Organizational Design with Portable Skills*

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Abstract

Employees learn from the tasks they perform, and in the process they accumulate human capital that is potentially portable. If companies cannot commit to specific task assignments, they may have the incentive to assign workers to tasks that reduce the cost of retaining them but do not maximize their productivity. In contrast, equity partnerships assign tasks efficiently to their partners, 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 transition from equal sharing towards performance-based remuneration systems.

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1 Introduction

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

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

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

[1]Other examples of portable human capital can be executive education paid by the previous employer, know-how, network of suppliers.

[2]Ellingsen and Kristiansen (2019) describe the impact of portability on experts' competitive compensation schemes. Further implications of firms' competition for workers' human capital are negative effects in the quality of their corporate governance (Acharya and Volpin, 2010) and on their ability to provide insurance to their employees (Acharya, Pagano and Volpin, 2016, and Pagano and Picariello, 2020).

[3]IRS Data on the amount 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.

capital? Second, if the firm is organized as a partnership rather than as a corporation, will it assign tasks to workers 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 featuring a talent-sensitive production technology, and the other being talent-insensitive. 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 a worker may be appointed to be either an attorney, who goes to court and whose talent affects the outcome of trials, and has access to the firm's network of clients; or a back office employee executing bureaucratic, routine tasks, whose output does not depend on her forensic talent and who does not interact much with clients. If the latter were to leave the current employer, she would carry along fewer clients than an attorney would.

Firms hire a pool of workers whose talent is observable to everyone in the industry, yet nonverifiable in courts, as it is defined as 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. 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 where workers can commit not to leave the incumbent employer after task allocation and human capital accumulation (for instance because their labor contract contains a binding non-compete clause); and another setting where firms can commit to task allocation (alternatively, talent is verifiable in courts).

I then turn to a third setting, where labor contracts are bilaterally incomplete in the sense that neither firms nor workers can commit to agreements, and show that, if firms are organized as corporations, they assign the more talent-sensitive task to fewer workers than in the efficient benchmark, so as to reduce their retention costs. The magnitude of this inefficiency depends on the portability of the human capital acquired while executing either 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 when assigned to the more talent-sensitive task, yet are assigned to the less-sensitive one because shareholders do not capture enough value from it, due to high retention costs. The waste of talent implied by such an inefficient task allocation clearly entails a loss of output for society.

I compare task assignment in a corporation controlled by shareholders, with that in an equity partnership, in which prospective partners buy equity in the firm, get control rights and are compensated with dividends. When designing optimal partnership contracts, an "eat-what-you-kill" sharing rule entitling more productive workers to higher shares of the realized profit (namely, to 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 empirical and anecdotal evidence show that more and more partnerships in professional service industries have been adopting the productivity-based eat-what-you-kill remuneration scheme instead of seniority-based ones (Levin and Tadelis, 2005), so that within cohorts, partners tend to share profits equally.

Partners choose task allocation to maximize the profit to be shared. Since they produce revenues but impose no retention costs at the production stage, a sufficient condition to obtain efficient task allocation in partnerships is that all the workers who would be inefficiently assigned to tasks in a corporation are made partners. This condition is satisfied in equilibrium: the firm's founder is willing to make these workers partners to extract the higher surplus they generate when assigned to tasks more efficiently in a partnership than in a corporation, via the price of the equity she sells to them. The model shows that if labor contracts are bilaterally incomplete, partnerships assign tasks more efficiently than corporations. Hence, firms adopting the former organizational form are more productive. The empirical prediction is that more firms should be organized as partnerships in industries where competition for workers is fierce and workers' talent is not easily verifiable, so that task assignment is noncontractible.

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 firm's founder may fear that her private benefits from control would be constrained by her 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, so that she does she will not want to appoint as partners all the workers who would be inefficiently allocated in a corporation. As a result, task assignment is less efficient than in the benchmark case. Hence, firms whose founders

face higher equity issuance costs or care more about their private benefits of control, should be organized as corporations rather than partnerships.

Wealth constraints may also prevent workers from acquiring an equity stake in the partnership if they cannot borrow the necessary amount due to credit rationing. This delivers the prediction that wealthier workers may become partners earlier than less wealthy (and more talented) ones, and thus have steeper career profiles in partnerships. This may also affect workers' sorting across firms, depending on the adopted organizational forms.

If there are technological differences across firms, more productive firms should be expected to retain partners more easily than less productive competitors. Thus, the more productive firms should be organized as partnerships, as these can provide partners with sustainable dividends, whereas less productive firms may not generate enough profits to retain partners: they therefore be organized as corporations.

If firms' profits are uncertain, also workers' risk aversion may impair the possibility to organize the firm as a partnership. While salaried workers have limited liability, partners do not, as they earn a share of profit and share in the assets and liabilities of the company. As a result, sufficiently risk-averse workers require excessively high shares of profit to become partners and stay with the current firm, as they forgo the certain income they would get being employed in a corporation. This effect could be mitigated by setting up a limited liability partnership, in which partners get a certain income, irrespective of the realized profit. Thus, limited liability partnerships (LLPs) should be more likely to be established in riskier industries, where firms' revenues are more volatile.

The paper is structured as follows. Section 2 reviews the related literature. Section 3 sets up the basic model. Section 4 derives the efficient task allocation and shows that the efficient outcome can be implemented if workers' mobility can be limited or firms can commit to task allocation. Section 5 introduces the allocative inefficiency due to portability of talent and contractual incompleteness. Section 6 modifies the baseline model introducing the possibility for the firm's owner to sell equity of the firm to some workers 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: that on the optimal allocation of talent within firms and that on organization 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 incumbent employer observes workers' ability. All other firms observe only task assignment and use this information as a signal of workers' ability. As a result, the current employer allocates tasks inefficiently to send an incorrect signal to the opponents so as to prevent them from poaching the best workers. Bernhardt (1995) uses a similar argument to justify the existence of the so-called *"Peter principle"*. This principle describes the empirical evidence that some promoted workers 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. (2017) provide experimental evidence of talent misallocation within firms when the employer has the opportunity to hide workers' talent via task assignment. Differently from all these papers, I focus on a case in which workers' talent is observed by all firms in the economy but the development of their human capital depends on the task workers execute, as in Rajan and Zingales (1998) and (2001), so that the firm can reduce retention costs by assigning some workers to tasks where 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 if the employer cannot commit to a certain task allocation, which in turn affects human capital accumulation and thus workers' subsequent productivity.

This paper also relates to the branch of labor economics on human-capital acquisition and its firm-specificity. Key contributions on this topic are Becker (1964), Rosen (1972), Acemoglu and Pischke (1998), Moen and Rosen (2004) for analyses on the mobility of human capital and the cost of its accumulation. Differently from all these papers, I study a model in which human capital specificity depends on the task a worker is assigned to, so that its accumulation can be manipulated by the

employer via task allocation so as to reduce retention wages commanded by workers with highly portable human capital.

Within the literature on organizational design, this paper is related to work on the comparison between partnerships and corporations. Levin and Tadelis (2005) argue that partnerships abound in professional service industries because nonspecialist clients cannot perfectly observe the quality of the products supplied (for instance, a patient cannot perfectly tell whether a medical diagnosis is correct, or a plaintiff could not evaluate a lawyer's technical advice). The authors show that firms are set up as partnerships to signal the quality of their output. They assume partners to share profits equally, so that they maximize average profits instead of the total. As a result, they optimally hire the most productive workers. My framework differs from that of Levin and Tadelis (2005) in several respects. First, I assume the quality of the output produced to be observable. Second, in my model the firm hires workers who may develop all the possible talents. Third, I depart from the assumption that partners share profits equally, as I am not concerned with the signaling problem. The results provided in this paper show that the retention motive implies that partners should receive a share of profit proportional to their productivity and not the average share.

Most contributions on the economics of partnerships focus on moral hazard issues: 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 workers do not want to share equally profits 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 turn from partnership to corporation organizational form and argue that technological progress has reduced the importance of knowledge transmission across cohorts of partners.

Finally, this paper is linked to the literature on incomplete contracts and control rights in organizations, dating back to Grossman and Hart (1986), Hart and Moore (1988), Hart and Moore (1990) and Aghion and Tirole (1997). Differently from the extant literature, in this paper, contracts feature bilateral incompleteness: firms cannot commit to task allocation and workers cannot commit to stay with their employer. These frictions generate inefficient talent allocation but transferring control

rights to some workers, as done in the existing literature, does not suffice to implement efficient task assignment as even workers can hold the employer up. Hence, in this paper, not only control rights should be granted to some workers, but once these become partners they should be remunerated according to their productivity in order to retain them.

3 The Model

I consider a setting in which homogeneous firms bid to hire a continuum of measure 1 of workers with zero reservation wage and unknown productivity from 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 in the economy. The output price is normalized to 1 and output is produced only by means of workers' talent.[4] Employer and employees are risk-neutral and the latter get utility from consumption, namely from the wage they earn. 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 it is unknown at the beginning of the job relationship. Hired workers undergo a nonproductive training period.[5]

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

Hence, contracts contingent on workers' talent are not enforceable: since the employer chooses task allocation depending on talent, she cannot take any commitment based on it.[6] Notice that the realized talent y does not per se affect productivity

[4]Picariello (2019) removes 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 such framework, talent allocation has a dual role: on the one hand it can reduce mobility, on the other hand, it serves as an incentive for workers to acquire human capital.

[5]The output of this task 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.

[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 for workers themselves to leave with the portable human capital to start-up their own firm, thus obtaining the same results as under perfect information in among firms but nonverifiability in courts.

before task allocation, but determines the *potential* productivity that the worker develops while dealing with a task in the firm. Hence, the assumption of talent non-verifiability rests on the fact that it is difficult to enforce a contract based on potential productivity.

Once talents are observed, the employer allocates workers to either of two tasks, thus determining how their talent will be used in the organization. This allocation is determined by a new spot contract defining a task and a retention wage. Tasks differ in the talent-intensity of their output and in the portability of the human capital workers acquire while executing them. After task allocation, workers may be poached by competing firms operating in the same industry, or start their own company. Hence, after task assignment, firms bid competitively to poach or retain workers (if the worker threatens to be an entrant in the industry with a spin-off company, she bargains with the incumbent employer). If the worker receives two equal bids from the current employer and another firm, she is assumed to stay with the former; similarly, if she earns as much as she would by starting up her own company, she will stay with the current employer. There is no discounting across the two periods.

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

3.1 Contracts and Tasks

The firm's owner offers spot wage contracts:[7] 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 while executing task i (namely, the share of output a worker assigned to task i and leaving can produce outside the current firm). The two tasks are characterized as follows:

Assumption 2. Task A *produces* βy *with* $\beta \in \mathbb{R}_+$ *and gives access to human capital with portability rate* $\theta_A \in (0; 1]$.

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

Task B *produces* $x \in (0\,,\,\beta\bar{y}]$ *and gives access to human capital with portability rate* $\theta_B \in [0\,;\,\theta_A)$.

Once a worker is assigned a task, her talent is transformed into effective productivity. Task A is the more talent-sensitive of the two and the human capital workers acquire while executing it is more portable, whilst task B can be thought of as a routine task whose output is talent-insensitive, so that a worker who deals with it learns to produce a fixed amount, thus forgoing talent development.[8] The assumption that the human capital acquired when working on task A is more portable than that deriving from working on task B is motivated by the fact that in first output is positively correlated with innate talent, hence it can be produced by the same worker also in other firms, rather than depending on the firm's technology.[9] Recalling the law company example in the introduction, one may think of task A as the "attorney" task, where β 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 won cases, and θ_A is the share of clients she can carry along when leaving the current employer. Task B, instead, can be thought of as a "back-office" routine task, generating an output that does not depend on the worker's talent to win cases in court and that gives her access to fewer clients.

I assume workers' talent to be unknown to everyone at the beginning of the game. For this reason, workers receive an homogeneous hiring wage offer w_1. After talent becomes observable and task allocation takes place, every worker will have heterogeneous outside options depending on the human capital acquired on the assigned job. Specifically, a worker assigned to task A can produce outside the initial firm

$$\theta_A \beta y,$$

while a worker assigned to task B, can produce

$$\theta_B x.$$

[8] The ranking of portability rates could be changed and all the main results of the paper would hold true, although the inefficiencies shown later are reversed.

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

Summing up, a worker assigned to task i acquires the necessary human capital to execute only that task when leaving the firm. Namely, workers allocated to task B (respectively, A), cannot be poached to execute task A (respectively B) immediately, as they need retraining for the new task.

3.2 Time Line

The time line of the model includes 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 them 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 a new one.
- $t = 5$, 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 whether to accept a job from a firm at the hiring stage and whether to stay with this firm or move to a competing one (or start-up her own spin-off company) at the interim stage; firms, instead, choose wage contracts and task allocation. Hence, a subgame perfect Nash equilibrium for this game consists of a vector of wages and a noncontractible task allocation $\{w_1\,,\, w_2^i\,,\, i\}$.

4 Efficient Task Allocation

Productivity on task A is increasing with workers' talent y, whereas productivity on task B is constant, yet may be larger than the former, and since y is a continuous

variable, task allocation will follow a threshold rule of the kind

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

I 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 summation of the output generated on each task. This threshold is chosen so that all workers with talent larger or equal (respectively, smaller) than y^* are assigned to task A (respectively, task B). Let the social welfare be defined as

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

where π denotes the profit of the firm, whereas 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

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

which maximizes the total surplus. Notice that, ceteris paribus, the higher the production enhancer β, the lower y^*. Hence more workers should be allocated to task A. Instead, when x increases, the threshold value increases. Namely, only very productive workers should work on task A.

4.1 Decentralized Efficient Allocation

The baseline model features bilateral contract incompleteness. On the one hand, firms cannot commit to task allocation; on the other hand, workers cannot commit to stay with their employer after task allocation and human capital accumulation. I will now relax one incompleteness at a time, in order to show that when either of the

parties can commit to an agreement, efficient task allocation can be implemented in a decentralized setting.

4.1.1 Workers' Commitment

I first assume that workers can commit to stay with the incumbent employer after task allocation, for instance because labor contracts feature strict noncompete clauses.[10] If the parties can sign unconstrained labor contracts limiting 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 relegated to the Appendix. Intuitively, if the employer does not need to retain workers at the interim stage after human capital accumulation, she 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 incumbent employer. Thus, the firm allocates tasks only considering employees' marginal productivity on either 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 workers are free to leave their current employer after human capital accumulation and their talent is verifiable, so that the firm can credibly commit to 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.

[10] Noncompete clauses are legal tools forbidding workers to leave the current employer and to work in the same industry or geographic area for a certain period. These clauses are very diverse for which concerns the constraints they impose and they are heterogeneously enforced across states. In the US, for instance, some states such as Massachusetts enforce these clauses very strictly, whereas others, like California, do not.

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

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 to offer such wage flow, so that firms deviating from this particular contract offer, would not be able to attract workers and thus remain idle. Since the contract including task allocation is enforceable, the firm cannot hold workers up at the task allocation stage.

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 having accumulated the relative human capital; on the other hand, firms cannot commit to task assignment when hiring workers as talent is nonverifiable in courts. If workers are successfully poached by a competing firm or startup their own company, they produce the portable share of the human capital acquired in the source firm, depending on the task they executed. Therefore workers' outside option depends on task allocation and on their talent.

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

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

subject to workers' interim participation constraints:

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

and

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

The following proposition states the firm's allocation rule.

Theorem 1. *If workers cannot commit to stay with their initial employer after task allocation and firms cannot commit to task allocation, it is profit-maximizing to assign*

task A to fewer workers than in the efficient benchmark. The profit-maximizing talent cutoff for task assignment is

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

As after task allocation 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.[11] Hence, the optimal wage offers will be $w_2^A = \theta_A \beta y$ 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 initial 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 $\beta y > x$ for them), but they are not. As shown in Figure 1, some workers' productivity is not large enough to compensate the spread between $\theta_A \beta y$ and $\theta_B x$. Namely, the wage necessary to retain them at the interim stage if working on task A, is relatively too high. To reduce retention costs, firms strategically match them with the less portable task. Specifically, due to high retention costs, the employer does not manage to capture much of the value created by these workers when allocated to task A.[12]

Figure 1: Inefficiency

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

[11] Alternatively, when bargaining with the worker, the firm's owner would not leave her more than what she can produce starting up her own firm.

[12] Allowing firms to poach workers before task allocation would not change the result as all firms are identical and solve the same profit maximization problem. Namely, in equilibrium, no firm would bid to poach and allocate to task A a worker with talent $y \in [y^*, \hat{y}]$, as before task assignment y is potential productivity and will realize only after having executed the task, so that retention would still be an issue.

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

5.1 Complete vs Incomplete Contracts

I have shown that, when labor contracts are bilaterally incomplete, corporations implement inefficient task allocation. However, removing one source of incompleteness allows the implementation of the efficient task allocation. Namely, if either workers' talent is verifiable in courts, so that firms can commit to task allocation, or workers can commit not to leave the current employer after accumulating human capital, task allocation is efficient. In order to compare the setting with complete contracts against the one with 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

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

and workers expect to get retention wages at the interim stage [14]

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

[13] As a further remark, 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 do *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 a very talented worker is allocated to a simple routine task, she can signal her actual talent. This would increase her probability of being hired by a competing firm seeking highly productive employees. In this model, instead, given the acquisition of heterogeneous human capital, task allocation is an effective retention tool.

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

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

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

and workers expect a retention wage

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

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, 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

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

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 issues generated by the 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, should the firm be credible, the worker could accept $w_1(y^*)$ smaller than $w_1(\hat{y})$ to be hired. 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

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

If the firm's owner can holdup, she will do it, thus generating less surplus and earning a positive rent with respect to the efficient benchmark case. For this reason, anticipating this, workers will not accept a backloaded contract implying lower wage ex-ante in exchange of larger one later on. Hence, workers will require higher wages at the hiring stage and have a "flatter" wage schedule.

6 Partnership

In this section I allow the employer to choose the organizational form of the firm: it can be organized either as a corporation or as a partnership. A partnership is an organizational form in which some workers (referred to as "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 to make it an equity-based partnership, by offering shares of it to some workers. In the latter case, those workers who buy equity of the firm will run it as the owner's partners.[15]

If the firm is organized as a partnership, the firm's owner offers partnership contracts, describing amount and price of firm equity to which each prospective partner is entitled to.

6.1 Equity and Shares

I now introduce some notation: let ϕ denote the price of equity every prospective partner purchases from the initially sole firm's owner.[16] Let π^p denote the profit of the firm organized as a partnership. The firm's owner defines a subset in which a prospective partner's talent should lie. Let y_1 and y_2 be respectively the lower and

[15]The firm's owner can be thought of as a founding non-productive partner who selects amongst his employees whom should become her partner. However, the firm's owner may be even modeled as a productive partner, and this would not change the results provided in the model, as her task assignment would be unchanged, as it will become immediate to see later.

[16]This price may also be considered as a reduction in the ex-ante wage that a prospective partner pays in order to gain a higher wage ex-post.

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 $s \in [0\,,\,1]$. I impose a feasibility constraint on the shares sold to partners, so that $\int_{y_1}^{y_2} sf(y)dy \leq 1$ while the firm's owner retains the remaining shares, and her payoff in a partnership is

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

Hence, the firm's owner designs *partnership contracts* $\{\phi\,,\,s\}$ and makes *take-it-or-leave-it* offers to prospective partners.[17] Workers who accept the partnership contract become partners, so that their compensation is no longer a wage but a share of the profit of the firm: $s\pi^p(y_1, y_2)$.

6.2 New Timing

The baseline timeline is slightly modified. The new timing of the game is the following:

- 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 offer.
- 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.

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

6.3 Task Allocation in a Partnership

Before describing the design of partnership contracts, I discuss task allocation in a partnership, as this will affect the profit generated $\pi^p(y_1, y_2)$. The following lemma states 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 for the implementation of the efficient task allocation. If none of the workers who would be inefficiently matched to a task in a corporation is made partner, running the firm as a corporation or as a partnership makes no difference in terms of surplus generated. 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 firm's owner and workers.

A sufficient condition for the implementation of efficiency is that workers with talent $y \in [y^* , \hat{y})$ are made partners. Since partners receive dividends as remuneration, they have an incentive to allocate themselves and the other partners to tasks that maximize their productivity, increasing the profit generated and thus all partners' payoff.[18]

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

6.4 Partnership Contracts

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

[18]Given linearity of the problem at hand and perfect information, such result is attainable with both majoritarian and proportional voting rule.

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

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

for workers who would be assigned task A in the corporation.

Once created, the partnership is *stable* if partners are retained after task allocation and human capital accumulation: compensations should be designed to guarantee 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 in section 5. For partners instead, interim participation constraints depend on the task they are assigned. A partner working on task A will acquire the corresponding human capital, which will determine her outside option, so that she will not leave the partnership if

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

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 on the financial market, so that when a partner leaves the company, all her equity is costlessly recollected by the other partners and she only obtains the portable human capital acquired as outside option.[19]

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

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

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 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 can produce outside the current firm. Most results in the existing literature are based on mechanisms entailing equal profit sharing among partners (see, for instance, Levin and Tadelis, 2005). In this paper, workers have heterogeneous talent, so that the best partners have better outside options (higher returns to talent) with respect to the less productive ones. Hence, in order to ensure stability of the partnership it is necessary that partners earn (at least) a share of the profit proportional to their talent. This is a "eat-what-you-kill "sharing rule, according to which a partner's payoff is linked to the revenue or profit she brings into 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 featuring increasingly high turnover rates. Thus, an empirical prediction of this model is that eat-what-you-kill sharing rules should be more frequent in industries where labor market competition is fiercer (or partners acquire more portable human capital).

However, interim-participation constraints may not bind because equity issuance is costless and the price of such equity price (i.e., ϕ) is increasing with partners' shares, by the binding willingness-to-pay constraints. As I will discuss later in greater detail, if issuing each unit of equity has even an infinitesimally small cost, 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 firm's owner would still need to grant dividend at least equal to the value of their human capital outside the partnership.[20]

[20]Note that this program does not exclude the possibility for *equal-sharing partnership agreements*. However, if this sharing rule is adopted, with heterogeneous partners, the most talented should get at least their outside option, and the least talented ones, by getting as much as the highly talented ones, may earn much more than what they actually produce even inside the current firm. Thus, if the number of partners is sufficiently large, or if human capital is highly portable, such sharing

Notice that whether the interim-participation constraints bind or not does not affect the results presented next, so I will consider the case where they bind without loss of generality.

6.5 Partners' Selection

The firm's owner chooses prospective partners by defining the measure of the subset Y^p, to maximize her 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* $\{\phi^*(y),\, s^*(y)\} = \{\theta_A \beta y - \theta_B x,\, \frac{\theta_A \beta y}{\pi^p}\}$. *Hence, tasks are assigned more efficiently in a partnership than in a corporation.*

This theorem shows that the owner's optimal strategy when choosing the organizational form fulfills the condition for efficient task allocation in partnerships stated in Lemma 2. Intuitively, the firm's 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 efficiently execute task A. Hence, organizing the firm as a partnership and appointing these workers as partners generates more surplus compared to organizing the firm as a corporation. The owner extracts the surplus generated in this scenario by pricing the equity sold to prospective partners as $\phi^*(y) = \theta_A \beta y - \theta_B x$, and therefore prefers appointing all these workers as partners, so as to maximize the revenue from her equity sale.

Instead, the owner is indifferent about who should become partner among the workers with talent $y \notin [y^*, \hat{y}]$. The intuition is that all these workers are efficiently assigned to tasks 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 the wage they earn when assigned to task A and that earned when assigned to task B, i.e. $\phi^*(y) = \theta_A \beta y - \theta_B x$. One could imagine that before task assignment in a corporation, these workers may be willing a lower compensation in exchange of a

rule would violate the feasibility constraints, so that $\int_{y_1}^{y_2} s f(y) dy > 1$. Differently, when the interim participation constraints bind, the feasibility condition is always fulfilled.

promise to be assigned to task A.[21] However, since task allocation based on workers' talent is noncontractible, the firm's owner would have an incentive to deviate from such agreement and allocate tasks according to the profit-maximizing allocation rule, thus obtaining a higher payoff. Instead, if in a partnership the firm's owner retains equity after selling some of it to partners (i.e., $\int_{y_1}^{y_2} s(y)f(y)dy < 1$), she will prefer assigning partners efficiently, as she earns dividends that are maximal if partners are assigned efficiently to tasks. Hence, choosing a partnership as organizational form works as an implicit contract between the firm's owner and partners, ensuring efficient productivity irrespective of the share of equity retained by the owner.

6.6 Predictions

The model lays out mechanisms affecting the choice of organizational form in industries where firms compete for talent, such as professional services, thus yielding a set of empirical predictions regarding the distribution of partnerships and corporations within and across industries.

Summing up the theoretical results, when labor contracts are bilaterally incomplete, in the sense that neither firms can commit to talent-based task allocation, nor workers can commit to stay with the current employer after accumulating portable human capital, firms assign tasks across workers more efficiently in partnerships than in corporations. However, if either of the two sources of incompleteness is relaxed, even corporations assign tasks efficiently. This generates a number of testable predictions.

Competition in the labor market is softer if labor contracts embed strictly enforced noncompete clauses. In the extreme case in which there is no competition for workers after task assignment, corporations assign tasks as efficiently as partnerships. Hence, the model predicts that more firms should be organized as partnerships in industries where firms compete more fiercely in the labor market. When testing this result, one could use the fact that noncompete clauses are heterogeneously enforced across states. In the US, for instance, the strictness of enforcement of noncompete clauses has varied over the years in some states as detailed by Marx et al. (2009) and Bishara (2011).

[21] This resembles an "apprenticeship "program, where the apprentice is willing to accept a lower pay in exchange for training.

Second, if workers' performance is verifiable, corporations can commit to efficient task allocation. Since talent (or potential productivity) is nonverifiable, basing task assignment on workers' performance is easier the less talent-sensitive the production technology is: 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, whereas those providing more routine (less talent-sensitive) services, should be organized as corporations, as tasks are assigned efficiently even by adopting this organizational form.

This result parallels that in Levin and Tadelis (2005) that if the quality of a service produced in a sector 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, namely, competition in the labor market. To distinguish empirically this prediction from that by Levin and Tadelis (2005), one should expect to observe the verifiability of workers' output, to be associated with partnerships only in competitive labor markets, as in non-competitive ones corporations should have no less incentive than partnerships to assign tasks efficiently t their employees.

Hence, more complete labor contracts increase the efficiency of task assignment within corporations. Yet, in the stylized setting analyzed so far, partnerships always achieve efficient task allocation and thus have the largest productivity, so that corporations allocate talent at most as efficiently as a partnerships. As shown in the next section, however, allowing for some constraints to the formation of partnerships, may reduce their efficiency and feasibility, thus making corporations more efficient in some situations.

[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 executing more talent-sensitive tasks, are organized as partnerships, whilst only 6% of other legal and paralegal services firms employing legal practitioners primarily engaged in providing routinary services such as title handling, are partnerships. Another example is the accounting profession, including 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 while 61% financial accounting work was done by partnerships.

7 Frictions in Partnerships

In the frictionless setting analyzed so far, corporations assign tasks at most as efficiently as partnerships. I now introduce some frictions in the model to study how these affect partnerships' efficiency and feasibility.

In order to deliver clear predictions on the impact of frictions, I make some simplifying assumptions. First, I assume the firm to hire one worker, instead of a continuum. Second, I let $\theta_B = 0$ and simplify the notation so that $\theta_A = \theta$. Third, I 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, these assumptions imply that if the firm is organized as a corporation, it earns profit $\pi = x$, whereas if it is a partnership, it earns $\pi^p = \beta y$.

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 of issuing equity, as well as a loss of private benefits of control for the owner. In this scenario, the owner's maximization program when designing partnership contracts becomes:

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

subject to the WTP constraint

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

and the interim participation constraint

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

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

Intuitively, the owner bears the cost of issuing each unit of s, so that the unique optimal partnership contract offered to the prospective partner is $\{\phi^*, s^*\} = \{\theta\beta y, \theta\}$. Moreover, the owner does not capture all the extra surplus generated by more efficient

production in a partnership compared to the case in which the firm is organized as a corporation. This implies that the owner is willing to make a partnership only with sufficiently productive workers and not with those who would be inefficiently assigned to task B in a corporation. In fact, if $\kappa \geq \frac{x}{1-\theta}$, the firm's owner does not wish to organize a partnership with any worker with talent $y \in [y^*, \hat{y})$, so that the corporation is the only viable organizational form.

This result highlights that in the realistic scenario in which the firm founder enjoys high private benefits from control, so that she faces a high cost of selling equity to potential partners, she may organize the firm as a partnership only with very talented partners (instead of all those who would be inefficiently assigned task B in a corporation), thus reducing the productivity of the firm, or be willing to keep it running as a corporation.

7.2 Wealth Constraints

So far workers have been assumed to be able to pay for their equity stake in the firm. However, this may not be the case if workers face wealth and/or borrowing constraints. Even allowing for the possibility to borrow, workers' willingness to invest in the partnership may be constrained by their time preferences.

Let $\omega > 0$ denote the worker's observable wealth when the firm's owner offers partnership contracts. In order to focus on the most interesting case, I assume that $\omega < \theta\beta y^* = \theta x$. In this scenario, when designing partnership contracts, the firm's owner faces the following willingness-to-pay constraints:

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

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 firm's owner offers a partnership contract $\{\phi^*, s^*\} = \{\omega, \theta\}$ and organizes the firm as a partnership if the worker has talent $y \geq \frac{x-\omega}{(1-\theta)\beta} \equiv y'$, 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 in the partnership, as the maximum equity price

she can set is ω, and therefore she 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 appoint as partners workers with talent below the cutoff y', as the extra value their efficient task allocation generates cannot compensate for the discounted equity price she earns. Hence, in the presence of wealth constraints, task allocation is still inefficient (and may be 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, whereas wealthier workers should have steeper career profiles than equally talented but less wealthy ones. This is particularly relevant in economies with sharp wealth inequality: poorer workers may not become partners because of their wealth constraint, and as a result end up wasting their talent in inefficiently assigned tasks. Conversely, wealthier (or less credit constrained) workers become partners, thus earning even more and widening the wedge between their wealth and that of those who cannot become partners due to wealth constraints. 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, if one considers a framework in which workers decide how much productive effort to exert at the training stage, in the presence of wealth constraints, the objective of becoming partners may provide to young workers incentives to work hard in order to accumulate enough wealth to buy their stake in the company. Such mechanism may be a possible rationale for the fact that young non-partner employees often work overtime in professional services.

Summing up, when issuing equity is costly or workers are wealth-constrained, there is 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 when discussing the impossibility for credit constrained workers to pay for their on-the-job training.

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

7.3 Heterogeneous Firms

In the baseline model, firms have been considered to be homogeneous. However, firms may adopt heterogeneous productive technologies or strategies, thus affecting their profitability.[25] To account for productive heterogeneity I will change two assumptions of the baseline model: (i) I consider a duopoly in the labor market at the interim stage, with firms indexed $f = \{1, 2\}$ (namely, firms do not compete at the hiring stage, but they start the game with a worker each and will compete after task allocation);[26] (ii) one of the two firms uses talent in a more productive way than the other, for instance because it uses a technology that fits better workers' talent or has a larger network of clients than it's opponent's. Specifically, I assume $\beta_1 \leq \beta_2$, so that any worker allocated to task A in firm 2 generates a larger revenue than that she would produce 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. The following results hold in this framework:

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

- *the less productive firm assigns tasks than the other;*
- *if the portability of human capital is large enough ($\theta \geq \frac{\beta_1}{\beta_2}$), 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 than in firm 1, the latter needs to pay high retention wages, hence it optimally sets the threshold for assigning task A higher than the one it would set if the two firms were

[24] One may assume that on top of the frictions I will present later, either equity issuance has a small cost or workers have wealth constraints, thus not changing the qualitative results yet making it less immediate to understand the clear effect of each friction.

[25] Not just productive technologies, but also features such as the size of the pool of clients affect firms' profitability

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

identical. Moreover, if portability θ is sufficiently large, firm 1 cannot be organized as a stable partnership: not only the competing firm is more productive than the incumbent employer, but also the share of human capital the partner carries along upon departure is so large that she cannot be retained even by offering her the whole profit, which makes partnership unfeasible (i.e., one requiring $s^* > 1$).

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

7.4 Risk Aversion

Yet another friction that can play against partnerships is workers' risk aversion. An important difference between partners and workers is that the former share in the firms' profits and liabilities, whereas the latter usually have limited liability, so that they earn a fixed wage, irrespective of the firm's performance. In order to introduce this further friction in the formation of partnerships, I consider a setting in which the firm's profit is uncertain, for instance due to demand volatility, as one of two possible states of the world may occur. In one state, the firm generates the usual profit, while in the other it makes no profit:[27]

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

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

[27] In this simplified framework, the company does not suffer losses, however, partnerships' losses are usually borne by all partners. Allowing for strictly negative profits would not change the qualitative results hereby discussed.

maximizes her objective function

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

subject to the willingness-to-pay constraint

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

and the interim participation constraint

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

Note that after task assignment and human capital accumulation, the partner has a safe outside option as she may leave for a competing firm organized as a corporation and earn the certain wage $\theta\beta y$. In order to retain the partner, 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 the safe outside option. This implies that it is necessary to offer $s^* > \theta$ and that the probability of producing a positive profit p is sufficiently large. Both p and s should be larger 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 to retain her 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 earning a zero dividend, the interim participation constraint is

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

In this scenario, the partner earns a fixed, positive amount irrespective of the profit realized and by concavity of the worker's utility function, the share of profit needed to retain a partner, denoted by s^{**}, is smaller than the one granted without insurance. Hence, ceteris paribus, organizing the firm as a limited liability partnership favors the stability of the partnership, being therefore feasible even in scenarios where regular partnerships would not. As an example, consider the case in which in order to retain the partner at the interim stage in a regular partnership, it is necessary to offer her

a share of profit s^* slightly lager than 1. If this is the case, the stable partnership is unfeasible; insuring the partner against profit volatility would lower such share up to $s^{**} < 1 < s^*$, so that the limited liability partnership is feasible whereas the regular one is not.

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

This provides 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 organizational form (or pay fixed dividends independent of the profit generated to partners) 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 working for limited-liability partnerships, as these would offer more stable career profiles: choosing a certain organizational form may thus affect workers' selection across industries and organizations.

8 Conclusions

Retaining skilled workers is an important issue in professional service industries, where firms rely on their workers' human capital more than in other sectors. Workers accumulate such human capital on the job and by doing so they 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.

I build a model in which firms produce by means of tasks featuring different talent-sensitivity of their output and portability of the human capital that workers accumulate while executing them. Labor contracts are bilaterally incomplete, i.e., neither firms can commit to task allocation based on nonverifiable talent, nor workers can commit to stay in a firm after accumulating portable human capital. In this framework, a profit maximizing corporation assigns some workers to tasks where they accumulate less portable human capital than a partnership so as to reduce retention costs, and as a result their talent ends up not being efficiently developed to reduce

retention costs. This inefficiency is reduced if either of the two sources of contract incompleteness is relaxed.

In contrast, task assignment is efficient in an equity-partnership in which some workers become partners and buy equity in the firm, thus acquiring control rights over task assignments and earning dividends as compensation. Partners are optimally assigned to the task where they are more productive in order to maximize dividends. This provides a novel rationale for the evidence that many firms adopt the partnership organizational form in professional service industries.

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

Finally, I analyze some frictions that may impair both the efficiency and the feasibility of the partnership organizational form. Frictions such as private benefits of control and workers' wealth constraints may imply that task assignment and productivity are less efficient in a partnership than in a corporation; moreover, low firm productivity and high workers' risk aversion may impair the feasibility of stable partnership. In all these circumstances, therefore, partnerships may end up losing their comparative advantage over corporations as business organization. Hence, the framework analyzed provides a host of predictions yet to be empirically tested, which may be of interest for future research studying the distribution of organizational forms within and across industries, as well as 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 for employer and employee to 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 $w_2 = 0$. Namely, the firm pays workers' reservation wage regardless of task allocation. Now, by backward induction, consider task allocation. The employer matches workers to tasks to maximize her profit. To do so, she defines a threshold talent y^{**} for a worker to be allocated to task A. Namely, 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

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

The first-order condition for the profit maximization problem is

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

delivering the optimal threshold value

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

Therefore the employer allocates all workers with talent $y \geq \frac{x}{\beta}$ to task A, and all the others to task B in a competitive equilibrium without labor market competition after task allocation. ■

Proof of Proposition 2

Proof. If talent is verifiable, so that task allocation is contractible upfront, 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

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

At the hiring stage, workers' lifetime expected 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:

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

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

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

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 the 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 workers' 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 :

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

subject to the the *"interim" participation constraints*

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

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

First, notice that the interim participation 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 staying with the current employer who then can optimally offer the worker's outside productivity to retain her.

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:

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

yielding the equilibrium threshold:

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

Comparing the profit maximizing threshold (18) with the efficient one (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 workers to tasks. Partners make these choices in order to maximize their dividends $s\pi^p(y_1.y_2)$. From now on, I will drop the notation $\pi^p(y_1, y_2)$ in proofs and will use π^p for simplicity.

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

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

Task allocation for salaried workers will be the same as in the case of corporation, as it is profit maximizing. I know 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

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

   For the values of y_1 and y_2 considered in this scenario,it is immediate to see that $[F(y_2) - F(y_1)]x > \int_{y_1}^{y_2} \beta y f(y)dy$, hence all partners will agree upon allocating 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

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

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

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

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

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

Since y_1 and y_2 lie between y^* and $\hat{y}$, these partners are more productive when assigned to task A: $[F(y_2) - F(y_1)]x < \int_{y_1}^{y_2} \beta y f(y)dy$, so that partners will agree upon allocating 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

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

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. I prove this lemma by first deriving the optimal partnership contracts. From now on I will simplify notation by letting $\pi^p(y_1, y_2) = \pi^p$. I will solve the employer's problem in a general framework, namely by denoting w_c the wage prospective partners would get as salaried employees in a corporation, and 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-a-vis with a prospective partner, the firm's 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 to the WTP-constraints and μ that associated to 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, on the other hand, the interim participation constraint may not bind as the shadow cost of providing equity is zero as the quantity of equity is priced. Let us now consider the case in which the interim participation constraint binds, then 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

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

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

Proof of Theorem 2

Proof. I prove this theorem by considering three regions of talent values to describe how does the firm's owner decide the measure of Y^p and by making use of the results obtained in Lemmas 2 and 3. Recall that I focus on 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 firm's owner offers partnership contracts $\{\phi^*, s^*\} = \{0, \frac{\theta_B x}{\pi^p}\}$. Hence, the firm's owner chooses the measure of Y^p in order to maximize her 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 gets immediately that $\pi^p = \pi$, which is independent of the measure of the bounds of Y^p and shows that the firm's owner is indifferent between organizing the firm as a partnership or as a corporation, and thus on whom 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 firm's owner offers partnership contracts $\{\phi^*, s^*\} = \{0, \frac{\theta_A \beta y}{\pi^p}\}$. Hence, when deciding whom should become partner, the firm's owner maximizes

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

   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 firm's owner is indifferent between organizing the firm as a partnership or as a corporation, and thus on whom 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 firm's owner offers partnership contracts

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

Hence, when deciding whom should become partner, the firm's 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

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

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

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

and

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

Hence, the firm's owner's payoff is increasing with y_2 and decreasing in y_1. Since the objective function is linear, the firm's 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 firm's owner's maximization program when designing partnership contracts is

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

subject to:

$$\phi \leq s\beta y,$$

$$s\beta y \geq \theta\beta y.$$

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

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

The Kuhn-Tucker conditions for this maximization program yield:

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

and

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

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

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

whereas, by organizing the firm as a corporation, she earns x. Hence, the firm's owner prefers the partnership organizational form over the corporation one, if

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

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 firm's owner's maximization program when designing partnership contracts is

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

subject to:

$$\phi \leq \omega,$$

$$s\beta y \geq \theta\beta y.$$

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

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

The Kuhn-Tucker conditions for this maximization program yield:

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

and

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

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

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

whereas, by organizing the firm as a corporation, she earns x. Hence, the firm's owner prefers the partnership organizational form over the corporation one, if

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

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

Proof of Proposition 5

Proof. I prove this proposition in two steps:

(i) First, I show that the two firms have different promotion threshold. The efficient thresholds for firm 1 and firm 2 are respectively $y_1^* = \frac{x}{\beta_1}$ and $y_2^* = \frac{x}{\beta_2}$. The profit maximizing thresholds, instead, are $\hat{y_1} = \frac{x}{(\beta_1 - \theta\beta_2)}$ and $\hat{y_2} = \frac{x}{(\beta_2 - \theta\beta_1)}$.

It is immediate to see that $y_1^* > y_2^*$ and that $\hat{y_1} > \hat{y_2}$, but in order to prove the claim 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

$$\left(\frac{\beta_2}{\beta_1}\right)^2 > \frac{\beta_1 - \theta\beta_2}{\beta_2 - \theta\beta_1}. \tag{27}$$

Since $\beta_2 > \beta_1$, the left-hand side of (27) is larger than 1, whereas the right-hand side is smaller than 1, so the inequality is certainly met. This proves the claim that firm 2 allocates tasks relatively more efficiently than firm 1.

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

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

subject to the WTP-constraint

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

and the interim participation constraint

$$s\pi^p \geq \theta\beta_2 y.$$

Since $\pi^p = \beta_1 y$ and the two constraints bind in equilibrium, the optimal partnership contract is $\{\phi^*, s^*\} = \left\{\theta\beta_2 y,\ \frac{\theta\beta_2}{\beta_1}\right\}$.

The optimal share s^* to insure the partnership's stability, is feasible (i.e., $s^* < 1$) if $\theta < \frac{\beta_2}{\beta_1}$ and is not otherwise. Hence, when firms are heterogeneous, the less productive ones can afford being organized as partnerships, only if the portability rate of the human capital acquired on task A is not too large, otherwise, they should pledge more than the whole profit generated to retain the partner at the interim stage. ■