A Theory of Partnerships*

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Abstract

We compare the costs and benefits of partnerships relative to the corporate form of organization. We show that organizing as a partnership can be desirable in human-capital intensive industries where product quality is hard to observe. The theory explains the relative scarcity of partnerships outside of professional service industries such as law, accounting, medicine, investment banking, architecture, advertising, and consulting. It also explains features of partnerships such as up-or-out promotion systems, the use of non-compete clauses, motives for profit sharing as well as recent trends in professional service industries.

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1 Introduction

Modern economies exhibit a wide diversity of organizational forms: from closely held private firms to employee-owned partnerships and co-operatives to investor-owned corporations. A fundamental economic problem is to understand the forces that lead to these different forms of organization and hence determine the structure of productive enterprise in the economy. One striking puzzle in this regard is the distribution of partnerships relative to corporations across industries. While the corporate form dominates across manufacturing, technology and many service industries, partnerships have been prominent in human-capital intensive professional services such as law, medicine, investment banking, management consulting, advertising, and accounting.

In this paper, we investigate an economic rationale for partnerships and their presence in the professional services. We take the defining feature of a partnership to be re-distribution of profits among the partners.[1] Profit-sharing leads individuals to be particularly selective as to whom they take on as partners. This feature of partnerships assures clients of quality service. We show that as a result, if clients are concerned about quality and are in a relatively poor position to assess quality, then partnerships tend to be a preferable mode of organization relative to a profit-maximizing corporation.

Our model suggests that partnerships will emerge under some market conditions but not others. In particular, the theory predicts that partnerships will emerge when human capital plays a central role in determining product quality and when clients are at a disadvantage relative to firms in assessing the ability of employees. In our view, these conditions aptly characterize the professional services, but are a much worse description of manufacturing or technology industries where partnerships are quite unusual.

This basic story is developed in Sections 2 and 3. We consider a simple model that focuses on the hiring policies of different organizations. Firms face a distribution of heterogeneous workers in the labor market and the ability of the employees that are

[1] In practice of course, many partnerships combine productivity based compensation with straight profit sharing. Even when productivity measures are used, however, as if the case in many law firms, there is typically a significant amount of sharing. Aside from being a natural lay definition of partnership, our focus on profit sharing is also loyal to the Internal Revenue Service code. A partnership's tax returns must show the names and addresses of each partner and each partner's *distribution share* of income. An alternative and complementary view of partnerships would start with the allocation of control rights (see Hart and Moore, 1996). Interestingly, however, a joint undertaking merely to share expenses over jointly owned assets, or co-ownership of property that is maintained and leased, or rented, would not qualify as a partnership under the tax code (see IRS package 1065).

hired determines the quality of the firm's product. We assume that a corporation makes decisions with the intention of maximizing profits, while an equal-sharing partnership would like to maximize profits per partner. As was first observed in the classic work of Benjamin Ward (1958), this profit sharing makes a partnership relatively less inclined to expand its labor force in comparison to a corporation. Intuitively, existing partners will hesitate to bring in new employees unless they raise the average partner share and as a result, partnerships may pass up hires whose marginal product is above the going wage. Given the distribution of talent in the labor market, this selectivity translates into a higher quality threshold for employment, and (to the extent that human capital plays an important role in production) higher quality product. An equilibrium partnership is more selective than an equilibrium corporation and has higher quality. Our model uses the simplification of equal-sharing within the partnership, but the conclusion that partnerships will be more selective extends to a much broader class of sharing rules.

Into this simple model of organizational decision-making, we incorporate the possibility that clients may not be able to perfectly perceive product quality. This *imperfect market monitoring* is characteristic of many professional service industries. In the case of law or medicine, for example, clients may not be able to assess the quality of service for many years, if ever. We show that when there are no problems with market monitoring, a profit maximizing corporation hires efficiently while partnerships provide too high a level of quality. With less effective market monitoring, however, both corporations and partnerships are tempted to reduce quality and hire less able workers, hoping to benefit in the event that the market does not discern this loss of quality. Corporations consequently move away from efficient production as market monitoring deteriorates, generating less profits, but partnerships move closer to efficient hiring (though profits *per partner* decrease). This leads to our main result: if market monitoring is sufficiently reliable, corporations perform better than partnerships, while if market monitoring is weak, partnerships are strictly more profitable than corporations.

In Section 4 we generalize our results to an environment in which salaries are correlated with ability. In this case, corporations may have an incentive to substitute in less talented, but cheaper workers. Partnerships always aim to attract the most talented employees. When higher ability workers have higher reservation wages, however, equal-sharing partnerships can unravel if the most able employees are not willing to engage in profit sharing. This suggests that labor market competition may force partnerships to adopt more productivity-based compensation.

Beyond the cross-sectional prediction that partnerships should be most prevalent in

the professional services, our model generates a variety of more detailed implications for the structure of partnerships. In Section 5, we show how common features of partnerships such as up-or-out promotion systems and non-compete clauses can be interpreted as part of a partnership's quality commitment mechanism. We also consider how physical capital requirements or wealth limitations of prospective partners might favor a corporate form. Finally, we connect the model with some recent trends away from the traditional partnership structure in investment banking and law. To do this, we combine insights from the basic model with our analysis of labor market competition.

Though the literature does not offer a commonly accepted reason for why partnerships are observed in some industries but not others, several papers relate to this question. Starting with the influential work of Alchian and Demsetz (1972), much research has focused on the incentive aspects of profit-sharing and the role of productivity measurement in determining organizational form. Alchian and Demsetz, for instance, write that "[w]hile it is relatively easy to manage or direct the loading of trucks by a team of dock workers where input activity is so highly related in an obvious way to output, it is more difficult to manage and direct a lawyer in the preparation and presentation of a case." (p.786). They conclude that such professionals will be less likely to be organized as traditional capitalist firms.

In his broad study of ownership patterns, Hansmann (1996) takes aim at this incentive hypothesis, arguing that "[i]n the service professions, where employee ownership is the norm, the productivity of individual employees can be, and generally is, monitored remarkably closely, because the quantity and quality of each individual's inputs and outputs can be observed with relative ease." (p. 70). Hansmann goes on to suggest that "there must be other factors that are much more important in determining the distribution of employee ownership, since the types of firms in which employee ownership is most common seem to be firms in which employee monitoring is relatively easy." (p. 71).

Our theory departs from this line of research by emphasizing the effect of profit-sharing on the selection of employees rather than on their motivation. The model does allow a role for informational imperfections, but the monitoring problem is *between* the firm and prospective clients rather than *within* the firm. That is not to say that incentive problems are not important in the professional services or that there might not be more effective financial compensation schemes than the equal sharing of profits (see for instance Holmstrom, 1982). Rather, our emphasis on assembling talented employees is consistent with the view that financial compensation is just one aspect of motivation, and implicit incentives, reputation, and social pressure may be able to substitute for

direct productivity-based pay in some cases.[2]

The model we develop also relates to a large literature on labor-managed firms. That literature, which builds on Ward's early paper, concentrates primarily on industrial cooperatives rather than professional partnerships, with emphasis on the idea that labor-managed firms might react differently to input price changes or other shocks. Typically, the question of why one organizational form would be chosen over another is not considered. A notable exception is Miyazaki (1984), who argues that labor-managed firms do a better job of insuring employees. As a result, firms may convert to labor management in the face of short-run financial difficulties, but convert back to a corporate form in the long run.[3] A problem with applying this story to the professional services is that most existing partnerships started as partnerships rather than converting in the face of financial distress, and many have been successful for years without switching to a corporate form.

One might also argue that some individuals simply prefer organizing as a partnership. However, given the paucity of labor-managed firms outside of professional services (the Washington state plywood firms studied by Pencavel and Craig, 1993, are a rare exception), the most basic preference story would lead one to conclude that consultants and investment bankers systematically care more about being partners and less about profits than employees of manufacturing firms.

2 A Monopoly Model

2.1 Technology, Preferences and Information

Consider a continuum of agents, of unit measure, whose abilities are distributed on the interval $[\underline{a}, \overline{a}]$ with continuous distribution $F(\cdot)$ and positive density $f(\cdot)$. Each agent has access to an outside labor market that pays a fixed wage $w \in (\underline{a}, \overline{a})$, independent of ability. As we show in the next section, the constant wage simplifies the analysis, but is not crucial to the main results.

[2] Kandel and Lazear (1992) argue that sociological motivators such as guilt and shame can often overcome the free-rider problem in partnerships.

[3] Hansmann (1996) also argues that co-operatives will face decision-making problems if their membership is heterogeneous. Hart and Moore (1996) and Kremer (1997) develop models in which majority voting leads to ineffiency in consumer and worker co-operatives respectively. Dow (1993) considers a model of bargaining over quasi-rents with specific physical or human capital that provides another explanation for employee ownership.

The agents have access to a production technology that requires labor and a fixed capital cost $K > 0$.[4] If a (measurable) set A of agents are employed, the firm can produce a quantity $|A|$, equal to the probability measure of A. Its product quality equals the average ability of agents in A:

$$q(A) = \frac{1}{|A|} \int_{\tilde{a} \in A} \tilde{a} dF(\tilde{a}) .$$

The market for the firm's services is composed of a large number of identical clients. Each places a value on the firm's services equal to the expected quality of service. Thus, if the market knows that the firm has employed a set A of agent, willingness to pay is equal to

$$p(A) = q(A).$$

For many products, and certainly most professional services, consumers do not have perfect information about quality. We incorporate this informational asymmetry by assuming that the market observes the firm's quality only with probability μ. With probability $1-\mu$, the market cannot assess quality and instead forms an expectation A^e. Thus, depending on the market's information the market price commanded by the firm is either $p(A)$ or $p(A^e)$.

This simple formulation of information abstracts from important issues of signalling or reputation formation. Nevertheless, it captures the fundamental idea from such models that demand should depend both on the firm's actual choices and on the market's beliefs about these choices. When μ is higher, demand tracks more closely the firm's actual choices as opposed to the market's beliefs. We thus interpret μ as a measure of informational efficiency or market monitoring.

When choosing employees, the firm faces an expected price:

$$\mu p(A) + (1-\mu) p(A^e).$$

If the firm hires the set A, it will be able to sell a quantity $|A|$ of services irrespective of market monitoring.

Now suppose that the market correctly anticipates the firm's hiring choices (as will happen in a rational expectations equilibrium) or alternatively that $\mu = 1$. The firm's economic profits, or revenues net of capital costs and employees' opportunity costs

[4] This is a simple way of introducing increasing returns, a necessary condition for group production to dominate individual production. Other forms of increasing returns would suffice to yield our results.

(wages), can be written as:

$$\Pi(A) = \int_{a \in A} (a - w)\, dF(a) - K.$$

Economic profits are maximized by employing all agents with abilities $a \geq w$. To make the analysis interesting, we assume that if the firm makes first-best efficient hiring decisions and employs the set $A^{FB} = [w, \overline{a}]$, then $\Pi\left(A^{FB}\right) > 0$. We also assume that if the firm simply hires every agent, it will make negative economic profits, i.e. $\Pi([\underline{a}, \overline{a}]) < 0$.

Given this description of the production technology and the product market, we will characterize the *equilibrium* behavior of corporations and partnerships. We define a corporation in the standard neoclassical sense, as an entity that maximizes profits and must pay employees at least their reservation wage. We define a partnership as an organization in which members share profits equally.

The timing works as follows. Given the choice of organizational form, the market forms an expectation A^e of who will be employed. The firm then makes hiring decisions and selects A, which the market learns with probability μ. Finally, the market price is set and the firm produces. We consider the *rational expectations equilibrium* for both a corporation and a partnership, and then consider the optimal choice of organizational form.

Our view is that organizational form will be chosen to maximize the equilibrium profits of the organization. One justification for this is basic arbitrage. If a partnership existed, but a corporation would generate more profits, an entrepreneur would be willing to buy out the partnership and convert it to a corporation. Conversely, if a corporation existed, but a partnership would generate higher profits, a group of agents would be willing to buy out the owners of the corporation and convert the firm to a partnership. This suggests that optimal organizational form will maximize net economic surplus, which equals profits plus wages.

2.2 Corporation Equilibrium

A corporation makes hiring decisions to maximize profits. Since agents command the same outside wage, and since the expected price that the firm can charge is increasing in the quality of its employees, it is easy to see that a corporation will select the most qualified agents. Thus its optimal hiring strategy is to choose a threshold a and employ agents with abilities above a.

Slightly abusing our previous notation, let quality with threshold a be denoted:

$$q(a) = \frac{1}{1 - F(a)} \int_a^{\overline{a}} \tilde{a} dF(\tilde{a}),$$

while quantity is $1 - F(a)$. With similar notational abuse, let $p(a)$ denote the price if the market is informed, and $p(a^e)$ the price if the market has conjecture a^e.

Given beliefs a^e, the firm chooses its hiring threshold to maximize expected profits:

$$\pi(a, a^e) \equiv [1 - F(a)] [\mu p(a) + (1 - \mu) p(a^e) - w] - K.$$

The first order condition for a to be an optimal threshold is that:

$$\mu a + (1 - \mu) p(a^e) = w.$$

The corporation's optimal policy is to hire up to the point where the *expected* marginal product of the agent being hired is exactly equal to the wage. As the marginal product of each successive employee is decreasing, the hiring optimum is unique.[5]

In a rational expectations equilibrium, the market will correctly anticipate the firm's hiring choice. If a^* is the firm's hiring threshold, then in equilibrium, $p(a^e) = p(a^*)$. Combining this with optimization yields the corporation's equilibrium hiring threshold a^C:

$$\mu a^C + (1 - \mu) p\left(a^C\right) = w. \tag{1}$$

There is a natural relationship between market monitoring and equilibrium hiring. With perfect monitoring ($\mu = 1$), profit maximization dictates efficient hiring, $a^C = a^{FB} = w$. As monitoring becomes less effective, the firm internalizes less of any drop in quality, leading to a lower equilibrium hiring threshold $a^C < a^{FB}$.

Should it choose to operate, the corporation's equilibrium profits will be:

$$\pi(a^C, a^C) = \Pi(a^C) = \int_{a^C}^{\overline{a}} (a - w)\, dF(a) - K\,.$$

The corporation will want to operate in equilibrium if and only if $\Pi\left(a^C\right) > 0$.[6]

[5] If μ is sufficiently low, or beliefs are sufficiently optimistic, the first order condition may not hold for any $a \in [\underline{a}, \overline{a}]$. In this case, the unique solution is the corner solution $a = \underline{a}$.

[6] This statement implicitly supposes a weak sequential rationality condition on how beliefs are formed in equilibrium. The subtlety is the following. If $\Pi\left(a^C\right) > 0$, there is of course an equilibrium in which the firm operates, but (for levels of $\mu < 1$) there may be as second Nash equilibrium in which the firm chooses not to operate, and this behavior is supported by the market's belief that if the firm did choose to operate it would make a sub-optimal hiring choice (for instance — hire only the least qualified workers). We maintain the natural assumption that if the market sees the firm in operation, it believes the firm will make optimizing decisions. This sequential rationality requirement gives a unique equilibrium.

2.3 Partnership Equilibrium

In a partnership, each partner receives an equal share of profits. If the market's expectation of hiring is A^e, and a partnership is formed with a set A of partners, each partner obtains an equal share:

$$s(A, A^e) \equiv \mu p(A) + (1-\mu)p(A^e) - \frac{K}{|A|}.$$

The first two terms are the price per unit of labor; the last term represents the capital cost divided among the partners.

Given that the market price decreases in quality, and that agents command a uniform outside wage, it seems reasonable that a partnership will choose a partnership threshold in the same way a corporation chooses an employment threshold. To obtain such a characterization, we introduce the notion of *stability*. A stable partnership satisfies two natural requirements: First, individual rationality suggests that partners should get a share of profits that exceeds w. Second, the partners should not want to dismiss any current partners or admit additional partners. Formally,

Definition: A partnership $A \subset [\underline{a}, \overline{a}]$ is *stable* if $s(A, A^e) \geq w$, and there do not exist small $\varepsilon, \delta \geq 0$ such that a mass $|A| - \varepsilon$ of partners benefit by replacing a mass ε of members with a mass δ of non-members, each of whom is willing to join.

A straightforward argument shows that the only stable partnership will be the interval of agents $[a, \overline{a}]$ that achieves the maximum share per partner, subject to this share being above w.[7] Therefore, given market beliefs, the stable partnership solves:

$$\max_{a \in [\underline{a}, \overline{a}]} s(a, a^e) = \mu p(a) + (1-\mu)p(a^e) - \frac{K}{1-F(a)}.$$

The first-order condition for this problem is:

$$\mu a + (1-\mu)p(a^e) = \mu p(a) + (1-\mu)p(a^e) - \frac{K}{1-F(a)}.$$

[7] The key to seeing this is the following. If workers of ability a are included but those of ability $a' > a$ are not, then all partners other than those of ability a would prefer to replace some or all of the partners of ability a with new partners of ability a'. This raises the share per partner, so if agents were willing to participate in the earlier partnership, they will be willing to participate in the later one. This establishes that any stable partnership must be an interval $[a, \overline{a}]$. If all partners of ability $a' > a$ could increase their share from dropping those of the lowest ability, they would choose to do so.

The partnership hires up to the point where the marginal product of the last member is equal to the average profit share of the members already hired. As for the corporation, there is a unique solution.[8]

Combining partnership optimization with rational expectations yields an expression for the partnership's unique equilibrium hiring threshold a^P:

$$\mu a^P + (1-\mu)p\left(a^P\right) = p\left(a^P\right) - \frac{K}{1-F\left(a^P\right)}. \tag{2}$$

Again, there is a clear relationship between market monitoring and hiring. As for a corporation, worse monitoring leads to a decrease in the hiring threshold.

The partnership's economic profits are equal to

$$\Pi(a^P) = [1-F(a^P)] \cdot [s(a^P, a^P) - w] \ . \tag{3}$$

The partnership will be viable only if $\Pi(a^P) > 0$.

3 The Costs and Benefits of Partnerships

3.1 Comparative Analysis

Our first result compares the hiring incentives of a corporation and a partnership.

Proposition 1 *For any level of market information $\mu \in [0,1]$, and any market beliefs that allow positive profits, a corporation chooses a lower hiring threshold than a partnership.*

Proof. In solving both the corporation and partnership problems, we can restrict attention to choices of a for which $\pi(a, a^e) \geq 0$. Observe that the partnership is willing to lower its threshold slightly below some level a if and only if:

$$\mu a + (1-\mu)p(a^e) \geq \mu p(a) + (1-\mu)p(a^e) - \frac{K}{1-F(a)}.$$

But if this holds, and $s(a, a^e) \geq w$, then it must be that:

$$\mu a + (1-\mu)p(a^e) \geq w,$$

so the corporation also prefers to lower its threshold. Thus the corporation will choose a lower hiring threshold (and a strictly lower threshold if $a^P > \underline{a}$). *Q.E.D.*

[8] If μ is sufficiently low then it may be optimal for the partnership to choose $\underline{a}$.

Proposition 1 has a natural logic that echoes Ward's (1958) analysis. If adding a given agent increases the average economic profits *per employee*, then adding that agent must strictly increase the total economic profits. It follows that whatever hiring threshold a partnership sets, a corporation would prefer a lower threshold.

Our next result shows that this logic carries over from the firm's optimization problem to the equilibrium problem, and furthermore that corporations and partnerships will make identical shut-down decisions in equilibrium.

Proposition 2 *There is some $\underline{\mu} \in (0,1)$ such that if $\mu \leq \underline{\mu}$ neither a corporation nor a partnership could be profitable in equilibrium. If $\mu > \underline{\mu}$, both could be profitable and the corporation sets a strictly lower equilibrium hiring threshold, $a^C < a^P$.*

Proof. By the definition of profits, for any $a \in [\underline{a}, \overline{a}]$,

$$\Pi(a) \gtreqless 0 \qquad \Leftrightarrow \qquad p(a) - \frac{K}{1 - F(a)} \gtreqless w. \tag{4}$$

Notice that the LHS of both equilibrium conditions (1) and (2) is the same, and it is increasing in a. Furthermore, notice that for a given a, the RHS of (2) is greater (less) than the RHS of (1) if and only if profits are positive (negative). Combining (2) with (4) we obtain:

$$\Pi\left(a^P\right) \gtreqless 0 \qquad \Leftrightarrow \qquad a^P \gtreqless a^C,$$

and combining (1) with (4) we obtain:

$$\Pi\left(a^C\right) \gtreqless 0 \qquad \Leftrightarrow \qquad a^P \gtreqless a^C.$$

We conclude that for any given μ, $\Pi\left(a^P\right)$ has the same sign as $\Pi\left(a^C\right)$. That is, if the partnership obtains positive profits, so does the corporation and vice versa. To consider whether either is profitable for a given μ, it thus suffices to consider the corporation. If $\mu = 1$, then the corporation is profitable since $a^C = a^{FB}$, and by assumption $\Pi(a^{FB}) > 0$. If $\mu = 0$, the corporation is not profitable since $a^C = \underline{a}$ and $\Pi(\underline{a}) \leq 0$. As a^C is strictly increasing in μ, and $\Pi(a)$ is strictly increasing in a on $[\underline{a}, a^{FB})$, then there exists some $\underline{\mu} \in (0,1)$ such that the corporation will operate for all $\mu > \underline{\mu}$. *Q.E.D.*

As μ decreases from 1 to $\underline{\mu}$, a^C decreases from a^{FB}, and $\Pi\left(a^C\right)$ decreases from maximal profits to zero, while a^P decreases from some level above a^{FB}, so $\Pi\left(a^P\right)$ first increases up to maximal, and only then decreases to zero. This gives:

Proposition 3 *There exists some $\hat{\mu} \in (\underline{\mu}, 1)$ such that a partnership achieves strictly higher profits than a corporation if $\mu \in (\underline{\mu}, \hat{\mu})$, while a corporation achieves strictly higher profits than a partnership if $\mu \in (\hat{\mu}, 1]$.*

Proof. We know that $a^P > a^C$ for all $\mu \in (\underline{\mu}, 1]$, and that if $\mu = 1$, then $a^C = w$, so $\Pi\left(a^C\right)$ is maximal and greater than $\Pi\left(a^P\right)$. On the other hand, if

$$\mu = \mu^P = \frac{K}{\Pi(w) + K},$$

then $a^P = w$, so $\Pi\left(a^P\right)$ is maximal and $\Pi\left(a^P\right) > \Pi\left(a^C\right)$. Since $\Pi(\cdot)$ is concave, there is some $\hat{\mu} \in (\mu^P, 1)$ such that $\Pi(a^C) \gtreqless \Pi(a^P)$ whenever $\mu \gtreqless \hat{\mu}$. *Q.E.D.*

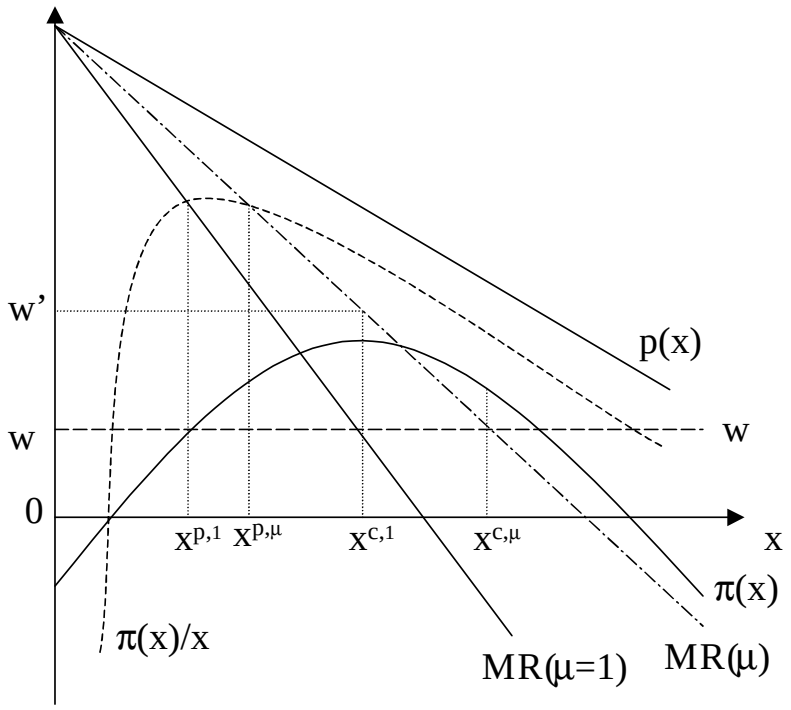
3.2 Discussion

Our result that partnerships are more profitable than corporations whenever market monitoring is sufficiently imperfect rests on three assumptions. First, there is a distribution of talent in the labor market, so that the selection of employees matters to clients. Second, the market has imperfect information about the firm's hiring decisions and the resulting quality of service. Finally, firms are able to commit to an organizational form, but are not able to make other commitments that affect employee selection, such as to pay above-market wages.

Given that wages are constant, the interplay of the first two assumptions can be tied neatly to the older literature on labor-managed firms and indeed, placed squarely in the context of standard monopoly theory. To see this, think of the firm as choosing a quantity x rather than a hiring threshold. Of course, any quantity $x \in [0, 1]$ has a corresponding threshold $a(x) = F^{-1}(1 - x)$. Let $p(x) \equiv p(a(x))$ be the market price when the market observes x, and $p(x^e)$ be the price when the market does not and instead believes the hiring threshold is $a(x^e)$. The firm's costs, in terms of quantity, are $w \cdot x + K$. Letting $MR(x) \equiv \mu x + (1 - \mu) p(x)$ denote the *rational expectations marginal revenue*, we have a twist on the standard monopoly problem.

Figure 1 provides an illustration. For a corporation, the equilibrium quantity x^C equates the rational expectations marginal revenue to the market wage w. In contrast, for a partnership, the equilibrium quantity x^P equates the rational expectations marginal revenue to a partner's share. When $\mu = 1$, a corporation is efficient, while a partnership is inefficiently small (i.e. of inefficiently high quality). The equilibrium choices with $\mu = 1$ are denoted in Figure 1 by x_1^C and x_1^P. This is precisely the problem studied

by Ward (1958) — as he observed more than four decades ago, the result is that the corporation earns higher profits.



Graphical illustration in price/quantity space

As μ drops below one, both a corporation and a partnership choose higher quantities (lower qualities). Consequently, the partnership's *total profits* are increasing, while the corporation's are decreasing. For some $\widehat{\mu}$ both organizational forms will generate the same total profits, and this is given by the quantities $x^C_{\widehat{\mu}}$ and $x^P_{\widehat{\mu}}$ respectively. As μ drops below $\widehat{\mu}$ the partnership will be more profitable than the corporation , until the shutdown value of $\underline{\mu}$. Thus, with imperfect market information, the partnership's tendency toward being selective compensates for the firm's incentive to reduce quality. The result is that a partnership is the more profitable form of organization.

This interpretation might convey the impression that the link between quality and quantity is essential to the theory. This is not the case. The next section shows that

when wages depend on ability, similar results obtain despite the fact that quality and quantity are not directly tied in equilibrium.

The final assumption driving our result is that a partnership operates as a commitment to share profits, while a corporation cannot commit to a specific wage policy. The key is that a partnership pays its threshold employee more than his marginal product while a corporation pays its threshold employee precisely his marginal product. Once one realizes this, it is clear that the equal sharing of profits is not crucial. Indeed, regardless of how the inframarginal partners distribute profits, the partnership will be more selective than a corporation so long as the marginal partner receives more than his marginal product.

In theory, a corporation might be able to find alternative commitment mechanisms to ensure quality. For example, committing to pay every employee a wage $w' > w$ would ensure a higher hiring threshold (although it might reduce equilibrium profits). However, such a commitment seems difficult to maintain in practice. A worker who is left unemployed due to the higher wage w' would be willing to accept an offer of w and would have no incentive to reveal this lower offer to the market. Thus, the market should rationally anticipate that firms will renege on their stated wage policy if possible, and hiring decisions will unravel to be those in the solution above. In practice, organizational form is usually more rigid. Once a partnership is formed and a charter is written, organizational changes tend to occur slowly and may be more visible.

4 Labor Market Competition

The model assumes that outside wages are not sensitive to an agent's ability. If there is competition for workers, however, it is natural to think that more talented employees will command higher outside wages. In this section, we consider the optimal hiring policy and choice of organizational form for a firm facing a set of workers whose wages increase with ability.[9]

While our main results remain intact, some new insights emerge. For instance, a corporation no longer hires the most able workers, but those for whom the gap between marginal product and outside wage is largest. In contrast, partnerships do attempt to hire the most talented workers but are susceptible to "unraveling" if the most able workers prefer their outside salaries to sharing profits with less able workers. This section

[9] In Levin and Tadelis (2002) we develop a free entry model that simultaneously endogenizes organizational form, hiring, and the equilibrium market wage as a function of ability.

also demonstrates that the link between quality and quantity is an artifact of the constant wage assumption rather than an important element for our results..

To capture the effects of labor market competition on wages, we assume that wages are given by an increasing and continuous function $w(a)$. If a firm hires all workers in the set A, and the market correctly anticipates this decision, economic profits are:

$$\int_{a \in A} (a - w(a)) dF(a) - K.$$

To ensure that hiring is meaningful for efficiency and profits, suppose that there exists some $\hat{a} \in (\underline{a}, \overline{a})$ such that $a \geq w(a)$ for all $a \geq \hat{a}$ and $a < w(a)$ for all $a < \hat{a}$. Efficiency then dictates that a worker should be employed if and only if $a \geq \hat{a}$. As above, we assume that if a firm hires efficiently in equilibrium, it will make sufficient profits to cover its fixed costs.

4.1 Corporation Equilibrium

Given a market expectation p^e, the corporation's optimal hiring policy is to employ all workers whose marginal product $\mu a + (1 - \mu)p^e$ is above their market wage $w(a)$. In certain non-generic cases, there may be a positive mass of agents whom the firm is just indifferent to hiring. Because of this, the optimal hiring policy need not be unique. Let $\mathcal{A}(p^e, \mu)$ denote the collection of optimal hiring sets. If $A \in \mathcal{A}(p^e, \mu)$, then

$$a \in A \qquad \Rightarrow \qquad \mu a + (1 - \mu)p^e \geq w(a)$$

and

$$a \in A \qquad \Leftarrow \qquad \mu a + (1 - \mu)p^e > w(a).$$

In a rational expectations equilibrium, the market correctly anticipates the firm's hiring decision. Thus a set of workers A corresponds to equilibrium hiring if $A \in \mathcal{A}(p(A), \mu)$.

While an equilibrium always exists in this more general setting, there may no longer be a unique equilibrium. For each μ, we consider the equilibrium most favorable to the firm — this is also the equilibrium with highest quality.

Proposition 4 *There exists some $\underline{\mu} \in (0, 1)$ such that a corporation is profitable in equilibrium if and only if $\mu > \underline{\mu}$. Furthermore, a corporation's equilibrium quality and profits are increasing in μ. The corporation is efficient if $\mu = 1$.*

The intuition for this result follows from considering the firm's best response to a given market expectation. Consider the change in the profit from employing a worker of ability a when market monitoring increases from μ to μ'. The change is positive if $a > p^e$, and negative if $a < p^e$. That is, good workers become relatively more valuable and bad workers relatively less valuable when market monitoring increases. We show in the Appendix that this intuition can be extended to show that the average quality of employees hired in equilibrium increases with market monitoring.

4.2 Partnership Equilibrium

To consider the problem of partnership formation, we first note that our definition of a stable partnership is easily adopted to this more general environment. Given an expectation p^e, a partnership A is stable if (i) the resulting partnership share is greater than the outside wage of each partner, and (ii) partners would not benefit from dropping some existing partners and replacing them with some new partners, each of whom is willing to join.

It is easy to see that any stable partnership must be an interval.[10] Indeed, in many cases, the stable partnership considered in the previous section will still be a stable partnership under rational expectations. Given μ, let $a^P(\mu)$ be the equilibrium threshold partner from the previous section, i.e. that solves (2).

Proposition 5 *The partnership $[a^P(\mu), \overline{a}]$ is stable if and only if $s(a^P(\mu), a^P(\mu)) \geq w(\overline{a})$. More generally, for a given μ, the interval $A = [a, a']$ is stable under rational expectations if and only if (i) $\mu a + (1-\mu)p(A) = s(A, A)$, (ii) $s(A, A) = w(a')$ (or $\geq$ if $a' = \overline{a}$).*

The important observation here is that labor market competition affects partnerships quite differently from the way it affects corporations. While a corporation may be tempted to employ low ability but cheap workers, a partnership will always want to add the highest ability workers. The problem faced by partnerships is that the highest ability workers may not want to engage in profit-sharing with agents who are less talented. As a result, a partnership may unravel as the best partners opt out. In some

[10] To see this, note that given any market expectation, if a and a'' are included, but a' is not, where $a < a' < a''$, then by replacing some or all members of ability a with new partners of ability a', the average share can be increased. Morever, as the previous share was greater than $w(a'')$ then the new share will certainly be greater than $w(a')$.

cases, this unraveling is complete. If the top partnership $[a^P, \overline{a}]$ is not stable, then no inferior partnership is stable.

The conditions in Proposition 5 for a partnership to be stable under rational expectations are easy to understand. First, the worst partner must generate profit exactly equal to a partner share. Second, the share is just enough to compensate the best partner.

4.3 Comparing Partnerships and Corporations

To compare partnerships and corporations for a given level of market monitoring, we focus on comparing the highest quality equilibrium corporation with the highest quality equilibrium partnership. In particular, we focus on the top partnership $[a^P, \overline{a}]$.

Putting aside the question of whether the top partnership is feasible (i.e. whether $s(a^P, a^P) \geq w(\overline{a})$), note that if $\mu = 1$, then the corporation is efficient, while the partnership is of higher than efficient quality. As μ decreases, Proposition 4 implies that the corporation's quality and its profits also decrease. The partnership's quality and partner share also decrease when μ decreases, but the partnership's total profits first increase and then decrease. As in the previous section, there is some cut-off $\hat{\mu}$ such that a corporation is more profitable than a partnership if and only if $\mu \geq \hat{\mu}$. Again we expect to see the partnership form chosen when market monitoring is sufficiently imperfect.

The caveat to this comparison is that a partnership may not be feasible despite generating higher total profits than a corporation. In particular, a partnership of the highest ability agents will be stable in equilibrium only if μ is sufficiently high so that each partner's share exceeds $w(\overline{a})$. In this sense, the model predicts that intense competition for the best agents will tend to favor the corporate form.

4.4 Partnerships, Profit-Sharing and Acquisitions

Our analysis treats the choice of organizational form as a once and for all decision. In practice, however, existing organizations change their form, most often converting from partnership to corporate form. Our model suggests that two changes — a more informed set of clients or a more competitive labor market might naturally inspire such a change.

One way a partnership might convert to corporate form is by making a public equity offering or by selling to an outside acquirer. In either case, the resulting organization will make decisions to maximize profits rather than the share of each partner. In particular, it will have an incentive to hire additional (or perhaps different) employees. Assuming that the acquirer would, under rational expectations, end up making corporation profits, an

acquisition would be profitable if and only if corporate profits exceed the price demanded by the partners for a sale.

What price would the partners demand? The most stringent condition is that the partners would need to unanimously agree. In this case, the acquirer would need to offer each partner he intends to continue employing at least the partnership share, and each partner he intends to dismiss at least the difference between the partner share and their market wage. To have sufficient money to do this and still make a profit, the corporation profits would need to just exceed the partnership profits.

In practice, changes in labor market competition might not induce a sell-out, but rather a change in the partnership's compensation structure. Suppose that labor market pressures threaten to skim the best partners, undermining the stability of a partnership. A response would be to relax equal sharing and implement some form of productivity based compensation. This sort of change appears to have occurred in many law firms, as we discuss below.

5 Discussion

In this section we relate the model to some stylized empirical facts and to some recent changes in professional service firms. We then discuss a few aspects of partnerships that are ignored by our model.

5.1 Partnerships in Practice

At the outset, we observed that partnerships have been the traditional mode of organization in the professional services, despite being relatively rare in other industries. Our model explains this by showing that the combination of significant quality uncertainty on the part of clients and a close relationship between human capital and quality, two features that we believe characterize the professional services, make partnerships a desirable form of organization.

The theory suggests that when the quality of a service is harder to evaluate, this service is more likely to be supplied by partnerships. Some rough census numbers support this prediction. Table 1 reports statistics on the legal form of organization across sectors taken from the 1997 Economic Census. Consistent with casual empiricism, there are hardly any partnerships in retail trade, transportation and warehousing (high μ sectors), but a significant number in professional, scientific and technical services.

Table 1: Percent of business performed by legal organization*

Sector	% corp	% part.	% sole	% other
Retail Trade - 44-45	90.47	2.82	4.87	1.84
Transportation and Warehousing - 48-49	93.43	2.15	3.41	1.01
Professional, Scientific & Technical Services - 54	75.93	18.32	5.36	0.39
Offices of lawyers - 54111	39.96	47.51	12.28	0.25
Accounting, taxes, etc. - 5412	47.31	44.80	7.44	0.45
CPA offices - 541211	31.90	60.85	7.00	0.25
Tax return prep. - 541213	66.66	4.42	28.86	0.06
Architectural, engineering, etc. - 5413	92.35	4.33	3.08	0.25
Architectural services - 54131	82.42	9.18	8.29	0.11
Engineering services - 54133	94.42	3.68	1.45	1.67
Geoph. surveying & mapping - 54136	95.78	1.14	17.07	0.61
Mgmt, sci. & tech. consulting - 5416	80.25	15.95	3.12	0.68
Admin mngmnt cons. - 541611	68.74	28.42	2.25	0.58
HR & exec. search cons. - 541612	90.44	4.81	4.28	0.46
Process, dist. & log. cons. - 541614	84.07	12.72	1.53	1.68

* Source: U.S. Census Bureau, 1997 Economic Census report, Establishment/Firm Size, Legal Form

Note that within the professional service sector there is further variation that agrees with our model's predictions. For instance, within accounting, firms that offer individual tax form preparation (high μ) are unlikely to be partnerships, while a majority of CPA firms that perform complex accounting tasks (low μ) are organized as partnerships. Another example is architectural and engineering firms. Architectural services are generally hard to evaluate relative to engineering and surveying services. Similarly in consulting, administrative and management consulting is relatively complex compared to process and production consulting, which in turn is harder to evaluate than human resource services (head hunting). Table 1 shows that in all these case, the distribution of partnerships moves in accordance with our predictions.

Recent Trends in the Professional Services

The prevalence of partnerships in the professional services dates back at least to the beginning of the twentieth century. The past two decades, however, have seen striking organizational changes in some of these industries. We briefly discuss these changes in

light of our theory.

Both anecdotal and empirical evidence suggests that law firms increasingly have moved away from the traditional method of lock-step or seniority-based profit-sharing (the "Cravath model") in favor of productivity-based, "eat-what-you-kill" forms of profit-sharing (Altman Weil, 2000). These changes have made firms less like the partnerships we have modeled and more corporate — although it should be emphasized that even law firms that use productivity measures in compensation often do a great deal of re-distribution. Our analysis suggests several possible explanations for this trend: re-distribution may have become less sustainable due to competition in the labor market or changes in the returns to talent; alternatively, changes in market information might have made a commitment to equal-sharing less valuable.

Though we do not know of a comprehensive empirical study, there is some evidence of a competitive trend in the labor market for lawyers. One commonly referenced cause is the changing role of in-house counsel. Gilson and Mnookin (1985) write that "twenty years ago, the chief in-house lawyer for a corporation was commonly viewed as a competent professional who probably would not quite measure up to partnership quality... Today, however, corporations regularly persuade important partners in major law firms to resign from the partnership to become general counsel." (p. 382) To the extent that this change led to a more active market for senior lawyers, our analysis suggests that top lawyers in firms with equal-sharing compensation might credibly threaten to leave if compensation practices were not altered. Interestingly, a second consequence of better in-house counsel suggested by Gilson and Mnookin is that firms become more discriminating consumers. In the context of our model, this could be seen a better monitoring (higher μ) that would also push toward a more corporate form.

Beyond the changing role of in-house counsel, changes in the sharing structure of law partnerships have also coincide with an increase in litigation awards and in some accounts to more star oriented firms. To the extent that this might allow some partners to demand larger salaries — for instance, by threatening to start their own firms — this change could also lead to the sort of unraveling we considered in the previous section. Thus, a change in the returns to ability or specialty could provide another explanation for the move toward productivity-based compensation.

Law firms are not the only professional service firms to become more corporate in recent years. In the financial services industry, virtually all the major investment banks have sold their partnerships to outside investors. In the period from 1981 to 1986, these sales included Salomon Brothers, Lehmann Brothers, Kidder Peabody, Bear Stearns,

Dean Witter and Morgan Stanley. This remarkable transformation coincided with several changes in the industry — the introduction of trading in risky derivatives and the opening of international markets, which some argue required firms to have larger capital bases, a much more mobile and competitive labor market, and rapid growth and then consolidation of the major firms. To the extent that our model relates the corporate form to a more competitive labor market and an increase in optimal firm size, the simultaneity of these changes seems consistent with our basic story. Below, we argue that increased capital requirements also favor the corporate form.[11]

5.2 Features of Partnerships

Capital Requirements

A notable feature of many professional service firms is that they are not capital-intensive.[12] Thus, one might ask whether capital requirements are related to the distribution of partnerships across industries. Of course, the relationship is not perfect — in many low-capital industries, the corporate form is standard. For instance, the software industry has very low capital requirements, but very few partnerships.[13] Still, the correlation suggests looking for a reason why partnerships might be at a disadvantage in raising capital. As it turns out, our model suggest a very simple reason why partnerships might have trouble at least raising equity finance.

To see why, suppose a partnership could sell a stake (e.g. a claim on some percent of profits) to outside shareholders. The immediate problem that arises is that these shareholders now have a different objective than the partners. While the partners want to keep average profitability high, the shareholders are interested in total profits — they are likely to want to expand the firm at the cost of lower quality. How this conflict plays out depends on how control is allocated, but it seems clear that such a conflict would

[11] Interestingly, many advertising partnerships sold out at a similar point in time (and there was significant growth in major firms). There also have been significant changes in the structure of medical practices. A full discussion of these changes is beyond the scope of this paper.

[12] One notable exception is that some medical partnerships have significant investments in specialized equipment, though this equipment is sometimes leased. As we mentioned above, investment banks have become more capital intensive, a change that coincided with partnership sales.

[13] See U.S. Census. In light of our model, software is a product that is relatively easy for the market to assess, despite the importance of human capital in its production. So a partnership arrangement would not have an important benefit. Enterprise software (large specialized programs) might be somewhat different, although typically the product is purchased in stages and can be tested before payments are made (unlike for instance medical care where quality may not be known for years if ever).

be likely to have adverse consequences.[14] Thus, one story for why investment banks sold out their partnerships in the 1980s is that they felt compelled to raise capital and saw a sale to outside shareholders as the best avenue to do this. (Interestingly, a main exception to the trend was Goldman Sachs, which was able to raise a significant amount of equity finance without dissolving its partnership.)

Up-or-Out Promotion Schemes

A common feature of many partnerships, particularly in law, is the use of up-or-out promotion schemes at the point when associates reach partner level. If we take a more dynamic view of our model, we can suggest a simple explanation for this. Specifically, imagine that firms do not learn the actual talent of employees immediately (when they are hired) but rather after some initial employment period. Under this interpretation, the hiring decision in our model can be interpreted as a promotion to partner decision. Indeed, in an earlier version of this paper, we used exactly this approach with young employees joining the firm at a low wage (an "entry fee") and then being promoted to partner if they turned out to be above the threshold for promotion.

In this light, an up-or-out promotion scheme can be an integral part of a partnership's commitment to guaranteeing the high quality of long-term employees. Because current partners will promote only the best associates to a full partner share, those that are not of extremely high quality will be let go even if they might make a positive contribution to the firm's total profits. To the extent that partnerships can retain senior employees without promoting them to partner, some of the commitment to quality is lost. At the same time, if partnerships do less profit re-distribution (e.g. move toward more productivity-based compensation), the title of partner becomes less meaningful and the up-or-out system becomes less important.[15]

This interpretation seems consistent with recent trends in law firms. In many firms, changes in the compensation structure have been accompanied by a relaxation of the up-or-out system. As Gilson and Mnookin put it: "firms are creating new categories of employee lawyers ... permanent associate, staff lawyer, special council, non-equity partner, junior partner" (1989, p.567). The idea that an up-or-out system would become less

[14] This assumes that outside shareholders buy a fixed fraction of the equity rather than join on as "passive" partners. However, there would be an incentive to lower quality even if outside shareholders bought partner shares because productive partners would feel less of a dilution effect from marginal hires.

[15] Kahn and Huberman (1988) propose a different role for up-or-out schemes by showing that they can mitigate a form of hold-up involving human capital investment. However, they do not have results suggesting that we should see this form of promotion in partnerships but not corporations.

attractive once the compensation scheme involved less strict re-distribution fits naturally with our theory.

Non-Compete Clauses

A non-compete clause in a labor contract specifies that if an employee leaves a firm, he cannot practice in the same profession within some time period and geographical location. Many partnerships include some form of non-compete clause in their contracts.[16] One interpretation stemming from incentive theory is that these clauses might be in place to mitigate hold-up problems in general human capital investment. For example, if a law firm makes a large investment to train an associate, this investment could be lost if the associate leaves and a non-compete clause might be useful to alleviate this hold-up. However, this account looks weak once one observes that non-compete clauses are generally signed at the late stage when employees join as partners or are promoted to partner.

In the context of our model, non-compete clauses might play a different role, namely to prevent employees from taking up lucrative outside options rather than sharing profits with the other partners. In this account, the usefulness of such a clause turns on the employee not having precise knowledge of his future alternatives at the time of becoming a partner. If this were known, the worker would demand at least his outside wage as a condition for becoming a partner in a given firm. If there is uncertainty, however, a prospective partner might sign a non-compete clause that could eventually become binding in the event that attractive outside opportunities arose. In such an environment, a non-compete clause can play an important role: by hindering departure, they protect the partnership against the danger of unraveling.

5.3 Legal and Tax Issues

While our theory emphasizes functional differences between partnerships and corporations, there is also a distinction between partnerships and corporations as legal entities.

[16] A recent highly publicized example is Arthur Andersen. It is sometimes argued that non-compete clauses are a violation of antitrust law, but an exception seems to be made for professional partnerships. For instance, in Rash v. Toccoa Clinic Med. Assoc., 253 Ga. 322, 320 S.E.2d 170 (1984), the Georgia Supreme Court ruled that partners should receive particular leeway to make mutually beneficial covenants as the partners are in an equal bargaining position. In particular, the court upheld an agreement that prohibited physicians in a medical practice from leaving to practice within twenty-five miles of Toccoa, Georgia, for three years (see Grady, 1997).

In principle, a firm can legally be defined as a partnership without doing significant profit sharing.[17] Similarly, a firm can legally be defined as a corporation yet implement significant profit sharing using wage bonuses. In practice, however, there is a significant correlation between the legal status and the lay distinction that we employ.

Our sense is that a firm's choice of legal status tends to follow its functional organization. Nevertheless, a firm's legal status may have liability, tax and regulatory consequences. In this section we briefly discuss these issues and argue that none of them can on their explain the observed distribution of partnerships across industries.

Limited Liability

A prominent feature of the traditional General Partnership is the unlimited liability of the partners. In theory, the presence of unlimited liability might make partnerships either more or less attractive as an organizational form. Unlimited liability places partners at increased risk of financial ruin, but it does provide clients with a strong signal of each partner's belief in her own and her colleagues ability. In practice, unlimited liability seems to be a cost of the partnership form rather than an explanation for its use. In particular, since the recent introduction of legal form options such as the limited liability partnership (LLP) and limited liability company (LLC), unlimited liability partnerships are rarely seen in the professional service.[18] Indeed, even prior to the introduction of these forms, partnerships were able to purchase liability insurance — although unfortunately we do not know of evidence on how widespread this was.

Taxes

Tax law also distinguishes between partnerships and corporations, and hence provides another possible motive for choosing a partnership as one's legal form of organization. A main distinction is that, relative to a corporation, partnerships are free from the corporate income tax and thus can avoid the "double taxation" that results from paying both this tax and individual taxes on dividends. (Note that this distinction is relative to C-corporations — subchapter S-corporations, Limited Liability Companies and Sole Proprietorships are taxed in the same way as partnerships.)

[17] Historically this was not the case. As late as the 1950s firms lost their legal partnership status for attempting to depart too radically from equal-sharing. Currently, if parties organize as a partnership, equal sharing of profits is the legal default, but this default can be contracted around.

[18] The LLC was introduced by Wyoming in 1977, but did not receive partnership (flow-through) tax treatment from the IRS until 1988, after which it was recognized in many states. The LLP was introduced in Texas in 1991 and most states rapidly followed.

However, while this distinction is surely important for certain investment vehicles, it seems unlikely to be the sole explanation for the observed distribution of partnerships across industries. In particular, the differential tax treatment applies in all sectors, rather than just the professional sectors. It is also relatively straightforward for C-corporations to distribute earnings in such a way that makes the double taxation problem all but disappear. Note also that once a company decides to issue stock and go public, it is taxed as a C-corporation regardless of its original legal form.[19]

Legal Constraints

While firms nearly always have freedom in choosing between organizational forms (see Hansmann, 1996, p. 85 for a discussion), there is one striking case where state law constrains organizational form. In most states, law firms are prohibited from having "layman" equity investors (though they need not be wholly owned by their practicing partners). A remarkable feature of these laws is that they are to some extent self-imposed — they stem directly from the guidelines of the American Bar Association, the professional association of lawyers.

In the ABA's Model Rules for Professional Conduct, lawyers are prohibited from practicing in a for profit corporation if non-lawyers have decision stakes in the firm (rule 5.4(d)). This is part of a broader rule (5.4) that Hazard and Hodes (1989) interpret as "[protecting] clients by increasing the likelihood that they will receive competent professional services." Our model is consistent with Hazard and Hodes in that we argue that partnerships will give rise to a higher quality than corporations. As we show, partnerships can also have the benefit of generating not just higher quality for clients, but higher profits for lawyers.[20]

6 Conclusion

In this paper, we consider firms in which production is based on human capital. Relative to standard profit-maximizing corporation, profit sharing partnerships are more selective

[19] Moreover, in recent years the tax code has evolved in such a way that corporations and partnership can practically face the same type of tax schedules given that they are carefully designed. (We thank Joe Bankman from the Stanford Law school for this information.)

[20] One might wonder why the industry would need regulation to ensure the partnership form if individual firms would choose it directly. If lawyers had some "collective reputation" that could be hurt by rogue firms, a centralized regulation would be desirable to ensure quality.

in hiring, resulting in a higher level of quality than is dictated by profit maximization. This quality commitment pays off if clients cannot perfectly observe in advance what they are buying. We used this insight to show that in markets where clients may not be able to monitor quality well, partnerships emerge as a desirable form of organization. We also discussed the impact of labor market competition in upsetting partnerships, and used the model to explain features of partnerships such as non-compete clauses and up-or-out promotion.

Our analysis leaves open several issues. First, we do not address the internal structure of production, in particular, the allocation of client work within a partnership or corporation. A step in this direction is taken by Garicano and Santos (2001). Second, decision rights are not emphasized in our model. This is because in an equal sharing partnership with no outside financing, all partners have the same objective. Once one moves away from strict equal sharing, the structure of decision rights becomes important. This is an important topic for future research.

Appendix

Proof of Proposition 4. Given market expectation p^e and monitoring μ, define $Z(p^e, \mu) = \{a : \mu a + (1-\mu)p^e - w(a) = 0\}$ to be the set of agents who generate zero profit. If $Z(p^e, \mu)$ is zero measure, then there is a unique optimal hiring policy (which may be the null set). On the other hand, there may be non-generic cases where $Z(p^e, \mu)$ is of positive measure. In this case, $\mathcal{A}(p^e, \mu)$ is set-valued. This is the one complicating factor in the arguments that follow.

To prove the proposition, it is convenient to define the mapping from expected quality to actual quality induced by optimal hiring. Let $\phi(p^e, \mu)$ denote the set of average qualities consistent with optimal hiring given p^e and μ. Thus, $p \in \phi(p^e, \mu)$ if and only if $p = p(A)$ for some $A \in \mathcal{A}(p^e, \mu)$. The image $\phi(p^e, \mu)$ is single-valued (set-valued) whenever $\mathcal{A}(p^e, \mu)$ is single-valued (set-valued).

PROPERTIES OF ϕ. We show that: *(i)* ϕ is convex-valued; *(ii)* ϕ is upper semi-continuous in p^e; and *(iii)* ϕ is increasing (in an appropriate sense) in μ.

(i) ϕ is convex-valued. Fix p^e and μ. Suppose $p_1, p_2 \in \phi(p^e, \mu)$ and A_1 and A_2 are the corresponding optimal hiring sets. Then A_1 and A_2 differ only in which elements of $Z(p^e, \mu)$ they contain. Of course, if $Z(p^e, \mu)$ is zero measure, then $p_1 = p_2$. If not, then we can construct an optimal hiring set with any quality p between p_1 and p_2 by

including all agents in $A_1 \cap A_2$ along with an appropriate subset of $Z(p^e, \mu)$.

(ii) ϕ is upper semi-continuous in p^e. Consider a sequence $p^e_n \to p^e$ and a corresponding sequence $p_n \to p$ with $p_n \in \phi(p^e_n, \mu)$ for all n. Let A_n denote the optimal hiring set associated with p_n. We want to show that $p \in \phi(p^e, \mu)$. (We will assume that for each p^e_n, the firm does want to hire some agents, but the argument is easily adopted to the case where no hiring is optimal.) If there is a unique optimal hiring policy, the argument is straightforward. For each a, if $\mu a + (1-\mu)p^e - w(a)$ is strictly positive or strictly negative, it will also be strictly positive or negative if p^e is replaced by p^e_n for n sufficiently large. Thus the sets A_n will converge to a set A with $A \in \mathcal{A}(p^e, \mu)$ and $p = p(A)$. (Specifically, $A_n \to A$ if $\mathcal{L}(\{A_n \cup A\} \backslash \{A_n \cap A\}) \to 0$, where $\mathcal{L}$ is the Lebesgue measure.) Things are slightly more complex if there are a positive mass of agents for whom $\mu a + (1-\mu)p^e - w(a) = 0$ — i.e. if $Z(p^e, \mu)$ is of positive measure. In this case, to generate the limiting optimal hiring set A, we need to decide which subset of $Z(p^e, \mu)$ to include in A. To do this, let A include all $a \in Z(p^e, \mu)$ if $p^e_n \to p^e$ from above, and let A include no $a \in Z(p^e, \mu)$ if $p^e_n \to p^e$ from below. This ensures that the sets A_n converge to a set $A \in \mathcal{A}(p^e, \mu)$ and that $p_n \to p = p(A)$.

(iii) ϕ is increasing in μ in the following sense: if $\mu' > \mu$, $p \in \phi(p, \mu)$, and $p' \in \phi(p, \mu')$, then $p' \geq p$. To see this, let A and A' be optimal hiring sets associated with p and p'. Now, note that starting from monitoring μ, and *any* expectation p^e, the returns to hiring worker a increase when monitoring increases to μ' if and only if $a > p^e$. Specifically, suppose $p^e = p = p(A)$. Then if $a \in A \backslash A'$, it must be that $a \leq p(A)$, while if $a \in A' \backslash A$, then $a \geq p(A)$. The result is immediate. Moreover, a similar argument implies that if $p' \in \phi(p', \mu')$ and $p \in \phi(p', \mu)$ then $p \leq p'$.

Equilibrium Comparative Statics. Given μ, there is an equilibrium corporation of quality p if and only if $p \in \phi(p, \mu)$ and the firm makes sufficient profits given expectation p, monitoring μ and optimal hiring to cover fixed costs. Using this fact, we show that *(i)* equilibrium quality is increasing in μ; and *(ii)* equilibrium profits are increasing in μ.

(i) Equilibrium quality increases in μ. Given the continuity of ϕ in p^e, and the monotonicity of ϕ in μ, arguments analogous to those in Milgrom and Roberts (1994) imply that the highest fixed point of the map $\phi(\cdot, \mu') : [\underline{a}, \overline{a}] \rightrightarrows [\underline{a}, \overline{a}]$ is at least as high than the highest fixed point of the map $\phi(\cdot, \mu)$ if $\mu' > \mu$. Thus the quality of the highest quality equilibrium corporation is increasing in the accuracy of monitoring. This will apply for any two values μ' and μ where the firm chooses to operate in equilibrium. As we note below, for sufficiently low μ, the firm may simply choose not to operate in

equilibrium.

(ii) Equilibrium profits increase in μ. Suppose $\mu' > \mu$ and A', A are the highest quality equilibrium corporations associated with μ' and μ. We show that if $a \in A \backslash A'$ then a makes a negative contribution to equilibrium profits, while if $a \in A' \backslash A$, then a makes a positive contribution to equilibrium profits.

Suppose that $a \in A \backslash A'$. Then $\mu a + (1-\mu)p(A) - w(a) \geq 0$ but $\mu' a + (1-\mu')p(A') - w(a) < 0$. Combining these two inequalities with the just-established fact that $p(A') \geq p(A)$, we obtain $a < p(A)$. As a consequence $a < p(A')$. But then

$$0 > \mu' a + (1-\mu')p(A') - w(a) \geq \mu' a + (1-\mu')a - w(a) = a - w(a).$$

Conversely, suppose that $a \in A' \backslash A$. Then $\mu a + (1-\mu)p(A) - w(a) < 0$ and $\mu' a + (1-\mu')p(A') - w(a) \geq 0$. Combining these inequalities with the fact that $p(A') > p(A)$ implies that $a > p(A')$. But then

$$0 \leq \mu' a + (1-\mu')p(A') - w(a) < \mu' a + (1-\mu')a - w(a) = a - w(a).$$

Thus equilibrium profits are higher at μ' than at μ.

It follows that ignoring the recovery of fixed costs, equilibrium profits are increasing in μ. If $\mu = 1$, the corporation hires efficiently and by assumption can operate profitably. For sufficiently low μ, the corporation may not be able to cover fixed costs. In particular, there may exist some $\underline{\mu}$ such that if $\mu < \underline{\mu}$, a corporation will not operate in equilibrium while for values of μ above $\underline{\mu}$, the corporation will choose to operate in equilibrium and quality and profits will increase with μ. *Q.E.D.*

Proof of Proposition 5. Fix μ and consider the partnership $[a^P(\mu), \overline{a}]$. Assume first that $s(a^P(\mu), a^P(\mu)) \geq w(\overline{a})$. Then $s(a^P(\mu), a^P(\mu)) \geq w(a)$ for any $a \in [a^P(\mu), \overline{a}]$ so no partner wants to leave. Moreover, by the arguments in Section 2.3, the partners do not want to add or subtract members implying that the partnership is stable. Conversely, if $s(a^P(\mu), a^P(\mu)) < w(\overline{a})$, then at least some partners (i.e. the best) want to leave, so the partnership $[a^P(\mu), \overline{a}]$ is not stable.

For the second part of the Proposition, fix a market expectation p^e and a level of market monitoring μ and consider a candidate partnership $A = [a, a']$. If the partnership is stable, then existing partners must not want to expand just below a or contract just above a, that is:

$$\mu a + (1-\mu)p^e = s(A, A^e).$$

Moreover, it must be the case that the best partner is willing to participate, $s(A, A^e) \geq w(a')$ but that no better agent would want to participate $s(A, A^e) < w(a'')$ for any $a'' > a'$ (because $w(\cdot)$ is continuous, this means that if $a' < \overline{a}$, then $s(A, A^e) = w(a')$). This means conditions (i) and (ii) are necessary for equilibrium stability.

Conversely, if conditions (i) and (ii) hold, given a market expectation $p^e = p(A)$, the collection of agents A will not want to dismiss any members nor add any individual $a'' < a$. Moreover, because $w(\cdot)$ is increasing, no individual $a'' > a'$ is willing to join. *Q.E.D.*

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