SCALE AND SKILL IN ACTIVE MANAGEMENT

Lubos Pastor

Booth School of Business
University of Chicago

Robert F. Stambaugh

The Wharton School
University of Pennsylvania

Lucian A. Taylor

The Wharton School
University of Pennsylvania

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$$\boxed{\text{Motivation}}$$

- Fund performance depends on **skill** as well as **scale**

  – To learn about skill, we must understand scale

- Nature of **returns to scale** in active fund management?

  – **Fund** level?

   * Fund size ↑ ⇒ This fund's performance ↓
   * Perold and Solomon (1991), Berk and Green (2004)
   * Evidence: Chen et al. (2004), Bris et al. (2007), Yan (2008), Ferreira et al. (2013), Reuter and Zitzewitz (2013)

  – **Industry** level?

   * Industry size ↑ ⇒ All funds' performance ↓
   * Pástor and Stambaugh (2012)
   * Evidence: ?

Main Results

Scale:

- Strong evidence of decreasing returns to scale at **industry** level
    - Stronger for high-turnover, high-volatility, and small-cap funds
- Mixed evidence of decreasing returns to scale at **fund** level
    - Insignificant after removing econometric biases

Skill:

- Active funds have become **more skilled** over time
    - Yet their performance has not improved
- Negative **age-performance** relation
    - A fund's performance decreases over its lifetime
    - Younger funds outperform older funds

Narrative

- New funds tend to be more skilled than existing funds
  - Education? Technology?

- Given their better skill, new funds tend to outperform initially

- As these funds grow older, their performance suffers
  - Because industry keeps growing ($\Rightarrow$ more skilled competition)

Methodology

- Three methods for estimating **fund-level** returns to scale:

  1. **Pooled OLS:** $R_{it} = a + \beta q_{it-1} + \varepsilon_{it}$
     - Biased: omitted variable (skill)

  2. **OLS with fund fixed effects:** $R_{it} = a_i + \beta q_{it-1} + \varepsilon_{it}$
     - Biased: $\mathrm{Corr}(q_{it}, \varepsilon_{it}) > 0$

  3. **Recursive demeaning:** new procedure
     - Unbiased

Sample

Data: CRSP and Morningstar, 1979–2011

- Check accuracy across databases (return, size, expense ratio)
- Only domestic active equity mutual funds with size $\geq$ \$15 million

Final sample: $\sim$350,000 monthly observations of 3,126 funds

- Main sample: 1993–2011
- Extended sample: 1979–2011
  - Noisier data but very similar results, same conclusions
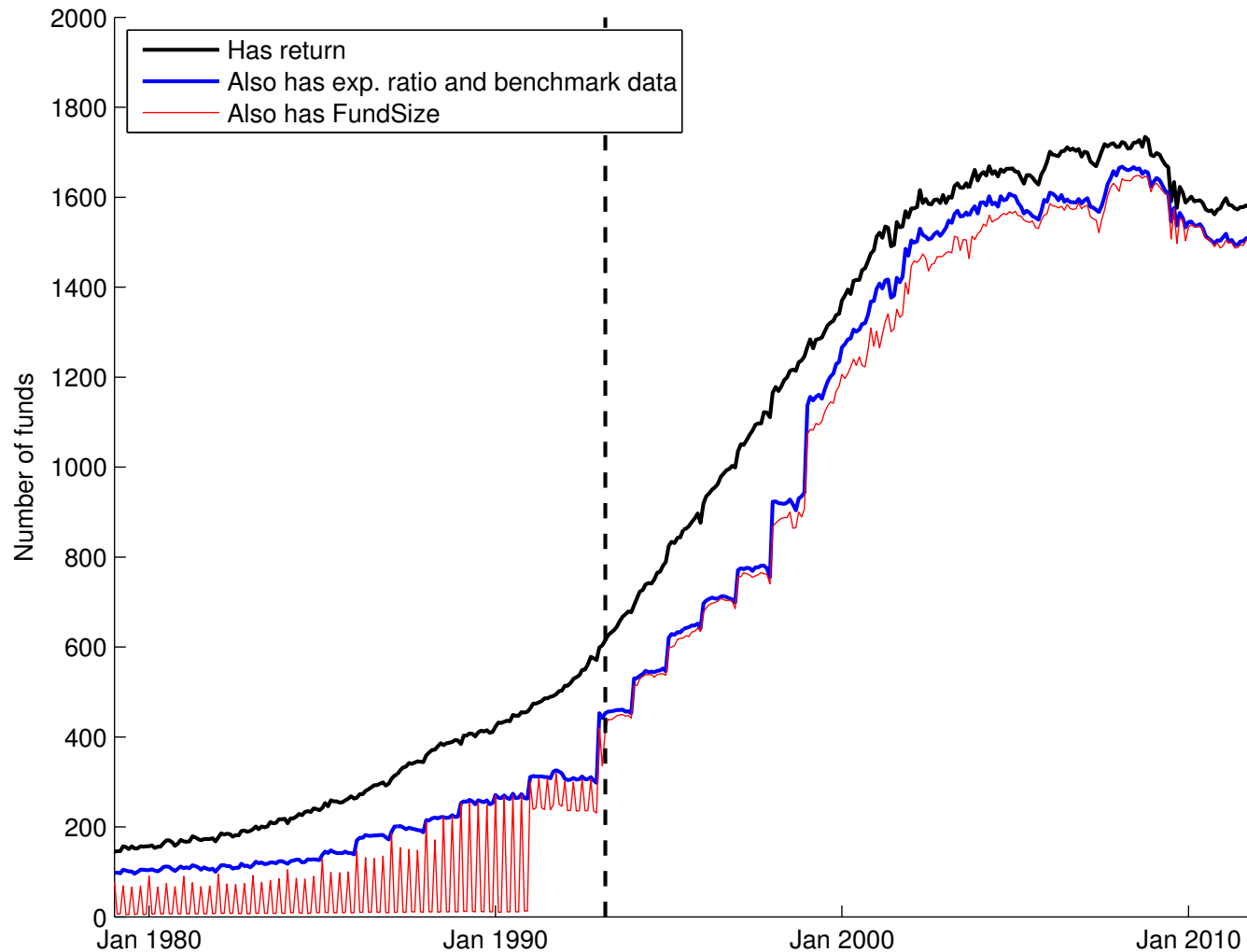
Main Variables

$GrossR$: Fund return gross of fees, minus benchmark return

E.g., for Large Growth, benchmark is Russell 1000 Growth Index

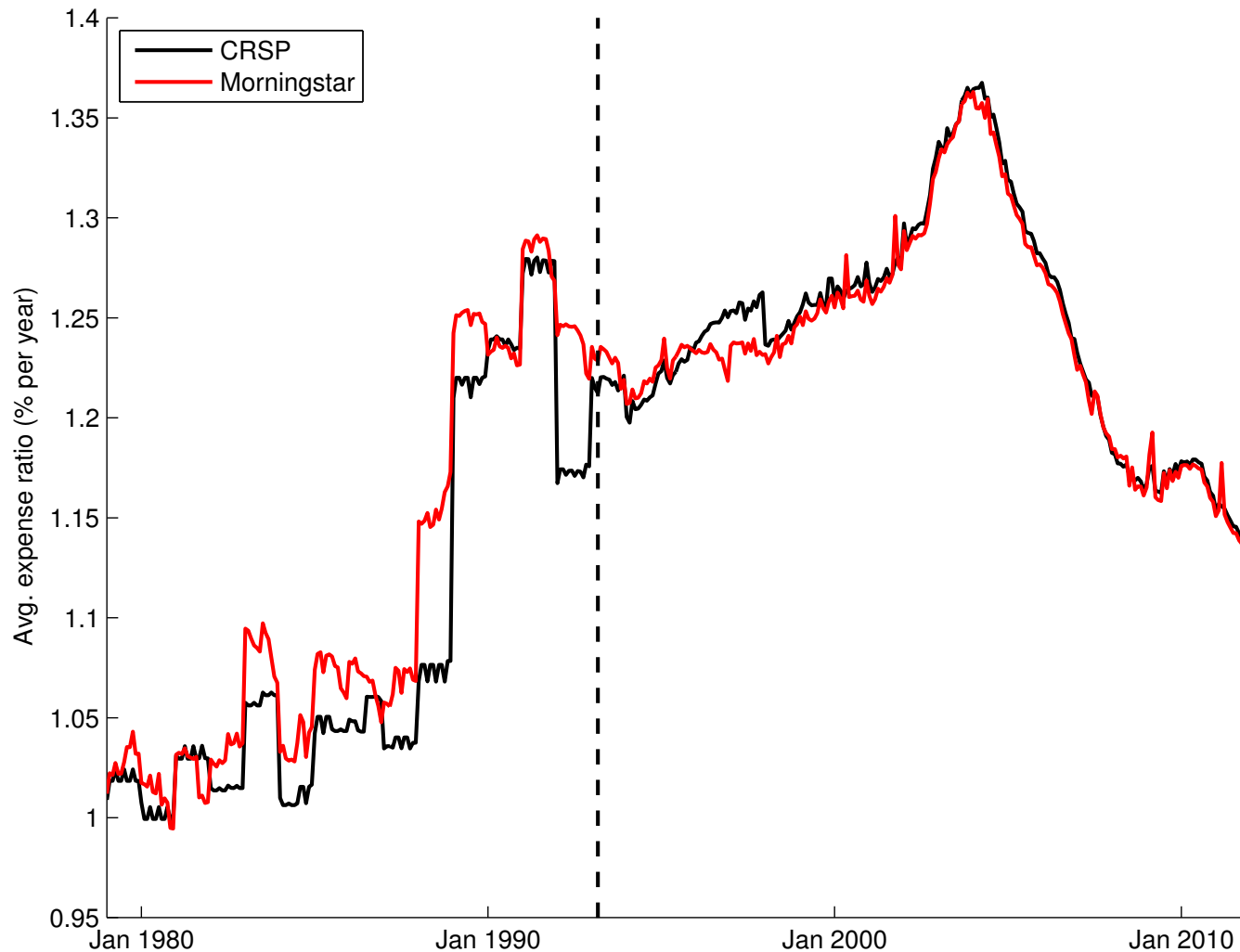$$FundSize = \frac{\text{Fund's AUM today}}{\text{Total mkt.cap. today}} \times \text{Total mkt.cap. in Dec. 2011}$$

$$IndustrySize = \frac{\text{Funds' total AUM today}}{\text{Total mkt.cap. today}}$$
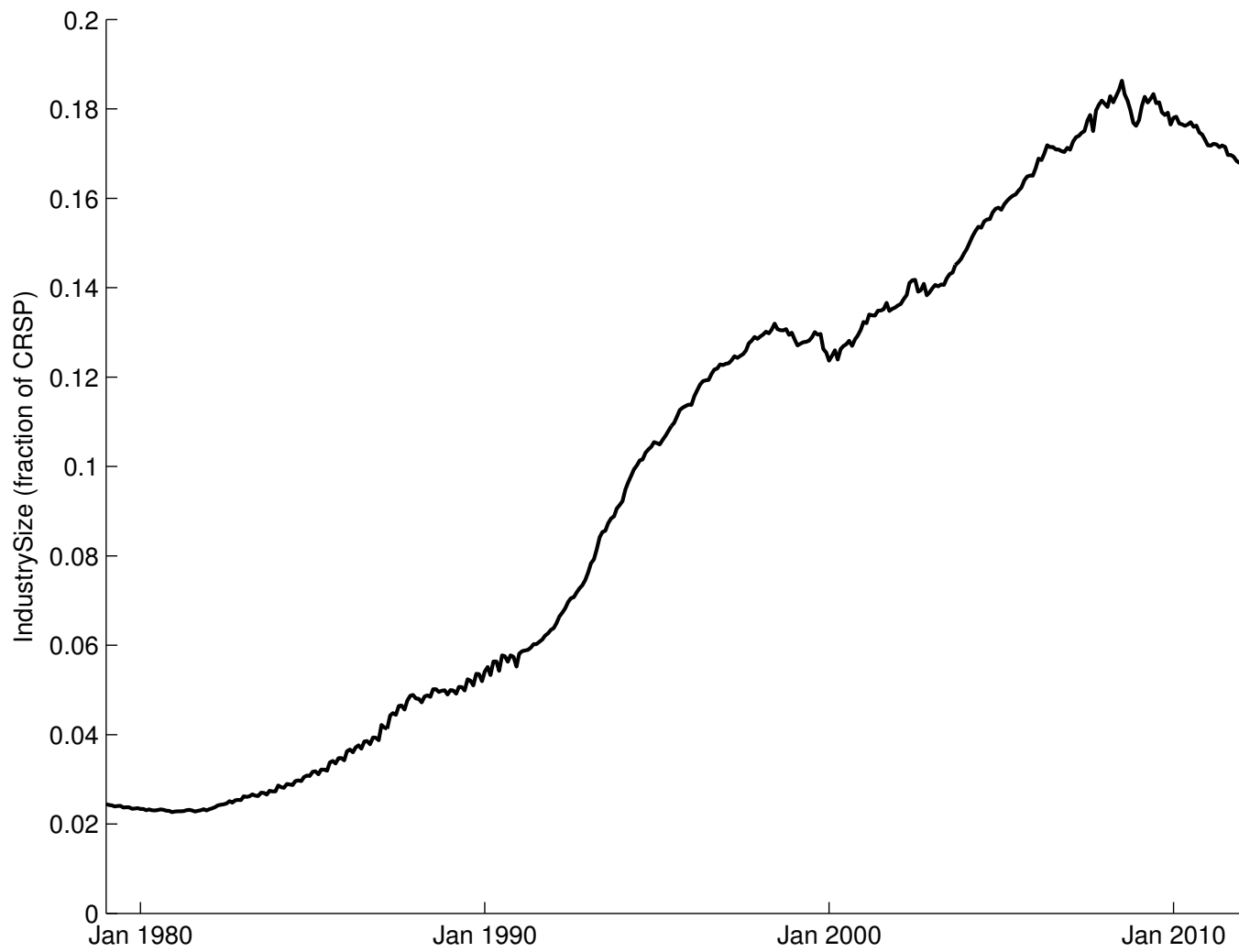
Sample Size Over Time

Main sample: March 1993 – December 2011
Extended sample: January 1979 – December 2011

Main sample: March 1993 – December 2011
Extended sample: January 1979 – December 2011

Industry Size over Time

Decreasing Returns to Scale at Fund Level?

Dependent variable: GrossR

FundSize	-0.0137	-0.168***	-0.220
	(-1.87)	(-9.38)	(-0.62)
Constant	0.000503*		
	(2.18)		
Observations	275847	275847	270556
Estimator	OLS no FE	OLS FE	RD

Decreasing Returns to Scale at Industry Level?

Dependent variable: GrossR

IndustrySize	-0.0169	-0.0326***	-0.0326*
	(-1.93)	(-3.60)	(-2.49)
Constant	0.00304*		
	(2.18)		
Observations	283046	283046	283046
Estimator	OLS no FE	OLS FE	RD

Fund- vs. Industry-level Returns to Scale

Dependent variable: GrossR

FundSize	-0.0147*	-0.148***	-0.425
	(-2.02)	(-9.09)	(-1.25)
IndustrySize	-0.0165	-0.0295**	-0.0277*
	(-1.90)	(-3.27)	(-2.14)
Constant	0.00300*		
	(2.09)		
Observations	275847	275847	270556
Estimator	OLS no FE	OLS FE	RD

Industry Size: Just a Time Trend?

Dependent variable: GrossR

IndustrySize	-0.0326		-0.0852
	(-3.60)		(-3.04)
Time Trend		-10.26	23.89
		(-2.99)	(2.21)
Observations	283046	283046	283046

A Closer Look at Industry Size

Dependent variable: GrossR

IndustrySize				-0.115
				(-2.60)
Average Fund Size	-3.862		-8.885	4.315
	(-3.03)		(-3.56)	(0.73)
Number of Funds		0.450	-4.031	8.493
		(0.83)	(-3.23)	(1.61)
Observations	283046	283046	283046	283046

Determinants of the Size-Performance Relation

Dependent variable: GrossR

	(1)	(2)	(3)	(4)	(5)	(6)	(7)	(8)
FundSize	-0.0987	0.0228	-0.316				0.271	0.318
	(-0.66)	(0.03)	(-0.30)				(0.42)	(0.49)
FundSize*1(SmlCap)	0.273						-1.402	-0.959
	(0.13)						(-0.70)	(-0.49)
FundSize*Std(AbnRet)		-10.40					-29.83	-30.19
		(-0.28)					(-0.94)	(-0.94)
FundSize*Turnover			0.207				0.0588	0.0360
			(0.21)				(0.20)	(0.12)
IndustrySize				-0.0120	0.0248	0.00541	0.0450	0.0194
				(-3.04)	(2.92)	(1.11)	(2.35)	(0.68)
IndustrySize*1(SmlCap)				-0.0348			-0.0340	-0.0360
				(-2.67)			(-1.33)	(-1.41)
IndustrySize*Std(AbnRet)					-2.137		-2.013	-2.010
					(-4.51)		(-2.19)	(-2.19)
IndustrySize*Turnover						-0.0287	-0.0250	-0.0249
						(-4.45)	(-2.57)	(-2.56)
Fund age								0.000151
								(1.23)

Estimating Skill

- Our measure of **skill**:

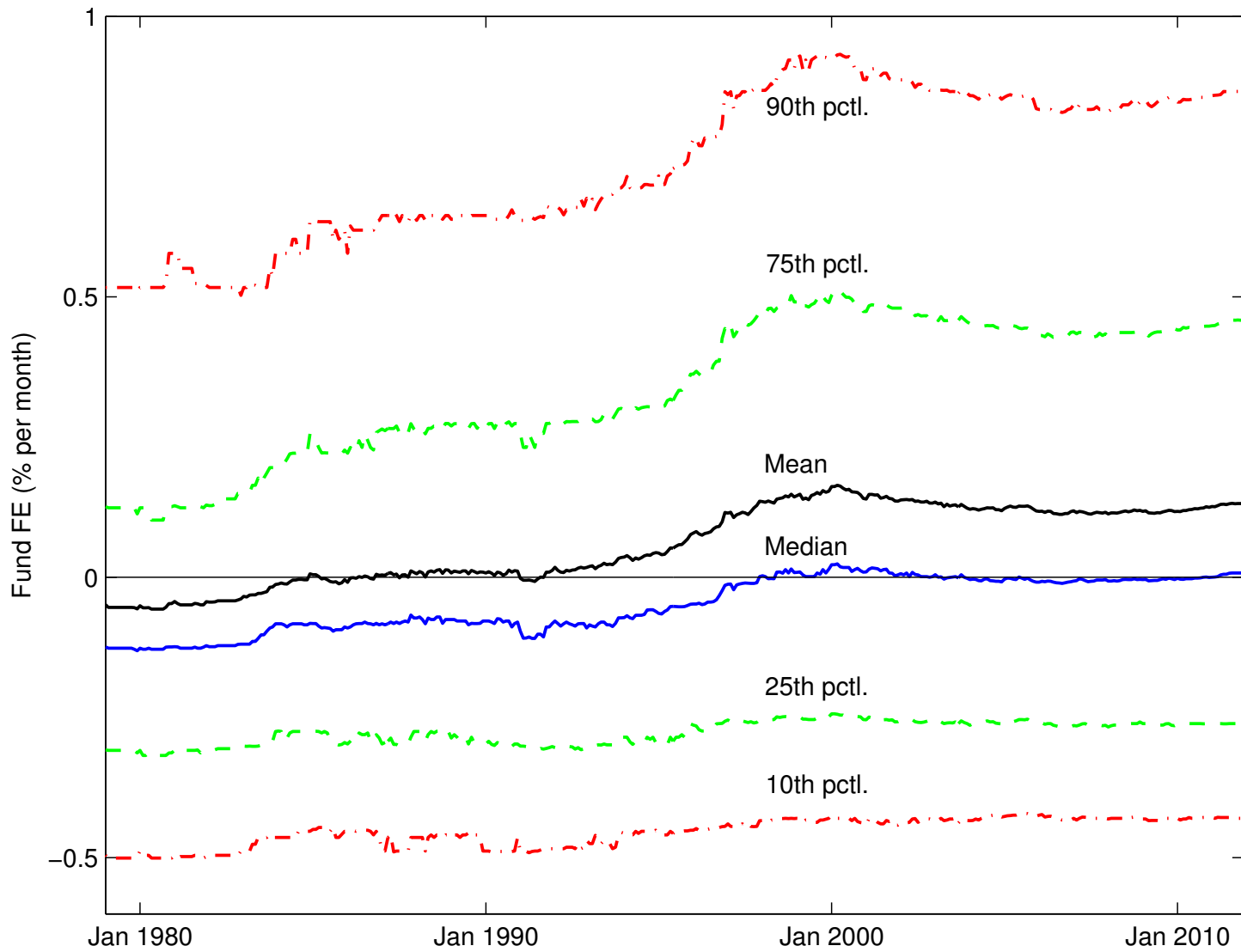 – Gross alpha when $FundSize = IndustrySize = 0$

    (Average benchmark-adjusted return on the fund's first dollar invested, with no other funds in the industry)

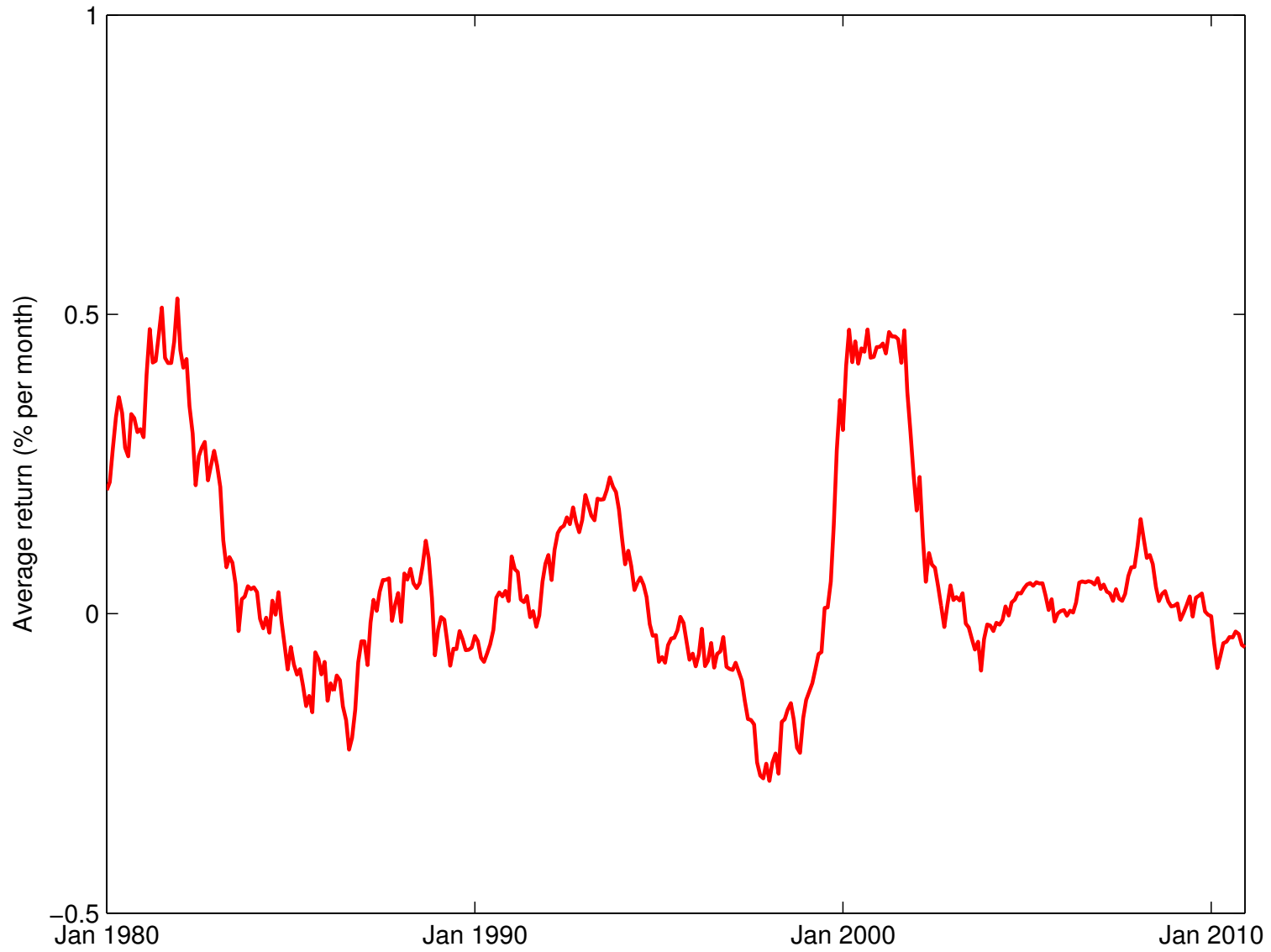- We measure fund skill by a_i in

  $$GrossR_{it} = a_i + FundSize_{it-1}(\beta_0 + \beta_1 X_i) + IndustrySize_{it-1}(\gamma_0 + \gamma_1 X_i) + \varepsilon_{it}$$

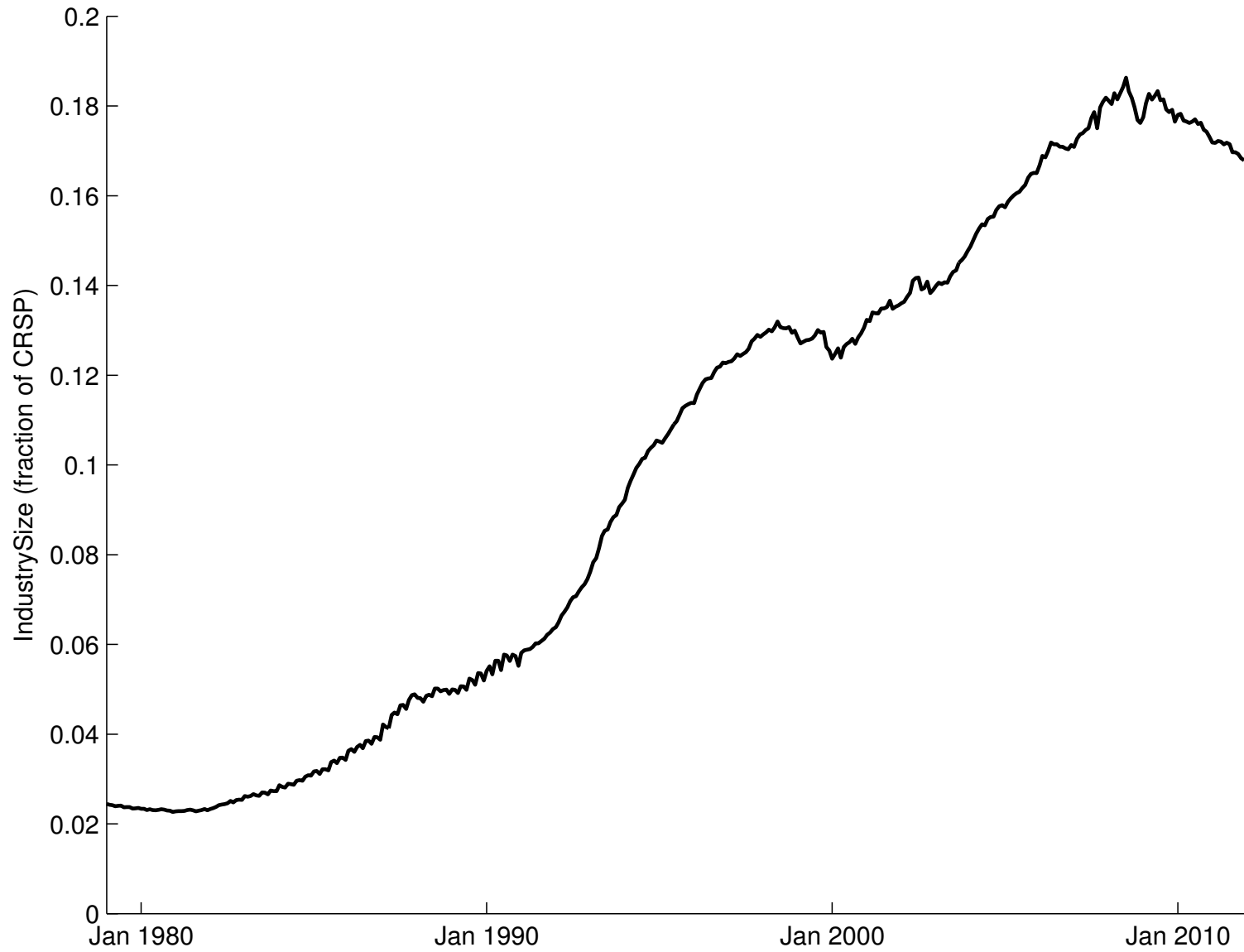 where X_i includes all fund characteristics from previous table
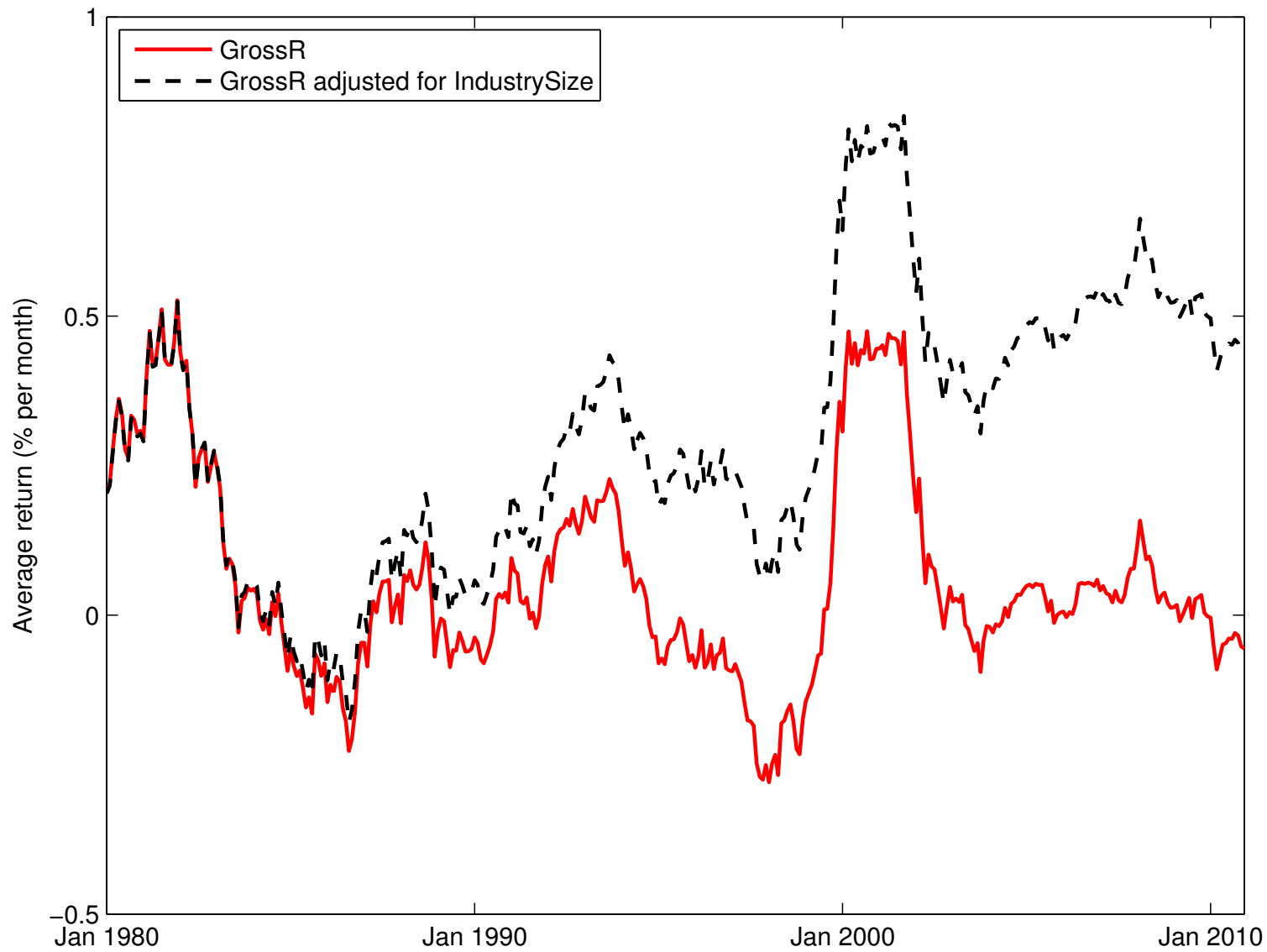
Distribution of Fund Skill over Time

Industry Size over Time

Average Fund Performance over Time

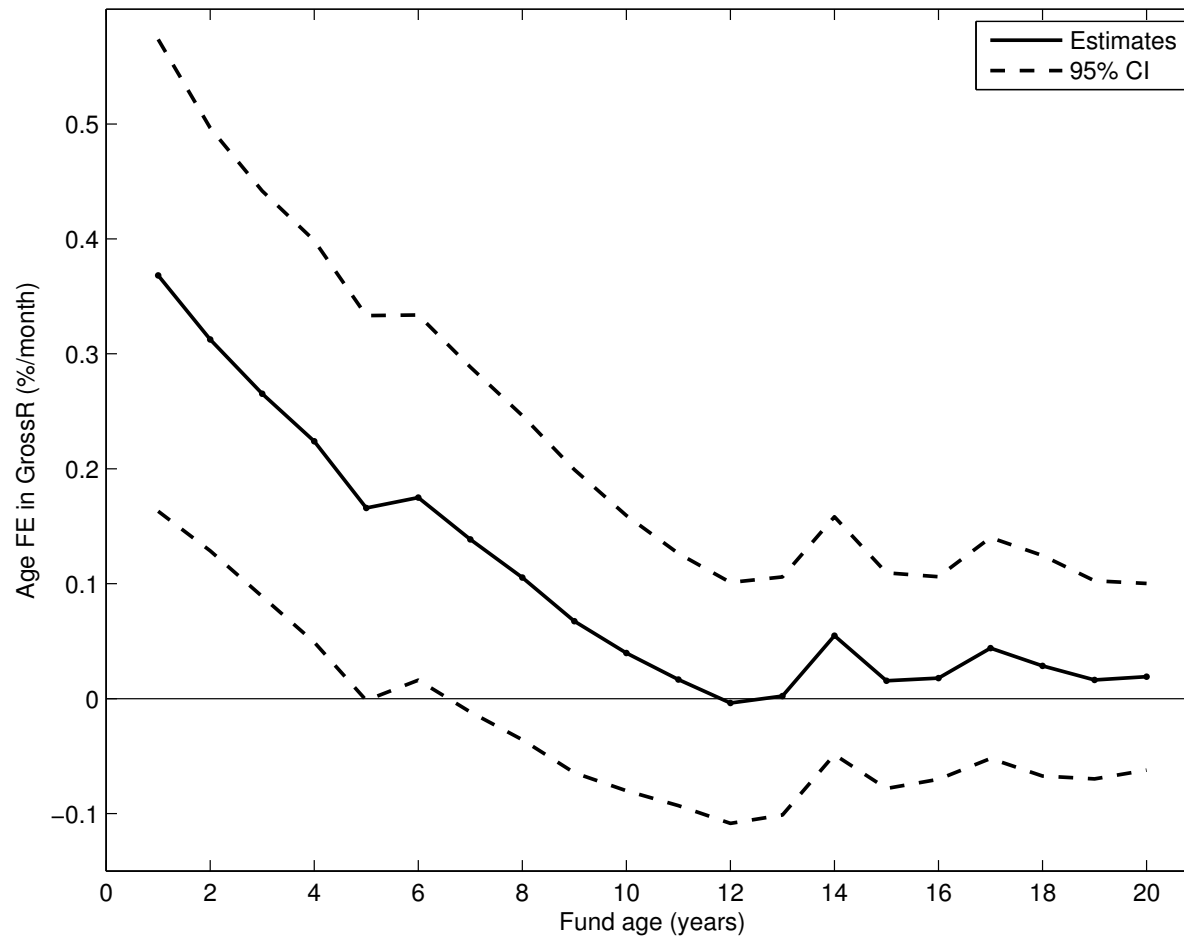## Fund Age vs. Performance

Prediction:

Fund's skill constant

Industry-level DRTS   } Performance ↓ over fund's life

Industry size ↑

Fund Age vs. Performance: Age Fixed Effects

$$GrossR_{it} = a_i + \beta_1 1_{\{age=1\}} + \ldots + \beta_{20} 1_{\{age=20\}} + \varepsilon_{it}$$

## Fund Age vs. Performance: Continuous Age

Dependent variable: GrossR

Fund age	-0.000123**	0.000283*	-0.000102*	0.000281*
	(-3.00)	(2.19)	(-2.37)	(2.19)
IndustrySize		-0.0845**		-0.0799**
		(-3.02)		(-2.86)
Observations	283046	283046	248050	248050
Fund ages	All	All	≥3 years	≥3 years

Learning on the Job?

- We modify our skill measure to allow learning on the job

- As before, skill is alpha when $FundSize = IndustrySize = 0$

- But now, $Skill_{it} = a_i + b\, FundAge_{it}$

$$GrossR_{it} = a_i + b\, FundAge_{it} +$$
$$FundSize_{it-1}(\beta_0 + \beta_1 X_i) + IndustrySize_{it-1}(\gamma_0 + \gamma_1 X_i) + \varepsilon_{it}$$

Distribution of Fund Skill, With Learning on the Job
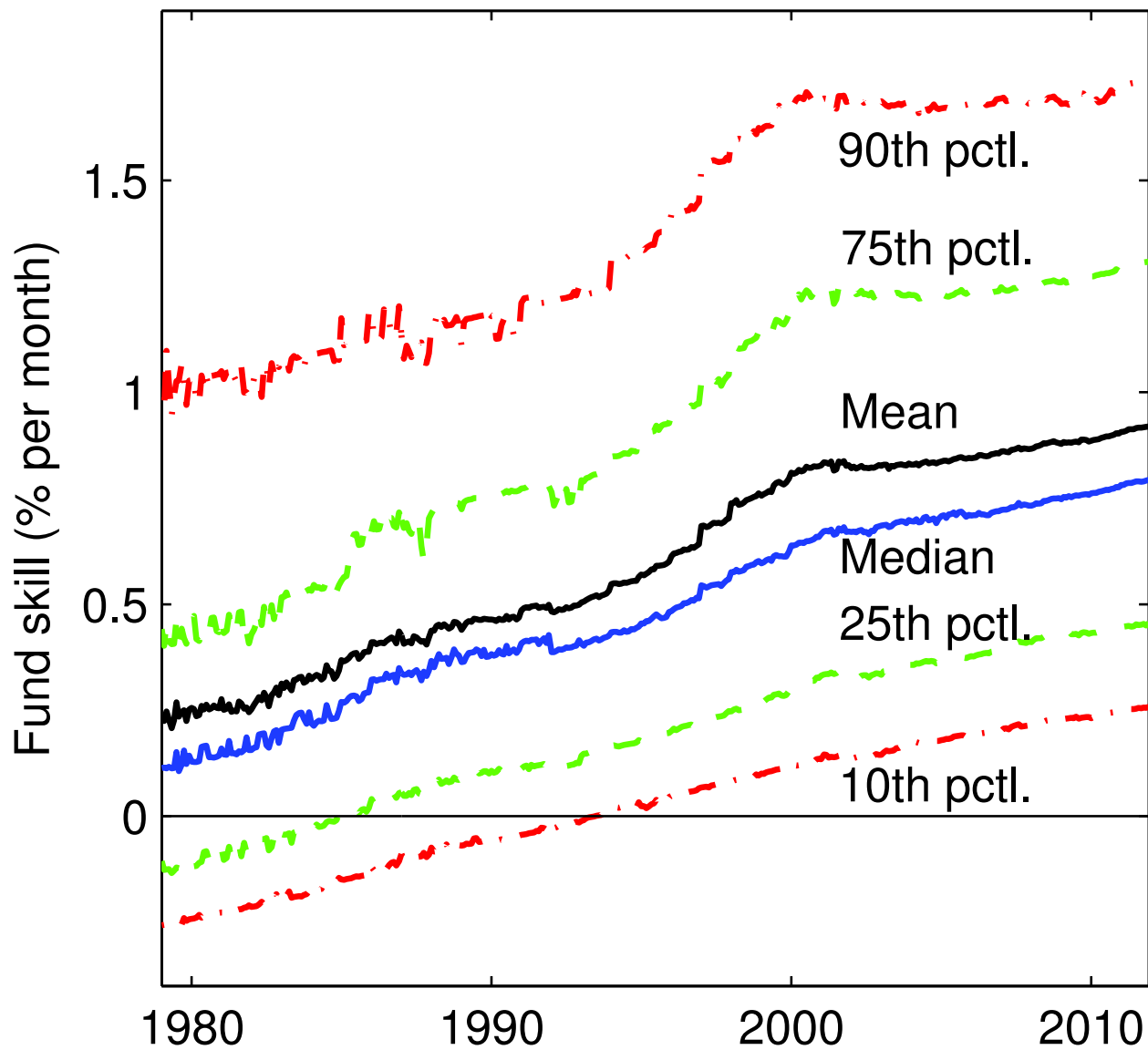
Age-based Investment Strategies

Fund age	Average portfolio return				Average differences			F- test
	[0, 3]	(3, 6]	(6, 10]	>10	[0,3] - (>10)	(3,6] - (>10)	(6,10] - (>10)	p-value
Avg. GrossR	0.084	0.056	0.020	0.012	0.072	0.043	0.008	0.014
	(2.33)	(1.45)	(0.55)	(0.30)	(2.85)	(2.48)	(0.52)	
Avg. NetR	-0.005	-0.052	-0.084	-0.083	0.077	0.031	-0.001	0.008
	(-0.15)	(-1.38)	(-2.29)	(-2.07)	(3.10)	(1.79)	(-0.08)	

Robustness

Our conclusions are robust to

- Controlling for business cycle variables
- Controlling for $FamilySize$

- Trimming extreme outliers in $FundSize$
- Different functional forms for $FundSize$

- Alternate benchmark-adjustments
  - Fama-French
  - Morningstar benchmark with estimated betas

Main Takeaways for Practitioners

- You are **more skilled** than your predecessors!
  - But so is your competition, and there is more of it
    - $\Rightarrow$ Don't expect better industry performance

- It is harder for active managers to outperform in a **larger industry**
  - Especially for high-turnover, high-volatility, and small-cap funds
  - Likely to hold at strategy level, too
    - $\Rightarrow$ Stay away from crowded trades/strategies/industries!

- A fund's **performance deteriorates** over its lifetime
  - Due to growing competition
  - Despite learning on the job
    - $\Rightarrow$ Invest in younger funds!