

The Optimal Size, Financing and Personal Liability of Professional Partnerships*

Shiqi Chen

Lancaster University Management School

Bart M. Lambrecht

Cambridge Judge Business School and CEPR

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Abstract

We show that equity capital is a professional partnership's preferred source of financing. Capital-constrained partners determine the partnership's size and financing by trading off the cost from recruiting equity partners who dilute average profits against the expected liquidation and bankruptcy costs from issuing debt. Weakly capital-constrained partners register as a General Partnership with debt secured by partners' personal assets. Severely capital-constrained partners register as a Limited Liability Partnership with risky debt. The optimal partner mix equalizes marginal productivity per share between senior and junior equity partners. A two-tier partnership structure with salaried "partners" levers up equity partners' value per share.

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1 Introduction

Partnerships predate corporations by millennia. They remained the dominant business form in Europe until the nineteenth century, when corporate forms became more widely available. Professional partnerships, which are the focus of this paper, are common in knowledge-intensive professional service sectors such as law, accounting, advertising, management consulting, medicine and architecture (Von Nordenflycht (2010)). They are cornerstones of the health care system, legal system and professional-services economy.¹ Lack of publicly available data means that we know relatively little about the size, financing, liability and investment decisions of professional partnerships.

According to the US 1994 Revised Uniform Partnership Act a partnership is “an association between two or more persons to carry on as co-owners a business for profit”. The key feature that distinguishes partnerships from other business structures is the sharing of profits, losses, liabilities and management duties, i.e. partnerships involve joint ownership and joint management of the business. There is no separation between ownership and control. There is neither outside ownership in professional partnerships (Von Nordenflycht (2010)).² Profits and losses are “passed through” to the individual partners who report this income on their personal tax returns. The firm does not pay

¹The top 100 U.S. law firms by revenue (according to the 2025 Am Law 100 ranking) collectively generated approximately \$160 billion in gross revenue in 2024. Nearly all (> 95%) are structured as partnerships (mostly Limited Liability Partnerships (LLPs) with a few General Partnerships (GPs)). The top three US strategy consulting firms (McKinsey, BCG, Bain) jointly generated about \$35 billion in revenue in 2023 (The Economist, 5 October 2023). The top 25 UK law firms collectively generate more than £33 billion in annual revenue (2023/24), while the UK’s Big Four accounting partnerships alone report a combined fee income exceeding £18 billion (sources: The Lawyer UK 200 Financials 2024; FRC Transparency Reports 2024). The total revenue in 2024 for General Medical Practices in the UK is £16.6bn (£14.5bn is from national health service, £1.4bn is from private practices)(Stalker (2025)).

²Model Rule 5.4(d) of the American Bar Association (ABA) Model Rules of Professional Conduct, for instance, restricts lawyers from practicing in for-profit entities if nonlawyers own interests, act as corporate directors/officers, or control professional judgment. It aims to protect a lawyer’s independence, and ensure service quality. Dow and Lapuerta (2005) argue that restricting the type of ownership structure is a blunt instrument for ensuring service quality and that the appropriate level of intervention involves direct regulation of conduct rather than prohibiting particular ownership structures.

taxes on its profits nor does it pay social insurance taxes on its partners. Income from equity as well as income from debt are taxed only at the personal level. In contrast, equity income from corporations is subject to both corporation and personal tax, whereas interest from corporate debt is taxed at the personal level only, giving corporate debt a taxshield advantage relative to corporate equity.

Corporate shareholders feature only on the equity side of the balance sheet. As residual claimants, they maximize total shareholder value and focus on total profits. Therefore, corporations hire employees up to the point where the employees' marginal revenue product equals their wage rate. In professional partnerships, by contrast, partners affect both sides of the balance sheet: they are both equityholders and providers of the firm's key productive asset -their human capital. Because partners are compensated through a share of profits, they focus on average profits per partner rather than on total profits (see Online Appendix B for anecdotal evidence). Consequently, partnerships are reluctant to admit partners who would dilute average profits, as illustrated by the following quote from the Financial Times:³

Senior PwC staff in the UK who will never be partners are to be offered a new “managing director” title as the Big Four firm seeks to keep top employees whom it is unwilling to admit to its £1mn-a-year partnership... The move underlines how the Big Four accounting firms are trying to balance the expansion of their workforces with protecting the profit pool that is shared between partners. Bosses have been under pressure in recent years to keep average partner pay near £1mn. (Foy (2024))

“Managing directors”, “associates”, and so-called “salaried partners” feature in two-tier

³For example, two partners who jointly generate £2 million in profits (split equally) may be unwilling to admit a third equity partner who contributes £700,000, as this would dilute profits to £900,000 per partner. They may, however, retain that person as an associate on a salary of, say, £300,000, sharing the remaining surplus of £400,000 between themselves.

partnerships, which comprise both equity partners and non-equity “partners”. In recent decades the two-tier structure has been widely adopted among law firms, as noted by Ring and Wiggins (*Financial Times*, 23 June 2025):

In all, 87 of the 100 largest law firms now have salaried partners ... It was “a leverage play in terms of the economics, how much money you can make off your people”, a partner at a global top-10 firm said. “There’s a tier of hundreds of lawyers who are not eating into the profits of the equity partners in fact they’re adding to the profits.”... A partner compensation survey of America’s top 200 firms... in 2024 found that equity partners took home more than three times the pay of salaried partners.

We derive the optimal financing, size (i.e. number of senior and junior partners), personal liability and investment policy of a new partnership within a complete information setting with taxes, capital constraints, liquidation costs and bankruptcy costs as key frictions. Partners are capital constrained and subject to personal taxes. Due to liquidation costs only a fraction of the value of the partnership’s assets and the partners’ personal assets can be recovered when sold. Upon closure a solvent partnership only incurs liquidation costs, whereas an insolvent partnership incurs both liquidation costs and bankruptcy costs.

This paper focuses on the two main forms of partnership: General Partnership (GP) and Limited Liability Partnership (LLP).⁴ Partners in a GP have “unlimited liability”. Although creditors first have to exhaust the partnership’s assets, they can claim the partners’ personal assets (such as a private residence) to cover any shortfalls.⁵ GPs have a

⁴Hansmann and Kraakman (2000, p427) note: “In the late nineteenth century, a variety of intermediate forms of defensive asset partitioning were in common use. Today these intermediate forms have largely fallen into disuse, leaving only the two extreme rules -full limited liability on the one hand, and unlimited joint and several personal liability on the other hand.”

⁵General partners can shield some of their personal assets from creditors by a transfer of title to

long tradition, whereas LLPs were recently established (in 1996 and 2000 for, respectively, the US and the UK). In an LLP, partners' liabilities are limited to the amount they put into the business. LLPs are common in large law and accounting firms.⁶

We explore the following research questions. What is the optimal number of senior and junior equity partners (i.e. the partnership "size")? What is the optimal mix of equity partners and associates? Why do partnerships employ non-equity salaried "partners"? What is the optimal capital structure and how does it interact with partnership size? Should partners provide any personal guarantees and, if so, for what amount? When should partners waive all personal liability by registering as an LLP? Do the optimal capital structures of a GP and LLP differ? Given that LLPs are not subject to corporate taxes and enjoy limited liability, why is this business structure not more prevalent outside the professional services industry?

Consider, for example, a medical partnership. By forming a partnership physicians can share fixed costs and inputs (office space, equipment, staff), investment expenditures (marketing and infrastructure) and enjoy economies of scale (see Pope and Burge (1996)). A partnership can also provide a more comprehensive and timely (e.g. during weekends) health care service than a single physician.^{7,8}

What is the partnership's optimal capital structure? Equity capital is the preferred choice of financing since debt entails expected liquidation or bankruptcy costs but does not convey a superior taxshield relative to equity in the absence of corporate taxes.

a family member or trust before the partnership is set up, and therefore have some control over their exposure. Most of the large professional partnerships have converted from a GP to an LLP since the start of the century. Examples of large General Partnerships include the international law firm Slaughter and May, and the corporate law firm Wachtell, Lipton, Rosen & Katz. Baker and Krawiec (2005) find that size is a significant factor in explaining the organizational form.

⁶In 2024, 20 out of 25 top UK law firms by revenue operated as LLPs (TheCityUK, 2024).

⁷Risk averse agents' desire to spread risk is another reason to form partnerships (see Gaynor and Gertler (1995), Holmes and Zimmer (1998)). Agents are risk neutral in our model.

⁸Holmes and Zimmer (1998) argue there are economies of scale in accounting partnerships, such as marketing and recruitment economies, sharing specialised central technical support teams, and synergies in terms of cross-referrals and knowledge sharing.

Borrowing may, however, take place if partners are capital-constrained (e.g. they recently finished medical school). We show that the firm's optimal size, capital structure, and personal liability depend on partners' personal wealth constraints. There is a pecking order in partnership financing.

(i) If partners have sufficiently deep pockets to fund the investment, the “first-best” partnership size is determined by operational considerations alone (i.e. the effect of size on revenues, costs, and profits per share), and not by financing aspects. Equity can be complemented by safe debt that is fully secured by the firm's assets. Since no personal assets are required to secure financing, it does not matter whether the firm registers as a GP or an LLP.

(ii) If partners are weakly capital-constrained and the first-best number of partners are unable to put up enough equity capital or issue enough debt backed by the firm's assets, then they raise, in the first instance, more equity: one (possibly on a fractional basis) or more additional partners are admitted to loosen the capital constraint. Next, when the marginal cost from recruiting more partners (in terms of diluting revenues per share) exceed the expected marginal cost of liquidation associated with debt, partners take out loans that are backed by their personal assets (e.g. house, land, car) as collateral. When the personal collateral is exhausted, more equity partners can be recruited whose personal assets serve as collateral for more borrowing. Partners register as a General Partnership to pledge their personal assets as a security for creditors.

(iii) We show that there is a critical capital contribution level per partner below which the firm becomes “severely” capital constrained and for which unsecured, risky debt is optimal. Upon future closure the partnership will therefore be insolvent and incur bankruptcy costs. Although the partnership recruits more equity partners than is first-best, any further tightening of the financing constraint is entirely absorbed by taking on more unsecured debt without affecting the partnership size. In order to minimize

the deadweight bankruptcy and liquidation costs, partnerships with risky debt do not provide personal guarantees. Therefore, risky debt financing always coincides with zero personal liability, which partners achieve by registering as an LLP. The critical capital contribution level below which risky debt is optimal decreases with bankruptcy costs. Higher bankruptcy costs make risky debt costlier and less attractive.

We also study two-tier partnerships and compare them with full-equity partnerships with senior and junior equity partners. Replacing junior equity partners by associates mitigates equity dilution and boosts equity partners' value per share, which might explain the rising popularity of two-tier partnerships (Ring and Wiggins (2025)).

Next, we study the firm's investment policy. The firm has senior and junior partners who can either join the firm or earn their respective outside reservation wage. We determine the lowest breakeven output price above which both the junior and senior partners' participation constraints are satisfied.

Previously, we mentioned two possible sources of economic inefficiency with respect to the optimal number of partners. First, partners optimize value per share rather than total value. This creates an incentive to keep partnerships inefficiently small. Second, financing frictions force partnerships to increase size. We show that the first source of inefficiency no longer applies for partners' breakeven investment policy. Whether one maximizes value per share or total value, the breakeven output price is the same because downward output price pressure increases the partnership's optimal size and forces its size (and debt level) to be the same under both optimization criteria. Therefore, partners' "first-best" (i.e. unconstrained) breakeven investment policy coincides with the total value-optimizing investment policy, and the corresponding partnership sizes are the same under both policies. Inefficiencies that are due to financing frictions remain, however, under the breakeven investment policy. A tightening capital constraint raises partners'

investment threshold, leading to under-investment. Partners' personal guarantees increase debt capacity, loosen the financing constraint and mitigate the under-investment problem. The under-investment problem is largest for severely capital constrained partnerships with high expected bankruptcy costs because far too many equity partners are recruited to meet the financing constraint. This may explain why capital-intensive firms do not register as partnerships but adopt a business structure (such as corporation) that provides access to outside equity financing.

Section 7.2 extends the model to include the effort exerted by partners. In line with existing models (e.g. McGinty (2014), Galashin and Popov (2016)) we find that a larger partnership size reduces partners' individual effort due to the free-rider problem. Our results regarding the firm's financing, investment and optimal liability remain in essence the same. We also extend the model to study the role of senior partners' reputation (Section 7.3) and fixed bankruptcy costs (Section 7.4) on firm policies and discuss how senior and junior partners' ownership shares can be endogenized (Section 7.4).

Our model endogenizes three key aspects of professional partnerships: (1) its capital structure, (2) its size (i.e. the number of senior partners and junior partners/associates), and (3) partners' personal liability. As such the paper contributes to several literatures. First, existing papers assume that professional partnerships are all-equity financed, and that partners are hired exclusively for their contribution to output (and not as a source of equity financing or collateral). One exception is (Wilson (2012)), in which debt acts as a signalling device for the partnership's unobservable quality. A large literature in corporate finance studies related aspects such as borrowing constraints and the role of collateral for corporate capital structure and investment (e.g. Morellec (2001), Albuquerque and Hopenhayn (2004), Rampini and Viswanathan (2010, 2013)), and Donaldson, Gromb and Piacentino (2025), among others). In these studies equityholders have limited liability and financing constraints are alleviated by the firm's assets (but not personal assets) serving

as collateral. Other papers examine the role of inalienable human capital for corporate policies (Jaggia and Thakor (1994), Hart and Moore (1994), Berk, Stanton, and Zechner (2010), Lambrecht and Pawlina (2013), Bolton, Wang and Yang (2019) among others). A partnership's inability to trade its future rents limits its debt capacity.

Second, the literature on partnership size and team decision-making does not distinguish between senior and junior partners (or associates), and treats all-equity financing and liability structure as exogenous. Existing models show that partnerships tend to be inefficiently small or underinvest in quality or effort. Maximizing profits per partner (as under profit sharing) leads to a smaller optimal size than maximizing total profits (Ward (1958)). Holmstrom (1982) highlights the free-rider problem inherent in partnerships. Subsequent work shows that this inefficiency may be mitigated by peer pressure (Kandel and Lazear (1992)), improved risk-sharing (Huddart and Liang (2003, 2005)) or technological complementarities in team production (Kaya and Vereshchagina (2014)).

In Levin and Tadelis (2005) both partnerships and corporations are tempted to reduce imperfectly observed quality and suboptimally hire low ability workers, leading to an increase in the labor force that moves corporations further away and partnerships closer to the efficient outcome. Farrell and Scotchmer (1988) show that partnerships may differ in size depending on the distribution of partners' ability. In our model partners are homogenous, and dilution arises from decreasing returns to scale in the partnership's output function rather than from the admission of lower-ability partners.

Third, a few papers study the role of company owners' personal liability. The emphasis is on how liability affects risk taking (Jensen and Meckling (1976)), service quality (Dye (1993)), effort towards risk prevention (Biais et al. (2010)) or externalities imposed on society such as tort damages (Feess and Hege (1998), Hou (2023)). We identify the partnership's optimal degree of personal liability in conjunction with size and capital

structure. Winton (1993) models the optimal choice of liability and ownership structure. When liquidating wealth is costly, contingent liability dominates direct investment as a wealth commitment device but could lead to an adverse selection problem where only poor investors hold shares. Liquidation costs in our model imply that partners prefer to pledge personal illiquid assets as collateral for debt financing rather than liquidate those assets to generate cash.⁹

2 Model Setup and Assumptions

Consider the formation of a new partnership (e.g. a medical practice), which requires a lump sum investment K (e.g. for medical equipment, infrastructure, advertising). The partnership decides on the optimal number of senior partners, n_1 , and junior partners, n_2 , in the firm. Senior and junior partners are risk neutral and each receive φ_1 and φ_2 shares, respectively (with $\varphi_1 \geq \varphi_2$). Hence, the total number of shares is given by $N \equiv \varphi_1 n_1 + \varphi_2 n_2$.¹⁰ Each partner is endowed with an amount of capital c per share which is entirely contributed towards the investment.¹¹ The partnership decides how much debt D to take on. The financing constraint requires that the partners' capital contribution plus the debt must cover at least the investment cost K , i.e. $Nc + D \geq K$. If D is negative, then the partnership has a net cash position.

The defining feature of a partnership is the sharing of profits among equity partners

⁹Our model abstracts from several important aspects of partnerships that are covered elsewhere in the literature such as monitoring and asymmetric information (e.g. Kandel and Lazear (1992), Levin and Tadelis (2005), Liang, Rajan and Ray (2008), Ramos and Sadzik (2019)), partners' reputation (Morrison and Wilhelm (2004)), risk-sharing and co-insurance (Borch (1962), Wilson (1968), Gilson and Mnookin (1985), Huddart and Liang (2003, 2005)), partnership dissolution mechanisms (McAfee (1992), Li and Wolfstetter (2010), Loertscher and Wasser (2019)) and dynamic group decision-making with heterogeneous members (Garlappi, Giammarino and Lazrak (2017, 2022), Chen and Lambrecht (2025)).

¹⁰ φ_1 and φ_2 are exogenous. We discuss in Section 7.4 how they can be endogenized. For a partnership model that endogenizes the ownership structure we refer to Loertscher and Wasser (2019).

¹¹We verify in Section 7.4 that it is optimal for partners to contribute their entire capital endowment, assuming that savings within the firm earn the same rate of interest as personal savings.

(legally, a partnership does not exist if partners do not share profits). The partnership's profits after taxes are given by:¹²

$$\pi = (pL(n_1, n_2) - f - \rho D) T_p \quad \text{where } T_p \equiv (1 - \tau_p) \quad (1)$$

τ_p denotes the personal tax rate. Partnerships are taxed at the personal level only (and, unlike corporations, not at the firm level). $L(n_1, n_2)$ denotes a strictly concave production function ($L_{11} < 0$ and $L_{11}L_{22} > (L_{12})^2$). Concavity ensures there is an interior optimal partnership size. We also assume a positive cross-derivative between the two input factors (i.e. $L_{12} > 0$), which is the case for all standard production functions (such as the Cobb-Douglas, Leontief, and CES more generally).^{13,14}

Each medical treatment or consultation represents a particular number of care units. The output $L(n_1, n_2)$ is the total number of care units delivered by the partnership.¹⁵ p denotes the price per care unit as set by the government or insurer under a fee-for-service system.¹⁶ f is the fixed cost of production (e.g. heating, the cost of employing a receptionist or nurse). ρD is the interest flow on the debt principal D . ρ equals (exceeds) $r/(1 - \tau_p)$ if the debt is safe (risky), where r denotes the risk-free rate of interest.

The upfront investment K , and decisions regarding the optimal partnership sizes n_1^* and n_2^* , and the optimal debt level D^* are made under uncertainty: the investment can

¹²In Internet Appendix C.1.2 we introduce partner effort into the model and compare different contractual arrangements for partners.

¹³A positive cross-derivative could, for example, reflect the mentoring effect of senior on junior partners.

¹⁴Online Appendix D presents an analytical model solution for a Cobb-Douglas production function $L(n_1, n_2) = n_1^{\theta_1} n_2^{\theta_2}$. If senior and junior partners are substitutes (e.g. they perform the same tasks), then our model collapses to the special case of a production function with one input factor (i.e. $L(n_1, n_2) = L(n_1 + n_2) = L(n)$) since only the total number of partners, n , matters.

¹⁵More generally, total output not only depends on the number of partners but also on the effort they exert. We assume here that effort is exogenous (e.g. one unit per partner). We endogenize partners' effort in Section 7.2 and show that a larger partnership size exacerbates the free-rider problem, hereby decreasing the returns from scaling up.

¹⁶For countries with a capitation system (e.g. UK), $L(n_1, n_2)$ denotes the number of patients registered with the practice, and p the average fee per patient. We discuss in Section 7.3 how service fees can be linked to partners' reputation.

be a success with probability q ($0 < q \leq 1$) or a failure with probability $1 - q$. If the investment is a failure then the partnership is closed down immediately. If the investment is successful then the firm generates the above profit flow π until the partnership is dissolved. Termination happens according to a Poisson arrival process with arrival rate λ . The firm's expected life-time is therefore $1/\lambda$. Termination may be triggered by an adverse shock that makes the business no longer viable or because the partnership project reaches a natural end. The parameters q and λ capture uncertainty regarding the partnership's profit level and life expectancy, respectively. A simple two-date model fails to capture the effects of uncertainty about the life expectancy (see Section 6, item 6).

The firm can register as a General Partnership (GP) or as a Limited Liability Partnership (LLP). Although there is no set maximum for General Partners' "unlimited" liability, in practice the partners' liability is limited by their personal assets as partners can invoke personal bankruptcy if they lack sufficient personal assets to cover creditors' claims. Each partner is endowed with an amount A of personal assets per share. Hence, each senior (junior) partner owns a total amount of assets (such as the family home, land...) equal to $\varphi_1 A$ ($\varphi_2 A$). The partners can choose to register an amount a ($\leq A$) of these assets per share in their personal name. Partners can shield the remaining assets ($A - a$) from the GP's creditors by a transfer of title to a family member or trust prior to setting up the partnership. Partners can eliminate all liability (i.e. $a = 0$) by registering as an LLP. As such partners' personal liability exposure (a) is a decision variable and determines the type of partnership that is adopted, i.e. GP ($a > 0$) or LLP ($a = 0$).¹⁷

The partnership is financed by a combination of equity and debt. The debt is issued when the firm is set up at time $t=0$, an instant before the uncertainty regarding the

¹⁷In principle LLPs could pledge personal assets as collateral to the partnership's creditors, blurring the distinction between a GP and an LLP. However, while the liability of the partners in an LLP is limited to the assets they pledged, the GP's creditors can claim all assets owned by the General Partners. To maintain a clear distinction between a GP and LLP, we define LLPs as having zero personal liability.

success of the investment is resolved. Conditional on the investment being successful, the continuation value of the partnership's equity, debt and total firm value for $t > 0$ are:

$$E(D, n_1, n_2, a) = \frac{(pL(n_1, n_2) - f - \rho D) T_p + \lambda \underline{E}(D, n_1, n_2, a)}{r + \lambda} \quad (2)$$

$$B(D, n_1, n_2, a) = \frac{\rho D T_p + \lambda \underline{B}(D, n_1, n_2, a)}{r + \lambda} \quad (3)$$

$$W(D, n_1, n_2, a) = E(D, n_1, n_2, a) + B(D, n_1, n_2, a) = \frac{(pL(n_1, n_2) - f) T_p + \lambda \underline{W}(D, n_1, n_2, a)}{r + \lambda} \quad (4)$$

The equity value equals the present value of all future profits after interest and taxes up to closure, plus the residual terminal value $\underline{E}(D, n_1, n_2, a)$ paid out to (or, if negative, payable by) the partners at closure. The debt value equals the present value of all after-tax interest repayments plus the lender's claim $\underline{B}(D, n_1, n_2, a)$ at closure. $\lambda/(r + \lambda)$ is a discount factor equal to the present value of receiving a dollar at termination. The total firm value equals the present value of all operating cashflows plus the firm value $\underline{W}(D, n_1, n_2, a)$ at closure.

The firm value described by Equation (4) does not include a debt taxshield because income from debt and income from equity are each taxed at the personal level only (unlike corporations where equity income is also subject to corporation tax).¹⁸ Hence, debt does not convey an interest taxshield advantage at the firm level.¹⁹ We will show that debt mitigates equity dilution and that capital-constrained partners may use debt as part of the financing mix.²⁰

The value of the partnership's debt at $t = 0$, B_0 , is given by: $B_0(D, n_1, n_2, a) = (1-q)\underline{B}(D, n_1, n_2, a) + qB(D, n_1, n_2, a)$. Assuming the debt is issued at par (i.e. $B_0 = D$),

¹⁸The usual interest taxshield term $(\rho D \tau_c)$ that applies to corporations is missing in Equation (4) because partnerships are not subject to corporation tax ($\tau_c = 0$).

¹⁹We assume that income from debt and income from equity are taxed at the same personal tax rate, and ignore taxshield effects that arise from the difference in these rates.

²⁰We include personal taxes in our model because partnerships operate under pass-through taxation. We show that personal taxes influence partners' optimal policies and effort, albeit not as a first-order determinant (see Sections 6 and 7.2).

the contractual interest rate on the debt is given by:

$$\rho = \frac{1}{qT_p} \left[r + \lambda - \frac{B}{D} ((1-q)(r + \lambda) + q\lambda) \right] \quad (5)$$

In the absence of insolvency (i.e. $\underline{B} = D$), the debt becomes risk-free and the loan interest rate simplifies to $\rho = r/T_p$.

The total value of the partnership (i.e. its equity plus debt) at time $t = 0$ is given by: $W_0(D, n_1, n_2, a) = qW(D, n_1, n_2, a) + (1-q)\underline{W}(D, n_1, n_2, a)$. Since partners not only own the firm but also generate the firm's output, $L(n_1, n_2)$, this generates a direct link between the equity ownership and the operating cash flows. Whereas shareholders in a corporation can buy or sell shares without affecting the firm's operating cash flows, this is not possible within professional partnerships. Therefore, partners will not wish to recruit an equity partner who dilutes existing partners' claims. The net value per share from investment at $t = 0$ is:

$$\begin{aligned} V(D, n_1, n_2, a) &= \frac{W_0(D, n_1, n_2, a) - K}{N} = \left(\frac{qT_p}{r + \lambda} \right) \frac{pL(n_1, n_2) - F(D, n_1, n_2, a)}{N} \quad (6) \\ F(D, n_1, n_2, a) &= \frac{(K - D)(r + \lambda) + qT_p(f + \rho D) - \underline{E}(D, n_1, n_2, a)((1-q)(r + \lambda) + q\lambda)}{qT_p} \quad (7) \end{aligned}$$

The net value per share is the expected present value of the after-tax cash-flows to the partners divided by the number of shares in the partnership. $F(D, n_1, n_2, a)$ is the net annuitized fixed cost from running the partnership and is determined by equityholders' initial investment cash outlay, $K - D$, the after-tax fixed cost from operations and interest on debt, $(f + \rho D)T_p$, and equityholders' expected payoff upon closure, $\underline{E}(D, n_1, n_2, a)$.

The values accruing from the investment to each senior and each junior partner are, respectively, $\varphi_1 V(D, n_1, n_2, a)$ and $\varphi_2 V(D, n_1, n_2, a)$. For partners to join the firm at inception ($t = 0$), these values must exceed what they can earn outside the partnership.

Let senior and junior partners' after-tax outside wage rate be given, respectively, by $w_1 T_p$ and $w_2 T_p$. Tax law does not allow equity partners to receive a salary as they are not employees (we discuss salaried “partners” and two-tier partnerships in Section 5). Instead, equity partners get a share of the profits. The expected present value of the outside wages that senior and junior partners' forgo during the partnership's life-time is then $qw_1 T_p/(r+\lambda)$ and $qw_2 T_p/(r+\lambda)$. Partners forgo their after-tax reservation wage only with probability q , as with probability $1-q$ the firm fails and is closed down immediately, in which case partners leave the firm and earn their reservation wage.

Senior and junior partners maximize the value from joining the partnership ($\varphi_1 V$ and $\varphi_2 V$, respectively). Since φ_1 and φ_2 are exogenously fixed, partners maximize the net value per share, V , subject to the financing and participation constraints:

$$\max_{\{D, n_1, n_2, a\}} V(D, n_1, n_2, a) \quad \text{subject to} \quad (8)$$

$$(\varphi_1 n_1 + \varphi_2 n_2)c + D \geq K \quad (\text{financing constraint}) \quad (9)$$

$$V(D, n_1, n_2, a) \geq \frac{qT_p}{r+\lambda} \max \left[\frac{w_1}{\varphi_1}, \frac{w_2}{\varphi_2} \right] \quad (\text{participation constraints}) \quad (10)$$

The participation constraints impose a lower bound on V and determine a breakeven investment threshold $\bar{p}$ for the output price p . Investment by the partners at $t = 0$ only takes place if $p \geq \bar{p}$. The number of equity partners (n_1 and n_2) determines not only the amount of equity financing but also the firm's output ($L(n_1, n_2)$) creating a link between the partnership's financing and production decision.

The model setup is summarized in Figure 1. The figure illustrates the partnership's key decisions at inception, i.e. whether or not to invest K , how many partners join (n_1, n_2), how much to borrow (D), and how many personal assets to pledge (a).

To solve the model we now specify partners' and creditors' payoffs at closure.

1) At termination the partnership has no going-concern value to creditors in the absence

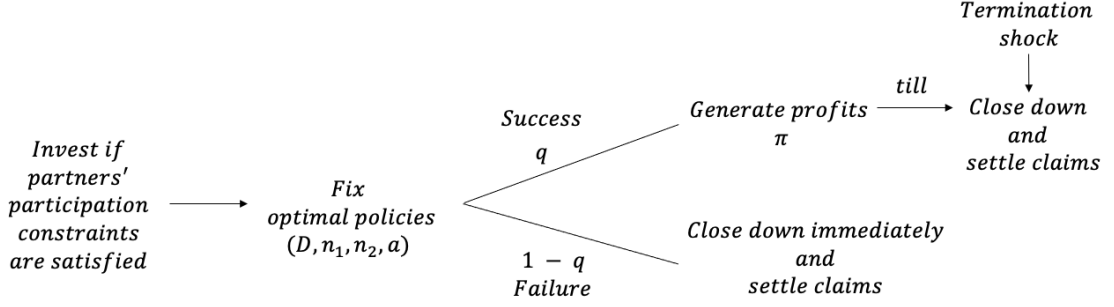


Figure 1: Model setup

of the partners and their specialist human capital.

2) The liquidation values for the partnership's assets and the partners' personal assets are given by αK and γNa (with $0 \leq \alpha, \gamma \leq 1$), respectively. α and γ denote the recovery rate for the partnership's assets and personal assets, respectively. The proportional liquidation costs, $1 - \alpha$, result from the fact that tangible assets (such as equipment) are sold at a discount and some investment expenditure (such as marketing and refurbishment costs) cannot be recouped. Similarly, personal assets (such as real estate or cars) may be discounted in a forced sale and transaction costs may be incurred.

3) If the partnership is insolvent at closure then it also incurs bankruptcy costs (such as legal and administrative costs, court fees, fines, possible loss of practising certificate or license, and reputational costs), which equal a fraction ϕ ($0 \leq \phi \leq 1$) of the net liquidation value of the partnership's assets and the partners' personal assets, i.e. $\phi(\alpha K + \gamma Na)$.²¹

We introduce an indicator function I which equals 0 or 1 if the partnership is, respectively, solvent or insolvent at closure. The partnership is solvent ($I = 0$) if the firm's liquidation value, αK , plus the liquidation value of the partners' personal assets, γNa , exceed the debt liability D . The partnership is insolvent otherwise (i.e. $I = 1$ if $D > \alpha K + \gamma Na$). Upon closure, the value of the partnership's debt, equity and its

²¹Section 7.4 and Online Appendix C.3 cover the case of fixed bankruptcy costs.

total value (all of which are functions of the control variables D , n_1 , n_2 , and a) are:

$$\underline{B}(D, n_1, n_2, a) = D(1 - I) + (1 - \phi)(\alpha K + \gamma N a) I \quad (11)$$

$$\underline{E}(D, n_1, n_2, a) = \begin{cases} \alpha K - D & \text{if } D \leq \alpha K \\ \frac{\alpha K - D}{\gamma}(1 - I) - NaI & \text{if } D > \alpha K \end{cases} \quad (12)$$

$$\underline{W}(D, n_1, n_2, a) = \begin{cases} \alpha K & \text{if } D \leq \alpha K \\ \alpha K - \frac{1-\gamma}{\gamma}(D - \alpha K) & \text{if } \alpha K < D \leq \alpha K + \gamma Na \\ (1 - \phi)(\alpha K + \gamma Na) - Na & \text{if } \alpha K + \gamma Na < D \end{cases} \quad (13)$$

The specification defines three regions, depending on the value for D . For $D \leq \alpha K$, the partnership is solvent and only incurs liquidation costs $(1 - \alpha)K$ on the partnership's assets. For $\alpha K < D \leq \alpha K + \gamma Na$, the partnership is solvent, but closure involves costs from liquidating both the partnership's assets and some of the partners' personal assets. For $\alpha K + \gamma Na < D$, the partnership is insolvent, and closure involves liquidation and bankruptcy costs on the partnership's assets and the partners' personal assets.

If, upon closure, the debt liability exceeds the liquidation value of the partnership ($D > \alpha K$) then partners are liable with their personal assets for the shortfall, causing partners' equity stake in the partnership to have negative value. If the partnership is insolvent ($I = 1$) then the partnership becomes a net liability up to the total of the partners' personal guarantees Na , i.e. $\underline{E}(D, n_1, n_2, a) = -Na$. The intermediate region where debt is kept safe thanks to partners' personal assets does not arise for corporations because shareholders' assets are out of lenders' reach. The width of this new region is determined endogenously by the size a of the partnership's liability. This intermediate region vanishes when $a = 0$, which is the case for an LLP.

We solve partners' optimization problem (8) - (10) in several stages. We first derive

the optimal policies for D, n_1, n_2 and a assuming that the financing constraint (9) and participation constraints (10) do not strictly bind (which is the case if $c \geq c_h$ and $p \geq \bar{p}$, where c_h and $\bar{p}$ remain to be determined). Next, we solve the problem assuming the financing constraint strictly binds (i.e. $c < c_h$). Finally, in Section 4 we examine whether the partners invest in the first place by deriving the lowest output price $\bar{p}$ for which the senior and junior partners' participation constraints are both satisfied.

3 Optimal Partnership Size, Financing and Liability

3.1 Optimal financing and size without capital constraints

Proposition 1 *If partners are not capital-constrained (i.e. $c \in \Psi_u \equiv [c_h, \infty)$) then the number of senior (n_{1u}) and junior (n_{2u}) partners that maximize partners' net value per share are the solution to the two first-order conditions in (14):*

$$\frac{pL_i}{\varphi_i} = \frac{pL(n_{1u}, n_{2u}) - G_u}{N_u} \geq w_i \text{ for } i = 1, 2 \quad (14)$$

$$\text{where } G_u \equiv F(D_u, n_{1u}, n_{2u}, a) = \frac{qfT_p + K(r + \lambda) - \alpha K(r + \lambda - rq)}{qT_p} \quad (15)$$

$$N_u \equiv \varphi_1 n_{1u} + \varphi_2 n_{2u} \text{ and } c_h = \frac{K(1 - \alpha)}{N_u} \quad (16)$$

The preferred source of financing is inside equity capital ($N_u c$) provided by the partners, with safe net debt D_u (backed by the firm's assets) acting as a residual financing source, i.e. $D_u = K - N_u c \leq \alpha K$. There is no need for personal guarantees.

In the absence of capital constraints (hereafter referred to as regime U) the optimal sizes n_{1u} and n_{2u} are determined by operational considerations only. Senior (junior) partners are recruited up to the point where the marginal revenues per share from adding a senior

(junior) partner equal the profits per share.²² This implies that the marginal revenues per share for senior partners equal the marginal revenues per share for junior partners.

Hereafter we call n_{1u} and n_{2u} partners' "first-best" sizes.²³ Under the first-best sizes each senior (junior) partner's profit exceeds her outside wage w_1 (w_2). Professionals working outside the partnership at this wage (e.g. physicians employed by a hospital) would benefit from joining the partnership and increase the partnership's total net present value ($NPV_0 \equiv W_0 - K$). Additional partners will, however, not be admitted as this would dilute the net value and profits for each existing partner.

Net debt is merely a residual variable to plug the gap between the investment required (K) and the first-best amount of inside equity raised ($N_u c$). For the partnership to be financially unconstrained the liquidation value of the partnership's assets (which serves as collateral for the partnership debt) plus the optimal amount of inside equity must be enough to finance the cost of investment (i.e. $\alpha K + N_u c \geq K$). Since no personal guarantees are needed, the firm value is independent of the degree of personal liability a .

3.2 Optimal financing, size and liability with capital constraints

We now consider the case where partners are unable to adopt the first-best policies because their capital endowment is inadequate (i.e. $c < c_h$). Faced with a capital constraint partners have three options to address the shortfall.

Option 1: The partnership could recruit more equity partners. However, increasing the partnership sizes above n_{1u} and n_{2u} dilutes the value per share.

Option 2: The partnership could issue more safe debt using the partners' personal assets

²² n_{1u} and n_{2u} are continuous variables. Partners can be appointed on a fractional (part-time) basis. E.g. $n_{2u} = 3.75$ corresponds to 3 full-time junior partners, and one junior partner who works 75% in the medical partnership, and 25% at her outside wage w_2 (e.g. in a hospital).

²³The "first-best" label should not be interpreted within a social welfare context. Rather it means that n_{1u} and n_{2u} are ideal from partners' viewpoint as these sizes are not distorted by a capital constraint.

(Na) as collateral. Selling these personal assets when the partnership is closed down will, however, entail liquidation costs.

Option 3: The partnership could issue under-collateralized (i.e. risky) debt, and accept the spectre of liquidation and bankruptcy costs when the partnership is closed down.

The above three financing options are not mutually exclusive. For example, the partnership could both recruit more equity partners (option 1) and issue unsecured debt (option 3).

We introduce the following notations and auxiliary functions. The NPV per share when the partnership adopts safe (S) and risky (R) debt are given by:

$$V_k = \frac{qT_p}{r + \lambda} \left[\frac{pL(n_{1k}, n_{2k}) - F(D_k, n_{1k}, n_{2k}, a_k)}{\varphi_1 n_{1k} + \varphi_2 n_{2k}} \right] \quad \text{for } k = S, R \quad (17)$$

where $F(D, n_1, n_2, a)$ is defined by Equation (7). We will show that V_S is a weakly increasing, continuous function of c and independent of ϕ , hereafter denoted as $V_S(c)$. V_R is independent of c but decreasing in the bankruptcy cost parameter ϕ , and is hereafter denoted as $V_R(\phi)$. We can now state the following proposition.

Proposition 2 *A) If the partnership is weakly capital-constrained (i.e. $c \in [C^*(\phi), c_h]$) then the optimal number of senior ($n_1^*(c)$) and junior ($n_2^*(c)$) partners are:*

$$\begin{aligned} - \text{ If } c \in \Psi_h \equiv [c_m, c_h) \quad (\text{Regime H}) : \quad n_1^*(c) = n_{1h}(c) \text{ and } n_2^*(c) = n_{2h}(c) \quad \text{where} \\ \varphi_2 L_1(n_{1h}, n_{2h}) = \varphi_1 L_2(n_{1h}, n_{2h}) \text{ and } (\varphi_1 n_{1h} + \varphi_2 n_{2h}) c = K(1 - \alpha) \end{aligned} \quad (18)$$

$$\begin{aligned} - \text{ If } c \in \Psi_m \equiv [c_l, c_m) \quad (\text{Regime M}) : \quad n_1^*(c) = n_{1m} \text{ and } n_2^*(c) = n_{2m} \text{ where} \\ \frac{pL_i(n_{1m}, n_{2m})}{\varphi_i} = \frac{pL(n_{1m}, n_{2m}) - G_m}{\varphi_1 n_{1m} + \varphi_2 n_{2m}} \quad \text{for } i=1,2 \end{aligned} \quad (19)$$

$$\begin{aligned} - \text{ If } c \in \Psi_l \equiv [0, c_l) \quad (\text{Regime L}) : \quad n_1^*(c) = n_{1l}(c) \text{ and } n_2^*(c) = n_{2l}(c) \quad \text{where} \\ \varphi_2 L_1(n_{1l}, n_{2l}) = \varphi_1 L_2(n_{1l}, n_{2l}) \text{ and } (\varphi_1 n_{1l} + \varphi_2 n_{2l})(\gamma A + c) = K(1 - \alpha) \end{aligned} \quad (20)$$

$$\text{with } c_l \equiv \frac{K(1-\alpha)}{N_m} - \gamma A \leq c_m \equiv \frac{K(1-\alpha)}{N_m} < c_h \equiv \frac{K(1-\alpha)}{N_u} \quad (21)$$

In regimes M and L, partners pledge the maximum amount of personal assets they have, i.e. $a_m(c) = a_l(c) = A$. Partners' personal assets do not matter in regime H.

B) If the partnership is severely capital-constrained (i.e. $c \in [0, C^*(\phi)]$) then the optimal number of senior (n_{1R}) and junior (n_{2R}) partners satisfy the following conditions:

$$\frac{pL_i(n_{1R}, n_{2R})}{\varphi_i} = \frac{pL(n_{1R}, n_{2R}) - G_R}{\varphi_1 n_{1R} + \varphi_2 n_{2R}} \equiv \frac{pL(n_{1R}, n_{2R}) - G_R}{N_R} \text{ for } i = 1, 2 \quad (22)$$

Partners do not take on any personal liability, i.e. $a_R = 0$. The capital contribution threshold $C^*(\phi)$ is the solution to the equation $V_S(C^*) = V_R(\phi)$, where $V_S(c)$ is a continuously increasing and differentiable function of c , while $V_R(\phi)$ is independent of c but decreasing in ϕ .²⁴ G_m and G_R are defined in Equation (47). The optimal debt level is $D^*(c) = D_j = K - c N_j$, where $N_j \equiv \varphi_1 n_{1j} + \varphi_2 n_{2j}$, for $j = u, h, m, l, R$.

The optimal policies depend on the severity of the capital constraint. If partners are weakly capital-constrained ($c \in [C^*(\phi), c_h]$), there are three possible regimes: a high-capital regime H for $c_m \leq c < c_h$, a medium-capital regime M for $c_l \leq c < c_m$, and a low-capital regime L for $0 \leq c < c_l$. The firm is severely capital-constrained if $c \leq C^*(\phi)$ (regime R).

A binding financing constraint ($c < c_h$) forces the firm to recruit more senior and junior partners than is first-best (i.e. $n_{1j}(c) > n_{1u}$ and $n_{2j}(c) > n_{2u}$ for $j \in \{h, m, l, R\}$). However, senior partners' marginal revenue per share still equal junior partners' revenues per share in all constrained regimes (i.e. $pL_1/\varphi_1 = pL_2/\varphi_2$). This ensures that neither class of partners is a drag on revenues per share and causes the number of seniors and

²⁴ $C^*(\phi)$ exists provided that $\phi < \phi_0$ where ϕ_0 is the solution to $V_R(\phi_0) = V_S(0)$. If $\phi \geq \phi_0$ then safe debt is always optimal.

juniors to move in lockstep.

In regime H (i.e. $c \in \Psi_h$) the partnership borrows the maximum amount of safe debt guaranteed by the partnership's assets, $D_h = \alpha K$, and it finances the remainder with inside equity, $c N_h(c) = K(1 - \alpha)$. The partnership size $N_h(c)$ depends on the amount of capital that partners can contribute.

As the partnership becomes even more financially constrained in regime M (i.e. $c \in \Psi_m$), the firm caps the number of senior partners at n_{1m} ($> n_{1u}$) and junior partners at n_{2m} ($> n_{2u}$) to avoid further dilution. The shortfall is met by issuing debt that is secured by the partners' personal assets (i.e. $D_m(c) = K - cN_m \in (\alpha K, \alpha K + \gamma N_m A]$). The caps n_{1m} and n_{2m} (the solution to (19)) do not vary with c because G_m is a constant.

For the low capital regime L (i.e. $c \in \Psi_l$), the partnership recruits yet more partners and simultaneously issues more safe debt that is backed by the new partners' personal assets until the investment is entirely financed (i.e. till $N_l(c + \gamma A) + \alpha K = K$).

In the severely capital-constrained regime R (i.e. $c \leq C^*(\phi)$) restricting debt to be safe would lead to excessive equity dilution. In regime R it is therefore optimal to rely on risky debt that is not secured by the partners' assets.

Finally, whether partners are “weakly” ($c \geq C^*(\phi)$) or “severely” ($c \leq C^*(\phi)$) constrained depends on the proportional bankruptcy parameter ϕ . In the absence of bankruptcy costs ($\phi = 0$) risky debt is “cheap” and becomes optimal as soon as partners are financially constrained ($c < c_h = C^*(0)$). Higher bankruptcy costs increase the loan interest rate, make risky debt less attractive, and decrease the threshold $C^*(\phi)$ (i.e. $C^{*'}(\phi) < 0$).

Corollary 1 *Our model implies the following pecking order of financing:*

- 1) *Partners who are not capital constrained ($c \geq c_h$) prefer to finance the firm with inside equity ($N_u c$) complemented (if needed) with safe debt secured by the partnerships assets.*
- 2) *If partners are weakly capital constrained ($C^*(\phi) \leq c \leq c_h$) then:*

- a) *partners issue more inside equity in the first instance by recruiting more partners.*
- b) *Next, partners issue (in addition to more equity) more safe debt that is fully secured by their personal assets. A higher degree of personal liability increases the partnership's debt capacity and relaxes the capital constraint.*
- c) *Next, (in addition to the above) the partnership recruits even more equity partners and simultaneously issues more debt backed by the additional partners' personal assets.*
- 3) *If partners are severely capital constrained ($c \leq C^*(\phi)$) then the partnership issues more equity than is first-best and issues risky debt that is not secured by the partners' personal assets.*

The above regimes are ranked in order of priority.²⁵ Not all regimes may be optimal, though. For example, if $c_l < C^*(\phi) < c_m$ then regime L is dominated by the risky debt regime since $c_l < C^*(\phi)$. Regime L does not arise when partners' personal assets are high enough (i.e if $A > K(1 - \alpha)/(N_m\gamma) = c_m/\gamma$ such that $c_l < 0$) because in that case partners will always have enough personal assets for collateral purposes.

Consider next partners' personal liability in more detail. The first-order condition for the partners' optimal degree of personal liability under risky debt, a_R , is given by:

$$\frac{\partial V(D, n_1, n_2, a)}{\partial a} = -\delta_0 [1 - \gamma(1 - \phi)] \leq 0 \quad \text{for } D > \alpha K + \gamma Na \quad (23)$$

$\delta_0 \equiv \frac{r+\lambda-rq}{r+\lambda}$ equals the present value at $t = 0$ of receiving one dollar when the firm is closed down. $\gamma(1 - \phi)$ is the net liquidation value after bankruptcy costs of a dollar of personal assets. Conditional on debt being risky, the marginal effect of personal guarantees on the value per share is negative because extra personal assets increase the partners' expected deadweight costs of liquidation $(1 - \gamma)$ and bankruptcy (ϕ) . Hence, with risky debt it is optimal to avoid any personal liability by setting $a_R = 0$, and to limit bankruptcy costs

²⁵Proofs of all the corollaries are in Online Appendix A.2.

to a fraction of the firm's assets ($\phi\alpha K$).

Corollary 2 *If partners are weakly capital constrained ($c \in [C^*(\phi), c_h]$) then they register as a General Partnership and assume personal liability for the debt which is fully secured. If partners are severely capital constrained ($c \leq C^*(\phi)$) then the optimal debt level is risky and partners assume zero personal liability by registering as an LLP (i.e. $a^* = a_R = 0$).*

Figure 2 illustrates the solution. We use the iso-elastic output function ($L(n_1, n_2) = n_1^{\theta_1} n_2^{\theta_2}$ with $\theta_1, \theta_2 \in (0, 1)$ and $\theta_1 + \theta_2 < 1$).²⁶ Panels A and B of Figure 2 plot $V(c)$, the net value per share, as a function of partners' capital contribution if the bankruptcy cost parameter equals $\phi = 0.2$ and $\phi = 0.5$, respectively. The solid line, dash-dotted line and dotted line represent the solution when the partnership is, respectively, unconstrained, weakly capital-constrained, and severely capital-constrained. The thin dashed line plots the value per share with safe debt when safe debt is sub-optimal.

The share value with safe debt is a strictly concave, increasing function of c in regimes L and H , and a linear increasing function in regime M , and constant in regime U , reflecting the different policies for n_1^* , n_2^* , and D^* . The NPV per share with safe debt goes up from 1.49 to 2.27 as the partners' capital contribution increases from $c = 0$ to $c_h = 0.80$, the latter being the level at which the partnership becomes unconstrained. The value function under safe debt is a continuous and differentiable function of c , including at the optimal regime switching points $c_l = 0.27$, $c_m = 0.39$, and $c_h = 0.80$.

Safe debt financing is not optimal for severely capital-constrained partners. They can do better by registering as an LLP and by adopting risky, unsecured debt. The NPV per

²⁶Our baseline parameter values are drawn from several empirical studies: Greenwald et al. (2020) for recovery rates (α and γ); Franks and Sussman (2005), Thorburn (2000), and Ang and Fatemi (1997) for bankruptcy costs (ϕ); and Artunç and Guinnane (2019) for partnership life expectancy ($1/\lambda$). The partners' output elasticities θ_1 and θ_2 and outside wage rates w_1 and w_2 are chosen to match the average partner-to-associate ratio reported in Garicano and Hubbard (2016). Section 6 and Internet Appendix E.1 provide additional justification for the baseline parameter values.

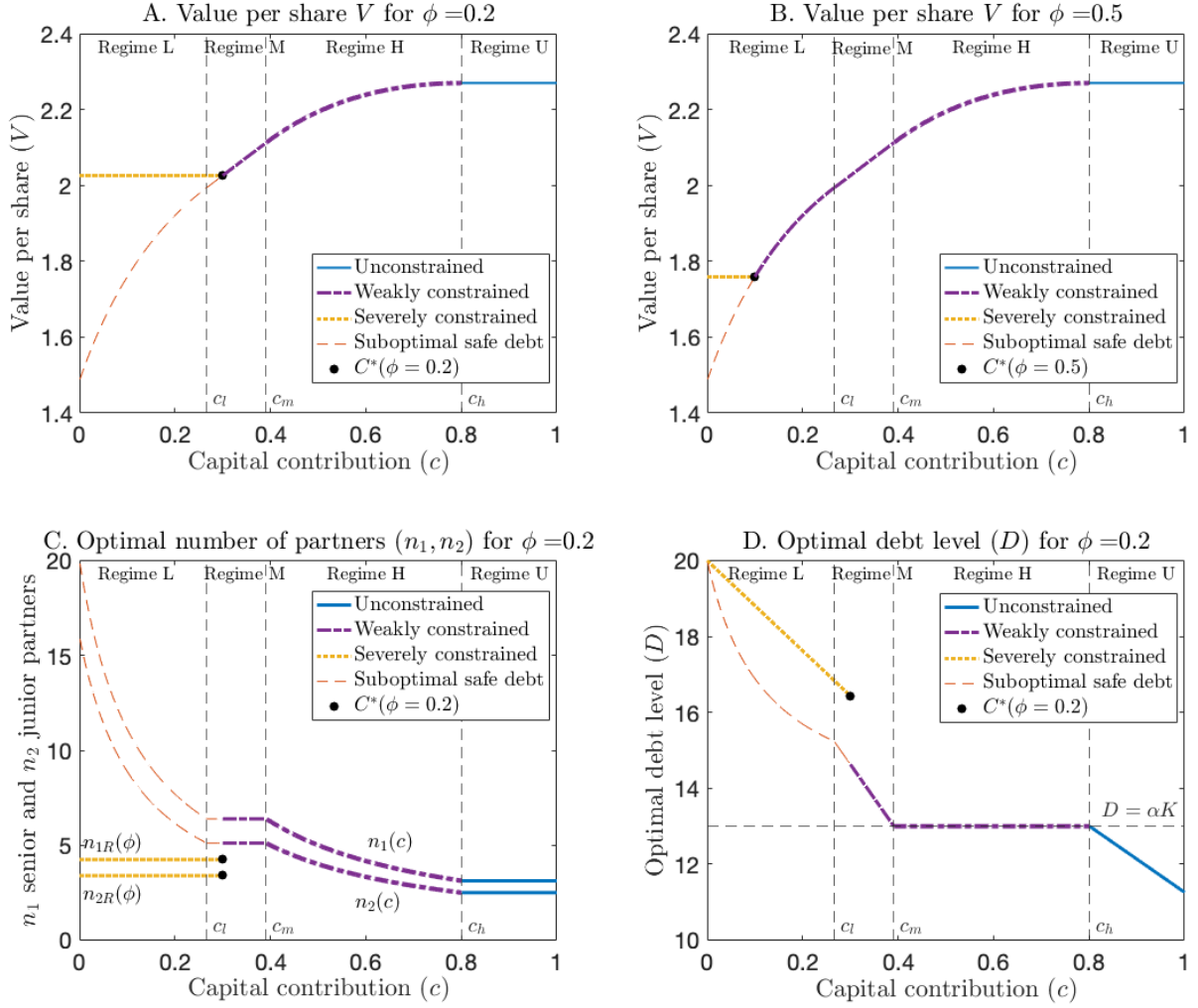


Figure 2: Partners' value per share and optimal policies

The figure plots the net value per share (V) for two levels of bankruptcy cost ($\phi = 0.2$ in Panel A and $\phi = 0.5$ in Panel B), the optimal number of senior (n_1) and junior (n_2) partners (Panel C) and the optimal debt level (Panel D), as functions of partner's capital contribution per share c . The switching point $C^*(\phi)$ at which the partnership is indifferent between safe and risky debt for a given bankruptcy cost level ϕ is indicated by a black dot. Risky (safe) debt is optimal for values of c below (above) this point. The baseline parameter values are: $K = 20, f = 1, A = 0.25, \tau_p = 0.2, r = 0.01, \lambda = 0.1, q = 0.55, \alpha = 0.65, \gamma = 0.5, p = 4, \theta_1 = 0.45, \theta_2 = 0.18, w_1 = 0.36, w_2 = 0.24, \phi = 0.2, \varphi_1 = 2$ and $\varphi_2 = 1$.

share for severely constrained partners, $V_R(\phi)$, is represented by the horizontal dotted line and is plotted for two different bankruptcy cost parameter values: $\phi = 0.2$ (Panel A) and $\phi = 0.5$ (Panel B). $V_R(\phi)$ does not vary with c but decreases with ϕ . $V_R(\phi)$ equals 2.02 and 1.76 for $\phi = 0.2$ and $\phi = 0.5$, respectively. The optimal switching point from safe to risky debt (indicated with a black dot in the figure) corresponds to the point where the

NPV per partner with safe debt intersects with the NPV per partner with risky debt, which always exists provided that bankruptcy costs are sufficiently low. As bankruptcy costs increase, the intersection point $C^*(\phi)$ moves to the left and is given by lower values for c , causing safe debt to dominate for a larger range of c . If $\phi > \phi_0 = 0.99$, where ϕ_0 is the value at which $C^*(\phi_0) = 0$ (i.e. $V_R(\phi_0) = V_S(0)$), safe debt always dominates. In the absence of bankruptcy costs ($\phi = 0$), risky debt always dominates for a capital-constrained partnership (i.e. for $c < c_h$). When $A > c_m/\gamma = 0.78$ regime L no longer exists (c_l becomes negative) because the partnership always has the backing of sufficient personal guarantees fully to secure the debt, even if partners contribute zero capital.

To characterize the partnership's optimal size and debt level, we need to identify within which regime $C^*(\phi)$ lies. This requires identifying the bankruptcy cost cutoffs ϕ_m , ϕ_l and ϕ_0 for which the partnership is indifferent between safe debt and risky debt at the regime capital contribution cutoffs $c = c_m$, $c = c_l$ and $c = 0$, respectively. The bankruptcy cost cutoffs are defined by:

$$V_R(\phi_m) = V_S(c_m), \quad V_R(\phi_l) = V_S(c_l), \quad \text{and} \quad V_R(\phi_0) = V_S(0) \quad (24)$$

These cutoffs arise because the value function with safe debt is monotonically increasing in capital contribution (c), while the value function with risky debt is independent of c but decreasing in bankruptcy cost (ϕ). The cutoffs ϕ_m , ϕ_l and ϕ_0 help us identify the relevant regime and $V_S(c)$. For example, if $\phi \in (\phi_m, \phi_l)$ then $C^*(\phi)$ lies in regime M and $V_S(c) = V_S(D_m(c), n_{1m}, n_{2m}, a_m)$. Knowing $C^*(\phi)$ and its corresponding regime allows us to calculate the optimal value per share as $V(c) = \max\{V_S(c), V_R(\phi)\}$, where $V_S(c) \geq (\leq) V_R(\phi)$ for $c \leq (\geq) C^*(\phi)$.

Our previous analysis identifies which regime and therefore which policies are optimal for the partnership. Figure 2 plots the optimal number of senior (n_1) and junior (n_2)

partners (Panel C) and the optimal debt level (Panel D) as functions of partners' capital contribution c . The first-best partnership sizes that maximize the NPV per share equal $n_{1u} = 3.12$ and $n_{2u} = 2.50$. The partnership becomes financially constrained for $c < c_h = 0.80$. Consider first the optimal size with risk-free debt financing only. As c drops from $c_h = 0.80$ to $c_m = 0.39$, the optimal partnership sizes increase to $n_{1m} = 6.40$ and $n_{2m} = 5.11$. The sizes remain constant at n_{1m} and n_{2m} in regime M, and rise in regime L all the way up to $n_{1l} = 19.84$ and $n_{2l} = 15.87$ for $c = 0$. The senior and junior partnership sizes move in lockstep. Risky debt financing becomes optimal if c is sufficiently low. A switch from safe debt to risky debt (marked with a black dot) coincides with a drop in the senior and junior partnership sizes. Raising the debt level enables the partnership to cut down on equity financing and to recruit fewer partners.

Panel D plots the optimal debt level D as a function of c for $\phi = 0.2$. Recall that $D_j = K - cN_j$ (for $j = u, h, m, l, R$).²⁷ The debt level is (weakly) decreasing in c . The debt level is constant at $D_h = \alpha K = 13$ in regime H (N_h rises as c falls, keeping cN_h and D_h constant). For $c < c_m = 0.39$, the debt level rises as partners' capital contribution falls, reaching a maximum of $D^* = K = 20$ for $c = 0$.

Higher bankruptcy costs (ϕ) make risky debt financing costlier and provide incentives to replace debt with equity by recruiting more partners and increasing N_R . Since $D_R = K - cN_R$, it follows that D_R decreases in ϕ .

Partners achieve their first-best outcome whenever bankruptcy costs at closure are absent, which occurs in two cases: $\phi = 0$ or $\alpha = 0$. In the latter ($\alpha = 0$), the firm's assets are worthless upon closure, so partners avoid personal liability by registering as an LLP. First-best is also achieved when liquidation costs are zero ($\gamma = 1$), in which case $c_m = c_h$ and regime H disappears. When $\gamma = 1$ and $\max[C^*(\phi), c_l] \leq c < c_m = c_h$, first-best is achieved in regime M, where $G_m = G_u$, $n_{1m} = n_{1u}$, $n_{2m} = n_{2u}$ and $\alpha K \leq$

²⁷Strictly speaking, $D_u \leq \alpha K$, but since we can plot only one value for D_u we pick $D_u = K - cN_u$.

$$D_m = K - cN_m \leq \alpha K + aN_m.$$

We conclude this section with a corollary that examines the relationship between the optimal partnership sizes (n_1^*, n_2^*) and the output price (p) .

Corollary 3 *A lower (higher) output price increases (reduces) the optimal senior and junior partnership sizes (i.e. $\frac{\partial n_i^*(p)}{\partial p} \leq 0$ for $i = 1, 2$).*

From Proposition 2 and Equation (22) we know that $L_i = \varphi_i(L - G_j/p)/N_i$ (for $i = 1, 2$ and $j = u, m, R$). The optimal partnership sizes depend on the ratio of the cost to output price, G_j/p . Since partners share the costs G_j (such as the fixed costs of operations, f , and the investment cost K), a higher output price allows these costs to be spread across a smaller output level (and therefore smaller size). From Proposition 2 it follows immediately that a marginal change in the output price p has no effect on the optimal size for a financially constrained partnership in regimes H and L . Hence, a higher output price either has no effect or a strictly negative effect on the optimal partnership size.

4 The Partnership's Investment Policy

Partners invest if their participation constraints (see Equation (10)) are satisfied, which means that partners' NPV from joining the firm exceeds the NPV from working outside the partnership.

$$\varphi_i V(D^*, n_1^*, n_2^*, a^*) \geq \frac{qT_p w_i}{r + \lambda} \text{ for } i = 1, 2 \Leftrightarrow V(D^*, n_1^*, n_2^*, a^*) \geq \frac{qT_p}{r + \lambda} \max \left[\frac{w_1}{\varphi_1}, \frac{w_2}{\varphi_2} \right]$$

For a given regime j , $j = u, h, m, l, R$, denote the investment threshold as $\bar{p}_j$, for which $V_j(D_j, n_{1j}, n_{2j}, a_j; \bar{p}_j) = (qT_p/(r + \lambda)) \max [w_1/\varphi_1, w_2/\varphi_2]$. This gives us 5 possible candidate solutions for the breakeven investment threshold. Each solution applies to a par-

ticular regime and we denote its corresponding interval for c by $\Psi_j(\bar{p}_j)$ ($j = u, h, m, l, R$).

We define the breakeven investment threshold, $\bar{p}^*(c, \phi)$, as the lowest output price for which both senior and junior partners are willing to join the partnership: $\bar{p}^*(c, \phi) = \min\{\bar{p}_S(c), \bar{p}_R(\phi)\}$, where $\bar{p}_S(c)$ is the investment threshold for a given c under safe debt:

$$\bar{p}_S(c) = \min_{j \in \{u, h, m, l\}} \left\{ \bar{p}_j(c) | c \in \Psi_j(\bar{p}_j) \text{ with } V(\bar{p}_j; c, \phi) = \frac{qT_p}{r + \lambda} \max \left[\frac{w_1}{\varphi_1}, \frac{w_2}{\varphi_2} \right] \right\} \quad (25)$$

With some abuse of notation, we now express V (evaluated at the optimal policies D^*, n_1^*, n_2^*, a^*), as a function of p, c and ϕ .

The breakeven threshold $\bar{p}^*(c, \phi)$ is easily determined if the optimal regime j (with $j \in \{u, h, m, l, R\}$) for given capital contribution level c and bankruptcy cost ϕ is known. However, the optimal regime for any given (c, ϕ) has to be determined in conjunction with the investment threshold $\bar{p}^*$ since regime boundaries themselves depend on p (through n_1^* and n_2^*) creating a feedback loop for which a fixed point has to be found. The mapping $\bar{p}^*(c, \phi)$ has to be ex post consistent with the regime boundaries, i.e. if the minimum investment threshold for c' is given by $\bar{p}^*(c', \phi) = \bar{p}_j(c')$ ($\bar{p}^*(c', \phi) = \bar{p}_R(\phi)$) with $j \in \{u, h, m, l\}$ ($j = R$) then it must be the case that c' falls under regime j and therefore lies in interval $\Psi_j(\bar{p}_j)$ ($\Psi_R(\bar{p}_R)$) for $\bar{p}_j(c')$ ($\bar{p}_R(\phi)$) to be the correct investment threshold.

Using Proposition 2 we can write the safe-debt fixed point boundaries $\bar{c}_j$ of the intervals Ψ_j for $j = h, m, l$ as the solutions to the following equations:

$$\bar{c}_h = \frac{K(1 - \alpha)}{N_u(\bar{p}_u)}, \quad \bar{c}_m = \frac{K(1 - \alpha)}{N_m(\bar{p}_m(\bar{c}_m))} \text{ and } \bar{c}_l = \frac{K(1 - \alpha)}{N_m(\bar{p}_m(\bar{c}_l))} - \gamma A \quad (26)$$

We show (see the proof of Proposition 3 in Appendix) that the investment cutoff for the safe-debt case ($\bar{p}_S(c)$) is a continuous decreasing function in c . Furthermore, $\bar{p}_R$ is independent of c and increasing in the level of bankruptcy cost ϕ , with $\bar{p}_R(\phi = 0) = \bar{p}_u$.

The point where $\bar{p}_S(c)$ and $\bar{p}(\phi)$ intersect, denoted as $\bar{C}^*(\phi)$, is the threshold below which risky debt regime is optimal for the partnership's breakeven threshold $\bar{p}^*$. Define $\bar{\phi}_0$ as the solution to $\bar{p}_R(\bar{\phi}_0) = \bar{p}_S(c = 0)$. We then prove the following proposition:

Proposition 3 *If $\phi < \min[\bar{\phi}_0, 1]$ then there exists a capital contribution threshold $\bar{C}^*(\phi)$ such that risky debt and the investment threshold $\bar{p}_R(\phi)$ are optimal for $c \leq \bar{C}^*(\phi)$ whereas safe debt and the investment threshold $\bar{p}_S(c)$ are optimal for $c \geq \bar{C}^*(\phi)$, where $\bar{C}^*(\phi)$ is the solution to $\bar{p}_S(\bar{C}^*(\phi)) = \bar{p}_R(\phi)$. If $\min[\bar{\phi}_0, 1] \leq \phi \leq 1$ then safe debt is always optimal. The function $\bar{C}^*(\phi)$ is piece-wise defined over the regimes H , M and L .²⁸*

Figure 3 plots the breakeven investment threshold $\bar{p}^*$ for two levels of personal asset: $A = 0.02$ and $A = 0.25$. If the partnership relies on safe debt financing only, then the investment threshold ($\bar{p}_S$) is a decreasing, continuous and differentiable function of the partners' capital contribution c (dashed line for $A = 0.02$ and dotted line for $A = 0.25$). Tightening financial constraint increases the breakeven output price threshold. However, if general partners pledge personal assets that creditors can draw from, then this loosens the capital constraint and reduces the underinvestment problem. Figure 3 shows that by increasing partners' personal assets from 0.02 to 0.25, the investment threshold drops from 5.36 to 2.83 for $c = 0$. The shaded area covering the interval $[0.07, 0.17]$ illustrates the effect on $\bar{c}_l$ from increasing A from 0.02 to 0.25. It expands regime M and shrinks regime L as it reduces the threshold $\bar{c}_l$ from 0.17 to 0.07.

The two horizontal lines represent the investment threshold under risky debt, which is optimal for $c \leq \bar{c}_l$, for $A = 0.02$ (dash-dotted line) and $A = 0.25$ (solid line). For given (c, ϕ) , the investment threshold $\bar{p}^*(c, \phi)$ is the minimum of risky-debt investment threshold ($\bar{p}_R(\phi)$) and the safe-debt investment threshold ($\bar{p}_S(c)$). The points where the safe-debt and risky-debt thresholds intersect represent the optimal switching points from safe to

²⁸If $A > \bar{A} \equiv K(1 - \alpha) / [\gamma N_m(\bar{p}_m(0))]$, then $\bar{c}_l$ becomes negative and regime L no longer exists.

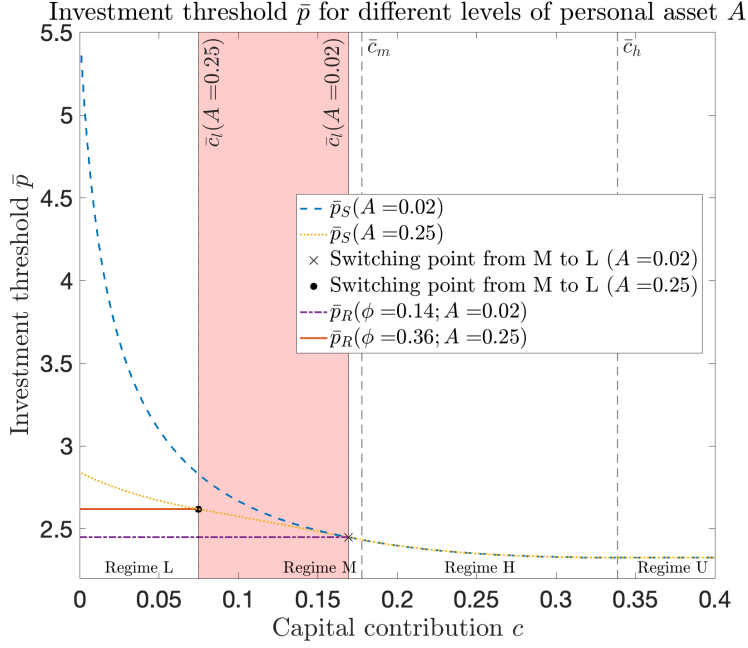


Figure 3: The Partnership's breakeven investment threshold

The figure plots the partnership's breakeven investment threshold $\bar{p}$ as a function of partner's capital contribution per share c for two levels of personal asset $A = 0.02$ and $A = 0.25$. The shaded area represents the effect of increased personal assets on the cutoff ($\bar{c}_l$) between regime M and regime L. The parameter values are the same as in Figure 2 (except for p , which is now endogenized).

risky debt (indicated with a black dot ($A = 0.02$) and a cross ($A = 0.25$)), with risky debt preferable for capital contributions below the intersection. A higher bankruptcy cost imposes larger deadweight losses on the lender and raises the investment threshold, shifting the switching point leftward. Increasing personal asset postpones the switch to risky debt. The bankruptcy costs for which the partnership switches to risky debt when c drops below $\bar{c}_l$ are 0.14 and 0.36 for $A = 0.02$ and $A = 0.25$, respectively.

The wedge between the partnership's breakeven investment threshold and the first-best investment threshold, $\bar{p}^*(c, \phi) - \bar{p}_u$, is a measure for the degree of underinvestment that results from partners' capital constraints. The underinvestment problem is most severe for partnerships with high bankruptcy costs and low capital contributions, reaching a maximum at $c = 0$ of $\bar{p}_R(\bar{\phi}_0) - \bar{p}_u = \bar{p}_S(0) - \bar{p}_u$, which equals $2.84 - 2.33 = 0.51$ for $A = 0.25$ and $5.36 - 2.33 = 3.06$ for $A = 0.02$.

Although personal collateral mitigates the capital constraint, the underinvestment

problem can remain significant. Our model suggests that for capital-intensive firms with high bankruptcy costs another business structure may be more efficient. The corporation appears to be an obvious candidate as it enables abundant access to capital through shareholders who do not need to be involved in the production side of the firm, and it shields managers from personal liability.

5 Two-tier Partnerships

Partnerships could profitably hire more equity partners, but refuse to do so to avoid dilution. Whereas “full-equity partnerships” have equity partners only, “two-tier partnerships” have both equity partners and non-equity partners. Non-equity partners (sometimes referred to as associates or salaried “partners”) receive a salary and do not contribute capital. We show that two-tier partnerships mitigate equity dilution and increase equity partners’ value per share. Two-tier partnerships are common in large law, accounting and consulting partnerships.

Our model can be modified to include salaried partners by setting $\varphi_2 = 0$ (i.e. salaried partners receive no shares) and by redefining the after-tax profit function to include salaried partners’ wage, w_2 (the subscript t refers to two-tier partnership):

$$\pi_t = (pL(n_{1t}, n_{2t}) - n_{2t} w_2 - f - \rho D_t) T_p \quad (27)$$

Equity partners’ optimization problem is now:

$$V_t = \max_{\{D_t, n_{1t}, n_{2t}, a_t\}} \frac{qT_p}{r + \lambda} \frac{pL(n_{1t}, n_{2t}) - n_{2t} w_2 - F(D_t, n_{1t}, n_{2t}, a_t)}{\varphi_1 n_{1t}} \quad (28)$$

$$\text{subject to } \varphi_1 n_{1t} c + D_t \geq K \text{ and } V_t \geq \frac{qT_p}{r + \lambda} \left(\frac{w_1}{\varphi_1} \right) \quad (29)$$

In what follows we focus on the unconstrained case (i.e. $c \geq K(1 - \alpha)/(\varphi_1 n_{1t})$). The solution for the constrained case is presented in Online Appendix D.2 and its comparative statics are discussed in Section 6 of the paper.²⁹

Proposition 4 *If partners are not capital-constrained then the optimal number of senior partners (n_{1t}) and salaried partners (n_{2t}) are the solution to:*

$$pL_1(n_{1t}, n_{2t}) = \frac{pL(n_{1t}, n_{2t}) - n_{2t}w_2 - G_u}{n_{1t}} \quad \text{and} \quad pL_2(n_{1t}, n_{2t}) = w_2 \quad (30)$$

The partnership's breakeven investment threshold, $\bar{p}_t$, is the solution to:

$$\varphi_1 V_t(D_t, n_{1t}, n_{2t}, a; \bar{p}_t) = \frac{qT_p w_1}{r + \lambda} \Leftrightarrow \frac{\bar{p}_t L(n_{1t}, n_{2t}) - n_{2t}w_2 - G_u}{n_{1t}} = w_1 \quad (31)$$

Senior and salaried partners' marginal revenues equal their respective wage rate at the breakeven investment threshold ($\bar{p}_t L_i(n_{1t}, n_{2t}) = w_i$ for $i = 1, 2$).

Salaried partners are recruited up to the point where marginal revenues equal the wage rate w_2 . We prove the next proposition for the Cobb-Douglas production function.

Proposition 5 *If $L(n_1, n_2) = n_1^{\theta_1} n_2^{\theta_2}$ then two-tier partnerships have fewer senior partners but more juniors than full-equity partnerships, i.e.:*

$$n_{1u}(p) \geq n_{1t}(p) \quad \text{and} \quad n_{2u}(p) \leq n_{2t}(p) \quad \text{for } p \geq \bar{p}_u \quad (32)$$

The proposition shows that, at least for the Cobb-Douglas production function, two-tier partnerships replace to some degree senior partners with junior salaried partners. Two-tier partnerships enable senior partners to lever up value per share, as shown in the next proposition.

²⁹Proofs of all the propositions in this section are in Online Appendix A.1.

Proposition 6 *Any two-tier partnership with n_1 equity partners and n_2 salaried partners generates a higher value per share than a corresponding full-equity partnership with n_1 senior and n_2 junior equity partners that satisfies junior equity partners’ participation constraint (i.e. $V_t(p; n_1, n_2) \geq V(p; n_1, n_2)$). Consequently, senior equity partners are better off under a two-tier partnership than under a full-equity partnership ($V_t(p; n_{1t}, n_{2t}) \geq V(p; n_{1u}, n_{2u})$ for $p \geq \bar{p}_u$). The full-equity partnership’s first-best investment threshold exceeds or equals the partnership’s unconstrained investment threshold with salaried partners (i.e. $\bar{p}_u \geq \bar{p}_t$).*

Given that two-tier partnerships dominate regular partnerships, why have not all partnerships adopted the two-tier model? Ring and Wiggins (2025) argue that some law firms (e.g. the UK elite firm Slaughter and May) resist a non-equity partnership tier but instead promote outstanding young lawyers earlier to partner than their peers, making these firms less vulnerable to top talent leaving. Furthermore, some in the legal industry fear that salaried partners undermine the prestige of the partner title.

6 Comparative Statics and Empirical Predictions

We now present comparative statics for the partnership with senior and junior equity partners (hereafter the “full-equity” partnership) and for the two-tier partnership. We assume that $L(n_1, n_2) = n_1^{\theta_1} n_2^{\theta_2}$ and present analytical solutions for the partnership sizes and various thresholds in Online Appendix D. The output elasticities θ_1 and θ_2 ($\theta_i = n_i(\partial L / \partial n_i) / L$ for $i = 1, 2$) proxy the relative productivity of seniors (the “rainmakers”) to juniors and determine the senior to junior ratios in our model.

Our baseline parameter values are as in Figure 2 (see footnote 26 and Internet Appendix E.1 for justification). The parameter ranges in Table 1 are chosen to replicate

the observed dispersion in partner-to-associate ratio of two-tier partnerships reported by Chambers Associate (2025) and Fisher (2025). Our baseline senior-to-junior equity partner ratio (where $L = n_1^{\theta_1} n_2^{\theta_2}$ yields $n_1/n_2 = (\theta_1 \varphi_2)/(\theta_2 \varphi_1)$) equals 1.25 across all regimes. For the two-tier partnership, the partner-to-associate ratio for regime U and R evaluated at the competitive output price $\bar{p}_t$ (where $L = n_1^{\theta_1} n_2^{\theta_2}$ gives $n_{1t}(\bar{p}_t)/n_{2t}(\bar{p}_t) = (\theta_1 w_2)/(\theta_2 w_1)$) equals 1.67. The latter is consistent with Garicano and Hubbard (2016), who report that in a sample of 9,283 US law firms, the average partner worked alongside 15 other partners and 0.6 associates, implying a partner-to-associate ratio of 1.67.

Table 1 illustrates how optimal partnership size, the optimal financing regime and value per share vary with the main parameters, for the full-equity partnership (Panel A) and the two-tier partnership (Panel B). Panels A.1 and B.1 report optimal policies when the partnership operates above the breakeven price ($p > \bar{p}$), while Panels A.2 and B.2 present comparative statics at the breakeven price $p = \bar{p}$ and $p = \bar{p}_t$, respectively.

1) A higher senior partner output elasticity (θ_1) increases the number of senior and junior equity partners, the senior-to-junior ratio, and value per share (Panel A.1). For example, increasing θ_1 from 0.2 to 0.8 raises the number of senior (junior) equity partners from 3.07 (5.53) to 45.37 (20.41), the senior-to-junior ratio from 0.56 to 2.22, and value per share from 1.34 to 5.14.

Turning to the two-tier partnership (Panel B.1), increasing θ_1 also raises the number of equity partners (n_1) and associates (n_2) and value per share when the firm operates above the breakeven price, but the effect on the partner-to-associate ratio is non-monotonic. The ratios are lower and more variable than for the full-equity partnership. Increasing θ_1 from 0.2 to 0.8 raises the number of senior (associates) from 1.58 (4.27) to 31.11 (109.22). The ratio initially rises from 0.37 (for $\theta_1 = 0.20$) to 0.54 (for $\theta_1 = 0.45$), before falling to 0.28 (for $\theta_1 = 0.80$). Value per share rises from 1.44 to 7.49, substantially higher than for the

full-equity partnership.

Table 1: Comparative statics for the full-equity partnership and the two-tier partnership

This table presents comparative statics for the full-equity partnership (with senior and junior equity partners) and the two-tier partnership (with equity partners and associates) for $c = 0.8$. Ψ denotes the optimal regime; V and V_t are the value functions; $\bar{p}$ and $\bar{p}_t$ are the investment price thresholds. n_1 and n_2 in Panel A are the optimal number of senior and junior partners, respectively, and $\frac{n_1}{n_2}$ is the senior-to-junior ratio. n_{1t} and n_{2t} in Panel B are the optimal number of equity partners and associates, respectively, and $\frac{n_{1t}}{n_{2t}}$ is the partner-to-associate ratio. The baseline parameter values are the same as in Figure 2.

A. Full-equity partnership with senior and junior equity partners												
		A.1. $p = 4$					A.2. $p = \bar{p}$					
Variables		Ψ	n_1	n_2	$\frac{n_1}{n_2}$	V	Ψ	$\bar{p}$	n_1	n_2	$\frac{n_1}{n_2}$	V
θ_1	0.20	H	3.07	5.53	0.56	1.34	H	3.36	3.07	5.53	0.56	0.96
	0.45	H	4.17	3.33	1.25	2.24	U	2.33	7.38	5.90	1.25	0.96
	0.80	U	45.37	20.41	2.22	5.14	U	0.77	242.71	109.22	2.22	0.96
p	3.70	H	4.17	3.33	1.25	2.00	U	2.33	7.38	5.90	1.25	0.96
	4.00	H	4.17	3.33	1.25	2.24	U	2.33	7.38	5.90	1.25	0.96
	6.40	R	2.01	1.61	1.25	4.27	U	2.33	7.38	5.90	1.25	0.96
λ	0.00	R	0.92	0.74	1.25	39.25	M	1.74	3.62	2.90	1.25	10.56
	0.10	H	4.17	3.33	1.25	2.24	U	2.33	7.38	5.90	1.25	0.96
	0.40	U	14.56	11.65	1.25	0.34	U	3.33	19.47	15.58	1.25	0.26
τ_p	0.00	H	4.17	3.33	1.25	2.96	U	2.21	6.41	5.13	1.25	1.20
	0.20	H	4.17	3.33	1.25	2.24	U	2.33	7.38	5.90	1.25	0.96
	0.40	U	4.27	3.42	1.25	1.52	U	2.50	8.99	7.20	1.25	0.72
B. Two-tier partnership with equity partners and associates												
		B.1. $p = 4$					B.2. $p = \bar{p}_t$					
Variables		Ψ	n_{1t}	n_{2t}	$\frac{n_{1t}}{n_{2t}}$	V_t	Ψ	$\bar{p}_t$	n_{1t}	n_{2t}	$\frac{n_{1t}}{n_{2t}}$	V_t
θ_1	0.20	R	1.58	4.27	0.37	1.44	H	3.27	5.83	4.58	1.27	0.72
	0.45	M	5.04	9.27	0.54	2.78	U	2.04	9.84	5.90	1.67	0.72
	0.80	U	31.11	109.22	0.28	7.49	U	0.61	323.61	109.22	2.96	0.72
p	3.70	H	5.83	9.14	0.64	2.43	U	2.04	9.84	5.90	1.67	0.72
	4.00	M	5.04	9.27	0.54	2.78	U	2.04	9.84	5.90	1.67	0.72
	6.40	R	1.11	7.16	0.15	7.77	U	2.04	9.84	5.90	1.67	0.72
λ	0.00	R	0.54	2.73	0.20	66.35	M	1.53	4.87	2.82	1.73	7.92
	0.10	M	5.04	9.27	0.54	2.78	U	2.04	9.84	5.90	1.67	0.72
	0.40	U	12.96	15.58	0.83	0.39	U	2.93	25.96	15.58	1.67	0.19
τ_p	0.00	R	2.37	6.13	0.39	3.88	U	1.94	8.55	5.13	1.67	0.90
	0.20	M	5.04	9.27	0.54	2.78	U	2.04	9.84	5.90	1.67	0.72
	0.40	H	5.83	10.05	0.58	1.91	U	2.20	11.99	7.20	1.67	0.54

The two-tier partnership structure allows equity partners to lever up profits per partner. At the default parameter values, the ratio of value per share under the two-tier partnership to that under the full-equity partnership equals $2.78/2.24=1.24$, so the two-tier structure generates a value per share 24% higher than the full-equity partnership. This

is also reflected in the breakeven output prices: the ratio $\bar{p}_t/\bar{p} = 2.04/2.33 = 0.88$ implies that the breakeven output price for the two-tier partnership is approximately 12% lower than for the full-equity partnership. This lower breakeven price explains why, somewhat misleadingly, value per share at the breakeven price is higher for the full-equity partnership than for the two-tier partnership (i.e. $V(\bar{p}) = 0.96 > V_t(\bar{p}_t) = 0.72$). When evaluated at the same output price, value per share is always higher under the two-tier structure ($V_t(p) > V(p)$), which may help explain the growing popularity of the two-tier partnership (see Ring and Wiggins (2025)).

2) The sensitivity of partnership size to changes in output elasticity is much greater when firms operate at the breakeven output price. Panel A.2 shows that, for the full-equity partnership, increasing θ_1 from 0.2 to 0.8 raises the number of senior (junior) equity partners from 3.07 (5.53) to 242.71 (109.22) a substantially larger increase than when $p = 4 > \bar{p}$. Output price pressure forces the partnership to accept equity dilution, making its size much more sensitive to potential shocks. The senior-to-junior ratio increases from 0.56 to 2.22. For the two-tier partnership (Panel B.2), the partner-to-associate ratio increases monotonically from 1.27 to 2.96 as θ_1 rises from 0.2 to 0.8, accompanied by large increases in both the number of equity partners and associates.

3) Lower output prices increase the number of senior and junior partners in both the full-equity and two-tier partnerships. While lower output prices do not affect the senior-to-junior equity partner ratio, they significantly increase the partner-to-associate ratio (e.g. from 0.15 for $p = 6.4$ to 0.64 for $p = 3.7$ in Panel B.1). Competitive output prices ($p = \bar{p}_t$) coincide with high partner-to-associate ratios of around 1.67 (Panel B.2).

4) Based on data from 137 US law firms reported by Chambers Associate (2025), partner-to-associate ratios range from 0.23 to 2.77, with a mean of 0.84 and a median of 0.82. To generate a ratio as high as 2.77, one requires a high output elasticity for

senior partners in a competitive price environment (e.g. $\theta_1 = 0.8$ and $p = \bar{p}_t$ yield a ratio of 2.96 in Panel B.2). Conversely, generating a low ratio of 0.23 requires a combination of two or more of the following: a low senior-to-junior output elasticity ratio (θ_1/θ_2), a low reservation wage for associates, a high output price, a long expected partnership lifetime, a high success probability, a low personal tax rate or low bankruptcy costs. These suggest that low partner-to-associate ratios prevail in economic environments that are very benign for equity partners. The wide dispersion in partner-to-associate ratios across law firms suggest significant heterogeneity in the degree of price pressure they face, underlying “production function” and business setup.

Empirically, partner-to-associate ratios vary over time and across sectors. In England, the average ratio in medical practices dropped from 2.38 in 2015 to 0.99 in 2024 (Fisher (2025)). These ratios are much higher than those observed for US law firms. Medical practices in England are highly regulated: prices are set by the government, a practice’s patient base is determined by its geographic catchment area, and NHS practices are relatively uniform in their setup and operation. This may explain why medical partnerships are more limited in leveraging up profits through associates, and why we might expect less dispersion in the partner-to-associate ratios across medical practices.

5) Output prices affect not only production decisions (partnership size) but also the firm’s financing and optimal liability. Higher output prices enable fewer partners to share the firm’s fixed operating and investment costs, which in turn affects the optimal financing regime. Increasing the output price from 3.7 to 6.4 reduces the number of seniors (associates) from 5.83 (9.14) in regime H to 1.11 (7.16) in regime R, causing the firm to become more financially constrained (Panel B.1). The ratio of partner-to-associate ratio falls from 0.64 to 0.15. Paradoxically, better economic conditions (higher p) tightens the financing constraint because the partnership recruits fewer equity partners, which limits the available equity capital.

6) Increasing the partnership's expected life-time $1/\lambda$ from 2.5 years ($\lambda = 0.4$) to 10 years ($\lambda = 0.1$) reduces the optimal number of senior (junior) equity partners from 14.56 (11.65) to 4.17 (3.33) and increases the value per share V from 0.34 to 2.24 (Panel A.1). The corresponding breakeven output price ($\bar{p}$) decreases from 3.33 to 2.33 (Panel A.2). Panel A.1 shows that a partnership with an expected life-span of 2.5 years is primarily equity financed (regime U), whereas a perpetual partnership ($\lambda = 0$) recruits few partners and adopts risky debt financing (regime R) within an LLP structure.³⁰

Increasing the personal tax rate (τ_p) from 0 to 0.4 raises the breakeven output price from 2.21 to 2.50 (Panel A.2) and marginally increases the number of senior (junior) equity partners from 4.17 (3.33) to 4.27 (3.42) (Panel A.1). A higher tax rate reduces future after-tax profits, which in turn raises the partnership's breakeven output price threshold ($\bar{p}$), and discourages both debt financing and investment. Recall that debt provides no interest taxshield advantage relative to equity for partnerships.³¹

Online Appendix E.1 discusses the effect of other parameters (such as q , ϕ , w_2 , γ and c) on the firm's optimal policies, and presents comparative statics for the case where partners are penniless ($c = 0$). One can verify that tighter capital constraint amplifies many of the effects described in this section.

7 Extensions and Further Discussion

7.1 Firm value optimization

Partners maximize the value per share, not total firm value. How do partners' first-best policies differ from those policies that maximize total firm value? An answer to

³⁰Online Appendix E.2 proves that a shorter expected life-span increases the number of senior (n_1) and junior (n_2) equity partners and the cost of risky debt, and reduces the amount of debt financing.

³¹Online Appendix E.3 provides analytical results of the effect of τ_p on firm policies.

this question may be relevant for policymakers and regulators in deciding whether key services such as health care should be provided by partnerships or whether alternative providers (such as state run entities) might be more appropriate.

In the interest of space we only consider the value-maximizing policies for a firm that is not capital-constrained. Partners' participation constraints still need to be satisfied, however, because partners only join the firm if the present value of their payouts exceeds the present value of their outside wages. The objective function is to maximize the firm's total net value, $W_0(D, n_1, n_2, a) - K$, subject to partners' participation constraints, $V(D, n_1, n_2, a) \geq \frac{qT_p}{r+\lambda} \max[\frac{w_1}{\varphi_1}, \frac{w_2}{\varphi_2}]$, which leads to the following proposition.³²

Proposition 7 *If partners are not capital constrained then the value-maximizing partnership sizes (n_1^o and n_2^o) exceed the first-best sizes that maximize the value per share, i.e. $n_1^o(p) > n_{1u}(p)$ and $n_2^o(p) > n_{2u}(p)$ for $p > \bar{p}_u$. The corresponding optimal net debt level (D^o) is lower than the first-best debt level (D_u), i.e. $D^o = K - c(\varphi_1 n_1^o + \varphi_2 n_2^o) \equiv K - cN^o < D_u = K - cN_u \leq \alpha K$.*

Under the value-maximizing policy, senior and junior partners are added until the participation constraint of one class of partners becomes binding.³³ In contrast, the first-best policy admits partners only as long as doing so increases profits per share, making both classes of partners strictly better off joining the firm. The first-best policy thus leads to under-recruitment of both senior and junior partners at the individual firm level relative to the total value-maximising policy.

Corollary 4 *A lower (higher) output price reduces (increases) the senior and junior partnership sizes that maximize total firm value (i.e. $\frac{\partial n_i^o}{\partial p} > 0$ for $i = 1, 2$).*

³²Proofs of all the propositions in Section 7 are in Online Appendix A.1.

³³If the output $L(n_1, n_2)$ is monotonically increasing in n_1 and n_2 then the value-maximizing size would be infinite (i.e. $n_1^o = n_2^o = \infty$) in the absence of partners' participation constraint (e.g. if $w_1 = w_2 = 0$). If L has an interior maximum then the result $n_1^o > n_{1u}(p)$ and $n_2^o > n_{2u}(p)$ for $p > \bar{p}_u$ still holds but the value-maximizing size (which now solves $L_1(n_1^o, n_2^o) = L_2(n_1^o, n_2^o) = 0$) no longer depends on p .

The value-maximizing partnership sizes (n_1^o and n_2^o) increase with the output price, contrary to partners' first-best sizes (n_{1u} and n_{2u}), which decrease with p .

Proposition 8 *Partners' first-best breakeven investment threshold ($\bar{p}_u$) and corresponding partnership size equal, respectively, the unconstrained value-maximizing breakeven threshold ($\bar{p}^o$) and partnership size, i.e.*

$$\bar{p}_u = \bar{p}^o \quad \text{and} \quad n_{1u}(\bar{p}_u) = n_1^o(\bar{p}^o) \quad \text{and} \quad n_{2u}(\bar{p}_u) = n_2^o(\bar{p}^o) \quad \text{for } c \geq \bar{c}_h \quad (33)$$

Partners' constrained breakeven investment threshold and partnership size exceed, respectively, the unconstrained value-maximizing breakeven threshold and partnership size:

$$\bar{p}^*(c, \phi) > \bar{p}^o \quad \text{and} \quad n_1^*(\bar{p}^*) > n_1^o(\bar{p}^o) \quad \text{and} \quad n_2^*(\bar{p}^*) > n_2^o(\bar{p}^o) \quad \text{for } c < \bar{c}_h \quad (34)$$

As previously shown, a first-best policy leads to a lower partnership size compared to the value-maximizing size ($N_u(p) < N^o(p)$ for $p > \bar{p}_u$). A lower output price induces a larger first-best partnership size, but decreases the value-maximizing size, reducing the wedge $N^o(p) - N_u(p)$ for $p > \bar{p}$. If partners are not capital constrained then partners' first-best breakeven investment threshold coincides with the value-maximizing investment threshold ($\bar{p}_u = \bar{p}^o$), and at this threshold partners adopt the value-maximizing partnership size ($N^o(\bar{p}^o) = N_u(\bar{p}_u)$). A lower price per care unit, p , therefore increases the provision of health care at the individual medical practice level, but discourages some partnerships from entering the sector if p is set below the partnership's breakeven level.

A breakeven investment policy combined with a capital constraint in the presence of liquidation and bankruptcy costs forces the partnership to recruit more equity partners and to delay investment, irrespective of whether the partnership adopts safe or risky debt, i.e. $N^*(\bar{p}^*(c, \phi)) > N^o(\bar{p}^o)$ and $\bar{p}^*(c, \phi) > \bar{p}^o$. Whereas the existing literature argues

that partnerships are inefficiently small, we show that capital constrained partnerships are an exception to this rule. An alternative business structure, such as a corporation with outside equityholders, may be more efficient for severely capital constrained firms.

7.2 The partnership model with effort

Assume now that the firm's output is determined not only by the number of partners, but also by each partner's effort. To keep the solutions tractable, we focus on the case where there is only one class of n equity partners.³⁴ We follow the model framework of McGinty (2014) and Galashin and Popov (2016) who study the effect of team size and returns to scale on team members' effort (within a full-equity financed firm).

Partners set their effort level $(e_1, e_2, \dots, e_n)$ while the firm is operational and after it has fixed its liability structure (a) , size (n) and financing (D) . Solving the problem backwards, partner i 's optimal effort level e_i is the solution to:

$$\max_{e_i} \frac{1}{r + \lambda} \left\{ \frac{[pL(e_1, e_2, \dots, e_n) - f - \rho D] T_p + \lambda \underline{E}(D, n, a)}{n} - g(e_i) \right\} \quad (35)$$

where $g(e_i)$ is partner i 's cost of effort per unit of time. The first-order condition for partner i 's effort is:

$$\frac{pT_p}{n} \frac{\partial L}{\partial e_i} = g'(e_i) \quad \text{for } i = 1, \dots, n \quad (36)$$

The optimal effort level is independent of f and ρD . Hence, including a fixed pay component to partners' income by holding a net cash position ($D < 0$) that pays out a constant interest payment (ρD) does not incentivize partners to put in more effort.³⁵

³⁴Online Appendix C.1 provides the complete derivation for the case with a single class of partners, as well as the solution for the more general case with two classes of partners.

³⁵Legally, a partnership requires partners to share profits and losses. Equity partners hold by definition an equity contract. It would not make sense for partners to hold a debt claim (i.e. $D > 0$) as debt is not performance-sensitive and does not induce effort (see Internet Appendix C.1.2 for further discussion).

To solve the problem, we have to make assumptions regarding the effort cost function, the effort aggregation function and the production function. We adopt a special case of the models of McGinty (2014) and Galashin and Popov (2016) by assuming that team members are perfect substitutes and that partners' output is determined by the sum of their efforts, i.e. $L(e_1, \dots, e_n) = (\sum_{i=1}^n e_i)^\theta$.³⁶ Partner i 's cost of effort is given by $g(e_i) = \chi e_i^2$. The first-order condition for partner i 's effort is:

$$\frac{pT_p}{n} \frac{\partial L}{\partial e_i} = \frac{\theta pT_p}{n} \left(\sum_{i=1}^n e_i \right)^{\theta-1} = g'(e_i) = 2\chi e_i \quad \text{for } i = 1, \dots, n \quad (37)$$

$$\Leftrightarrow e_i = \frac{p\theta T_p (\sum_{i=1}^n e_i)^{\theta-1}}{2n\chi} \quad \text{or equivalently } e_i = e \equiv \left(\frac{p\theta T_p}{2\chi} \right)^{\frac{1}{2-\theta}} \frac{1}{n} \equiv \frac{M}{n} \quad (38)$$

It follows that partners' aggregate effort ne is constant and equal to M , irrespective of partnership size n . A larger partnership is exactly offset by lower effort per partner, such that aggregate effort remains unchanged. This is a manifestation of the well-known free-rider problem within teams. Having identified the optimal effort levels as a function of D, n and a , the partnership's optimal size, liability and financing are the solution to:

$$\begin{aligned} \max_{\{D, n, a\}} \frac{1}{n} \sum_{i=1}^n \left[\frac{E_0(D, n, a) + B_0(D, n, a) - K}{n} - \frac{q g(e_i)}{r + \lambda} \right] &\equiv \frac{1}{n} \sum_{i=1}^n V_i(D, n, a; e_i) \\ \text{subject to } nc + D &\geq K \quad \text{and} \quad V_i(D, n, a; e_i) \geq \frac{qT_p w}{r + \lambda} \quad \text{for } i = 1, \dots, n \end{aligned} \quad (39)$$

Solving (see Online Appendix C.1) results in the same 5 regimes (u, h, m, l, R) and the following optimal size, effort and debt level:

$$n_j = \begin{cases} \frac{2\chi M^2}{(pM^\theta - G_j)T_p} & \text{for } j = u, m, R \\ \frac{K(1-\alpha)}{c + \gamma a \Gamma} & \text{for } j = h, l \quad \text{with } \Gamma = 1(0) \text{ if } j = l(j = h) \end{cases} \quad (40)$$

$$e_j n_j = M \quad \text{and} \quad D = K - n_j c \quad \text{for } j = u, h, m, l, R \quad (41)$$

³⁶McGinty (2014) and Galashin and Popov (2016) assume that $L = (\sum_{i=1}^n e_i^\rho)^{\frac{\theta}{\rho}}$ for $\rho \leq 1$.

where the constants G_j and the demarcation thresholds for the 5 regimes (c_h, c_m, c_l and $C^*(\phi)$) are given in Online Appendix C.1. The optimal size (effort) increases (decreases) in the cost of effort χ . Other properties of the optimal size (n) and debt level (D) are illustrated in Online Appendix C.1.

7.3 Senior partners' reputation

Our model takes the service price (p) as exogenous, whereas in practice fees depend both on the reputation of the senior partners and on the number of senior partners within the firm (insofar as a larger senior cohort can enhance perceived quality, reduce client risk, and support the delivery of complex services). However, these effects are likely subject to diminishing returns due to coordination costs and dilution of partner attention. This idea is consistent not only with reputation-based theories of partnerships (Morrison and Wilhelm (2004)), but also with human-capital aggregation and quality signaling (Gilson and Mnookin (1985)) and the concept of organizational capital in professional firms (Garicano and Hubbard (2016)).

Online Appendix C.2 extends our model by making the service price p a function of the number of senior partners, i.e. $p(n_1)$ with $p'(n_1) > 0$, $p''(n_1) < 0$ and $p(0) > 0$ (with numerical results for $p(n_1) = \mu + \xi n_1^\eta$ for $\xi \geq 0$ and $0 < \eta < 1$). This leads to a clearer differentiation between senior and junior partners' contribution to revenues $p(n_1)L(n_1, n_2)$. We show that our earlier result with 5 different financing regimes ($u, h, m.l, R$) remains intact. The effect of reputation on optimal size (n_1, n_2) is more complicated as it varies across regimes (see Figures OA.2 and OA.3 in Online Appendix C.2).

7.4 Model assumptions and further discussion

In this section we provide further discussion of our model assumptions.

1) Partners optimize value per partner (or value per share with unequal sharing) when setting optimal partnership size. Is this an assumption? No, it is a result. Partners' objective function follows from (i) the legal requirement that partners enter into a profit sharing agreement, and (ii) partners being the primary generators of the firm's profits.

2) We assume partners' capital endowment c to be exogenous. What is the optimal level for c ? Any level at which partners are not capital-constrained is optimal because in that case the optimal partnership size is solely determined by productivity considerations, and not by the amount of equity capital that has to be raised.

Is it optimal for partners to contribute their entire capital endowment c to the partnership, or might they prefer to retain some capital in a personal savings account? If the partners are weakly or severely capital-constrained, then it is optimal fully to invest c to minimize dilution costs from raising equity or liquidation costs from issuing debt. If the partnership is unconstrained, partners are indifferent between saving through the firm and saving through a personal account, since both offer the same rate of return.

Why do capital-constrained partners not raise equity capital from outside investors, such as limited partners? Partners with little capital and few personal assets could benefit from limited partners' capital if it is provided on sufficiently competitive terms. However, ethical codes established by professional associations prohibit non-professionals from owning stakes in law, accounting and medical firms (Von Nordenflycht (2010)) to prevent non-professionals from influencing professionals' judgement.

3) Might it be optimal for capital-constrained partners to liquidate their personal assets and contribute the cash proceeds as extra capital? Leaving aside the inconvenience of liquidating one's car or home, doing so implies that the liquidation costs are incurred upfront. By pledging the assets as collateral for secured debt, the liquidation costs of a successful partnership are deferred for the expected duration ($1/\lambda$) of the partnership.

4) Risky debt optimally emerges in conjunction with an LLP (i.e. $a = 0$). How robust is this result? We know from Equation (23) that value per share decreases in a for risky debt because $\partial V/\partial a = -\delta_0 [1 - \gamma(1 - \phi)] < 0$. Therefore, an LLP is optimal when debt is risky if personal assets are liquidated at a discount ($\gamma < 1$) or if bankruptcy costs are positive ($\phi > 0$). Liquidation costs need not be proportional. A fixed cost (e.g. auction commission fee) charged against the proceeds from selling personal assets is sufficient for an LLP to prevail when debt is risky.

What if bankruptcy costs are a fixed amount κ (e.g. court fees) that does not vary with partners' personal collateral a (i.e. lenders recover $\alpha K + \gamma Na - \kappa$ in bankruptcy). Our previous results and pecking order remain intact. Without bankruptcy costs ($\kappa = 0$) an LLP with risky debt is optimal as soon as the firm is capital constrained. As κ increases, the cutoff $C^*(\kappa)$ for the switch from safe to risky debt declines in κ , narrowing the interval $[0, C^*(\kappa)]$ over which an LLP with risky debt is optimal (see Online Appendix C.3).

5) We treat senior and junior partners' shareholdings as exogenously given. It is possible to endogenize φ_1 and φ_2 . Since senior partners call the shots, they set φ_1 and φ_2 to maximize the value of their shareholding $\varphi_1 V(\varphi_1, \varphi_2)$ subject to partners' participation constraint $V(\varphi_1, \varphi_2) \geq \max[\frac{w_1}{\varphi_1}, \frac{w_2}{\varphi_2}] q T_p / (r + \lambda)$. Senior partners' claim $\varphi_1 V(\varphi_1, \varphi_2)$ is declining in φ_2 . Therefore, if it is optimal to invest (i.e. there exist values for φ_2 for which the participation constraint is satisfied), then senior partners' claim is maximized by setting φ_2 equal to the lowest value φ_2^* that satisfies junior partners' participation constraint. Furthermore, if junior partners' reservation wage is less than senior partners' reservation wage ($w_2 \leq w_1$) then a junior's optimal shareholding is strictly less than a senior's, i.e. $\varphi_2^* < \varphi_1$ (see Online Appendix C.4 for details and numerical examples).

8 Empirical Implications and Conclusions

This paper examines the optimal size, financing, liability and investment policy of professional partnerships. Since partnerships are pass-through entities, debt does not provide a corporate taxshield advantage relative to equity. The optimal debt-equity mix is determined by a trade-off between expected liquidation and bankruptcy costs, and the cost of equity dilution. Our model generates several empirical implications.

1) We predict a pecking order of partnership financing. Inside equity is the preferred form of financing for professional partnerships. We expect average leverage levels to be low for professional partnerships.³⁷ If partners are capital-constrained then equity is complemented by debt that may or may not be secured by personal guarantees.³⁸

2) Our model predicts that weakly capital-constrained partnerships have safe debt and register as a General Partnership. Severely capital-constrained partnerships at risk of future insolvency optimally register as an LLP. Although partners in LLPs could voluntarily provide personal guarantees to creditors, it is not optimal for them to do so. We predict that LLPs have a higher leverage level and riskier debt than GPs.

3) Downward output price pressure or higher fixed costs not only make it harder for medical partnerships to enter or to survive in the industry, but also increase the size of active partnerships leading to more consolidation and concentration. Since fixed costs and price pressure vary significantly across medical specialties (such as obstetrics, ophthalmology, general practice,...), one would expect to see a corresponding variation in

³⁷A survey of 20 law firms from the Am Law 100 revealed that seven of them do not borrow any money at all. After 2008, in particular, many firm leaders began to question the whole idea of bank debt (Weiss (2013)). The story quotes Perkins Coie managing partner Robert Giles. “After all the firms started to fail, starting with Brobeck, then Heller, we stopped borrowing from the bank,” he said.

³⁸Anecdotal evidence suggests guarantees are common. E.g., the lender Funding Circle writes in its online physician’s guide to medical practice loans that medical practices often secure loans, lines of credit, or lease agreements through personal guarantees. Personal collateral or guarantees are an important component of lending to small businesses more generally (Avery et al. (1998)).

the partnership sizes across the different types of medical practices.

4) Partnerships do not maximize total profits but profits per partner (or, more generally, value per partner) leading to a smaller partnership size. This is consistent with empirical evidence by Pope and Burge (1996) who estimate the technically efficient medical practice size to be 5.2, compared to a sample average size of 2.4 physicians, which appears to suggest that medical practices leave money on the table.

Senior and junior equity partners may be allocated a different number of shares, but the marginal revenues per share is equalized between both classes of partners to ensure that neither class dilutes the value per share. This may explain why the capacity to generate business revenues is a key requirement to make it to partner.

If partnerships wish to scale up and do not need more equity capital, then a two-tier structure with senior equity partners and junior non-equity partners (associates or salaried “partners”) leads to a higher number of juniors and enables equity partners to lever up profits per partner compared to a full-equity partnership. We predict that two-tier partnerships are common in larger, less capital intensive professional services organizations such as law, auditing and consulting firms. Ring and Wiggins (2025) report that 87 of the 100 largest US law firms now have salaried partners. Garicano and Hubbard (2016) analyzing a sample of 9,283 US law offices find that about 40% of lawyers are associates, 25% are unleveraged partners (partners in offices with no associates), and 35% are leveraged partners. The average partner worked in an office with 15 partners and a partner-to-associate ratio of 1.67. Highly skilled lawyers leverage their talent by working with associates. This type of hierarchy boosts aggregate output by at least 30% and significantly increases earnings per partner. Our model shows that shifting from a full-equity partnership to a two-tier partnership easily boosts the value per share by 30% or more (see Table 1).

5) Our model highlights the intricate interaction between the partnership’s policies. Equity partners not only contribute capital but also produce services, creating a link between financing and production. A tightening capital constraint means that the partnership has to issue more debt or recruit more equity partners. High expected bankruptcy costs limit the firm’s debt capacity, causing partnerships to become inefficiently large if partners are recruited not for their profit generating capability, but for the capital or personal guarantees they contribute.

6) Our model predicts that knowledge-based services firms with low capital requirements are ideal candidates for the partnership model. Prime examples are law, accounting, and management consulting firms. Capital requirements within the medical sector vary a lot as some equipment (e.g. scanners) can be very expensive. This may explain why medical service providers with relatively low capital requirements such as physicians, dentists, psychiatrists, ophthalmologists, physical therapists, chiropractors, veterinarians, and specialist health clinicians operate in partnerships. Capital-intensive specialists such as radiologists, anesthesiologists, and surgeons usually have a practice within a private or state-owned hospital. Finally, firms that are both knowledge-intensive and capital-intensive may prefer a business structure that allows ownership and control to be separated. For example, a team of scientists that set up a biotech firm or R&D lab with a view to invent a new drug or product may initially operate as a LLC and raise the required capital from passive equityholders.

Appendix

Proof of Proposition 1

The first-order conditions for n_i , $i = 1, 2$, are given by (14). Differentiate V with respect

to D and a gives $\frac{\partial V}{\partial D} = -\frac{1}{N} \frac{qT_p}{r+\lambda} \frac{\partial F}{\partial D}$ and $\frac{\partial V}{\partial a} = -\frac{1}{N} \frac{qT_p}{r+\lambda} \frac{\partial F}{\partial a}$, with the following:

$$\begin{aligned} \text{if } D \leq \alpha K : \frac{\partial F}{\partial D} &= 0, \frac{\partial F}{\partial a} = 0, \frac{\partial F}{\partial n_1} = \frac{\partial F}{\partial n_2} = 0 \\ \text{if } \alpha K < D \leq \alpha K + \gamma Na : \frac{\partial F}{\partial D} &= \frac{r + \lambda - rq}{qT_p} \left(\frac{1}{\gamma} - 1 \right) > 0, \frac{\partial F}{\partial a} = \frac{\partial F}{\partial n_1} = \frac{\partial F}{\partial n_2} = 0 \\ \text{if } D > \alpha K + \gamma Na : \frac{\partial F}{\partial D} &= 0, \frac{\partial F}{\partial a} = N \frac{r + \lambda - rq}{qT_p} (1 - \gamma + \phi\gamma) > 0, \\ &\frac{\partial F}{\partial n_i} = -\frac{(r + \lambda - rq)}{qT_p} ((1 - \phi)\gamma - 1) a \varphi_i \text{ for } i = 1, 2 \end{aligned}$$

As a result, $D^* = D_u \leq \alpha K$ and a becomes irrelevant. The resulting value function is

$$V_u = \frac{qT_p}{r + \lambda} \frac{pL(n_{1u}, n_{2u}) - G_u}{N_u} = \frac{qT_p}{r + \lambda} \frac{pL_1(n_{1u}, n_{2u})}{\varphi_1} = \frac{qT_p}{r + \lambda} \frac{pL_2(n_{1u}, n_{2u})}{\varphi_2} \quad (42)$$

The second-order conditions are satisfied if $L_{11} < 0$, $L_{22} < 0$ and $L_{11}L_{22} > (L_{12})^2$. ■

Proof of Proposition 2

To solve the problem in (8) - (10), we first assume p is high enough such that the participation constraints are satisfied and introduce a multiplier β :

$$H = \max_{\{D, n_1, n_2, a\}} \frac{qT_p}{r + \lambda} \frac{pL(n_1, n_2) - F(D, n_1, n_2, a)}{N} + \beta(Nc + D - K) \quad (43)$$

$$\frac{\partial H}{\partial n_i} = \frac{qT_p}{r + \lambda} \frac{\left(pL_i - \frac{\partial F}{\partial n_i} \right) N - (pL - F) \varphi_i}{N^2} + \beta c \varphi_i = 0 \text{ for } i = 1, 2 \quad (44)$$

$$\frac{\partial H}{\partial D} = -\frac{qT_p}{r + \lambda} \frac{1}{N} \frac{\partial F}{\partial D} + \beta = 0 \Rightarrow \beta = \frac{qT_p}{r + \lambda} \frac{1}{N} \frac{\partial F}{\partial D} \quad (45)$$

$$\frac{\partial H}{\partial a} = -\frac{qT_p}{r + \lambda} \frac{1}{N} \frac{\partial F}{\partial a} \leq 0, \frac{\partial H}{\partial \beta} = Nc + D - K \geq 0 \quad (46)$$

where $F(D, n_1, n_2, a)$ is given in (7). $n_i \frac{\partial H}{\partial n_i} = \beta \frac{\partial H}{\partial \beta} = a \frac{\partial H}{\partial a} = 0$ are required to ensure n_i, a

and β are non-negative. Substituting (45) to (44) yields: $p \frac{L_i(n_1, n_2)}{\varphi_i} = \frac{pL(n_1, n_2) - G}{N}$, where

$$G = \begin{cases} G_u \equiv \frac{1}{qT_p} [fqT_p + (r + \lambda)K - (r + \lambda - rq)\alpha K] & \text{if } D \leq \alpha K \\ G_m \equiv \frac{1}{qT_p} \left[fqT_p + (r + \lambda)K - \left(\frac{\alpha}{\gamma} + 1 - \frac{1}{\gamma} \right) (r + \lambda - rq)K \right] & \text{if } \alpha K < D \leq \alpha K + Na\gamma \\ G_R \equiv \frac{1}{qT_p} [fqT_p + (r + \lambda)K - (1 - \phi)(r + \lambda - rq)\alpha K] & \text{if } D > \alpha K + Na\gamma \end{cases} \quad (47)$$

The first-order conditions imply the following solutions:

Solution U: given by Proposition 1, and is valid for $c \geq c_h \equiv \frac{K - \alpha K}{N_u}$.

Solution H: $D_h = \alpha K$, and $a_h \in \mathcal{R}^+$. The binding budget constraint and (44) imply $n_{1h}(c)$ and $n_{2h}(c)$ are solution to (18). We show later solution H is dominated by either solution M or L for $c \leq c_m$. Thus, it is the optimal solution for $[c_m, c_h]$ with

$$V_h(c) = \frac{qT_p}{r + \lambda} \frac{1}{N_h} [pL(n_{1h}, n_{2h}) - G_u] \quad (48)$$

Solution M: Equations (44) and (45) imply n_{1m} and n_{2m} are such that (19) is satisfied. Note $G_m \geq G_u \Leftrightarrow \alpha \leq 1$. Condition (45) gives $D_m = K - N_m c \in (\alpha K, \alpha K + N_m a_m \gamma]$, implying $N_m > N_u$. Therefore, solution M is valid for $c_l \equiv \frac{K - \alpha K}{N_m} - a_m \gamma \leq c \leq \frac{K - \alpha K}{N_m} \equiv c_m$. We show later that $a_m = A$. The resulting value function is

$$V_m(c) = \frac{qT_p}{r + \lambda} \left[pL_i(n_{1m}, n_{2m}) + \frac{(\frac{1}{\gamma} - 1)(r + \lambda - rq)}{qT_p} c \varphi_i \right] \frac{1}{\varphi_i} \text{ for } i = 1, 2 \quad (49)$$

Solution L: $D_l = \alpha K + N_l A \gamma = K - N_l c$. $n_{1l}(c)$ and $n_{2l}(c)$ are solution to (20). We show later $a_l = A$ and solution L is dominated by either solution H or M for $c_l \leq c \leq c_h$. Therefore, it is the optimal solution for $c \leq c_l$ with

$$V_l(c) = \frac{qT_p}{r + \lambda} \frac{1}{N_l} [pL(N_{1l}, n_{2l}) - F(D_l, n_{1l}, n_{2l}, a_l)] \quad \text{where} \quad (50)$$

$$F(D_l, n_{1l}, n_{2l}, a_l) \equiv \frac{1}{qT_p} [fqT_p + (r + \lambda)K - (r + \lambda - rq)(\alpha K - (1 - \gamma)N_l A)] \quad (51)$$

Solution R: $D_R \geq \alpha K + n_R a_R \gamma$, and (n_{1R}, n_{2R}) are such that (22) holds. The first-order condition (23) implies $a_R = 0$. Substituting the optimal policies shows

$$V_R(\phi) = \frac{qT_p}{r + \lambda} \frac{pL(n_{1R}, n_{2R}) - G_R}{N_R} = \frac{qT_p}{r + \lambda} \frac{pL_i(n_{1R}, n_{2R})}{\varphi_i}, \quad i = 1, 2 \quad (52)$$

The second-order conditions for solutions H, M and L are satisfied if $2\varphi_1\varphi_2L_{12} > \varphi_1^2L_{22} + \varphi_2^2L_{11}$, which holds if $L_{12} \geq 0$. At $c = c_m$, $(D_j, n_{ij}, N_j) = (\alpha K, n_{im}, \frac{K - \alpha K}{c_m})$ for $j = m, h$, with $V_m(c_m) = V_h(c_m)$. At $c = c_l$, $(D_j, n_{ij}, a_j, N_j) = (\alpha K + N_m A, n_{im}, A, \frac{K - \alpha K}{c_l + \gamma A})$ for $j = m, l$, with $V_l = V_m$. Differentiating (48) - (50) with respect to c gives

$$\begin{aligned} \frac{\partial V_h}{\partial c} &= -\frac{qT_p}{r + \lambda} \frac{1}{c} \left(p \frac{L_i}{\varphi_i} - \frac{pL - G_u}{N_h} \right), \quad \frac{\partial V_l}{\partial c} = -\frac{qT_p}{r + \lambda} \frac{1}{c + \gamma A} \left(p \frac{L_i}{\varphi_i} - \frac{pL - G_u}{N_l} \right) \\ \frac{\partial V_l}{\partial c} \Big|_{c_l} &= \frac{(\frac{1}{\gamma} - 1)(r + \lambda - rq)}{r + \lambda} = \frac{\partial V_m}{\partial c} > 0, \quad \frac{\partial^2 V_h}{\partial c^2} = -\frac{qT_p p}{r + \lambda} \frac{p}{\varphi_1 c} \left(L_{11} \frac{\partial n_1}{\partial c} + L_{12} \frac{\partial n_2}{\partial c} \right) \leq 0, \\ \frac{\partial^2 V_m}{\partial c^2} &= 0, \quad \text{and} \quad \frac{\partial^2 V_l}{\partial c^2} = -\frac{qT_p p}{r + \lambda} \frac{p}{\varphi_1(c + \gamma A)} \left(L_{11} \frac{\partial n_1}{\partial c} + L_{12} \frac{\partial n_2}{\partial c} \right) \leq 0 \end{aligned}$$

Note that $\frac{\partial V_h}{\partial c} > 0$ for $c \leq c_h$, while $\frac{\partial V_l}{\partial c} > (<)0$ for $c \leq (\geq)c_h - \gamma A$. These imply that V_h is a concave increasing function of c for $c \leq c_h$, V_m is linearly increasing in c , and V_l is a concave increasing (decreasing) function of c for $c \leq (\geq)c_h - \gamma A \in [c_l, c_h]$. Both smooth-pasting and value-matching conditions are satisfied at $c = c_m$, implying $V_m \geq V_h$ for $c \leq c_m$. V_h and V_u value-match and smooth-paste at c_h , while V_l smooth-pastes and value-matches with V_m at $c = c_l$. Therefore, $V_m \geq V_l$ for all $c \geq 0$. To compare solutions H and L, one can show that $V_h(c_h) = V_u(c_h) > V_l(c_h)$, $V_h(c_m) = V_m(c_m) > V_l(c_m)$, and $V_h(c_l) < V_m(c_l) = V_l(c_l)$. Consequently, there is a unique crossing point $c_{hl} \in (c_l, c_m)$ such that $V_h \geq (\leq)V_l \Leftrightarrow c \geq (\leq)c_{hl}$, implying $V_l \leq (\geq)V_h$ for $c_m \leq c \leq c_h$ ($c \leq c_l$). As a result, $V_S(c)$ is a continuously decreasing function of c . Note that n_{iu} and n_{im} are independent

of c , while n_{ih} and n_{il} are decreasing in c . Therefore, $n_{1S}(c)$, $n_{2S}(c)$ and $D_S(c)$ are weakly decreasing and continuous functions of c .

Since solution L is always dominated by M, the partnership finds it optimal to increase a to expand regime M, i.e. $a_m = A$. For solution L, with a given c , substituting $N_l a = (K - \alpha K - c)/\gamma$ to (51) gives $F_l = G_m - \frac{1}{qT_p}(r + \lambda - rq)(\frac{1}{\gamma} - 1)c$. Moreover, for $N_l \leq N_m$,

$$\frac{\partial V_l}{\partial a}|_c = -2 \frac{qT_p \gamma}{r + \lambda} \frac{K - \alpha K}{(c + a\gamma)^2} \left[p \frac{L_1}{\varphi_1} - \frac{pL - G_m}{N_l} - \frac{r + \lambda - rq}{qT_p} \left(\frac{1}{\gamma} - 1 \right) c \right] \leq 0 \quad (53)$$

Therefore, $a_l = A$. Note that $c_l \leq 0 \Leftrightarrow A \geq c_m/\gamma$, in which case regime L drops out.

Whenever $V_R(\phi) \geq V_S(0)$, there exists a $C^*(\phi) \geq 0$ s.t. $V_R(\phi) \leq (\geq) V_S(c) \Leftrightarrow c \geq (\leq) C^*(\phi)$ since V_R is independent of c but decreasing in ϕ , with $V_R(\phi = 0) = V_u$, while $V_S(c)$ is continuously decreasing in c . If $V_R(\phi) < V_S(0)$, safe debt is always preferred. ■

Proof of Proposition 3

$\bar{p}_u$ is such that $L_1(n_{1u}(\bar{p}_u), n_{2u}(\bar{p}_u))/\varphi_1 = \max[\frac{w_1}{\varphi_1}, \frac{w_2}{\varphi_2}] \equiv B$ and is independent of c . One can show that for $j = h, l$, and for regime M and R:

$$\begin{aligned} \frac{\partial \bar{p}_j}{\partial c} &= \frac{1}{L_j} \left[\varphi_1 \frac{\partial n_{1j}}{\partial c} \left(\frac{\bar{p}_j L_j - G_u}{N_j} - \bar{p}_j \frac{L_1}{\varphi_1} \right) + \varphi_2 \frac{\partial n_{2j}}{\partial c} \left(\frac{\bar{p}_j L_j - G_u}{N_j} - \bar{p}_j \frac{L_2}{\varphi_2} \right) \right] \leq 0, \\ \frac{\partial \bar{p}_m}{\partial c} &= - \left[\frac{L_1}{\varphi_1} + \frac{r + \lambda - rq}{qT_p} \left(\frac{1}{\gamma} - 1 \right) \right] \frac{N \bar{p}_m^2}{G_m \varphi_1} \leq 0 \quad \text{and} \quad \frac{\partial \bar{p}_R}{\partial \phi} = \frac{\alpha K (r + \lambda - rq)}{qT_p L} \frac{1}{N_R} \frac{L_1}{\varphi_1} > 0 \end{aligned}$$

Therefore, $\bar{p}_S$ is continuously decreasing in c given the cutoffs in (26). Additionally, $\bar{p}_R(\phi) \geq \bar{p}_u$ for $\phi \geq 0$. Note that $\bar{\phi}_m$ and $\bar{\phi}_l$ are such that $\bar{p}_R(\bar{\phi}_m) = \bar{p}_S(\bar{c}_m)$ and $\bar{p}_R(\bar{\phi}_l) = \bar{p}_S(\bar{c}_l)$. For $0 \leq \phi \leq \min[1, \bar{\phi}_0]$, there exists a $\bar{C}^*(\phi)$ such that $\bar{p}_R(\phi) \leq (\geq) \bar{p}_S \Leftrightarrow c \leq (\geq) \bar{C}^*(\phi)$. $\bar{C}^*(\phi) = \bar{C}_S(\phi)$ for $S = h, m, l$ is:

$$\bar{C}_h(\phi) \text{ is s.t. } \bar{p}_h(c) = \frac{N_h(c)B + G_u}{L(n_{1h}(c) + n_{2h}(c))} = \bar{p}_R(\phi) \text{ for } 0 \leq \phi \leq \min[\bar{\phi}_m, 1] \quad (54)$$

$$\bar{C}_m(\phi) = \frac{\bar{p}_R(\phi)qT_p(1-\gamma)(L_{1R}(\phi, \bar{p}_R) - L_{1m}(\bar{p}_R))}{\varphi_1(r + \lambda - rq)\gamma} \text{ for } \min[\bar{\phi}_m, 1] < \phi \leq \min[\bar{\phi}_l, 1] \quad (55)$$

$$\bar{C}_l(\phi) \text{ is s.t. } \bar{p}_l(c) = \frac{BN_l(c) + F_l(c)}{L(n_{1l}(c), n_{2l}(c))} = \bar{p}_R(\phi) \text{ for } \min[\bar{\phi}_l, 1] < \phi \leq \min[\bar{\phi}_0, 1] \quad (56)$$

If $\min[\bar{\phi}_m, 1] = 1$, $\bar{C}^*(\phi) = \bar{C}_h(\phi)$ for all ϕ . When $\min[\bar{\phi}_l, 1] = 1$, $\bar{C}^*(\phi) = \bar{C}_m(\phi)$ or $\bar{C}_h(\phi)$. If $\min[\bar{\phi}_0, 1] = 1$, $\bar{C}^*(\phi) \in [0, \bar{c}_h]$. When $\min[\bar{\phi}_0, 1] < \phi$, $\bar{p}^*(c, \phi) = \bar{p}_S$ for $c \geq 0$.

When $A \geq \bar{A}$, where $\bar{A}$ is such that $\bar{c}_l = 0$, there are only two cutoffs: $\bar{\phi}_m$ and $\bar{\phi}_0$. If $\min[\bar{\phi}_m, 1] \leq \phi \leq \min[\bar{\phi}_0, 1]$: $\bar{p}^*(c, \phi) = \bar{p}_m(c)$ for $\bar{C}_m(\phi) \leq c \leq \bar{c}_m$. For $\min[\bar{\phi}_0, 1] \leq \phi \leq 1$: $\bar{p}^*(c, \phi) = \bar{p}_m(c)$ for $0 \leq c \leq \bar{c}_m$. ■

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