1-\overline{p})]$
$$+ (1-\gamma)[\beta w_m + (1-\beta)w_n] - e^{em}$$
$$\geq \beta w_m + (1-\beta)w_n - e^{m}, \qquad \text{(IC2)}$$

$\gamma[w_{sm}\overline{p}+w_{fm}(1-\overline{p})]$
$$+ (1-\gamma)[\beta w_m + (1-\beta)w_n] - e^{em}$$

$$\geq \gamma[w_{sm}\overline{p}+w_{fm}(1-\overline{p})]$$
$$+ (1-\gamma)[w_{sm}\underline{p}+w_{fm}(1-\underline{p})] - e^{m}, \qquad \text{(IC3)}$$

$$w_m \geq w_n, \qquad \text{(IC4)}$$

$$w_{sm}\overline{p}+w_{fm}(1-\overline{p}) \geq w_m, \qquad \text{(IC5)}$$

$$w_{sm}\overline{p}+w_{fm}(1-\overline{p}) \geq w_n, \qquad \text{(IC6)}$$

$$w_{sm}\underline{p}+w_{fm}(1-\underline{p}) \leq w_m, \qquad \text{(IC7)}$$

$$w_{sm}\underline{p}+w_{fm}(1-\underline{p}) \leq w_n, \qquad \text{(IC8)}$$

$$w_{sm},w_m,w_n,w_{fm} \geq 0. \qquad (13)$$

IC6 and IC7 are redundant. The remaining constraints imply $w_{sm} \geq w_m \geq w_n \geq w_{fm}$, so either the IR constraint binds or one or more wage payments are zero. If IC1 is slack, it would be weakly optimal to raise w_n and lower w_{sm} or w_m, unless doing so violated IC2 or IC4. If IC4 binds, then IC1 binds. If IC4 is slack, it is again weakly optimal to raise w_n lower w_m. So IC1 binds. If IC2 is slack, it is weakly optimal to raise w_m and lower w_{sm} unless this violates IC5. So either IC2 or IC5 must bind, but not both. This also means that IC4 must be slack, for if IC4 binds, both IC2 and IC5 would be slack. If IC3 is slack, it is weakly optimal to raise w_{fm} and lower w_m unless this violates IC8. So either IC3 or IC8 must bind, but not both. Taking stock, we are left with four mutually exclusive cases: either IR and one or more nonnegativity constraints plus IC1 with (a) IC2 and IC8, (b) IC2 and IC3, (c) IC5 and IC8, or (d) IC3 and IC5. We can then use algebra and comparison with the unused constraints to determine the wage payments and boundary conditions and show that the IR constraint is slack.

Program for a Generalist—Low Information Environment and Sequencing, $\beta = 0$
The program is a simplified version of (13) where $\beta = 0$; IC2, IC5, and IC7 are no longer relevant because w_m is not relevant; and $\gamma e^{em} + (1-\gamma)e^{e}$ is substituted for e^{em}.

Endnotes

[1] The cost of effort could also be interpreted as an opportunity cost of redirecting firm resources away from the manager's preferred activity.

[2] Although a COO generally reports to the CEO, the COO usually has regular access to the board and, in some companies, is close to the CEO's equal in authority (Bennett and Miles 2006). Our analysis of the division of managerial labor applies to the CEO/COO dichotomy provided that the board of directors can observe the terms of the COO's wage contract, which would be the case in most public companies. We discuss this issue more in §4.

[3] This is based on information in Yum! Brands' 2009 annual report.

[4] If $e^{em} = e^{e} + e^{m}$ and $\beta = 0$, a generalist's expected wages are $e^{e}(1 + \underline{p}/((\overline{p} - \underline{p})\gamma(1-\gamma))) + e^{m}(1 + \underline{p}/((\overline{p} - \underline{p})\gamma))$, which is clearly larger than the wages in (5) by an additional agency cost equal to $e^{m}(\underline{p}/((\overline{p} - \underline{p})\gamma))$.

[5] An example of the focus on execution is the CHAMPS operations management system, which was created after the spin-off to ensure each restaurant's cleanliness, hospitality, accuracy, maintenance, product quality, and speed with service worldwide. See Blanchard et al. (2004, pp. 111–117).

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