

Partnership Firms, Reputation, and Human Capital*

Alan D. Morrison

Saïd Business School and Merton College,
University of Oxford.

William J. Wilhelm, Jr.

McIntire School of Commerce,
University of Virginia;
Saïd Business School,
University of Oxford.

January 24, 2003

*We thank Bruno Biais, Zhaohui Chen, Robert Hauswald, Jack Kereken, Jonathan Levin, Colin Mayer, Margaret Meyer, Alexander Stomper, Steven Tadelis, Lucy White, Andrew Winton and Joseph Zechner for helpful discussions. We are also grateful to seminar participants at American University, the University of Minnesota, Nuffield College, The Saïd Business School and the University of Vienna for their comments.

Correspondence address: Alan Morrison, Merton College, Oxford OX1 4JD, UK. email: alan.morrison@sbs.ox.ac.uk. Bill Wilhelm, McIntire School of Commerce, Monroe Hall, Charlottesville, VA 22903, USA. email: william.wilhelm@sbs.ox.ac.uk

Partnership Firms, Reputation, and Human Capital

Abstract

In human capital intensive industries where it is difficult to contract upon the training effort of skilled agents a socially suboptimal level of training may occur. We show how partnership organisations can overcome this problem by tying human and financial capital. Partnerships are opaque so that the willingness of clients to pay depends upon reputation. Partnerships are illiquid and partners must stay with the firm until clients discover their type and update the firm's reputation. This renders unskilled agents, who will adversely affect reputation, unwilling to accept partnerships. Skilled agents therefore train the next generation so as to ensure that there is an adequate market for their own shares. We comment upon the salient differences between partnerships and joint stock firms.

KEY WORDS: Partnership, on-the-job training, human capital, collective reputation.

JEL CLASSIFICATION: J24, J41, L14, L22.

1. Introduction

In this paper we examine problems associated with on-the-job development and inter-generational transfer of human capital. We focus on tacit human capital that does not lend itself to codification or to arms-length exchange.¹ We envision such human capital including client relationships, a personal reputation for fair dealing, and certain forms of knowledge that, without further scientific development, cannot be codified. For example, a personal reputation is not a fungible asset and even firm reputations have limited fungibility.² Similarly, many elements of law, management

¹Polanyi (1966) draws the distinction between tacit and explicit knowledge. Bell (1973) identifies scientific advances that increase capacity for codifying theoretical knowledge as a driving force in industrial development. Fama and Jensen (1983*a,b*) draw a similar distinction between general and specific knowledge, the latter being defined as difficult to transfer among agents, to study the interplay between ownership structure and organizational complexity (where complexity increases with diffusion of specific knowledge among agents).

²See Tadelis (1999) on the latter point.

consulting, investment banking and even accounting remain arts in spite of the best efforts of professional schools to codify practice.

Skilled agents preserve such human capital by augmenting the human capital of unskilled agents under their guidance. In a world with perfect information, unskilled agents would be prepared to borrow against their future income to pay for such mentoring. We assume, however, that in practice mentoring is costly for senior agents, that their effort is unobservable, and hence that mentoring is noncontractible. The problem is more severe in team production where individuals have incentives to free ride on the mentoring efforts of their peers. In this setting, agents prefer after being mentored not to mentor the next generation, and simply to enjoy the rent which their own human capital generates. In other words, a classic time-consistency problem arises in the labour markets: while every agent would be prepared in exchange for receiving mentoring today to commit to mentoring the next generation of workers, he is *ex post* unwilling to do so.

Against this background we argue that partnership organizations have features that prevent senior workers from selling their labour to the highest bidder, and thus from avoiding mentoring obligations in settings where production requires development of tacit human capital. As a corollary to this argument, the transition from partnership to public, joint stock ownership can be understood in part as a response to codification of what previously was tacit human capital. With this transition the benefits of partnership organization decline relative to the financial risk-sharing benefits of public, joint stock ownership. Our argument focuses on three dimensions along which partnerships and publicly-traded firms differ.

Firstly, partnerships are operationally opaque. Partnerships face few public reporting requirements and they manage employee visibility in a variety of ways ranging from flat pay scales within employee ranks to emphasis upon teamwork.³ The primary element of transparency is an “up-or-out” employment policy that yields a single discrete assessment of employee quality associated with whether one is invited to join the partnership. Thus, relative to publicly-traded firms, partnerships maintain considerable proprietary information about the performance of individual employees throughout their tenure with the firm.

³Endlich (1999, p. 21) provides a striking example of the cultural tendency within the Goldman Sachs investment-banking partnership toward downplaying individual accomplishment. Gilson and Mnookin (1985, p. 365, fn 89) observe that the holdup threat presented by marketing the firm through the writing and lecturing of individual lawyers “... may account for the recent development of seminars for existing and potential clients put on by a single law firm. These seminars are designed to provide direct information concerning quality to potential clients, but unlike writing and lecturing by individual lawyers, this approach features a number of the firm’s lawyers as opposed to a single star...”

Secondly, partnership stakes are extremely illiquid. Once an agent accepts a partnership, he leaves on terms which are set by his peers. Partnerships demand fixed and often long-term commitments and early exit terms can be punitive, including being sued by the remaining partners for lost wages associated with the early withdrawal of human capital.⁴ Publicly-traded firms use a variety of contractual mechanisms to bind financial capital and human capital but enforcement is compromised by legal jurisdictional differences and the ease in establishing market values for equity stakes.

Thirdly, partnerships deal primarily in human capital-intensive production of experience goods. Clients observe the quality of the partnership's human capital only after their business relationship is well advanced. Hence they depend upon their past experiences or the partnership's reputation to determine the fees they are willing to pay. Loss of reputation can be quite costly and even fatal to partnerships. Arthur Andersen's recent collapse in response to fallout from its role in the Enron scandal suggests that even well-established organizations of this sort are fragile. Although similar arguments can be applied to publicly-traded firms, we believe that they generally carry less force.

In Section 2 we incorporate these features in a simple model of an infinitely-lived firm. All agents are born without human capital. Organizations hire these unskilled agents as "associates" and experienced "partners" augment associates' human capital through mentoring. All associates have the same *ex ante* probability of success, but mentoring is ineffective for some. Those who acquire human capital are offered the option to acquire an illiquid equity stake in the firm. Associates who remain unskilled are fired. Although partners learn the quality of their hires during the associate stage, operational opacity prevents outsiders from distinguishing between skilled and unskilled agents without employing them. They can however make inferences from the partnership's promotion decisions.

In equilibrium, only unskilled agents are not promoted to partner so the labour market treats as unskilled any associate not promoted to partner. This gives the partners the leverage needed to persuade new partners to accept illiquid equity-based contracts. Once they have done so, holdup

⁴A less extreme approach was taken by Marvin Bower, who led McKinsey & Co. for several decades following James McKinsey's death in 1939 and "stipulated that new partners should buy out old partners at the book value rather than the much higher market value of their shares, making it less attractive for old partners to sell out." (*The Economist*, March 22, 1997, Management Consultancy Survey, p.19). Similarly, until 1996 Goldman Sachs permitted retiring partners to withdraw only between 25 and 50 percent of their accumulated capital within the first year of retirement with the remainder to be withdrawn over five years. The firm's management committee reserved the right to extend the payout schedule and did so in 1996 in the wake of large trading losses (Wilhelm and Downing, 2001, chapter 7).

threats are held at bay until clients discover their ability. If a partner is discovered to be unskilled clients react by withdrawing their trust from the firm and its fee income and value drop. Unskilled agents know that if they accept an illiquid partnership the firm will lose its reputation before they leave, and hence that they will experience a capital loss on their partnership share.⁵ They therefore refuse to accept a partnership. Skilled partners anticipate this effect and they mentor new associates to ensure that there is a market for their partnership shares.

There is a free-rider problem in mentoring which places an upper limit on the size of the partnership. This reduces the partnership's ability to make significant investments in physical capital, as very large investments can only be used by a suboptimal number of partners. In some circumstances the idle capital costs associated with minimum efficient physical scale will outweigh the benefits of human capital investment and the partnership cannot be sustained.

The paper contributes to a voluminous literature on the form and function of business organizations. Hansmann (1996) provides an extensive overview of this literature with particular attention to the structure of private partnerships and other producer cooperatives. With these institutional features in mind, we accept the three dimensions outlined above along which partnerships differ from publicly-traded firms as constraints on our analysis. Our goal is to demonstrate that variation along these dimensions can give rise in certain circumstances to an optimal level of human capital production; we do not attempt to derive an unconstrained optimal corporate structure. Our approach is further distinguished from much of the existing literature in that we focus not on free-riding in output but rather on the preservation of the organization.

Structurally, the model is in the spirit of Cremer's (1986) analysis of an infinitely-lived organization serving as a mechanism for coordinating the interests of overlapping generations of finite-lived agents. The analysis of the time inconsistency problem in developing human capital complements the literature on efficiency wages (see for example Shapiro and Stiglitz, 1984, and Stiglitz, 1987) where senior workers face the threat of being fired after having earned less than their marginal product at early stages of their careers.

Holmström (1982) provides the seminal analysis of team incentives when individual effort levels are unobservable. In our model the partnership's reputation plays a vital role in providing mentoring incentives. The threat of being branded untrustworthy which we study is in the spirit of Pichler and

⁵Even if it were possible to sell the stake outside the firm, doing so would send a poor signal and would result in a loss of client trust.

Wilhelm (2001), who study how reputational considerations in team settings mitigate coordination problems. Kreps (1990) also suggests that a partnership may serve as a conduit for reputations: an agent who has paid for a stake in a high-reputation partnership will work hard so as to sustain the reputation and hence to ensure the existence of a market for her stake. In Kreps' model however, partnership reputation does not capture any specific qualities of the partners who bear it.

Tadelis (1999) shows in a mode of pure adverse selection how the reputation attached to traded names may convey information about their owners. In later work (Tadelis, 2002) he extends his model to incorporate moral hazard, in which case the value accruing to a traded name provides incentives. The tradeability of names upon which Tadelis' conclusions rely rests upon an assumption that name trades are unobservable. A consequence of this is that names cannot separate good from bad agents. In contrast high reputation partnerships in our model will never attract low quality partners, as they will be unable to avoid detection by anonymously selling their stake in the firm. Incentives in our model are therefore provided by a mechanism which is closer to Kreps' (1990): agents work hard so as to ensure that there is a market for their partnership stake. Unlike Kreps however, we incorporate adverse selection and in our model the future quality of partners is determined by the effort level of today's.⁶

Several authors examine the incentive effects of an equal-sharing rule in partnerships. In a model of the formation of equal-sharing coalitions, Farrell and Scotchmer (1988) show that this constraint limits the size of partnerships and hence may be inefficient. Levin and Tadelis (2002) argue that equal sharing (or any form of redistribution) imposes a higher quality threshold on new partners than on employees in public corporations. Thus partnership organizations dominate where product quality is hard to observe.⁷ Alternatively redistribution measures might be advanced as means of rewarding workers for investing in firm-specific human capital in spite of their negative effect on incentives toward effort (see Holström, 1982, and Alchian and Demsetz, 1972).

These arguments carry force when equal profit sharing or other redistribution measures are the distinguishing feature of partnerships. However, in the U.S. equal profit sharing is no longer

⁶Hörner (2002) also discusses the incentive effect of reputations. In his model, competitive forces provide customers with an outside option and hence incentivise effort even in firms with a strong reputation. We rely instead upon the outside options which able employees have when their firm loses its reputation.

⁷Gilson and Mnookin (1985) envision a "sharing model" embodying seniority-based compensation and/or lock-step promotion schemes promotes pooling of human capital. In turn, risk-averse "human capitalists" gain diversification benefits that increase with firm size. Socialization and development of firm-specific human capital mitigate holdup problems and shirking. For more on partnerships as insurance mechanisms see Lang and Gordon (1995) and Gaynor and Gertler (1995).

imposed by law and many partnerships exhibit substantial differences of income among partners.⁸ Moreover, *human capital explicitly is not firm-specific in our model* and yet there remains a role for the partnership in promoting inter-generational transfer of tacit human capital. We contend that this is more likely the partnership's dominant function in professional services industries where human capital is readily transferrable (as evidenced by the high level of mobility among employees) and where routinely some partners are more equal than others.

Our analysis of the limits of the partnership is in the spirit of Winton's (1993) analysis of tradeoffs between shareholder liability and trading restrictions in promoting monitoring of one's partners. In professional services industries, one's peers are best able to monitor effort but they also maintain the bulk of their wealth in human capital. Thus the partnership form couples strong monitoring incentives with smaller initial financial capital investment. However, the threat of free riding increases with the number of partners and thus promotes demand for limited liability.

2. Model

We consider a discrete time model of an infinitely lived firm. Agents in the model have two-period careers. They are able in the first period to augment their human capital, in which case we refer to them in the second period as *skilled*. Agents become skilled by working with a skilled agent who mentors them. Learning is costless, but mentoring is costly for skilled agents.

The per-period product of an unskilled agent (one without human capital) is w_l and the per-period product of a skilled agent is $w_h = w_l + \Delta w > w_l$. Note that non-human capital has no productive role: this assumption allows us to focus upon incentives for mentoring, and is relaxed in section 4. Any agent can sell his labour in a competitive market but in the absence of information, a firm discovers an agent's type only by employing him.⁹ We assume that all agents are risk neutral and that the per period risk free interest rate is r .

At each date there are two generations of employees in the partnership: associates and partners.

Figure 1 shows the career path of an agent whose career stretches from time 1 to time 3 and who

⁸Although every partner in our model has an equal equity stake, this feature does not drive our results. When partners are clearly paid less then the reputation of the partnership is not placed on the line by their promotion. The most able partners earn supernormal fees, as in our model, and billing at this level *does* risk the partnership's reputational capital and so is consistent with our reasoning. Moreover, the upper limit on partnership size which emerges endogenously in our model is a consequence of free-riding amongst partners rather than of the equal sharing rule.

⁹This establishes the agent's outside option. We do not assume that the partnership has to compete for new hires.

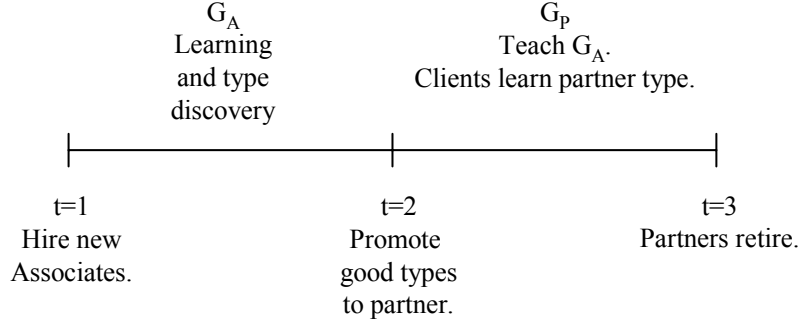


Figure 1: Career path of a partner.

remains with the partnership throughout his career: the respective generations to which he will belong are labelled G_A and G_P . For specificity we describe the career path of an agent who is hired at time 1.

At time 1 there are N partners in generation G_P and n associates are hired per partner, so that the total number of associates is Nn . Every associate starts his career with no personal wealth and with no skills. Associates are paid a first period wage of w_A . Some but not all associates acquire human capital at time 2; we describe below the process by which this takes place.

At time 2 associates learn their own type (skilled or unskilled) and partners learn the type of every associate. As a consequence of the partnership's structural opacity discussed in section 1, this information is not revealed to agents outside the partnership. They can only deduce agents' types by inference from the time 2 promotion decision.

Some associates receive time 2 take-it-or-leave-it offers to join the partnership. We assume that every partner has one share in the business and that the retiring partners are constrained to offering their shares to incoming partners at the same price. Other associates are fired and work elsewhere in the second period of their career.

The shares acquired by new partners are illiquid. In practice, partners can leave the partnership early, but to do so is costly because exit terms are determined by the defector's peers. In the interests of model parsimony, and without significant loss of generality, we assume that early exit is impossible.¹⁰ Partners have two roles: they interact with clients, and they are expected to mentor new associates. When partners mentor associates they experience a disutility (cost) of c .

¹⁰A more complete model might allow for early exit to occur in response to (unobservable) liquidity shocks. The associated contract design issues are studied in a venture capital setting by Aghion, Bolton and Tirole (2000): they are not germane to our discussion.

In exchange, partners earn a wage w_P .

If $M \leq N$ skilled partners spend c on mentoring then M associates drawn at random from the Nn associates will become skilled. If M is strictly less than N there is no way of determining which partner shirked his mentoring responsibilities: mentoring is a team effort in which outcomes but not effort levels are observable.¹¹ Note that no associate is guaranteed to become skilled. When all partners perform mentoring, employment as an associate is equivalent to participation in a lottery in which the probability of success is $\frac{1}{n}$ and the prize is a human capital augmentation of Δw in the second career period.

We assume that mentoring is socially optimal:¹²

$$c < \frac{\Delta w}{1+r}. \quad (1)$$

Equation 1 implies that each associate would willingly borrow $\frac{c}{n}$ against future earnings in order to pay for mentoring. We assume however that this is impossible because the partner's decision to mentor is unobservable and hence noncontractible. Skilled agents therefore face a mentoring externality: they cannot rely upon the marketplace to compensate them for their mentoring effort. Thus they would prefer to sell their services (at w_h) to the highest bidder when their mentoring ends and to avoid mentoring new associates.

Clients cannot observe *ex ante* the type of the partner with whom they are dealing, although they learn this in the course of their relationship and they know it *ex post*; this information percolates to the other clients of the partnership.¹³ Because partner type is revealed only through an ongoing relationship, this information is not verifiable in a court and so is not contractible. Client fees cannot therefore be contingent upon observations of partner type. They are contracted *ex ante* and are paid *ex post*. Observations of partner type can however affect future contracts and we show below how they affect clients' future willingness to pay for services rendered.

At time 3 clients learn partner types, and partners determine which associates are offered partnerships, and upon what basis. Retiring partners are paid a dividend and then sell their

¹¹It is common for professional partnerships to assign at least temporary responsibility for an associate to a specific partner. However, we contend that hierarchy among partners and collaborative efforts among work teams and their periodic restructuring generally expose associates to multiple partners. In investment banking partnerships, for example, it was common for teams of product specialists to collaborate both with one another and with various client relationship managers as well as to come in contact with partners involved primarily in management functions. See Eccles and Crane (1988).

¹²Training augments the human capital of the next generation and enables them to train their successors. Since each generation of agents is identical, training is optimal if and only if it is valuable on a per-generation basis.

¹³It is reasonable to assume that performance information would become common knowledge over several generations. In the interests of tractability we assume that it is shared immediately.

shares.¹⁴

In this setting, we define a partnership equilibrium as follows:

DEFINITION 1 *A partnership equilibrium consists of a share price P at which new partners acquire a partnership stake, wages w_A , w_P and a rule relating realised partner quality to future willingness to pay w such that:*

- (PE1) *w is the expected next period productivity of partners;*
- (PE2) *New associates wish to join the firm;*
- (PE3) *Skilled associates wish to enter the partnership;*
- (PE4) *Unskilled associates do not wish to enter the partnership;*
- (PE5) *New partners elect to mentor associates.*

Partnership equilibria overcome the time consistency problem identified above. When new associates enter the firm, they receive mentoring but commit themselves to provide mentoring in the future if they become skilled. Thus in equilibrium, the partnership is a device for incubating and transferring human capital that cannot be exchanged at arms length.

3. Existence of Equilibria

In a partnership equilibrium, each agent behaves according to rules PE1-5, given that all other agents do so. Constraining P to be a constant as in definition 1 is without loss of generality. It simply implies that each generation of partners extracts from the partnership in salary and dividends precisely what is added during its tenure by the associates and partners. The precise value of P will depend upon bargaining between outgoing and new partners which is outside the scope of this paper: without loss of generality, we assume that P is the fair value of the company.

¹⁴In practice, retiring partners do not literally sell their stakes to incoming partners nor is there necessarily a one-for-one mapping between incoming and outgoing partners. However, we do believe it is reasonable to think of the firm intermediating the purchase and sale of equity stakes by incoming and outgoing partners. It is not uncommon for incoming partners to borrow from the partnership to fund their initial capital contribution. From the retiring partner's perspective, there is no standard mechanism for cashing out. In the investment banking industry, where production often involves putting capital at risk, it was common for the retiring partner's capital stake to be withdrawn over an extended period rather than in a lump sum upon retirement. In the case of Goldman Sachs, prior to the firm's public offering retiring partners essentially entered a fixed-term debt-for-equity swap with the firm providing for staged withdrawal of capital and a fixed return on capital over the withdrawal period. Finally, a tendency toward existing partners stepping down to make way for new partners is often seen as a sign of health (see Wilhelm and Downing, 2001, chapter 7 for a discussion of this element of the Goldman Sachs culture). It will become apparent that such mechanisms are consistent with equilibrium in our model.

3.1. Client Fees

We now state the rule which gives as a function of realised partner quality the fee w_C which clients are willing to pay:¹⁵

$$w_C = \begin{cases} w_h, & \text{if all partners in every preceding period were skilled;} \\ w_l, & \text{otherwise.} \end{cases} \quad (2)$$

It is helpful to think of this rule in terms of institutional reputation. Call a partnership “trustworthy” if $w_C = w_h$ and “untrustworthy” otherwise. When a trustworthy firm is revealed to have promoted an unskilled associate to partner it is regarded henceforth as untrustworthy. Condition PE1 implies that in equilibrium, untrustworthy firms deserve their reputations. The fees which they can charge are reduced accordingly. We show that this concern for loss of reputation (being downgraded from trustworthy status) ensures that mentoring (PE5) and promotion (PE3-4) strategies are first best. We therefore formalise the notion that partnerships are repositories of collective reputations.

In the remainder of this section we show that when client fees are determined by rule 2, trustworthy firms are in a partnership equilibrium. To do so we firstly examine the properties of an untrustworthy firm. This establishes the equilibrium consequences of failing to mentor associates, and of low quality agents accepting promotion. We then demonstrate that the consequences are sufficiently costly to provide the incentives required to maintain a partnership equilibrium.

3.2. Untrustworthy firms

We prove firstly that mentoring will not occur in untrustworthy firms. Since partnerships will not in equilibrium become untrustworthy, we need an assumption about the off equilibrium path beliefs which outside firms will hold concerning human capital levels within a partnership firm which is discovered to have an unskilled partner. We need only the weak assumption that they will assign a positive probability to the event that at least one of the firm’s associates has been mentored.¹⁶

¹⁵It turns out that this is the *unique* rule which is consistent with rational expectations. Any reputational equilibrium must be sustained by a rule which punishes a single bad experience with a temporary reduction in fees. As we show below, any trained agents will respond to such a withdrawal by refusing partnerships. Future generations will never be trained and so clients will never again pay w_h .

¹⁶This assumption is required only to ensure that for skilled agents in untrustworthy firms, resignation is *strictly* preferred to promotion to partner and hence is not critical. This belief assessment is consistent for each stage game in the sense of Kreps and Wilson (1982). To see this, consider a stage game with n partners which follows one in which every retiring partner was revealed to be skilled. Define the strategy set π^m for this stage as follows: skilled

Now consider a skilled agent's incentives to accept a partnership in a firm immediately after it is deemed to be untrustworthy. If he does so he will by rule 2 earn w_l in the final period of his career. If he does not then our belief assumption above implies that he will earn at least marginally more than w_l from the competitive outside labour market. He therefore leaves the firm. Partnership opacity ensures that unskilled agents are pooled in the outside labour market with skilled agents and hence that they face the same incentives. It follows that every associate will leave the firm in the period after an unskilled partner is discovered.

It follows from the above that future hires will not be mentored by the firm and that they will therefore demand their outside wage option w_l . The firm will therefore consist in the future only of unskilled agents earning w_l , so that the threat embodied in rule 2 is time consistent. Furthermore, since employees are extracting the whole of their per-period product, the value of the firm will be 0.

3.3. Trustworthy Firms

If an unskilled agent becomes a partner in a trustworthy firm then the illiquidity of his partnership share ensures that he will remain a partner long enough for clients to learn his type. The firm is then relabelled as untrustworthy. We now demonstrate that this threat is sufficiently potent to enforce requirements PE3-5 and hence, when associate wages are chosen to satisfy PE2, to sustain a partnership equilibrium.

To prove this we assume that all agents in the current generation act in accordance with rules PE3-5 and that all agents in future generations are expected to do likewise. We show that no agent

partners mentor with probability $1 - \frac{1}{m}$, skilled associates accept promotion with probability $1 - \frac{1}{m}$ and unskilled agents do so with probability $\frac{1}{m}$. Retiring partners attempt to promote n partners, starting with skilled members of the partnership and then if necessary offering promotion to others. Customers set prices according to rule 2. Now denote by μ_j^m the probability assigned by the customers that at least one associate has been mentored, given that $j < n$ partners are revealed in this stage game to be unskilled. We know that j of the retiring partners did not train. μ_j^m is consistent with Bayes' rule provided

$$\begin{aligned} \mu_j^m &= \sum_{i=1}^{n-j} \left\{ (i \text{ of previous generation mentored}) \sum_{k=1}^i (k \text{ skilled promoted}) P \{ \text{at least one mentors} | k \text{ promoted} \} \right\} \\ &= \sum_{i=1}^{n-j} \sum_{k=1}^i \binom{n-j}{i} \left(1 - \frac{1}{m}\right)^i \left(\frac{1}{m}\right)^{n-j-i} \binom{i}{k} \left(1 - \frac{1}{m}\right)^k \left(\frac{1}{m}\right)^{i-k} \left(1 - \left(\frac{1}{m}\right)^k\right). \end{aligned}$$

Then π^m is strictly mixed and tends towards the sequentially rational strategy set (PE2 - 5) which we describe in the paper, and for every j , $\mu_j^m \rightarrow 1$ as required. Moreover, it is easy to check that the beliefs derived from π^m using Bayes' rule for the number of skilled agents in the next stage tends towards the beliefs used in the body of the paper: in other words, our equilibrium is sequentially rational.

has incentive to deviate from this behaviour. Then the assumption about future generations is rational and the economy is in a partnership equilibrium. We begin by determining the associate wage offered in this case.

(iii) *Associate Wages*

Since the share price P is a constant, each partner's total equilibrium income from salary and dividends must be the sum of net income from associates and his own marginal product, or $n(w_l - w_A) + w_h$. In the second period of their careers, associates become skilled with probability $\frac{1}{n}$ and earn this quantity less their cost c of mentoring new associates. If they do not join the partnership they earn w_l , so that a new associate's outside option is to earn w_l in both periods of his life. The new associate's participation, or individual rationality (IR), constraint PE2 can therefore be written as:

$$\frac{1}{n} \left(w_A + \frac{n(w_l - w_A) + w_h - c}{1 + r} \right) + \left(1 - \frac{1}{n} \right) \left(w_A + \frac{w_l}{1 + r} \right) \geq w_l \frac{2 + r}{1 + r},$$

or

$$w_A \geq w_l - \left(\frac{\Delta w - c}{nr} \right). \quad (\text{AIR})$$

Since agents are born without wealth, we assume¹⁷

$$w_A \geq 0. \quad (\text{AssBC})$$

Finally, we assume that¹⁸

$$w_l < \frac{c}{n}. \quad (3)$$

Equations 1 and 3 together imply that $w_l < \frac{\Delta w - c}{nr}$ and hence that at any non-negative wage every agent strictly prefers working for the partnership to his outside option.¹⁹ Therefore partners offer new associates the following wage:

$$w_A = 0, \quad (4)$$

and new associates satisfy PE2 by accepting it.

¹⁷We ignore subsistence requirements. Incorporating them into the budget constraint would complicate our notation but would have no material effect upon our conclusions.

¹⁸For low enough w_l this requirement is trivially consistent with equation 1.

¹⁹This assumption is consistent with the casual observation that, notwithstanding their low (hourly-adjusted) current salaries, associates of the most reputable professional partnerships can expect super-normal lifetime earnings. Wilhelm and Downing (2001, chapter 7) make this argument with respect to a partnership stake in Goldman Sachs and suggest that, in line with our model, associates would bid (accept negative wages) for employment (and training) were it not for informational friction.

(iii) *Share Price*

At the end of each period the shareholders in the firm (the partners) are paid a dividend equal to the total production during the period by the shareholder and n associates: $(w_h + nw_l) - w_P$. Since trustworthy firms remain trustworthy in equilibrium, the per share *ex div* firm value is therefore

$$P = P_{TR} \equiv \frac{w_h + nw_l - w_P}{r}. \quad (5)$$

(iii) *Acceptance of Promotion*

Now consider a skilled agent invited to join the partnership at share price P . If he refuses then he will be fired. By assumption every other skilled agent accepts promotion and so a total of $N(n-1)+1$ agents return to the labour force. The labour market knows that of these one is skilled and the rest are not,²⁰ but the (assumed) opacity of the partnership prevents identification of the skilled agent. Agents who do not join the partnership are therefore offered a wage of $\frac{N(n-1)w_l + w_h}{N(n-1)+1}$. Alternatively, the skilled agent may obtain utility $w_h + nw_l - c$ by accepting the partnership. Accepting the partnership is therefore optimal (and PE3 is satisfied) if and only if

$$\begin{aligned} c &< w_h + nw_l - \frac{N(n-1)w_l + w_h}{N(n-1)+1} \\ &= \frac{\Delta w}{1 + \frac{1}{N(n-1)}} + nw_l. \end{aligned} \quad (6)$$

It follows immediately from assumption 1 that this will be satisfied for sufficiently high n : we assume that this is the case.

The associate has no wealth and so must finance his partnership stake. However, it is crucial to our argument that he be unable to signal his quality to the labour market through the raising of finance. We demonstrate in section 3.3.iv that, irrespective of his ability, the most a partner can lose in equilibrium is $\frac{P_{TR}}{N}$. Provided $r > \frac{1}{N}$ he can finance this amount from his lifetime earnings as a partner. We assume that this is the case and that retiring partners (but not associates offered partnership) can credibly convey associate quality to a financier.²¹ Retiring partners can therefore arrange a package coupling promotion to the partnership with the necessary financing and thus prevent independent borrowing against the offer to signal a new partner's quality.

²⁰This is an off-equilibrium path belief: it is again consistent in the Kreps and Wilson (1982) sense, using the strategies π^m defined in footnote 16.

²¹In a richer model with career paths exceeding two periods the least cost financing alternative would be for junior partners to borrow from active senior partners who are best positioned to assess the borrower's quality and to monitor the loan.

Suppose instead that an unskilled agent is offered a partnership stake. He knows that his acceptance will cause the firm to become untrustworthy and hence that (assuming as usual that his end of period dividend will equal the net cashflows generated during his partnership) his share will have value 0. Until clients determine that he is unskilled, the firm is treated as trustworthy and he and all of the other partners earn a wage w_h . His end of period income is therefore $w_h + nw_l$, compared to the outside option of w_l and he accepts a partnership at share price P if and only if $-P(1+r) + w_h + nw_l \geq w_l$, or²²

$$P \leq P_{USK} \equiv \frac{\Delta w + nw_l}{1+r} < P_{TR}. \quad (7)$$

Next we demonstrate that in equilibrium retiring partners will not offer shares at this price. It follows that at the prevailing share price no unskilled agent will enter the partnership, so that PE4 is satisfied.

(iii) The Mentoring Decision

If a skilled partner elects to mentor associates, he derives utility $w_h + nw_l - c$ from his stake in the firm. If he is the only partner who shirks mentoring responsibility then by assumption his shirking will not be observable but only $N - 1$ associates will have their human capital augmented.

The argument in the preceding section implies that the partnership can either promote $N - 1$ partners at share price P_{TR} and remain trustworthy, or that it can promote N partners at share price P_{USK} , in which case the firm will after one further period become untrustworthy. The income from the former strategy exceeds that from the latter precisely when

$$(N - 1) \frac{w_h - w_P + nw_l}{r} \geq N \left(\frac{\Delta w + nw_l}{1+r} \right),$$

or

$$w_P \leq \frac{N(N - (1+r))}{(N - 1)(1+r)} (w_h + nw_l) + w_l \frac{Nr}{(N - 1)(1+r)}.$$

The multiplier of w_h in this expression exceeds 1 for $N \geq 2$. Since $w_P < w_h$ this condition is satisfied. In other words, if a partner shirks his mentoring responsibility the firm optimally reduces the number of partners rather than accepting an incompetent partner (as anticipated in section 3.3.iii, this proves PE4).

²²Note that, since all partners pay the same price for their shares, an attempt to sell shares at P_{USK} will immediately reveal to skilled partners that an unskilled agent is entering the partnership and hence that the exit share price will be 0. Since their time 2 outside option is equal to that of the unskilled agents, they will be prepared to accept this price.

Mentoring is subject to a free-rider problem among partners. A partner who shirks mentoring retains the entire associated utility gain c while the losses associated with his behaviour are shared equally amongst the partners. If the number of partners is reduced from N to $N - 1$ the per partner share value declines by $P_{TR} - \frac{N-1}{N}P_{TR} = \frac{P_{TR}}{N}$. This loss is experienced at the end of the partner's career, while the mentoring cost is incurred immediately. Thus partners mentor associates rather than suffer this loss if and only if $c \leq \frac{P_{TR}}{N(1+r)}$, or precisely when

$$N \leq \frac{P_{TR}}{c(1+r)}. \quad (8)$$

Condition 8 places an upper bound on the size of the partnership which rules out partners free-riding on one another. It confirms the natural intuition that the size of the partnership in equilibrium is larger when the present value of a partner's interest in sustaining a reputation for being trustworthy is large relative to the cost of doing so. Thus we might expect to observe larger partnerships in settings where client service and mentoring are highly complementary. Alternatively, if the disutility of mentoring is inversely related to the quality of associate hires we might expect firms for whom the constraint 8 bites to invest more heavily in screening new associates. In general, if condition 8 is satisfied, the equilibrium requirement PE5 also is satisfied.

The preceding discussion is summarised in proposition 2.

PROPOSITION 2 *Suppose that conditions 6 and 8 are satisfied. Then wages $w_A = 0$ and $w_P < w_h$ with the client payment rule 2 together constitute a partnership equilibrium.*

4. Physical Capital Investment

Thus far our model focuses on the creation and transfer of human capital by assigning no role to physical capital. In this section we discuss the complexities introduced by physical capital. We adopt a simple technology with a minimum operating scale above which there are constant marginal returns to scale. We think of this as a technology, such as a computerised accounting system or client database, which increases the productivity of skilled and unskilled partners. Such systems codify some of the partners' tacit knowledge and by narrowing the gap between the output of skilled and unskilled agents undermine the partnership's role in preserving human capital.

Some of our modelling assumptions are necessary because of the central role played in our model by agents' outside options. Participation constraints for associate hires and hence their

salaries depend crucially upon the wage level which they can earn in the market place. Incentives to accept partnerships depend upon associate wages and upon outside offers. In the simple model of sections 2 and 3 physical capital has no role in production and we can therefore assume that an agent's productivity and hence his wage is precisely determined by his ability. This need not remain true when physical capital is used in production: the agent's productivity then depends upon the effectiveness of the capital which he uses and hence in general upon the size of the firm for which he works. Firm size depends in turn upon the wage level. Joint determination of wages and of firm size is thus impossible in a partial equilibrium setting.

Levin and Tadelis (2002) also compare partnership and corporate organisations with physical capital. They are not concerned with mentoring and hence assume an exogenous outside wage. They then compute the optimum firm size given an exogenous distribution of agent abilities. We want to examine the effects of an outside option which is endogenously determined by skill levels and we therefore constrain the production technology to exhibit constant returns and assume that, even with physical capital, agents can extract as wages the whole of the economic surplus which they generate. The analysis of this section should therefore be regarded as an example. We believe that our intuition would carry over unchanged to a more general equilibrium framework.

4.1. Technology

Suppose that an agent's productivity can be increased in combination with physical capital. The minimum investment in physical capital is $K_{\min} \equiv M$. For $i \in \{l, h\}$, an agent who produces w_i without the use of physical capital can produce $w_i + \pi_i$ with a unit of physical capital. The productive technology therefore exhibits constant returns beyond its minimum scale. The per period cost of a unit of physical capital is r . We assume that

$$\pi_h > r; \pi_l > r. \quad (9)$$

This rules out trivial cases in which physical capital should not be used and in which the analysis of sections 2 and 3 applies verbatim. Note that, since no agent can productively use more than one unit of physical capital, M is the minimum number of agents who can operate the technology efficiently.

4.2. Equilibrium

Define W_h and W_l to be the respective net output of skilled and unskilled agents who have access to physical capital:

$$\begin{aligned} W_h &\equiv w_h + \pi_h - r; \\ W_l &\equiv w_l + \pi_l - r, \end{aligned}$$

and let $\Delta W \equiv W_h - W_l$. If mentoring is no longer socially optimal with physical capital then partnerships no longer have an economic role. We rule out this trivial case with the following assumption:

$$c < \frac{\Delta W}{1+r}. \quad (10)$$

We search in this case for partnership equilibria.

The analysis is complicated by the existence of a minimum operating scale M for physical capital. A partnership of size N will use $N(n+1)$ units of physical capital. If this is below M then $(M - N(n+1))$ units of capital will remain idle. The cost of any idle capital must be shared equally amongst the partners. In a partnership firm with capital the output of a partner *net of the cost of idle capital* is therefore

$$W_{PTR} = W_h - \max \left\{ r \left(\frac{M}{N} - (n+1) \right), 0 \right\}$$

We make the following simplifying assumption, which is analogous to equation 3:

$$W_l < \frac{c}{n}. \quad (11)$$

The analysis of section 3 can now be applied, with the wages w_l and w_h relabelled as W_l and W_{PTR} respectively. The partnership is constrained by the free-rider problem to be no larger than $P_{TR}(W_{PTR}, W_l, W_P) = \frac{W_{PTR} + nW_l - W_P}{cr(1+r)}$. The partnership wage W_P may be freely assigned in the range $[0, W_h]$, so a partnership of size N will not be subject to free-riding if and only if

$$N \leq P_{TR}(W_{PTR}, W_l, 0). \quad (12)$$

Lemma 3 provides a more convenient characterisation of condition 12.

LEMMA 3 *Condition 12 is equivalent to condition 13.*

$$N \leq \begin{cases} \bar{N} \equiv \frac{W_h + nW_l}{cr(1+r)}, & \text{if } M \leq M_l \equiv \bar{N}(n+1) \\ f(N) \equiv \bar{N} - \frac{1}{c(1+r)} \left(\frac{M}{N} - (1+n) \right), & \text{if } M > M_l \equiv \bar{N}(n+1) \end{cases} \quad (13)$$

Proof. Equation 12 reduces to $N \leq \bar{N}$ when $W_{PTR} = W_h$ and this is the case precisely when $M \leq \bar{N}(n+1)$. When $M > \bar{N}(n+1)$ we cannot have $N > \bar{N}$ and for $N < \bar{N}$, $M > N(n+1)$ and hence $W_{PTR} = W_h - r \left(\frac{M}{N} \right)$ so that equation 12 reduces to $N \leq f(N)$. \square

If N satisfies condition 13 then a partnership of size N is sustainable provided mentoring is socially optimal at this size:

$$c < \frac{W_{PTR} - W_l}{1+r}. \quad (14)$$

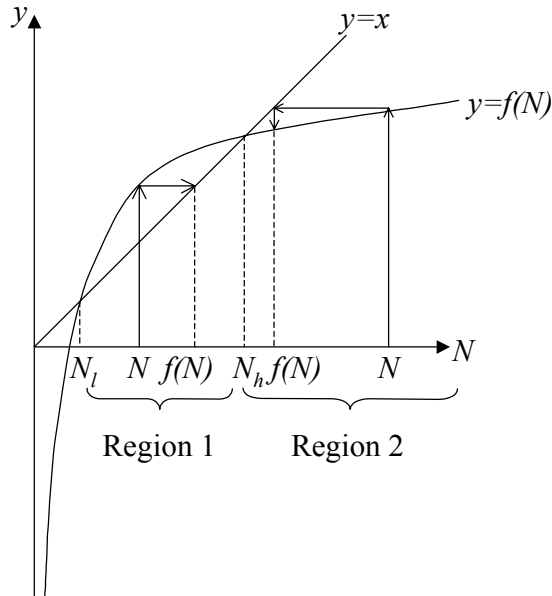


Figure 2: Low and intermediate minimum efficient operating scale.

The line $y = f(N)$ is plotted in figure 2 in the case where it intersects $y = N$ and in figure 3 when the two lines do not intersect. The points labelled N_l and N_h in figure 2 correspond to values

$$\frac{1}{2} \left\{ \bar{N}_0 + \frac{1+n}{c(1+r)} \pm \sqrt{\left(\bar{N}_0 + \frac{1+n}{c(1+r)} \right)^2 - \frac{4M}{c(1+r)}} \right\}.$$

The following lemma is established by straightforward manipulation of the relevant expressions.

LEMMA 4 *The lines $y = f(N)$ and $y = N$ do not cross precisely when*

$$M > M_h \equiv \frac{1}{4cr^2(1+r)} (W_h + nW_l + r(1+n))^2.$$

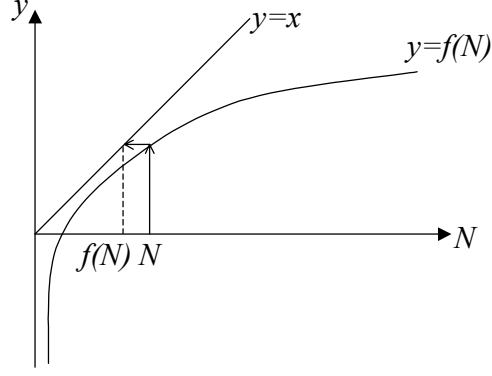


Figure 3: High minimum operating scale: partnership equilibria are unsustainable.

When $M \leq M_h$ so that the two lines do cross, \bar{N} lies in region 1 in figure 2 precisely when $M < M_l$ and lies in region 2 precisely when $M > M_l$.

It is clear from figure 2 that $N \leq f(N)$ only when $N_l \leq N \leq N_h$, or when N lies in region 1. From Lemma 4 this occurs only when $M \leq M_l$. In this case lemma 3 implies that the maximum partnership size is \bar{N} . When $M > M_l$, we know from lemma 3 that $\bar{N} > N_h$ and it is clear from figure 2 that the highest $N \leq \bar{N}$ for which $N \leq f(N)$ is N_h . Finally, if $M > M_h$ lemma 4 and figure 3 together imply that for no N is $N \leq f(N)$ and hence that partnership equilibria are unsustainable.

We summarise our discussion in proposition 5 and then discuss the intuition for the result.

PROPOSITION 5 *Suppose that productivity improvements are attainable using physical capital with the properties described in section 4.1 and suppose that equations 9 and 10 are satisfied, so that the first best outcome is for physical capital to be used and for agents to be mentored.*

1. *If $M \leq M_l$ then a partnership equilibrium is sustainable;*
2. *If $M_h \geq M > M_l$ then a partnership equilibrium is sustainable precisely when $c < \frac{\Delta W}{1+r} - \frac{kr}{1+r} \left(\frac{M}{\text{int } N_h} - (1+n) \right)$, where $\text{int } n$ denotes the integer part of n ;*
3. *If $M > M_h$ then a partnership equilibrium is not sustainable.*

Proof. Only the social optimality of partnership in parts 1 and 2 remains to be proved. For part 1, when $M \leq M_l$ the optimality condition 14 is equivalent to assumption 10. The condition in part 2 of the statement of the proposition is equivalent when $N = \text{int } N_h$ to condition 14. \square

As we note at the start of this section, the introduction of technology which completely codifies the tacit knowledge of the partners trivially obviates the need for the partnership structure. Proposition 5 examines instead the situation where investment in both physical and human capital is optimal. In this case the free-rider mentoring problem in the partnership is important, as it places an upper limit on the number of partners among whom the minimum capital investment can be shared. As a consequence, whenever the minimum capital investment M exceeds M_l each partner will have to bear more than his marginal capital costs.

Part 1 of the proposition states that the partnership structure will survive when the free-rider problem does not bite and each partner has only to bear his marginal capital costs. Part 2 states that when each partner has to bear the costs of some idle capacity, the effective cost of mentoring is raised by $\frac{kr}{1+r} \left(\frac{M}{\text{int } N_h} - (1+n) \right)$, so that marginal partnerships will not survive. Part 3 states that, when M is sufficiently high, partnerships cannot survive.

The proposition demonstrates that partnerships may not survive in the face of high capital costs or alternatively when the minimum efficient scale of physical capital investment increases. This is true even when the first best outcome would involve the mentoring and human capital development facilitated by the partnership structure.

A concrete example illustrates the intuition which we draw from this result. Advances in option-pricing theory stemming from the work of Black and Scholes (1973) and Merton (1973) narrowed margins in many trading functions as they diffused throughout the investment-banking industry. Codification of these functions coupled with advances in information technology amplified scale economies. Minimum scale essentially increased as competition forced massive investment in communications, data storage and processing and larger commitments of risk capital.²³ This change in production technology spawned conflicts between traders and traditional investment bankers (or “dealmakers”) whose production technology remained centered on tacit human capital. A common refrain involved criticism of traders for free-riding on the past efforts of the traditional investment bankers.²⁴ Thus our model suggests that the demise of investment-banking partnerships during the 1970s and 1980s may be attributable to the inability of integrated banks to sustain intergenerational

²³Risk capital is defined as the value of or cost of manufacturing a put option against a net risk exposure. Merton (1990, chapter 14) provides the seminal treatment of the application of contingent-claims analysis to the production technology of financial intermediaries.

²⁴Labour market-driven bonus schemes that essentially compensated traders with call options on their positions aggravated the conflict. In the context of our model, this tendency toward greater sensitivity to external labour market conditions can be interpreted as a reflection of greater functional transparency providing traders with a more attractive outside option at the second stage of their career.

transfers of human capital in the face of technology-induced increases in minimum scale (in at least some dimensions of production).²⁵

5. Conclusion

In this paper general human capital is augmented through mentoring, but mentoring effort is neither observable nor contractible. Although mentoring is welfare increasing, unskilled junior agents are unable to contract with skilled senior agents for mentoring effort. Moreover, it is impossible for them to make an *ex ante* commitment to perform mentoring after their own mentoring is completed.

We demonstrate that these problems can be overcome in a partnership. Our argument rests upon three important characteristics of partnerships. Firstly, they are opaque and outsiders cannot observe the ability of individual employees. Secondly, partnership stakes are illiquid: partnership is a long-term commitment. Thirdly, partnerships rely in the face of asymmetries of information upon reputational capital.

In equilibrium only unskilled agents are not promoted to partner. This gives the partners the leverage needed to persuade new partners to accept illiquid equity-based contracts. Once they have done so they cannot immediately sell themselves to the highest bidder and they must stay with the firm long enough for clients to discover their ability. If a partner is discovered to be unskilled clients react by withdrawing their trust from the firm and its fee income and value drop. Unskilled agents know that if they accept an illiquid partnership the firm will lose its reputation before they leave, and hence that they will experience a capital loss on their partnership share. They therefore refuse to accept a partnership. Skilled partners anticipate this effect and they mentor new associates to ensure that there is a market for their partnership shares.

There is a free-rider problem in mentoring which places an upper limit on the size of a partnership. This reduces the partnership's ability to make significant investments in physical capital, as very large investments can only be used by a suboptimal number of partners. In some circumstances the need to operate at efficient physical scale will outweigh the benefits of human capital investment and the partnership cannot be sustained.

²⁵After 1986, Goldman Sachs remained the only private partnership among bulge bracket banks. Goldman, more than most banks, voiced a desire to promote mentoring of associates and teamwork throughout the firm. But even in this case, the tension we describe led Geoff Boisi, a prominent "culture carrier" and the youngest ever partner, to describe the firm as a partnership in name only following his departure in 1991 (Wilhelm and Downing, 2001, chapter 7).

What prevents a publicly-traded, joint stock firm from replicating the incentives that we identify with partnerships? In our model, the most important distinguishing feature of the partnership is the inseparability of human and financial capital, which causes unskilled agents to refuse promotion. In joint stock firms financial capital is supplied by investors who are typically distinct from the employees who supply human capital.

Although it appears seldom to occur, a joint stock firm could surely manufacture the opacity of a partnership. However, deliberately introducing opacity into a joint stock firm exacerbates the well-documented principal agent problems to which such firms are subject (see Jensen, 1986, and references therein). Moreover, it would not on its own resolve the mentoring problem. Although skilled agents would have a lower outside option and so would accept promotion with more restrictive contracts, unskilled agents without a capital exposure would also be prepared to accept promotions. This would cause the mechanism which we have outlined to unravel. A similar argument applies to non-compete contracts that seek to limit employee mobility by preventing them from selling their human capital to the firm's direct competitors.²⁶

Unskilled agents might be dissuaded from accepting promotion in joint stock firms if it was contingent upon the purchase of shares in the firm. As we have argued in this paper, this policy will only be successful when skilled agents cannot use the signal which promotion sends to earn their marginal product in the labour market. Restricted stock programs approximate our mechanism by requiring executives to hold or to acquire nontransferrable stock that vests only with continued employment. In some instances, the firm lends the employee funds for the express purpose of acquiring such shares. Generally, when restricted shares vest they convert to unrestricted shares. Our analysis suggests that vesting periods should correspond with the time horizon over which the senior employee's commitment to mentoring is demonstrated and might benefit further from conversion on terms set by insiders. Finally, the potential for unravelling is diminished when human capital is firm-specific.

Given the difficulties in replicating the incentives created by the partnership, we conclude that joint stock companies will be most effective in industries where human capital is not dependent upon noncontractible and costly mentoring, or where it is hard to transfer human capital between firms. In the latter case, mentoring can be incentivised by requiring new managers to buy spe-

²⁶Moreover, considerable uncertainty surrounds the enforceability of such contracts and they may induce undesirable self-selection amongst incoming employees who have private information about their own ability.

cial shares in the company which they cannot easily redeem before retirement. Firms in other industries, such as law and stockbroking, will be more effectively organised as partnerships, and will deliberately surround themselves with barriers to the flow of information. The tension introduced by a rising minimum efficient scale for physical capital investment in more highly codified dimensions of professional practice may shed light on the apparent difficulty in sustaining recent large-scale combinations of investment banks with commercial banks and of accounting practices with management-consulting firms.

Having drawn this conclusion, one final observation seems in order. Much of what we envision as tacit human capital lies within the realm of nonrival goods: as knowledge, relationships, reputation and the like are transferred across generations in the partnership, there is no barrier to their simultaneous application by several generations of workers. Romer (2002) notes that there are alternatives to strong property rights for encouraging the provision of nonrival goods. We contend that organizational structure, and partnerships in particular, historically played this role in professional services industries and therefore truncated demand for legal protection of tacit assets. From the perspective of our model, it is perhaps not coincidental that recent technological advances that codify previously tacit knowledge have been associated with the demise of partnerships and a simultaneous sharp increase in both contractual experiments aimed at controlling employee mobility and patent applications for financial products (see Lerner, 2002) and business methods.²⁷

References

- Aghion, Philippe, Patrick Bolton and Jean Tirole.** “Exit Options in Corporate Finance: Liquidity versus Incentives.” Working paper, Princeton University, 2000.
- Alchian, Armen A. and Harold Demsetz.** “Production, Information Costs, and Economic Organization.” *American Economic Review*, December 1972, 62(5), pp. 777 – 795.
- Bell, Daniel.** *The Coming of Post-Industrial Society*. Basic Books, New York, NY, 1973.
- Black, F. and M. Scholes.** “The Pricing of Options and Corporate Liabilities.” *Journal of Political Economy*, 1973, 81, pp. 637–653.

²⁷Lerner ascribes much of the recent activity to the July 1998 appellate decision in *State Street Bank and Trust v. Signature Financial* which resolved ambiguity regarding the patentability of financial discoveries in the U.S. This is surely a large part of the explanation for subsequent years. However, Lerner’s data also suggest a regime shift in annual patent awards between 1986 and 1987 from a near-zero level to a consistently positive level. This shift corresponds with Morgan Stanley’s 1986 initial public equity offering leaving Goldman Sachs (until June 1999) as the only bulge bracket investment bank organized as a private partnership.

- Cremer, Jacques.** “Cooperation in Ongoing Organisations.” *Quarterly Journal of Economics*, February 1986, 101(1), pp. 33 – 49.
- Eccles, Robert G. and Dwight B. Crane.** *Doing Deals: Investment Banks at Work*. Harvard Business School Press, Cambridge, MA, 1988.
- Endlich, Lisa J.** *Goldman Sachs: The Culture of Success*. Alfred A. Knopf, New York, NY, 1999.
- Fama, Eugene F. and Michael C. Jensen.** “Agency Problems and Residual Claims.” *Journal of Law and Economics*, June 1983a, 26(2), pp. 327 – 49.
- . “Separation of Ownership and Control.” *Journal of Law and Economics*, June 1983b, 26(2), pp. 301 – 325.
- Farrell, Joseph and Suzanne Scotchmer.** “Partnerships.” *Quarterly Journal of Economics*, May 1988, 103(2), pp. 279 – 297.
- Gaynor, Martin and Paul Gertler.** “Moral Hazard and Risk Spreading in Partnerships.” *RAND Journal of Economics*, Winter 1995, 26(4), pp. 591 – 613.
- Gilson, Ronald J. and Robert H. Mnookin.** “Sharing Among the Human Capitalists: An Economic Inquiry Into the Corporate Law Firm and How Partners Split Profits.” *Stanford Law Review*, January 1985, 37(2), pp. 313 – 392.
- Hansmann, Henry.** *The Ownership of Enterprise*. Harvard University Press, Cambridge, MA, 1996.
- Holmström, Bengt.** “Moral Hazard in Teams.” *Bell Journal of Economics*, Autumn 1982, 13(2), pp. 324 – 40.
- Hörner, Johannes.** “Reputation and Competition.” *American Economic Review*, June 2002, 92(3), pp. 644 – 663.
- Jensen, Michael C.** “Agency Costs of Free Cash Flow, Corporate Finance and Takeovers.” *American Economic Review*, May 1986, 76(2), pp. 323–329.
- Kreps, David M.** “Corporate Culture and Economic Theory,” in James E. Alt and Kenneth A. Shepsle, eds., *Perspectives on Positive Political Economy*. Cambridge, MA: Cambridge University Press, 1990, pp. 90 – 143.
- Kreps, David M. and Robert Wilson.** “Sequential Equilibria.” *Econometrica*, July 1982, 50(4), pp. 863 – 894.

- Lang, Kevin and Peter-John Gordon.** “Partnerships as Insurance Devices: Theory and Evidence.” *RAND Journal of Economics*, Winter 1995, 26(4), pp. 614 – 629.
- Lerner, Josh.** “Where Does *State Street* Lead? A First Look at Finance Patents, 1971 to 2000.” *Journal of Finance*, April 2002, 57(2), pp. 901 – 930.
- Levin, Jonathan and Steven Tadelis.** “A Theory of Partnerships.” Working paper, Stanford University, Stanford, CA, 2002.
- Merton, Robert C.** “Theory of Rational Option Pricing.” *Bell Journal of Economics and Management Science*, 1973, 4, pp. 141–83.
- . *Continuous Time Finance*. Blackwell, Cambridge, Mass., 1990.
- Pichler, Pegaret and William Wilhelm.** “A Theory of the Syndicate: Form Follows Function.” *Journal of Finance*, December 2001, 56(6), pp. 2237 – 64.
- Polanyi, Michael.** *The Tacit Dimension*. Doubleday, Garden City, NY, 1966.
- Romer, Paul.** “When Should We Use Intellectual Property Rights?” *American Economic Review*, May 2002, 92(2), pp. 213 – 216.
- Shapiro, Carl and Joseph E. Stiglitz.** “Equilibrium Unemployment as a Worker Discipline Device.” *American Economic Review*, June 1984, 74(3), pp. 433 – 44.
- Stiglitz, Joseph E.** “The Causes and Consequences of the Dependence of Quality on Price.” *Journal of Economic Literature*, March 1987, 25(1), pp. 1 – 48.
- Tadelis, Steven.** “What’s in a Name? Reputation as a Tradeable Asset.” *American Economic Review*, June 1999, 89(3), pp. 548 – 563.
- . “The Market for Reputations as an Incentive Mechanism.” *Journal of Political Economy*, August 2002, 110(4), pp. 854 – 882.
- Wilhelm, William J. and Joseph D. Downing.** *Information Markets*. Harvard Business School Press, Boston, MA, 2001.
- Winton, Andrew.** “Limitation of Liability and the Ownership Structure of the Firm.” *Journal of Finance*, June 1993, 48(2), pp. 487 – 512.