Organizational Design with Portable Skills*

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Abstract

Employees learn from performing their tasks, and in the process they accumulate potentially portable human capital. If companies cannot commit to specific task assignments, they may have an incentive to assign workers to tasks that reduce the cost of retaining them but do not maximize their productivity. By contrast, equity partnerships assign tasks to their partners efficiently, because their remuneration increases with their talent and with the portability of their human capital. This provides a novel rationale for the widespread presence of partnerships in professional services and for the tendency to move from equal sharing towards performance-based remuneration systems.

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1 Introduction

In professional service industries like law, engineering, accounting and medicine, retaining skilled employees is an important matter: these industries not only rely more on human capital than others, but also feature higher turnover rates – fully 63.3% in 2019, according to the US Bureau of Labor Statistics, compared with an average 45% in the rest of the US economy. When moving across firms, workers carry with them the human capital they have acquired. The portion that may also benefit their new employers is referred to as portable (Groysberg et al. 2008; Groysberg, 2010). This encompasses not only portable productive skills, but any expertise that may affect their employers' performance, such as client networks or relationships with valuable collaborators or suppliers developed in past employment.[1]

Firms use several contractual tools to retain their best employees, such as wage bonuses, noncompete clauses and perks. One common strategy is to assign talented workers to tasks that make them less attractive for competitors in the labor market, as in Waldman (1984), Bernhardt (1995), Mukherjee and Vasconcelos (2018), thus limiting their outside options and consequently their retention wage.[2]

This paper analyzes whether competition for talent affects the organizational design of professional service firms and whether this in turn affects employee retention. As opposed to corporations, where shareholders have all control and residual cash flow rights, in professional service industries, many firms are organized as partnerships in which some workers (partners) not only participate into the productive process, but also acquire both control and cash flow rights in the firm.[3]

I address two questions: first, will a profit-maximizing corporation efficiently allocate workers across tasks that differ in their potential to develop portable human capital? Second, if the firm is a partnership rather than a corporation, will it assign

[1]Other examples of portable human capital are executive education paid for by the previous employer, know-how and supplier networks.

[2]Ellingsen and Kristiansen (2021) describe the impact of portability on experts' competitive compensation schemes. Further implications of firms' competition for workers' human capital are adverse effects on the quality of corporate governance (Acharya and Volpin, 2010) and on firms' ability to provide insurance to their employees (Acharya, Pagano and Volpin, 2016, and Pagano and Picariello, 2020).

[3]IRS data on the number of professional partnerships in the U.S. highlight a significant increase in the last ten years, with an average growth rate of 5.6% per year.

tasks more efficiently, and how will it design partnership contracts in a competitive labor market with portable human capital?

In the model, firms are assumed to produce output by means of two tasks: one with a talent-sensitive production technology, the other with a talent-insensitive one. Importantly, tasks convert workers' talent in output by means of on-the-job human capital accumulation. The first task is assumed to give access to more portable human capital than the second. An example may be that of a law firm where one may be either trained as an attorney who goes to court, whose talent affects the outcome of trials, and who has access to the firm's network of clients; or as a back office employee performing routine, bureaucratic tasks, whose output does not depend on forensic talent and who does not interact much with clients. If the latter were to leave the current employer, she would carry along far fewer clients than an attorney.

Firms hire a pool of workers whose talent is observable to everyone in the industry, but not verifiable in court, as it is potential rather than actual productivity. Since tasks differ in the talent-sensitivity of their output, task assignment will depend on workers' talent and follow a cutoff rule that is noncontractible, being based on nonverifiable talent which will be translated in productivity only if the worker will accumulate human capital via on-the-job training. First, I derive the efficient (surplus-maximizing) task assignment rule that would be chosen by a central planner. Next, I describe benchmark contracts that decentralize the efficient task allocation in two different settings: one in which workers can commit not to leave the employer after task allocation and human capital accumulation (for instance because their labor contract contains a binding non-compete clause); and another in which firms can commit to task allocation (alternatively, talent is verifiable in court).

I then turn to a third setting, in which labor contracts are bilaterally incomplete in the sense that neither firms nor workers can commit to agreements; in this case, corporations assign the more talent-sensitive task to fewer workers than in the efficient benchmark, so as to reduce retention costs. The magnitude of this inefficiency depends on the portability of the human capital acquired while performing each of the two tasks. This echoes the tradeoff between value creation and value extraction: workers who are inefficiently assigned to the less talent-sensitive task would create more value if assigned to the more talent-sensitive one, but shareholders would not capture enough value from the latter, due to high retention costs. As firms affect how workers' talent is developed into actual productivity by means of task assign-

ment, they waste the talent of those workers who are inefficiently assigned the less talent-sensitive task. Such waste of talent clearly entails a loss of output for society.

I compare task assignment in a corporation controlled by shareholders, with that in an equity partnership, where prospective partners purchase equity, get control rights and are compensated with dividends. When designing optimal partnership contracts, an "eat-what-you-kill" sharing rule entitling the more productive workers to larger shares of the profit (i.e.,more cash-flow and control rights) incentivizes the best workers to become partners and not to leave the firm after accumulating portable human capital. This is an interesting result, as both systematic and anecdotal empirical evidence show that more and more partnerships in professional service industries have been adopting this type of productivity-based remuneration instead of seniority-based schemes (Levin and Tadelis, 2005).

Partners choose task allocation so as to maximize the profit to be shared. Since they produce revenues but impose no retention costs at the production stage, a sufficient condition for efficient task allocation in partnerships is that all the workers who would be inefficiently assigned to low-sensitivity tasks in a corporation be made partners. This condition is satisfied in equilibrium: the founder is willing to make them partners in order to extract the additional surplus generated by more efficient task assignment, via the price of the equity they purchase. The model shows that if labor contracts are bilaterally incomplete, partnerships assign tasks more efficiently than corporations and are therefore more productive. In principle, a compensation scheme such that workers compensate the firm for their training in exchange of efficient task assignment could be implemented in a corporation; however, if the firm owner cannot commit to task assignment, she will have an incentive to renege this agreement and to implement the profit-maximizing task allocation. The empirical prediction is that more firms will be organized as partnerships in industries where competition for workers is fierce and workers' talent is not easily verifiable, so that task assignment is non-contractible.

Finally, I discuss the frictions that may impair the feasibility and efficiency of partnerships, namely costly equity issuance, wealth constraints, heterogeneous firm productivity and workers' risk aversion. Selling equity to prospective partners may entail transaction costs, or the founder may fear that her private benefits from control would be constrained by the partners. In this scenario, the firm founder extracts the surplus generated by organizing the firm as a partnership, but faces a cost per share

sold and will accordingly not want to bring all the workers who would be inefficiently allocated in a corporation in as partners. As a result, task assignment is less efficient than in the benchmark case. Hence, firms with higher costs of equity issuance or whose founders care more about their private benefits of control (e.g., family firms) should be organized as corporations rather than partnerships.

Wealth constraints may also prevent workers from acquiring an equity stake if they cannot borrow owing to credit rationing. This implies the prediction that wealthier employees become partners earlier than the less wealthy (but possibly more talented), and thus have better career profiles in partnerships. This may also affect the sorting of employees across firms, depending on organizational form.

If there are technological differences between firms, the more productive should be expected to retain partners more easily than less productive competitors. Thus, the former should be organized as partnerships, whereas the less productive may not generate enough profits to retain partners via suitable, sustainable dividends and may therefore be organized as corporations.

If firms' profits are uncertain, employees' risk aversion too may impede organization as a partnership. While salaried workers have limited liability, partners do not: not only do they earn a share of profit, they also share in the firm's liabilities. As a result, sufficiently risk-averse employees require excessive profit shares to become partners and stay with the firm, as they forgo the risk-free income they would get at a corporation. This effect could be mitigated by a limited liability partnership, in which partners get a predetermined income, irrespective of the profit. Thus, limited liability partnerships (LLPs) should be more likely to be established in riskier industries, where firms' earnings are more volatile.

The paper is structured as follows. Section 2 reviews the relevant literature. Section 3 sets up the basic model. Section 4 derives the efficient task allocation and shows that it can be implemented if employees' mobility can be limited or firms can commit to task allocation. Section 5 introduces the allocative inefficiency due to portability of talent and incomplete contracts. Section 6 modifies the baseline model, introducing the possibility for the owner to sell equity in the firm to some employees and run it as an equity-based partnership. Section 7 proposes some frictions that may impair the feasibility and efficiency of the partnership organizational form. Section 8 concludes.

2 Related Literature

This paper contributes to two strands of research: on the optimal allocation of talent within firms and on organizational design and control allocation.

Task allocation within organizations has been analyzed in settings with asymmetric information among firms. Waldman (1984) models a competitive labor market in which only the current employer observes workers' ability. The other firms observe only task assignment and use this information as a signal of workers' ability, but the employer, in order to send an incorrect signal to the opponents so as to prevent them from poaching the best workers, allocates tasks inefficiently. Bernhardt (1995) uses a similar argument to justify the so-called "Peter principle" whereby, empirically, promoted workers often turn out to be less productive than when they were working on a simpler task. Bar-Isaac and Levy (2019) study a model of career concerns in which the firm manipulates workers' visibility in the labor market to affect their outside options, although this process is independent of task allocation. Dato et al. (2021) provide experimental evidence of talent misallocation within firms when the employer can effectively conceal workers' talent via task assignment. Unlike all these papers, the present one posits that workers'talent is observed by all firms in the economy but that the development of their human capital depends on the task they perform, as in Rajan and Zingales (1998) and (2001), so that the firm can reduce retention costs by assigning some workers to tasks at which they acquire less portable human capital. Hence, the allocation inefficiency persists when workers' talent is observable in the industry, but task allocation is not contractible. I argue that observing workers' talents is not enough to obtain efficient outcomes unless the employer can commit to a certain task allocation, which in turn affects human capital accumulation and thus workers' subsequent productivity.

This paper also relates to the labor economics of human capital acquisition and its firm-specificity. Key contributions are Becker (1964), Rosen (1972), Acemoglu and Pischke (1998), and Moen and Rosen (2004) for analysis of human capital mobility and the cost of its accumulation. Unlike those papers, this one considers a model in which human capital specificity depends on the task a worker is assigned to, so that accumulation can be manipulated by the employer via task allocation to lower the retention wages commanded by workers with highly portable human capital.

Within the literature on organizational design, this paper relates to work comparing partnerships and corporations. Levin and Tadelis (2005) argue that partnerships abound in professional service industries because non-specialist clients cannot perfectly observe the quality of the product (for instance, a patient cannot really tell whether a medical diagnosis is correct, nor can a plaintiff truly evaluate a lawyer's technical advice). The authors show that firms set up as partnerships in order to signal the quality of their output. They assume partners share profits equally, so that they maximize average profits instead of the total, and thus optimally hire the most productive workers. My framework is different in several respects. First, I assume the quality of the product to be observable. Second, in my model the firm hires workers who may develop all the possible talents. Third, I drop the assumption that partners share profits equally, as I am not concerned with the signaling problem. The results show that the retention motive implies that partners should receive not the average profit but a share proportional to their productivity.

Most work on the economics of partnerships focuses on moral hazard: Alchian and Demsetz (1972) emphasize the incentive for partners to work hard even if their performance is hard to monitor; Farrell and Scotchmer (1988) show that many law firms have few partners because the best do not want to share profits equally with less productive partners; Garicano and Santos (2004) show that a partnership can favor the transmission of human capital between senior and junior partners; Morrison and Whilelm Jr. (2004) study the reasons why some companies switch from partnership to the corporate organizational form, arguing that technological progress has diminished the importance of knowledge transmission between cohorts of partners. Kaya and Vereshchagina (2014) show that the organizational form affects the trade-off between workers' complementarities and free-riding in a setting with production in teams.

Cooley, et al. (2020), show that firms' organizational form affects the allocation of talent across firms. The authors focus on contractual commitment as the main difference between partnerships and public companies. In a directed search model, if the quality of the match between employers and employees deteriorates over time, partnerships retain workers, while corporations let them go, thus reducing losses. As a consequence, when firms are organized as corporations, workers move to competing companies where they could be more productive, thus increasing the surplus generated and favoring competition for talent in the labor market. As in this paper, the authors study how limited commitment could affect productivity, but a

crucial difference is that Cooley, et. al (2020) impose heterogeneity in commitment across organizations, whilst in this paper, corporations and partnerships are compared keeping contracts bilaterally incomplete, so that more commitment and more efficient production realize as an equilibrium outcome in partnerships.

Finally, this paper is linked to the literature on incomplete contracts and control rights, dating back to Grossman and Hart (1986), Hart and Moore (1988) and (1990) and Aghion and Tirole (1997). Here, contracts are characterized by bilateral incompleteness: firms cannot commit to task allocation and workers cannot commit to stay with their employer. These frictions generate inefficient talent allocation. However, transferring control rights to some workers, as in the existing literature, does not suffice to produce efficient task assignment, as employees too can hold the employer up. Hence, in this paper, not only should some workers be granted control rights; they should also get payoff rights and be remunerated according to their productivity in order to be retained.

3 The Model

Consider a setting in which homogeneous firms bid to hire a continuum of measure 1 of workers with zero reservation wage and unknown productivity, in a perfectly competitive labor market. Each firm has a measure $J > 1$ of job openings, so that workers and not jobs are the scarce input. The output price is normalized to 1 and output is generated solely by workers' talent.[4] Both employer and employees are risk-neutral and the latter get utility from consumption, i.e. from their earnings. Workers have heterogeneous talent $y \in Y := [0\,,\,\bar{y}]$. Talent is continuously distributed according to a cumulative distribution function $F(y)$ with $\frac{\partial F(y)}{\partial y} = f(y)$ and is unknown at the beginning of the employment relationship. Hired workers undergo a nonproductive training period.[5]

[4]Picariello (2019) drops this assumption to study the interaction between promotions (or task allocation) and workers' incentives to acquire more or less firm-specific human capital with competitive labor markets. In this framework, talent allocation has a dual role: on the one hand it can reduce mobility but on the other it constitutes an incentive for workers to acquire human capital.

[5]The output of this training is normalized to zero for simplicity, but it could be whatever constant value independent of workers' talent without changing the qualitative results provided throughout the paper.

Assumption 1. *After the training stage, workers' talent becomes observable in the labor market, but is not verifiable in court.*

Notice that talent y does not per se affect productivity before task allocation, but does determine the *potential* productivity that the worker develops while handling her task in the firm. Specifically, a worker develops her talent into an output only after on-the-job training yielding human capital. This could be thought of as the case of a young employee who has dealt with several tasks during her training period, in order to evaluate her talent, but that has not accumulated sufficient human capital to execute any of them, so that she needs a more specific training after task allocation, as it often happens in some firms' junior or graduate programs. The assumption of talent nonverifiability rests on the difficulty of enforcing contracts based on potential productivity. Hence, contracts contingent on workers' talent are not enforceable: since task allocation is chosen according to talent, the employer cannot make any commitment based on it.[6]

Once talents are observed, the employer assigns workers to either of two tasks, thus determining how their talent will be developed into productivity within the organization. This assignment is set by a new spot contract defining task and retention wage. Tasks differ both in the talent-intensity of output and in the portability of the human capital acquired. After task assignment, workers can be poached by competing firms in the industry, or may start up their own company. At this point, that is, firms bid competitively to poach or retain workers (if workers threaten to become a new entrant in the industry with a spin-off, they bargain with their current employer). If a worker receives two equal bids from the current employer and another firm, she is assumed to stay with the former; similarly, if the present job pays as much as the prospective start-up, she stays with the current employer. There is no discounting across the two periods.[7]

[6]Even considering an information structure as in Waldman (1984), in which only the current employer and the worker are perfectly informed on workers' talent, in this model I analyze access to human capital and consider the possibility of workers leaving the firm with their portable human capital to start up a firm of their own, thus obtaining the same results as under perfect information among firms but lack of legal verifiability.

[7]Workers may be poached even before task assignment, however, at that stage, their talent has not been developed yet, hence their reservation wage is the same as the one at the hiring stage. Since in the model firms affect workers' productivity by means of task assignment, if workers were poached before task assignment, the results presented later on would not change.

The firm's output (or revenue) is given by the sum of the outputs generated by task A and by task B.

3.1 Contracts and Tasks

The firm's owner offers spot wage contracts:[8] let w_1 be the wage offered to hire workers and w_2^i, with $i = \{A, B\}$, denote the retention wage offered to workers after they are assigned task i, thus acquiring more or less portable human capital.

Let θ_i define the *portability rate,* of the human capital acquired executing task i (that is, the share of output that a departing task i worker can produce outside the current firm). The two tasks are characterized as follows:

Assumption 2. *Task A produces αy with $\alpha \in \mathbb{R}_+$ and gives access to human capital with portability rate $\theta_A \in (0; 1]$. Task B produces $x \in (0\,,\, \alpha\bar{y}]$ and gives access to human capital with portability rate $\theta_B \in [0\,;\, \theta_A)$.*

Once a worker is assigned a task, talent is transformed into effective output. Task A is talent-sensitive, and the human capital it gives access to is more portable. Task B, instead, can be thought of as a routine, talent-insensitive task, so that the worker learns to produce a fixed amount, thus forgoing talent development.[9] The assumption that the human capital acquired via task A is more portable is motivated by the fact that the output is correlated with innate talent and can therefore be produced by the same worker in other firms, rather than depending on the firm's technology.[10]

Recalling the example of the law firm, one may think of task A as the"attorney" task, where α denotes the number of clients or cases the company deals with, y is the lawyer's ability to convince the judge and the jury, directly translated into the share of cases won, and θ_A is the share of clients the lawyer can carry along to a new firm. Task B, instead, can be thought of as a routine back-office task, generating an

[8]Since labor contracts are bilaterally incomplete in the baseline model, long-term contracts would deliver the same outcomes as spot contracts.

[9]Even if the ranking of portability rates were changed, all the main results of the paper would still hold, although the inefficiencies discussed below would be reversed.

[10]Alternatively, one could think of task A as making workers more visible (hence, attractive) in the labor market as in Milgrom and Oster (1987).

output that does not depend on the worker's talent for winning cases in court and that gives access to few clients.

At the beginning of the game workers' talent is unknown to everyone. For this reason, workers receive a homogeneous hiring wage offer w_1. After talent becomes observable and tasks are allocated, workers will have heterogeneous outside options depending on the human capital acquired on the task assigned. Specifically, a worker assigned to task A can produce outside the initial firm

$$\theta_A \alpha y,$$

while a worker assigned to task B, can produce

$$\theta_B x.$$

Summing up, a worker assigned to task i acquires only the human capital necessary to execute that task when leaving the firm. That is, workers allocated to task B cannot be poached to execute task A immediately, and vice versa, as they need retraining for the new task. This is a consequence of the assumption that workers need on-the-job training to learn how to execute a certain task and to develop their talent in output.

Notice that workers may be poached after task allocation and human capital acquisition. Before task allocation workers have not accumulated yet the needed human capital to execute either task, thus their reservation wage before task assignment is the same as the one at the hiring stage. Workers' reservation wage changes after human capital accumulation. Hence, allowing firms to poach workers before task allocation would not change the results of the model, as firms are all identical and solve the same profit maximization problem when assigning tasks to workers.

3.2 Time Line

The model has five stages:

- $t = 1$ *(hiring stage),* firms bid competitively for workers offering w_1, and workers who accept undergo a training period.

- $t = 2$ *(training stage),* workers' talents become observable to themselves and to all the firms in the labor market.
- $t = 3$ *(task allocation),* firms offer a new spot contract specifying task i and wage w_2^i.
- $t = 4$ *(interim poaching stage),* workers can leave the initial firm for another.
- $t = 5$, the production process is completed.

3.3 Equilibrium Concept

The model features perfect information about workers' talent in a sequential game. The equilibrium concept is *subgame perfect Nash equilibrium* (SPNE).In the baseline model, workers only decide, at the hiring stage, whether to accept a job from a firm and, at the interim stage, whether to stay with this firm or move to a competitor (or start up their own spin-off company). Firms, instead, choose wages and task allocation. Hence, a subgame perfect Nash equilibrium for this game consists of a vector of wages and a non-contractible task allocation $\{w_1\,,\, w_2^i\,,\, i\}$.

4 Efficient Task Allocation

Productivity on task A is increasing with workers' talent y, whereas that on task B is constant, but may be higher than the former, and since y is a continuous variable, task allocation will follow a threshold rule of the type

$$\mathcal{A}(y^*) = \begin{cases} \textit{task } A & \forall\ y \in [y^*\,,\, \bar{y}], \\ \textit{task } B & \forall\ y \in [0\,,\, y^*). \end{cases}$$

We can now derive the efficient threshold value for workers' talent $y^* \in [0\,,\, \bar{y}]$ in a centralized framework, recalling that the firm's output is given by the sum of the outputs generated on the two tasks. This threshold is chosen so that all workers with talent equal to or greater than y^* are assigned to task A, those with less talent to

task B. Let social welfare be defined as

$$W(y^*) = \underbrace{\int_{y^*}^{\bar{y}} \alpha y f(y)dy + F(y^*)x - w_1 - \int_0^{\bar{y}} w_2^i(y)f(y)dy}_{\pi} + w_1 + \int_0^{\bar{y}} w_2^i(y)f(y)dy, \tag{1}$$

where π denotes the profit of the firm and the other terms define the sum of wages earned by the workers.

The efficient cutoff value for workers' productivity solves:

$$y^* = argmax\ W(y^*),$$

and the first-order condition delivers the threshold

$$y^* = \frac{x}{\alpha} \tag{2}$$

which maximizes the total surplus. Notice that, ceteris paribus, the higher the production enhancer α, the lower y^*. Hence more workers should be assigned to task A. Instead, when x increases, the threshold value rises. In this case, only very productive workers should be assigned to task A.

4.1 Decentralized Efficient Allocation

The baseline model features bilateral contract incompleteness. Firms cannot commit to task allocation and workers cannot commit to stay with their employer after task allocation and human capital accumulation. We now relax one incompleteness assumption at a time, in order to show that when either of the parties can commit to an agreement, efficient task allocation can occur in a decentralized setting.

4.1.1 Workers' Commitment

First assume that workers can commit to stay with their incumbent employer after task allocation, for instance possibly because labor contracts feature feature strict non-compete clauses.[11] If the parties can sign unconstrained labor contracts limiting

[11]Non-compete clauses are legal tools prohibiting workers from leaving the employer to work in the same industry or geographical area for a certain period. These clauses are very diverse as

workers' mobility, retention at the interim stage is not an issue for the employer and the following proposition holds:

Proposition 1. *If the employer and the employees can sign unconstrained labor contracts limiting workers' mobility, task allocation is efficient in the corporation.*

The proofs of this and all other propositions, theorems and lemmas are given in the Appendix. Intuitively, if the firm does not need to retain workers at the interim stage after human capital accumulation, it pays workers a fixed wage independent of the task they are assigned to. Specifically, they just need to obtain their reservation wage to stay with the present employer. Thus in allocating tasks the firm considers only employees' marginal productivity on the task: this leads to an efficient outcome. The cutoff talent for a worker to be allocated to task A will be $y^{**} = y^*$, which maximizes productivity.

4.1.2 Firms' Commitment

Suppose now that workers are free to leave their current employer after human capital accumulation and their talent is verifiable, so that the firm can credibly commit on task allocations contingent to talent at the hiring stage. Specifically, the firm can offer contracts of the type

$$\{w(y)\,,\, i(y)\}.$$

By means of this contract, the firm can commit to the efficient task allocation.

Proposition 2. *If workers' talent is verifiable, the employer optimally commits to match workers to tasks efficiently, according to the cutoff value* $y^* = \frac{x}{\alpha}$.

Intuitively, when bidding to hire workers, the firm can attract them by offering the highest total expected surplus possible as lifetime wage. Efficient task allocation allows such an offer, so that firms deviating from this particular contract would be unable to attract workers and thus remain inactive. Since the contract including task allocation is enforceable, the firm cannot violate it at the task allocation stage.

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regards the constraints they impose and they are heterogeneously enforced. In the United States, for instance, some states such as Massachusetts enforce these clauses very strictly, whereas others, like California, do not.

5 Portability and Inefficiency

Consider now the case in which labor contracts are bilaterally incomplete: on the one hand, workers can leave the firm after being assigned a task and accumulating the relative human capital; on the other hand, firms cannot commit to task assignment when hiring workers, as talent is non-verifiable in court. If workers are poached by a competing firm or start up a company of their own, they produce the portable share of the human capital acquired in the source firm, depending on the task they were assigned. Therefore workers' outside option depends on task assignment and on their talent.

In this scenario, the firm chooses the optimal talent threshold $\hat{y} \in Y$ for task allocation by solving

$$\underset{\{\hat{y}\}}{\text{Max}} \ \pi(\hat{y}) = \int_{\hat{y}}^{\overline{y}} \alpha y f(y) dy + F(\hat{y})x - \int_{\hat{y}}^{\overline{y}} w_2^A f(y) dy - \int_0^{\hat{y}} w_2^B f(y) dy$$

subject to workers' interim participation constraints:

$$w_2^A \geq \theta_A \alpha y \ \ \forall y \geq \hat{y}$$

and

$$w_2^B \geq \theta_B x \ \ \forall y < \hat{y}.$$

The following proposition states the firm's task assignment rule.

Theorem 1. *If workers cannot commit to stay with their initial employer after task assignment and firms cannot commit to task assignment, the profit-maximizing talent cutoff for task assignment is*

$$\hat{y} = \frac{(1-\theta_B)x}{(1-\theta_A)\alpha} > y^*.$$

As after task assignment firms bid competitively for workers, the incumbent employer's wage offer does not exceed the opponent's, which equals the worker's marginal productivity outside the current firm.[12] Hence, the optimal wage offers will

[12] Alternatively, when bargaining with workers, the firm's owner would not offer more than they could produce starting up their own firm.

be $w_2^A = \theta_A \alpha y$ for workers assigned to task A, and $w_2^B = \theta_B x$ for those assigned to task B, so that task allocation determines workers' outside options and wages.

Theorem 1 shows that if workers can leave their employer, the latter sets a less favorable allocation rule than the efficient one. Workers with talent $y \in (y^*, \hat{y})$ could potentially be assigned to task A (since $\alpha y > x$ for them), but they are not. Hence, some workers' productivity is not high enough to offset the spread between $\theta_A \alpha y$ and $\theta_B x$. That is, the wage necessary to retain them at the interim stage if working on task A is relatively too high. To lower retention costs, firms strategically match them with the less portable task. Specifically, owing to high retention costs the employer does not manage to capture much of the value created by these workers when allocated to task A.

This outcome does not maximize productivity and surplus: some talent is used and developed inefficiently. If workers are matched with task B, they will not be able to work on task A in another firm, although they would be potentially good at it, so their talent fails to be fully developed.

If θ_A increases, ceteris paribus, the threshold value $\hat{y}$ rises. As in Waldman (1984), the severity of allocative inefficiency is decreasing in the firm-specificity of workers' human capital. In our setting, however, the inefficiency does not require informational asymmetries across firms, as it stems from the impossibility of designing enforceable talent-contingent contracts.[13]

5.1 Complete vs Incomplete Contracts

When labor contracts are bilaterally incomplete, corporate task allocation is inefficient, while removing one of the sources of incompleteness allows efficient allocation. That is, either if workers' talent is legally verifiable, so that firms can commit to task allocation, or if workers can commit not to leave the employer after accumu-

[13]Further, suppose workers can send a signal about their ability to the market in the setting presented by Waldman (1984). Such action may reduce the relevance of the signal delivered by task allocation. Workers could engage in signal jamming (as in Holmström, 1999) to convey more precise information about their ability, out of task allocation. The more informative the signal (the more important the signal jamming activity), the less effective is task allocation for firms to retain the best workers. Indeed, if very talented workers are assigned to simple routine tasks, they can signal their actual talent. This would increase their probability of being hired by a competing firm seeking highly productive employees. In our model, instead, given the acquisition of heterogeneous human capital, task allocation is an effective retention tool.

lating human capital, task allocation is efficient. In order to compare the settings with complete and incomplete contracts, consider the case in which firms can credibly commit to task allocation and offer long-term labor contracts, thus producing the largest surplus possible. Since the labor market is perfectly competitive, at the hiring stage the firm offers wages

$$w_1(y^*) = (1-\theta_A)\int_{y^*}^{\bar{y}} \alpha y f(y)dy + F(y^*)(1-\theta_B)x$$

and, before their talent y is realized, workers expect to get retention wages at the interim stage [14]

$$\mathbb{E}[w_2(y^*)] = \theta_A \int_{y^*}^{\bar{y}} \alpha y f(y)dy + F(y^*)\theta_B x.$$

When labor contracts are bilaterally incomplete, instead, firms offer a hiring wage

$$w_1(\hat{y}) = (1-\theta_A)\int_{\hat{y}}^{\bar{y}} \alpha y f(y)dy + F(\hat{y})(1-\theta_B)x$$

and workers expect a retention wage

$$\mathbb{E}[w_2(\hat{y})] = \theta_A \int_{\hat{y}}^{\bar{y}} \alpha y f(y)dy + F(\hat{y})\theta_B x.$$

It is immediate to see that the following inequalities hold:

$$w_1(y^*) < w_1(\hat{y}) \tag{3}$$

since hiring wages equal expected profits, and the firm offers higher retention wages when it is expected to implement the inefficient but profit maximizing allocation rule; moreover,

$$\mathbb{E}[w_2(y^*)] > \mathbb{E}[w_2(\hat{y})] \tag{4}$$

as efficient task assignment increases workers' expected outside productivity.

Let

$$w_1(y) + \mathbb{E}[w_2(y)] \equiv W(y) \tag{5}$$

[14] In the case in which workers' interim participation constraints bind in equilibrium.

for any assignment threshold y, and since y^* is the surplus-maximizing cutoff for talent, one gets the following inequality:

$$W(y^*) \geq W(\hat{y}) \tag{6}$$

Taking stock of these inequalities, one can get a clear picture of the problems generated by inability to commit to task allocation. Suppose that the firm promises a worker that at $t = 3$, task allocation will be efficient. In this case, if the firm is credible, the worker could accept $w_1(y^*)$ less than $w_1(\hat{y})$ to be hired, or even to pay the employer in exchange of the promise of efficient task assignment.[15] However, if firms cannot actually commit to task allocation, they will have an incentive to allocate tasks inefficiently later on, so as to obtain a positive rent

$$w_1(\hat{y}) - w_1(y^*) = [F(\hat{y}) - F(y^*)](1 - \theta_B)x - (1 - \theta_A)\int_{y^*}^{\hat{y}} \alpha y f(y) dy. \tag{7}$$

If the firm can renege on the commitment to workers, it will do so, thus generating less surplus and earning a positive rent with respect to the efficient benchmark case. Anticipating this, workers will not accept a backloaded contract implying lower wage ex-ante in exchange for a higher one later on. Hence, workers will require higher wages at the hiring stage and have a "flatter" wage schedule.

6 Partnership

In this section we allow the employer to choose the firm's organizational form either as a corporation or as a partnership. In a partnership some workers ("partners") take part in the productive process and have both cash flow and control rights in the organization. Suppose that before task allocation the employer can decide whether to run the firm as a corporation or make it an equity-based partnership by offering shares to some workers. In the latter case, those workers who buy into the firm will run it as the owner's partners.[16]

[15]Note that w_1 may be negative, namely the worker could pay the employer $\theta_A \alpha y - \theta_B x$ just before task allocation so as to make her indifferent between assigning her task A or task B.

[16]The owner can be thought of as a founding non-productive partner who selects, among the employees, those who should become partners. However, the owner may also be modeled as a

In a partnership, the owner offers partnership contracts, describing the amount and price of the equity to which each prospective partner is entitled.

6.1 Equity and Shares

Let us now introduce some notation: let ϕ denote the price of the equity every prospective partner purchases from the original sole owner.[17] Let π^p denote the profit of the firm organized as a partnership. The owner defines a subset within which a prospective partner's talent should lie. Let y_1 and y_2 be respectively the lower and the upper bound of Y^p chosen by the employer:

$$Y^p \coloneqq [y_1, y_2] \subseteq Y.$$

Every partner is entitled to a share of the firm's profit $s \in [0\,,\,1]$. Let us impose a feasibility constraint on the shares sold to partners, so that $\int_{y_1}^{y_2} sf(y)dy \leq 1$ while the owner retains the remaining shares, getting a payoff in a partnership of

$$\int_{y_1}^{y_2} \phi f(y)dy + \left(1 - \int_{y_1}^{y_2} sf(y)dy\right)\pi^p. \tag{8}$$

Hence, the owner designs *partnership contracts* $\{\phi\,,\,s\}$ and makes *take-it-or-leave-it* offers to prospective partners.[18] Workers who accept the partnership contract become partners, so that their compensation is no longer a wage but a share of the firm's profit: $s\pi^p(y_1, y_2)$.

6.2 New Time Line

The baseline timeline is modified slightly, to the following:

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productive partner without changing the results generated in the model, since task assignment would be unchanged, as will be seen later.

[17] This price may also be considered as a reduction in the prospective partner's ex-ante wage in order to gain a higher wage ex-post

[18] As the firm hires a continuum of measure 1 of workers, the employer does not offer a contract to each individual, but since each worker's productivity is perfectly observed the employer can design a partnership contract for each talent realization y.

- At $t = 1$, firms bid competitively for workers offering w_1, and workers who accept undergo a training period.
- At $t = 2$, workers' talent becomes known to all the firms in the industry.
- At $t = 3$, the firm's owner chooses the measure of the subset Y^p and offers partnership contracts $\{\phi\,,\, s\}$.
- At $t = 4$, potential partners accept or reject the partnership contract.
- At $t = 5$, partners choose task allocation for themselves and salaried workers.
- At $t = 6$, partners and salaried workers can leave the firm.
- At $t = 7$, the production process is completed.

6.3 Task Allocation in a Partnership

Before describing the design of partnership contracts, let us discuss task allocation in a partnership, which affects the profit generated $\pi^p(y_1, y_2)$. The following lemma lays down a sufficient condition for task allocation in partnerships to be efficient:

Lemma 1. *If workers with talent $y \in [y^*, \hat{y})$ are made partners, tasks are assigned more efficiently in a partnership than in a corporation.*

The selection of partners is crucial to efficient task allocation. If none of the workers who would be inefficiently matched to a task in a corporation are made partners, the surplus generated is indifferent to whether the firm is a corporation or a partnership. Profit-maximizing partners match tasks and workers in the same way as the sole owner would in a corporation. Thus, there is no improvement with respect to a corporation: the firm generates the same surplus, which is differently distributed between owner and employees.

A sufficient condition for efficiency is that workers with talent $y \in [y^*\,,\, \hat{y})$ be made partners. Since partners are remunerated with dividends, they have an incentive to assign themselves and the other partners to tasks that maximize their productivity, increasing the overall profit and thus all partners' payoff.[19]

[19]Given linearity of the problem at hand and perfect information, this result can be obtained either with majoritarian or with proportional voting.

Based on this result, we can now describe optimal partnership contracts and verify whether it is optimal for the owner to make at least the workers with talent $y \in [y^*, \hat{y})$ partners.

6.4 Partnership Contracts

Solving the model by backward induction, I first discuss the design of the partnership contracts $\{\phi, s\}$ to be offered to workers with talent $y \in Y^p$. These workers decide whether to buy equity in the firm by accepting the partnership contract offered. A worker accepts if the cost of equity is not too high, so that it satisfies a *"willingness-to-pay"constraint* (WTP). Depending on the task that would be assigned in a corporation, either of two conditions needs to be satisfied for the worker to buy equity:

$$\phi \leq s\pi^p(y_1, y_2) - \theta_B x \;\; \forall y \in [0\,,\, \hat{y}) \qquad (WTP_B)$$

for workers who would be assigned task B if the firm were organized as a corporation, and

$$\phi \leq s\pi^p(y_1, y_2) - \theta_A \alpha y \;\; \forall y \in [\hat{y}\,,\, \bar{y}]. \qquad (WTP_A)$$

for workers who would be assigned task A.

Once created, the partnership is *stable* if partners are retained after task allocation and human capital accumulation: compensation should be designed to ensure such stability. Even salaried workers should be retained after task allocation, and their interim participation constraints are the same as in the maximization program for a corporation (see Section 5). For partners, instead, interim participation constraints depend on the task they are assigned. Partners working on task A will acquire the corresponding human capital, which will determine their outside option, so that they will not leave the partnership if

$$s\pi^p(y_1\,,\, y_2) \geq \theta_A \alpha y. \qquad (IPC_A)$$

A partner working on task B, instead, will not leave the firm if

$$s\pi^p(y_1\,,\, y_2) \geq \theta_B x. \qquad (IPC_B)$$

These constraints are based on the assumption that there is a *partnership buyout agreement* forbidding partners to sell their equity outside the firm, so that when a partner leaves the company, all the pertinent equity is costlessly re-collected by the other partners, and the departing partner's outside option consists solely in the portable human capital acquired.[20]

The owner designs partnership contracts so as to maximize the objective function in equation (8), taking the constraints described above into account. The following result holds

Lemma 2. *If partners' interim participation constraints bind in equilibrium, the firm's owner offers each prospective partner a profit share that is non-decreasing in her individual talent.*

Partners' interim participation constraints may bind in equilibrium. If this is the case, the owner offers partnership contracts featuring an "eat-what-you-kill" sharing rule: each partner is entitled to a dividend equal to the revenue they could produce outside the current firm. Most of the existing literature posits equal profit sharing among partners (see, for instance, Levin and Tadelis, 2005). Here, instead, workers have heterogeneous talent, so that the best partners have better outside options (higher returns to talent) than the less productive. Hence, in order to ensure stability partners have to earn a share of the profit at least proportional to their talent. This is an "eat-what-you-kill "sharing rule, linking each partner's payoff to the revenue or profit produced for the firm.

Interestingly, the resulting sharing rule is linked to the competition in the labor market (via the portability of the human capital acquired on task A) and this is a characteristic of professional services, which now appear to feature increasingly high turnover rates. Thus, an empirical prediction of this model is that eat-what-you-kill sharing should be more frequent in industries where labor market competition is fiercer (or partners acquire more portable human capital).

It is also possible, however, that interim participation constraints may not bind, since equity issuance is cost-free and the price of the equity (i.e., ϕ) is increasing with partners' shares, owing to the binding willingness-to-pay constraints. As is discussed

[20]This is an empirically relevant assumption, as already stated in Morrison and Whilelm Jr. (2008), who also provide some anecdotal evidence corroborating their assumption that partnership shares are highly illiquid.

later in greater detail, if issuing each unit of equity has a cost, however small, then the interim participation constraints bind in equilibrium and there exists a unique optimal partnership contract.

Even if the interim participation constraints were not binding, in order to retain partners working on task A the owner would still need to grant dividends at least equal in value to their human capital outside the firm.[21]

Notice that whether the interim participation constraints bind or not does not affect the results presented immediately below, so we can consider only the case where they bind without loss of generality.

6.5 Selection of Partners

Prospective partners are selected by defining the measure of the subset Y^p, to maximize the owner's payoff in equation (8). This decision will also affect task allocation in the partnership, as stated in Lemma 2. The following theorem defines the optimal selection of partners:

Theorem 2. *The firm's owner is indifferent about whom to make partner among workers with talent* $y \notin [y^*, \hat{y}]$ *and strictly prefers making partners workers with talent* $y \in [y^*, \hat{y}]$, *offering them contracts* $\{\phi^*(y),\, s^*(y)\} = \{\theta_A \alpha y - \theta_B x,\, \frac{\theta_A \alpha y}{\pi^p}\}$. *Hence, tasks are assigned more efficiently in a partnership than in a corporation.*

This theorem shows that the owner's optimal strategy in deciding organizational form satisfies the condition for efficient task allocation in partnerships set out in Lemma 2. Intuitively, the owner finds it optimal to appoint all workers with talent $y \in [y^*\,,\, \hat{y})$ as partners because, when this is the case, they will execute task A efficiently. Hence, a partnership and with these workers as partners generates more surplus than a corporation. The owner extracts the surplus generated in this scenario by pricing the equity sold to prospective partners as $\phi^*(y) = \theta_A \alpha y - \theta_B x$, and therefore

[21] Note that this program does not preclude *equal-sharing partnership agreements*. However, if this sharing rule is adopted, with heterogeneous partners, the most talented should get at least their outside option, while the least talented, getting as much as the talented, may make much more than they actually produce even inside the current firm. So, if the number of partners is sufficiently large, or if human capital is highly portable, the equal-sharing rule would violate the feasibility constraints, so that $\int_{y_1}^{y_2} sf(y)dy > 1$. By contrast, when the interim participation constraints bind the feasibility condition is always satisfied.

prefers appointing all these workers as partners, so as to maximize the revenue from the equity sale.

As regards workers with talent $y \notin [y^*, \hat{y}]$, by contrast, the owner is indifferent about who should become partners. The intuition is that all these workers are assigned to tasks efficiently even in a corporation, so that in their case the two organizational forms generate the same surplus and the same payoff for the owner.

Notice that partners with talent $y \in [y^*, \hat{y}]$ are charged the difference between what they earn when assigned to task A and what they earn on task B, namely, $\phi^*(y) = \theta_A \alpha y - \theta_B x$. As shown in Section 5.1, one could imagine that before task assignment in a corporation, these workers may accept lower compensation (or even to pay the owner) in exchange for the promise of being assigned to task A in the future, as in a sort of "apprenticeship" program, thus accepting contracts like the partnership ones. However, since task allocation based on workers' talent is non-contractible, the owner would have an incentive to renege on the agreement and allocate tasks according to the profit-maximizing rule, obtaining a higher payoff. Instead, if in a partnership the owner retains equity after selling some to partners (i.e., $\int_{y_1}^{y_2} s(y)f(y)dy < 1$), he will prefer assigning partners efficiently, as dividends are maximal if partners are assigned to tasks efficiently. Hence, choosing the partnership form acts as an implicit contract between the owner and the partners, ensuring efficient productivity irrespective of the share of equity retained by the owner.

6.6 Predictions

The model lays out mechanisms that affect the choice of organizational form in industries where firms compete for talent, such as professional services, yielding a set of empirical predictions about the distribution of partnerships and corporations within and between industries. To summarize the theoretical results, when labor contracts are bilaterally incomplete (firms cannot commit to talent-based task allocation and workers cannot commit to stay with the employer once they have accumulated portable human capital), firms organized as partnerships assign tasks more efficiently than those organized as corporations. However, if either of the two sources of incompleteness is removed, corporations too assign tasks efficiently. This generates a number of testable predictions. Competition in the labor market is less severe if labor contracts embed strictly enforced non-compete clauses. In the extreme case in which

there is no competition for workers after task assignment, corporations assign tasks as efficiently as partnerships. The model accordingly predicts that more firms should be organized as partnerships in industries where firms compete more fiercely in the labor market. To test this result, one could use the fact that non-compete clauses are heterogeneously enforced. In the United States, for instance, the strictness of enforcement has varied over the years in some states, as detailed by Marx et al. (2009) and Bishara (2011).

Second, if workers' performance is verifiable, corporations can commit to efficient task allocation. Since talent (or potential productivity) is non-verifiable, basing task assignment on workers' performance is easier, the less talent-sensitive the production technology: in this case, a worker's contribution is easier to asses, whereas courts cannot tell precisely how much productivity depends on talent, as there is no objective measure of it. Hence, the empirical prediction is that even within professional service industries, firms providing more talent-sensitive services should be organized as partnerships, while those providing more routine services should be organized as corporations.

This result parallels that of Levin and Tadelis (2005), namely that if the quality of a service is hard to evaluate, then firms operating in that sector are more likely to be organized as partnerships.[22] Though similar, the result in this paper is driven by a different mechanism, competition in the labor market. To distinguish this prediction from that of Levin and Tadelis (2005) empirically, one should expect to observe the verifiability of workers' output, to be associated with partnerships only in competitive labor markets, given that in non-competitive ones corporations should have no less incentive than partnerships to assign tasks efficiently. Hence, more complete labor contracts increase the efficiency of task assignment within corporations. However, in our stylized setting partnerships always achieve efficient task allocation and so have the highest productivity, so that corporations can only allocate talent, at most, as efficiently as partnerships. As is shown in the next section, however, where there

[22]Levin and Tadelis (2005) provide several examples, using data from the 1997 US Economic Census. One is the legal profession, in which about 48% of companies employing attorneys who perform more talent-sensitive tasks are organized as partnerships, compared with only 6% of other legal and paralegal service firms, which employ legal practitioners primarily engaged in routine services such as title handling. Another example is accounting, comprising both tax preparation firms, delivering more automated (software-based) services and financial accounting CPA firms, providing more talent-sensitive services; 67% of tax preparation work was done by corporations, 61% of financial accounting work by partnerships.

are constraints on the formation of partnerships, this may reduce their efficiency and feasibility, so that in some situations corporations become more efficient.

7 Frictions in Partnership Design

In the frictionless setting analyzed so far, corporations assign tasks less efficiently than partnerships, or at most equally efficiently. I now introduce some frictions to consider how they may affect the efficiency and feasibility of partnerships.

In order to deliver clear predictions on the impact of the frictions, some simplifying assumptions will be useful. First, assume the firm hires one worker, instead of a continuum. Second, let $\theta_B = 0$ and simplify the notation so that $\theta_A = \theta$. Third, consider a set of talents such that $Y := [y^*, \hat{y}]$. These assumptions are without loss of generality, as the results presented later on will hold even relaxing them. Finally, they imply that if the firm is a corporation it earns profit $\pi = x$, while a partnership earns $\pi^p = \alpha y$.

7.1 Private Benefits of Control

First, consider a setting where the firm's owner faces a cost $\kappa > 0$ to issue a unit of equity. This may reflect underwriting fees or compliance costs, as well as a loss of private benefits of control. In this scenario, when designing partnership contracts, the owner solves:

$$\underset{\{\phi,s\}}{Max} \;\; \phi + (1-s)\pi^p - s\kappa$$

subject to the WTP constraint

$$\phi \leq s\pi^p$$

and the interim participation constraint

$$s\pi^p \geq \theta\alpha y$$

Proposition 3. *If the owner faces a cost $\kappa > 0$ for each unit of equity issued, she offers a partnership contract $\{\phi^*, s^*\} = \{\theta\alpha y, \theta\}$ and organizes the firm as a partnership only if the worker has talent $y \geq \frac{x+\theta\kappa}{\alpha} \equiv y' > y^*$.*

Intuitively, the owner bears the cost of issuing s, so that the unique optimal partnership contract offered to the prospective partner is $\{\phi^*, s^*\} = \{\theta\alpha y, \theta\}$. Moreover, the owner does not capture all the extra surplus generated by more efficient production in a partnership than in a corporation. This implies that the owner is willing to form a partnership only with sufficiently productive workers, not with all those who would be inefficiently assigned to task B in a corporation. In fact, if $\kappa \geq \frac{x}{1-\theta}$, the owner will not want to organize a partnership with a worker of talent $y \in [y^*, \hat{y})$, so corporation is the only viable organizational form.

This result makes it clear that in the realistic scenario in which the firm's founder enjoys substantial private benefits of control, and faces an accordingly high cost of selling equity to potential partners, the owner will organize a partnership only with very talented partners (and not all of those who would be inefficiently assigned task B in a corporation), thus reducing the productivity of the firm, or else will keep it running as a corporation.

7.2 Wealth Constraints

So far employees have been assumed to be able to pay for their equity stakes. But this may not be the case if they are subject to wealth or borrowing constraints. And even allowing for borrowing, workers' willingness to invest in the partnership may be constrained by time preferences.

Let $\omega > 0$ denote the worker's observable wealth when the owner offers partnership contracts. To focus on the most interesting case, let us assume $\omega < \theta\alpha y^* = \theta x$. In this scenario, in drafting partnership contracts, the owner faces the following willingness-to-pay constraint:

$$\phi \leq min\{\omega,\, s\pi^p\} \tag{WTP}$$

and the usual interim participation constraint. The following proposition states the optimal partnership contract offer and the condition under which the owner finds it optimal to organize the firm as a partnership:

Proposition 4. *If the worker has wealth $\omega \in (0,\, \theta x)$, the owner offers a partnership contract $\{\phi^*, s^*\} = \{\omega, \theta\}$ and organizes the firm as a partnership if the worker has talent $y \geq \frac{x-\omega}{(1-\theta)\alpha} \equiv y'$, with $y' \in (y^*, \hat{y})$.*

When the worker has a wealth constraint, the owner cannot extract all the surplus generated by efficient task allocation, as the maximum price of equity is ω, which leaves some rents to the partner. As a consequence, the shadow cost of issuing equity is positive, and the partner's interim-participation constraint binds in equilibrium, so that $s^* = \theta$, and the optimal partnership contract offer is $\{\phi^*, s^*\} = \{\omega, \theta\}$.

In this case, the firm's owner finds it unprofitable to make workers with talent below the cutoff y' partners, as the extra value generated by efficient task allocation cannot compensate for the discounted equity price at which the owner sells. Hence, in the presence of wealth constraints, task allocation is still inefficient (possibly as inefficient as in a corporation): only highly talented workers are made partners and matched efficiently with task A (i.e., those with talent $y \geq y'$).

The prediction here is that wealth-constrained workers should not become partners unless they are exceptionally talented, while wealthier workers should have steeper career paths than equally talented but less wealthy ones. This is particularly relevant in economies with severe wealth inequality: poorer workers may not become partners and so waste their talent in inefficiently assigned tasks. Conversely, wealthier (or less credit constrained) workers do become partners, thus earning even more and widening the wedge between their wealth and that of those who cannot become partners. This inefficiency would be mitigated in the presence of arrangements to promote credit access for young workers, so as to allow them to buy equity shares in partnerships.[23]

Finally, in a framework in which workers decide how much effort to exert at the training stage, in the presence of wealth constraints the objective of becoming partners may provide young workers incentives to work hard so as to accumulate enough wealth to purchase their partnership stake. Such a mechanism may be behind the fact that young non-partners often work overtime in professional services.

Summing up, when issuing equity is costly or workers are wealth-constrained, there exists a unique optimal partnership contract. In the following extensions, this may not be the case, but I will focus on the case in which the interim participation

[23]Becker (1964) makes a similar argument in discussing the impossibility for credit constrained workers to pay for their on-the-job training.

constraint binds in order to provide a clearer indication of the effect of other frictions that may impair the feasibility of partnerships.[24]

7.3 Heterogeneous Firms

In the baseline model, all firms produce using the same technology. Yet firms may adopt heterogeneous productive technologies or strategies affecting their profitability.[25] To account for productive heterogeneity, change two assumptions of the baseline model: (i) assume a duopoly in the labor market at the interim stage, with firms indexed $f = \{1, 2\}$ (that is, firms do not compete at the hiring stage but start the game with one worker each and compete after task allocation);[26] (ii) assume one firm uses talent in a more productive way than the other, say because its technology fits workers' talent better or because it has a larger network of clients. Specifically, let $\alpha_1 \leq \alpha_2$, so that any worker allocated to task A in firm 2 generates a larger revenue than she would in firm 1. This affects workers' reservation wages at the interim stage, and the incumbent employer may need to pay too much to retain workers. In this framework, the following results hold:

Proposition 5. *If firms differ in productivity, then:*

- *the less productive firm assigns tasks less efficiently than the other;*
- *if the portability of human capital is high enough ($\theta \geq \frac{\alpha_1}{\alpha_2}$), then the less productive firm will not choose to be a partnership.*

Intuitively, since a worker dealing with task A produces more in firm 2, firm 1 faces high retention wages, so it optimally sets the threshold for assigning task A higher than it would if the two firms were identical. And if portability θ is sufficiently large, firm 1 cannot be organized as a stable partnership: not only is the competing firm

[24] One may assume that in addition to the frictions set forth below, either equity issuance has some cost or workers have wealth constraints, which does not alter the qualitative results but makes it less immediate to see the clear effect of each friction.

[25] Firms' profitability is affected not just by productive technologies but also by such features as the size of the pool of clients.

[26] This assumption allows both firms to be active at the task allocation stage, thus facilitating the comparison of their assignment strategies

more productive, but also the amount of human capital partners carry along upon departure is so large that they cannot be retained even by an offer of the entire profit – partnership thus becomes unfeasible (i.e., it would require $s^* > 1$).

This extension yields the prediction that only the most productive firms may be organized as partnerships, as only they can produce profits high enough to retain partners. The least productive, instead, are organized as corporations and allocate tasks inefficiently across workers if competitive pressure is fierce due to high asset portability. This, in turn, increases the performance differential between partnerships and corporations, as the most productive firms, being organized as equity partnerships, also have more efficient task allocation and thus develop their employees' skills more effectively.

7.4 Risk Aversion

Another friction that can play against partnerships is workers' risk aversion. While partners share in the firm's profits and losses, non-partner employees usually have limited liability, earning a fixed wage irrespective of the firm's performance. To model this further friction in the formation of partnerships, consider a setting in which the firm's profit is uncertain, for instance due to demand volatility. Two states of the world are possible. In one, the firm generates the usual profit, in the other no profit:[27]

$$\pi^p = \begin{cases} \alpha y & \text{with probability } p \in (0,1), \\ 0 & \text{otherwise .} \end{cases}$$

The employee has utility over earnings $u(w)$, with $u' > 0, u'' < 0$ and $u(0) = 0$, so that she is risk averse. When drafting partnership contracts, the firm's owner maximizes the objective function

$$\phi + (1-s)p\alpha y, \tag{9}$$

[27] In this simplified framework, the company does not suffer losses, but in the real world partnerships' losses are generally borne by all partners. Allowing for negative profits would not change the qualitative results.

subject to the willingness-to-pay constraint

$$\phi \leq pu(s\alpha y) \tag{10}$$

and the interim participation constraint

$$pu(s\alpha y) \geq u(\theta\alpha y). \tag{11}$$

Note that after task assignment and human capital accumulation, the partner has a safe outside option of leaving for a competing firm organized as a corporation and earning the certain wage $\theta\alpha y$. In order to retain the partner, therefore, dividends in the two states of the world should be such that the utility from their certainty equivalent is at least equal to the utility obtained from this outside option. This implies that it is necessary to offer $s^* > \theta$ and that the probability of producing a positive profit p is sufficiently high. Both p and s should be greater the more risk-averse the prospective partner is. However, the partnership is feasible if each partner's share of profit is $s \leq 1$, while the optimal share s^* satisfying the interim participation constraint of a sufficiently risk-averse worker may exceed 1: the more risk-averse the worker is, the larger is the share s^* required for retention at the interim stage, and the more likely it is that such share exceeds 1, thus impairing the feasibility of a stable partnership.

Differently, if the firm is organized as a *limited liability partnership* (LLP), so that partners are insured against the risk of receiving no dividend, the interim participation constraint is

$$u(sp\alpha y) \geq u(\theta\alpha y). \tag{12}$$

In this scenario, the partner earns a fixed, positive amount irrespective of profit, and by concavity of the worker's utility function, the amount of profit needed to retain a partner, denoted by s^{**}, is smaller than that granted without insurance. Hence, ceteris paribus, organizing the firm as a limited liability partnership favors stability and is therefore feasible even in scenarios where regular partnerships would not be. As an example, suppose that in order to retain the partner at the interim stage in a regular partnership, it is necessary to offer a share of profit s^* slightly greater than 1. In this case, the stable partnership is not feasible; insuring the partner against profit volatility would drive this share up to $s^{**} < 1 < s^*$, so the limited liability partnership is feasible but that with unlimited liability is not.

However, if workers are sufficiently risk averse or if the probability p of earning a positive profit is too low, even a limited liability partnership becomes unfeasible (i.e., $1 < s^{**} < s^{*}$). In this case, the only possible organizational form is the corporation.

This yields an empirical prediction concerning not only the distribution of partnerships across and within industries, but also risk-sharing within partnerships: more firms should adopt the limited-liability partnership form (or pay fixed dividends, regardless of profit) in industries where profits are more volatile, or when the workforce is more risk-averse. Even at the hiring stage, more risk-averse workers may prefer limited-liability partnerships, which would offer more stable career profiles: organizational form may thus affect workers' selection across industries and organizations.

8 Conclusions

Retaining skilled workers is important for professional service industries, where firms rely more heavily on workers' human capital. Workers accumulate human capital on the job, and in doing so they may also benefit competing firms: the more portable human capital they acquire, the more attractive they become in the labor market, and the more productive the economy as a whole is.

In the model presented here, firms produce via tasks differing in the talent-sensitivity of output and in the portability of the human capital that workers accumulate on the job. Labor contracts are bilaterally incomplete: neither can firms commit to task allocation based on non-verifiable talent, nor can employees commit to stay with a firm after accumulating portable human capital. In this framework, a profit-maximizing corporation, in order to lower retention costs, assigns some workers to tasks on which they accumulate less portable human capital than they would in a partnership. As a result, ultimately, their talent is not developed efficiently.This inefficiency is attenuated if either of the two sources of contract incompleteness is relaxed.

By contrast, in an equity partnership in which some employees become partners and purchase equity in the firm, task assignment is efficient. Partners are assigned optimally to the tasks where they are most productive, maximizing dividends. This constitutes a novel explanation for the evidence that in professional service industries many firms adopt the partnership organizational form.

However, in order to be retained within the partnership after having accumulated portable human capital, partners should earn a sufficiently large dividend. Accordingly the profit may be shared via an "eat-what-you-kill" rule, so that more talented partners take larger shares of profit. This result shows that labor market competition and human capital accumulation generate a transition from seniority-based to productivity-based compensation schemes.

Finally, the paper examines some frictions that may impair both the efficiency and the feasibility of the partnership organizational form. Private benefits of control and wealth constraints on employees may make task assignment less efficient in a partnership than in a corporation, lowering productivity. Further, low firm productivity and strong employee risk aversion may undermine the feasibility of stable partnerships. In all these circumstances, therefore, partnerships may lose their comparative advantage over corporations. Hence, the framework posited here yields a host of predictions that have yet to be tested empirically. This is an interesting area for future research on the distribution of organizational forms within and across industries or on the efficiency of talent allocation and the sorting of workers across firms adopting different organizational forms.

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Appendix

Proof of Proposition 1

Proof. Consider the possibility that employer and employee sign a contract in which the latter can commit not to leave the firm after task allocation. In this framework, at $t = 3$, workers are locked in and the firm can offer a fixed wage $w_2 = 0$. That is, the firm pays the reservation wage regardless of task allocation. Now, by backward induction, consider task allocation. The employer matches workers to tasks to maximize her profit, defining a threshold talent y^{**} for a worker to be allocated to task A. That is, the allocative mechanism $\mathcal{A}(y^{**})$ is such that tasks will be assigned as follows:

$$\mathcal{A}(y^{*}*) = \begin{cases} task\ A & \forall\ y \in [y^{**}\,,\,\bar{y}], \\ task\ B & \forall\ y \in [0\,,\,y^{**}). \end{cases}$$

After the training stage and talent revelation, the firm's profit is given by

$$\pi(y^{**}) = \int_{y^{**}}^{\bar{y}} \alpha y f(y) dy + F(y)x. \tag{13}$$

The first-order condition for the profit maximization problem is

$$f(y^{**})x - \alpha y^{**} f(y^{**}) = 0$$

delivering the optimal threshold value

$$y^{**} = \frac{x}{\alpha} = y^{*}. \tag{14}$$

Therefore the employer allocates all workers with talent $y \geq \frac{x}{\alpha}$ to task A, and all the others to task B in a competitive equilibrium with no labor market competition after task allocation. ■

Proof of Proposition 2

Proof. If talent is verifiable, so that task allocation is contractible in advance, the employer offers long-term contracts

$$\left\{w_1(y^{**})\,,\, w_2^i(y^{**})\,,\, i(y^{**})\right\},$$

where y^{**} denotes the optimal threshold. If the firm hires workers, its expected profit is

$$\pi = \int_0^{y^{**}} x dF(y) + \int_{y^{**}}^{\bar{y}} \alpha y dF(y) - \mathbb{E}(w_2^i).$$

At the hiring stage, workers' expected lifetime utility is

$$U = w_1 + \mathbb{E}(w_2^i).$$

Since firms bid competitively to hire workers, they will offer all the surplus they expect to generate:

$$w_1 = \pi \Rightarrow U = \int_{y^{**}}^{\bar{y}} \alpha y dF(y) + F(y^{**})x \tag{15}$$

and the task allocation that maximizes workers' lifetime expected utility is such that

$$y^{**} = \frac{x}{\alpha} = y^* \tag{16}$$

Only firms committing to the efficient task allocation are able to attract workers at the hiring stage. ■

Proof of Theorem 1

Proof. The firm's owner maximizes profit by choosing a threshold $\hat{y}$ for the allocation rule

$$\mathcal{A}(\hat{y}) = \begin{cases} \textit{Task A} & \forall\ y \in [\hat{y}\,,\, \bar{y}], \\ \textit{Task B} & \forall\ y \in [0\,,\, \hat{y}). \end{cases}$$

Since labor contracts are spot contracts, after talent revelation the firm decides task assignment taking in to account the interim participation constraints for every task assignment, so that at $t = 3$ the firm's problem is :

$$\underset{\{\hat{y}\in[0\,;\,\bar{y}]\}}{Max} \quad \pi = \int_{\hat{y}}^{\bar{y}} \alpha y f(y)dy + F(\hat{y})x - w_1 - \int_{\hat{y}}^{\bar{y}} w_2^A(y)f(y)dy - F(\hat{y})w_2^B \tag{17}$$

subject to the *"interim" participation constraints*

$$w_2^A \geq \theta_A \alpha y \tag{IPC_A}$$

$$w_2^B \geq \theta_B x \tag{IPC_B}$$

First, notice that these constraints bind in equilibrium. It is immediate to see this as given partial portability of human capital across firms, the worker can always produce more by staying with the current employer, who can therefore optimally offer the worker's outside productivity in order to guarantee retention.

Now, by plugging the binding interim participation constraints into the objective function and maximizing with respect to $\hat{y}$, one gets the first-order condition:

$$(1 - \theta_A)\alpha\hat{y}f(\hat{y}) - f(\hat{y})(1 - \theta_B)x = 0$$

yielding the equilibrium threshold:

$$\hat{y} = \frac{(1 - \theta_B)x}{(1 - \theta_A)\alpha} \tag{18}$$

Comparing the profit maximizing threshold (18) with the efficient threshold (14) , since $\theta_B < \theta_A$, it is immediate to see that $\hat{y} > y^*$. This result is robust as it persists in the limit values of θ_A and θ_B. ■

Proof of Lemma 1

Proof. To describe task assignment in a partnership, recall that partners assign themselves and employees to tasks. Partners make these choices in order to maximize their dividends $s\pi^p(y_1.y_2)$. From now on, let us drop the notation $\pi^p(y_1, y_2)$ in proofs and use π^p for simplicity.

From the previous analysis, recall that the profit in a corporation is defined as

$$\pi = F(\hat{y})(1-\theta_B)x + \int_{\hat{y}}^{\overline{y}} (1-\theta_A)\alpha y f(y)dy.$$

Task allocation for salaried workers will be the same as in the case of corporation, as it is profit maximizing. We can now consider three cases in order to show how partners will be assigned to tasks.

1. *Let $y_1 \in [0\,,\, y_2]$ and $y_2 \in [y_1\,,\, y^*)$*
   Partners choose task allocation for themselves and all other partners to maximize the profit $\pi^p(y_1, y_2)$ given by

   $$\pi^p(y_1, y_2) = \pi - [F(y_2) - F(y_1)](1-\theta_B)x + max\Big\{[F(y_2) - F(y_1)]x \;,\; \int_{y_1}^{y_2} \alpha y f(y)dy\Big\}.$$

   For the values of y_1 and y_2 considered in this scenario,it is immediate to see that $[F(y_2) - F(y_1)]x > \int_{y_1}^{y_2} \alpha y f(y)dy$, hence all partners will agree to assign themselves and the other partners to task B. Hence, task allocation is as efficient as in a corporation and the partnership will generate a profit

   $$\pi^p(y_1, y_2) = \pi + [F(y_2) - F(y_1)]\theta_B x. \tag{19}$$

2. *Let $y_1 \in (\hat{y}\,,\, y_2]$ and $y_2 \in [y_1\,,\, \bar{y})$*

   Partners choose task allocation for themselves and others in order to maximize the profit

   $$\pi^p(y_1, y_2) = \pi - \int_{y_1}^{y_2} (1-\theta_A)\alpha y f(y)dy + max\Big\{[F(y_2) - F(y_1)]x \;,\; \int_{y_1}^{y_2} \alpha y f(y)dy\Big\}.$$

For the region of talent where y_1 and y_2 lie in this case, one can immediately see that $[F(y_2) - F(y_1)]x < \int_{y_1}^{y_2} \alpha y f(y) dy$, so that partners will agree to assign themselves and the other partners to task A. In this case too, task allocation is as efficient as in a corporation and the partnership will generate a profit

$$\pi^p(y_1, y_2) = \pi + \int_{y_1}^{y_2} \theta_A \alpha y f(y) dy. \tag{20}$$

3. *Let $y_1 \in [y^*\,,\, y_2]$ and $y_2 \in [y_1\,,\, \hat{y}]$*

In this case, the profit that partners maximize when choosing task allocation is

$$\pi^p(y_1, y_2) = \pi - [F(y_2) - F(y_1)](1 - \theta_B)x + max\Big\{[F(y_2) - F(y_1)]x\ ,\ \int_{y_1}^{y_2} \alpha y f(y) dy\Big\}.$$

Since y_1 and y_2 lie between y^* and $\hat{y}$, these partners are more productive when assigned to task A: $[F(y_2) - F(y_1)]x < \int_{y_1}^{y_2} \alpha y f(y) dy$, so that partners assign themselves and the other partners to task A. Differently from the two previous cases, task allocation is more efficient than in a corporation and the partnership will generate a profit

$$\pi^p(y_1, y_2) = \pi + \int_{y_1}^{y_2} \alpha y f(y) dy - [F(y_2) - F(y_1)](1 - \theta_B)x. \tag{21}$$

Taking stock of the three cases analyzed, one can immediately see that for any $y_1 \in [y^*\,,\, y_2]$ and $y_2 \in [y_1\,,\, \hat{y}]$, a partnership assigns tasks and produces efficiently. ■

Proof of Lemma 2

Proof. To prove this lemma let us first derive the optimal partnership contracts. From here, notation is simplified by letting $\pi^p(y_1, y_2) = \pi^p$. The employer's problem is solved in a general framework, denoting as w_c the wage prospective partners would get as salaried employees in a corporation, and as w_p the outside opportunity they get after becoming partners, so that the generic constraints of the firm's owner's maximization program are

$$\phi \leq s\pi^p - w_c \tag{WTP}$$

and

$$s\pi^p \geq w_p. \tag{IPC}$$

Thus, when contracting vis-à-vis a prospective partner, the owner's program is given by

$$\underset{\{\phi,s\}}{Max} \;\; \phi + (1-s)\pi^p$$

subject to (WTP) and (IPC). Let λ be the Lagrange multiplier associated with the WTP constraints and μ that associated with the IPC. The Lagrangean function for this problem is thus

$$\mathcal{L} = \phi + (1-s)\pi^p - \lambda(\phi - s\pi^p + w_c) + \mu(s\pi^p - w_p).$$

The Kuhn-Tucker conditions for this maximization program yield:

$$\lambda = 1 \Rightarrow \phi = s\pi^p - w_c$$

and

$$\mu\pi^p = 0 \Rightarrow \mu = 0 \Rightarrow s\pi^p \geq w_p.$$

On the one and, the WTP constraint will bind in equilibrium, while on the other, the interim participation constraint may not bind as the shadow cost of providing equity is zero given that the quantity of equity is priced. Let us now consider the case in which the interim participation constraint binds: now for partners working on task B, the share to be offered is

$$s = \frac{\theta_B x}{\pi^p} \tag{22}$$

which is constant, so that $\frac{\partial s(y)}{\partial y} = 0$.

On the other, hand for partners that will be allocated to task A, the owner needs to offer a share

$$s = \frac{\theta_A \alpha y}{\pi^p} \tag{23}$$

which is increasing in y, namely, $\frac{\partial s(y)}{\partial y} > 0$. ■

Proof of Theorem 2

Proof. The proof of this theorem considers three regions of talent values to describe how the firm's owner chooses the measure of Y^p and uses of the results obtained in Lemmas 2 and 3. Recall that we are considering the case in which partners' interim-participation constraints bind in equilibrium.

1. *Let* $y_1 \in [0\,,\, y_2]$ *and* $y_2 \in [y_1\,,\, y^*)$

   From the proof of Lemma 3, in this region of talents the owner offers partnership contracts $\{\phi^*, s^*\} = \{0, \frac{\theta_B x}{\pi^p}\}$. Hence, the owner chooses the measure of Y^p in order to maximize own payoff

   $$\left[1 - \int_{y_1}^{y_2} s^* f(y)dy\right]\pi^p = \pi^p - [F(y_2) - F(y_1)]\theta_B x.$$

   Using the equation for the partnership profit in equation (19), one immediately obtains that $\pi^p = \pi$, which is independent of the measure of the bounds of Y^p and shows that the owner is indifferent between organizing the firm as a partnership or as a corporation, and thus on who should be made partner in this interval of talents.

2. *Let* $y_1 \in (\hat{y}\,,\, y_2]$ *and* $y_2 \in [y_1\,,\, \bar{y})$

   In this region of talents, the owner offers partnership contracts $\{\phi^*, s^*\} = \{0, \frac{\theta_A \alpha y}{\pi^p}\}$. Hence, when deciding who should become partner, the owner maximizes

   $$\left[1 - \int_{y_1}^{y_2} s^*(y) f(y)dy\right]\pi^p = \pi^p - \int_{y_1}^{y_2} \theta_A \alpha y f(y)dy.$$

   Using the equation for the partnership profit in equation (20), it is immediate to see that $\pi^p = \pi$. As in the previous case, the owner is indifferent between organizing as partnership and as corporation, and thus on who should be made partner in this interval of talents.

3. *Let* $y_1 \in [y^*\,,\, y_2]$ *and* $y_2 \in [y_1\,,\, \hat{y}]$

In this case, the owner offers partnership contracts

$$\{\phi^*, s^*\} = \Big\{\theta_A \alpha y - \theta_B x,\ \frac{\theta_A \alpha y}{\pi^p}\Big\}.$$

Hence, when deciding who should become partner, the owner maximizes

$$\int_{y_1}^{y_2} \phi^*(y) f(y) dy + \left[1 - \int_{y_1}^{y_2} s^*(y) f(y) dy\right] \pi^p = \pi^p - [F(y_2) - F(y_1)]\theta_B x.$$

Using the equation for the partnership profit in equation (21), one gets the objective function denoted as U_o

$$\pi + \int_{y_1}^{y_2} \alpha y f(y) dy - [F(y_2) - F(y_1)]x = U_o. \tag{24}$$

By differentiating the owner's payoff in (24), one gets

$$y_1 \geq y^* \Rightarrow \frac{\partial U_o}{\partial y_1} \leq 0$$

and

$$y_2 \geq y^* \Rightarrow \frac{\partial U_o}{\partial y_2} \geq 0.$$

Hence, the owner's payoff is increasing in y_2 and decreasing in y_1. Since the objective function is linear, the owner finds it optimal to make Y^p as large as possible in this region of parameters, namely: $Y_1 = y^*$ and $y_2 = \hat{y}$, so that

$$Y^p := [y^*, \hat{y}] \subseteq Y.$$

■

Proof of Proposition 3

Proof. To prove the proposition, first recall that the owner's maximization program when designing partnership contracts is

$$\underset{\{\phi,s\}}{Max}\ \phi + (1-s)\pi^p - s\kappa$$

subject to:

$$\phi \leq s\alpha y,$$

$$s\alpha y \geq \theta\alpha y.$$

Let λ be the Lagrange multiplier associated with the WTP constraints and μ that associated with the IPC. The Lagrangean function for this problem is thus

$$\mathcal{L} = \phi + (1-s)\alpha y - s\kappa - \lambda(\phi - s\alpha y) - \mu(\theta - s).$$

The Kuhn-Tucker conditions for this maximization program yield:

$$\lambda = 1 \Rightarrow \phi = s\alpha y$$

and

$$\mu = \frac{\kappa}{\alpha y} \Rightarrow \mu > 0 \Rightarrow s = \theta.$$

Hence, the optimal contract is $\{\phi^*, s^*\} = \{\theta\alpha y, \theta\}$. The worker definitely accepts such a contract, as it yields a strictly positive payoff (in the corporation the worker would earn zero, being allocated to task B). The owner instead gets an equilibrium payoff

$$\theta\alpha y + (1-\theta)\alpha y - \theta\kappa, \tag{25}$$

whereas, organizing as a corporation, the owner would earn x. Hence, the owner prefers partnership over corporation, if

$$\theta\alpha y + (1-\theta)\alpha y - \theta\kappa \geq x \iff y \geq \frac{x + \theta\kappa}{\alpha} \equiv y'.$$

Since $\kappa > 0$, then $y' > y^*$ and $y' \leq \hat{y} \iff \kappa \leq \frac{x}{1-\theta}$ ■

Proof of Proposition 4

Proof. To prove the proposition, first recall that the owner's maximization program when drafting partnership contracts is

$$\underset{\{\phi,s\}}{Max}\ \phi + (1-s)\pi^p$$

subject to:

$$\phi \leq \omega,$$

$$s\alpha y \geq \theta\alpha y.$$

Let λ be the Lagrange multiplier associated with the WTP constraints and μ that associated with the IPC. The Lagrangean function for this problem is thus

$$\mathcal{L} = \phi + (1-s)\alpha y - \lambda(\phi - \omega) - \mu(\theta - s).$$

The Kuhn-Tucker conditions for this maximization program yield:

$$\lambda = 1 \Rightarrow \phi = \omega$$

and

$$\mu = \alpha y \Rightarrow \mu > 0 \Rightarrow s = \theta.$$

Hence, the optimal contract is $\{\phi^*, s^*\} = \{\omega, \theta\}$. The worker definitely accepts such a contract, as it yields a strictly positive payoff (in the corporation the worker would earn zero, being allocated to task B). The owner instead gets an equilibrium payoff

$$\omega + (1-\theta)\alpha y, \tag{26}$$

whereas, organizing as a corporation, the owner would earn x. Hence, the owner prefers partnership over corporation, if

$$\omega + (1-\theta)\alpha y \geq x \iff y \geq \frac{x-\omega}{(1-\theta)\alpha} \equiv y'.$$

Finally, since we assume that $\omega \in (0, \theta x)$, it is immediate that $y' \in (y^*, \hat{y})$. ■

Proof of Proposition 5

Proof. The proof of this proposition has two steps:

(i) First, show that the two firms have different promotion thresholds. The efficient thresholds for firm 1 and firm 2 are respectively $y_1^* = \frac{x}{\alpha_1}$ and $y_2^* = \frac{x}{\alpha_2}$. The profit maximizing thresholds, instead, are $\hat{y_1} = \frac{x}{(\alpha_1 - \theta\alpha_2)}$ and $\hat{y_2} = \frac{x}{(\alpha_2 - \theta\alpha_1)}$.

It is immediate to see that $y_1^* > y_2^*$ and that $\hat{y_1} > \hat{y_2}$, but in order to prove that firm 2 allocates tasks more efficiently than firm 1, we need to show that

$$\hat{y_1} - y_1^* > \hat{y_2} - y_2^*.$$

By substituting for the values of the thresholds, the above condition becomes

$$\left(\frac{\alpha_2}{\alpha_1}\right)^2 > \frac{\alpha_1 - \theta\alpha_2}{\alpha_2 - \theta\alpha_1}. \tag{27}$$

Since $\alpha_2 > \alpha_1$, the left-hand side of (27) is greater than 1, whereas the right-hand side is less than 1, so the inequality certainly obtains. This proves the proposition that firm 2 allocates tasks more efficiently than firm 1.

(ii) Second, check whether firm 1 can be organized as a feasible partnership: the owner maximizes payoff

$$\phi + (1 - s)\pi^p$$

subject to the WTP constraint

$$\phi \leq s\pi^p$$

and the interim participation constraint

$$s\pi^p \geq \theta\alpha_2 y.$$

Since $\pi^p = \alpha_1 y$ and the two constraints bind in equilibrium, the optimal partnership contract is $\{\phi^*, s^*\} = \left\{\theta\alpha_2 y,\ \frac{\theta\alpha_2}{\alpha_1}\right\}$.

The optimal share s^* to ensure a stable partnership is feasible (i.e., $s^* < 1$) if $\theta < \frac{\alpha_2}{\alpha_1}$ and is not otherwise. Hence, when firms are heterogeneous, the less productive can afford to organize as partnerships only if the portability rate of the human capital acquired on task A is not too high; otherwise, at the interim stage they would have to pledge more than the entire profit generated in order to retain the partner. ■