Retail Capital as a Stepping Stone in Venture Capital: Theory and Empirics*

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Abstract

What are the general equilibrium effects of retail investor entry into private markets? The conventional debate focuses on direct effects: potential benefits (portfolio diversification, access to high-return assets) versus costs (excessive fees, inefficient capital allocation by retail investors). We identify a countervailing mechanism: retail investors fund experimentation with unproven general partners (GPs), enabling institutions to free-ride by poaching proven talent. We document that 34% of value created by institutional investments in private markets comes from GPs who started with retail capital. We formalize this *stepping-stone* mechanism by extending Berk and Green (2004) to venture capital with heterogeneous investors and uncertain manager skill. New GPs with moderate perceived ability initially raise retail capital to reveal their true skill; after observing performance, skilled GPs graduate to institutional capital while unsuccessful GPs exit. Retail investors pay for information production, but institutions capture benefits through better manager selection. Our calibrated model shows that retail investor entry increases aggregate welfare when stepping-stone benefits exceed inefficient allocation costs. Policies restricting retail access may harm efficiency by restricting this talent discovery path.

Keywords: Venture Capital, Performance Persistence, Retail Investors, Learning, Skill Discovery

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1 Introduction

What are the general equilibrium effects of retail investor entry into venture capital markets? Access to venture capital has traditionally been limited to institutional investors and wealthy individuals, with retail investors largely excluded from this asset class. Recently, however, policymakers worldwide have shown increasing interest in broadening access to private investments. The JOBS Act (2012) and SEC amendments (2020) in the United States, alongside similar initiatives in Europe such as MiFID II (2018) and the revised ELTIF framework (2023), reflect this trend.[1]

The conventional debate about retail access focuses on direct effects weighing potential benefits against costs (Balloch et al., 2025; Miller et al., 2025). On the benefit side, retail investors could diversify their portfolios and gain access to high-return assets, contributing to financial democratization. On the cost side, retail investors may face excessive fees, lack the sophistication to evaluate venture investments properly, and allocate capital inefficiently, potentially leading to net wealth destruction. This traditional view evaluates retail access primarily through its impact on retail investors' own returns.

We argue that this perspective misses indirect effects. For example, retail capital's role in talent discovery may create positive externalities for the entire private markets ecosystem. We begin by documenting a striking empirical pattern. As shown in Figure 1, most new general partners (GPs) start their careers by raising capital from retail (individual) investors, with a gradual transition toward institutional capital as GPs establish track records over subsequent funds. The pattern is clear and pervasive: substantial numbers of first and second sequence funds raise capital from retail investors, while institutional capital dominates later fund sequences.

This pattern has major economic implications. We show that 34% of the value created by institutional VC investments comes from GPs who initially raised retail capital. This fraction is even higher for established funds: among GPs managing their ninth fund or later, those who started with retail capital now account for 67% of institutional assets under management and 44% of institutional value creation. Since institutional capital dominates overall value creation in venture capital, retail investors' role in talent discovery generates substantial positive externalities for the entire ecosystem. Rather than serving merely as a temporary funding source, retail capital functions as a crucial pathway for discovering talented managers who subsequently create substantial value with institutional capital.

What explains retail capital's substantial indirect value creation? We argue that retail investors serve a critical information production role. By funding unproven GPs, retail investors generate performance signals that reveal manager skill. Institutional investors then benefit by selectively investing in GPs who have demonstrated talent with retail capital. We formalize this stepping-stone mechanism through a model of venture capital fundraising with heterogeneous investors and uncertain GP skill.

Building on the skill-learning framework of Berk and Green (2004), we extend it to incorporate key institutional features of venture capital that fundamentally alter the model's logic. Unlike mutual funds, venture capital involves sequential fundraising with infrequent learning signals over long fund cycles (typically 7–10 years), limiting opportunities to learn

[1] In this paper, we use individual investors and retail investors interchangeably.

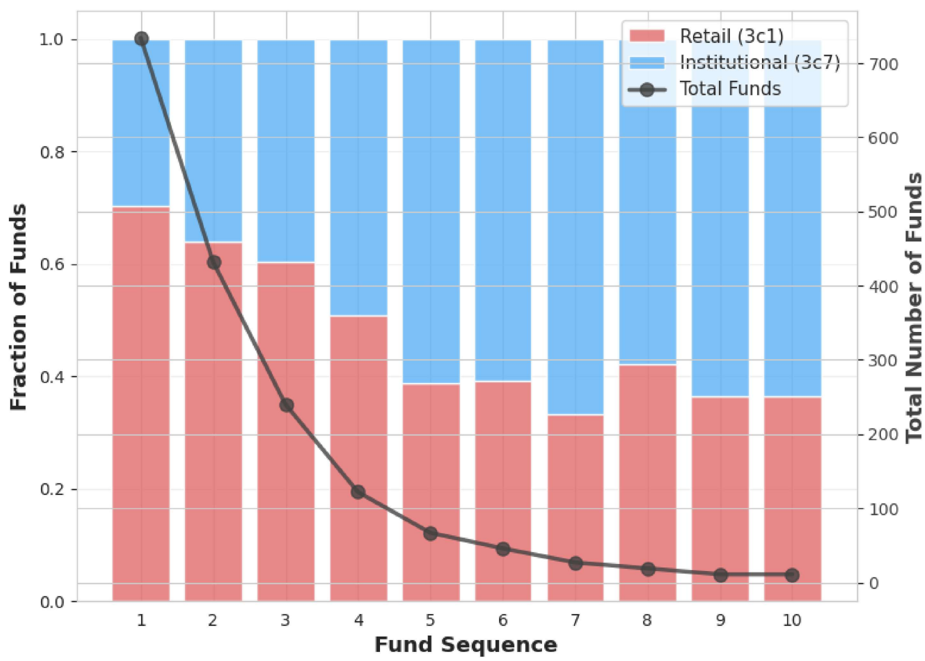

Figure 1: **Distribution of Funds by Capital Source and Fund Sequence.** This figure shows the fraction of venture capital funds by fund sequence (the Nth fund raised by each GP), separately for retail and institutional investors. The classification follows Form ADV filings: funds relying on Section 3(c)(1) of the Investment Company Act are retail, and those relying on Section 3(c)(7) are institutional. The gray line, using the right axis, reports the total number of funds.

about GP skill. Investor types are heterogeneous: institutional investors have lower administrative costs per dollar but require larger minimum fund sizes, while retail investors accept lower expected returns due to access constraints, portfolio benefits, or behavioral factors. Finally, venture capital creates real value through entrepreneurial investment, contrasting with the near zero-sum redistribution in mutual fund settings. These features generate market segmentation and information production dynamics absent from the original Berk-Green framework.

Our model reveals how investor heterogeneity and skill uncertainty generate market segmentation. GPs with low perceived skill cannot raise capital from any investors. Those with moderate perceived skill can only access retail investors, whose lower return requirements and smaller minimum fund sizes make them accessible to unproven GPs. Those with high perceived skill prefer institutional capital due to its lower costs and larger scale economies.

Our modifications to the Berk-Green framework are not ad hoc: they generate empirically realistic patterns. Specifically, the model naturally produces the persistent return differentials observed in venture capital markets. In the original Berk and Green (2004) model, capital flows eliminate performance persistence. However, our extensions—discrete fundraising cycles and investor heterogeneity in return requirements—generate persistent outperformance by GPs who graduate to institutional capital. These managers maintain performance advantages because they benefit from lower costs and larger scale while being selected through demonstrated skill. This prediction aligns with extensive empirical evidence documenting return persistence in venture capital (Kaplan and Schoar, 2005; Harris et al., 2023; Nanda et al., 2020), suggesting our institutional features capture economically relevant frictions.

Most importantly, retail investment creates significant social value through information production. By funding GPs with moderate perceived skill, retail capital generates performance signals that reveal true ability. This creates option value: skilled GPs graduate to institutional capital in subsequent funds, while unsuccessful GPs exit. The market thus discovers talented managers who would otherwise remain unfunded. This information production generates a striking welfare trade-off. Retail investors bear the costs of experimentation and may experience losses in expectation, while institutional investors capture the benefits through superior manager selection. We show that retail entry can increase aggregate welfare even when retail investors earn negative expected returns, provided the stepping-stone benefits—improved capital allocation and talent discovery for the institutional segment—exceed the direct costs of value destruction in the retail segment.

Our analysis has important implications for the ongoing policy debate on expanding retail access to venture capital. We develop a welfare framework that endogenously determines the optimal degree of retail access to maximize overall economic impact. The framework highlights the fundamental trade-off: expanding retail access enhances talent discovery through the stepping-stone effect but may also induce value destruction when retail investors allocate capital inefficiently. The optimal policy balances these forces, potentially tolerating retail losses for long-term gains in talent identification and capital allocation efficiency.

Recent regulatory initiatives across jurisdictions—such as the JOBS (Jumpstart Our Business Startups) Act of 2012 and the SEC's 2020 amendments to the accredited investor definition in the United States, as well as similar initiatives in Europe—reflect growing efforts to increase retail investor access to venture capital and other alternative assets. These reforms have created natural experiments for assessing the broader consequences of financial market democratization. Prior research in this area, however, has largely focused on direct investor protection concerns and micro-level regulatory outcomes. For example, Howell et al. (2025) documents that Rule 506(c) of the 2013 JOBS Act, which allowed public advertising in private markets, was adopted disproportionately by less-networked and underrepresented managers, while the need for hard information in arm's-length fundraising imposed signaling costs that limited uptake. Similarly, Rosenberg (2002) and Sensoy et al. (2014) study how legal and market design features shape venture capital partnership structures, limited partner performance, and investor sophistication over time.

Our model complements and extends this literature by providing a theoretical framework to evaluate macro-level welfare implications of expanding retail access. Specifically, it quantifies the option value created when a more inclusive investor base improves the discovery of skilled venture capital managers. Unlike previous work and policy discussions that emphasize investor protection alone, our framework highlights the positive externalities of retail participation: enhanced information about GP skill that ultimately benefits the entire market, including institutional investors, through more efficient capital allocation. This perspective underscores the importance of designing regulations that balance investor protection with the broader social benefits of financial market democratization.

The remainder of the paper is organized as follows. Section 2 reviews the related literature and positions our contribution. Section 3 presents our model setup. Section 4 derives the optimal fund size and investor choice decisions. Section 5 characterizes explicit thresholds for investor participation and GP preferences. Section 6 analyzes the option value of learning and the stepping stone mechanism. Section 7 quantifies the economic value of retail investor access and derives the optimal retail bias for welfare maximization. Section 8 discusses policy implications for expanding retail access to venture capital. Section 9 presents our data sources, sample construction, and summary statistics. Section 10 provides numerical results and empirical evidence supporting our theoretical predictions. Section 11 concludes.

2 Literature Review and Contribution

Our work contributes to several interconnected strands of literature in financial economics: learning about fund manager skill, venture capital performance persistence, market segmentation in capital allocation, and retail investor access to alternative assets. We develop the first theoretical framework that explains how retail capital can serve as a stepping stone for venture capital general partners while creating broader economic value through improved skill discovery.

2.1 Learning About Fund Manager Skill

Our study adapts the seminal framework in Berk and Green (2004) for mutual funds to venture capital, where key institutional features lead to fundamentally different implications. Our approach relates to broader literature on delegation and investor misperception in financial markets (e.g., Gennaioli et al. (2015)).

The venture capital setting differs fundamentally from mutual funds in ways that affect learning dynamics and equilibrium outcomes. Metrick and Yasuda (2010) discuss how the institutional design of venture capital funds, including fee structures, investment horizons, and illiquidity, create different incentives than those in public markets. Cochrane (2005) analyzes the risk and return characteristics of venture capital after correcting for selection bias and compares the risk-adjusted performance of VC relative to public markets.

Our key theoretical innovation demonstrates that the institutional differences between venture capital and mutual funds enable GPs to use retail capital as a stepping stone, demonstrating their skills to investors through the Berk and Green learning mechanism before graduating to more efficient institutional capital.

2.2 Market Segmentation and Capital Allocation

Our work contributes to the literature on market segmentation in financial markets and its effects on capital allocation efficiency. Theoretical work by Gennaioli et al. (2015) shows how delegation can lead to market segmentation when investors have different levels of sophistication, risk tolerance, or trust in financial intermediaries. Greenwood and Hanson (2013) examine how fluctuations in the composition of bond issuers — particularly the prevalence of low-credit-quality issuance — predict future corporate bond returns. They interpret these patterns as evidence that demand-driven, segmented credit markets can lead to time-varying mispricing and inefficient capital allocation.

In the venture capital context, several papers examine different forms of market segmentation. Hellmann et al. (2008) study how bank-affiliated venture capital funds differ from independent venture capital in their investment behavior and performance. Lerner (2012) provides a comprehensive analysis of government interventions in venture capital markets and their mixed track record, showing how targeted or poorly designed policies can create segmentation and distortions in entrepreneurial finance ecosystems. Ewens et al. (2022) show that contract terms vary systematically with startup and investor characteristics, reflecting a trade-off between incentive alignment, control rights, and risk sharing.

Our contribution is to provide the first formal model of how heterogeneity in investor performance sensitivity and administrative costs (or value creation) can lead to beneficial rather than destructive market segmentation. Crucially, we show that this segmentation improves overall capital allocation efficiency by creating a graduated entry path for emerging managers, enabling skill discovery that would not occur in a unified market. This perspective contrasts with much of the segmentation literature that views market fragmentation as reflecting inefficiencies or market failures.

2.3 Retail Investors in Alternative Assets

A growing literature examines retail investor participation in alternative assets, an area traditionally dominated by institutional investors due to regulatory restrictions, high investment minimums, and complexity. Lerner et al. (2007) document the historical dominance of institutional investors in private equity, though they find significant heterogeneity in sophistication and performance even among institutions.

Recent work has examined new vehicles for retail participation in alternative assets. Gupta and Van Nieuwerburgh (2021) examines how to value private equity investments using cash flow data ("strip by strip").

In venture capital specifically, the primary evidence comes from labor-sponsored venture capital corporations (LSVCCs) in Canada. Cumming and MacIntosh (2006) and Brander et al. (2015) find that while LSVCCs underperform traditional venture capital funds, they may serve a useful role in developing local venture capital ecosystems and providing capital to early-stage companies that might otherwise lack funding. Da Rin et al. (2006) analyze how public policy affects the creation of active venture capital markets across different countries, providing context for policy interventions.

Our theoretical contribution is to develop the first comprehensive framework for analyzing when and why retail investment in venture capital creates value, both for individual participants and for the broader economy. While previous work has focused primarily on the direct costs and benefits to retail investors themselves—typically finding that retail investors are disadvantaged—we identify an indirect stepping stone function that retail capital can play in the venture ecosystem. This perspective shifts the analysis from retail investor protection to the broader economic benefits of expanding market access, including improved capital allocation and skill discovery.

2.4 Venture Capital Performance Persistence

A substantial empirical literature documents strong and persistent performance differences across venture capital funds, presenting a puzzle relative to other asset classes. Kaplan and Schoar (2005) provide seminal evidence of performance persistence in private equity funds, with GPs whose funds outperform in one period significantly more likely to outperform in subsequent funds. More recently, Harris et al. (2023) find that venture capital performance remains remarkably persistent across funds raised by the same GP, while buyout fund persistence has weakened over time. Nanda et al. (2020) provide additional evidence of persistent returns and link them to GPs' ability to maintain access to high-quality deal flow.

This persistence contrasts sharply with mutual funds, where performance persistence is typically weak (Carhart, 1997). Several explanations have been proposed for venture capital persistence, including skill differences among GPs (Korteweg and Sorensen, 2017), privileged access to deal flow (Nanda et al., 2020), network effects that create barriers to entry (Hochberg et al., 2007), and market segmentation that prevents competitive arbitrage (Lerner et al., 2007).

Our model contributes a novel mechanism that complements these existing explanations. We show how the interaction between skill uncertainty and investor segmentation creates structural persistence that cannot be eliminated through capital flows, even when investors learn about GP skill over time. Unlike previous explanations that focus primarily on GP characteristics (skill, networks) or market access (deal flow), we demonstrate how the demand side of the market—specifically investor heterogeneity—contributes to persistence patterns. This perspective helps explain why performance differences persist even as the venture capital industry has matured and become more competitive.

2.5 Broader Stepping Stone and Entry Literature

Our work also connects to a broader literature examining how market entrants can create value for incumbents through segmentation and stepping stone mechanisms, challenging traditional competitive entry models that focus solely on rivalry and displacement. This literature spans industrial organization, labor economics, and information theory, though applications to financial markets remain limited.

Resource partitioning theory (Carroll, 1985) provides a foundational framework showing how markets can accommodate both large incumbents and small entrants without destructive competition through size-based segmentation. Progressive entry frameworks (Bourreau and Drouard, 2010) demonstrate how service-based competition phases allow entrants to gradually acquire market experience before full competitive entry. These models primarily focus on operational competition across industries rather than financial market dynamics.

Arrow's learning-by-doing framework (Arrow, 1962) and knowledge spillover models (Glaeser and Kerr, 2010) identify how competitive participation generates valuable information with positive externalities, while empirical work documents stepping stone patterns across sectors from investment banking talent pipelines (Morrison and Wilhelm Jr, 2004) to broader professional mobility patterns. However, these theories lack formal mechanisms for quantifying option values in financial markets.

Our venture capital model contributes to this literature by formalizing the option value mechanism through which graduated market access operates in financial intermediation. We extend the theoretical foundation by developing a formal framework that quantifies how investor heterogeneity and performance preferences create natural market segmentation in venture capital. Unlike previous stepping stone research that documents descriptive patterns (Carpentier and Suret, 2019), our model provides theoretical tools for understanding when and why retail capital access creates option value for skill discovery, moving beyond empirical observation to formal economic modeling within the venture capital context.

Our framework advances the information production strand of this literature by providing formal tools to evaluate the option value of learning externalities. We fill a gap by developing a theoretical framework that calculates the option value generated when retail investors enable marginal GPs to enter venture capital markets and potentially discover high skill levels. By formalizing the option value of graduated access mechanisms, our framework offers a foundation for future welfare analysis and policy design in financial market democratization.

3 Model Setup

We consider a two-period model where GPs and investors share uncertainty about the GP's skill. GPs raise capital at times $t = 0$ and $t = 1$, invest, observe returns at times $t = 1$ and $t = 2$, and update beliefs about skill. They can raise capital from investor type $j \in \{I, R\}$ with I for institutional investors and R for retail investors.

3.1 Key Variables and Parameters

- θ_i: GP i's true skill, unknown to all parties including the GP
- μ_0: Initial perceived skill based on observable characteristics
- μ_1: Updated perceived skill after observing first period return
- σ_t^2: Variance of skill estimate at time $t \in \{0, 1\}$
- A_0: Fund size chosen at $t = 0$ (first fund)
- A_1: Fund size chosen at $t = 1$ (second fund)
- r_1: Return realized at $t = 1$ from first fund
- r_2: Return realized at $t = 2$ from second fund
- c_I: Administrative cost per dollar for institutional capital
- c_R: Administrative cost per dollar for retail capital, with $c_R > c_I > 0$
- m: Management fee rate
- p: Performance fee rate (carried interest)
- b: Diseconomy of scale parameter, $b > 0$
- δ: Retail investors' utility adjustment parameter
- β: Discount factor for future payoffs
- A^I_{min}: Minimum viable fund size for institutional capital
- A^R_{min}: Minimum viable fund size for retail capital, with $A^I_{min} > A^R_{min} > 0$

A key distinction in our model is that we explicitly account for the possibility that the maximum amount of capital that can be raised given investor participation constraints ($A_t^{j,max}$) might be smaller than the minimum required fund size (A^j_{min}). In such cases, the GP cannot start or continue the fund with that investor type.

3.2 Prior Beliefs, Fund Performance, and Learning

Initially, all parties (GPs and investors) share a common prior about a GP's skill:

$$\theta_i \sim N(\mu_{0,i}, \sigma_{0,i}^2). \tag{1}$$

We suppress the subscript i for the problem of one GP in the following sections and recover it when discussing the entire distribution of GPs. The expected fund returns from the perspective of time t are:

$$E[r_1|\mu_0] = \mu_0 - bA_0 \tag{2}$$
$$E[r_2|\mu_1] = \mu_1 - bA_1. \tag{3}$$

The realized returns are:

$$r_1 = \theta - bA_0 + \epsilon_1 \tag{4}$$
$$r_2 = \theta - bA_1 + \epsilon_2, \tag{5}$$

where $\epsilon_1 \sim N(0, \sigma_\epsilon^2)$ is performance noise.

After observing the return r_1 at time $t = 1$, investors update their beliefs about the GP's skill according to Bayes' rule:

$$\mu_1 = \frac{\sigma_0^2(r_1 + bA_0) + \sigma_\epsilon^2 \mu_0}{\sigma_0^2 + \sigma_\epsilon^2} \tag{6}$$
$$\sigma_1^2 = \frac{\sigma_0^2 \sigma_\epsilon^2}{\sigma_0^2 + \sigma_\epsilon^2}. \tag{7}$$

3.3 Fee Structure

The GP charges:

- Management fee: $m \cdot A_t$
- Performance fee (carried interest): $p \cdot \max\{r_t \cdot A_t, 0\}$

The expected total fee from the perspective of time t is:

$$E[fee|\mu_t] = m \cdot A_t + p \cdot (\mu_t - bA_t) \cdot A_t. \tag{8}$$

To preserve both the analytical tractability of the model and the economic relevance of the performance fee in our benchmark setting, we abstract from the asymmetry introduced by return noise. Specifically, we use $p \cdot (\mu_t - bA_t)$ as a proxy for $E(p \cdot \max\{r_t A_t, 0\})$ and focus on equilibrium fund sizes for which $\mu_t - bA_t$ remains positive. We investigate the case with negative expected returns (i.e., with $\mu_t - bA_t < 0$) later in Section 6.3.

In Appendix Section C, we retain the asymmetric payoff $E(p \cdot \max\{r_t A_t, 0\})$ of the performance fee and show that the stepping-stone effect persists. However, all results must be obtained numerically due to this asymmetry.

3.4 Investor Participation Constraints

Institutional Investors:

$$\begin{aligned}(1-p)(\mu_t - bA_t) - m \geq 0 \\ A_t \geq A^I_{min}\end{aligned} \tag{9}$$

Retail Investors:

$$\begin{aligned}(1-p)(\mu_t - bA_t) - m + \delta \geq 0 \\ A_t \geq A^R_{min}\end{aligned} \tag{10}$$

The parameter $\delta > 0$ represents a wedge between retail and institutional investors' required returns. This wedge can arise from several mechanisms:

- **Access constraints**: Retail investors face greater barriers to accessing VC investments, whether from regulatory restrictions (accredited investor requirements), informational frictions, or limited distribution channels. This restricted access can create a premium that retail investors are willing to pay for available opportunities.
- **Portfolio considerations**: VC investments may provide particularly valuable diversification benefits for retail investors with limited exposure to private markets, relative to institutional investors with broad alternative investment access.
- **Behavioral and informational factors**: Differences in sophistication, belief formation, or non-pecuniary utility from participating in venture capital may lead retail investors to accept different expected returns.

The parameter δ captures the net effect of these factors in reduced form. It can be interpreted either as reflecting inherent differences between investor types or as a characteristic that can be influenced by policy choices regarding disclosure, education, and access restrictions. In our welfare analysis in Section 6.3, we treat δ as representing behavioral biases or distortions that do not directly enter retail investors' utility. This provides a conservative framework for evaluating optimal policy. To the extent that δ captures genuine diversification benefits or other real utility gains to retail investors, these additional benefits would strengthen the case for retail access.

The minimum fund size $A^j_{min} > 0$ represents the threshold below which investor type j will not participate, reflecting concerns about operational efficiency and portfolio diversification at the fund level. We assume $A^R_{min} < A^I_{min}$, capturing institutional investors' preference for larger, more established funds.

3.5 GP Profit

The GP's expected profit from a fund raised at time t is:

$$E[\Pi_t|\mu_t] = m \cdot A_t + p \cdot (\mu_t - bA_t) \cdot A_t - c_j \cdot A_t, \tag{11}$$

where $j \in \{I, R\}$ indicates the investor type.

4 GP's Decision Problem

4.1 Decision at $t = 1$

At $t = 1$, after observing the first fund's return r_1 and updating beliefs to μ_1, the GP chooses whether to raise a second fund and from which investor type. The GP's value function is:

$$V_1(\mu_1) = \max\{E[\Pi_1^I|\mu_1] \cdot \mathbf{1}_{\mu_1 \geq \mu_{1,I}^{min}}, E[\Pi_1^R|\mu_1] \cdot \mathbf{1}_{\mu_1 \geq \mu_{1,R}^{min}}, 0\} \tag{12}$$

where $E[\Pi_1^I|\mu_1]$ and $E[\Pi_1^R|\mu_1]$ are the expected profits from raising the second fund from institutional and retail investors, respectively. The indicator functions reflect that the GP can only raise from a particular investor type if the perceived skill meets the minimum threshold for that investor type, which now includes the constraint that $A_t^{j,max} \geq A_{min}$.

4.2 Decision at $t = 0$

At $t = 0$, the GP makes decisions based on μ_0 and anticipates how these decisions will affect learning and future options. The GP's value function is:

$$V_0(\mu_0) = \max\{E[\Pi_0^I|\mu_0] \cdot \mathbf{1}_{\mu_0 \geq \mu_{0,I}^{min}} + \beta E[V_1(\mu_1)|\mu_0, I], \tag{13}$$

$$E[\Pi_0^R|\mu_0] \cdot \mathbf{1}_{\mu_0 \geq \mu_{0,R}^{min}} + \beta E[V_1(\mu_1)|\mu_0, R], 0\} \tag{14}$$

This formulation explicitly accounts for the option value of learning about skill through first-period performance.

5 Optimal Fund Size and Investor Choice

5.1 Optimal Fund Size

Proposition 1. *Given that the maximum fund size $A_t^{j,max}$ determined by investor participation constraints exceeds the minimum viable fund size A_{min}, the profit-maximizing fund size for a GP with perceived skill μ_t raising from investor type $j \in \{I, R\}$ is:*

$$A_t^{j*} = \min\left\{\frac{m + p\mu_t - c_j}{2pb}, A_t^{j,max}\right\} \tag{15}$$

where $A_t^{I,max} = \frac{\mu_t - \frac{m}{1-p}}{b}$ and $A_t^{R,max} = \frac{\mu_t - \frac{m-\delta}{1-p}}{b}$ are the maximum fund sizes allowed by investor participation constraints.

If $A_t^{j,max} < A_{min}$, then the GP cannot raise capital from investor type j at time t.

If $A_t^{j,unc} < A_{min} \leq A_t^{j,max}$, then the GP sets $A_t^{j*} = A_{min}$.

Proof. The GP's expected profit is:

$$E[\Pi_t^j|\mu_t] = m \cdot A_t + p \cdot (\mu_t - bA_t) \cdot A_t - c_j \cdot A_t \tag{16}$$

Taking the derivative with respect to A_t:

$$\frac{\partial E[\Pi_t^j|\mu_t]}{\partial A_t} = m + p\mu_t - 2pbA_t - c_j = 0 \tag{17}$$

Solving for the unconstrained optimal fund size:

$$A_t^{j,unc} = \frac{m + p\mu_t - c_j}{2pb} \tag{18}$$

However, the fund size is constrained by investor participation. For institutional investors, the constraint is:

$$(1-p)(\mu_t - bA_t) - m \geq 0 \tag{19}$$

$$\mu_t - bA_t \geq \frac{m}{1-p} \tag{20}$$

$$A_t \leq \frac{\mu_t - \frac{m}{1-p}}{b} \tag{21}$$

So $A_t^{I,max} = \frac{\mu_t - \frac{m}{1-p}}{b}$.

For retail investors, the constraint is:

$$(1-p)(\mu_t - bA_t) - m + \delta \geq 0 \tag{22}$$

$$\mu_t - bA_t \geq \frac{m-\delta}{1-p} \tag{23}$$

$$A_t \leq \frac{\mu_t - \frac{m-\delta}{1-p}}{b} \tag{24}$$

So $A_t^{R,max} = \frac{\mu_t - \frac{m-\delta}{1-p}}{b}$.

Additionally, we have the minimum fund size constraint $A_t \geq A_{min}^j$. For the fund to be viable, we need $A_t^{j,max} \geq A_{min}^j$.

If $A_t^{j,max} < A_{min}^j$, then the GP cannot raise capital from investor type j.

If $A_t^{j,max} \geq A_{min}^j$, we need to consider the unconstrained optimum $A_t^{j,unc}$:

1. If $A_t^{j,unc} \geq A_{min}^j$, then the optimal fund size is $A_t^{j*} = \min\{A_t^{j,unc}, A_t^{j,max}\}$

2. If $A_t^{j,unc} < A_{min}^j \leq A_t^{j,max}$, then the GP sets $A_t^{j*} = A_{min}^j$, since profit is increasing in fund size when $A_t < A_t^{j,unc}$ □

5.2 Investor Participation Thresholds

Proposition 2. *For a GP to be able to raise capital from institutional investors, the perceived skill level must satisfy:*

$$\mu_t \geq \mu_{min}^I = bA_{min}^I + \frac{m}{1-p}. \tag{25}$$

For a GP to be able to raise capital from retail investors, the perceived skill level must satisfy:

$$\mu_t \geq \mu_{min}^R = bA_{min}^R + \frac{m-\delta}{1-p}, \tag{26}$$

where $\mu_{min}^I > \mu_{min}^R$ since $\delta > 0$ and $A_{min}^I > A_{min}^R$.

Proof. For institutional investors, we need $A_t^{I,max} \geq A_{min}^I$ to satisfy both the participation constraint and the minimum fund size requirement. This condition implies:

$$\frac{\mu_t - \frac{m}{1-p}}{b} \geq A_{min}^I \tag{27}$$

$$\Rightarrow \mu_t \geq bA_{min}^I + \frac{m}{1-p} = \mu_{min}^I \tag{28}$$

Similarly, for retail investors:

$$\frac{\mu_t - \frac{m-\delta}{1-p}}{b} \geq A_{min}^R \tag{29}$$

$$\Rightarrow \mu_t \geq bA_{min}^R + \frac{m-\delta}{1-p} = \mu_{min}^R \tag{30}$$

Since $\delta > 0$ and $A_{min}^I > A_{min}^R$, we have $\mu_{min}^I > \mu_{min}^R$. □

5.3 GP's Investor Type Preference

We now derive the threshold μ_t^* that determines when a GP switches from preferring retail to institutional investors. The correct derivation requires solving a quadratic equation and checking which constraints are actually binding.

5.3.1 Determining When Constraints Bind

To determine the appropriate case structure, we first identify when constraints start binding:

For institutional investors, the return constraint binds when:

$$A_t^{I,unc} > A_t^{I,max} \Rightarrow \mu_t < \frac{m(1+2p) + c_I(p-1)}{p(1-p)} \equiv \mu_{t,I}^{bind} \tag{31}$$

For retail investors, the return constraint binds when:

$$A_t^{R,unc} > A_t^{R,max} \Rightarrow \mu_t < \frac{m(1+p) + c_R(p-1) - 2p\delta}{p(1-p)} \equiv \mu_{t,R}^{bind} \tag{32}$$

5.3.2 Case 1: Neither Constraint Binds

When $\mu_t \geq \mu_{t,I}^{bind} \geq \mu_{t,R}^{bind}$, we have:

$$\mu_t \geq \frac{m(1+2p) + c_I(p-1)}{p(1-p)} \tag{33}$$

$$\mu_t \geq \frac{m(1+p) + c_R(p-1) - 2p\delta}{p(1-p)} \tag{34}$$

In this case, comparing profits:

$$E[\Pi_t^I|\mu_t] = \frac{(m + p\mu_t - c_I)^2}{4pb} \tag{35}$$

$$E[\Pi_t^R|\mu_t] = \frac{(m + p\mu_t - c_R)^2}{4pb} \tag{36}$$

Since $c_I < c_R$, we have $E[\Pi_t^I|\mu_t] > E[\Pi_t^R|\mu_t]$. Therefore, when neither return constraint binds and both $A_t^{j,unc} \geq A_{min}^j$, institutional investors are always preferred.

5.3.3 Case 2: Only Institutional Constraint Binds

When $\mu_{t,R}^{bind} < \mu_t < \mu_{t,I}^{bind}$, only the institutional investor return constraint binds. The GP compares:

$$E[\Pi_t^I|\mu_t] = \left(m + p\mu_t - pb\frac{\mu_t - \frac{m}{1-p}}{b} - c_I\right)\frac{\mu_t - \frac{m}{1-p}}{b} \tag{37}$$

$$E[\Pi_t^R|\mu_t] = \frac{(m + p\mu_t - c_R)^2}{4pb} \tag{38}$$

Setting $E[\Pi_t^I|\mu_t] = E[\Pi_t^R|\mu_t]$ and simplifying gives the quadratic equation:

$$p^2\mu_t^2 + (2mp - 2pc_R - 4p\left(\frac{m}{1-p} - c_I\right))\mu_t + \left(m^2 - 2mc_R + c_R^2 + \frac{4pm}{1-p}\left(\frac{m}{1-p} - c_I\right)\right) = 0 \tag{39}$$

Let $a = p^2$, $b_{coef} = 2mp - 2pc_R - 4p\left(\frac{m}{1-p} - c_I\right)$, and $c_{coef} = m^2 - 2mc_R + c_R^2 + \frac{4pm}{1-p}\left(\frac{m}{1-p} - c_I\right)$.

The solutions are:

$$\mu_t^* = \frac{-b_{coef} \pm \sqrt{b_{coef}^2 - 4ac_{coef}}}{2a} \tag{40}$$

The economically relevant solution is typically the smaller positive root that satisfies the constraint conditions.

5.3.4 Case 3: Both Constraints Bind

When $\mu_t < \min\{\mu_{t,I}^{bind}, \mu_{t,R}^{bind}\}$, both constraints bind. The GP compares:

$$E[\Pi_t^I|\mu_t] = \left(\frac{m}{1-p} - c_I\right)\frac{\mu_t - \frac{m}{1-p}}{b} \tag{41}$$

$$E[\Pi_t^R|\mu_t] = \left(\frac{m-\delta}{1-p} - c_R\right)\frac{\mu_t - \frac{m-\delta}{1-p}}{b} \tag{42}$$

Setting these equal and solving for μ_t:

$$\mu_t^* = \frac{\left(\frac{m}{1-p} - c_I\right)\left(-\frac{m}{1-p}\right) - \left(\frac{m-\delta}{1-p} - c_R\right)\left(-\frac{m-\delta}{1-p}\right)}{\left(\frac{m}{1-p} - c_I\right) - \left(\frac{m-\delta}{1-p} - c_R\right)} \tag{43}$$

5.3.5 Algorithm for Finding μ_t^*

The correct μ_t^* is determined by:

1. Calculate $\mu_{t,I}^{bind}$ and $\mu_{t,R}^{bind}$
2. For Case 2 (only institutional constraint binds): Solve the quadratic equation and verify that at the solution, $A_t^{I,unc} > A_t^{I,max}$ and $A_t^{R,unc} \leq A_t^{R,max}$
3. For Case 3 (both constraints bind): Use the linear solution and verify that both $A_t^{I,unc} > A_t^{I,max}$ and $A_t^{R,unc} > A_t^{R,max}$
4. Select the valid solution based on which constraints are actually binding

5.4 The Complete Threshold Solution

The effective institutional threshold is $\mu_I^{eff} = \max\{\mu_{min}^I, \mu^*\}$. When $\mu^* > \mu_{min}^I$, the GP's decision rule is:

1. If $\mu_t < \mu_{min}^R = bA_{min}^R + \frac{m-\delta}{1-p}$: Cannot raise capital (no funding)
2. If $\mu_{min}^R \leq \mu_t < \mu_{min}^I = bA_{min}^I + \frac{m}{1-p}$: Must raise from retail investors (retail only)
3. If $\mu_{min}^I \leq \mu_t < \mu_t^*$: Prefers to raise from retail investors (retail by choice)
4. If $\mu_t \geq \mu_t^*$: Prefers to raise from institutional investors (institutional by choice)

where μ_t^* is determined using the algorithm above, ensuring that the constraints are correctly verified at the solution.

When the institutional minimum fund size A_{min}^I is relatively large, the corresponding threshold level of perceived skill required for institutional participation, μ_{min}^I, is also high. Hence, the effective institutional threshold becomes $\mu_I^{\text{eff}} = \mu_{\text{min}}^I$ rather than μ_t^*. This captures the empirical observation that institutional investors typically require substantially larger fund sizes. The GP's decision rule therefore simplifies to:

1. If $\mu_t < \mu_{min}^R$: Cannot raise capital (no funding)
2. If $\mu_{min}^R \leq \mu_t < \mu_{min}^I$: Must raise from retail investors (retail only)
3. If $\mu_t \geq \mu_{min}^I$: Prefers to raise from institutional investors (institutional by choice)

This market segmentation creates the foundation for the stepping stone mechanism analyzed in the next section.

We focus on the case $\mu_I^{\text{eff}} = \mu_{\text{min}}^I$ to capture an empirically realistic setting to analyze the stepping-stone effect (SS). Under this condition, the GP optimally chooses to raise capital from institutional investors when $\mu_{t,i} > \mu_{\text{min}}^I$.

6 Option Value of Learning and Stepping Stone Mechanism

6.1 Distribution of Initial Perceived Skill

We recover the subscript i in this section to discuss the distribution of perceived skill of all GPs. Let's assume that the initial perceived skill $\mu_{0,i}$ for the entire population of potential GPs follows a normal distribution:

$$\mu_{0,i} \sim N(\bar{\mu}, \sigma_\mu^2) \tag{44}$$

where $\bar{\mu}$ represents the average perceived skill level across all potential GPs and σ_μ^2 captures the heterogeneity in initial skill perceptions.

Given this distribution, the density function $f(\mu_{0,i})$ is:

$$f(\mu_{0,i}) = \frac{1}{\sqrt{2\pi\sigma_\mu^2}} \exp\left(-\frac{(\mu_{0,i} - \bar{\mu})^2}{2\sigma_\mu^2}\right) \tag{45}$$

The proportion of potential GPs who fall into each market segment is:

$$P(\text{No funding}) = P(\mu_{0,i} < \mu_{min}^R) = \Phi\left(\frac{\mu_{min}^R - \bar{\mu}}{\sigma_\mu}\right) \tag{46}$$

$$P(\text{Retail only}) = P(\mu_{min}^R \leq \mu_{0,i} < \mu_{min}^I) = \Phi\left(\frac{\mu_{min}^I - \bar{\mu}}{\sigma_\mu}\right) - \Phi\left(\frac{\mu_{min}^R - \bar{\mu}}{\sigma_\mu}\right) \tag{47}$$

$$P(\text{Institutional}) = P(\mu_{0,i} \geq \mu_{min}^I) = 1 - \Phi\left(\frac{\mu_{min}^I - \bar{\mu}}{\sigma_\mu}\right) \tag{48}$$

where $\Phi(\cdot)$ is the standard normal cumulative distribution function.

6.2 Option Value of Retail Access

Option value of access to retail investors:

$$OV(\mu_{0,i}) = \int_{\mu_{min}^R}^{\mu_{min}^I} \left\{E[\Pi_0^R|\mu_{0,i}] + \beta E[V_1(\mu_{1,i})|\mu_{0,i}]\right\} f(\mu_{0,i}) d\mu_{0,i} \tag{49}$$

Expected value in period 1:

$$E[V_1(\mu_{1,i})|\mu_{0,i}] = \int_{\mu_{min}^I}^{\infty} E[\Pi_1^I|\mu_{1,i}] f(\mu_{1,i}|\mu_{0,i}) d\mu_{1,i} \tag{50}$$

$$+ \int_{\mu_{min}^R}^{\mu_{min}^I} E[\Pi_1^R|\mu_{1,i}] f(\mu_{1,i}|\mu_{0,i}) d\mu_{1,i} \tag{51}$$

where the first term represents the profits from graduating to institutional capital (SS effect), and the second term represents the direct profits of access to retail capital in period 1.

6.3 Value Added to the Economy from Access to Retail Investors

We define the value added of the GP to the real economy (economic value added) as the value created from the investment minus administrative costs, given the GP's choice of investor type j:

$$VA_t^j = (\mu_{t,i} - bA_t)A_t - c_j A_t. \tag{52}$$

The economic value added under the GP's optimal choice of investor type j to maximize her profits given the perceived skill $\mu_{t,i}$ in period t is denoted by $VA_t(\mu_{t,i})$. Total value added of the GP conditional on its perceived skill $\mu_{0,i}$ in period 0 is:

$$TVA(\mu_{0,i}) = VA_0(\mu_{0,i}) + \beta E[VA_1(\mu_{1,i})|\mu_{0,i}], \tag{53}$$

where the expected future value added in period 1 is:

$$E[VA_1(\mu_{1,i})|\mu_{0,i}] = \int_{\mu^I_{min}}^{\infty} VA_1(\mu_{1,i}) f(\mu_{1,i}|\mu_{0,i}) d\mu_{1,i} + \int_{\mu^R_{min}}^{\mu^I_{min}} VA_1(\mu_{1,i}) f(\mu_{1,i}|\mu_{0,i}) d\mu_{1,i}. \tag{54}$$

For GPs raising capital from retail investors in period 0 (i.e., $\mu_{0,i} \in [\mu^R_{min}, \mu^I_{min}]$), the first term captures the value added from the stepping stone (SS) effect:

$$VA_{SS}(\mu_{0,i}) = \int_{\mu^I_{min}}^{\infty} VA_1(\mu_{1,i}) f(\mu_{1,i}|\mu_{0,i}) d\mu_{1,i}. \tag{55}$$

6.3.1 Value Added Under Optimal Fund Size

The general equilibrium characterization of fund size and economic value added depends on the magnitudes of return wedge δ and perceived managerial skill $\mu_{t,i}$. Our analysis identifies three distinct regimes that emerge endogenously from the GP's optimization problem. While the complete theoretical framework encompasses all three regimes, we focus our analysis on the case where $\delta > m$, a regime in which return wedge exceeds the management fee threshold, enabling GPs to raise capital despite negative expected returns. This parameter configuration generates a particularly sharp economic tradeoff: expanding access to retail capital through higher return wedge facilitates talent discovery and potentially valuable stepping-stone effects, yet simultaneously enables value destruction through negative expected return investments. By examining this extreme case, we illuminate the fundamental tension between the ex-ante benefits of broadening market access for talent discovery and the ex-post costs of capital misallocation when investor protection mechanisms are weakened. For completeness, we include the solutions under all three regimes in Appendix Sections B.1 & B.2.

Regime: Negative Expected Returns ($\delta > m$)

When $\delta > m$, retail investors may participate even with negative expected returns and the performance fee becomes zero (i.e., $p = 0$). The participation constraint becomes:

$$\underbrace{(\mu_{t,i} - bA_t)}_{E(r_{t+1})} - m + \delta \geq 0. \tag{56}$$

As shown, a higher δ allows a larger fund size A_t and a more negative expected return, through this retail participation constraint.

The maximum fund size is:

$$A_t^{R,neg} = \frac{\mu_{t,i} + \delta - m}{b} > 0. \tag{57}$$

Substituting Eq. (A.10) into Eq. (A.1) gives the value added as:

$$VA_t^{R,neg}(\mu_{t,i}, \delta) = \underbrace{(m - \delta - c_R)}_{\text{Per-\$ destruction } (<0)} \times \underbrace{\frac{\mu_{t,i} + \delta - m}{b}}_{\text{Fund size } A_t^{R,neg}} < 0. \tag{58}$$

This is always negative since returns are negative $(\mu_{t,i} - bA_t^{R,neg} = m - \delta < 0)$ and $c_R > 0$.

6.4 Aggregate Economic Impact with Heterogeneous GPs and Optimal Retail Bias

The total economic impact of retail access across the entire population of potential GPs is:

$$TEI = \int_{\mu^R_{min}}^{\mu^I_{min}} TVA(\mu_{0,i}) f(\mu_{0,i}) d\mu_{0,i}.$$

Complete Decomposition of the Objective Function: The total economic impact can be decomposed as:

$$TEI(\delta) = \underbrace{\int_{\mu^R_{min}(\delta)}^{\mu^I_{min}} VA_0(\mu_{0,i}, \delta) f(\mu_{0,i}) d\mu_{0,i}}_{\text{Term 1: Direct value in period 0}} \tag{59}$$

$$+ \underbrace{\beta \int_{\mu^R_{min}(\delta)}^{\mu^I_{min}} \int_{\mu^I_{min}}^{\infty} VA_1(\mu_{1,i}) f(\mu_{1,i}|\mu_{0,i}) d\mu_{1,i} f(\mu_{0,i}) d\mu_{0,i}}_{\text{Term 2: Value from stepping stone effect}} \tag{60}$$

$$+ \underbrace{\beta \int_{\mu^R_{min}(\delta)}^{\mu^I_{min}} \int_{\mu^R_{min}(\delta)}^{\mu^I_{min}} VA_1(\mu_{1,i}, \delta) f(\mu_{1,i}|\mu_{0,i}) d\mu_{1,i} f(\mu_{0,i}) d\mu_{0,i}}_{\text{Term 3: Direct value in period 1}}. \tag{61}$$

In this section, we optimize over the retail investor bias parameter δ to maximize welfare.

6.4.1 Optimal Retail Access for Welfare Maximization

Problem Setup: A welfare-maximizing social planner chooses the optimal return wedge δ^* to maximize total economic impact. We maintain consistency with the earlier model assumptions.

Interpretation of the Welfare Function: Our welfare maximization framework implicitly assumes that δ represents a wedge between retail and institutional investors' required returns that does not directly enter retail investors' true utility. This interpretation is most appropriate when δ captures:

- **Behavioral biases**: Optimism bias, overconfidence, or irrational exuberance about VC returns
- **Perception distortions**: Scarcity-induced willingness to overpay due to restricted access
- **Information frictions**: Retail investors' inability to properly assess expected returns

In these cases, the $TEI(\delta)$ function correctly measures social welfare because retail investors' willingness to accept lower returns reflects mistakes or distortions rather than genuine utility gains. The optimal δ^* then balances the stepping stone benefits against the costs of enabling these distortions.

Alternative Interpretation: If δ instead captures *direct benefits* to retail investors—such as portfolio diversification gains, liquidity services, or consumption utility from VC participation—then these benefits should be explicitly added to the welfare function. In that case, the social welfare function would be:

$$TEI^{full}(\delta) = TEI(\delta) + \underbrace{\text{Direct utility gains to retail investors from } \delta}_{\text{Not captured in current framework}} \tag{62}$$

Our baseline analysis focuses on the case where δ represents distortions rather than direct benefits, which provides a conservative lower bound on the optimal bias. To the extent that retail investors do derive genuine utility from VC access, our results understate the optimal level of δ.

Model Assumptions:

1. **Normal skill distribution:** $\mu_{0,i} \sim N(\bar{\mu}, \sigma_\mu^2)$ as defined in Section 6.1
2. **Bayesian updating:** $\mu_{1,i} = \frac{\sigma_0^2(r_1+bA_0)+\sigma_\epsilon^2\mu_{0,i}}{\sigma_0^2+\sigma_\epsilon^2}$ and $\sigma_1^2 = \frac{\sigma_0^2\sigma_\epsilon^2}{\sigma_0^2+\sigma_\epsilon^2}$ as defined in Section 3.2

The graduation probability for a GP with initial skill $\mu_{0,i}$ is:

$$P_{grad}(\mu_{0,i}) = P(\mu_{1,i} \geq \mu^I_{min}|\mu_{0,i}) = \Phi\left(\frac{\mu_{0,i} - \mu^I_{min}}{\sigma_1}\right), \tag{63}$$

where $\Phi(\cdot)$ is the standard normal cumulative distribution function. The expected stepping stone value for a graduating GP with initial skill $\mu_{0,i}$ is:

$$\bar{VA}_{SS}(\mu_{0,i}) = \int_{\mu^I_{min}}^{\infty} VA_1^I(\mu_{1,i})\frac{f(\mu_{1,i}|\mu_{0,i})}{P_{grad}(\mu_{0,i})}d\mu_{1,i}, \tag{64}$$

where $f(\mu_{1,i}|\mu_{0,i})$ is the normal density with mean $\mu_{0,i}$ and variance σ_1^2.

Let:

- $\mu^R_{min}(\delta) = \max\{m - \delta + bA^R_{min}, 0\}$ when $\delta > m$

The total economic impact decomposes as:

When $\delta > m$, all GPs operate with negative expected returns:

$$TEI(\delta) = \underbrace{\int_{\mu^R_{min}(\delta)}^{\mu^I_{min}} VA_0^{R,neg}(\mu_{0,i},\delta) f(\mu_{0,i}) d\mu_{0,i}}_{\text{Period 0: Negative returns (always < 0)}} \tag{65}$$

$$+ \beta \underbrace{\int_{\mu^R_{min}(\delta)}^{\mu^I_{min}} P_{grad}(\mu_{0,i}) \bar{VA}_{SS}(\mu_{0,i}) f(\mu_{0,i}) d\mu_{0,i}}_{\text{Stepping stone effect}} \tag{66}$$

$$+ \beta \underbrace{\int_{\mu^R_{min}(\delta)}^{\mu^I_{min}} [1 - P_{grad}(\mu_{0,i})] VA_1^{R,neg}(\mu_{1,i},\delta) f(\mu_{0,i}) d\mu_{0,i}}_{\text{Period 1: Negative returns (always < 0)}} \tag{67}$$

6.4.2 Optimal Retail Bias for Welfare Maximization

First-Order Conditions for $\delta > m$:

The total economic impact is:

$$TEI(\delta) = \underbrace{(m - \delta - c_R)}_{\text{Per-\$ destruction}} \ \underbrace{[N_0(\delta) + \beta N_1(\delta)]}_{\text{Aggregate fund sizes}} + \underbrace{\beta M_S(\delta)}_{\text{Stepping stone value}} \tag{68}$$

where:

$$N_0(\delta) = \int_{\mu^R_{min}(\delta)}^{\mu^I_{min}} \frac{\mu_0 + \delta - m}{b} f(\mu_0) d\mu_0 \tag{69}$$

$$N_1(\delta) = \int_{\mu^R_{min}(\delta)}^{\mu^I_{min}} [1 - P_{grad}(\mu_0)] E\left[\frac{\mu_1 + \delta - m}{b} | \mu_0, \text{no grad}\right] f(\mu_0) d\mu_0 \tag{70}$$

The first-order condition is:

$$\frac{dTEI}{d\delta} = -[N_0 + \beta N_1] + (m - \delta - c_R)\left[\frac{dN_0}{d\delta} + \beta \frac{dN_1}{d\delta}\right] + \beta \frac{dM_S}{d\delta} = 0 \tag{71}$$

This yields the optimal bias for $\delta > m$:

$$\boxed{\delta^{neg*} = m - c_R + \frac{\beta \frac{dM_S}{d\delta} - (N_0 + \beta N_1)}{\frac{dN_0}{d\delta} + \beta \frac{dN_1}{d\delta}}} \tag{72}$$

For $\delta^{neg*} > m$ (Negative Returns):

$$\delta^{neg*} = \underbrace{m - c_R}_{\text{Break-Even Bias}} + \underbrace{\frac{\beta \frac{dM_S}{d\delta} - (N_0 + \beta N_1)}{\frac{dN_0}{d\delta} + \beta \frac{dN_1}{d\delta}}}_{\text{Welfare Adjustment}} \tag{73}$$

The welfare adjustment term can be decomposed as:

$$\text{Welfare Adjustment} = \frac{\overbrace{\beta\frac{dM_S}{d\delta}}^{\text{Stepping Stone Effect}} \quad - \quad \overbrace{(N_0 + \beta N_1)}^{\text{Value Destruction Costs}}}{\underbrace{\frac{dN_0}{d\delta} + \beta\frac{dN_1}{d\delta}}_{\text{Marginal Participation}}} \tag{74}$$

Economic Interpretation of Three Effects:

1. **Effect 1 - Baseline Bias:**
   - For $\delta > m$: Break-even bias $m - c_R$ represents the threshold where value destruction begins
2. **Effect 2 - Discovery Premium:**
   - Stepping stone effect: $\beta\frac{dM_S}{d\delta}$ captures marginal talent discovery value (present in both regimes)
   - This effect pushes optimal bias upward when talent discovery is substantial
3. **Effect 3 - Cost/Destruction Discount:**
   - For $\delta > m$: Value destruction costs $N_0 + \beta N_1$ represent direct economic losses from negative return investments
   - This effect pushes optimal bias downward to minimize value destruction

The optimal policy may involve allowing $\delta > m$ (negative expected returns and value destruction) when stepping stone benefits are sufficiently large. This represents a fundamental insight: short-term value destruction can be socially optimal if it enables sufficient talent discovery that benefits the broader economy.

7 Implications for Market Design and Policy

Our analysis of the value added from the stepping stone effect yields several implications for market design and policy:

7.1 Information Externalities

The stepping stone mechanism creates positive externalities by generating information about GP skill that benefits the broader capital market but is not fully captured by retail investors. The value of this information production is:

$$Info_{Value} = \beta \int_{\mu^R_{min}}^{\mu^I_{min}} \int_{\mu^I_{min}}^{\infty} [VA_1(\mu_1) - \Pi^I_1(\mu_1)] f(\mu_1|\mu_0) d\mu_1 f(\mu_0) d\mu_0 \tag{75}$$

This represents the difference between the total value added to the economy and the private profits captured by the GPs. Policy interventions that acknowledge and compensate for these information externalities can enhance welfare.

7.2 Optimal Market Segmentation

Our model suggests that some degree of market segmentation between retail and institutional investors is economically beneficial. The optimal gap between retail and institutional thresholds balances:

1. Allowing sufficient entry through retail capital for talent discovery; 2. Maintaining meaningful graduation incentives for skill demonstration; 3. Preserving efficiency advantages of institutional capital for proven GPs.

Complete elimination of these differences might reduce overall market efficiency by removing the graduated entry path for emerging managers.

8 Data and Measurement

This section describes the data sources, sample construction, and key variable definitions used to test our model's predictions and quantify the economic impact of retail investor access to venture capital.

8.1 Data Sources

Our empirical analysis combines three primary data sources to construct a comprehensive dataset of venture capital funds, their investors, and portfolio investments.

8.1.1 SEC Form ADV Filings

To identify investor type composition, we utilize SEC Form ADV filings required under the Dodd-Frank Act. Since 2012, all investment advisers managing private funds with assets exceeding $150 million must file Form ADV, which includes detailed information about fund structure and investor eligibility requirements.[2]

Critically, Form ADV requires funds to disclose which Investment Company Act exclusions they rely upon. These exclusions provide a clear legal framework for distinguishing between funds targeting retail (individual) versus institutional investors. The former uses section 3(c)(1) exclusion, and the latter uses section 3(c)(7). We use these regulatory classifications as our primary measure of investor type, as they reflect legally binding restrictions on investor eligibility and fund structure that are central to our theoretical framework. More details of Investment Company Act exclusions and this classification are provided in Appendix Section A.

8.1.2 Data of Venture Capital Funds in PitchBook

We obtain fund-level data from PitchBook, which provides detailed information on venture capital funds, including fund names, vintage years, total commitments (Assets Under Management), and geographic locations. Fund sequence number is calculated based on vintage

[2] The reporting requirement began in 2012 for all funds active at that time, providing a comprehensive snapshot of the industry from that point forward.

years of funds in the same GP company. The database covers a large universe of venture capital funds globally, with particularly comprehensive coverage of U.S. funds.

8.1.3 Deal-Level Investment Data

We obtain deal-level investment information from PitchBook, including deal dates, deal sizes, pre-money and post-money valuations, and exit outcomes. This granular data allows us to construct bottom-up measures of fund performance based on actual investment cash flows, complementing the fund-level return data. We also utilize cash flow data from Preqin for robustness checks.

8.2 Sample Construction

We match SEC Form ADV filings to PitchBook funds using fund names and adviser (GP) identities, achieving a match rate of approximately 8.4% (2,212 funds) of funds with ADV filings through an exact matching of keywords and websites.

Our primary sample consists of venture capital funds with identifiable investor eligibility classifications from Form ADV matched to PitchBook fund characteristics and deal-level investments. We apply the following filters to the data:

1. **Fund Type:** We focus on venture capital funds, excluding buyout, growth equity, and other private equity strategies to maintain sample homogeneity.

2. **Vintage Year Restrictions:** For our main analyses, we include all 2,212 matched funds. We conduct robustness checks using funds with vintage years from 2003 onward (2,065 out of 2,212), ensuring that all funds in the sample had the opportunity to be captured in Form ADV filings initiated in 2012, given typical fund lives of 10-12 years. We conduct robustness checks using funds with vintage years from 2012 onward (1,705 funds), and funds with vintage years before 2015 to ensure sufficient time for performance observation (919 funds). Results are similar.

8.3 Key Variable Definitions

8.3.1 Fund Sequence and GP Career Progression

Fund sequence represents the ordinal number of a fund raised by the same general partner (GP) or fund management company. We track fund sequences from 1 (first-time fund) through 9+ to analyze career progression and the stepping stone mechanism. Fund sequence is determined at the GP entity level, linking all funds raised by the same management team.

Importantly, we track whether GPs switch between retail 3(c)(1) and 3(c)(7) structures across their fund sequence. A transition from 3(c)(1) in early funds to 3(c)(7) in later funds provides direct evidence of the stepping stone mechanism — GPs demonstrating skill with retail capital and graduating to institutional capital.

8.3.2 Value Added Measurement

We construct the measure of economic value added (VA) to capture the value creation gross of fees and costs:

Deal-Level Value Added (Pre-Fee):

Following the methodology of Braun et al. (2025), which adapts the value-added framework of Berk and Van Binsbergen (2015) to the venture capital and private equity setting, we compute the value added (net present value, NPV) at the deal level using investment cash flows and exit outcomes. For each portfolio company investment, we calculate

$$VA_{deal} = \sum_t \frac{CF_t}{(1 + r_{benchmark})^t}, \tag{76}$$

where CF_t represents cash inflows (exits, dividends) minus cash outflows (investments) at time t. Following the Public Market Equivalent (PME) approach in Kaplan and Schoar (2005), we use the return on the S&P 500 index as the benchmark return $r_{benchmark}$ for discounting. We then aggregate deal-level value added to the fund level to obtain a measure of gross value creation before management fees and carried interest.

8.4 Summary Statistics

Table 1 presents summary statistics for our main sample. Panel A reports the distribution of our sample across Investment Company Act exclusion types. Of the 2,212 funds raised by 810 GPs, 57.1% rely on Section 3(c)(1) (Retail Funds) while 31.6% use Section 3(c)(7) (Institutional Funds), with the remaining 11.4% employing both exemptions. Panel B reveals substantial economic differences between these structures, consistent with the fact that retail and institutional capital sources impose different constraints. Section 3(c)(1) funds average \$89.3 million in size compared to \$503.9 million for Section 3(c)(7) funds—a 5.6-fold difference. This size gap reflects the targeting of different LP bases. Institutional funds require higher median minimum investments (\$0.25 million versus \$0.10 million) but attract modestly larger investor bases (69.1 LPs versus 52.9 LPs), suggesting that qualified purchasers commit larger individual checks despite the higher entry barriers.

Panel C demonstrates the evolution of fund characteristics across the GP lifecycle, providing evidence for our model's learning and graduation mechanism. First-time funds average \$108.3 million and attract 47.2 investors with a median minimum investment of \$0.10 million. By the sixth fund and beyond, the mean fund size increases nearly fivefold to \$548.2 million with 85.1 investors—growth consistent with reputation building and successful performance signaling. This expansion trajectory aligns with our model's prediction that GPs with uncertain ex-ante skill initially access smaller pools of retail capital under the 3(c)(1) structure, then graduate to larger institutional capital under 3(c)(7) as they establish track records. The 810 first-time funds in our sample represent potential entrants to this stepping stone path, while the declining sample sizes across sequences (503 second funds, 601 funds in sequences 3-5, and 298 funds in sequence 6+) reflect both natural attrition and the selection process through which only successful GPs raise follow-on funds. The increasing dispersion in fund sizes across sequences (standard deviations rising from \$198.0 million for Fund 1 to \$1,173.5 million for Fund 6+) further supports the model's prediction of widening performance divergence as learning resolves uncertainty about GP quality.

9 Numerical Results and Empirical Evidence

This section presents comprehensive numerical simulations of our theoretical model, generating figures that illustrate key mechanisms and validate our analytical predictions. Using calibrated parameters consistent with venture capital industry characteristics, we demonstrate the stepping stone mechanism, market segmentation patterns, and value creation dynamics predicted by our theory.

9.1 Simulation Setup and Parameters

Our simulations use the following parameter values, calibrated to match venture capital industry characteristics:

$$
\begin{aligned}
m &= 0.02 \quad \text{(2\% management fee)} && (77)\\
p &= 0.20 \quad \text{(20\% carried interest)} && (78)\\
b &= 0.001 \quad \text{(diseconomy of scale parameter)} && (79)\\
A^R_{min} &= 1 \quad \text{(\$1M minimum fund size for retail investors)} && (80)\\
A^I_{min} &= 10 \quad \text{(\$10M minimum fund size for institutional investors)} && (81)\\
c_I &= 0.001 \quad \text{(0.1\% institutional cost)} && (82)\\
c_R &= 0.005 \quad \text{(0.5\% retail cost)} && (83)\\
\delta &= 0.015 \quad \text{(1.5\% retail utility adjustment)} && (84)\\
\sigma_0^2 &= 0.03^2 \quad \text{(initial skill uncertainty)} && (85)\\
\sigma_\epsilon^2 &= 0.005^2 \quad \text{(performance noise)} && (86)\\
\bar{\mu} &= 0.02 \quad \text{(2\% mean abnormal return)} && (87)\\
\sigma_\mu^2 &= 0.02^2 \quad \text{(distribution of prior } \mu_0\text{)} && (88)\\
\beta &= 0.9 \quad \text{(discount factor)} && (89)
\end{aligned}
$$

The simulation considers a population of 10,000 potential GPs with heterogeneous initial skill perceptions drawn from $\mu_{0,i} \sim N(0.02, 0.02^2)$. This distribution ensures meaningful representation across all market segments while maintaining realistic skill variation observed in venture capital markets.

9.2 Market Segmentation and Talent Discovery

9.2.1 Theoretical Distribution of GPs

Figure 2 illustrates our model's key insight: retail capital access allows significantly more GPs to participate in the market and reveal their potential. The figure shows the distribution of GPs across different skill levels and their access to capital markets under two scenarios: with and without retail investor access.

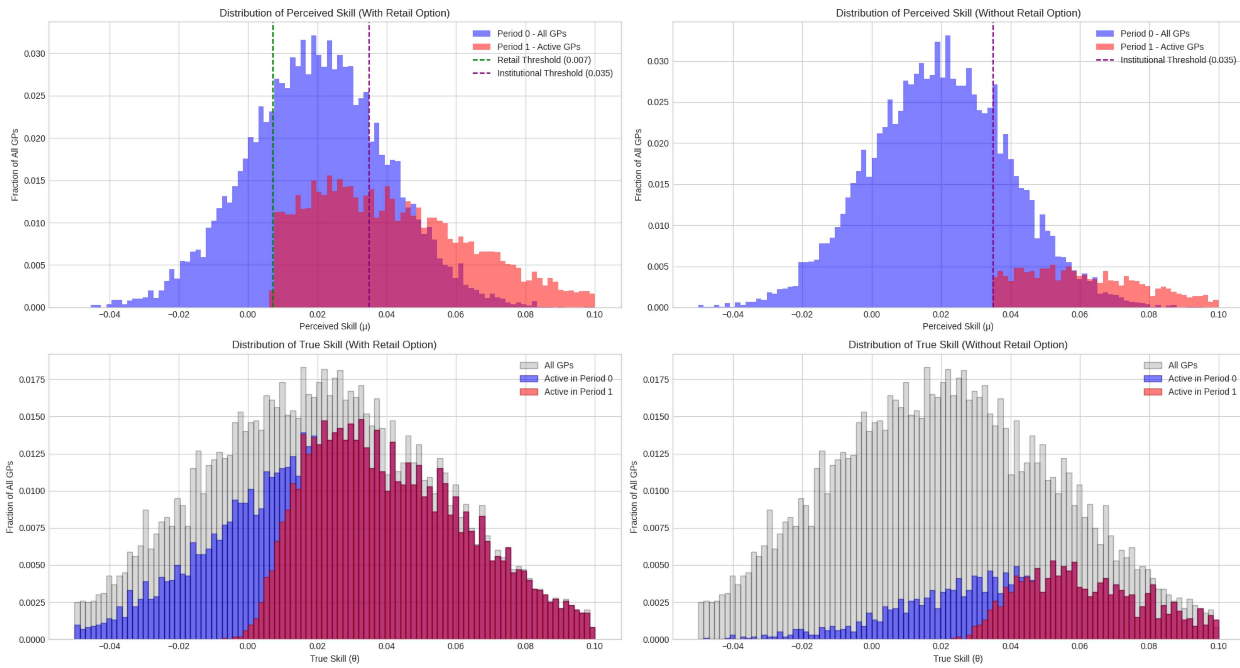

Figure 2: Talent Discovery from Retail Access (Theory). This figure shows the distribution of perceived (true) skill in period 0 and period 1 with retail option and without retail option in the upper(lower) panels.

As shown in the upper-left panel of Figure 2, general partners (GPs) with perceived skill μ to the right of the green dashed line can raise capital from retail investors, while those to the right of the purple dashed line can raise capital from institutional investors. The red shaded region indicates GPs who actively remain in the market in the second period. Comparing the upper-left panel with the upper-right panel, which excludes the retail option, reveals that the total number of GPs able to raise institutional capital (i.e., to the right of the purple dashed line) is significantly larger when the option to raise capital from retail investors in the first period is available. Moreover, as shown in the two bottom panels, the number of GPs with high true skill θ is also substantially greater when the retail capital option is present.

This simulation under the current parameters show that:

- Without retail access: Only 23% of potential GPs can raise capital in the first period.
- With retail access: 74% of potential GPs can participate in the first period.
- This expanded participation creates substantial opportunities for talent discovery (i.e., a larger number of GPs with high true skill θ).

Next, we plot the distribution of GPs benefiting from the stepping-stone effect.

As shown in both panels of Figure 3, the option to raise capital from retail investors brings a substantial amount of GPs into the market in period 0 (as captured by the blue

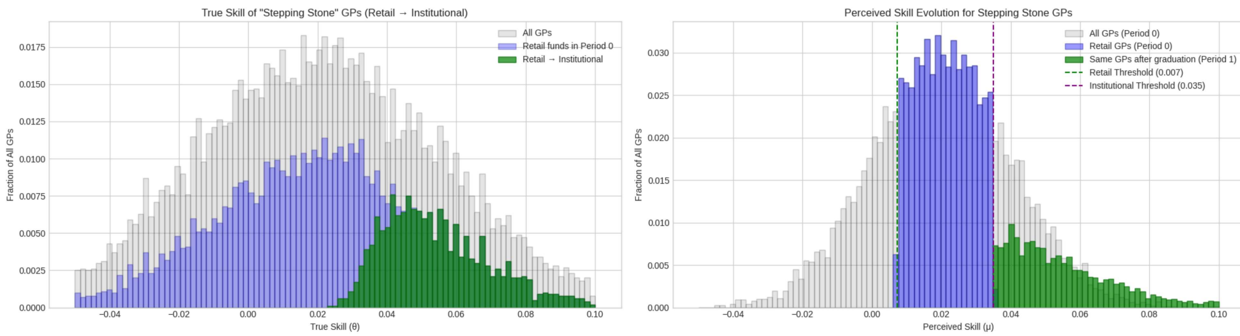

Figure 3: Retail Access as a Stepping-Stone (Theory). This figure shows the distribution of GPs starting with retail capital in period 0 (blue shaded region) and switch to institutional capital in period 1 (green shaded region) for true skill in the left panel and perceived skill in the right panel. The gray shaded region is for all GPs in period 0.

shaded region), many of whom are eventually revealed to be skilled in period 1 (as captured by the green shaded region).

9.2.2 GP Distribution across Periods and Investor Types

Figure 4 shows the theoretical prediction for fund distribution across periods and investor types. As shown in the left panel, the majority of GPs start with retail capital in period 0. In period 1, the number of GPs with retail capital decreases substantially and a large fraction graduating to institutional capital. Without the retail option (as shown in the right panel), only a small fraction of the total population of GPs can start with institutional capital in period 0, and an even smaller fraction remains in the game in period 1. This sharp contrast confirms the importance of retail option in price discovery.

This patter is consistent with the actual distribution of funds by fund sequence of GP and investor type in the data as show in Figure 1. The data shows that substantial numbers of first and second sequence funds raising capital from retail investors, with this pattern gradually shifting toward institutional capital as GPs establish track records. This distribution exactly matches our model's prediction that GPs with moderate perceived skill levels ($\mu^R_{min} \leq \mu_0 < \mu^I_{min}$) initially access retail capital and potentially graduate to institutional capital based on performance.

9.3 Value Creation and the Stepping Stone Mechanism

Next, we investigate the distribution of value creation across fund sequence and investor type and the effect of the stepping stone mechanism on the society's total value added.

9.3.1 Value Added Patterns

Figure 5 demonstrates our model's prediction for value creation patterns across periods and investor types. The figure shows how value added evolves as the market sorts GPs efficiently through the stepping stone mechanism.

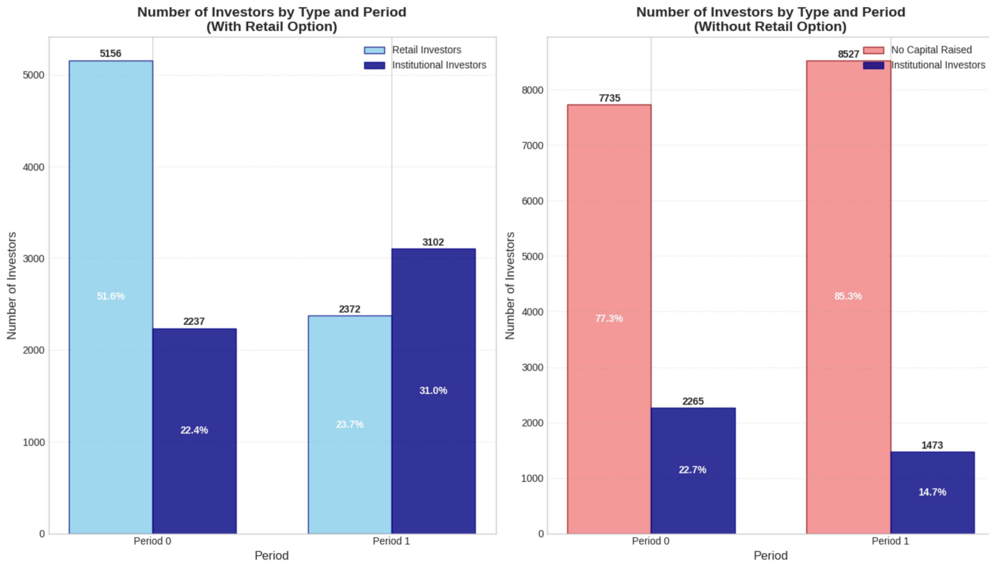

Figure 4: Number of Funds by Capital Source and Period (Theory). The figure shows the model's prediction for how fund distribution evolves from Period 0 (initial funds) to Period 1 (follow-on funds). In Period 0, many GPs start with retail capital due to skill uncertainty. In Period 1, successful GPs graduate to institutional capital while others remain with retail investors or exit the market.

As shown in Figure 5, while the total value creation of funds with retail capital remains small, the total value creation of funds with institutional capital increases substantially in Period 1 as skilled GPs graduate from retail to institutional capital, accessing larger fund sizes and lower costs.

This prediction is confirmed by the data pattern in Figure 6. The data shows that value added by institutional funds increases dramatically with fund sequence, reflecting both the graduation of skilled GPs to institutional capital and the optimal scaling that occurs when skilled managers access more efficient capital sources. This validates our model's central mechanism linking skill discovery, graduation, and value creation. In contrast, the total value added of funds with retail capital remains small as the fund sequence increases.

9.3.2 Value Added from Switching

In this section, we focus our model prediction on the value added of funds switching from retail capital to institutional capital. The left Panel of Figure 7 illustrates the economic importance of the stepping stone mechanism by showing the distribution of value added across different GP switching type across their life cycles.

As shown in the left Panel of Figure 7, a significant fraction of total value added comes from the stepping stone effect — GPs who switch from raising retail capital to institutional investors. This highlights the economic importance of maintaining retail access as a pathway for talent discovery and development.

The value added by switch types in the data (as shown in the right Panel of Figure 7) confirms this prediction. The data shows a dramatic increase in value added when GPs

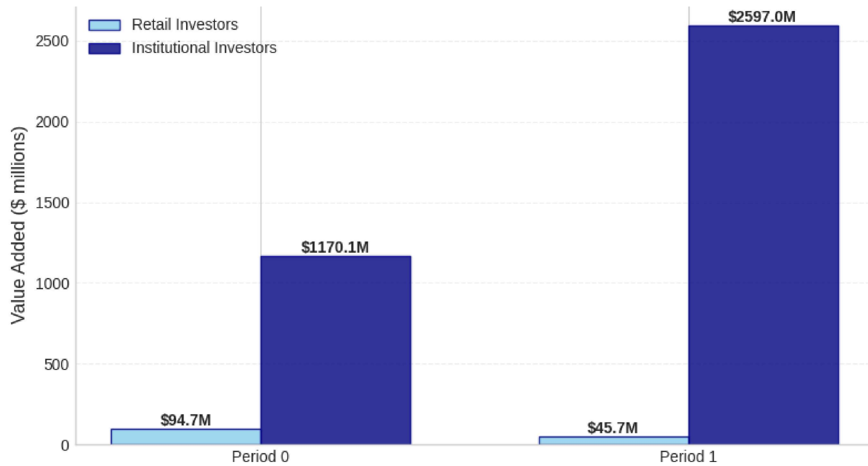

Figure 5: Value Added by Capital Source and Period (Theory).

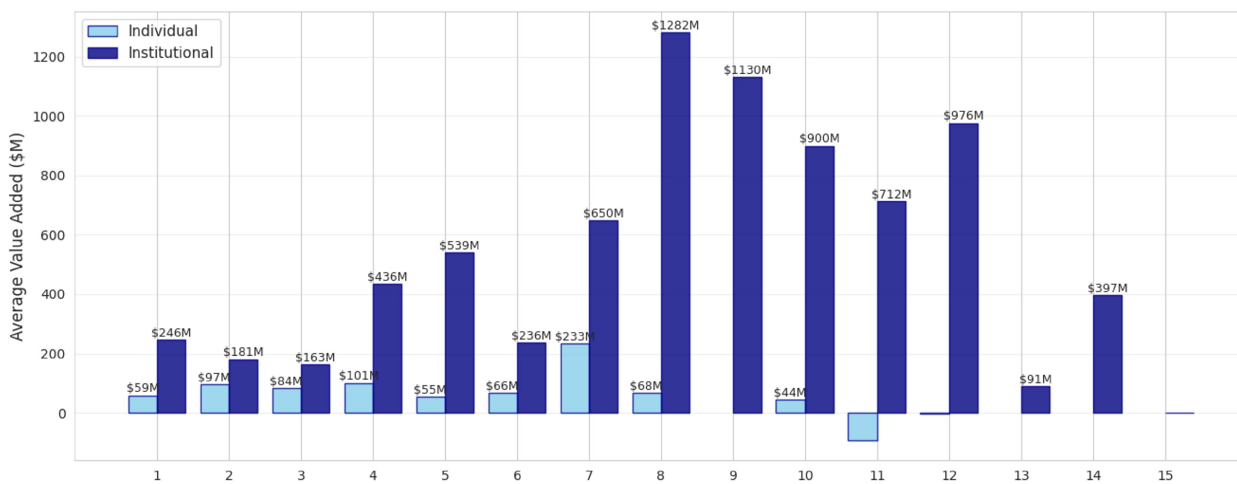

Figure 6: Value Added by Fund Sequence and Investor Type (Data). Value added of institutional funds increases substantially with fund sequence, while individual investor funds show more modest growth, consistent with our model's graduation and optimal scaling predictions.

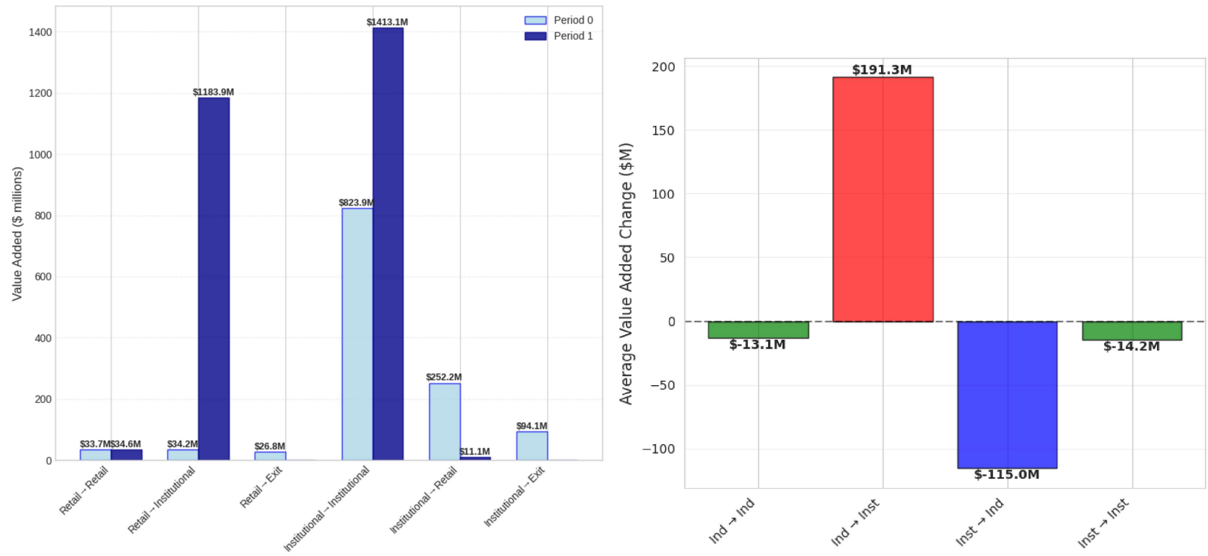

Figure 7: Value Added by Switching Type. Left panel shows theoretical prediction; right panel shows data. Both show a large increase in value creation when GPs switch from retail to institutional capital, validating the stepping stone mechanism.

transition from raising capital from retail investors to institutional investors. This provides strong support for our model's prediction that skilled GPs benefit substantially from graduating to institutional capital through access to larger fund sizes and lower administrative costs.

9.3.3 Economic Value of Stepping Stone Effect and GP Migration Patterns

Our model's central prediction is that retail capital serves as a stepping stone, allowing GPs to demonstrate skill and graduate to institutional capital and create substantial value. Figure 8 shows total value added by investor type and separate the value added of GPs starting with retail capital and those starting with institutional capital. The data confirms that institutional funds create the majority of total value in the venture capital industry, consistent with our model's prediction that skilled GPs with $\mu_t \geq \mu^I_{min}$ optimally choose institutional capital due to lower administrative costs and better terms. Furthermore, about 34% of the total value added of institutional funds comes from GPs starting from retail capital. This result confirms the economic importance of retail capital serving as a stepping stone, allowing GPs to demonstrate skill and graduate to institutional capital and create substantial value.

Figure 9 provides more direct evidence for this mechanism. Among institutional funds in later sequences (funds 6-9+), a substantial and increasing fraction began their careers by raising capital from individual investors. This directly validates our model's prediction that skilled GPs initially perceived as having moderate skill levels can demonstrate their abilities through retail-funded investments and subsequently graduate to institutional capital.

More importantly, Figure 10 shows that the percentage of institutional funds' total AUM and value added from GPs starting with retail capital increases substantially over fund

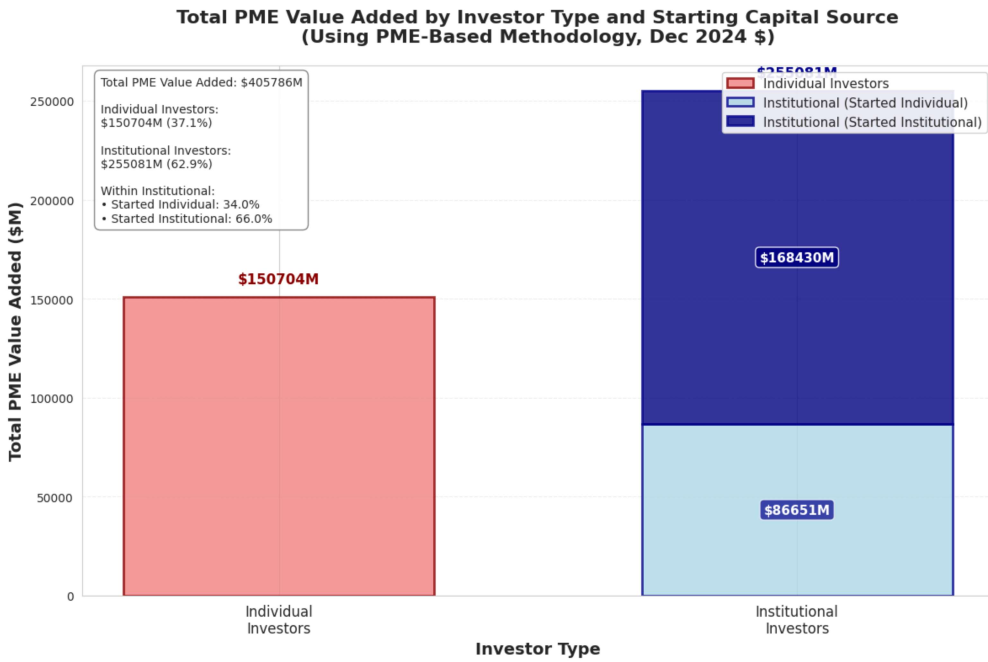

Figure 8: Total Value Added by Investor Type (Data). Value added is measured by the total valued of LPs in dollars using the PME based methodology and S&P 500 index as the benchmark.

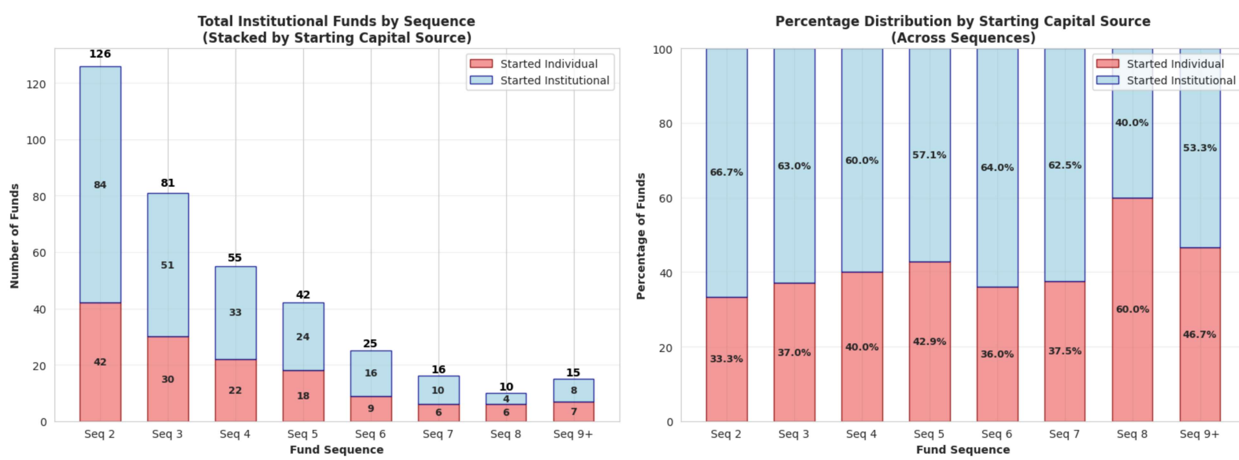

Figure 9: Distribution of Institutional Funds by Starting Capital Source (Data). The fraction of institutional funds that started with retail capital increases substantially over fund sequence, providing strong evidence for the stepping stone mechanism predicted by our model.

sequence. By fund sequences 7-9+, about 29% to 67% of the assets under management and value added by institutional funds comes from GPs who initially started by raising capital from individual investors, which is substantially larger than the 18% in fund sequence two. This finding demonstrates that the stepping stone mechanism is not merely a theoretical possibility but represents a major channel for value creation in the venture capital industry.

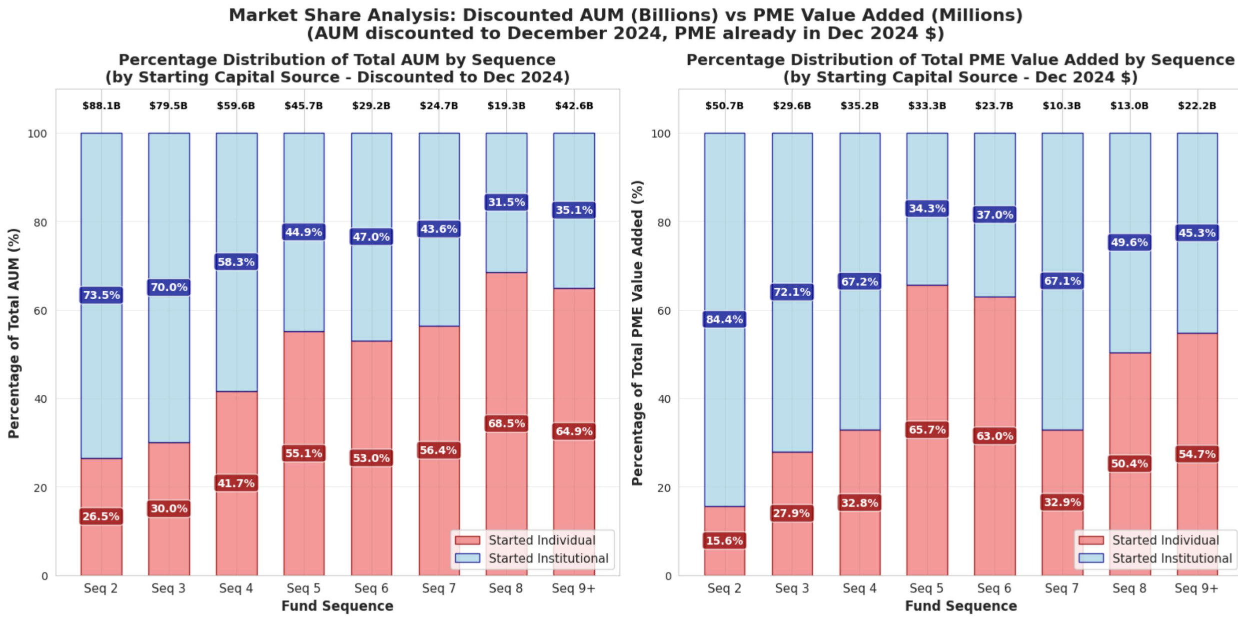

Figure 10: Distribution of Institutional Funds' Value by Starting Capital Source (Data). The percentage of institutional funds' total AUM and value added from GPs starting with retail capital increases substantially over fund sequence, demonstrating the substantial economic impact of the stepping stone mechanism.

The magnitude of this effect suggests that policies restricting retail access to venture capital could have significant negative consequences for long-term capital allocation efficiency and innovation financing, validating our model's welfare analysis.

10 Conclusion

This paper develops a theoretical framework for understanding the role of retail investors in venture capital markets. By extending the Berk and Green learning model to incorporate key institutional features of venture capital—including minimum fund sizes, investor heterogeneity, and discrete fundraising—we demonstrate that retail capital can serve as a valuable stepping stone for emerging managers.

Our main contributions are threefold. First, we show that retail investor access creates significant economic value through a learning option mechanism that enables talent discovery and improved capital allocation. Second, we provide a rigorous analytical framework for understanding when and why market segmentation between retail and institutional investors enhances welfare. Third, we derive testable empirical predictions that can guide future research and policy evaluation.

The corrected solution for the preference threshold μ^* ensures that our theoretical predictions are mathematically sound and empirically testable. By properly accounting for constraint binding conditions and using the appropriate case structure, our model provides reliable guidance for both researchers and policymakers interested in expanding access to venture capital.

Our findings suggest that policies aimed at broadening retail access to venture capital can generate substantial economic benefits, provided they are designed to preserve the beneficial aspects of market segmentation while protecting investor interests. The stepping stone mechanism we identify represents a previously unrecognized channel through which financial market democratization can enhance innovation financing and economic growth.

Future empirical work should focus on testing our model's predictions using comprehensive venture capital datasets that track GP career progression, fund performance, and investor composition over time. Such research will be crucial for validating our theoretical framework and informing evidence-based policy decisions in this rapidly evolving area of financial regulation.

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Tables and Figures

Table 1: Summary Statistics

This table reports summary statistics for the VC funds in our sample. Panel A presents the full sample of 2,212 funds, Panel B breaks down the statistics by LP type, and Panel C by fund sequence. Funds are classified into three categories based on their Form ADV exclusions: (i) Retail Funds relying on Section 3(c)(1), (ii) Institutional Funds relying on Section 3(c)(7), and (iii) Mixed Funds using both exclusions. Fund sequence denotes the Nth fund established by a GP based on vintage year.

Panel A: Overall summary statistics

Characteristic	Value
Total Funds	2212
Total GPs	810
Vintage Years	1973-2023
Mean Vintage Year	2015
Retail Funds (3c1)	1262
Institutional Funds (3c7)	698
Mixed Funds	252
% Retail	57.1
% Institutional	31.6
% Mixed	11.4

Panel B: Summary statistics by LP type

		Fund Size($M)		Number	Minimum Investment
LP Type	N	Mean	SD	of LPs	Median($M)
Retail (3c1)	1262	89.3	218.4	52.9	0.10
Institutional (3c7)	698	503.9	933.2	69.1	0.25

Panel C: Summary statistics by fund sequence

	N	Mean	SD	Number of LPs	Minimum Investment Median($M)
1	810	108.3	198.0	47.2	0.10
2	503	171.6	355.4	52.6	0.10
3-5	601	319.5	625.7	58.3	0.13
6+	298	548.2	1173.5	85.1	0.05

Internet Appendix

A Investor Type Classification via Investment Company Act Exclusions

We classify funds based on their reported Investment Company Act exclusions in Form ADV, which provide legally binding frameworks for investor eligibility and fund structure. U.S. venture capital funds typically rely on one of two exclusions from registration as investment companies:

Section 3(c)(7) Funds (Institutional-Oriented):

Funds organized under Section 3(c)(7) of the Investment Company Act (15 U.S.C. § 80a-3(c)(7)) are exempt from investment company registration if:

(i) owned exclusively by "qualified purchasers", which requires substantially higher wealth thresholds: \$5+ million in investments for individuals or \$25+ million for institutional investors.

There is no limit on the number of investors, as long as all are "qualified purchasers". The qualified purchaser requirement aligns with our model's characterization of institutional capital.

Section 3(c)(1) Funds (Retail-Oriented):

Venture captial funds organized under Section 3(c)(1) of the Investment Company Act (15 U.S.C. § 80a-3(c)(1)) are exempt from investment company registration if they satisfy two conditions:

(i) no more than 250 beneficial owners

(ii) no more than \$12 million in aggregate capital contributions and uncalled capital commitments

This type of VC funds may include accredited investors who do not meet the higher "qualified purchaser" standard. Therefore, most of them target accredited individuals with lower wealth levels, aligning with the characterization of retail capital in our model.

Therefore, we classify funds into three categories based on their Form ADV reported exclusions:

- **Retail Funds:** Funds that rely exclusively on the Section 3(c)(1) exclusion.
- **Institutional Funds:** Funds that rely exclusively on the Section 3(c)(7) exclusion.
- **Mixed:** Funds that report using both exclusions. These represent a small fraction of our sample and are excluded from our main analyses but included in robustness checks.

B Value Added Under All Retail Capital Regimes

B.1 Value Added to the Economy from Access to Retail Investors (Complete)

We define the value added of the GP to the real economy (economic value added) as the value created from the investment minus administrative costs, given the GP's choice of investor type j:

$$VA_t^j = (\mu_t - bA_t)A_t - c_j A_t. \tag{A.1}$$

The economic value added under the GP's optimal choice of investor type j to maximize her profits given the perceived skill μ_t in period t is denoted by $VA_t(\mu_t)$. Total value added of the GP conditional on its perceived skill μ_0 in period 0 is:

$$TVA(\mu_0) = VA_0(\mu_0) + \beta E[VA_1(\mu_1)|\mu_0], \tag{A.2}$$

where the expected future value added in period 1 is:

$$E[VA_1(\mu_1)|\mu_0] = \int_{\mu_{min}^I}^{\infty} VA_1(\mu_1) f(\mu_1|\mu_0) d\mu_1 + \int_{\mu_{min}^R}^{\mu_{min}^I} VA_1(\mu_1) f(\mu_1|\mu_0) d\mu_1. \tag{A.3}$$

For GPs raising capital from retail investors in period 0 (i.e., $\mu_0 \in [\mu_{min}^R, \mu_{min}^I]$), the first term captures the value added from the stepping stone (SS) effect:

$$VA_{SS}(\mu_0) = \int_{\mu_{min}^I}^{\infty} VA_1(\mu_1) f(\mu_1|\mu_0) d\mu_1. \tag{A.4}$$

B.1.1 Value Added Under Different Retail Capital Regimes

The GP's optimal fund size and resulting value added depend on three distinct regimes based on perceived skill μ_t and retail bias δ:

Regime 1: Binding Retail Constraint ($\mu_t < \mu_{t,R}^{bind}$, $\delta < m$)

When $\mu_t < \mu_{t,R}^{bind} = \frac{m(1+p) - c_R(1-p) - 2p\delta}{p(1-p)}$ as in Eq. (32), the GP raises maximum allowable retail capital:

$$A_t^{R,max} = \frac{\mu_t - \frac{m-\delta}{1-p}}{b}. \tag{A.5}$$

Substituting Eq. (A.5) into Eq. (A.1) gives the value added as:

$$VA_t^{R,bind}(\mu_t, \delta) = \left(\frac{m-\delta}{1-p} - c_R\right) A_t^{R,max} = \left(\frac{m-\delta}{1-p} - c_R\right) \frac{\mu_t - \frac{m-\delta}{1-p}}{b}. \tag{A.6}$$

The sign of value added depends solely on whether $\frac{m-\delta}{1-p} > c_R$, independent of μ_t.

Regime 2: Interior Solution ($\mu_t \geq \mu_{t,R}^{bind}$, $\delta < m$)

When $\mu_t \geq \mu_{t,R}^{bind}$, the retail constraint does not bind and the GP chooses optimal fund size:

$$A_t^{R,int} = \frac{\mu_t - m - c_R}{2b}. \tag{A.7}$$

Substituting Eq. (A.7) into Eq. (A.1) gives the value added as:

$$VA_t^{R,int}(\mu_t) = \frac{(\mu_t - m - c_R)^2}{4b} > 0. \tag{A.8}$$

Note this is always positive when the GP chooses to operate and is independent of δ.

Regime 3: Negative Expected Returns ($\delta > m$)

When $\delta > m$, retail investors may participate even with negative expected returns and the performance fee becomes zero (i.e., $p = 0$). The participation constraint becomes:

$$(\mu_t - bA_t) - m + \delta \geq 0. \tag{A.9}$$

The maximum fund size is:

$$A_t^{R,neg} = \frac{\mu_t + \delta - m}{b} > 0. \tag{A.10}$$

Substituting Eq. (A.10) into Eq. (A.1) gives the value added as:

$$VA_t^{R,neg}(\mu_t, \delta) = (m - \delta - c_R)\frac{\mu_t + \delta - m}{b} < 0. \tag{A.11}$$

This is always negative since returns are negative ($\mu_t - bA_t^{R,neg} = m - \delta < 0$) and $c_R > 0$.

B.2 Aggregate Economic Impact with Heterogeneous GPs and Optimal Retail Bias (Complete)

The total economic impact of retail access across the entire population of potential GPs is:

$$TEI = \int_{\mu_{min}^R}^{\mu_{min}^I} TVA(\mu_0) f(\mu_0) d\mu_0.$$

Complete Decomposition of the Objective Function: The total economic impact can be decomposed as:

$$TEI(\delta) = \underbrace{\int_{\mu^R_{min}(\delta)}^{\mu^I_{min}} VA_0(\mu_0,\delta)f(\mu_0)d\mu_0}_{\text{Term 1: Direct value in period 0}} \tag{A.12}$$

$$+ \underbrace{\beta \int_{\mu^R_{min}(\delta)}^{\mu^I_{min}} \int_{\mu^I_{min}}^{\infty} VA_1(\mu_1)f(\mu_1|\mu_0)d\mu_1 f(\mu_0)d\mu_0}_{\text{Term 2: Value from stepping stone effect}} \tag{A.13}$$

$$+ \underbrace{\beta \int_{\mu^R_{min}(\delta)}^{\mu^I_{min}} \int_{\mu^R_{min}(\delta)}^{\mu^I_{min}} VA_1(\mu_1,\delta)f(\mu_1|\mu_0)d\mu_1 f(\mu_0)d\mu_0}_{\text{Term 3: Direct value in period 1}}. \tag{A.14}$$

In this section, we optimize over the retail investor bias parameter δ to maximize welfare.

B.2.1 Optimal Retail Bias for Welfare Maximization

Problem Setup: A welfare-maximizing social planner chooses the optimal retail investor bias δ^* to maximize total economic impact. We maintain consistency with the earlier model assumptions.

Model Assumptions:

1. **Normal skill distribution:** $\mu_0 \sim N(\bar{\mu}, \sigma^2_\mu)$ as defined in Section 5.1
2. **Bayesian updating:** $\mu_1 = \frac{\sigma_0^2(r_1+bA_0)+\sigma_\epsilon^2\mu_0}{\sigma_0^2+\sigma_\epsilon^2}$ and $\sigma_1^2 = \frac{\sigma_0^2\sigma_\epsilon^2}{\sigma_0^2+\sigma_\epsilon^2}$ as defined in Section 2.2

The graduation probability for a GP with initial skill μ_0 is:

$$P_{grad}(\mu_0) = P(\mu_1 \geq \mu^I_{min}|\mu_0) = \Phi\left(\frac{\mu_0 - \mu^I_{min}}{\sigma_1}\right), \tag{A.15}$$

where $\Phi(\cdot)$ is the standard normal cumulative distribution function. The expected stepping stone value for a graduating GP with initial skill μ_0 is:

$$\bar{VA}_{SS}(\mu_0) = \int_{\mu^I_{min}}^{\infty} VA^I_1(\mu_1)\frac{f(\mu_1|\mu_0)}{P_{grad}(\mu_0)}d\mu_1, \tag{A.16}$$

where $f(\mu_1|\mu_0)$ is the normal density with mean μ_0 and variance σ_1^2.

The total economic impact must account for all three regimes. Let:

- $\mu^R_{min}(\delta) = \max\left\{bA^R_{min} + \frac{m-\delta}{1-p}, 0\right\}$ when $\delta < m$
- $\mu^R_{min}(\delta) = \max\{m - \delta + bA^R_{min}, 0\}$ when $\delta > m$
- $\mu^{bind}_R(\delta) = \frac{m(1+p)-c_R(1-p)-2p\delta}{p(1-p)}$ when $\delta < m$

The total economic impact decomposes as:

Case A: $\delta < m$ (Positive Expected Returns)

When $\delta < m$, we have two sub-regimes:

$$TEI(\delta) = \underbrace{\int_{\mu_{min}^R(\delta)}^{\mu_R^{bind}(\delta)} VA_0^{R,bind}(\mu_0, \delta) f(\mu_0) d\mu_0}_{\text{Period 0: Binding constraint}} + \underbrace{\int_{\mu_R^{bind}(\delta)}^{\mu_{min}^I} VA_0^{R,int}(\mu_0) f(\mu_0) d\mu_0}_{\text{Period 0: Interior solution}} \tag{A.17}$$

$$+ \beta \underbrace{\int_{\mu_{min}^R(\delta)}^{\mu_{min}^I} P_{grad}(\mu_0) \bar{VA}_{SS}(\mu_0) f(\mu_0) d\mu_0}_{\text{Stepping stone effect}} \tag{A.18}$$

$$+ \beta \underbrace{\int_{\mu_{min}^R(\delta)}^{\mu_{min}^I} [1 - P_{grad}(\mu_0)] E[VA_1^R(\mu_1, \delta) | \mu_0, \text{no grad}] f(\mu_0) d\mu_0,}_{\text{Period 1: Continuation}} \tag{A.19}$$

where the Period 1 continuation value is:

$$E[VA_1^R(\mu_1, \delta) | \mu_0, \text{no grad}] = \int_{\mu_{min}^R(\delta)}^{\mu_R^{bind}(\delta)} VA_1^{R,bind}(\mu_1, \delta) \frac{f(\mu_1|\mu_0)}{1 - P_{grad}(\mu_0)} d\mu_1 \tag{A.20}$$

$$+ \int_{\mu_R^{bind}(\delta)}^{\mu_{min}^I} VA_1^{R,int}(\mu_1) \frac{f(\mu_1|\mu_0)}{1 - P_{grad}(\mu_0)} d\mu_1. \tag{A.21}$$

Define the period 1 continuation components:

$$M_1^{bind}(\delta) = \int_{\mu_{min}^R(\delta)}^{\mu_{min}^I} [1 - P_{grad}(\mu_0)] \int_{\mu_{min}^R(\delta)}^{\mu_R^{bind}(\delta)} \frac{\mu_1 - \frac{m-\delta}{1-p}}{b} \frac{f(\mu_1|\mu_0)}{1 - P_{grad}(\mu_0)} d\mu_1 f(\mu_0) d\mu_0 \tag{A.22}$$

$$M_1^{int}(\delta) = \int_{\mu_{min}^R(\delta)}^{\mu_{min}^I} [1 - P_{grad}(\mu_0)] \int_{\mu_R^{bind}(\delta)}^{\mu_{min}^I} \frac{(\mu_1 - m - c_R)^2}{4b} \frac{f(\mu_1|\mu_0)}{1 - P_{grad}(\mu_0)} d\mu_1 f(\mu_0) d\mu_0 \tag{A.23}$$

Case B: $\delta > m$ (Negative Expected Returns Allowed)

When $\delta > m$, all GPs operate with negative expected returns:

$$TEI(\delta) = \underbrace{\int_{\mu_{min}^R(\delta)}^{\mu_{min}^I} VA_0^{R,neg}(\mu_0,\delta) f(\mu_0) d\mu_0}_{\text{Period 0: Negative returns (always ¡ 0)}} \tag{A.24}$$

$$+ \beta \underbrace{\int_{\mu_{min}^R(\delta)}^{\mu_{min}^I} P_{grad}(\mu_0) \bar{VA}_{SS}(\mu_0) f(\mu_0) d\mu_0}_{\text{Stepping stone effect}} \tag{A.25}$$

$$+ \beta \underbrace{\int_{\mu_{min}^R(\delta)}^{\mu_{min}^I} [1 - P_{grad}(\mu_0)] VA_1^{R,neg}(\mu_1,\delta) f(\mu_0) d\mu_0}_{\text{Period 1: Negative returns (always ¡ 0)}} \tag{A.26}$$

B.2.2 Optimal Retail Bias for Welfare Maximization

First-Order Conditions for $\delta < m$:

Define the components:

$$M_0^{bind}(\delta) = \int_{\mu_{min}^R(\delta)}^{\mu_R^{bind}(\delta)} \frac{\mu_0 - \frac{m-\delta}{1-p}}{b} f(\mu_0) d\mu_0 \tag{A.27}$$

$$M_0^{int}(\delta) = \int_{\mu_R^{bind}(\delta)}^{\mu_{min}^I} \frac{(\mu_0 - m - c_R)^2}{4b} f(\mu_0) d\mu_0 \tag{A.28}$$

$$M_S(\delta) = \int_{\mu_{min}^R(\delta)}^{\mu_{min}^I} P_{grad}(\mu_0) \bar{VA}_{SS}(\mu_0) f(\mu_0) d\mu_0 \tag{A.29}$$

The total economic impact can be written as:

$$TEI(\delta) = \left(\frac{m-\delta}{1-p} - c_R\right) \left[M_0^{bind}(\delta) + \beta M_1^{bind}(\delta)\right] + M_0^{int}(\delta) + \beta M_1^{int}(\delta) + \beta M_S(\delta). \tag{A.30}$$

The first-order condition becomes:

$$\frac{dTEI}{d\delta} = -\frac{1}{1-p}\left[M_0^{bind} + \beta M_1^{bind}\right] + \left(\frac{m-\delta}{1-p} - c_R\right)\left[\frac{dM_0^{bind}}{d\delta} + \beta \frac{dM_1^{bind}}{d\delta}\right] \tag{A.31}$$

$$+ \frac{dM_0^{int}}{d\delta} + \beta \frac{dM_1^{int}}{d\delta} + \beta \frac{dM_S}{d\delta} = 0. \tag{A.32}$$

This yields the optimal bias for $\delta < m$:

$$\boxed{\delta^{int*} = m - (1-p)c_R + \frac{\beta(1-p)\frac{dM_S}{d\delta} + (1-p)\left(\frac{dM_0^{int}}{d\delta} + \beta\frac{dM_1^{int}}{d\delta}\right) - \left(M_0^{bind} + \beta M_1^{bind}\right)}{\frac{dM_0^{bind}}{d\delta} + \beta \frac{dM_1^{bind}}{d\delta}}} \tag{A.33}$$

First-Order Conditions for $\delta > m$:

When $\delta > m$, the total economic impact is:

$$TEI(\delta) = (m - \delta - c_R)\left[N_0(\delta) + \beta N_1(\delta)\right] + \beta M_S(\delta) \tag{A.34}$$

where:

$$N_0(\delta) = \int_{\mu^R_{min}(\delta)}^{\mu^I_{min}} \frac{\mu_0 + \delta - m}{b} f(\mu_0) d\mu_0 \tag{A.35}$$

$$N_1(\delta) = \int_{\mu^R_{min}(\delta)}^{\mu^I_{min}} [1 - P_{grad}(\mu_0)] E\left[\frac{\mu_1 + \delta - m}{b} | \mu_0, \text{no grad}\right] f(\mu_0) d\mu_0 \tag{A.36}$$

The first-order condition is:

$$\frac{dTEI}{d\delta} = -\left[N_0 + \beta N_1\right] + (m - \delta - c_R)\left[\frac{dN_0}{d\delta} + \beta \frac{dN_1}{d\delta}\right] + \beta \frac{dM_S}{d\delta} = 0 \tag{A.37}$$

This yields the optimal bias for $\delta > m$:

$$\boxed{\delta^{neg*} = m - c_R + \frac{\beta \frac{dM_S}{d\delta} - (N_0 + \beta N_1)}{\frac{dN_0}{d\delta} + \beta \frac{dN_1}{d\delta}}} \tag{A.38}$$

B.2.3 Three-Effect Decomposition

The optimal bias in each regime can be decomposed into three effects:

For $\delta^{int*} < m$ (Interior/Binding Mix):

$$\delta^{int*} = \underbrace{m - (1-p)c_R}_{\text{Value-Neutral Bias}} + \underbrace{\frac{\beta(1-p)\frac{dM_S}{d\delta} + (1-p)\left(\frac{dM_0^{int}}{d\delta} + \beta \frac{dM_1^{int}}{d\delta}\right) - \left(M_0^{bind} + \beta M_1^{bind}\right)}{\frac{dM_0^{bind}}{d\delta} + \beta \frac{dM_1^{bind}}{d\delta}}}_{\text{Welfare Adjustment}} \tag{A.39}$$

The welfare adjustment term can be further decomposed as:

$$\text{Welfare Adjustment} = \frac{\overbrace{\beta(1-p)\frac{dM_S}{d\delta}}^{\text{Stepping Stone Effect}} + \overbrace{(1-p)\left(\frac{dM_0^{int}}{d\delta} + \beta \frac{dM_1^{int}}{d\delta}\right)}^{\text{Interior Efficiency Gains}} - \overbrace{\left(M_0^{bind} + \beta M_1^{bind}\right)}^{\text{Binding Constraint Costs}}}{\underbrace{\frac{dM_0^{bind}}{d\delta} + \beta \frac{dM_1^{bind}}{d\delta}}_{\text{Marginal Participation}}} \tag{A.40}$$

For $\delta^{neg*} > m$ (Negative Returns):

$$\delta^{neg*} = \underbrace{m - c_R}_{\text{Break-Even Bias}} + \underbrace{\frac{\beta \frac{dM_S}{d\delta} - (N_0 + \beta N_1)}{\frac{dN_0}{d\delta} + \beta \frac{dN_1}{d\delta}}}_{\text{Welfare Adjustment}} \tag{A.41}$$

The welfare adjustment term can be decomposed as:

$$\text{Welfare Adjustment} = \frac{\overbrace{\beta\frac{dM_S}{d\delta}}^{\text{Stepping Stone Effect}} - \overbrace{(N_0 + \beta N_1)}^{\text{Value Destruction Costs}}}{\underbrace{\frac{dN_0}{d\delta} + \beta\frac{dN_1}{d\delta}}_{\text{Marginal Participation}}} \tag{A.42}$$

Economic Interpretation of Three Effects:

1. **Effect 1 - Baseline Bias:**
   - For $\delta < m$: Value-neutral bias $m - (1-p)c_R$ ensures zero direct value creation/destruction from binding constraint GPs
   - For $\delta > m$: Break-even bias $m - c_R$ represents the threshold where value destruction begins
2. **Effect 2 - Discovery/Efficiency Premium:**
   - Stepping stone effect: $\beta\frac{dM_S}{d\delta}$ captures marginal talent discovery value (present in both regimes)
   - Interior efficiency (only for $\delta < m$): $(1-p)\left(\frac{dM_0^{int}}{d\delta} + \beta\frac{dM_1^{int}}{d\delta}\right)$ captures efficiency gains from GPs with non-binding constraints
   - These effects push optimal bias upward when talent discovery and efficiency gains are substantial
3. **Effect 3 - Cost/Destruction Discount:**
   - For $\delta < m$: Binding constraint costs $M_0^{bind} + \beta M_1^{bind}$ represent resource misallocation from overinvestment by low-skill GPs
   - For $\delta > m$: Value destruction costs $N_0 + \beta N_1$ represent direct economic losses from negative return investments
   - These effects push optimal bias downward to minimize inefficiency and value destruction

B.2.4 Optimal Policy Selection

The welfare-maximizing retail bias is:

$$\delta^* = \begin{cases} \delta^{int*} & \text{if } TEI(\delta^{int*}) > TEI(m) \text{ and } \delta^{int*} < m \\ m - \epsilon & \text{if } TEI(\delta^{int*}) \leq TEI(m) \text{ and stepping stone value is high} \\ \delta^{neg*} & \text{if } TEI(\delta^{neg*}) > \max\{TEI(\delta^{int*}), TEI(m)\} \text{ and } \delta^{neg*} > m \\ 0 & \text{if all } TEI < 0 \text{ (shut down retail market)} \end{cases} \tag{A.43}$$

Key Policy Insights:

1. **Moderate Bias Regime ($\delta^* < m$):** Optimal when stepping stone benefits and interior efficiency gains outweigh binding constraint inefficiencies
2. **Boundary Solution ($\delta^* = m - \epsilon$):** Optimal when maximizing participation while avoiding value destruction is critical
3. **High Bias Regime ($\delta^* > m$):** Only optimal when stepping stone benefits are extraordinarily high, justifying temporary value destruction for talent discovery
4. **Market Shutdown ($\delta^* = 0$ or no retail):** Optimal when administrative costs and inefficiencies overwhelm all benefits

The optimal policy depends critically on:

- The distribution of GP talent $f(\mu_0)$
- The learning technology (variance reduction through experience)
- The relative magnitude of stepping stone value vs. direct value creation
- Administrative cost differentials between retail and institutional capital
- The discount factor β for future value realization

C Model with Hurdle Rates

We consider a two-period model where GPs and investors share uncertainty about the GP's skill. GPs raise capital at times $t = 0$ and $t = 1$, invest, observe returns at times $t = 1$ and $t = 2$, and update beliefs about skill. They can raise capital from investor type $j \in \{I, R\}$ with I for institutional investors and R for retail investors.

C.1 Key Variables and Parameters

- θ_i: GP i's true skill, unknown to all parties including the GP
- μ_0: Initial perceived skill based on observable characteristics
- μ_1: Updated perceived skill after observing first period return
- σ_t^2: Variance of skill estimate at time $t \in \{0, 1\}$
- A_0: Fund size chosen at $t = 0$ (first fund)
- A_1: Fund size chosen at $t = 1$ (second fund)
- r_1: Return realized at $t = 1$ from first fund
- r_2: Return realized at $t = 2$ from second fund
- c_I: Administrative cost per dollar for institutional capital

- c_R: Administrative cost per dollar for retail capital, with $c_R > c_I > 0$
- m: Management fee rate
- p: Performance fee rate (carried interest)
- b: Diseconomy of scale parameter, $b > 0$
- δ: Retail investors' utility adjustment parameter
- β: Discount factor for future payoffs
- A^I_{min}: Minimum viable fund size for institutional capital
- A^R_{min}: Minimum viable fund size for retail capital, with $A^I_{min} > A^R_{min} > 0$

C.2 Prior Beliefs and Learning

Initially, all parties (GPs and investors) share a common prior about a GP's skill:

$$\theta_i \sim N(\mu_0, \sigma_0^2) \tag{A.44}$$

After observing the return r_1 at time $t = 1$, beliefs about the GP's skill are updated:

$$\mu_1 = \frac{\sigma_0^2(r_1 + bA_0) + \sigma_\epsilon^2 \mu_0}{\sigma_0^2 + \sigma_\epsilon^2} \tag{A.45}$$

$$\sigma_1^2 = \frac{\sigma_0^2 \sigma_\epsilon^2}{\sigma_0^2 + \sigma_\epsilon^2} \tag{A.46}$$

where $r_1 = \theta_i - bA_0 + \epsilon_1$ is the fund's realized return, and $\epsilon_1 \sim N(0, \sigma_\epsilon^2)$ is performance noise.

C.3 Fund Performance

The realized returns are:

$$r_1 = \theta_i - bA_0 + \epsilon_1 \tag{A.47}$$

$$r_2 = \theta_i - bA_1 + \epsilon_2 \tag{A.48}$$

From the perspective of time t, the return $r_{t+1} \sim N(\mu_t - bA_t, \sigma_t^2 + \sigma_\epsilon^2)$.

C.4 Fee Structure with Hurdle Rate

Key Change: The GP now earns performance fees only on positive returns, reflecting standard industry practice with a hurdle rate at zero.

The GP charges:

- Management fee: $m \cdot A_t$

- Performance fee (carried interest): $p \cdot \max\{r_{t+1} \cdot A_t, 0\}$

The expected total fee from the perspective of time t is:

$$E[\text{fee}_{t+1}|\mu_t] = m \cdot A_t + p \cdot A_t \cdot E[\max\{r_{t+1}, 0\}|\mu_t] \tag{A.49}$$

where:

$$E[\max\{r_{t+1}, 0\}|\mu_t] = (\mu_t - bA_t)\Phi(z_t) + \sigma_{t+1}\phi(z_t) \tag{A.50}$$

with $z_t = \frac{\mu_t - bA_t}{\sigma_{t+1}}$, $\sigma_{t+1} = \sqrt{\sigma_t^2 + \sigma_\epsilon^2}$, and $\Phi(\cdot)$ and $\phi(\cdot)$ are the standard normal CDF and PDF, respectively.

C.5 Investor Participation Constraints

Institutional Investors:

$$(1-p) \cdot E[\max\{r_{t+1}, 0\}|\mu_t] - m \geq 0 \tag{A.51}$$
$$A_t \geq A^I_{min} \tag{A.52}$$

Retail Investors:

$$(1-p) \cdot E[\max\{r_{t+1}, 0\}|\mu_t] - m + \delta \geq 0 \tag{A.53}$$
$$A_t \geq A^R_{min} \tag{A.54}$$

C.6 GP Profit

The GP's expected profit from a fund raised at time t is:

$$E[\Pi_{t+1}|\mu_t] = m \cdot A_t + p \cdot A_t \cdot E[\max\{r_{t+1}, 0\}|\mu_t] - c_j \cdot A_t \tag{A.55}$$

Substituting the truncated normal expectation:

$$E[\Pi_{t+1}|\mu_t] = m \cdot A_t + p \cdot A_t \cdot [(\mu_t - bA_t)\Phi(z_t) + \sigma_{t+1}\phi(z_t)] - c_j \cdot A_t \tag{A.56}$$

D GP's Decision Problem

D.1 Decision at $t = 1$

At $t = 1$, after observing the first fund's return r_1 and updating beliefs to μ_1, the GP chooses whether to raise a second fund and from which investor type. The GP's value function is:

$$V_1(\mu_1) = \max\{E[\Pi_2^I|\mu_1] \cdot \mathbf{1}_{\mu_1 \geq \mu_{1,I}^{min}}, E[\Pi_2^R|\mu_1] \cdot \mathbf{1}_{\mu_1 \geq \mu_{1,R}^{min}}, 0\} \tag{A.57}$$

D.2 Decision at $t = 0$

At $t = 0$, the GP makes decisions based on μ_0 and anticipates how these decisions will affect learning and future options. The GP's value function is:

$$V_0(\mu_0) = \max\{E[\Pi_1^I|\mu_0] \cdot \mathbf{1}_{\mu_0 \geq \mu_{0,I}^{min}} + \beta E[V_1(\mu_1)|\mu_0, I], \tag{A.58}$$

$$E[\Pi_1^R|\mu_0] \cdot \mathbf{1}_{\mu_0 \geq \mu_{0,R}^{min}} + \beta E[V_1(\mu_1)|\mu_0, R], 0\} \tag{A.59}$$

E Optimal Fund Size and Investor Choice

E.1 Optimal Fund Size with Hurdle Rate

Proposition 3. *The profit-maximizing fund size for a GP with perceived skill μ_t raising from investor type $j \in \{I, R\}$ solves:*

$$\frac{\partial E[\Pi_{t+1}|\mu_t]}{\partial A_t} = m - c_j + p \cdot \frac{\partial}{\partial A_t}[A_t \cdot E[\max\{r_{t+1}, 0\}|\mu_t]] = 0 \tag{A.60}$$

This yields the first-order condition:

$$m - c_j + p\,[(\mu_t - bA_t^*)\Phi(z_t^*) + \sigma_{t+1}\phi(z_t^*) - bA_t^*\Phi(z_t^*) + \textit{adjustment terms}] = 0 \tag{A.61}$$

where the adjustment terms arise from the dependence of z_t on A_t.

The optimal fund size A_t^{j*} must be solved numerically and is subject to:

$$A_t^{j*} = \min\left\{A_t^{j,unc}, A_t^{j,max}\right\} \tag{A.62}$$

where $A_t^{j,unc}$ is the unconstrained optimum (solved numerically) and $A_t^{j,max}$ is determined by investor participation constraints.

Key Difference from Original Model: The optimal fund size no longer has a closed-form solution. The hurdle rate introduces non-linearity through the truncated normal distribution, requiring numerical methods.

E.2 Investor Participation Thresholds

Proposition 4. *For a GP to be able to raise capital, the perceived skill level must satisfy:*

Institutional investors:

$$E[\max\{r_{t+1}, 0\}|\mu_t, A_t = A_{min}^I] \geq \frac{m}{1-p} \tag{A.63}$$

Retail investors:

$$E[\max\{r_{t+1}, 0\}|\mu_t, A_t = A_{min}^R] \geq \frac{m-\delta}{1-p} \tag{A.64}$$

The minimum skill thresholds μ_{min}^I and μ_{min}^R must be solved numerically from these conditions.

Comparison with Original Model: The thresholds are now implicitly defined through the truncated normal expectation rather than having explicit linear forms.

E.3 GP's Investor Type Preference

The threshold μ_t^* determining when a GP switches from preferring retail to institutional investors solves:

$$E[\Pi_{t+1}^I|\mu_t^*] = E[\Pi_{t+1}^R|\mu_t^*] \tag{A.65}$$

This requires comparing:

$$mA_I^* + pA_I^*[(\mu_t^* - bA_I^*)\Phi(z_I^*) + \sigma_{t+1}\phi(z_I^*)] - c_I A_I^* = \tag{A.66}$$
$$mA_R^* + pA_R^*[(\mu_t^* - bA_R^*)\Phi(z_R^*) + \sigma_{t+1}\phi(z_R^*)] - c_R A_R^* \tag{A.67}$$

where A_I^* and A_R^* are the optimal fund sizes for each investor type at skill level μ_t^*.

F Option Value of Learning and Stepping Stone Mechanism

F.1 Distribution of Initial Perceived Skill

As in the original model:

$$\mu_0 \sim N(\bar{\mu}, \sigma_\mu^2) \tag{A.68}$$

The proportion of potential GPs in each market segment remains structurally similar, though the specific thresholds change.

F.2 Option Value of Retail Access

The option value of access to retail investors is:

$$OV(\mu_0) = \int_{\mu_{min}^R}^{\mu_{min}^I} \left\{E[\Pi_1^R|\mu_0] + \beta E[V_1(\mu_1)|\mu_0]\right\} f(\mu_0) d\mu_0 \tag{A.69}$$

where:

$$E[\Pi_1^R|\mu_0] = mA_0^R + pA_0^R[(\mu_0 - bA_0^R)\Phi(z_0^R) + \sigma_1\phi(z_0^R)] - c_R A_0^R \tag{A.70}$$

F.3 Value Added to the Economy from Access to Retail Investors

Important Note: The economic value added remains as in the original model, representing the total value created minus administrative costs:

We define the value added of the GP to the real economy (economic value added) as the value created from the investment minus administrative costs, given the GP's choice of investor type j:

$$VA_t^j = (\mu_t - bA_t)A_t - c_j A_t \tag{A.71}$$

This represents the expected gross return to investors plus the GP's skill-based value creation, minus the administrative costs. The economic value added under the GP's optimal choice of investor type j to maximize her profits given the perceived skill μ_t in period t is denoted by $VA_t(\mu_t)$.

Total value added of the GP conditional on its perceived skill μ_0 in period 0 is:

$$TVA(\mu_0) = VA_0(\mu_0) + \beta E[VA_1(\mu_1)|\mu_0], \tag{A.72}$$

where the expected future value added in period 1 is:

$$E[VA_1(\mu_1)|\mu_0] = \int_{\mu^I_{min}}^{\infty} VA_1(\mu_1)f(\mu_1|\mu_0)d\mu_1 + \int_{\mu^R_{min}}^{\mu^I_{min}} VA_1(\mu_1)f(\mu_1|\mu_0)d\mu_1. \tag{A.73}$$

For GPs raising capital from retail investors in period 0 (i.e., $\mu_0 \in [\mu^R_{min}, \mu^I_{min}]$), the first term captures the value added from the stepping stone (SS) effect:

$$VA_{SS}(\mu_0) = \int_{\mu^I_{min}}^{\infty} VA_1(\mu_1)f(\mu_1|\mu_0)d\mu_1. \tag{A.74}$$

F.3.1 Value Added Under Maximum Retail Capital

When the GP optimally chooses to raise the maximum amount of capital from retail investors (which occurs when the perceived skill is relatively low), the maximum capital that can be raised from retail investors must satisfy the participation constraint with the hurdle rate structure:

$$E[\max\{r_{t+1}, 0\}|\mu_t, A_t^{R,max}] = \frac{m-\delta}{1-p} \tag{A.75}$$

This implicitly defines $A_t^{R,max}$ as a function of μ_t. The value added when raising maximum capital is:

$$VA_t^{R,max}(\mu_t) = (\mu_t - bA_t^{R,max})A_t^{R,max} - c_R A_t^{R,max} \tag{A.76}$$

Key Insight: While the fee structure has changed to include hurdle rates, the fundamental economic value created (before fees) remains $(\mu_t - bA_t)A_t$. The hurdle rate affects the *distribution* of this value between GPs and investors through the fee mechanism, but not the total value created.

F.3.2 Comparison with Original Model

In the original model without hurdle rates, when the return constraint binds:

$$A_t^{R,max} = \frac{\mu_t - \frac{m-\delta}{1-p}}{b} \tag{A.77}$$

With hurdle rates, $A_t^{R,max}$ must be solved numerically from the participation constraint, but the value added formula remains:

$$VA_t^{R,max}(\mu_t) = (\mu_t - bA_t^{R,max})A_t^{R,max} - c_R A_t^{R,max} \tag{A.78}$$

The sign and magnitude of value added now depend on the implicit relationship between μ_t and $A_t^{R,max}$ through the truncated normal expectation.

F.3.3 Heterogeneous Retail Investors

To allow for optimal equilibrium, we consider heterogeneous retail investors with bias parameters δ_i distributed according to density function $g(\delta)$ over support $[\delta_{min}, \delta_{max}]$. Each retail investor type i with bias δ_i will only invest in GPs meeting their participation constraint:

$$E[\max\{r_{t+1}, 0\}|\mu_t, A_t] \geq \frac{m - \delta_i}{1 - p} \tag{A.79}$$

The retail capital market equilibrium determines which investor types participate and the resulting aggregate value added.

F.4 Aggregate Economic Impact with Heterogeneous GPs and Optimal Retail Bias

The total economic impact of retail access across the entire population of potential GPs is:

$$TEI = \int_{\mu_{min}^R}^{\mu_{min}^I} TVA(\mu_0) f(\mu_0) d\mu_0.$$

Complete Decomposition of the Objective Function: The total economic impact can be decomposed as:

$$TEI(\delta) = \underbrace{\int_{\mu_{min}^R(\delta)}^{\mu_{min}^I} VA_0(\mu_0, \delta) f(\mu_0) d\mu_0}_{\text{Term 1: Direct value in period 0}} \tag{A.80}$$

$$+ \underbrace{\beta \int_{\mu_{min}^R(\delta)}^{\mu_{min}^I} \int_{\mu_{min}^I}^{\infty} VA_1(\mu_1) f(\mu_1|\mu_0) d\mu_1 f(\mu_0) d\mu_0}_{\text{Term 2: Value from stepping stone effect}} \tag{A.81}$$

$$+ \underbrace{\beta \int_{\mu_{min}^R(\delta)}^{\mu_{min}^I} \int_{\mu_{min}^R(\delta)}^{\mu_{min}^I} VA_1(\mu_1, \delta) f(\mu_1|\mu_0) d\mu_1 f(\mu_0) d\mu_0}_{\text{Term 3: Direct value in period 1}} \tag{A.82}$$

where value added in each term is calculated as $VA_t^j = (\mu_t - bA_t)A_t - c_j A_t$.

F.4.1 Optimal Retail Bias for Welfare Maximization

The welfare-maximizing social planner chooses the optimal retail investor bias δ^* to maximize total economic impact. The first-order condition for optimal bias becomes:

$$\frac{dTEI}{d\delta} = 0 \tag{A.83}$$

This condition is more complex than in the original model because changing δ affects fund sizes through the hurdle rate constraint rather than through a simple linear relationship. The optimal δ^* must be solved numerically, accounting for:

1. How δ affects the participation threshold $\mu^R_{min}(\delta)$ through the truncated normal expectation

2. How δ affects optimal fund sizes $A^*_t(\mu_t, \delta)$ through the modified profit maximization

3. How these changes propagate through the stepping stone mechanism

G Key Similarities and Differences

G.1 Preserved Results

1. **Stepping Stone Mechanism:** GPs with $\mu_0 \in [\mu_R^{min}, \mu_I^{min}]$ can still start with retail capital and potentially graduate to institutional capital after successful performance.

2. **Learning Dynamics:** Bayesian updating of skill beliefs remains unchanged.

3. **Value Added Formula:** Economic value creation still follows $VA^j_t = (\mu_t - bA_t)A_t - c_j A_t$.

4. **Heterogeneous Investors:** The distinction between institutional and retail investors through costs ($c_I < c_R$) and bias (δ) is maintained.

5. **Threshold Structure:** The qualitative ordering $\mu_R^{min} < \mu_I^{min} < \mu^*$ persists.

G.2 Modified Results

1. **Fee-Profit Relationship:** While value added remains unchanged, the relationship between fees and profits is now non-linear due to the hurdle rate.

2. **Optimal Fund Size:** No closed-form solution; requires numerical optimization. Generally smaller than in the original model due to performance fee asymmetry.

3. **Participation Constraints:** Binding constraints now involve truncated normal expectations rather than simple linear relationships.

4. **Threshold Values:** All thresholds must be solved numerically and generally require higher skill levels due to the hurdle rate.

5. **GP Incentives:** GPs face asymmetric payoffs, earning performance fees only on positive returns while bearing downside through reduced future fundraising.

G.3 New Economic Insights

1. **Risk-Return Tradeoff:** GPs must balance expected returns against the probability of earning performance fees, creating more complex fund size decisions.

2. **Volatility Effects:** Return volatility (σ_{t+1}) directly affects expected profits through $\phi(z_t)$, but not economic value added.

3. **Distribution vs. Creation:** The hurdle rate affects how value is distributed between GPs and investors but not the total value created.

4. **Enhanced Learning Incentive:** Understanding true skill θ_i becomes more valuable as it helps GPs optimize fund size given the hurdle constraint.

H Implementation and Empirical Implications

H.1 Numerical Methods Required

The hurdle rate model requires:

- Numerical optimization for optimal fund sizes
- Numerical solution of implicit equations for thresholds
- Monte Carlo simulation for welfare analysis
- Numerical integration for value functions

H.2 Testable Predictions

1. **Fund Size Distribution:** Funds should be smaller on average than predicted by models without hurdle rates, particularly for GPs with moderate skill levels.

2. **Performance Clustering:** Returns should cluster above zero as GPs manage fund size to avoid negative returns.

3. **Skill-Size Relationship:** The relationship between perceived skill and fund size should be steeper and potentially non-monotonic.

4. **Value Creation vs. Fees:** The ratio of economic value added to fees should vary with skill level differently than in linear models.

5. **Stepping Stone Prevalence:** The hurdle rate may increase the importance of retail capital as a stepping stone by making institutional access more difficult.

I Conclusion

Incorporating a hurdle rate structure into the stepping stone model provides a more realistic representation of the asset management industry while preserving the key economic insights. The main qualitative results—the stepping stone mechanism, heterogeneous investor types, and the option value of retail access—remain valid.

Critically, the economic value added formula $VA_t^j = (\mu_t - bA_t)A_t - c_jA_t$ remains unchanged, reflecting that hurdle rates affect the *distribution* of value between GPs and investors rather than the total value created. However, the hurdle rate introduces important non-linearities in the fee and profit functions that affect optimal fund sizes, participation thresholds, and the dynamics of the stepping stone mechanism.

The model shows that performance fee asymmetry creates additional frictions in the talent discovery process, potentially strengthening the case for retail investor participation as a stepping stone for emerging managers. While analytical solutions are no longer available for many components, the framework provides a richer set of empirical predictions about fund behavior and more realistic policy implications.

Future work should focus on calibrating the model parameters using industry data and conducting numerical simulations to quantify how hurdle rates affect the welfare-maximizing level of retail investor bias and the efficiency of talent discovery in financial markets.