Benchmarking Intensity

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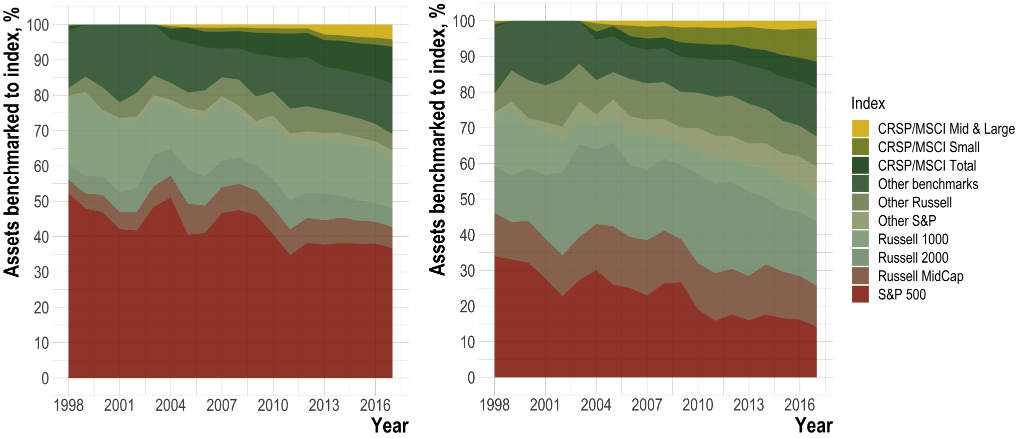
Q Group Spring Seminar 2023

London Business School

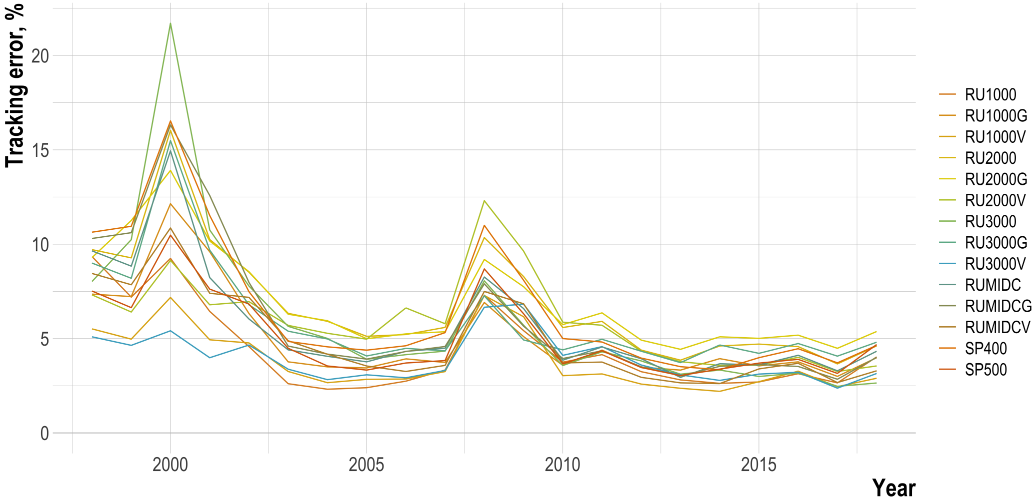
Benchmarked Assets by Index Group



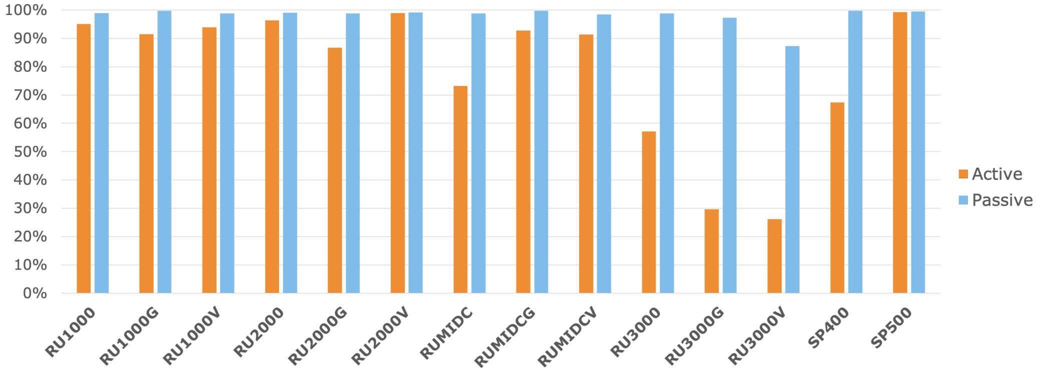
(a) All market cap

(b) Market cap between 75% and 95%

Tracking Errors of Active Funds Have Been Decreasing Over Time



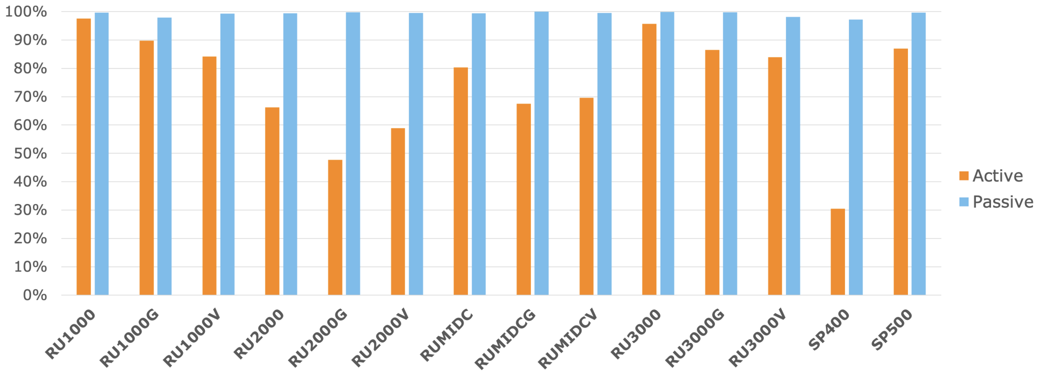
Fraction of Benchmark Stocks Held



Note: Average values for 2018. Holdings of all funds with the same benchmark are aggregated into one portfolio.

→ Funds do not hold all stocks in their benchmarks due to **optimized sampling**

% of Portfolio Value Invested in Benchmark



Note: Holdings of all funds with the same benchmark are aggregated into one portfolio.

→ Most of AUM is invested in benchmark stocks

This Paper

Theory

- Managers have inelastic demand for stocks in their benchmarks
- Benchmarks form the preferred habitat of both active and passive managers
- Preferred habitat investors push up prices of stocks in their benchmarks

  ... and lower their expected returns (cost of equity)

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Empirics

- Novel measure of total inelastic demand – benchmarking intensity (BMI)
- Use Russell 1000/2000 cutoff to exploit exogenous variation in BMI
- Increase in BMI lowers long-run stock returns
- Active funds buy additions to and sell deletions from their benchmarks
- Measure the price elasticity of demand using changes in BMI

Related Literature

- **Asset pricing and benchmarking (theory):** Brennan (1993), Cuoco and Kaniel (2011), Basak and Pavlova (2013), Buffa, Vayanos, Woolley (2022), Buffa and Hodor (2023), Kashyap et al. (2023)
- **Index effect (empirical):** Harris and Gurel (1986), Schleifer (1986), Chen, Noronha, Singal (2005), Chang, Hong, Liskovich (2015), Bennett, Stulz, and Wang (2022), Greenwood and Sammon (2022)
- **Price elasticity of demand for stocks:** Wurgler and Zhuravskaya (2002), Greenwood (2005), Petajisto (2009), Koijen and Yogo (2019), Gabaix and Koijen (2021)

Theory

Model Features

Environment

- One period
- N stocks and 1 risk-free asset with $r_f = 0$
- Stock dividends are normally distributed: $D_i \sim N(\bar{D}, \Sigma)$

Agents

- 2 types of agents: direct investors and fund managers
- CARA preferences, risk aversion γ
- Direct investors maximize utility from wealth; fund managers - from compensation

Contract-Induced Optimal Demand

- Fund manager j (mass $\boldsymbol{\lambda_j}$) has a benchmark with return B_j (weights $\boldsymbol{\omega_j}$)
- Contract features absolute, relative, and fixed parts (Ma, Tang, Gomez, 2019):

$$\textit{total compensation}_j = aR_j + b(R_j - B_j) + c, \quad a \geq 0,\ b > 0$$

- Optimal portfolios:

$$\theta_j = \frac{1}{\gamma}\Sigma^{-1}\left[\bar{D} - S\right] \qquad \text{(direct investor)}$$

$$\theta_j = \frac{1}{\gamma(a+b)}\Sigma^{-1}\left[\bar{D} - S\right] + \frac{\boldsymbol{b}}{\boldsymbol{a+b}}\boldsymbol{\omega_j} \qquad \text{(fund manager)}$$

- **Prediction:** Inelastic demand increases fund ownership of stocks in the benchmark.

Testable Implications

- **Prediction:** the equilibrium stock prices increase in benchmarking intensity (BMI)

$$S = \bar{D} - \gamma A \Sigma \bar{\theta} + \gamma A \Sigma \frac{b}{a+b} \underbrace{\sum_{j=1}^{J} \lambda_j \omega_j}_{\textbf{BMI}}$$

- **Prediction:** for otherwise identical stocks, the higher the BMI the lower the expected return.

Empirical Analysis

Dataset Structure

Granular benchmark composition history

- 34 benchmarks, 1998-2018
- LSE-FTSE data for Russell indices
- S&P and CRSP indices from Morningstar

Dynamic panel of fund benchmarks

- Self-designated benchmarks from fund prospectuses scraped from the U.S. Securities and Exchange Commission (SEC) EDGAR[1]

U.S. domestic equity mutual fund and ETF holdings

- Merged Thomson Reuters S12 and CRSP Mutual Fund Database
- Quarterly, March 1998 - December 2018

[1] Validation with the Morningstar snapshot from September 2018 and the SEC Mutual Fund Risk and Return Database (2010-2018)

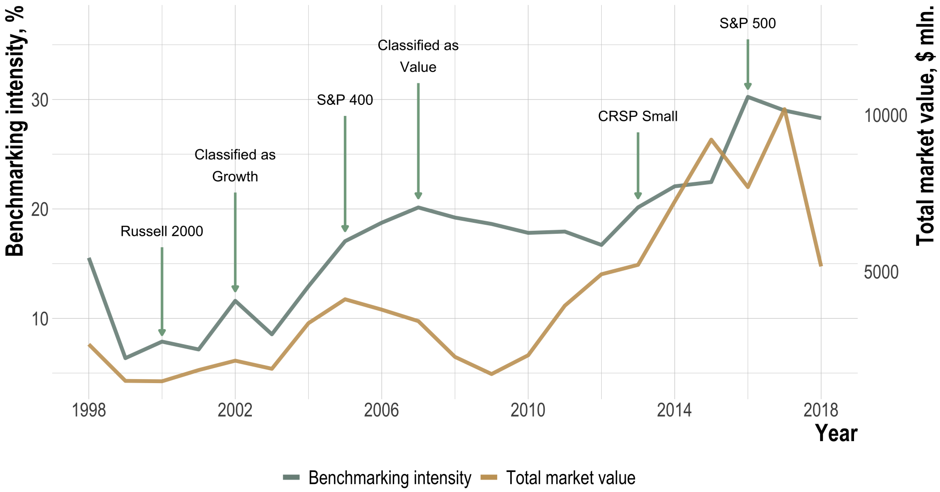
Measure of Benchmarking Intensity

Benchmarking intensity (stock-level):

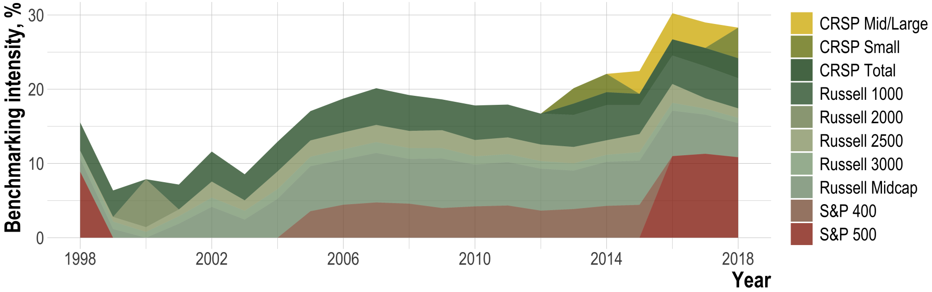
$$BMI_{i,t} = \frac{\sum_{j=1}^{J} \lambda_{j,t} \times \omega_{i,j,t}}{MV_{i,t}}$$

- $\lambda_{j,t}$ – the AUM of mutual funds and ETFs benchmarked to index j in quarter t
- $\omega_{i,j,t}$ – weight of stock i in benchmark j in quarter t
- $MV_{i,t}$ – market capitalization of stock i in quarter t

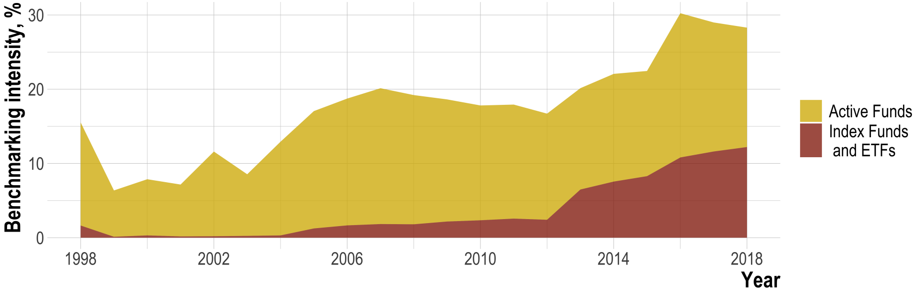
Benchmarking Intensity of Foot Locker Inc.



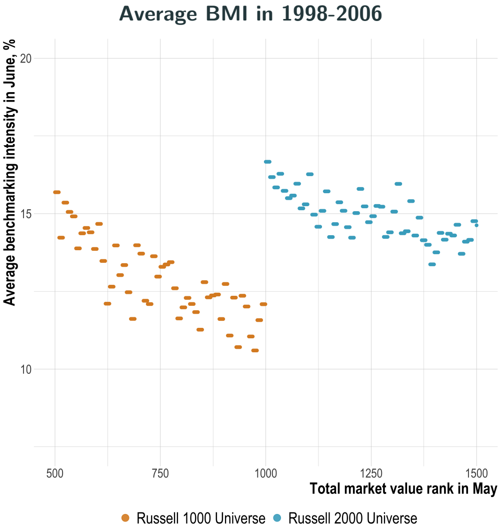
Contribution of Index Groups to BMI of Foot Locker Inc.



Contribution of Investor Types to BMI of Foot Locker Inc.

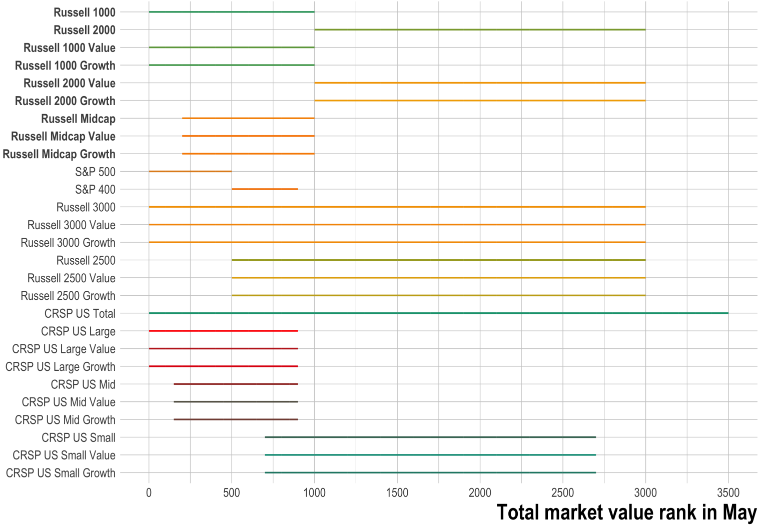


The Russell Cutoff and Benchmarking Intensity



- index cutoff at market value rank 1000
- reconstitution in June, based on ranks in May
- similar with two cutoffs after 2007

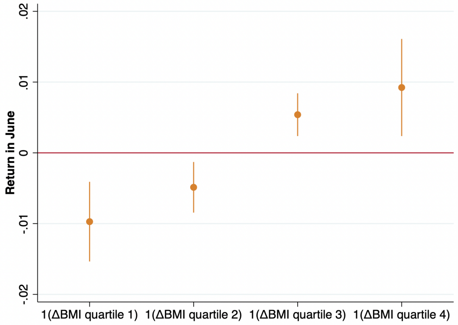
Largest Benchmarks in BMI



BMI and the Index Effect Size

	Return in June					ΔBMI, %
	(1)	(2)	(3)	(4)	(5)	(6)
ΔBMI	0.26**	0.27**	0.28**			
	(2.55)	(2.66)	(2.74)			
$1(\Delta BMI$ quartile 1)				-0.010***	-0.010***	-3.02
				(-3.41)	(-3.39)	
$1(\Delta BMI$ quartile 2)				-0.004**	-0.005***	-0.39
				(-2.16)	(-2.67)	
$1(\Delta BMI$ quartile 3)				0.006***	0.005***	0.49
				(3.62)	(3.50)	
$1(\Delta BMI$ quartile 4)				0.008**	0.009***	3.24
				(2.26)	(2.64)	
Fixed effect	Year	Year	Stock & Year	N	N	
$\bar{X}$ controls	N	Y	Y	N	Y	
Observations	14,549	14,549	14,549	14,549	14,549	
Adj. R^2, %	17.1	17.5	19.2	1.3	1.8	

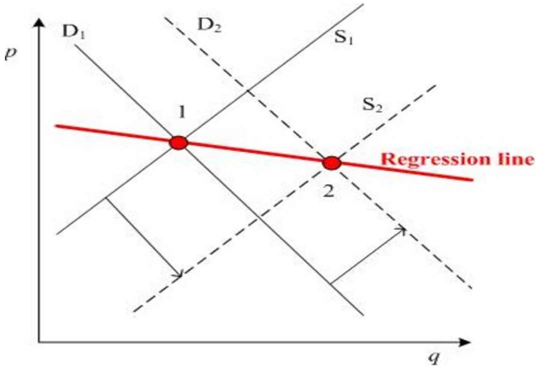
Band width is 300. S.E. clustered by stock and year. In columns (4)-(5) both the dependent variable and controls are demeaned by year.



Larger change in BMI → larger index effect

Price Impact of Institutional Investors

"Endogeneity" problem:



An OLS regression produces a biased estimate

Price Impact of a Change in Institutional Ownership

- Use an Instrumetal Variables (IV) approach – $\Delta BMI_{i,t}$ as an instrument for Δ institutional ownership (IO)
- Estimate near the cutoff

$$\Delta IO_{i,t} = \alpha_1 \Delta BMI_{i,t} + \delta_1' Controls_{i,t} + \mu_{1t} + \varepsilon_{i,t}$$
$$Return_{i,t}^{June} = \boldsymbol{\alpha} \widehat{\Delta IO}_{i,t} + \delta' Controls_{i,t} + \mu_{2t} + \eta_{i,t}$$

- $\Delta IO_{i,t}$ – change in total institutional ownership of stock i from March to June of year t
- $\Delta BMI_{i,t}$ – change in BMI of stock i between May and June of year t
- $Controls_{i,t}$ – $logMV_{i,t}$, $Float_{i,t}$, $BandingControls_{i,t}$, and $\bar{X}_{i,t}$ as of May
- μ_{1t} and μ_{2t} – year fixed effects

BMI as IV for Ownership

	June Return, %				April-June Return, %
	OLS		2SLS		
	(1)	(2)	(3)	(4)	(5)
Panel A: Second-stage estimates					
ΔIO, %	0.09***	2.27	1.46**	1.47**	2.26**
	(3.75)	(1.44)	(2.55)	(2.57)	(2.80)
Panel B: First-stage estimates					
ΔBMI, %			0.20***	0.19***	0.19***
			(5.90)	(6.34)	(6.43)
D^{R2000}		0.85***	-0.15		
		(2.78)	(-0.54)		
F-Stat (excl. instruments)		7.73	20.07	40.20	41.41
Hansen J test, p-value			0.19		
Controls	Y	Y	Y	Y	N
Observations	12,862	12,862	12,862	12,862	12,862

Band width is 300. Year fixed effects and all baseline controls are included in columns (1)-(4). Column (5) only includes year fixed effects. S.E. clustered by stock and year (HAC for J test).

- ΔBMI is a valid instrument for change in institutional ownership
- Price impact of 1.47 is consistent with Koijen and Yogo (2019)
- Institutions buy = remaining investors sell
- Implies that demand elasticity of remaining investors is 2.27

Do Active Funds Buy Additions to and Sell Deletions From Their Benchmarks?

Estimate for the aggregate portfolio of funds with benchmark j (active or passive):

$$\Delta Own_{i,j,t} = \boldsymbol{\alpha_{1j}} D_{i,t}^{R2000\to R1000} + \boldsymbol{\alpha_{2j}} D_{i,t}^{R1000\to R2000} + \delta_j' Controls_{i,t} + \mu_{j,t} + \epsilon_{i,j,t}$$

- $D_{i,t}^{R2000\to R1000}$ – 1 when stock i is moved from Russell 2000 to 1000 in June of year t
- $\Delta Own_{i,j,t}$ – change in aggregate ownership of stock i by funds with benchmark j from March to September of year t (fraction of shares or ownership dummy)
- $Controls_{i,t}$ – $logMV_{i,t}$, $Float_{i,t}$, and $\bar{X}_{i,t}$ as of May
- $\mu_{j,t}$ – year fixed effects

Do Passive Funds Rebalance Upon Index Reconstitution?

	Change in the aggregate ownership of funds with the same benchmark, %					
	Stocks ranked < 1000				Stocks ranked > 1000	
Benchmark	Russell 1000		Russell Midcap		Russell 2000	
Fund type	Active	Passive	Active	Passive	Active	Passive
Panel A: Change in ownership share						
$D^{R2000 \rightarrow R1000}$	0.12***	0.11***	0.39***	0.11***	-0.55***	-0.84***
	(2.97)	(3.60)	(4.41)	(3.16)	(-4.95)	(-4.18)
$D^{R1000 \rightarrow R2000}$	-0.10**	-0.10***	-0.26***	-0.10***	0.12	0.77***
	(-2.22)	(-3.29)	(-3.69)	(-2.90)	(1.47)	(3.61)
Panel B: Change in holding status						
$D^{R2000 \rightarrow R1000}$	0.36***	0.46***	0.29***	0.44***	-0.32***	-0.92***
	(7.05)	(7.93)	(5.02)	(5.20)	(-7.13)	(-11.47)
$D^{R1000 \rightarrow R2000}$	-0.30***	-0.83***	-0.24***	-0.69***	0.11**	0.83***
	(-4.68)	(-5.84)	(-5.62)	(-4.27)	(2.39)	(6.87)

Band width is 300. Controls include *logMV*, *Float*, CAPM beta, bid-ask spread, year fixed effects. S.E. are clustered at stock and year level. *p<0.10; **p<0.05; ***p<0.01.

→ Passive funds buy benchmark additions and sell deletions

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Band width is 300. Controls include *logMV*, *Float*, CAPM beta, bid-ask spread, year fixed effects. S.E. are clustered at stock and year level. *p<0.10; **p<0.05; ***p<0.01.

→ Active funds also buy additions to and sell deletions from their benchmarks

More Active Funds Rebalance Less

	Change in the holding status of funds with the same benchmark, %					
	Stocks ranked < 1000				Stocks ranked > 1000	
Benchmark	Russell 1000		Russell Midcap		Russell 2000	
Fund type	More active	Less active	More active	Less active	More active	Less active
Panel A: Active share						
$D^{R2000 \to R1000}$	0.14***	0.41***	0.22***	0.26***	-0.07**	-0.26***
	(4.43)	(9.30)	(4.04)	(6.22)	(2.21)	(-5.75)
$D^{R1000 \to R2000}$	-0.08**	-0.33***	-0.21***	-0.23***	-0.04	0.12*
	(-2.66)	(-5.10)	(-4.20)	(-4.67)	(0.78)	(2.08)
Panel B: Tracking error						
$D^{R2000 \to R1000}$	0.17***	0.42***	0.25***	0.28***	-0.07**	-0.28***
	(5.40)	(8.71)	(5.97)	(5.96)	(2.43)	(-5.10)
$D^{R1000 \to R2000}$	-0.12**	-0.33***	-0.19***	-0.27***	-0.02	0.10*
	(-2.85)	(-6.23)	(-4.28)	(-5.74)	(0.39)	(1.83)

Band width is 300. Controls include *logMV*, *Float*, CAPM beta, bid-ask spread, year fixed effects. S.E. are clustered at stock and year level. *p<0.10; **p<0.05; ***p<0.01.

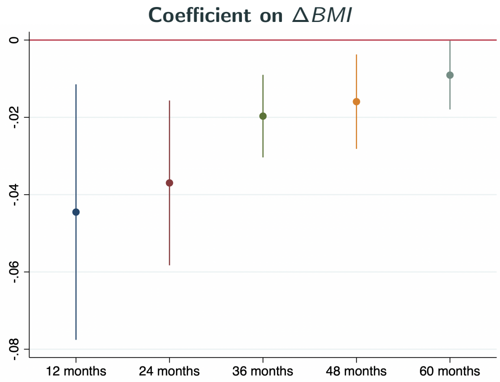
BMI and Long-Run Returns

Estimate for stocks near the cutoff:

$$Y_{i,t+h} = \alpha \Delta BMI_{i,t} + \delta' Controls_{i,t} + \mu_i + \mu_t + \varepsilon_{i,t}$$

- $\Delta BMI_{i,t}$ – change in BMI of stock i between May and June of year t
- $Y_{i,t+h}$ – average excess return over horizon h (up to 5 years) of stock i in September of year t
- $Controls_{i,t}$ – $logMV_{i,t}$, $Float_{i,t}$, $BandingControls_{i,t}$, and $\bar{X}_{i,t}$ as of May
- μ_i – stock fixed effects
- μ_t – year fixed effects

BMI and Long-Run Returns

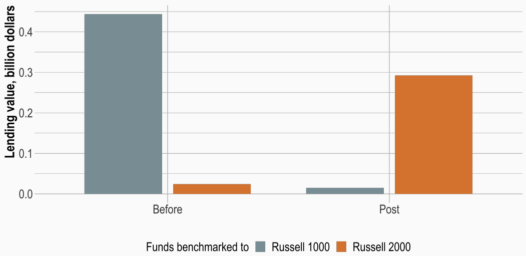


- Additions to Russell 2000 underperform by 2.8% per year
- Deletions from Russell 2000 outperform by 2.4% per year

Increase in BMI $\rightarrow$ lower returns up to 5 years

Sikorskaya (2023): Funds Lend What They Own

Russell reconstitutions in 2020-2022:



(a) Russell 2000 additions

(b) Russell 2000 deletions

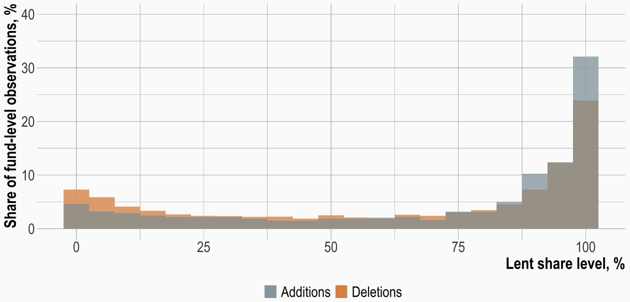
→ Passive funds' securities lending supply moves along BMI

→ Similar picture, though not as striking, for active funds

Sikorskaya (2023): How Does Benchmarking Affect Shorting Costs?

Benchmarking increases **shorting demand** through higher stock price.

Lending supply does not increase enough as funds reach the limit of how much they are allowed to lend.



→ **Lending fee goes up in BMI,** despite the increase in institutional ownership

Conclusion

- Propose a theory-backed measure of benchmarking intensity
- Show that change in BMI is an instrument for change in ownership
- Highlight importance of the mechanism with evidence from funds' rebalancing
- Increase in BMI leads to underperformance relative to peers
- Growth in asset management + switch to passive should amplify inelastic demand