

Anatomy of a VC Boom: A Theory of Skills and Bargaining Power

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Abstract

This paper provides the first microfounded theory of how bargaining power evolves over the lifecycle of a venture capital boom. Bargaining power acts as the Walrasian price that clears the market for talent. The initial phase of a boom features pure price adjustment, where incumbent VCs capture windfall rents. High prospective returns induce a long-run phase of quantity adjustment, as new VCs and entrepreneurs enter the market. The ultimate long-run reallocation of bargaining power is governed by which party's talent is rendered scarce at the margin—a function of the initial distribution of skills, asymmetric sensitivities to market heat, and a “*rich-get-richer*” dynamic consistent with incumbent VC performance persistence.

JEL: G24, M13, C78

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1 Introduction

The allocation of bargaining power between entrepreneurs and venture capitalists (VCs) governs nearly every measure observed by empiricists: from the financial returns earned by each party, to exit timing and the patience VCs exhibit toward under-performing projects. Yet any attempt to understand the drivers of this crucial variable is confronted by a severe identification problem. First, when econometricians observe equilibrium quantities and prices, they do not observe the underlying supply and demand for capital that jointly determine them. Second, this challenge is compounded by multiple, nested layers of unobserved negotiation: the bargain struck between an entrepreneur and a VC’s general partners is distinct from the one between those general partners and their limited partners. Third, the primary empirical proxy—returns to limited partners—is realized only with long lags and is confounded by unexpected shocks that occur years after the initial contract is signed. Faced with these layers of unobservability, the empirical literature has largely relied on “theory-lite” narratives of what determines bargaining power. While these stories can provide ex-post rationalization for observed patterns, they lack the formal structure needed to rigorously analyze the underlying economic mechanisms or make new predictions.

This paper provides the first microfounded theory of how bargaining power evolves over the lifecycle of a venture boom.¹ In our model, a positive shock generates a two-phase cycle: an initial short-run phase of price adjustment, where incumbent VCs capture windfall rents, followed by a long-run phase of quantity adjustment in which new VCs and new entrepreneurs enter the market. The long-run change in bargaining power in response to this market heating, however, is not uniform. Its direction depends on the interplay between the talent pools on each side of the market. For instance, a “*Democratizing Shock*” like

¹While some search-based models have endogenized the outcome of a bargain between VC and entrepreneur, they typically do so by employing a Nash bargaining framework where the parties’ relative power is governed by an exogenously specified Nash parameter β . Such models are silent on the market-wide entry incentives that would make any pre-specified β untenable in a market with free entry; if it were too low, for instance, few entrepreneurs would enter to meet a large supply of VCs.

the dot-com boom creates a deep pool of entrepreneurs with closely substitutable business plans. Conversely, a “*Specializing Shock*” like the AI or CRISPR boom creates demand for a scarce and non-substitutable set of skills. Our model’s key insight is that the ultimate shift in bargaining power is determined not by the average scarcity of talent, but by the local density of skill at the margin: whether the market must accept a large drop in quality to attract a wave of entrants of a given magnitude, or can instead draw from a deep pool of close substitutes. It is this marginal elasticity of talent supply that dictates which party’s bargaining power improves as investment opportunities shift. Further, these elasticities need not be fixed as a boom matures and the market dives deeper into both talent pools.

Our approach models a market with free entry for a continuum of heterogeneous agents on both sides. Agents with varying skill levels choose whether to become venture capitalists or entrepreneurs based on their expected profits. Equilibrium arises when the division of surplus—our measure of bargaining power—adjusts to equate the supply of VCs with the demand from entrepreneurs. In this market-clearing equilibrium, the marginal (i.e., worst active) agent on each side earns zero economic profit, while all inframarginal agents earn rents based on the scarcity and substitutability of their unique skills. This framework allows us to analyze not only how the division of surplus is determined, but also how the composition of active market participants changes over the economic cycle.

More specifically, we model agent quality as coming from a continuous distribution. We refer to an agent as ‘special’ if the probability density is low in the region adjacent to him; that is, there are few agents of comparable quality. One key parameter in our model is v , defined as the exit value of successful projects. As higher exit values directly increase the total surplus available from an investment, v drives market activity and serves as our measure of market heat.² A second key parameter, k , acts as a proxy for bargaining power.

²The link between high public market valuations, which increase the value of the exit option for entrepreneurs, and booms in business creation is a standard theoretical result.

This framework allows us to analyze how bargaining power varies with market heat. While the general effect is ambiguous, the final *long-run* outcome in a hotter market is governed by three key properties of our model:

1. Hot markets favor the party who is more ‘special’ at the margin (i.e., the party whose skills are less easily replaced at the current equilibrium).
2. Hot markets favor the party whose payoffs are less sensitive to it at equilibrium.
3. (“*Rich get richer*”) Hot markets amplify the the existing allocation of rents between VCs and entrepreneurs.

To understand Property 1, imagine a technological shock that increases exit values. More entrepreneurs are enticed to create startups, which in turn requires more VCs to enter and satisfy this new capital demand. The new allocation of bargaining power depends on the relative elasticity of supply on each side of the market. Suppose, for instance, that there is a large mass of potential entrepreneurs with skills similar to the current marginal agent. In this case, the entrepreneurial supply is highly elastic; a small improvement in their contract terms would induce a large influx of new entrants. By contrast, suppose the supply of VC talent is inelastic, with a steep drop-off in quality below the current margin. To prevent an imbalance where capital demand vastly outstrips supply, the market must adjust: bargaining power endogenously shifts toward the VCs, the relatively scarce and less substitutable factor of production.

To understand Property 2, it is useful to first consider the source of each party’s surplus. There is no reason to assume that an entrepreneur and a VC should benefit equally from a higher exit value. The two parties contribute a fundamentally different mix of inputs—from

sweat equity and human capital on one side to financial and reputational capital on the other. An increase in a project’s exit value does not imply that the returns to these distinct inputs will scale in lockstep. Moreover, the nature and intensity of these contributions may themselves change with market conditions; a hotter market might require more effort from a founder, or perhaps less intensive monitoring from a VC managing a riskier portfolio. The sensitivity of each party’s net payoff to market heat is therefore not fixed, but is determined by the specific production technology of the venture. Our framework shows how these potential asymmetries translate into market outcomes through entry incentives. To maintain equilibrium, the market must temper the entry incentives of the more sensitive party. Consequently, bargaining power endogenously shifts toward the party whose value function is less sensitive to market heat, as this is the only way to keep the supply and demand for talent in balance.

Property 3 captures the interaction between market heat and inframarginal rents. Even if bargaining power shifts slightly against VCs, the “rising tide” of higher exit values (v) ensures that incumbent VCs are strictly better off. Crucially, this benefit is not uniform. The equilibrium mechanism forces the marginal VC to zero profit, but because high-skill VCs are much further from this zero-profit bound, they capture a disproportionate share of the new surplus.

This “rich get richer” dynamic provides a new, market-based resolution to the puzzle of performance persistence in venture capital. Empirical studies famously show that, unlike in mutual funds, the performance of top-quartile VC funds is highly likely to persist in subsequent funds. The puzzle is why competitive capital inflows do not erode these returns to skill. Our model answers this by highlighting the role of the extensive margin. In a boom, the entry of lower-quality VCs prevents the market-clearing price of capital from tightening enough to extract the surplus generated by high-skill incumbents. More formally,

a hot market steepens the slope of the return-to-skill function—a mechanism we term *skill amplification*. Consequently, while the “rich get richer” effect preserves rents for the sector in the aggregate, it disproportionately amplifies the returns of the highest-skilled agents. The market cycle thus acts to widen the performance gap between elite and average VCs, yielding the novel prediction that performance persistence should be procyclical—strongest when the market is hot.

The remainder of the paper proceeds as follows. Section 2 develops the long-run model. Section 3 analyzes the short-run dynamics and presents the full anatomy of a venture boom, accompanied by a numerical example that illustrates our key results. Section 4 provides empirically testable predictions for the two types of market booms: *Democratizing* versus *Specializing shocks*. Section 5 concludes.

1.1 Related Literature

A vast empirical literature documents the cyclical nature of venture capital markets. A central stylized fact is the “*money chasing deals*” phenomenon, where large capital inflows into the industry are associated with higher startup valuations and subsequently lower returns for VC funds (Gompers and Lerner, 2000). Recent work shows this dynamic persists, with increased competition among VCs leading to more founder-friendly terms, such as lower VC equity stakes and less board control (Dai, Jo, and Ross, 2023). Our paper provides a rigorous microfoundation for these cyclical swings in bargaining power.

While many models of venture capital focus on a single entrepreneur-VC pair, a growing stream of the literature recognizes that financing is the outcome of a matching process with search frictions, building on the canonical frameworks from labor economics (e.g., Pissarides (2000)). For example, Inderst and Müller (2004) layer search over top of a model in which firm value depends upon effort provision by both the entrepreneur and VCs. Agents are

matched in a costly search model. Once matched, they engage in Nash bargaining, which requires specifying each party’s reservation utility—what happens if the deal breaks down—as well as a parameter β which captures the notion of bargaining power. [Inderst and Müller \(2004\)](#) employ Walrasian-like reasoning in determining reservation utilities, arguing that a larger number of VCs should improve entrepreneurs’ outside options. The Nash bargaining itself, however, uses an exogenous bargaining power parameter β . The central finding of [Inderst and Müller \(2004\)](#) is that imbalances in this parameter are harmful, as the party with too little power will under-contribute effort, thus destroying firm value.

More fundamentally, our approach differs from the canonical search-and-matching paradigm in its central economic question. That literature’s normative benchmark, established in the classic work of [Hosios \(1990\)](#), is to identify the division of bargaining power that is socially efficient by internalizing search externalities for a *given* pool of market participants. Our paper asks a different, positive question: what determines the division of surplus in a competitive market with free entry? In our framework, bargaining power is not a parameter to be optimized for social welfare, but is instead the market-clearing price that governs the extensive margin—who enters the market in the first place.

Our assumptions and conclusions are therefore quite different from [Inderst and Müller \(2004\)](#). In their model, entrepreneurs are identical, as are VCs for most of the analysis. An extension that allows for an exogenous “entry cost” for VCs requires that net profits are driven to zero. Our paper differs on all of these margins. Both entrepreneurs and VCs are heterogeneous, and there is free entry on both sides. In our model, all but the marginal agent on each side earn strictly positive economic profits, as their skills are imperfectly substitutable.

Our approach complements foundational work on sorting in VC markets, such as

[Sørensen \(2007\)](#). Sørensen’s two-sided matching model explains the crucial cross-sectional pattern of why high-reputation VCs endogenously match with high-quality entrepreneurs. Our model, by contrast, isolates a different mechanism: how the aggregate level of bargaining power itself acts as a Walrasian price to clear the market, explaining the time-series variation in why the entire market can shift to become more VC- or entrepreneur-friendly.

[Ewens, Gorbenko, and Korteweg \(2022\)](#) provide another recent, important contribution by structurally estimating a dynamic search-and-matching model to quantify the impact of specific contract terms on firm value, while correcting for endogenous selection. A key finding is that while an optimal, value-maximizing contract exists, VCs use their bargaining power to negotiate more investor-friendly terms. While their work provides a detailed micro-level view of how contracts function within a given market state, our model provides the macro-level theory of how the entire market state—the prevailing level of bargaining power—evolves over the economic cycle.

Our model’s equilibrium approach also relates to other large-scale models of the venture ecosystem. [Gornall and Strebulaev \(2020\)](#), for instance, build a large-scale, computational equilibrium model of the entire U.S. venture capital sector to quantify its impact on innovation and the broader economy. While their focus is on quantifying aggregate welfare effects, our tractable analytical model is designed to isolate the specific mechanisms that drive the allocation of bargaining power during market cycles.

This paper builds directly on [Yung \(2017\)](#), which establishes the empirical fact that hot markets lead to wider dispersion in both entrepreneur and VC quality. However, that prior work focused exclusively on these second-moment predictions and, by assuming a uniform talent distribution, could not analyze the division of surplus. The present paper introduces two theoretical innovations: first, we endogenize bargaining power, making the division of

surplus the central object of study. Second, by allowing for general talent distributions, we can analyze how scarcity at the margin determines market outcomes. This richer framework allows us to explain the entire dynamic lifecycle of a boom, distinguishing between the short-run price adjustments that generate incumbency rents and the long-run quantity adjustments that ultimately determine how the gains from a boom are divided.

Our work shares a focus on potential conflicts with [Jovanovic and Szentes \(2013\)](#). They argue that VCs, being in short supply and having better outside options, are more impatient than entrepreneurs, and they study the resulting conflicts over liquidation decisions. Contrary to their approach, we allow free entry of VCs rather than assuming they are in short supply. In our model, the ability of each side to enter and exit the market in response to economic conditions is the very mechanism that determines the equilibrium division of surplus.

Our framework also provides a new, dynamic mechanism for the well-documented puzzle of performance persistence in venture capital. The persistence of top-quartile fund performance is a robust stylized fact, firmly established in surveys such as [Kaplan and Sensoy \(2015\)](#) and carefully disentangled from luck by [Korteweg and Sørensen \(2015\)](#). Existing explanations for this phenomenon are largely micro-level and static, focusing on the informational hold-up power derived from a VC’s network ([Hochberg, Ljungqvist, and Vissing-Jørgensen, 2014](#)) or the reputational feedback loops generated by early career success ([Nanda, Samila, and Sorenson, 2020](#)). Our model complements these views by introducing a distinct, market-wide amplification channel. While mechanisms like informational hold-up are persistent across market states, our “amplification of skill” result (Theorem 2.5) shows how market cycles themselves act as an engine that dynamically widens the performance gap between elite and average VCs. This suggests that the strength and statistical observability of performance persistence should be procyclical, a key prediction of our framework.

2 Model

2.1 Overview

This subsection outlines the players, the timeline, and the information structure. The timeline of the game is as follows.

Table 1: The timeline of the model

Period	Actions
$T = 1$ (Initialization)	Potential entrepreneurs and VCs privately observe their own skill levels
$T = 2$ (Entry)	Agents decide whether to incur search costs to enter the market
$T = 3$ (Matching)	Entrants are randomly matched (one VC to one entrepreneur)
$T = 4$ (Investment)	The VC screens the project and decides whether to fund
$T = 5$ (Realization)	If funded, the project outcome is realized and payoffs are distributed

2.1.1 Agents and Abilities

The economy consists of a population of potential entrepreneurs (of mass Ω_D) and a population of potential VCs (of mass Ω_S). Agents on both sides are heterogeneous and risk-neutral. At $T = 1$, each potential entrepreneur i is endowed with the ability to generate a business idea. The quality of this idea, denoted by w_i , is binary: $w_i \in \{w_B, w_G\}$, where w_G (or w_B) represents a ‘good’ (or a ‘bad’) idea. The entrepreneur does not observe w_i directly but knows his probability of generating a good idea, denoted $p_i := \Pr(w_i = w_G)$. The skill parameter p_i is an i.i.d. random variable drawn from a known prior distribution $G : (0, 1) \rightarrow [0, 1]$.

VCs are born with the ability to screen these ideas. Each potential VC j is endowed with a screening skill e_j , interpreted as an ‘error rate’ in their signal, which is defined in more detail below. This skill e_j is an i.i.d. random variable drawn from a known prior distribution $F : (0, 1/2) \rightarrow [0, 1]$.

2.1.2 Entry and Matching

At $T = 2$, agents make their entry decisions. Potential entrepreneurs decide whether to pay a search cost $C_e > 0$ to enter the market. Similarly, potential VCs decide whether to pay a search cost $C_{VC} > 0$ to enter. We interpret these costs as the opportunity cost of time required to prepare a pitch or set up a fund.

Next, at $T = 3$, all entrants are randomly matched. Each entrepreneur is matched with exactly one VC, and vice versa. We assume for now (and later verify) that entry follows a threshold rule: entrepreneurs enter if and only if their skill exceeds a minimum level required in the market: $p_i \geq p_{min}$. Similarly, VCs enter only if their skill is sufficiently high, i.e., their signal errors follow $e_j \leq e_{max}$.

2.1.3 Payoffs and Screening

Once matched, at $T = 4$, the VC must decide whether to invest an amount $I > 0$ to launch the project.

Screening Technology Before investing, the VC evaluates the entrepreneur's idea and receives a noisy signal $s_{i,j} \in \{H, L\}$. Let $\epsilon_{i,j} \in \{0, 1\}$ be an indicator for whether the signal is incorrect: i.e., $\epsilon_{i,j} = 1$ indicates that VC j receives an incorrect signal against the actual quality of entrepreneur i 's idea. The probability of an error depends on the VC's skill e_j (the error rate):

$$\begin{aligned} \Pr(\epsilon_{i,j} = 1 \mid w_i, p_i, e_j) &= \Pr(s_{i,j} = L \mid w_i = w_G) = \Pr(s_{i,j} = H \mid w_i = w_B) = e_j \\ \Pr(\epsilon_{i,j} = 0 \mid w_i, p_i, e_j) &= \Pr(s_{i,j} = L \mid w_i = w_B) = \Pr(s_{i,j} = H \mid w_i = w_G) = 1 - e_j \end{aligned} \quad (1)$$

Payoff Structure If a project is funded, its true quality w_i is realized at $T = 5$. If $w_i = w_B$, the project fails and yields a payoff of 0 to both parties. If $w_i = w_G$, the project

succeeds. The value of a successful project is governed by the parameter $v > 0$, which represents “market heat” (e.g., the exit value).

The surplus from a success is divided according to the bargaining power parameter $k \in (0, 1)$, where a higher level of k represents stronger bargaining power (thereby, a higher share of surplus) assigned to entrepreneurs in the market. We denote the value functions net of effort/investment costs as $V^{VC}(w, k, v)$ and $V^e(w, k, v)$, with the following properties:

$$\begin{aligned} V^{VC}(w_B, k, v) &= 0, & V^e(w_B, k, v) &= 0, \\ V^{VC}(w_G, k, v) &> 0, & V^e(w_G, k, v) &> 0, \end{aligned} \tag{2}$$

$$\begin{aligned} \frac{\partial V^{VC}}{\partial v} &> 0, & \frac{\partial V^e}{\partial v} &> 0, \\ \frac{\partial V^{VC}}{\partial k} &< 0, & \frac{\partial V^e}{\partial k} &> 0, \end{aligned} \tag{3}$$

where $V^{VC}(w_B, \cdot, \cdot) = 0$ and $V^e(w_B, \cdot, \cdot) = 0$ imply that when the entrepreneur’s idea is revealed to be bad, the project fails, leaving zero rents to both entities.

2.1.4 Equilibrium Conditions

For the market to function as a screening mechanism with voluntary participation, four conditions must be met simultaneously. First, the VC must find it optimal to invest after receiving a high signal, $s_{i,j} = H$. Second, she must find it optimal to decline after a low signal, $s_{i,j} = L$. Third and fourth, both the VC and the entrepreneur must expect positive net returns from paying the initial search costs, C_{VC} and C_e , respectively.

Let π_H denote the VC’s expected payoff conditional on funding after observing a high signal:

$$\pi_H := \Pi' \times [V^{VC}(w_G, \cdot, \cdot) - I] + (1 - \Pi')(-I) \tag{4}$$

The four equilibrium conditions are formally stated as:

$$\text{Incentive Compatibility (H): } \pi_H \geq 0 \quad (5)$$

$$\text{Incentive Compatibility (L): } \Pi'' \times [V^{VC}(w_G, \cdot, \cdot) - I] + (1 - \Pi'')(-I) \leq 0 \quad (6)$$

$$\text{VC Entry: } \Pi''' \times \pi_H - C_{VC} \geq 0 \quad (7)$$

$$\text{Ent. Entry: } \Pi'''' \times V^e(w_G, \cdot, \cdot) - C_e \geq 0 \quad (8)$$

where the probabilities Π' , Π'' , Π''' , and Π'''' appearing above are defined as follows:

$$\Pi' := \Pr(w_i = w_G | s_{i,j} = H, e_j, p_i \geq p_{min}) \quad (9)$$

$$\Pi'' := \Pr(w_i = w_G | s_{i,j} = L, e_j, p_i \geq p_{min}) \quad (10)$$

$$\Pi''' := \Pr(s_{i,j} = H | e_j, p_i \geq p_{min}) \quad (11)$$

$$\Pi'''' := \Pr(s_{i,j} = H, w_i = w_G | p_i, e_j \leq e_{max}) \quad (12)$$

Thus, Π' and Π'' represent the posterior probability of a good idea (project) given the signal. Π''' is the ex-ante probability that a VC receives a high signal, and Π'''' is the joint probability of a good project and a high signal from the entrepreneur's perspective.

2.2 Market Equilibrium and Model Properties

Following from the entry conditions in the previous subsection combined with the market-clearing condition, we see that market equilibrium is described by a set of three equations:

Proposition 2.1 (Entry Decisions). *If the triple $\{p_{min}, e_{max}, k\}$ is part of a screening equilibrium, it must satisfy the following system of equations:*

$$J := V^e(w_G, k, v) p_{min} [1 - \mathbb{E}(e | e_{max})] - C_e = 0, \quad (13)$$

$$L := [V^{VC}(w_G, k, v) - I] \mathbb{E}(p|p_{min}) (1 - e_{max}) - I [1 - \mathbb{E}(p|p_{min})] e_{max} - C_{VC} = 0, \quad (14)$$

$$H := F(e_{max}) - \omega [1 - G(p_{min})] = 0, \quad (15)$$

subject to (following from (6))

$$[V^{VC}(w_G, k, v) - I] \mathbb{E}(p|p_{min}) e_{max} - I [1 - \mathbb{E}(p|p_{min})] (1 - e_{max}) \leq 0, \quad (16)$$

where

$$\mathbb{E}(e|e_{max}) := \mathbb{E}(e_j | e_j \leq e_{max}) = \frac{1}{F(e_{max})} \int_0^{e_{max}} e dF(e),$$

$$\mathbb{E}(p|p_{min}) := \mathbb{E}(p_i | p_i \geq p_{min}) = \frac{1}{1 - G(p_{min})} \int_{p_{min}}^1 p dG(p),$$

and $\omega := \Omega_D/\Omega_S$ is the proportion of the entrepreneur population (Ω_D) to the VC population (Ω_S).

Proof: See Appendix A.

The intuition of Proposition 2.1 is as follows. Equation (13) represents the entry condition of the marginal entrepreneur (i.e., entrepreneur i with $p_i = p_{min}$), and is constructed by re-writing equation (8). The entrepreneur's utility is increasing in his own quality p_i , and there exists a cutoff $p_{min} \in (0, 1)$ such that the entrepreneur is indifferent to entry.

Equation (14) is the entry condition of the marginal VC (i.e., VC j with $e_j = e_{max}$), and is constructed by re-writing equation (7). The VC's utility is decreasing in e_j . There exists a cutoff $e_{max} \in (0, 1/2)$ such that the VC is indifferent to entry.

Condition (15) requires that supply equals demand. In equilibrium, $k \in (0, 1)$ must induce a balance between the number of VCs and entrepreneurs. (Note the dependence of

k in equations (13) and (14), so that k affects e_{max} and p_{min}). Counterfactually, if k were too large, there would be an imbalance in which too many entrepreneurs seek funding from too few VCs (i.e., $F(e_{max}) < \omega[1 - G(p_{min})]$). If k were too small, the opposite imbalance holds.

It is not possible to explicitly solve the system in Proposition 2.1 in general, but in what follows we derive the equilibrium's comparative static properties using the implicit function theorem.

For example, consider varying the exit value $v > 0$. This parameter can be considered a proxy for hot markets. Totally differentiating this system with respect to v , we have

$$\begin{aligned} \frac{dJ}{dv} &= \underbrace{\frac{\partial J}{\partial v}}_{\oplus} + \underbrace{\frac{\partial J}{\partial p_{min}}}_{\oplus} \times \frac{\partial p_{min}}{\partial v} + \underbrace{\frac{\partial J}{\partial e_{max}}}_{\ominus} \times \frac{\partial e_{max}}{\partial v} + \underbrace{\frac{\partial J}{\partial k}}_{\oplus} \times \frac{\partial k}{\partial v} = 0, \\ \frac{dL}{dv} &= \underbrace{\frac{\partial L}{\partial v}}_{\oplus} + \underbrace{\frac{\partial L}{\partial p_{min}}}_{\oplus} \times \frac{\partial p_{min}}{\partial v} + \underbrace{\frac{\partial L}{\partial e_{max}}}_{\ominus} \times \frac{\partial e_{max}}{\partial v} + \underbrace{\frac{\partial L}{\partial k}}_{\ominus} \times \frac{\partial k}{\partial v} = 0, \\ \frac{dH}{dv} &= \underbrace{\frac{\partial H}{\partial p_{min}}}_{\oplus} \times \frac{\partial p_{min}}{\partial v} + \underbrace{\frac{\partial H}{\partial e_{max}}}_{\oplus} \times \frac{\partial e_{max}}{\partial v} = 0. \end{aligned}$$

The above is a three-equation system which we solve for the three unknowns $\left\{ \frac{\partial p_{min}}{\partial v}, \frac{\partial e_{max}}{\partial v}, \frac{\partial k}{\partial v} \right\}$.

After omitted algebra, the solution is:

$$\begin{aligned} \frac{\partial e_{max}}{\partial v} &= \frac{\frac{\partial H}{\partial p_{min}} \left(\frac{\partial J}{\partial k} \times \frac{\partial L}{\partial v} - \frac{\partial L}{\partial k} \times \frac{\partial J}{\partial v} \right)}{\frac{\partial J}{\partial k} \times \frac{\partial H}{\partial e_{max}} \times \frac{\partial L}{\partial p_{min}} - \frac{\partial J}{\partial k} \times \frac{\partial L}{\partial e_{max}} \times \frac{\partial H}{\partial p_{min}} - \frac{\partial H}{\partial e_{max}} \times \frac{\partial L}{\partial k} \times \frac{\partial J}{\partial p_{min}} + \frac{\partial L}{\partial k} \times \frac{\partial J}{\partial e_{max}} \times \frac{\partial H}{\partial p_{min}}} \\ &= \frac{\oplus(\oplus \oplus - \ominus \oplus)}{\oplus} = \frac{\oplus}{\oplus} > 0, \end{aligned} \tag{17}$$

$$\begin{aligned}
\frac{\partial p_{min}}{\partial v} &= -\frac{\frac{\partial H}{\partial e_{max}} \left(\frac{\partial J}{\partial k} \times \frac{\partial L}{\partial v} - \frac{\partial L}{\partial k} \times \frac{\partial J}{\partial v} \right)}{\frac{\partial J}{\partial k} \times \frac{\partial H}{\partial e_{max}} \times \frac{\partial L}{\partial p_{min}} - \frac{\partial J}{\partial k} \times \frac{\partial L}{\partial e_{max}} \times \frac{\partial H}{\partial p_{min}} - \frac{\partial H}{\partial e_{max}} \times \frac{\partial L}{\partial k} \times \frac{\partial J}{\partial p_{min}} + \frac{\partial L}{\partial k} \times \frac{\partial J}{\partial e_{max}} \times \frac{\partial H}{\partial p_{min}}} \\
&= -\frac{\oplus (\oplus \oplus - \ominus \oplus)}{\oplus} < 0,
\end{aligned}
\tag{18}$$

$$\begin{aligned}
\frac{\partial k}{\partial v} &= \frac{\frac{\partial H}{\partial e_{max}} \times \frac{\partial L}{\partial v} \times \frac{\partial J}{\partial p_{min}} - \frac{\partial J}{\partial e_{max}} \times \frac{\partial L}{\partial v} \times \frac{\partial H}{\partial p_{min}} - \frac{\partial H}{\partial e_{max}} \times \frac{\partial L}{\partial p_{min}} \times \frac{\partial J}{\partial v} + \frac{\partial J}{\partial v} \times \frac{\partial L}{\partial e_{max}} \times \frac{\partial H}{\partial p_{min}}}{\frac{\partial J}{\partial k} \times \frac{\partial H}{\partial e_{max}} \times \frac{\partial L}{\partial p_{min}} - \frac{\partial J}{\partial k} \times \frac{\partial L}{\partial e_{max}} \times \frac{\partial H}{\partial p_{min}} - \frac{\partial H}{\partial e_{max}} \times \frac{\partial L}{\partial k} \times \frac{\partial J}{\partial p_{min}} + \frac{\partial L}{\partial k} \times \frac{\partial J}{\partial e_{max}} \times \frac{\partial H}{\partial p_{min}}} \\
&= \frac{\oplus \oplus \oplus - \ominus \ominus \oplus - \oplus \ominus \oplus + \oplus \ominus \oplus}{\oplus}.
\end{aligned}
\tag{19}$$

The partial derivatives indicate the key properties of our model. The result $\frac{\partial p_{min}}{\partial v} < 0$ and $\frac{\partial e_{max}}{\partial v} > 0$ are intuitively obvious. When the market gets hotter (i.e., $v \uparrow$), more entrepreneurs are active. Increased demand necessitates that more VCs must be active for markets to clear.

In contrast, $\frac{\partial k}{\partial v}$ is of an indeterminant sign. Rearranging slightly, we show that $\frac{\partial \kappa}{\partial v}$ is proportional to

$$f(e_{max}) \left[\underbrace{\frac{\partial L}{\partial v} \times \frac{\partial J}{\partial p_{min}}}_{\text{Direct Effect 1} > 0} - \underbrace{\frac{\partial J}{\partial v} \times \frac{\partial L}{\partial p_{min}}}_{\text{Indirect Effect 1} > 0} \right] + \omega g(p_{min}) \left[\underbrace{\frac{\partial J}{\partial v} \times \frac{\partial L}{\partial e_{max}}}_{\text{Direct Effect 2} < 0} - \underbrace{\frac{\partial J}{\partial e_{max}} \times \frac{\partial L}{\partial v}}_{\text{Indirect Effect 2} < 0} \right].
\tag{20}$$

Denote the probability densities of VC and entrepreneur talents by $f(e) := \frac{dF}{de}(e)$ and $g(p) := \frac{dG}{dp}(p)$, respectively. The expression (20) indicates that comparative static properties with respect to v depend on a set of direct and indirect forces which push in opposing directions. Those terms multiplied by $f(e_{max})$ capture the effects of v on capital supply (i.e., on the size of VC entry). The term $\frac{\partial L}{\partial v}$ represents the direct effect of changes in v to VC payoffs. Higher payoffs to the VC imply that more VCs enter. The next term in the expression $\frac{\partial L}{\partial p_{min}}$ captures an indirect effect: specifically, a change in v affects the pool of entrepreneurs willing to seek funding, in turn altering the VC's payoffs indirectly. Those

terms contained in the first bracket contain the net change in capital supply, considering both direct and indirect effect.

Similarly, the terms in the second bracket indicate the effect of v on capital demand. This includes a direct force (higher v resulting in higher payoffs to entrepreneurs), as well as an indirect force (higher v alters the pool of VCs that the entrepreneur encounters).

We study under which conditions the solution of the system of equations $\{(13), (14), (15)\}$ exists and holds as the market equilibrium. Note that satisfaction of these conditions is necessary for an equilibrium but not sufficient. First, there may be $\{p_{min}, e_{max}, k\}$ which satisfy this system but not condition (6)³.

To see that the solution is unique in k , we totally differentiate H :

$$\frac{dH}{dk} = \underbrace{\frac{\partial H}{\partial k}}_{=0} + \underbrace{\frac{\partial H}{\partial p_{min}}}_{\oplus} \times \underbrace{\frac{\partial p_{min}}{\partial k}}_{\ominus} + \underbrace{\frac{\partial H}{\partial e_{max}}}_{\oplus} \times \underbrace{\frac{\partial e_{max}}{\partial k}}_{\ominus} < 0.$$

Because this derivative is negative, H has a unique root. Heuristically, suppose a particular value k is associated with equilibrium. Increasing k strictly increases capital demand and strictly decreases capital supply, in which case markets no longer clear.

More formally, to derive conditions under which the equilibrium level of k lies in $(0, 1)$, let the value functions of the entrepreneur and the venture capitalist be denoted by $\mathbf{V}^e(k) \equiv V^e(w_G, k, v)$ and $\mathbf{V}^{VC}(k) \equiv V^{VC}(w_G, k, v)$, respectively. Since both $\mathbf{V}^e(k)$ and $\mathbf{V}^{VC}(k)$ are strictly monotone in k , they admit inverse functions, denoted $(\mathbf{V}^e)^{-1}(\cdot)$ and $(\mathbf{V}^{VC})^{-1}(\cdot)$.

Proposition 2.2 (Existence of a screening equilibrium). *The $\{p_{min}, e_{max}, k\}$ that solve*

³If (6) fails, then all projects should be funded regardless of the signal received. Such a world does not need a venture capital market, and all projects could simply be funded by public debt with no screening.

$\{(13), (14), (15)\}$ form part of a screening equilibrium if the following hold:

1. **(Incentive to Screen)** The marginal VC is sufficiently informative, i.e.,

$$\frac{1}{e_{max}} \geq 2 + \frac{C_{VC}}{I[1 - \mathbb{E}(p \mid p_{min})]}.$$

2. **(Market-Clearing Feasibility)** The parameters satisfy $\mathbf{V}^e(k) \xrightarrow{k \rightarrow \infty} \infty$ and

$$0 \leq (\mathbf{V}^e)^{-1}(C_e) < (\mathbf{V}^{VC})^{-1}(C_{VC} + I) \leq 1.$$

These inequalities are necessary and sufficient for the equilibrium to lie in the interior of the unit interval and hence to be a screening equilibrium.

Proof. See Appendix B.

The first condition ensures that the marginal VC (e_{max}) is not too close to one-half. If this bound is violated, the VC's posterior values under good and bad signals become too similar, making screening unprofitable and contradicting the definition of a screening equilibrium. The second condition restricts the relative magnitudes of $\{C_e, C_{VC}, I\}$: entry costs must permit a “zone of agreement” in which the surplus can be divided between the entrepreneur and the VC. When this interval is non-empty, a feasible share k^* exists that satisfies both sides' participation constraints.

We next turn to comparative statics, first varying the costs (search costs and initial investment) and the proportion of populations.

Theorem 2.3 (Comparative statics related to costs and population). *If a solution $\{p_{min}, e_{max}, k\}$ exists, it is unique. Equilibrium has the following properties:*

1. $\frac{\partial e_{max}}{\partial C_{VC}} < 0$, $\frac{\partial p_{min}}{\partial C_{VC}} > 0$, $\frac{\partial k}{\partial C_{VC}} < 0$.
2. $\frac{\partial e_{max}}{\partial C_e} < 0$, $\frac{\partial p_{min}}{\partial C_e} > 0$, $\frac{\partial k}{\partial C_e} > 0$.
3. $\frac{\partial e_{max}}{\partial I} < 0$, $\frac{\partial p_{min}}{\partial I} > 0$, $\frac{\partial k}{\partial I} < 0$.
4. $\frac{\partial p_{min}}{\partial \omega} > 0$, $\frac{\partial e_{max}}{\partial \omega} > 0$, $\frac{\partial k}{\partial \omega} < 0$.

The signs are all intuitive. For example, increasing the costs borne by the VC decreases the number of active VCs, and thus the number of active entrepreneurs. This change endogenously shifts bargaining power towards VCs, enabling them to recoup these increased costs. Altering entrepreneurial costs has the opposite effect. Finally, changing the relative size of the populations has the expected effects. As $\omega := \Omega_D/\Omega_S$ —the proportion of the entrepreneur population (Ω_D) to the VC population (Ω_S)— increases, entrepreneurs become more numerous. Consequently, in equilibrium one does not need to dig as deeply into the pool of entrepreneurs. Thus, p_{min} rises. For symmetric reasons, e_{max} rises. As entrepreneurs become numerous relative to VCs, bargaining power shifts away from them.

Theorem 2.4 (Comparative statics related to market heat). *An increase in market heat, v , has the following effects on the long-run equilibrium:*

1. *The market for talent expands: the quality of the marginal entrepreneur falls ($\frac{\partial p_{min}}{\partial v} < 0$), and the quality of the marginal VC also falls ($\frac{\partial e_{max}}{\partial v} > 0$).*

2. The direction of the change in bargaining power, $\frac{\partial k}{\partial v}$, is ambiguous and is governed by the following properties:

(a) (Property 1: Specialness) A hotter market favors the party whose talent is more scarce at the margin. Formally, the sensitivity of bargaining power to market heat is a decreasing function of the relative marginal density of entrepreneurs:

$$\frac{\partial (\partial k / \partial v)}{\partial (\omega \cdot g(p_{min}) / f(e_{max}))} < 0.$$

(b) (Property 2: Payoff Sensitivity) A hotter market favors the party whose value function is less sensitive to the change in v . Formally:

$$\frac{\partial (\partial k / \partial v)}{\partial (\partial V^e / \partial v)} < 0 \quad \text{and} \quad \frac{\partial (\partial k / \partial v)}{\partial (\partial V^{VC} / \partial v)} > 0.$$

(c) (Property 3: Rich Get Richer) A hotter market tends to amplify the existing allocation of rents. Formally:

$$\frac{\partial (\partial k / \partial v)}{\partial V^e} > 0 \quad \text{and} \quad \frac{\partial (\partial k / \partial v)}{\partial V^{VC}} < 0.$$

Proof: See Appendix C.

Theorem 2.4 formalizes the three key economic properties that govern the long-run allocation of bargaining power. The first property, ‘specialness,’ captures the importance of the elasticity of talent supply at the margin. If one party, say entrepreneurs, can draw from a deep pool of close substitutes (a high marginal density $g(p_{min})$) a small improvement in their

contract terms would induce a large influx of new entrants. To maintain market clearing, bargaining power must shift away from this more elastic side. The second property relates to payoff sensitivity. An increase in market heat incentivizes entry on both sides; if one party's value function is particularly sensitive to this change, it would create a disproportionate influx of that agent type. To restore equilibrium, bargaining power must shift toward the less sensitive party to temper the entry incentive of the more sensitive one. Finally, the third property describes how a hot market tends to amplify the existing allocation of rents. This is driven by the marginal agent's zero-profit condition: if VCs, for example, already hold significant bargaining power, contract terms cannot shift too far in the entrepreneurs' favor without making the marginal VC's position unprofitable, thereby ensuring that inframarginal VCs capture a large share of the new surplus.

Theorem 2.4.2a is a main result, corresponding to Property 1. Without loss of generality, consider the case where $f(e_{max})$ is large relative $g(p_{min})$. In this case, a small change in e_{max} leads to a large change in the mass of active VCs. Hence, to clear the market, k must adjust upwards to temper the effect, depressing the incentives of the marginal VCs and strengthening the incentives on marginal entrepreneurs.

To see why Theorem 2.4.2a holds, we can rewrite (19) as follows:

$$\frac{\partial k}{\partial v} \propto f(e_{max}) \left[\underbrace{\frac{\partial L}{\partial v} \times \frac{\partial J}{\partial p_{min}}}_{\text{Direct Effect 1} > 0} - \underbrace{\frac{\partial J}{\partial v} \times \frac{\partial L}{\partial p_{min}}}_{\text{Indirect Effect 1} > 0} \right] + \omega g(p_{min}) \left[\underbrace{\frac{\partial J}{\partial v} \times \frac{\partial L}{\partial e_{max}}}_{\text{Direct Effect 2} < 0} - \underbrace{\frac{\partial J}{\partial e_{max}} \times \frac{\partial L}{\partial v}}_{\text{Indirect Effect 2} < 0} \right].$$

Replacing these partial derivatives with their corresponding signs

$$f(e_{max}) \left[\underbrace{\oplus \times \oplus}_{\text{Direct Effect 1}} - \underbrace{\oplus \times \oplus}_{\text{Indirect Effect 1}} \right] + \omega g(p_{min}) \left[\underbrace{\oplus \times \ominus}_{\text{Direct Effect 2}} - \underbrace{\ominus \times \oplus}_{\text{Indirect Effect 2}} \right].$$

Suppose $g(p_{min})$ is very small. In this case, the second bracketed term is irrelevant. In addition, when $g(p_{min})$ is small, the indirect direct in the first bracketed term is negligible. This holds because for a given change in entrepreneurial cutoff, the conditional expectation of entrepreneurial quality has little change since not much mass is added, making $\frac{\partial L}{\partial p_{min}} \approx 0$.

Together, these two facts imply that when $g(p_{min})$ is small the comparative static $\frac{\partial k}{\partial v}$ is governed mainly by Direct Effect 1. Thus, $\frac{\partial k}{\partial v} > 0$ holds. Intuitively, a (local) dearth of available entrepreneurs implies that contracting terms must shift towards them in order to increase VC activity.

This analysis characterizes how the market clears in the aggregate. However, to understand the puzzle of performance persistence, we must move beyond aggregate rents and analyze how this market-clearing mechanism affects the cross-sectional returns to skill. We turn to this micro-level analysis in the next subsection.

2.3 The Amplification of Skill and Performance Persistence

Having established how the market-wide division of surplus ($k \in (0, 1)$) evolves, we now examine the implications for individual VC performance. Specifically, we analyze how the returns to skill—defined as the expected payoff difference between an elite (inframarginal) VC and a marginal one—change over the cycle. Consider the expected performance of an incumbent VC with a fixed skill level $e < e_{max}$. Her expected payoff is given by:

$$L(e, v) := \pi_H(e) \times \Pi'''(e) - C_{VC}, \quad (21)$$

where $\pi_H(e)$ and $\Pi'''(e)$ are the expected deal profits and deal probability defined in (4) and (11), respectively, evaluated at the equilibrium market terms $\{p_{min}, k\}$.

By rearranging (14), we find that, for any equilibrium $\{p_{min}, k\}$, a VC's ex-post payoff when $w = w_G$ is realized is equal to

$$V^{VC}(w_G, k, v) = I + \frac{I [1 - \mathbb{E}(p|p_{min})] e_{max} + C_{VC}}{\mathbb{E}(p|p_{min}) (1 - e_{max})}.$$

Hence, by plugging the right-hand side of the equation above into (21), we have the expected payoff (performance) of an incumbent VC as follows:

$$\begin{aligned} L(e, v) &\equiv [V^{VC}(w_G, k, v) - I] \mathbb{E}(p|p_{min}) (1 - e) - I [1 - \mathbb{E}(p|p_{min})] e - C_{VC} \\ &= \frac{e_{max} - e}{1 - e_{max}} \{I [1 - \mathbb{E}(p|p_{min})] + C_{VC}\}, \end{aligned} \quad (22)$$

which is linear in her skill, $e < e_{max}$. Thus, we can rearrange it as

$$\begin{aligned} L(e, v) &= \frac{e_{max} - e}{1 - e_{max}} \{I [1 - \mathbb{E}(p|p_{min})] + C_{VC}\} \\ &\equiv A(v) \cdot (e_{max} - e), \end{aligned}$$

where $A(v) := \frac{I[1-\mathbb{E}(p|p_{min})]+C_{VC}}{1-e_{max}}$ holds $A'(v) > 0$, deriving from Theorem 2.4.1:

$$A'(v) := \frac{dA}{dv} = \underbrace{\frac{\partial A}{\partial p_{min}}}_{\ominus} \cdot \underbrace{\frac{\partial p_{min}}{\partial v}}_{\ominus} + \underbrace{\frac{\partial A}{\partial e_{max}}}_{\oplus} \cdot \underbrace{\frac{\partial e_{max}}{\partial v}}_{\oplus} > 0.$$

Then, the mean and variance of VC performance in the market are computed as

$$\begin{aligned} \mathbb{E}[L(e, v) | e_{max}] &= \frac{1}{F(e_{max})} \cdot \int_0^{e_{max}} L(e, v) dF(e) \\ &= A(v) \cdot [e_{max} - \mathbb{E}(e | e_{max})] \\ &= L(e = \mathbb{E}(e | e_{max}), v), \end{aligned}$$

$$Var[L(e, v) | e_{max}] = A(v)^2 \cdot Var(e | e_{max}),$$

where the conditional variance of e under $e < e_{max}$ is

$$\text{Var}(e|e_{max}) = \mathbb{E}(e^2|e_{max}) - \mathbb{E}(e|e_{max})^2.$$

The comparative statics $\frac{d}{dv}\text{Var}(e|e_{max}) > 0$ and $\frac{d}{dv}\text{Var}[L(e, v)|e_{max}] > 0$ follow from the properties of truncated variance and $A'(v) > 0$.

Theorem 2.5 (Procyclical Skill Amplification and Dispersion). *The expected payoff $L(e, v)$ for an incumbent VC with skill $e < e_{max}$ exhibits the following properties in the long-run equilibrium:*

1. **Invariant Ranking:** $\frac{dL}{de} < 0$. *Better screening skill yields higher expected returns.*
2. **Rising Tide:** $\frac{dL}{dv} > 0$. *All incumbent VCs benefit from a hotter market, regardless of the direction of the shift in k .*
3. **Skill Amplification:** $\frac{d^2L}{dvde} < 0$. *The marginal benefit of market heat is strictly higher for higher-skilled VCs (lower e).*
4. **Procyclical Dispersion:**
 - (a) **Skill Dispersion:** $\frac{d}{dv}\text{Var}(e|e_{max}) > 0$. *Variance of skills among VCs increases.*
 - (b) **Performance Dispersion:** $\frac{d}{dv}\text{Var}[L(e, v)|e_{max}] > 0$. *The cross-sectional variance of incumbent VC performance increases.*

Proof. See Appendix [D](#).

To see why Theorem 2.5 generates performance persistence, consider two incumbent VCs active in a market with a given heat v . Suppose they have skills e_{high} and e_{low} , where $e_{high} < e_{low}$ (recall that lower error rates imply higher skill). Consequently, the high-skill VC earns higher expected profits than the low-skill VC in the initial state.

Now consider an upward shock to v . By Theorem 2.5.2 (“Rising Tide”), both VCs earn higher profits in the hotter market. However, by Theorem 2.5.3 (“Skill Amplification”), the profit gains accrue disproportionately to the high-skill VC. As the market heats up, the performance spread between the two widens. This mechanism generates positive autocorrelation in returns: funds that outperformed in the cold market are predicted to outperform by an even larger margin in the hot market.

Theorem 2.5.4 (“Procyclical Dispersion”) extends this logic to the aggregate distribution. As formalized in the proof, the variance of returns increases through two reinforcing channels: a *selection effect*, driven by the increase in marginal error rate e_{max} which widens the range of active skills in the market (4a), and a *magnification effect*, as the steeper slope of returns to skill ($A'(v) > 0$) amplifies the economic value of that heterogeneity (4b).

Finally, we clarify the interpretation of VC payoffs in our framework. Our model treats the venture firm as a unitary economic agent, abstracting from the internal contract between General Partners (GPs) and Limited Partners (LPs). While a distinct literature examines how this joint surplus is divided, our results regarding persistence extend to LPs under standard market frictions. Specifically, provided that GPs cannot perfectly and instantaneously extract all scarcity rents via higher fees—due to sticky fee structures or reputational concerns—the ‘amplification of skill’ derived in Theorem 2.5 is shared between the manager and the investor. Thus, the procyclical widening of the performance gap in our model predicts persistence in net-of-fee returns for LPs, consistent with the empirical evidence.

3 The Anatomy of a Boom

This section combines the paper’s core theoretical innovations to provide a full “*anatomy of a venture boom*.” We trace the market’s dynamic path from an initial equilibrium through its two-phase response to a positive shock to investment opportunities.

The central assumption of our short-run analysis is that the supply of venture capital is temporarily fixed, or “sticky.” The economic justification for this is straightforward. While new entrepreneurial ideas can be formulated relatively quickly, raising a new venture capital firm is a slow, multi-year process. It requires prospective general partners to build a track record, cultivate relationships with limited partners, secure capital commitments, and then begin the deployment cycle. This significant lag between the recognition of a new investment opportunity and the arrival of new capital to pursue it is a well-established feature of the venture market (e.g., [Gompers and Lerner \(2004\)](#), [Kaplan and Schoar \(2005\)](#)).

While the assumption of sticky short-run supply is standard, the full set of equilibrium consequences is far from obvious. The market’s response is not a simple story of rising prices. Rather, it involves a complex interplay between the division of surplus and the rents accruing to incumbent agents, which in turn shape the incentives for long-run entry. The nature of this ultimate transition, as we will show, depends critically on the marginal elasticity of talent supply—whether the market can draw from a deep pool of close substitutes or must accept a steep decline in quality to expand. To build this dynamic story, we begin by analyzing the short run in isolation.

3.1 Short Run Equilibrium with Sticky VC Supply

Suppose that the market is initially endowed with a market heat represented by $v > 0$. Denote the equilibrium of the given market by $\{p_{min}, e_{max}, k\}$. Then, assume that the degree

of market heat increases to $v^* > v$ while the market faces a sticky VC supply in the short run, fixing the marginal VC entry to the previous equilibrium's level, $\bar{e} \equiv e_{max}$.

By rearranging (15), we can represent the marginal entrepreneur talent p_{min} as the following function of $\bar{e}$:

$$p(\bar{e}) := G^{-1} \left(1 - \frac{F(\bar{e})}{\omega} \right).$$

The entry condition of the marginal entrepreneur can be written as in (13):

$$V^e(w_G, \bar{k}, v^*) p_{min} [1 - \mathbb{E}(e|\bar{e})] - C_e = 0,$$

where $\bar{k}$ represents the new equilibrium level of k in the short run. By plugging $p_{min} = p(\bar{e})$ and rearranging the equation above, we have

$$V^e(w_G, \bar{k}, v^*) = \hat{J}(\bar{e}) := \frac{C_e}{p(\bar{e}) [1 - \mathbb{E}(e|\bar{e})]} = V^e(w_G, k, v),$$

where $\hat{J}(\cdot)$ is a strictly increasing function, and the last equality follows from (13) in the previous equilibrium before a change in v .

Using the implicit function theorem, we verify the following property:

Proposition 3.1 (Effect of market heat in the short run). *In the short run, with a fixed VC supply, it follows that*

$$\frac{\partial k}{\partial v} = -\frac{\partial V^e / \partial v}{\partial V^e / \partial k} < 0.$$

Proposition 3.1 delivers the central result of the short-run analysis: an increase in market heat (v) unambiguously shifts bargaining power to VCs ($\partial k / \partial v < 0$). This stands in sharp contrast to the long-run equilibrium, where the effect is ambiguous. The intuition for

this stark result stems from the market’s adjustment mechanism when one side is constrained. In the long run, a hotter market leads to quantity adjustment, as quality thresholds for entry fall and more deals are done. In the short run, however, this channel is shut down. Because the number of VCs is fixed, the number of fundable projects is also fixed, meaning the market can only respond through price adjustment. VCs effectively become the fixed factor of production. With rising project values increasing the demand for a fixed supply of capital, competition forces entrepreneurs to accept progressively more VC-friendly terms (k falls), allowing incumbent VCs to capture the entire windfall from the market boom as an “incumbency rent.”

During this short-run equilibrium, VCs benefit doubly: both because of improved investment opportunities, and because of shifting bargaining power. In consequence, even marginal VCs in the previous and the new short-run equilibrium enjoy strictly positive rents *ex ante*:

$$L(\bar{e}, v^*) \equiv [V^{VC}(w_G, \bar{k}, v^*) - I] \mathbb{E}(p|p(\bar{e}))(1 - \bar{e}) - I[1 - \mathbb{E}(p|p(\bar{e}))] \bar{e} - C_{VC} > 0.$$

3.2 Transition to the long-run equilibrium

When the temporarily sticky VC supply is resolved, the market will shift to a new equilibrium, denoted by $\{p_{min}^*, e_{max}^*, k^*\}$. By Theorem 2.4.1, we know $p_{min}^* < p_{min} = p(\bar{e})$ and $e_{max}^* > e_{max} = \bar{e}$, reflecting the expansion of the talent pool in both sides of the market. Combined with the monotonicity of value functions (or equivalently, the *ex-post* payoffs when $w = w_G$ is realized after funding) in v and k , we have the following properties:

Proposition 3.2 (The Transition to a New Long-Run Equilibrium). *The high rents earned during the short-run phase induce new VC entry, resolving the supply constraint. This tran-*

sition from the hot short-run equilibrium $(\bar{k}, v^*)$ to the new hot long-run equilibrium (k^*, v^*) has the following effects:

1. New VC entry intensifies competition for deals, shifting bargaining power back toward entrepreneurs: $k^* > \bar{k}$.
2. This competition erodes the incumbency rents captured by VCs during the short-run phase. Relative to their short-run peak, VCs are worse off while entrepreneurs are better off:

$$V^{VC}(w_G, k^*, v^*) < V^{VC}(w_G, \bar{k}, v^*) \quad \text{and} \quad V^e(w_G, k^*, v^*) > V^e(w_G, \bar{k}, v^*).$$

3. Despite the erosion of temporary super-profits, the market boom is welfare-improving for all inframarginal participants. In the new long-run equilibrium, both parties are strictly better off than in the original cold market (k, v) :

$$V^{VC}(w_G, k^*, v^*) > V^{VC}(w_G, k, v) \quad \text{and} \quad V^e(w_G, k^*, v^*) > V^e(w_G, k, v).$$

Proof: See Appendix [E](#).

In principle, the supply of venture capital can adjust on either the intensive margin (incumbents raising larger funds) or the extensive margin (new firm creation). In this paper, we focus on the extensive margin. This modeling choice isolates our central mechanism: the deterioration of marginal talent (e_{max}) as the market expands. While the intensive margin is also operative during booms, it generates similar quality-degrading effects via attention dilution, as partners must spread their limited bandwidth across larger portfolios. Thus,

whether through new, lower-skilled entrants or overstretched incumbents, the aggregate economic outcome is the same: a decline in the average quality of VC services. Our framework captures this first-order effect in the most tractable way.

3.3 Anatomy of a Boom: A Numerical Example

The analysis thus far employs generic value functions in (2) with the partial derivatives (3). In this section, we chose a specific, simple functional form for these. Specifically, assume a funded project yields a gross payoff of $v > 0$ if it is of good quality ($w_i = w_G$) and is a total loss otherwise ($w_i = w_B$). The entrepreneur must exert a private effort cost of $x_e > 0$ for the project to succeed. The entrepreneur receives a share $k \in (0, 1)$ of the final payoff. The value functions are therefore:

$$\begin{aligned} V^e(v, k) &= k \cdot v - x_e, \\ V^{VC}(v, k) &= (1 - k) \cdot v. \end{aligned}$$

which satisfy the above expressions. For the distributions of agent skill, we assume that VC skill, e , follows a uniform distribution on $[0, 0.5]$, so its probability density is $f(e) = 2$. We assume entrepreneur skill follows a Beta distribution, $p \sim \text{Beta}(\alpha_p, \beta_p)$, with parameters chosen to create a right-skewed distribution where high-quality entrepreneurs are scarce.

The parameter values for our baseline simulation are as follows:

Parameter	Value	Description
I	200	VC's initial investment cost
C_{VC}	25	VC's entry cost
C_e	25	Entrepreneur's entry cost
x_e	10	Entrepreneur's effort cost
ω	1.5	Ratio of potential entrepreneurs to VCs
α_p, β_p	2, 8	Parameters for the Beta distribution of p

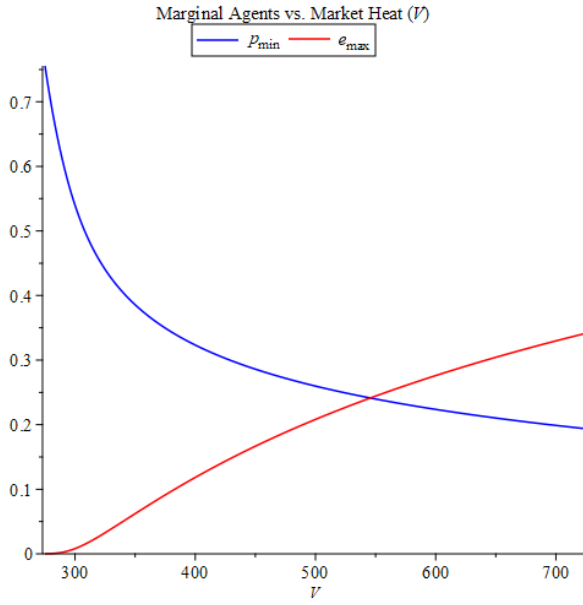
Substituting these forms into the general model yields the specific three-equation system in three unknowns $\{p_{min}, e_{max}, k\}$ that we solve numerically.

3.3.1 Long-Run Equilibrium Dynamics

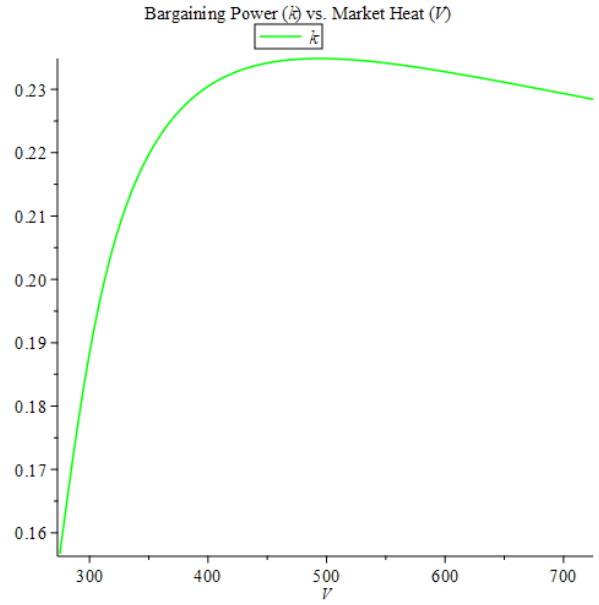
We first examine the long-run equilibrium, where the supply of both VCs and entrepreneurs can adjust freely. We solve the model for a range of market heat values, $v \in [275, 725]$. Figure 1 plots the equilibrium values of the marginal agents, the allocation of bargaining power, and the densities of the marginal agents as a function of v .

The four panels in Figure 1 provide a numerical illustration of the model's core mechanisms, tracing the long-run equilibrium's response to an increase in market heat, as proxied by the project value v .

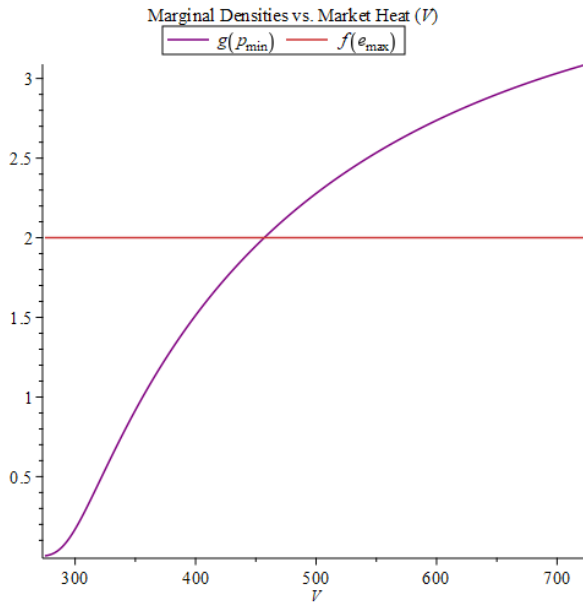
The top-left panel shows the evolution of the marginal agents. As expected, when



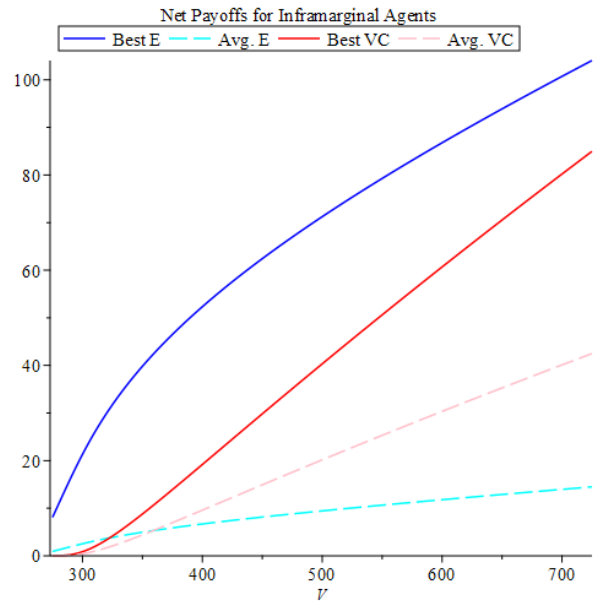
(a) p_{min} and e_{max} in v



(b) k in v



(c) $g(p_{min})$ and $f(e_{max})$ in v



(d) Rents of inframarginal agents in v

Figure 1: Long-run dynamics in v

the market is cold (low v), only high-quality agents are active: the marginal entrepreneur’s quality threshold (p_{min}) is high, and the marginal VC’s error rate (e_{max}) is low. As the market heats up, both thresholds relax, drawing in a larger but lower-quality pool of new entrants on both sides of the market. This panel also reveals the “specialness” of elite entrepreneurs, a direct result of their assumed talent distribution. As seen in the bottom-left panel, the density of entrepreneurs at the margin ($g(p_{min})$) is extremely low in cold markets. Consequently, to attract a given mass of new entrepreneurs, the quality bar p_{min} must drop substantially, which explains why the blue curve is much steeper than the red curve for low values of v .

This dynamic of marginal scarcity is the key to understanding the non-monotonic behavior of bargaining power, shown in the top-right panel. In colder markets where high-quality entrepreneurs are the scarce factor, an increase in market heat forces VCs to cede bargaining power— k must rise to induce more entrepreneurs to enter. However, as v grows large enough, the market moves into a region where the density of entrepreneurs is thicker, making them more substitutable. Past this point (around $v \approx 550$), the “specialness” effect reverses, and bargaining power begins to shift back toward VCs as k slopes downward.

The bottom-right panel illustrates how these forces translate into the division of economic rents. It is instructive to first consider the equilibrium in very “cold” conditions, such as $v = 275$. A simple calculation suggests a VC can barely break even, as the total project payoff barely covers the VC’s costs ($I + C_{VC} = 225$). However, the equilibrium remains viable due to the crucial role of screening. When v is this low, the market becomes intensely selective. The marginal VC screens a pool of exceptionally high-quality entrepreneurs and makes very few mistakes. The high probability of funding a successful project compensates for the low payoff magnitude, allowing the marginal VC to cover her costs. Yet, the plots show that in this state, nearly all economic rents accrue to the “special” entrepreneurs; the

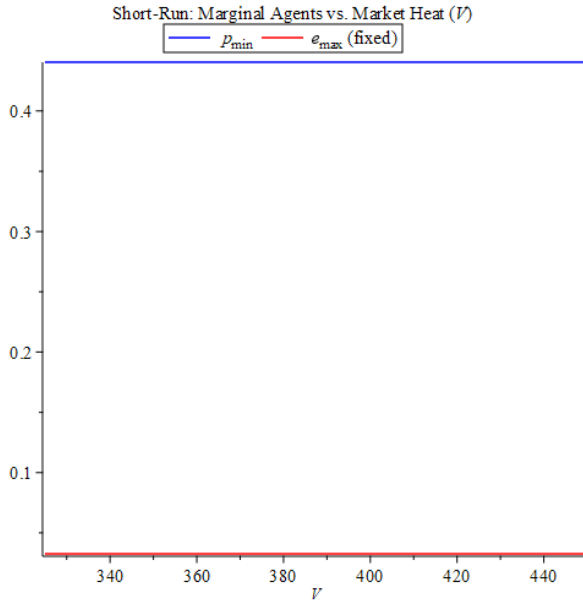
solid blue line (Best E) lies dramatically above all others.

Finally, the payoff plot reveals a rich set of dynamics for inframarginal agents over the entire cycle. The entrepreneur’s payoff curve is distinctly concave, reflecting the diminishing marginal returns to market heat as their bargaining power erodes. In stark contrast, the VC’s payoff curve is convex, as their gains accelerate in the hottest part of the market when they begin to reclaim a larger share of the growing surplus. The plots also reveal the powerful effect of the underlying talent distributions: the gap between the best and average entrepreneur’s payoff is not only larger than the corresponding gap for VCs, but it also widens more dramatically. This reflects the “permanent scarcity” of elite entrepreneurial talent assumed in our skewed Beta distribution. This dynamic culminates in a key empirical prediction: as the market heats up, the average net payoff to a VC grows faster than the average net payoff to an entrepreneur, reflecting the powerful shift in bargaining power toward the party with the less elastic supply of talent.

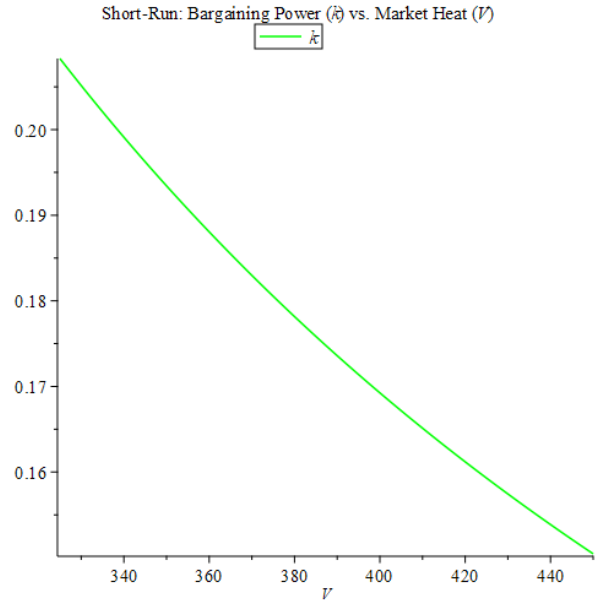
3.3.2 Short-Run Dynamics

Now let’s examine the short-run dynamics. Consider an economy in a relatively cold state with $v = 325$. Suppose the market experiences a sudden positive shock, moving the potential value to $v = 500$. In the long run, the market would adjust to a new equilibrium where k rises to approximately 0.235. But suppose that in the short run, the supply of VCs is fixed.

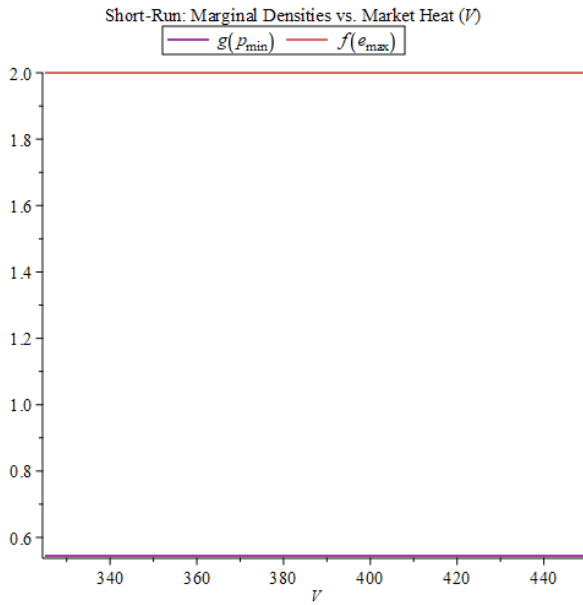
Figure 2 illustrates the short-run market dynamics, providing a stark contrast to the long-run equilibrium. The simulation begins from a relatively cool market equilibrium at $v = 325$. We then analyze the market’s response to a positive shock to investment opportunities (an increase in v up to 450), under the key assumption that the supply of active VCs remains fixed at its initial level. This scenario is designed to capture the “price adjustment” phase of a boom, before new capital and talent can enter the market.



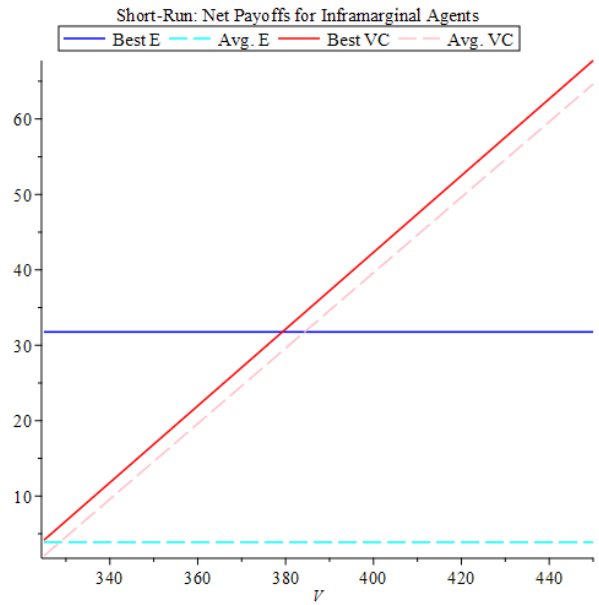
(a) $p_{\min}$ and $e_{\max}$ in v



(b) k in v



(c) $g(p_{\min})$ and $f(e_{\max})$ in v



(d) Rents of inframarginal agents in v

Figure 2: Short-run dynamics when $e_{\max}$ is fixed

The top panel shows the resulting path for bargaining power, k . In sharp contrast to the long-run case where k was initially rising, here it is a steeply decreasing function of v . The intuition is straightforward: with a fixed supply of VCs, the number of fundable projects is also fixed. As rising project values entice more entrepreneurs to seek funding, the only way to maintain market clearing and prevent demand from exceeding supply is for the price—the entrepreneur’s share k —to fall. This immediate, sharp decline in k is the market’s primary mechanism for absorbing the shock when quantity adjustment is not possible.

The bottom panel reveals the dramatic consequences for the division of rents. The short-run supply stickiness benefits all incumbent VCs, regardless of their quality. The rising tide of market heat (v), combined with their ability to capture the entire surplus through better terms (k falls), results in a massive windfall for the incumbent group. In stark contrast, no entrepreneur, not even the highest-quality agent, captures any of the marginal gains from the boom. Their “specialness” is reflected only in the high *level* of the best entrepreneur’s payoff; their inability to benefit from a hotter market illustrates their powerlessness when the quantity of available funding is fixed. The average entrepreneur’s payoff remains flat and close to zero, as the fixed pool of entrants is anchored by the marginal agent who earns zero profit by definition.

A striking feature of the bottom panel is that the payoff curve for the best VC is exactly linear. This is a direct result of the short-run equilibrium structure. As we have shown, the marginal entrepreneur’s zero-profit condition forces the term $(k \cdot v - x_e)$ to remain constant. Substituting the resulting expression for k into the best VC’s payoff function yields a linear relationship:

$$\text{Payoff}_{VC, Best} = v \cdot \mathbb{E}(p|p_{min}) - \text{Constant}.$$

The economic interpretation of this linearity is powerful. It demonstrates the purest form of rent extraction. With the pool of entrepreneurs fixed, the average quality of a funded

project, $\mathbb{E}(p|p_{min})$, is also fixed. The linearity implies that for every dollar of new surplus created by an increase in v , the best VC captures a constant fraction of that dollar, equal to the average quality of the projects they screen. The VC acts as a pure tollbooth, taking a fixed cut of all new value flowing into the market, because the competitive landscape is frozen in place.

4 Empirical Predictions

Our model provides a framework for understanding how market heat (v) translates into observable outcomes. A central insight of our analysis is that not all booms are created equal. The ultimate allocation of bargaining power depends critically on the nature of the technological shock—specifically, whether it democratizes entrepreneurship or favors specialized, scarce talent. We distinguish between these two regimes to generate a set of testable predictions for empirical researchers.

Before detailing specific predictions, we note a bridge between our abstraction and empirical reality. Strictly speaking, our model derives the equilibrium division of surplus, k . In practice, this abstract bargaining power manifests through a complex bundle of observable contract terms and investor behaviors. More broadly, we interpret k as proxying for a summary statistic for the entire deal structure. For example, when our model predicts a shift in bargaining power to VCs, we expect to see this reflected in lower pre-money valuations, stricter protective provisions (such as full-ratchet anti-dilution or participating liquidation preferences), and more aggressive governance. Conversely, a shift toward entrepreneurs should result in “cleaner” term sheets and looser oversight. This mapping allows us to extrapolate from our formal results on surplus division to predictions about contract design and investor patience.

The Nature of the Shock and Contract Terms. We first consider the evolution of contract terms. In a “Democratizing shock” (e.g., the dot-com boom), barriers to entry fall, creating a deep pool of substitute entrepreneurs (high marginal density $g(p)$). Our model predicts that in this regime, the supply of entrepreneurial talent is highly elastic. Consequently, despite rising valuations (v), bargaining power shifts toward VCs, the relatively scarce bottleneck. Empirically, this implies that while post-money valuations may rise with the tide, pre-money valuations (a proxy for the founder’s distinct contribution) will lag, effectively diluting the founder’s ownership share. Protective terms (such as liquidation preferences and board control) should also tighten. Conversely, in a “Specializing shock” (e.g., Generative AI or biotech), talent is scarce and inelastic (low $g(p)$). Here, the low density of marginal entrepreneurs implies that the average entrant is of high quality, leading to a higher overall probability of successful exits. VCs must compete for this limited pool of experts, driving up pre-money valuations and leading to founder-friendly terms (e.g., dual-class stock, “clean” term sheets) that mirror the high exit expectations. These predictions coincide with Property 1, the argument on the relative specialness of talents, formally stated in Theorem 2.4.2a.

Outcome Dispersion and Performance Persistence. The market cycle also shapes the second moment of outcomes. As derived in Theorem 2.5.4, hot markets strictly increase dispersion. For VCs, the entry of lower-skilled (“tourist”) capital increases the cross-sectional variance of fund returns. Ideally, empirical work would also examine the dispersion of entrepreneur payoffs. Just as the boom brings in marginal VCs, it attracts marginal business ideas (low p). In a Democratizing shock, this extensive margin effect is dominant, creating a “fat left tail” of failed startups. Furthermore, our model predicts that *performance persistence* for VCs is procyclical. The influx of unskilled capital prevents the market-clearing price from tightening enough to extract the full surplus from high-skill incumbents, strengthening the autocorrelation of top-tier fund returns during booms.

Scarcity, Patience, and Staging. Finally, we consider implications for governance and deal staging. The equilibrium bargaining power (k) reflects the opportunity cost of the scarce party. In a Democratizing shock where VCs are the bottleneck, their time is the constraining resource. We therefore expect VCs to exhibit *impatience* and impose tighter staging (more frequent milestones, shorter runways), allowing them to abandon underperforming projects quickly and reallocate resources. In contrast, in a Specializing shock where talent is the bottleneck, VCs must exhibit *patience* to retain scarce human capital. This predicts looser staging (longer runways) and implies that the startup failure rate may not rise as sharply as in a democratizing boom, as investors are willing to nurture marginal projects for longer. In addition, a smaller influx of lesser talent during booms, due to the specialized nature of required talent (low $g(p_{min})$), may also contribute to significantly lower failure probabilities than under a Democratizing shock.

Table 2 summarizes these predictions, mapping the type of shock to the expected directional change in observable market moments relative to a baseline cold market.

Table 2: Predicted Shifts in Observable Moments during Market Booms

Outcome Variable	Democratizing Shock (High $g(p)$, Elastic Talent)	Specializing Shock (Low $g(p)$, Inelastic Talent)
<i>Panel A: Contract Terms (Deal-Level)</i>		
Pre-Money / Post-Money Ratio	↓ (Higher Dilution)	↑ (Lower Dilution)
Investor Protections (e.g., Liq. Prefs)	↑ (Stricter)	↓ (Looser)
<i>Panel B: Outcomes & Performance (Fund & Founder Level)</i>		
Startup Failure Rate	↑↑	Ambiguous
VC Fund Return Variance	↑↑	↑
Entrepreneur Payoff Variance	↑↑	↑
VC Performance Persistence	↑ (Stronger)	↑ (Stronger)
<i>Panel C: Governance & Duration</i>		
Time to Liquidation (for Failures)	↓ (Impatient Capital)	↑ (Patient Capital)
Staging Intensity (Frequency of Rounds)	↑ (Tighter Control)	↓ (Looser Control)
Matching (VC-Founder Sorting)	↓ (Weaker)	↑ (Stronger)

5 Conclusion

This paper provides the first microfounded theory of how bargaining power evolves over the lifecycle of a venture capital boom. By endogenizing bargaining power as the Walrasian price that clears the market for talent, our framework reveals a distinct, two-phase “anatomy of a boom.” Following a positive shock, the market’s initial response is a short-run phase of pure price adjustment. Constrained by a fixed supply of incumbent VCs, the market clears by shifting bargaining power unambiguously in their favor, allowing them to capture windfall “incumbency rents.” These high returns, in turn, induce a long-run phase of quantity adjustment. As new, lower-quality entrants flood the market, the supply constraint is relaxed, and competition for deals intensifies, eroding the incumbent VCs’ super-normal profits and allowing entrepreneurs to finally capture a share of the boom’s surplus. The ultimate long-run division of bargaining power is nuanced, depending on the nature of the technological shock itself, which determines the marginal elasticity of talent supply on each side of the market.

This framework not only provides a rigorous explanation for the venture cycle but also offers new insights into other key empirical features of the market. For instance, the model provides a new, dynamic mechanism for the well-documented puzzle of performance persistence. A “rich get richer” property of the equilibrium shows how market booms act as a powerful amplifier of the returns to skill for elite VCs. Furthermore, the cyclical sorting of talent in our model offers a natural explanation for the procyclicality of innovation types, where cold markets dominated by elite agents are more conducive to radical innovation, while hot markets with lower-quality entrants favor more incremental projects. By providing a unified theory of these interconnected phenomena, our model offers a new lens through which to understand the complex dynamics of skill-intensive markets.

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A Proof of Proposition 2.1

Proof. First, we compute the conditional probability Π' , which corresponds to the incentive compatibility of a VC with talent e_j when she receives a high signal, $s_{i,j} = H$, from observing the idea of an entrepreneur with talent p_i . By its definition, we have

$$\Pi' := \Pr(w_i = w_G | s_{i,j} = H, p_i \geq p_{min}, e_j) = \frac{\Pr(w_i = w_G, s_{i,j} = H | p_i \geq p_{min}, e_j)}{\Pr(s_{i,j} = H | p_i \geq p_{min}, e_j)},$$

where the numerator is computed as

$$\begin{aligned} \Pr(w_i = w_G, s_{i,j} = H | p_i \geq p_{min}, e_j) &= \Pr(s_{i,j} = H | w_i = w_G, p_i \geq p_{min}, e_j) \\ &\quad \times \Pr(w_i = w_G, p_i \geq p_{min}, e_j) \\ &= \Pr(\epsilon_{i,j} = 0 | w_i, p_i \geq p_{min}, e_j) \times \Pr(w_i = w_G | p_i \geq p_{min}, e_j) \\ &\quad \times \Pr(p_i \geq p_{min}, e_j) \\ &= (1 - e_j) \mathbb{E}(p | p_{min}) [1 - G(p_{min})], \end{aligned}$$

and from the following computation

$$\begin{aligned} \Pr(w_i = w_B, s_{i,j} = H | p_i \geq p_{min}, e_j) &= \Pr(s_{i,j} = H | w_i = w_B, p_i \geq p_{min}, e_j) \\ &\quad \times \Pr(w_i = w_B, p_i \geq p_{min}, e_j) \\ &= \Pr(\epsilon_{i,j} = 1 | w_i, p_i \geq p_{min}, e_j) \times \Pr(w_i = w_B | p_i \geq p_{min}, e_j) \\ &\quad \times \Pr(p_i \geq p_{min}, e_j) \\ &= e_j [1 - \mathbb{E}(p | p_{min})] [1 - G(p_{min})], \end{aligned}$$

we derive the denominator as the sum of the two terms above:

$$\begin{aligned}\Pr(s_{i,j} = H | p_i \geq p_{min}, e_j) &= \Pr(w_i = w_G, s_{i,j} = H | p_i \geq p_{min}, e_j) \\ &\quad + \Pr(w_i = w_B, s_{i,j} = H | p_i \geq p_{min}, e_j) \\ &= [1 - G(p_i)] \times \{(1 - e_j) \times \mathbb{E}(p | p_{min}) + e_j \times [1 - \mathbb{E}(p | p_{min})]\}.\end{aligned}$$

Therefore, we have

$$\Pi' = \frac{(1 - e_j) \mathbb{E}(p | p_{min})}{(1 - e_j) \mathbb{E}(p | p_{min}) + e_j [1 - \mathbb{E}(p | p_{min})]}.$$

Secondly, we derive the participant constraint of the VC with e_j , using the outcome above and (7). By the definition of its corresponding conditional probability

$$\Pi''' := \Pr(s_{i,j} = H | p_i \geq p_{min}, e_j),$$

(7) is rearranged as

$$\Pr(w_i = w_G, s_{i,j} = H | p_i \geq p_{min}, e_j) \times (\mathbf{V}^{vc} - I) - \Pr(w_i = w_B, s_{i,j} = H | p_i \geq p_{min}, e_j) \times I - C_{VC} \geq 0,$$

or equivalently,

$$\mathbb{E}[\mathbf{1}_{\{w_i=w_G\}} \times \mathbf{1}_{\{s_{i,j}=H\}} | p_i \geq p_{min}, e_j] \times (\mathbf{V}^{vc} - I) - \mathbb{E}[\mathbf{1}_{\{w_i=w_B\}} \times \mathbf{1}_{\{s_{i,j}=H\}} | p_i \geq p_{min}, e_j] \times I - C_{VC} \geq 0.$$

Thirdly, we verify

$$\begin{aligned}\Pi''' \times \Pi' &= \Pr(s_{i,j} = H | p_i \geq p_{min}, e_j) \times \frac{\Pr(w_i = w_G, s_{i,j} = H | p_i \geq p_{min}, e_j)}{\Pr(s_{i,j} = H | p_i \geq p_{min}, e_j)} \\ &= \Pr(w_i = w_G, s_{i,j} = H | p_i \geq p_{min}, e_j).\end{aligned}$$

Next, by the assumption (1), we have

$$\begin{aligned} \underbrace{\Pr(\epsilon_{i,j} = 0 | w_i, p_i \geq p_{min}, e_j)}_{=1-e_j \text{ by assumption (1)}} &= 1 - e_j, \\ \Rightarrow \mathbb{E} \left[\underbrace{\Pr(\epsilon_{i,j} = 0 | w_i, p_i, e_j)}_{=1-e_j \text{ by assumption (1)}} \middle| w_i, p_i, e_j \leq e_{max} \right] &= 1 - \mathbb{E}(e | e_{max}). \end{aligned}$$

Finally, by using the law of iterated expectations (*LIE*), we verify

$$\begin{aligned} \Pr(w_i = w_G, s_{i,j} = H | p_i \geq p_{min}, e_j) &= \mathbb{E} [\mathbf{1}_{\{w_i=w_G\}} \times \mathbf{1}_{\{s_{i,j}=H\}} | p_i \geq p_{min}, e_j] \\ &= \mathbb{E} [\mathbf{1}_{\{w_i=w_G\}} \times \mathbf{1}_{\{\epsilon_{i,j}=0\}} | p_i \geq p_{min}, e_j] \\ &= \mathbb{E} [\mathbb{E} (\mathbf{1}_{\{w_i=w_G\}} \times \mathbf{1}_{\{\epsilon_{i,j}=0\}} | w_i, p_i \geq p_{min}, e_j) | p_i \geq p_{min}, e_j] \text{ (LIE)} \\ &= \mathbb{E} [\mathbf{1}_{\{w_i=w_G\}} \mathbb{E} (\mathbf{1}_{\{\epsilon_{i,j}=0\}} | w_i, p_i \geq p_{min}, e_j) | p_i \geq p_{min}, e_j] \\ &= \mathbb{E} [\mathbf{1}_{\{w_i=w_G\}} (1 - e_j) | p_i \geq p_{min}, e_j] \\ &= (1 - e_j) \mathbb{E} [\mathbb{E} (\mathbf{1}_{\{w_i=w_G\}} | p_i, e_j) | p_i \geq p_{min}, e_j] \text{ (LIE)} \\ &= (1 - e_j) \mathbb{E} (p_i | p_{min}). \end{aligned}$$

and conclude that (7) is rearranged as

$$\mathbb{E}(p_i | p_{min}) \times (1 - e_j) \times (\mathbf{V}^{vc} - I) - [1 - \mathbb{E}(p_i | p_{min})] \times e_j \times I - C_{VC} \geq 0.$$

Therefore, for a marginal VC with $e_j = e_{min}$, we derive her participation constraint as (14).

By (1) and $p_i := \Pr(w_i = w_G)$, we have $\Pi''' = p_i [1 - \mathbb{E}(e | e_{max})]$ and thereby, for a marginal entrepreneur with $p_i = p_{min}$ is computed as (13). Therefore, we conclude the proof. $\square$

B Proof of Proposition 2.2

Proof. 1. (*Proposition 2.2.1*) As we rearrange (14), it follows that

$$V^{VC}(w_G, k, v) - I = \frac{I[1 - \mathbb{E}(p|p_{min})]e_{max} + C_{VC}}{\mathbb{E}(p|p_{min})(1 - e_{max})}.$$

By plugging the right-hand side of the equation above into the left-hand side of (16), the latter is re-written as

$$\frac{I[1 - \mathbb{E}(p|p_{min})](2e_{max} - 1) + C_{VC} \cdot e_{max}}{1 - e_{max}}.$$

As we rearrange the numerator term, it follows that the left-hand side of (16) is weakly negative if and only if

$$C_{VC} \leq \frac{1 - 2e_{max}}{e_{max}} \cdot I[1 - \mathbb{E}(p|p_{min})],$$

which is equivalent to the inequality in Proposition 2.2.1.

2. (*Proposition 2.2.2*) By rearranging (15), we can represent e_{max} as a function of p_{min} :

$$e_{max} \equiv e(p_{min}) := F^{-1}[\omega(1 - G(p_{min}))] < \frac{1}{2},$$

where the bound of 1/2 follows from $F : (0, 1/2) \rightarrow [0, 1]$.

By plugging $e_{max} = e(p_{min})$ into (13) and (14), we can simplify the system of equations $\{(13), (14), (15)\}$ into a system of the two unknowns $\{p_{min}, k\}$ and the following two equations:

$$\mathbf{V}^e(k) = \tilde{J}(p_{min}) := \frac{C_e}{p_{min}(1 - \mathbb{E}[e|e(p_{min})])},$$

$$\mathbf{V}^{VC}(k) = \tilde{L}(p_{min}) := I + \frac{I[1 - \mathbb{E}(p|p_{min})]e(p_{min}) + C_{VC}}{\mathbb{E}(p|p_{min})[1 - e(p_{min})]},$$

where $\tilde{J}(p_{min})$ and $\tilde{L}(p_{min})$ are strictly decreasing functions of p_{min} . Equivalently, we can rearrange the above equations as follows:

$$k = k_e(p_{min}) := (\mathbf{V}^e)^{-1} \left[\tilde{J}(p_{min}) \right],$$

$$k = k_{VC}(p_{min}) := (\mathbf{V}^{VC})^{-1} \left[\tilde{L}(p_{min}) \right],$$

where $k_e(p_{min})$ is strictly decreasing and $k_{VC}(p_{min})$ is strictly increasing in p_{min} .

For $p_{min} = 1$, we have $\tilde{J}(1) = C_e$ and $\tilde{L}(1) = C_{VC} + I$, while $\tilde{J}(0) = \tilde{L}(0) = \infty$ for $p_{min} = 0$. We can restate the case with $p_{min} = 1$ as $k_e(1) = C_e$ and $k_{VC}(1) = C_{VC} + I$, where $k_e(0) = \infty$ (following from the condition $\mathbf{V}^e(k) \xrightarrow{k \rightarrow \infty} \infty$) and $k_{VC}(0) (< k_{VC}(1) = C_{VC} + I) < \infty$ for $p_{min} = 0$.

First, define $\phi(p_{min}) := k_e(p_{min}) - k_{VC}(p_{min})$. Since $\phi(0) = \infty$ and $\phi(\cdot)$ is strictly decreasing, it reaches zero at some unique value of p_{min} within $(0, 1)$ if and only if $\phi(1) < 0$ (equivalently, $k_e(1) < k_{VC}(1)$).

Next, denote the level of $p_{min} \in (0, 1)$ that holds $\phi(p_{min}) = 0$ by p_{min}^* . Let $k^* := k_e(p_{min}^*) = k_{vc}(p_{min}^*)$. Then, since $k_e(1) < k_e(p_{min}^*) = k_{VC}(p_{min}^*) < k_{VC}(1)$, we have $0 < k^* < 1$ if $k_e(1) \geq 0$ and $k_{VC}(1) \leq 1$ hold.

Therefore, we conclude the proof. □

C Proof of Theorem 2.4

Proof. Theorem 2.4.1 follows directly from (17) and (18). Theorem 2.4.2 is verified from an explicit algebra of the decomposition in the numerator of (19) as follows:

$$\begin{aligned} \frac{\partial k}{\partial v} \propto & \frac{\partial V^{VC}}{\partial v} \cdot V^e(w_G, c, v) \cdot (1 - e_{max}) \left[p_{min}^{-1} + \omega \cdot \frac{g(p_{min})}{F(e_{max})} \right] \\ & - \frac{\partial V^e}{\partial v} \cdot \left\{ \begin{aligned} & V^{VC}(w_G, c, v) \cdot \left[\omega \cdot \frac{g(p_{min})}{f(e_{max})} + \frac{g(p_{min})}{1-G(p_{min})} \left(1 - \frac{p_{min}}{\mathbb{E}(p|p_{min})} \right) \right] \\ & - I \cdot \left[\omega \cdot \frac{g(p_{min})}{f(e_{max})} \cdot \mathbb{E}(p|p_{min})^{-1} + \frac{g(p_{min})}{1-G(p_{min})} \cdot (1 + e_{max}) \left(1 - \frac{p_{min}}{\mathbb{E}(p|p_{min})} \right) \right] \end{aligned} \right\}. \end{aligned}$$

Therefore, we conclude the proof. $\square$

D Proof of Theorem 2.5

Proof. As we differentiate $L(e, v)$ in (22) with respect to e and v , respectively, we have

$$\frac{dL}{de} = -\frac{1}{1 - e_{max}} \{I[1 - \mathbb{E}(p|p_{min})] + C_{VC}\} < 0,$$

$$\frac{dL}{dv} = \frac{1 - e}{(1 - e_{max})^2} \cdot \{I[1 - \mathbb{E}(p|p_{min})] + C_{VC}\} \cdot \underbrace{\frac{\partial e_{max}}{\partial v}}_{\oplus} - \underbrace{\frac{d}{dp_{min}} \mathbb{E}(p|p_{min})}_{\oplus} \cdot \frac{e_{max} - e}{1 - e_{max}} \cdot \underbrace{\frac{\partial p_{min}}{\partial v}}_{\ominus} > 0,$$

verifying the first two partials. Hence, the cross derivative follows as

$$\frac{d^2 L}{dvde} = -\frac{1}{(1 - e_{max})^2} \cdot \{I[1 - \mathbb{E}(p|p_{min})] + C_{VC}\} \cdot \underbrace{\frac{\partial e_{max}}{\partial v}}_{\oplus} + \underbrace{\frac{d}{dp_{min}} \mathbb{E}(p|p_{min})}_{\oplus} \cdot \frac{1}{1 - e_{max}} \cdot \underbrace{\frac{\partial p_{min}}{\partial v}}_{\ominus} < 0,$$

verifying the third partial.

The derivative of $Var [L(e, v) | e_{max}]$ with respect to v is initially computed as

$$\begin{aligned} \frac{d}{dv} Var [L(e, v) | e_{max}] &= \frac{d}{dv} [A(v)^2 \cdot Var(e | e_{max})] \\ &= 2A(v) \cdot \underbrace{A'(v)}_{>0} \cdot Var(e | e_{max}) + A(v)^2 \cdot \frac{d}{dv} Var [L(e, v) | e_{max}]. \end{aligned}$$

The derivative of $Var(e | e_{max})$ with respect to v is initially computed as

$$\frac{d}{dv} Var(e | e_{max}) = \underbrace{\frac{de_{max}}{dv}}_{>0} \cdot \frac{d}{de_{max}} Var(e | e_{max}).$$

The derivative of $Var(e | e_{max})$ with respect to e_{max} is computed as

$$\begin{aligned} \frac{d}{de_{max}} Var(e | e_{max}) &= \frac{d}{de_{max}} [\mathbb{E}(e^2 | e_{max}) - \mathbb{E}(e | e_{max})^2] \\ &= \frac{d}{de_{max}} \left[\frac{1}{F(e_{max})} \cdot \int_0^{e_{max}} e^2 dF(e) - \left(\frac{1}{F(e_{max})} \cdot \int_0^{e_{max}} e dF(e) \right)^2 \right] \\ &= \frac{f(e_{max})}{F(e_{max})} \cdot \{e_{max}^2 - \mathbb{E}(e^2 | e_{max}) - 2\mathbb{E}(e | e_{max})[e_{max} - \mathbb{E}(e | e_{max})]\} \\ &= \frac{f(e_{max})}{F(e_{max})} \cdot \{[e_{max} - \mathbb{E}(e | e_{max})]^2 - Var(e | e_{max})\} \\ &= \frac{f(e_{max})}{F(e_{max})} \cdot \{[e_{max} - \mathbb{E}(e | e_{max})]^2 - \mathbb{E}([e - \mathbb{E}(e | e_{max})]^2 | e_{max})\} \\ &= \frac{f(e_{max})}{F(e_{max})} \cdot \mathbb{E}([e_{max} - \mathbb{E}(e | e_{max})]^2 - [e - \mathbb{E}(e | e_{max})]^2 | e_{max}) > 0. \end{aligned}$$

Hence, we have $Var [L(e, v) | e_{max}]$ and $Var(e | e_{max})$ strictly increasing in v . Therefore, we conclude the proof. $\square$

E Proof of Proposition 3.2

Proof. The verification follows directly from $e_{max}^* > \bar{e} = e_{max}$, which is a result of Theorem 2.4.1. As we rearrange (13) and (14) under the new long-run equilibrium, we have

$$V^e(w_G, k^*, v^*) = \widehat{J}(e_{max}^*) = \frac{C_e}{p(e_{max}^*) [1 - \mathbb{E}(e|e_{max}^*)]},$$

$$V^{VC}(w_G, k^*, v^*) = \widehat{L}(e_{max}^*) := I + \frac{I[1 - \mathbb{E}(p|p(e_{max}^*))]e_{max}^* + C_{VC}}{\mathbb{E}(p|p(e_{max}^*)) (1 - e_{max}^*)},$$

where $\widehat{J}(\cdot)$ and $\widehat{L}(\cdot)$ are strictly increasing functions. Hence, $e_{max}^* > e_{max}$ implies that

$$V^e(w_G, k^*, v^*) = \widehat{J}(e_{max}^*) > \widehat{J}(\bar{e}) = V^e(w_G, \bar{k}, v^*) = V^e(w_G, k, v),$$

$$V^{VC}(w_G, k^*, v^*) = \widehat{L}(e_{max}^*) > \widehat{L}(\bar{e}) = V^{VC}(w_G, k, v),$$

which verify Proposition 3.2.3 and the second inequality in Proposition 3.2.2.

Since $\partial V^e / \partial k > 0$, $V^e(w_G, k^*, v^*) > V^e(w_G, \bar{k}, v^*)$ implies $k^* > \bar{k}$, verifying Proposition 3.2.1. Likewise, since $\partial V^{VC} / \partial k < 0$, $k^* > \bar{k}$ implies $V^{VC}(w_G, k^*, v^*) < V^{VC}(w_G, \bar{k}, v^*)$, verifying the first inequality in Proposition 3.2.2.

The derivatives in 3.2.3 are verified as follows. First, by (14), a VC's ex-post payoff when $w = w_G$ is realized is equal to

$$V^{VC}(w_G, k, v) = I + \underbrace{\frac{I[1 - \mathbb{E}(p|p_{min})]e_{max} + C_{VC}}{\mathbb{E}(p|p_{min}) (1 - e_{max})}}_{:= RHS_{VC}},$$

where the right-hand side strictly increases in e_{max} and strictly decreases in p_{min} . Hence, by

differentiating the equation with respect to v , it follows that

$$\frac{d}{dv} V^{VC}(w_G, k, v) = \underbrace{\frac{dRHS_{VC}}{dp_{min}}}_{\ominus} \cdot \underbrace{\frac{\partial p_{min}}{\partial v}}_{\ominus} + \underbrace{\frac{dRHS_{VC}}{de_{max}}}_{\oplus} \cdot \underbrace{\frac{\partial e_{max}}{\partial v}}_{\oplus} > 0.$$

Similarly, by (13), an entrepreneur's ex-post payoff when $w = w_G$ is realized is equal to

$$V^e(w_G, k, v) = \frac{C_e}{\underbrace{p_{min} [1 - \mathbb{E}(e|e_{max})]}_{:=RHS_e}},$$

where the right-hand side strictly increases in e_{max} and strictly decreases in p_{min} . Hence, by differentiating the equation with respect to v , it follows that

$$\frac{d}{dv} V^e(w_G, k, v) = \underbrace{\frac{dRHS_e}{dp_{min}}}_{\ominus} \cdot \underbrace{\frac{\partial p_{min}}{\partial v}}_{\ominus} + \underbrace{\frac{dRHS_e}{de_{max}}}_{\oplus} \cdot \underbrace{\frac{\partial e_{max}}{\partial v}}_{\oplus} > 0.$$

Therefore, we conclude the proof. □