Financing Professional Partnerships

by

Linus Wilson
Department of Economics & Finance
University of Louisiana at Lafayette
B. I. Moody III College of Business
214 Hebrard Boulevard, Moody Hall 326
P. O. Box 44570
Lafayette, LA 70504-4570
Phone: (337) 482-6209
Fax: (337) 482-6675
E-mail: linuswilson [at] louisiana [dot] edu
Web: http://www.linuswilson.com/

First Draft: December 2003
This Draft: January 2008

Financing Professional Partnerships

Abstract

Increases in net-debt obligations of profit sharing partnerships give these organizations a strong incentive to expand. This paper argues that when capital structure is transparent, partnerships can signal their hiring intentions to uninformed clients by their net-debt levels. Levin and Tadelis (2005) predicts that professional service firms with fewer informed clients will tend to choose to organize as partnerships rather than corporations. The present paper demonstrates that this prediction only holds when financial frictions are present.

Keywords: capital structure; corporations; debt; partnerships

JEL Classifications: D2, L15, L2, G32, G34

1. Introduction

This paper shows how financial structure and net-debt levels, in particular, affect the behavior of professional service partnerships. (Net-debt is defined as debt obligations minus cash on hand.) The professional service firm that adopts a partnership structure chooses to tie employment to equity stakes and control rights. In contrast, the professional service firm can adopt a more traditional employment relationship in which control and residual claims are separated from employment contracts. Here we argue that partnerships can signal their hiring intentions through capital structure. Yet, the magnitude of financial frictions will play a large role in a professional service firm's decision to adopt a partnership or corporate structure.

This paper builds on an idea of Levin and Tadelis (2005). That paper argues that, when clients only detect the average ability of employees a small fraction of the time, the profit share-maximizing partnership will be more profitable and supply higher quality than the profit maximizing corporation. Yet, for high levels of market monitoring, Levin and Tadelis (2005) argue that the corporation is more profitable. This observation is used to explain why partnerships are clustered in the relatively opaque professional services where clients find it difficult to judge the quality of the firm's employees.

Unlike that study, here we argue that partnerships can always achieve the full monopoly profits when capital structure is transparent to potential clients. When all clients can observe these capital structure changes, they can infer the partnership's hiring decision from the partnership's choice of net-debt. Therefore, even if clients cannot observe the quality of the firm's professionals directly, they can infer employee ability from the partnership's fully informative capital structure signals.

When some clients are uniformed about the abilities of the professionals they employ, corporations may deviate from the profit maximizing output and quality level. Further, net-debt levels, capital structure, does not affect the corporation's hiring decision. Therefore, the corporation cannot credibly signal its hiring intentions to uninformed clients by its choice of capital structure.

Ward (1958) first discussed the importance of debt in a partnership's hiring practices. Yet, that paper did not envision workers themselves adjusting debt levels to increase their individual and joint consumption. Ward (1958) only envisioned a social planner adjusting debt levels at a macroeconomic level. In contrast to Ward (1958), which never envisioned a need for outside equity stakes in a static setting, the present paper has a role for non-voting equity. This essay argues that, when the partnership is too large with existing levels of fixed costs, it should sell non-voting equity claims to pay down its fixed obligations. When the partnership is too small, it can sell debt to increase its fixed costs and expand its equilibrium size. The solution in Ward (1958) involved having debt obligations equal to total profits. With uninformed clients, as in Levin and Tadelis (2005), such a prescription would lead the professional partnership, which is a type of worker cooperative, to hire too many professionals. Therefore, unlike Ward (1958), the present paper has a role for both outside equity and debt obligations in a static model.

Transparent capital structure and frictionless financial markets unambiguously make the partnership form more profitable than the corporate form. If clients can readily observe capital structure changes, then they can infer the optimal hiring decisions of the partnership for the observed level of net-debt. This transparency will encourage the partnership to only take on a level of debt or cash on hand that would induce the partnership to hire at the full-information, profit maximizing level. Financial transparency allows the partnership to be more profitable and more selective than the corporation. Financial frictions would only serve to diminish the profitability of the partnership when it has transparent finances.

With transparent finances and financial frictions, we are able to support the dichotomy advanced by Levin and Tadelis (2005). That is, the present paper supports Levin and Tadelis (2005)'s proposition that the partnership organizational form will be the preferred business structure when many clients are uninformed. Likewise, the corporate form will be the more preferred mode of organization when most clients directly observe the quality of the professionals that they hire. This support for Levin and Tadelis (2005, p. 142)'s "central comparative static result" only applies when finances are transparent and financial adjustments are costly.

There are several recent papers that attempt to explain the weaknesses and strengths of professional partnerships. Huddart and Liang (2003) and Huddart and Liang (2005) explore how free rider problems in the monitoring of the effort of partners affect the partnership's size. The former study discusses how exogenous variation in the partner's ability and risk tolerance affects their willingness to monitor and stay with the firm. In contrast, Huddart and Liang (2005) explores the endogenous design of control systems when partners have identical characteristics. The latter paper argues that either a partnership is small and all partners engage in production and monitoring or the partnership is large (like a Big Four accounting firm) and some partners specialize in monitoring and some engage in client service. In Morrison and Wilhelm (2004) free rider problems in the mentoring of associates are the justification for professional partnerships. In that paper, partners mentor so that they will be able to sell their shares in the firm to the next generation of partners. Morrison and Wilhelm (2008) argues that investment banks went public as the development of human capital became less important, relative to the raising and management of financial capital. Bar-Isaak (2007) also discusses the virtues of mentoring, but that paper says that mentoring can solve the moral hazard problems of the firm's more senior members. That paper argues that partners with good reputations have little incentive to exert effort unless they are residual claimants on part of the future reputations of their associates. Garicano and Santos (2004) says that profit sharing in partnerships gives partners incentives to make efficient referrals to their customers. This present paper builds on the idea of Levin and Tadelis (2005) that the partnership is a quality commitment that resolves the problem of over-hiring. Unlike these recent papers, the present paper argues that net-debt levels play a prominent role in the partnership's ability to profitably serve its clients. When net-debt levels are transparent to clients, partners can increase their individual and joint consumption by adjusting net-debt levels.

This paper is also closely related to Wilson (2008). In contrast to Wilson (2008) net-debt levels in the present paper are transparent. Wilson (2008) explores the case where net-debt levels are not observed by clients. In that paper, the partnership behaves very much like the corporation because the partnership cannot credibly signal its hiring intentions because its capital structure choice is secret.

Period = 0	**1**	**2**	**3**	**4**
Nature selects the accuracy of market monitoring, $0 \leq \mu \leq 1$.	Partnership or corporate structure is adopted. That is, $\gamma = 1$ or $\gamma = 0$, respectively.	Capital structure is chosen. Therefore, the financial variables α and F are determined.	N partners or employees are hired by firm.	•Consumers make bids. •Services are rendered to winning bidders. •All factors are paid.

Figure 1: The sequence of events

2. Model

Consider a firm that employs a one-to-one technology, $f(N) = N$, where N is the firm's size and output. The firm must pay an endogenous fixed cost, $K > 0$, to operate.

Suppose that the firm can hire employees who have abilities distributed over a continuous, smooth probability density function $g(a) > 0$, which is defined on the support $a \in [\underline{a}, \overline{a}]$. The continuous distribution of employee abilities is defined as

$G(\tilde{a}) \equiv \int_{\underline{a}}^{\tilde{a}} g(a)da$. Because the firm is unable to affect the distribution of abilities of its employees, the average quality of the firm's workforce declines in its size. Appendix 6.1 proves this property. The total number of potential employees is σ.

Let all employees vary in their ability, but they all have the same reservation wage $w \geq 0$. Let us assume that market price, $p(N)$, equals the average quality of the firm's employees, $q(N)$, times a constant, x. $p(N) \equiv xq(N)$. Therefore, the price, $p(N)$, that the firm can charge to informed consumers declines in output. This means that price falls in output or equivalently employment, $p_N < 0$, where subscripts denote partial derivatives.

Let us define profits before fixed costs as the following:

$$\pi(N) \equiv p(N)N - wN$$

We will make several assumptions that were made by Levin and Tadelis (2005) to ensure that the monopoly firm would pick an interior solution. These restrictive assumptions are not necessary but they are useful in comparing the principal comparative static result of Levin and Tadelis (2005, p. 142) to the results in the present paper. First, the profit function $\pi(N) - K$ is assumed to be concave.

$$\frac{\partial^2\{\pi(N)-K\}}{\partial N^2}=\frac{\partial^2\pi(N)}{\partial N^2}=Np_{NN}(N)+2p_N(N)<0 \qquad (1)$$

Second, hiring all potential employees leads to strictly negative profits. Let, $\bar{N}$ be the maximum size of the firm. Therefore, $\pi(\bar{N})-K<0$. Third, there is a hiring level for which positive, first-best profits are obtained. If we denote the first-best hiring level $N^{FB} \equiv N_0^*$, then $\pi(N_0^*)-K>0$.

There are two types of organizational forms that the firm can adopt in period 1. The first type of organizational structure is a corporation. A corporation is controlled by outside shareholders who do not work for the firm. We shall see show that they control the firm to maximize its value and the value of their shares. The second type of organizational structure is the partnership. In the partnership, employees are given the voting shares in the organization in exchange for their labors. Further, partners, not outside shareholders, have control over the firm's hiring decision.

Since joining fees are modest relative to the value of a stake in the partnership this paper like Levin and Tadelis (2005) assumes that partners are given stakes in the partnership in exchange for their labors. Nevertheless, this assumption is not necessary.

All that is necessary is that partners pay less to join the firm than the present value of their shares less their opportunity not covered by their fixed wages.[1]

Just as Levin and Tadelis (2005) we assume that the partnership has an equal profit sharing structure after profits are realized in period 4. The equal division of partnership shares is only a simplification, but is not necessary for the results of either paper to hold. Indeed, all that is necessary for the partnership to have different objectives than the corporation is that there is some cross-subsidisation between the most able partners and the marginal least able partners. The equal division assumption means that the decisive voter in the partnership has the same preferences as all other voters. Each voting equity member would like to increase profits by hiring a new partner, but hiring a new partner leads them to dilute their individual share of the profit. Therefore, the period 3 partners each vote to maximize their payoff. This is achieved in equilibrium by only hiring partners that increase the average payoff of all partners. This is the problem that was first introduced by Ward (1958).

[1] Joining fees that were worth the full present value of partnership shares would make corporations and partnerships have the same hiring objectives according to Dow (1986) and Dow (2003, p. 152-161). Yet, there are several obstacles which make it practically impossible for membership shares to trade for the same value as alienable shares in a corporation. For example, employees may not be the highest bidders for the firm's shares due to diversification motives. Moreover, casual empiricism seems to indicate that newly promoted partners do not pay for the full value of their partnership shares. (Morrison and Wilhelm (2004) make this argument, also.) Otherwise, promoted associates would be indifferent about accepting promotion. Indeed most associates seem quite keen to accept an offer to join a partnership. Harris (2002) reports that the joining fee for new partners at Arthur Andersen prior to the Enron scandal was $50,000. This seems to be less than the market value of those shares at the time, but, in fact, it may have been too much to pay for them after the scandal broke!

There are some obvious reasons for not making partners pay for the full (private) value of their shares. For example, for quality reasons, the partnership wants to select associates and not have associates in the position of selecting partnerships. Endlich (2002, p. 326-7) described late 1994 and early 1995 as the "darkest days" for the Goldman Sachs partnership. Despite this outlook, 57 of 58 associates invited to join the partnership during that period accepted the invitation. Making partners pay for the full value of their shares seems to be counterproductive in the case of professional partnerships. The partnership structure is adopted to make the firm more selective about whom it promotes. If employees had to pay the full value of their shares, not only would the partnership over-hire to the same degree as a corporation, but also it may have trouble selecting the most able employees.

For simplicity we will assume that all players value consumption in each period equally. Let us denote m_t as a player's consumption at period t = 0, 1, 2, 3, 4. The payoff, U, from consumption is $U = \sum_{t=0}^{4} m_t$. In particular, controlling partners will be indifferent between period two and period four consumption.

As long as there are no barriers to efficient bargains being struck, the identity of the period 2 control group in the partnership is irrelevant to the results of this paper. This is merely an application to the Coase theorem of Coase (1960). Nevertheless, for expositional purposes, we will assume the owners of the partnership in period 2 are a group of the most able potential partners drawn from the distribution of talent such that $N_2 \equiv \sigma \int_{a^2}^{\bar{a}} g(a)da$. It seems plausible that only the most able group of employees of a given size would control the firm either at its founding. Further, suppose that we envision this game as taking place within a firm that had been a going concern for some time. The firm will be periodically revisiting its ownership structure, capital structure policy, and its hiring decisions. In that case, it seems plausible that only the most able potential partners, who are located at the top end of the ability distribution, will be the control group in period 2.

Let us define an indicator variable, γ, that only takes on the value 0 or 1. If the firm adopts the corporate form in period 1, the indicator variable $\gamma = 0$. Alternatively, if the firm adopts the partnership form in period 1, then $\gamma = 1$. This is a choice variable of the firm's founding shareholders.

Let us consider three types of liabilities that must be paid in period 4 after production takes place—net-debt, non-voting equity, and voting equity. These financial contracts are selected by the firm's controlling shareholders in period 2. Net-debt, F, can be positive if the firm has debt obligations due in period 4. Alternatively, net-debt will be negative if the firm has extra cash to pay out to shareholders in period 4. Non-voting equity holders have a claim to the residual profits of the firm in period 4. Voting equity holders control the firm's hiring decisions and receive a residual profit share. Further, let α be the fraction of residual profits, $\pi(N) – K – F$, promised to non-voting equity holders, where $0 \leq \alpha \leq 1$. Therefore, voting equity holders split claims worth $(1 – \alpha)(\pi(N) – K– F)$.

We will assume that there are costs to raising outside finance. One way of measuring financing costs for public and newly public firms is the gross spread. Underwriter fees are often measured as the difference between what the issuing firm receives, the net proceeds, from the sale of the security and the price that the investment banking underwriter sells the security to the public, the gross proceeds. This is usually measured as a percent of gross proceeds. [(Gross proceeds – net proceeds)/gross proceeds]*100 percent = gross spread. Kim, Palia, and Saunders (2008) report that from 1970 to 2000 the median gross spread for debt and new equity issues were 0.750 percent and 7.00 percent, respectively.

Public firms often have more favorable disclosure and control arrangements when compared to privately held firms. Therefore, these numbers should be viewed as closer to the lower bound of financial frictions faced by the professional partnership. For example, outside equity will likely cost more in the partnership.

We assume that the financing cost function is piecewise defined to reflect the fact that the costs of raising equity exceed the costs of debt. Namely, $(\theta_d)^2 \leq (\theta_e)^2$. In addition, we will assume that costs are a constant fraction of the total amount raised. Further, let $1 > \theta_d \geq 0$ and $-1 < \theta_e \leq 0$. This reflects the fact that, when equity must be raised, new net-debt is negative. Further fees cannot be equal to or exceed 100 percent of the amount raised, $\theta_d < 1$ and $\theta_e > -1$. The cost of finance $c(F)$ is defined below:

$$c(F) \equiv \begin{cases} \theta_d F \geq 0, \text{where } F > 0 \quad \& \quad 1 > \theta_d \geq 0 \\ 0, \text{ where } F = 0 \quad \text{or} \quad \theta_0 = 0 \;\&\; F \in (-\infty, +\infty) \\ \theta_e F \geq 0, \text{ where } F < 0 \quad \& \quad -1 < \theta_e \leq 0 \end{cases} \tag{2}$$

Let us denote the parameter theta, θ_i, by the general subscript "*i*," which can take on the values 0, *d*, or *e*. That is, $i = 0$, *d*, or *e*. "0" denotes that there are no costs to either debt or equity. $\theta_0 = 0$. "*d*" denotes that the cost parameter is for debt financing. "*e*" denotes that the cost parameter refers to equity financing costs.

As with Levin and Tadelis (2005), we assume that the expected price that the firm will receive is weighted by the fraction of clients, μ, who detect the size of the firm, *N*, and thus the average quality, $q(N)$, of the firm's professionals, where $0 \leq \mu \leq 1$. The fraction of informed, μ, and uninformed clients, $1 - \mu$, is common knowledge.

Further like that paper, we will assume that the distribution of employees from which the firm draws is common knowledge. There is some positive cost to employing low quality workers because that leads to lower prices. Because all workers have the same opportunity cost, *w*, the firm will only select the highest quality *N* employees. Therefore, given that a client knows the number of workers employed, *N*, then this client can deduce the average quality of the firm.

Let $N^e(\mathbf{z}) = N^e$ be the uninformed clients' expectation of the firm's size. We will focus on the case where the market has rational expectations about firm size. That is, the $(1 - \mu)$*100% uninformed clients compute the profit maximizing size of the firm based on common knowledge variables. $\mathbf{z}$ is a row vector of endogenous variables—γ and F—, exogenous variables—θ_i, μ, x, w, K—, and the distribution of abilities—$G(a)$. $\mathbf{z} = [\gamma, F, \theta_i, \mu, x, w, K, G(a)]$.

Price is

$$p(N, N^e; \mu) = \mu p(N) + (1 - \mu) p(N^e(\mathbf{z})). \tag{3}$$

Informed and uninformed clients bid for services without observing the price. All winning bidders pay the uniform price that clears the market. In the rational expectations equilibrium, expectations of the uninformed are accurate because they have enough information to accurately infer the firm's hiring decision. Namely, uninformed buyers know both the firm's organizational objectives and the distribution of abilities from which the firm draws its workforce. We can also think of the firm's equilibrium objectives as being driven by these endogenous and exogenous variables. That is, $N = N(\mathbf{z})$. Therefore, in equilibrium, the rational expectations are accurate,

$$N^e(\mathbf{z}) - N(\mathbf{z}) = 0. \tag{4}$$

Let us define z_k to be a generic element of the vector of $\mathbf{z}$. Suppose that z_k is a non-zero element which is a continuously defined parameter over for a small change.[2] In this case,

$$\frac{\partial N^e(\mathbf{z})}{\partial z_k} - \frac{\partial N(\mathbf{z})}{\partial z_k} = 0. \tag{5}$$

The key difference between Wilson (2008) and the present paper is that, in the former, expectations do not move with the choice of net-debt, F. This is because net-debt not observed by clients in Wilson (2008). Here net-debt is observed by all potential clients. Therefore, in the present paper, unlike Wilson (2008), expectations, $N^e(\mathbf{z})$, move with F.

While hiring expectations converge on the actual hiring level, in equilibrium, the firm will treat expectations as given when choosing output. The reason for this is $N^e(\mathbf{z})$ does not depend on N. Therefore, the firm is unable to move expectations through its choice of N in period 3. Yet, it may be able to move expectations through its choice of γ and F in periods 1 and 2, respectively.

[2] γ only takes on the value of zero or one; therefore, it does not satisfy the criteria for (5) to hold. $G(a)$ would always be a non-zero element. Further, it could be that parameters of the distribution $G(a)$ could be continuous and satisfy the criteria. For example, the upper or lower bound of talent could shift. That is, movement in either $\overline{a}$ or $\underline{a}$, respectively, could lead to a continuous shift in expectations. Yet, if the distribution of talent moved from uniformly distributed to normally distributed, then (5) would not be well defined.

3. The role of net-debt on the firm's period 3 hiring decision

In this section, we consider the period 3 hiring problem where capital structure—$\{\alpha, F\}$—are taken as given by the corporation and the partnership, respectively. We find that both the corporation and the partnership will hire more employees as market monitoring falls. In subsection 3.1, we find that the corporation's hiring decision does not depend on the firm's capital structure—$\{\alpha, F\}$. In contrast, the number of employees demanded by the period 3 partnership is shown to depend on net-debt levels, F, in subsection 3.2. Yet, the period 3 partnership's hiring decision is not directly affected by non-voting equity stakes, α.

3.1 The corporation's problem

Generally, in the textbook theory of the firm we think of the firm as maximizing total profits. In this context, financial claims are irrelevant to the hiring and output decisions of a firm controlled by a fraction of shareholders $(1 - \alpha)$, where $0 \leq \alpha \leq 1$. Let us assume that there are fixed payments or inflows of a size F in period 4. A positive F means that the firm has bonds or loans that it must pay. A negative F means that the firm has reduced its fixed costs in period 4. Neither α nor F affects the neoclassical maximization problem below. Let V^C be the total value of the shares held by voting equity holders in a corporation.

Note that if we cast the corporation's problem as maximizing the returns to voting equity holders, the objective function would be the following:

$$\begin{aligned}\max_N \quad V^C &= (1-\alpha)(\pi(N, N^e; \mu, \theta_i) - K - F(1+\theta_i)) \\ &= (1-\alpha)(\{\mu\, p(N) + (1-\mu)\, p(N^e(\mathbf{z}))\}N - wN - K - F(1+\theta_i))\end{aligned} \tag{6}$$

Let us use the superscript "*C*" to denote the choice of *N* that would be chosen by the corporation that maximizes returns to voting equity holders.

$$\left.\frac{\partial V^C}{\partial N}\right|_{N=N^C} = \mu\, p_N(N^C)\, N^C + \{\mu\, p(N^C) + (1-\mu)\, p(N^e(\mathbf{z}))\} - w = 0 \tag{7}$$

If the firm was 100% inside equity owned with zero net-debt, then the objective of the firm would be to maximize total profit. In this case, $\alpha = F = 0$. This objective function is as follows:

$$\max_N \quad \{\pi(N, N^e; \mu) - K\} = \{\mu\, p(N) + (1-\mu)\, p(N^e(\mathbf{z}))\}N - wN - K \tag{8}$$

The first order condition of the objective function in equation (8) is the following:

$$\left.\frac{\partial\{\pi - K\}}{\partial N}\right|_{N=N^C} = \mu\, p_N(N^C)\, N^C + \{\mu\, p(N^C) + (1-\mu)\, p(N^e(\mathbf{z}))\} - w = 0 \tag{9}$$

Not surprisingly, the first order conditions in (7) and (9) are identical. The financial variables, F and α, drop out of the optimization problems. That is, for the corporation's voting equity holders the financial structure does not affect their hiring decision in this basic setup. When expectations are rational as in equation (4), then the first order conditions in (7) and (9) become the following:

$$\left.\frac{\partial V^C}{\partial N}\right|_{N=N^e=N^C} = \left.\frac{\partial\{\pi - K\}}{\partial N}\right|_{N=N^e=N^C} = \mu\, p_N(N^C)\, N^C + p(N^C) - w = 0 \tag{10}$$

The second order condition for (8) is the following:

$$\left.\frac{\partial^2\{\pi - K\}}{\partial^2 N}\right|_{N=N^C} = \mu\{2\, p_N(N^C) + N^C\, p_{NN}(N^C)\} < 0 \tag{11}$$

The second order condition in equation (11) must be negative according to our assumption in equation (1).

It is clear from the first order condition that the corporation is more selective in its hiring when market monitoring, μ, is higher. The comparative static is

$$\frac{\partial N^C}{\partial \mu} = -\frac{N^C\, p_N(N^C)}{\mu\{2\, p_N(N^C) + N^C\, p_{NN}(N^C)\} + (1-\mu)\, p_N(N^C)} < 0. \tag{12}$$

This is derived in the appendix 6.2. Equation (12) tells us that selectivity (hiring) is rising (falling) in μ.

We can use the envelope theorem to determine the relationship between profits and market monitoring levels in the corporation. Equation (13) below is derived in appendix 6.3. Total equilibrium profits in the corporation are unambiguously increasing in the fraction of clients who observe the firm's true size, and, thus, average quality.

$$\frac{\partial\{\pi(N^C;\mu)-K\}}{\partial\mu}=(1-\mu)p_N(N^C)\frac{\partial N^C}{\partial\mu}N^C>0, \quad \text{when } \mu\in[0,1). \tag{13}$$

Equations (12) and (13) tell us that the corporation would benefit from the increasing selectivity that comes from higher levels of market monitoring.

3.2 The partnership's problem

Let us consider the partnership's problem. Let us assume that partners control the firm to maximize their residual claims. Each partner is guaranteed his reservation wage *w* plus some profit share, *S*, equal to profits less the fixed payment (or inflow), *F*, times the partners' share of residual profits divided by the number of partners, *N*. In period 3, partners vote to choose a partnership size. The decisive voter in the partnership will want the firm to be controlled to maximize his or her share. Under an equal sharing rule, there will be unanimous agreement about the size that maximizes all partners' shares. The objective of the controlling partner is the following:

$$
\begin{aligned}
&\max_{N} \quad S(N;F,\alpha;\mu,N^{e}) = (1-\alpha)\left(\frac{\pi(N;\mu,N^{e})}{N} - \frac{K+F(1+\theta_i)}{N}\right) \\
&= (1-\alpha)\left(\{\mu\, p(N) + (1-\mu)\, p(N^{e}(\mathbf{z}))\} - w - \frac{K+F(1+\theta_i)}{N}\right)
\end{aligned} \tag{14}
$$

The first order condition is the following:

$$
\left.\frac{\partial S}{\partial N}\right|_{N=N^{e}=N^{P}} = \mu\, p_N(N^{P}) + \frac{K+F(1+\theta_i)}{(N^{P})^{2}} = 0 \tag{15}
$$

This is what Ward (1958) found. In particular, the level of net-debt enters the first order condition. Yet, the size of the non-voting equity stake, α, has no effect on the partnership's hiring decision. Therefore, the period 2 partnership can alter the period 3 partnership's hiring incentives through its choice of net-debt levels.

4. The partnership's period 2 capital structure choice

In contrast to the previous section, we allow the partnership to vary its financial structure prior to the period 3 hiring decision. Hiring in the period 3 partnership is increasing in the level of net-debt due at the end of period 4. Therefore, the period 2 partnership can shape the hiring decision of its future self, the period 3 partnership, by choosing some net-debt that maximizes total profits. When there are no costs to raising outside finance, $\theta_i = 0$, we show that the partnership can commit to hiring the profit maximizing number of partners through its choice of capital structure in period 2. We will also find that, in general, financial adjustment costs make the transparent partnership less profitable than the corporate form for high levels of market monitoring. This is because higher costs lower the transparent partnership's value through a pure "cost of finance effect."

In proposition 3, we support the dichotomy developed in Levin and Tadelis (2005). When financial frictions are present $(\theta_i \neq 0)$ and capital structure is transparent, proposition 3 finds that low market monitoring organizations will tend to adopt the partnership form. In addition, high market monitoring organizations will be more profitable if they adopt the corporate form. This is in sharp contrast to proposition 1. Without financial adjustment costs, we will find that the level of market monitoring was irrelevant to the decision whether to organize as a partnership or corporation. We find that the partnership would be strictly more profitable than a corporation for all $\mu \in [0,1)$, and it would be just as profitable as a corporation when $\mu = 1$.

Let us define a cost of finance function in terms of the number of partners employed. In particular, in equation (2) we assume that the net cost, $c(F)$, of outside finance is a fraction of the debt or equity raised. It would be inconvenient to analyse the hiring or quality decision of the partnership in terms of the amount of debt, F when $F > 0$, or equity, F when $F < 0$, raised. We have analysed this problem in previous sections by the number, N, of partners hired. The partnership actually chooses a target level of hiring through its choice of period 2 capital structure. Since taking on non-zero levels of net-debt is weakly costly, there are costs to taking on the new net-debt, $c(N)$. The financing costs of the particular level of hiring in the partnership can be derived by combining the first order condition in equation (15) and the costs of debt and equity defined in equation (2). This gives us the cost of finance function below

$$c(F(N)) = \theta_i F = -\frac{\theta_i}{1+\theta_i}(\mu N^2 p_N(N) + K) \geq 0. \tag{16}$$

This function is only well defined for non-negative financing costs.

First, let us explain the notation for the partnership's optimal hiring decision. Let us denote the best response choices of the transparent partnership by a superscript and a subscript. The superscript is the asterix "*." It denotes that the transparent partnership achieves the first best or nearly the first best profits. We will use the subscript $i = 0, d, e$. The subscript "i" can be represented in its generic form. It also can specify the cost and possibly the sign of the net-debt. When there is no cost to raising either debt or equity, then $i = 0$. The subscript will equal "d" when the best response refers to the case where net-debt is positive and weakly costly. In this case, debt must be raised and distributed in period 2 to meet the firm's hiring targets. In contrast, when the subscript "*e*" appears, negative net-debt is weakly costly, and non-voting equity must be raised to increase the cash, negative net-debt, inside the firm until period 4.

The transparent partnership always has the option of taking on zero net-debt, $F_i^* = 0$. In this case, the period 2 partnership is choosing to not affect the period 3 partnerships' hiring incentives. When this is the case, the equilibrium hiring will be given by equation (15) where $F_i^* = F = 0$. The presence of financial transaction costs, $\theta_i \neq 0$, makes the zero net-debt option non-trivial.

Let us assume that the period 2 partnership takes on a non-zero level of net-debt. That is, $F_i^* \neq 0$. Further, let us suppose that this level of net-debt, $F_i^* = c(N_i^*; \mu, \theta_i)$, satisfies the condition set out in equation (2) that $F_d^* > 0$ and $F_e^* < 0$. That is, net-debt is positive when the firm raises debt and has a cost of debt $\theta_d \geq 0$ and net-debt is negative when the firm raises equity and has a cost of negative net-debt $\theta_e \leq 0$. When these conditions are met, the cost of finance for any choice of the transparent partnership will be weakly positive, $c(N_i^*; \mu, \theta_i) \geq 0$.

The optimal hiring level for the partnership with financial adjustment costs is the level of hiring that satisfies the following maximization problem:

$$
\begin{aligned}
V_i^* &= \max_N \quad \{\pi(N;1) - K - c(N; \mu, \theta_i)\} \\
&= \max_N \quad \{p(N)N - wN - K + \frac{\theta_i}{1+\theta_i}(\mu N^2 p_N(N) + K)\}, \qquad (17) \\
&\text{where } c(N_i^*; \mu, \theta_i) \geq 0.
\end{aligned}
$$

The level of market monitoring is effectively unity from the perspective of the period 2 partnership, which has transparent net-debt levels. Any choice of net-debt will completely signal the firm's hiring intentions to uninformed clients.

Nevertheless, the level of market monitoring, μ, does enter the cost of finance equation. The cost of finance equation is based on the first order condition for the period 3 partnership in equation (15). The period 3 partnership still makes its hiring decision with the knowledge that some clients will not observe its hiring choice.

The first order condition for the problem in equation (17) is the following:

$$\left.\frac{\partial V_i^*}{\partial N}\right|_{N=N_i^*} = p_N(N_i^*)N_i^* + p(N_i^*) - w - \frac{dc(N_i^*)}{dN} = 0, \quad \text{where } c(N_i^*;\mu,\theta_i) \geq 0. \tag{18}$$

Given that the stationary point is a maximum, the partnership can choose the level of net-debt $F_i^*(N_i^*;\mu,\theta_i)$ consistent with the hiring level $N_i^*(\theta_i) \equiv N_i^*$.

$$F_i^* = \frac{1}{1+\theta_i}\left[\mu\left(\pi(N_i^*;1,\theta_i) - \frac{\partial c(N_i^*)}{\partial N}N_i^*\right) - K\right] \tag{19}$$

The derivation of (19) involves several steps, but is not complex. This derivation can be found in appendix section 6.4. The intuition for the level of net-debt in equation (19) is that the period 2 partnership is choosing a F_i^* that causes the first order conditions in both equations (18) and (15) to be satisfied. That is, the period 2 partnership is choosing a level of net-debt that causes the period 3 partnership to hire N_i^* employees. Further, all clients can observe this level of net-debt and expectations converge on $N^e(\mathbf{z}) = N_i^*$.

If we zero out the cost of finance terms in equations (18), we are left with the first order condition for a monopolist operating under perfect information. Further, the net-debt, function in equation (19) simplifies considerably when the costs of finance are zero.

Consider the following proposition:

Proposition 1

When capital structure is transparent and there are no extra costs associated with raising debt or equity, $\theta_0 = 0$, then the partnership will choose net-debt payments of $F_0^* = \mu\pi(N_0^*;1,0) - K$, and will earn the full-information monopoly profits.

Proposition 1 begs the question, "Why are partnerships so rare outside of professional services?" Whenever there is a $\mu < 1$, we would expect all firms to adopt the objective of maximizing profits per employee. When partnerships can achieve the full monopoly profits through their choice of F_0^*, the imperfect market monitoring explanation of Levin and Tadelis (2005) only explains why firms adopt the partnership form, but it does not explain why most firms are organized as corporations. We will see that that paper's predictions will fare better when financial adjustments are costly.

To illustrate that this level of net-debt not only maximizes the value of the firm, but also is in the interest of the controlling partners in period 2, let us consider a numerical example that shows the Coase theorem at work. This example is derived in appendix section 6.5. Suppose that first-best profits after fixed costs are \$40. The optimal level of hiring is 50 partners. The fixed costs operating are \$10, and the fraction of informed clients is 0.8. Suppose that without adjusting capital structure in period 2, a partnership as described in Levin and Tadelis (2005) would generate total profits of \$27.50 that would be split among 25 partners, giving each partner \$1.10 in period 4. Yet, if the partnership chooses the optimal level of net-debt implied by proposition 1, then $F_0^* = \$30$. Suppose that $N_2 = 40$. The period 2 partners will consume the positive net-debt in period 2 prior to the hiring decision. The proceeds of positive net debt must be taken outside of the firm in period 2 for there to be an impact on the hiring decision in period 3. The top 25 partners must get an increased share of the period 2 distribution from the proceeds of the debt, or they will not be in favor of the debt issue that will reduce their period 4 consumption. Suppose only the top 25 partners consume the entire proceeds of the debt issue worth \$30. That gives them consumption of \$30/25 = \$1.2 in period 2. In addition, the top 50 partners will share the remaining \$10 of profits in period 4 after production. \$10/50 = \$0.2. Therefore, the period 2 and period 4 consumption of top 25 partners is \$1.2 + \$0.2 = \$1.4, which is greater than the consumption of \$1.1 that they would have enjoyed in the partnership of Levin and Tadelis (2005) that does not adjust capital structure. The partners in the period 2 control group of ranks below 25 to 40 will also benefit from the debt policy because it means that each will enjoy profits of \$0.2. This is certainly better for those partners than being fired in a partnership of Levin and Tadelis (2005), which does not issue net-debt in period 2. Finally, the new hires of ranks below 40 to 50 will also share in the increased surplus receiving a period 4 share of \$0.2. While this is not the only split of the surplus that is possible, this illustrates the principle first attributed to Coase (1960). When there are no bargaining frictions, the ending allocation of ownership rights will lead to surplus maximization.

For a low enough level of market monitoring, a low μ, the level of net-debt could be negative. (By inspecting equation (19), for example, when $\mu = 0$, the level of net-debt must be negative.) If (19) is negative, then the partnership will have to sell an equity stake that generates proceeds of $-F_e^*$. That is,

$$-F_e^* = \alpha_e^*[\pi(N_e^*;1) - K - F_e^*(1+\theta_e)], \text{ when } F_e^* < 0. \tag{20}$$

If we rearrange (20) to solve for α_e^* and substitute in F_e^*, then we can represent the fraction of total profits awarded to outside equity as the following:

$$\alpha_e^* = \begin{cases} 0, \text{ if } F_d^* \geq 0 \\ \left(\dfrac{1}{1+\theta_e}\right)\left\{\dfrac{K - \mu\pi(N_e^*;1) + \mu\dfrac{\partial c(N_e^*)}{\partial N}N_e^*}{(1-\mu)\pi(N_e^*;1) + \mu\dfrac{\partial c(N_e^*)}{\partial N}N_e^*}\right\} \geq 0, \text{ if } F_e^* < 0. \end{cases} \tag{21}$$

To illustrate that issuing non-voting equity will also be supported by the period 2 control group, let us revisit our previous example. This example is derived in appendix 6.5.2. The only difference from our previous example is that market monitoring, μ, is assumed to be 0.1. The level of market monitoring does not change the fact that first-best profits after fixed costs are \$40, and the first-best number of partners is 50. Yet, the lower level of market monitoring means that the partnership of Levin and Tadelis (2005) would have approximately 70.71 partners and earn total profits of approximately \$31.42 or about \$0.44 per partner. In addition, this lower level of market monitoring means that the partnership will optimally have negative net-debt and thus will have to issue non-voting equity. According to proposition 1, the partnership will need to raise net-debt of 0.1(\$50) – \$10 = -\$5. It will do this by issuing non-voting equity in exchange for a 1/9 or 11.11 percent stake of the period 4 profits. (It does not matter if members of the firm or outsiders pay the \$5 for this non-voting stake.) The \$5 raised will stay in the firm until period 4. In period 4, the 50 partners will get eight-ninths of first best profits plus the five dollars raised from the sale of non-voting equity. That is, [(8/9)(\$40 + \$5)]/(50 partners) = \$0.8 per partner. The non-voting equity holders will get back in period 4 exactly what they contributed in period 2. That is, [(1/9)(\$40 + \$5)] = \$5. This is certainly better for the period 2 control group of N_2 = 40 partners. Without issuing non-voting equity, they would each have had a share of about \$0.44 in period 4. By issuing non-voting equity, they will each enjoy a share of \$0.80 in period 4.

It is conceivable that the desired level of negative net-debt in (21) will break the budget constraint and require the firm to sell greater than a 100 percent stake if the transaction costs of finance are large. Intuitively, α_e^* can exceed 1 because the term in rounded brackets "()," $1/(1 + \theta_e)$, will weakly exceed 1. This is because $-1 < \theta_e \leq 0$. By inspection, a corner solution is more likely when the costs of raising equity are very high or $-1 < \theta_e << 0$. In such a case, the first best profits after fixed and financing costs for the partnership are never positive. Therefore, if there is a solution where a professional service firm forms when $\alpha_e^* > 1$, the implied hiring, N_e^*, and net-debt level, F_e^*, cannot be part of a perfect Bayesian equilibrium.

There is an interval where the partnership finds zero net-debt optimal with financing costs. It is where the net-debt in (19) implied by the cost of equity parameter, $\theta_e \leq 0$, is positive and the net-debt implied by the cost of debt, $\theta_d \geq 0$, is negative. Both signs are contradictions indicating that the first order condition (18) no longer holds because $c(N) < 0$. Let us implicitly define the points where net-debt is equal to zero for the cases, $i = 0$, d or e, as the following:

$$ {}_0\mu_i^* \equiv \frac{K}{\pi(N_i^*;1) - \frac{\partial c(N_i^*)}{\partial N} N_i^*} \tag{22} $$

A special case of equation (22) occurs when $\theta_i = \theta_0 = 0$, and thus $\frac{\partial c(N_i^*)}{\partial N} = 0$ and $N = N_0^*$. We know from equation (19) when financing costs are zero that there is a μ where no net-debt is needed in the partnership. This is when $\mu\pi(N_o^*;1,0) - K = 0$. Rearranging this, the μ implied by zero net-debt is

$$ \mu^P \equiv \frac{K}{\pi(N_0^*;1)} = {}_0\mu_0^* \tag{23} $$

This μ^P conforms to the notation of Levin and Tadelis (2005, p. 165).[3] In that paper the partnership cannot adjust its financial structure; therefore, the partnership is most

---

[3] Our definition of lower case pi, "π," differs from Levin and Tadelis (2005)'s definition of uppercase pi, "Π." In the present paper, π is profits *before* fixed costs. In Levin and Tadelis (2005), Π stands for profits *after* fixed costs. Therefore, the slight difference in the denominator of μ^P in Levin and Tadelis (2005, p.

profitable at this level of market monitoring. The same is true here when we allow the partnership to adjust its financial structure when and $\theta_i \neq 0$. Yet, when financial costs were zero, all values of $\mu \in [0,1]$ allowed the partnership to achieve first-best profits, $\pi(N_0^*;1) - K$. Yet, when $\theta_i \neq 0$, there is only one such level of market monitoring, μ^P. As the actual μ moves further from μ^P, the financial costs of achieving the optimal hiring targets implied by (19) will rise, and profits will fall from the first-best.

Let us turn to how financing costs affect the transparent partnership. In the appendix section 6.6 we use the envelope theorem to derive the following partial derivative of the equilibrium net-debt:

$$\frac{\partial V_i^*(N_i^*)}{\partial \theta_i} = \begin{cases} \dfrac{\partial V_e^*(N_e^*)}{\partial \theta_e} = -\dfrac{1}{1+\theta_e} F_e^*(N_e^*;\mu,\theta_d) \geq 0, \ \& \\ \dfrac{\partial V_d^*(N_d^*)}{\partial \theta_d} = -\dfrac{1}{1+\theta_d} F_d^*(N_d^*;\mu,\theta_d) \leq 0. \end{cases} \tag{24}$$

The derivative in equation (24) leads us to the following proposition:

Proposition 2

The profitability of the transparent partnership is strictly declining in the cost of outside finance, $|\theta_i|$, *when equilibrium net-debt is not equal to zero,* $F_i^* \neq 0$.

165) reflects this slightly different definition of uppercase pi versus lowercase pi in the present paper. The definitions of μ^P are identical in both papers.

Proposition 2 follows from our discussion of equation (24) below. The sign of the comparative statics in (24) depends on whether or not net-debt, F_i^*, is positive, negative, or zero. $F_i^* = F_d^* > 0$, when the partnership adds to its obligations with debt, and $F_i^* = F_e^* < 0$, when the partnership raises cash with equity. The signs of the partial derivatives in equation (24) are non-zero when equilibrium net-debt, F_i^*, is non-zero. Further, the costs of equity are rising as θ_e falls or becomes more negative. The top partial derivative shows that as $\theta_e \leq 0$ approaches zero the transparent partnership is becoming more valuable. This supports proposition 2 above. Further, the bottom partial shows that as the cost of debt rises, that is as $\theta_d \geq 0$ gets further from zero, the value of the firm declines. This is what we wanted to show for debt costs. Therefore, firm value is at least weakly declining in the absolute value of θ_i. Further, firm value is strictly falling as the cost of finance parameter gets farther from zero when net-debt is non-zero. *Q.E.D.*

Proposition 2 is very intuitive. Because the transparent partnership without financial costs achieves the first best level of profits, any additional costs will make the organization less profitable. Further, the transparent partnership must adjust its capital structure to achieve its hiring targets, but a corporation does not. Therefore, the corporate form will be more attractive as financial costs rise. That is, as θ_i gets further from zero, the corporation will become relatively more attractive than the partnership.

It is also interesting to note that the sign of the comparative static in equation (24) depends on the magnitude of net-debt costs. A rise in the costs of net-debt, an increase in

$|\theta_i|$, means that the transparent partnership's total financing bill is going up. The transparent partnership only suffers from this negative "cost of finance effect."

Levin and Tadelis (2005) argues that partnerships become relatively more attractive as market monitoring, μ—the fraction of clients that observe the true quality of the firm—falls. Before we introduced financing costs, there was no such dichotomy. For all but the knife's edge case where $\mu = 1$, the transparent partnership would be strictly more profitable and thus preferred to the corporation. We denote the equilibrium choices by the superscript "*" and subscript "0" for the transparent partnership with no financing costs. That is, $\gamma_0^* = 1$ when $\mu \in [0, 1)$. Yet, when we add financing costs, Levin and Tadelis (2005)'s predictions perform better. As financing costs rise and θ_i becomes more distant from zero, proposition 2 tells us that total profits are falling in the transparent partnership. The corporation does not need to adjust its financial structure to achieve its hiring targets and thus does not have to incur the financial expenses of the partnership.

In contrast, the concavity assumption implies that since corporate hiring exceeds first-best hiring for all $\mu \in [0, 1)$, $N^C > N_0^*$, total profits are rising as market monitoring rises for the corporation until $\mu = 1$ and profits are first-best, $\pi(N_o^*) - K > 0$. Therefore, conceivably there can be some combination $\{\mu, \theta_i\}$ where both organizations are equally profitable.

While we know that the corporation benefits from a rise in market monitoring, does the partnership also benefit from higher market monitoring? The answer is that it depends on whether the partnership needs to raise debt or equity. Consider the effect of a rise in market monitoring on equilibrium profits for the transparent partnership. The envelope theorem allows us to differentiate the objective function in equation (17) directly.

$$\frac{\partial V_i^*}{\partial \mu} = \frac{\theta_i}{1+\theta_i}(N_i^*)^2 p_N(N_i^*) \tag{25}$$

The sign in equation (25) depends on whether or not the transparent partnership takes on debt or equity.

$$\frac{\partial V_i^*}{\partial \mu} = \begin{cases} \dfrac{\theta_d}{1+\theta_d}(N_d^*)^2 p_N(N_d^*) \le 0 \\ \dfrac{\theta_e}{1+\theta_e}(N_e^*)^2 p_N(N_e^*) \ge 0 \end{cases} \tag{26}$$

The value of the transparent partnership is weakly falling in market monitoring when the firm must raise positive net-debt, and it is weakly rising when the firm needs to raise negative net-debt with equity. These relationships become strict when the costs of finance are strictly non-zero, $\theta_i \neq 0.$ That is, when $\theta_d > 0$ and $\theta_e < 0,$ $\frac{\partial V_d^*}{\partial \mu} < 0,$ and $\frac{\partial V_e^*}{\partial \mu} > 0.$

The partial derivative in equation (26) helps lead us to the following proposition:

Proposition 3

If any organization form is profitable for a given μ*, the transparent partnership with non-zero financing costs,* $\theta_i \neq 0,$ *will be at least weakly more profitable than a corporation* *for* $\mu \in [0, \hat{\mu}_d^*)$. *For* $\mu \in [\hat{\mu}_d^*, 1]$, *a corporation will be weakly more profitable than a partnership.*

The proof is in the appendix section 6.7. The cut off levels of μ, $\hat{\mu}_d^*$ and $\hat{\mu}$, are defined mathematically below:

$$\begin{aligned} &\pi(N_d^*; \hat{\mu}_d^*, \theta_d) - K - c(N_d^*; \hat{\mu}_d^*, \theta_d) \equiv \pi(N^C; \hat{\mu}_d^*) - K \\ &\pi(N^P, F = 0; \hat{\mu}) - K \equiv \pi(N^C; \hat{\mu}) - K \end{aligned} \tag{27}$$

$\hat{\mu}_d^*$ is the level of market monitoring where the partnership with costly debt and the corporation earn the same level of profits. $\hat{\mu}$, which is from Levin and Tadelis (2005), is the level of market monitoring where the partnership that does not adjust its financial structure and the corporation earn the same level of profits. The hiring levels N_d^*, N^C, and N^P when $F = 0$ are defined by the first order conditions in equations (18), (10), and (15), respectively.

Let us define one more level of market monitoring which features prominently in Levin and Tadelis (2005). This is the level of market monitoring, $\underline{\mu}$, where the partnership with zero net-debt breaks even.

$$\pi(N^P, F = 0; \underline{\mu}) - K \equiv 0 \tag{28}$$

The intuition for proposition 3 is that the partnership is always more selective than the corporation for positive levels of profit. The transparent partnership will issue positive levels of net-debt for high levels of market monitoring. Yet, these positive levels of net-debt are costly when $\theta_d > 0$, and they cause total profits after fixed and financial costs to decline as the partnership moves farther away from μ^P in (23). We know this from equation (26). When $\theta_d > 0$, $\frac{\partial V_d^*}{\partial \mu} < 0$. In contrast, corporate profits are strictly rising in market monitoring according to equation (13).

Therefore, with financing costs and transparent net-debt, the relationship between market monitoring and the optimal organizational form generally confirms the "central comparative static result" of Levin and Tadelis (2005, p.142). That is, when net-debt is observed by clients and $\theta_i \neq 0$, the present paper finds that high levels of market monitoring tend to favor the corporate form and low levels of market monitoring favor the partnership.

While Levin and Tadelis (2005)'s main result is largely confirmed when $\theta_i \neq 0$, not all of the predictions of Levin and Tadelis (2005) are fully supported when net-debt is costly and is observed by clients. For example, with very low financing costs (θ_e close to zero) there need not be a lower level of market monitoring $\underline{\mu} > 0$ that puts all organizations out of business. Indeed, when $\theta_e = 0$ there is no lower bound level of market monitoring where the transparent partnership goes out of business. Further, if historic fixed costs, K, are very low relative to first-best profits before fixed and financial costs, $\pi(N_0^*)$, the transparent partnership will have no trouble raising net-debt nearly equal to $-K$. When capital structure adjustments are transparent but costly, the selectivity and the profitability of the partnership may not suffer enough to forgo entry into the business even for very low levels of market monitoring. In contrast, Levin and Tadelis

(2005)'s proposition 2 does predict that there exists a $\mu = \underline{\mu}$ in which both the partnership and the corporation make zero profits.

There is another difference between proposition 3 in the present paper and propositions 2 and 3 in Levin and Tadelis (2005). The minimum levels of market monitoring where the corporation is at least as profitable as the partnership differ in this section and in Levin and Tadelis (2005). $\hat{\mu}$, as defined in Levin and Tadelis (2005) and here in equation (27), applies only to a partnership that cannot adjust its net-debt levels. In this paper, the cut off level of market monitoring where the corporation is more profitable than the partnership, $\hat{\mu}_d^*$, will be weakly higher for a transparent partnership with financing costs than the cut off level in Levin and Tadelis (2005), $\hat{\mu}$. That is, $\hat{\mu}_d^* \geq \hat{\mu}$. This is discussed in the proof in appendix 6.7.

In figure 2, we compare the profitability of the transparent partnership with financing costs to the transparent partnership to the profits of a partnership that cannot adjust its net-debt levels.[4] The curve that peaks at 0.2 and crosses the horizontal axis at $\underline{\mu} \approx 0.0557$, which is defined in (28) above, is the profit function for the partnership that cannot adjust its net-debt levels. This curve is the profit function of the partnership in Levin and Tadelis (2005). The other curve that touches the horizontal axis at $\underline{\mu} \approx 0.0557$ is the corporation's profit function. Its profits are strictly rising in μ. The corporation's profit peaks as μ approaches 1. The transparent partnership's total profits are the curve that forms the top of the graph until it intersects the corporation's profit function at $\mu = \hat{\mu}_d^* \approx 0.8054$.

[4] The assumptions and profit functions that were used to plot the profit functions in figure 2 are discussed and derived in appendix 6.8.

In this example, there is no minimum μ where the transparent partnership goes out of business. Even when μ approaches 0, the period 2 partnership can pay down all the fixed obligations to prevent the period 3 partnership from hiring too many partners. Further, the transparent partnership will be profitable—more profitable than the corporation—for weakly larger ranges of μ than Levin and Tadelis (2005) predicts. The partnership of Levin and Tadelis (2005) would be the dominant organizational form for levels of market monitoring from $\mu \in (\underline{\mu}, \hat{\mu}),$ where $\underline{\mu} \approx 0.0557$ and $\hat{\mu} \approx 0.4780,$ and that paper would predict that corporations would dominate for $\mu \in (\hat{\mu}, 1].$ Yet, the present paper predicts that, in this example, the transparent partnership with financing costs would be the most profitable organizational form for market monitoring parameters $\mu \in [0, \hat{\mu}_d^*),$ where $\hat{\mu}_d^* \approx 0.8054.$ For $\mu \in (\hat{\mu}_d^*, 1],$ the corporate form will be more profitable and preferred. That is, the perfect Bayesian equilibrium (PBE) organizational strategy would be $\gamma_i^* = 1$ when $\mu \in [0, \hat{\mu}_d^*),$ $\gamma_i^* = 0$ or 1 at $\hat{\mu}_d^* \approx 0.8054,$ and $\gamma_i^* = 0$ when $\mu \in (\hat{\mu}_d^*, 1].$

θ_d = 0.02 & θ_e = –0.07

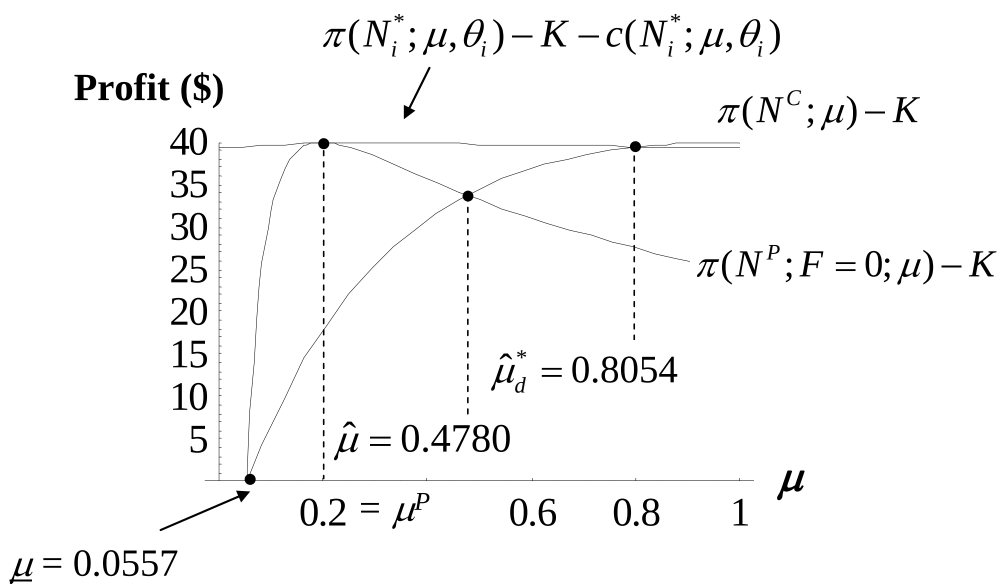

Figure 2: The total profits of various organizational forms as a function of the exogenous level of market monitoring (μ)

5. Conclusion

This paper has considered the effect of net-debt levels on the selectivity of professional service firms. When some clients are uninformed about the firm's true quality as in Levin and Tadelis (2005), the choice of organizational form by itself does not cause a professional partnership to signal increased hiring thresholds. Here we have argued that the partnership can get around its profit sharing constitution and the hiring distortions that this profit sharing creates by adjusting its net-debt levels.

This ability to adjust net-debt levels can be a fully informative signal of the firm's hiring intentions when capital structure is transparent. This ability to signal hiring intentions makes the partnership form more profitable. When capital structure is transparent but financial transaction costs are positive, this paper confirms "the central comparative static result" of Levin and Tadelis (2005 p.142). Namely, firms facing mostly informed clients will organize as corporations while firms facing mostly uninformed clients will form profit sharing partnerships.

References

Bar-Isaac, H., 2007, "Something to Prove: Reputation in Teams," *RAND Journal of Economics*, *38*, 495-511.

Coase, R., 1960, "The Problem of Social Cost," *Journal of Law and Economics*, *3*, 1-44.

Dow, G. K., 2003, *Governing the Firm: Workers' Control in Theory and Practice*, Cambridge, England: Cambridge University Press.

Dow, G. K., 1986, "Control Rights, Competitive Markets, and the Labor Management Debate," *Journal of Comparative Economics*, *10*, 48-61.

Garicano, L., and T. Santos, 2004, "Referrals," *American Economic Review*, *94*, 499-425.

Harris, E., March 29, 2002, "Analysis: Arthur Andersen Partners Face Many Uncertainties and Potential Liabilities," *All Things Considered*, National Public Radio, http://www.npr.org/features/feature.php?wfId=1140797.

Huddart S., and P.J. Liang, 2003, "Accounting in Partnerships," *American Economic Review Papers and Proceedings*, *93*, 410-414.

Huddart S., and P.J. Liang, 2005, “Profit Sharing and Monitoring in Partnerships,” *Journal of Accounting and Economics*, *40*, 153–187.

Kim, D., D. Palia and A. Saunders, 2008, “The Impact of Commercial Banks on Underwriting Spreads: Evidence from Three Decades,” *forthcoming Journal of Financial and Quantitative Analysis*.

Levin, J., and S. Tadelis, 2005, “Profit Sharing and the Role of Professional Partnerships,” *Quarterly Journal of Economics*, *120*, 131-171.

Morrison, A., and W.J. Wilhelm, 2004, “Partnership Firms, Reputation, and Human Capital,” *American Economic Review*, *94*, 1682-1692.

Morrison, A., and W.J. Wilhelm, 2008, “The Demise of Investment-Banking Partnerships: Theory and Evidence,” *Journal of Finance*, *63*, 311-350.

Ward, B., 1958, “The Firm in Illyria: Market Syndicalism,” *American Economic Review*, *48*, 566-589.

Wilson L., 2008, “Hidden Debt and the Selectivity of Professional Partnerships,” University of Louisiana at Lafayette, Working Paper, http://www.linuswilson.com/FinProfPart.pdf.

6. Appendix

6.1 The inverse relationship between size and quality

Here we want to show that there is an inverse relationship between the size and the average quality of the workforce. To do this, first, we will show that firm size falls as the ability of the minimum ability employee rises. Then, we will demonstrate that average quality rises as the cut off ability level rises. Therefore, if the firm lowers (raises) its ability threshold, size increases (falls) and quality falls (rises).

Firm size is the fraction of the distribution of employees selected multiplied by the number of employees in the distribution. σ is a parameter that stands for the number of potential employees in the distribution $G(a)$. For example, if the firm hired everyone, then firm size would be $\sigma = \sigma[G(\bar{a}) - G(\underline{a})]$. The firm will only select the highest ability subset of employees because all employees have the same wage. Therefore,

$$N(\tilde{a}) = \sigma \int_{\tilde{a}}^{\bar{a}} g(a)da = \sigma(1 - G(\tilde{a})) \tag{29}$$

If we differentiate (29) by the ability of the marginal, lowest ability employee, then given that $g(a) > 0$ inside its support

$$\frac{\partial N(\tilde{a})}{\partial \tilde{a}} = -g(\tilde{a}) < 0, \quad \forall a \in [\underline{a}, \bar{a}]. \tag{30}$$

This is the first assertion that we wanted to prove. *Q.E.D.*

Secondly, let us turn to the average quality of the workforce.

$$q(N(\tilde{a})) = q(\tilde{a}) = \frac{\int_{\tilde{a}}^{\bar{a}} ag(a)da}{G(\bar{a}) - G(\tilde{a})} \tag{31}$$

Differentiating (31) with respect to $\tilde{a}$, we are left with the following:

$$\frac{\partial q(\tilde{a})}{\partial \tilde{a}} = \frac{g(\tilde{a})}{G(\bar{a}) - G(\tilde{a})}\left[\frac{1}{G(\bar{a}) - G(\tilde{a})}\left(\int_{\tilde{a}}^{\bar{a}} ag(a)da\right) - \tilde{a}\right] \tag{32}$$

If we substitute (31) into (32) it becomes easier to see why quality must rise in $\tilde{a}$

$$\frac{\partial q(\tilde{a})}{\partial \tilde{a}} = \frac{g(\tilde{a})}{1 - G(\tilde{a})}\left[q(\tilde{a}) - \tilde{a}\right] > 0, \quad \forall a \in [\underline{a}, \bar{a}]. \tag{33}$$

The change in average quality as the lowest quality rises is the hazard rate times the difference between the average quality and the lowest quality. The lowest ability employee, with ability $\tilde{a}$, must have a lower ability than the average ability employee hired. Therefore, the square-bracketed term must be positive. Further, $g(\tilde{a}) > 0$. The sign in (33) must be positive, which is the second part that we wanted to demonstrate. *Q.E.D.*

As the firm chooses a higher ability threshold, $\tilde{a}$, for the lowest ability employee, size falls and quality rises.

6.2 Derivation of the comparative static, $\frac{\partial N^C}{\partial \mu} < 0$, in equation (12)

The endogenous $N^C(\mu)$ is entirely determined by the first order condition (FOC) in equation (9). We can use the first order condition to sign $\frac{\partial N^C(\mu)}{\partial \mu}$. We can use the FOC to derive the comparative static using the implicit function rule. The implicit function rule requires us to find the cross partial of N and μ and the second order condition (SOC), respectively.

$$\begin{aligned} m_\mu &\equiv \left.\frac{\partial^2\{\pi - K\}}{\partial N \partial \mu}\right|_{N=N^C} = p_N(N^C)N^C + p(N^C) - p(N^e(\mathbf{z})) + (1-\mu)p_N(N^e)\frac{\partial N^e(\mathbf{z})}{\partial \mu} \\ m_\mu &\equiv \left.\frac{\partial^2\{\pi - K\}}{\partial N \partial \mu}\right|_{N=N^e=N^C} = p_N(N^C)N^C + (1-\mu)p_N(N^C)\frac{\partial N^C(\mu)}{\partial \mu} \end{aligned} \tag{34}$$

$$m_N \equiv \left.\frac{\partial^2\{\pi - K\}}{\partial N^2}\right|_{N=N^e=N^C} = \mu\{p_{NN}(N^C)N^C + 2p_N(N^C)\} < 0 \tag{35}$$

While we cannot immediately sign (34), some algebra allows us to isolate $\frac{\partial N^C(\mu)}{\partial \mu}$.

$$\frac{\partial N^C(\mu)}{\partial \mu} = -\frac{m_\mu}{m_N}\bigg|_{N=N^e=N^C} = -\frac{\left(p_N(N^C)N^C + (1-\mu)p_N(N^C)\frac{\partial N^C(\mu)}{\partial \mu}\right)}{\mu\{p_{NN}(N^C)N^C + 2p_N(N^C)\}}$$

$$\frac{\partial N^C(\mu)}{\partial \mu} = \frac{-p_N(N^C)N^C}{\mu\{p_{NN}(N^C)N^C + 2p_N(N^C)\} + (1-\mu)p_N(N^C)} < 0, \tag{36}$$

when $\mu \in [0,1)$.

The sign in (36) follows from the negative sign for the second order condition in (35) and the assumption that $p_N < 0$.

6.3 Derivation of equation (13)

We want to find out how the value of the firm's equilibrium profit changes with a change in market monitoring. The envelope theorem allows us to differentiate the objective function without reference to the endogenous $N^C(\mu)$. Consider the objective function in (8), evaluated at the optimum. If we differentiate it by μ:

$$\begin{aligned} &\frac{\partial\{\pi - K\}}{\partial \mu}\bigg|_{N=N^e=N^C} + \frac{\partial\{\pi - K\}}{\partial N}\bigg|_{N=N^e=N^C} \frac{\partial N^C(\mu)}{\partial \mu} \\ &\frac{\partial\{\pi - K\}}{\partial \mu}\bigg|_{N=N^e=N^C}, \quad \because \frac{\partial\{\pi - K\}}{\partial N}\bigg|_{N=N^e=N^C} = 0 \end{aligned} \tag{37}$$

This is a restatement of the envelope theorem. Nevertheless, this problem is slightly complicated by the fact that we cannot ignore the μ contained in market expectations $N^e(\mathbf{r})$. Let us differentiate profits in equation (8) by μ:

$$\begin{aligned} \left.\frac{\partial\{\pi-K\}}{\partial\mu}\right|_{N=N^C} &= p(N^C)N^C - p(N^e)N^C + (1-\mu)p_N(N^e)\frac{\partial N^e(\mathbf{r})}{\partial\mu}N^C \\ \left.\frac{\partial\{\pi-K\}}{\partial\mu}\right|_{N=N^e=N^C} &= (1-\mu)p_N(N^e)\frac{\partial N^C(\mu)}{\partial\mu}N^C \end{aligned} \tag{38}$$

The second line relies on rational expectations shifting in response to exogenous stimuli in step with the endogenous N^C according to the assumption in (5). Armed with the sign in equation (36), we now can conclude that equation (38) is, in fact, positive when $0 \leq \mu < 1$. That is,

$$\left.\frac{\partial\{\pi-K\}}{\partial\mu}\right|_{N=N^e=N^C} = (1-\mu)p_N(N^e)\frac{\partial N^C(\mu)}{\partial\mu}N^C > 0, \quad \text{when } \mu\in[0,1). \tag{39}$$

This relationship is rewritten in equation (13).

6.4 Derivation of equation (19)

Equation (19) is found by rearranging and combining the first order conditions in (15) and (18). Suppose that both first order conditions are satisfied by N_i^* when a level of net-debt, $F_i^* \neq 0$ is chosen. First, equation (15) can be rearranged so that

$$p_N(N_i^*)(N_i^*)^2 = -\frac{1}{\mu}(K + F_i^*(1+\theta_i)) \tag{40}$$

If we multiply N_i^* by equation (18), then the first order condition can be rewritten as

$$N_i^* \left.\frac{\partial V_i^*}{\partial N}\right|_{N=N_i^*} = p_N(N_i^*)(N_i^*)^2 + p(N_i^*)N_i^* - wN_i^* - \frac{dc(N_i^*)}{dN}N_i^* = 0. \tag{41}$$

Substituting the left hand side of equation (40) into (41), we get the following relationship:

$$-\frac{1}{\mu}(K + F_i^*(1+\theta_i)) + p(N_i^*)N_i^* - wN_i^* - \frac{dc(N_i^*)}{dN}N_i^* = 0 \tag{42}$$

Equation (42) can be rewritten as a function of F_i^*.

$$F_i^* = \frac{1}{1+\theta_i}\left[\mu\left(p(N_i^*)N_i^* - wN_i^* - \frac{dc^{-1}(N_i^*)}{dN}N_i^*\right) - K\right] \tag{43}$$

Profits before fixed and financial costs when market monitoring is perfect and costly finance must be raised to hit hiring targets is

$$p(N_i^*)N_i^* - wN_i^* \equiv \pi(N_i^*;1,\theta_i). \tag{44}$$

If (44) is inserted into (43), then we have a restatement of equation (19). Since this is what we wanted to derive, we are done.

6.5 Numerical Example

Suppose that ability, a, is distributed uniformly on the continuous interval $[\underline{a},\overline{a}]$, where $\overline{a}$ is the talent of the highest ability individual in the distribution of potential employees. That is $a \sim U(\underline{a},\overline{a})$. The firm, which observes ability directly, will select professionals from the top of the talent distribution. That is, the firm will select individuals of abilities on the interval $a \in [\tilde{a},\overline{a}]$. The probability density function for the uniform distribution is as follows:

$$g(a) = \begin{cases} 0, & \text{when } a < \underline{a} \\ \dfrac{1}{\overline{a}-\underline{a}}, & \text{when } \underline{a} \le a \le \overline{a} \\ 0, & \text{when } a > \overline{a} \end{cases}$$

A firm that only hires workers of ability $a \ge \tilde{a}$ has an average ability of

$$q(\tilde{a}) = \int_{\tilde{a}}^{\bar{a}} \frac{a}{\bar{a}-\tilde{a}} da = \left. \frac{a^2}{2(\bar{a}-\tilde{a})} \right|_{\tilde{a}}^{\bar{a}} = \frac{\bar{a}+\tilde{a}}{2} \qquad (45)$$

Clients are risk neutral price takers who are randomly assigned employees from the pool of workers in the firm. They do not observe the workers' ability directly. Instead, they are willing to pay for the expected quality of workers in the firm. Suppose that the price that consumers are willing to pay is a multiple of the average quality, $q(\hat{a})$. That is,

$$p(\tilde{a}) = xq(\tilde{a}), \qquad (46)$$

where x is a parameter measuring clients' willingness to pay for ability.

If the size of the potential workforce is given by the parameter $\sigma > 0$, then the size of the firm is as follows:

$$N(\tilde{a}) = \sigma \left(\frac{\bar{a}-\tilde{a}}{\bar{a}-\underline{a}} \right), \quad \text{when } a \sim U(\underline{a}, \bar{a}) \qquad (47)$$

If we rearrange (47), we can solve for the ability cut off as a function of the size of the firm.

$$\tilde{a}(N) = \bar{a} - \frac{N}{\sigma}(\bar{a}-\underline{a}) \qquad (48)$$

If we combine equations (45) and (48) and equations (45), (46), and (48), we can solve for average quality and price, respectively, as a function of firm size, N.

$$
\begin{aligned}
q(N) &= \bar{a} - \frac{N}{2\sigma}(\bar{a} - \underline{a}) \\
p(N) &= x\bar{q}(N) = x\left(\bar{a} - \frac{N}{2\sigma}(\bar{a} - \underline{a})\right) \\
p_N(N) &= -\frac{x}{2\sigma}(\bar{a} - \underline{a})
\end{aligned}
\tag{49}
$$

The first order condition from equation (17) can be combined with the price function in equation (49).

$$
\left.\frac{\partial\{\pi(N;1,0) - K\}}{\partial N}\right|_{N=N_0^*} = x\left(\bar{a} - \frac{N_0^*}{2\sigma}(\bar{a} - \underline{a})\right) - \frac{N_0^* x}{2\sigma}(\bar{a} - \underline{a}) - w = 0 \tag{50}
$$

The implied first-best hiring rule is

$$
N_0^* = \frac{\sigma}{x}\left(\frac{x\bar{a} - w}{\bar{a} - \underline{a}}\right) \tag{51}
$$

Further, combining (51) and (49) the first best price is

$$
p(N_0^*) = \frac{1}{2}(x\bar{a} + w) \tag{52}
$$

If we insert equation (51) into our definition of profits before fixed costs, we can solve for this quantity. In this example, first-best profits before fixed costs is

$$\pi(N_0^*) = \frac{\sigma(x\bar{a} - w)^2}{2x(\bar{a} - \underline{a})}. \tag{53}$$

Let us consider the hiring decisions of the partnership. The FOC for the partnership is given by equation (15). Inserting in the values from equation (49), the first order condition becomes

$$\begin{aligned} \left.\frac{\partial S}{\partial N}\right|_{N=N^e=N^P} &= -\frac{\mu x}{2\sigma}(\bar{a} - \underline{a}) + \frac{K + F(1+\theta_i)}{(N^P)^2} = 0 \\ \Rightarrow N^P &= \sqrt{\frac{2\sigma(K + F(1+\theta_i))}{\mu x(\bar{a} - \underline{a})}} \end{aligned} \tag{54}$$

The equilibrium price for the partnership is

$$p(N^P) = x\bar{a} - \sqrt{\frac{x(\bar{a} - \underline{a})(K + F(1+\theta_i))}{2\sigma\mu}}. \tag{55}$$

The profit after fixed costs of the partnership as a whole is

$$\pi(N^P) - K = (x\bar{a} - w)\sqrt{\frac{2\sigma(K + F(1+\theta_i))}{\mu x(\bar{a} - \underline{a})}} - \frac{K + F(1+\theta_i)}{\mu} - K \tag{56}$$

Suppose that the firm has the following parameter values:

$$\begin{aligned} \bar{a} &= 1 \\ \underline{a} &= 0 \\ \sigma &= 100 \\ x &= \$4 \\ w &= \$2 \\ K &= \$10 \end{aligned} \tag{57}$$

The preceding parameter values mean that partner ability is uniformly distributed from zero to one; the maximum size of the firm is 100; the choke price where demand is zero is \$4; and the firm cannot cover its variable costs if the price falls below the wage of \$2. (Since all partners are paid their reservation wage in period 2, they will participate in period 4 even if they get a zero profit share.)

In addition we will assume that financial adjustment costs are zero.

$$\theta_0 = \theta_d = \theta_e = 0 \tag{58}$$

In the first-best, 100 percent market monitoring, benchmark case

$$\begin{aligned} N_0^* &= 50 \\ p(N_0^*) &= \$3 \\ \pi(N_0^*) &= \$50 \\ \pi(N_0^*) - K &= \$40 \end{aligned} \tag{59}$$

We will consider the optimal capital structure decisions when market monitoring is high, $\mu = 0.8$, and when market monitoring is low, $\mu = 0.1$.

6.5.1 High Levels of Market Monitoring ($\mu = 0.8$)

A partnership with a transparent capital structure will hire the same number of employees, be able to charge the same price, and will realize the same profits before and after fixed costs as the first-best in equation (59). Nevertheless, to achieve this feat, the partnership will have to take on some debt.

Recall the formula for the optimal level of net-debt for the transparent partnership in equation (19). We can combine this with our formula for first-best profits before investment costs in equation (53) to get the following relationship:

$$F_0^*(\mu) = \mu\left(\frac{\sigma(x\bar{a}-w)^2}{2x(\bar{a}-\underline{a})}\right) - K \tag{60}$$

In this case this will be

$$\begin{aligned} F_0^*(\mu) &= F^*(0.8) = 30 \\ \alpha_0^*(\mu) &= \alpha^*(0.8) = 0. \end{aligned} \tag{61}$$

If the partnership does not adjust its capital structure $F = 0$ as in Levin and Tadelis (2005), the size of the firm from equation (54), price from equation (55) profits after fixed costs from equation (56) are as follows when $\mu = 0.8$:

$$
\begin{aligned}
&N^P(F,\mu) = N^P(0,0.8) = 25 \\
&p(N^P(F,\mu)) = p(N^P(0,0.8)) = \$3.50 \\
&\pi(N^P; F,\mu) - K = \pi(N^P; 0,0.8) - K = \$27.50
\end{aligned}
\tag{62}
$$

6.5.2 Low Levels of Market Monitoring (μ = 0.1)

The partnership in which clients observe the capital structure choices of the partnership can achieve the first-best profits in equation (59). Nevertheless, to do so when $\mu = \mu_L = 0.1$ it must actually raise some cash by way of outside equity if it hopes to only hire $N^* = 50$ partners. By combining the general formula for the outside equity stake in equation (21) with our knowledge of first-best profits before fixed costs in (53) for this example, we can obtain the formula for a non-voting equity stake below:

$$
\alpha_0^*(\mu) = \begin{cases} 0, \text{ when } F^*(\mu) \geq 0 \\ \dfrac{K - \mu\left(\dfrac{\sigma(x\bar{a} - w)^2}{2x(\bar{a} - \underline{a})}\right)}{(1-\mu)\left(\dfrac{\sigma(x\bar{a} - w)^2}{2x(\bar{a} - \underline{a})}\right)}, \text{ otherwise.} \end{cases}
\tag{63}
$$

The capital structure choices obtained from combining equations (57), (60), (63), and the level of market monitoring, $\mu = 0.1$, are

$$
\begin{aligned}
&F_0^*(\mu) = F^*(0.1) = -\$5 \\
&\alpha_0^*(\mu) = \alpha^*(0.1) = 11.\bar{1}\%.
\end{aligned}
\tag{64}
$$

In the partnership of Levin and Tadelis (2005) where F = 0., the size of the firm from equation (54), price from equation (55) profits after fixed costs from equation (56) are approximately the following when $\mu = 0.1$:

$$\begin{aligned} &N^P(F,\mu) = N^P(0,0.1) \approx 70.71 \\ &p(N^P(F,\mu)) = p(N^P(0,0.1)) \approx \$2.59 \\ &\pi(N^P;F,\mu) - K = \pi(N^P;0,0.1) - K \approx \$31.42 \end{aligned} \tag{65}$$

6.6 Proof of Proposition 2

To prove this proposition we will differentiate the profit function at its maximum point with respect to the cost parameter θ_i. That is, we will sign $\dfrac{\partial V_i^*(N_i^*)}{\partial \theta_i}$. To do this we will use the envelope theorem. The objective function in (17) only depends on θ_i through the indirect financing cost equation $c(N;\mu,\theta_i)$. Therefore, using the definition of $c(N;\mu,\theta_i)$ in equation (16)

$$\frac{\partial V_i^*(N)}{\partial \theta_i} = \frac{\partial c(N;\mu,\theta_i)}{\partial \theta_i} = \frac{1}{(1+\theta_i)^2}\{\mu N^2 p_N(N) + K\}. \tag{66}$$

The envelope theorem allows us to translate to this to the optimal $N = N_i^*$. The optimal level of net-debt is given by equation (16) evaluated at N_i^*. This means that equation (66) can be rewritten as

$$\frac{\partial V_i^*(N_i^*)}{\partial \theta_i} = \frac{\partial c(N_i^*;\mu,\theta_i)}{\partial \theta_i} = -\frac{1}{1+\theta_i} F_i^*(N_i^*;\mu,\theta_i). \tag{67}$$

This is what we wanted to derive. *Q.E.D.*

An interpretation of this can be found near equation (24).

6.7 Proof of Proposition 3

There are two pieces to this proof. The first piece is to show that there must be a μ which we will denote, $\hat{\mu}_d^*$, defined in equation (27). For all $\mu \geq \hat{\mu}_d^*$, the corporation will be weakly more profitable than the transparent partnership. For all $\mu \in [\mu^P, \hat{\mu}_d^*)$ the partnership must be more profitable than the corporation. The second piece involves showing that there is no μ at or below μ^P where the corporation can earn non-zero profits higher than the transparent partnership can earn.

First, let us show that, when financial adjustments are costly but visible to clients, the corporate form must be weakly preferred for some $1 \leq \mu < \hat{\mu}_d^*$. If the $\pi(N)$ is concave and the corporation's profits are maximized at $\mu = 1$, then it must be the case that the corporation is becoming increasingly profitable as μ rises. (This is what we found in equation (13) without the global concavity assumption.) In contrast, the comparative static result in (26) says that the value of the transparent partnership is strictly declining in $\mu > {}_0\mu_d^*$, which is defined in equation (22), when it takes on some positive level of net-debt. Therefore, given that the partnership finds it optimal to take on some positive net-debt $F_d^*(\mu) > 0$, there must be some range of μ, $1 \leq \mu < \hat{\mu}_d^*$, where the corporation is more profitable than the transparent partnership.

Alternatively, suppose that the transparent partnership optimally takes on no debt for all $\mu \in [\mu^P, 1]$. We know that profits in the partnership with no net-debt are maximized at $N^P(\mu^P)$, where μ^P is defined in (23). Because the profit function is strictly concave any movement away from $N^P(\mu^P) = N_0^*$ will lead to a fall in profits for the partnership with zero net-debt. A sufficient condition for total profits in the zero net-debt partnership to be falling from $\mu \in (\mu^P, 1]$ is $\frac{\partial N^P}{\partial \mu} < 0$. The implicit function rule allows us to derive the comparative static from the first order condition for the period 3 partnership in equation (15). When net-debt is zero, the comparative static is

$$\frac{\partial N^P}{\partial \mu} = -\frac{\partial^2 S}{\partial N \partial \mu} \frac{\partial N^2}{\partial^2 S}\bigg|_{N=N^e=N^P} = \frac{-p_N(N^P)}{\mu p_{NN}(N^P) - 2K/(N^P)^3} < 0 \tag{68}$$

This is unambiguously negative since $p_N < 0$ and the denominator is the second order condition of a maximum point. Therefore, the zero net-debt partnership will never return to the optimal hiring point as long as $\mu \in (\mu^P, 1]$. In contrast, we know that the corporation's profits are strictly rising in μ. Therefore, if the partnership takes on no net-debt, there must be some $\hat{\mu}_d^* = \hat{\mu} \in [\mu^P, 1]$, where $\hat{\mu}$ is defined in equation (27), at which corporate profits equal partnership profits. Then corporate profits must weakly exceed partnership profits for those values of $\mu \in [\hat{\mu}_d^*, 1]$.

Let us turn to the second part of the proof. Namely, partnership profits are always weakly higher than corporate profits from $\mu \in [0, \hat{\mu}_d^*]$. We have already shown that the transparent partnership's profits must be higher than the corporation from $\mu \in [\mu^P, \hat{\mu}_d^*)$. We still need to prove that the transparent partnership with costly financial adjustments is weakly more profitable than the corporation from $\mu \in [0, \mu^P)$. To do this we consider a partnership with zero net-debt. (The transparent partnership can always choose to have zero net-debt and behave like a partnership that cannot adjust its capital structure.)

The second part of the proof relies more heavily on Levin and Tadelis (2005)'s propositions 1, 2, and 3 and on Ward (1958). Nevertheless, we do not attempt to confirm the assertion in proposition 2 of Levin and Tadelis (2005) that there exists a lower bound level of informed clients, $\underline{\mu}$, defined in equation (28), where the transparent partnership no longer makes positive profits.

The partnership that does not adjust its capital structure, $F_i^* = 0,$ is always more selective than a corporation, given that it makes positive profits. If there exists some μ in which neither organization is viable, they both will make zero profits by not operating. The transparent partnership always has the option to not adjust its capital structure, $F_i^* = 0,$ and mimic these payoffs.

We need to show that the partnership is always more profitable than the corporation for all $\mu < \mu^P$, in which either organization makes positive profits. Consider the first order condition in equation (15) for the period 3 partnership when $F = 0$.

$$\mu\, p_N(N^P) + \frac{K}{(N^P)^2} = 0 \tag{69}$$

We can rearrange this by and multiplying by N^P and then adding $p(N^P)$ to both sides.

$$\mu\, p_N(N^P)N^P + p(N^P) = p(N^P) - \frac{K}{N^P} \tag{70}$$

In contrast, let us consider the first order condition of the corporation in equation (10)

$$\mu\, p_N(N^C)N^C + p(N^C) = w \tag{71}$$

On the left hand sides (LHS) are the rational expectations marginal revenues, which we will denote $MR(N;\,\mu) \equiv \mu\, p_N(N)N + p(N),$ of the partnership and the corporation, respectively. On the right hand side (RHS) is the marginal cost of an employee to each organization. Suppose that the RHS of (70) is at least as large as the RHS of (71).

$$\begin{aligned} & p(N^P) - \frac{K}{N^P} \geq w \\ & \pi(N^P, 0; \mu) - K = p(N^P)N^P - wN^P - K \geq 0 \end{aligned} \tag{72}$$

This implies that the LHS of (70), the marginal revenue of the partnership, must meet or exceed the LHS of (71), the marginal revenue of the corporation whenever the partnership with zero net-debt makes non-negative profits. Namely,

$$
\begin{aligned}
&MR(N^P;\mu) \geq MR(N^C;\mu) \\
&\forall \mu \text{ where } \pi(N^P,0;\mu) - K \geq 0.
\end{aligned} \tag{73}
$$

Therefore, (73) implies that the partnership is weakly more selective than the corporation for all μ where the partnership earns non-negative profits. Since $\pi(N)$ is concave and the maximum point the for the partnership does not occur until $N^P(\mu^P) = N_0^*$, this weakly greater selectivity implied by equation (73) indicates that the partnership must also be weakly more profitable than the corporation for all $\mu \in [\underline{\mu}, \mu^P]$, where $\underline{\mu}$ is defined in (28) as the point where the partnership makes zero profits. Concavity also implies that the partnership with no net-debt makes strictly negative profits for all $\mu \in [0, \underline{\mu})$. Therefore, a partnership with zero net-debt will not operate for all $\mu \in [0, \underline{\mu})$.

Finally, we must show that the corporation does not operate for $\mu \in [0, \underline{\mu})$. That is, when the partnership with zero net-debt is out of business, the corporation is also out of business. The number of employees hired by the corporation when market monitoring is zero is either $N^C(0)$ implied by equation (10) or the corporation hires all available employees, $\bar{N}$. Consider when $\mu = 0$, then the first-order condition for the corporation is (71) is $p(N^C;0) = w$. This implies that the corporation cannot cover its fixed costs:

$$
\begin{aligned}
&\pi(N^C;0) - K = -K < 0, \\
&\because K > 0.
\end{aligned} \tag{74}
$$

By the assumption that we imported from Levin and Tadelis (2005) if the firm hires all available employees profits are negative, $\pi(\bar{N}) - K < 0$. Therefore, the corporation must make strictly negative profits when $\mu = 0$. The concavity of $\pi(N)$ assumption implies that that the corporation's profits are strictly increasing from $\mu = 0$ to $\mu = \underline{\mu}$. When the LHS of (70) and (71) are equal, profits for both the corporation and the partnership must be identically zero. By definition in equation (28), the μ at this level of profits is $\underline{\mu}$. In short, we can conclude that the corporation does not operate from $\mu \in [0, \underline{\mu})$.

This is what we wanted to show. *Q.E.D.*

In summary, there must be a crossing point $\hat{\mu}_d^*$, defined in equation (27), where the transparent partnership with financing costs and the corporation make the same profits. When $\mu \in [\hat{\mu}_d^*, 1]$ the corporation is the weakly more profitable organization. For all $\mu \in [0, \hat{\mu}_d^*)$, the transparent partnership is the weakly most profitable organization, given that any organization is profitable.

6.8 Derivation of Figure 2

The graph in figure 2 plots the profit functions as a function of market monitoring, μ, for the partnership with costly financial adjustments, the partnership that takes on zero net-debt, and the corporation. We assume a uniform distribution of employee talent as in section 6.5. We have already derived the profit function for the partnership that takes on zero net in equation (56). That leaves us to derive the profit functions for the partnership that adjusts financial structure with costly financial adjustments and the profit function for the corporation. All parameter values in figure 2 are identical to equation (57). Further, we will assume that there are financial transaction costs to debt and equity as follows:

$$\begin{aligned}\theta_d &= 0.02 \\ \theta_e &= -0.07\end{aligned} \tag{75}$$

First, let us derive the profit function for the partnership that adjusts net-debt. If we rearrange the period 2 partnership's demand for employees as a function of net-debt, $N^P(F;\mu,\theta_i)$, in equation (54) to the function $F(N;\ \mu,\ \theta_i)$ we are left with

$$F(N) = \frac{1}{1+\theta_i}\frac{\mu x(\overline{a} - \underline{a})}{2\sigma}(N)^2 - \frac{1}{1+\theta_i}K. \tag{76}$$

The cost of net-debt function is

$$c(N) = \theta_i F = \frac{\theta_i}{1+\theta_i}\frac{\mu x(\overline{a} - \underline{a})}{2\sigma}(N)^2 - \frac{\theta_i}{1+\theta_i}K. \tag{77}$$

When there are financial frictions, the partnership has to weigh the gains from a more profitable employment policy against the financing costs, given in equation (18). The problem for the period 2 partnership that is attempting to determine the optimal hiring level with costly finance that draws from the distribution of talent, which introduced in section 6.5, is in equation (78) below.

$$\underset{w.r.t.\quad N}{\arg\max} \quad V_i^* = (p(N) - w)N - K - c(N)$$
$$= \left(x\bar{a} - \frac{N}{2\sigma}(\bar{a} - \underline{a}) - w \right) N - K - \frac{\theta_i}{1+\theta_i} \frac{\mu x(\bar{a} - \underline{a})}{2\sigma} (N)^2 - \frac{\theta_i}{1+\theta_i} K \tag{78}$$

Equation (78) can be obtained by combining the objective function in equation (17), the definition of $c(N)$ in either equation (16) or (77), and the inverse demand function for this example in equation (49). Differentiating this function with respect to N, we can solve for the optimal hiring level of the partnership which can credibly signal its capital structure.

$$\left. \frac{\partial V_i^*}{\partial N} \right|_{N=N_i^*} = (x\bar{a} - w) - N_i^* \frac{x}{\sigma}(\bar{a} - \underline{a}) - N_i^* \frac{\theta_i}{1+\theta_i} \frac{\mu x}{\sigma} (\bar{a} - \underline{a}) = 0$$
$$\frac{\partial^2 V_i^*}{\partial N^2} = -\left(\frac{x}{\sigma}(\bar{a} - \underline{a}) \right) \left(\frac{1+\theta_i(1+\mu)}{1+\theta_i} \right) < 0 \tag{79}$$

Since the second order condition above is unambiguously negative, we can conclude that the stationary point N_i^* below is a maximum.

$$N_i^* = \frac{\sigma(x\bar{a} - w)}{x(\bar{a} - \underline{a})} \left(\frac{1+\theta_i}{1+\theta_i(1+\mu)} \right) \tag{80}$$

If we compare this to the case where financing costs were zero in equation (51), we can verify that zero financial costs is a special case of equation (80). The hiring level in (80) is identical to equation (51) when $\theta_i = 0$.

Combining $p(N)$ in equation (49) and N_i^* from (80) we have the equilibrium price,

$$p(N_i^*) = \frac{x\bar{a}(1+\theta_i(1+2\mu)) + (1+\theta_i)w}{2(1+\theta_i(1+\mu))}. \tag{81}$$

Equation (81) is identical to equation (52) when $\theta_i = 0$.

The profits before fixed and financing costs are

$$\pi(N_i^*) = \frac{\sigma(1+\theta_i)}{2x(\bar{a}-\underline{a})}\left(\frac{x\bar{a}-w}{1+\theta_i(1+\mu)}\right)^2 (1+\theta_i(1+2\mu)). \tag{82}$$

Financial cost are obtained by combining equations (77) and (80) below

$$c(N_i^*) = \frac{\mu\sigma\theta_i(1+\theta_i)}{2x(\bar{a}-\underline{a})}\left(\frac{x\bar{a}-w}{1+\theta_i(1+\mu)}\right)^2 - \frac{\theta_i}{1+\theta_i}K \tag{83}$$

Net-debt raised can be obtained by dividing equation (83) by θ_i.

$$F_i^* = c(N_i^*)/\theta_i = \frac{1}{1+\theta_i}\left[\mu\left(\pi(N_i^*) - \frac{dc(N_i^*)}{dN}N_i^*\right) - K\right]$$
$$= \frac{\mu\sigma(1+\theta_i)}{2x(\bar{a}-\underline{a})}\left(\frac{x\bar{a}-w}{1+\theta_i(1+\mu)}\right)^2 - \frac{K}{1+\theta_i} \tag{84}$$

The equilibrium value of the firm is obtained by combining equation (82), –*K*, and the financing costs in equation (83) into the equation below:

$$V_i^* = \pi(N_i^*) - K - c(N_i^*)$$
$$= \frac{\sigma(1+\theta_i)}{2x(\bar{a}-\underline{a})}\frac{(x\bar{a}-w)^2}{1+\theta_i(1+\mu)} - \frac{K}{1+\theta_i} \tag{85}$$

Equation (85) was the function used to plot the top curve in figure 2.

On the other hand, a corporation will hire according to the first order condition in (10), which can be rewritten for this example as the following:

$$\left.\frac{\partial V^C}{\partial N}\right|_{N=N^e=N^C} = \left.\frac{\partial\{\pi - K\}}{\partial N}\right|_{N=N^e=N^C} =$$
$$x\left(\bar{a} - \frac{N^C}{2\sigma}(\bar{a}-\underline{a})\right) - \frac{\mu x N^C}{2\sigma}(\bar{a}-\underline{a}) - w = 0 \tag{86}$$

This implies that the corporation will hire

$$N^C = \frac{\sigma}{x}\left(\frac{x\bar{a}-w}{\bar{a}-\underline{a}}\right)\left(\frac{2}{1+\mu}\right). \tag{87}$$

The equilibrium price for the corporation will be

$$p(N^C) = \frac{1}{1+\mu}(\mu x\bar{a} + w). \tag{88}$$

The profits after fixed costs will be

$$\pi(N^C) = \frac{2\mu\sigma}{x(\bar{a} - \underline{a})}\left(\frac{x\bar{a} - w}{1+\mu}\right)^2 - K. \tag{89}$$

Equation (89) was used to plot the profit curve resembling a quarter circle in figure 2.