Unexploited Gains
from International Diversification?

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Presentation

1. Motivation

2. Data

3. What Do Mutual Funds Hold?

4. What Explains Holding Patterns?

5. Are There Implicit Costs?

6. Conclusions

Presentation

1. **Motivation**

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1. Motivation: What We Do

- Recent increase in financial globalization

- However, not enough international diversification
  - Non-tradable goods
  - Direct barriers to international investment
  - Implicit barriers
    - Political & country risk, informational asymmetries, "familiarity"

- Evidence mostly aggregate
  - Theories with implications for investments across countries only
    - Cross-border holdings estimates based on accumulated capital flows
    - US Surveys of foreign holdings at the country-level (1994, 1997)
    - Cross-border equity flows data

1. Motivation: What We Do

- In this paper
  - Look at nice micro data and conduct "experiment"
  - Shed light on extent of international diversification
  - Explore causes and costs of diversification level

1. Motivation: Object of Study

- Unique micro data: Actual portfolios of institutions

- U.S. mutual funds (MFs)
  - Universe of funds
  - Funds meant to invest globally
  - Regular reporting requirements

- Data we assemble
  - Construct asset-level portfolios
  - Trace portfolios since inception
  - Collect return information

1. Motivation: Advantage in Studying MFs

- US MFs important

  - Very large

    - In 2005: 8,000 funds, $8 trillion mkt cap, 69% US GDP

  - Strong international presence

    - Hold more than 70% of world MF assets

  - Hold 24% of retirement savings

  - Relatively sophisticated investors

- Data available to construct portfolios

1. Motivation: Advantage in Studying MFs

- Documenting particular aspects of diversification
  - Different types of funds within same family
    - Global funds vs. specialized funds
    - Large industry shift toward global funds
  - Holding a stock means …
    - Available for trading (no obvious barriers)
    - Desirable, at least by other managers within family
    - Information available and already collected (in house)
  - Test of asymmetric information and transaction costs
  - Test other factors that can affect diversification
    - Capital market constraints, asset correlation

1. Motivation: Organization of the Results

- Degree of MF international diversification

  - Industry shift across fund types

  - Number of MF holdings (stocks, countries) by fund type

- Reasons behind extent of diversification

  - Capital market constraints

  - Information asymmetry

- Returns to being diversified

  - Global funds vs. portfolio of diversified funds

Presentation

2. Data: Holding Data

- Asset-level annual portfolios

- 1991 to 2005

- Total of 505 fund families

- 3,651 funds

- Cover most of the U.S. mutual fund industry

- Only on those investing internationally

- 8,547 fund-year observations

- 1,359,750 asset-level holdings, all funds all years

- Corresponding country of each stock identified

2. Data: Return Data

+ Fund-level returns

+ Daily frequency

+ September 1989 to June 2006

+ 36 largest fund families

+ 371 funds

+ 722,885 daily observations

2. Data: Coverage

	Holdings Data
Sample	1991-2005
Frequency	Annual
No. of Families	505
Total Number of Funds	3,651

	Price Data
Sample	September 1989 - June 2006
Frequency	Daily
No. of Families	36
Total Number of Funds	371

2. Data: Structure of the US MF Industry
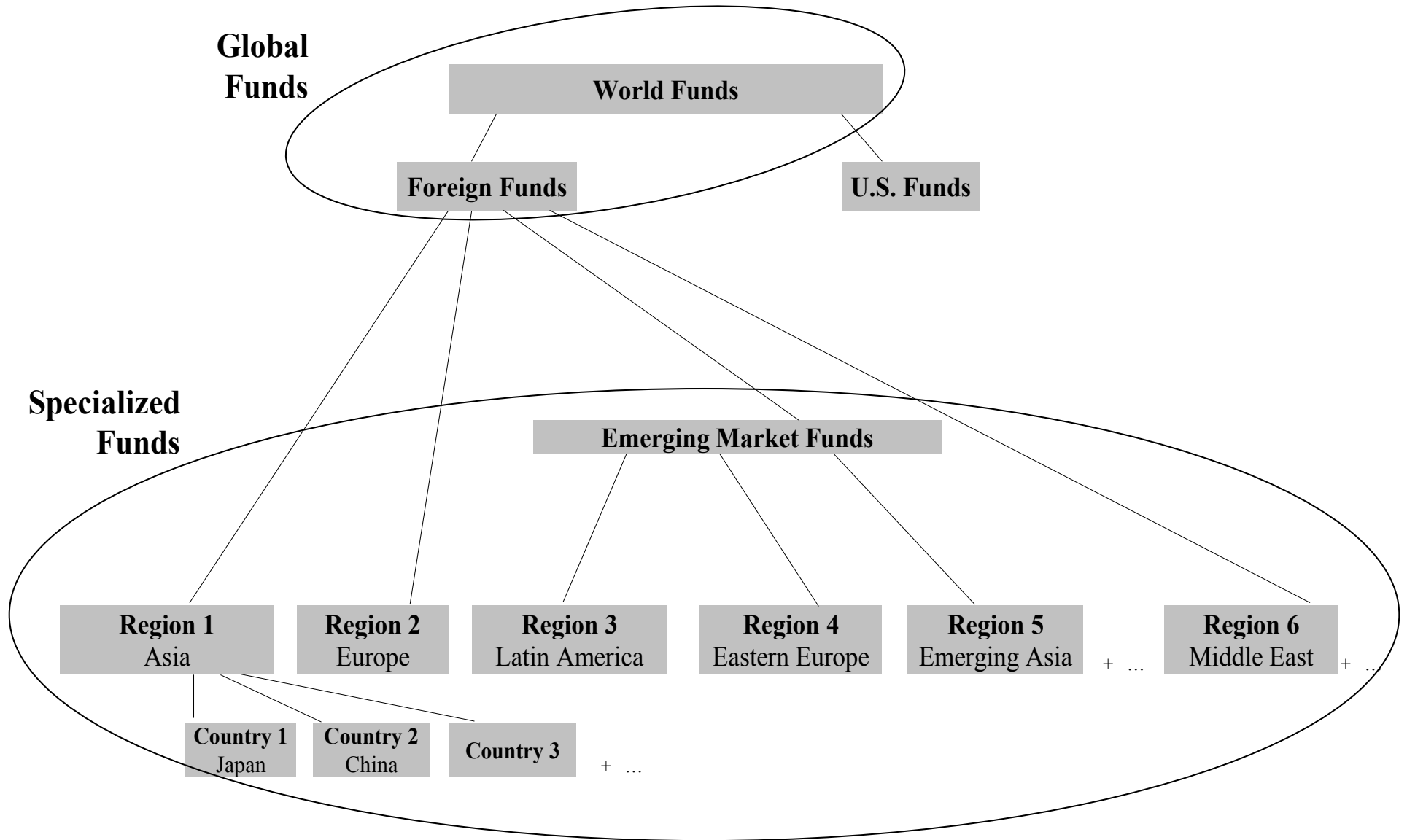
Presentation

1. Motivation

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3. **What Do Mutual Funds Hold?**

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3. Size of US MFs: Global Funds

3. Size of US MFs: Specialized Funds

3. MF Holdings
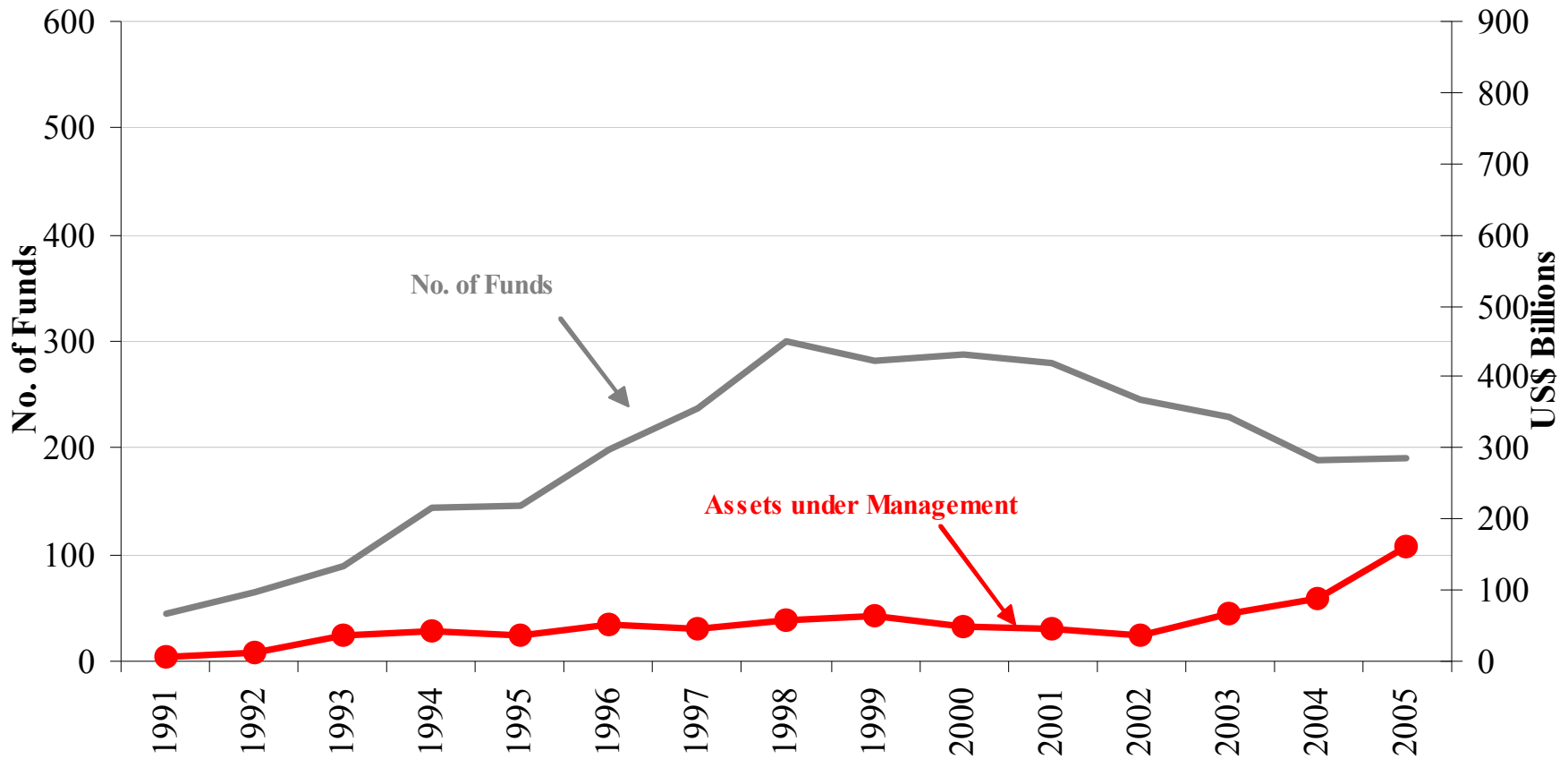
Number of Mutual Fund Holdings

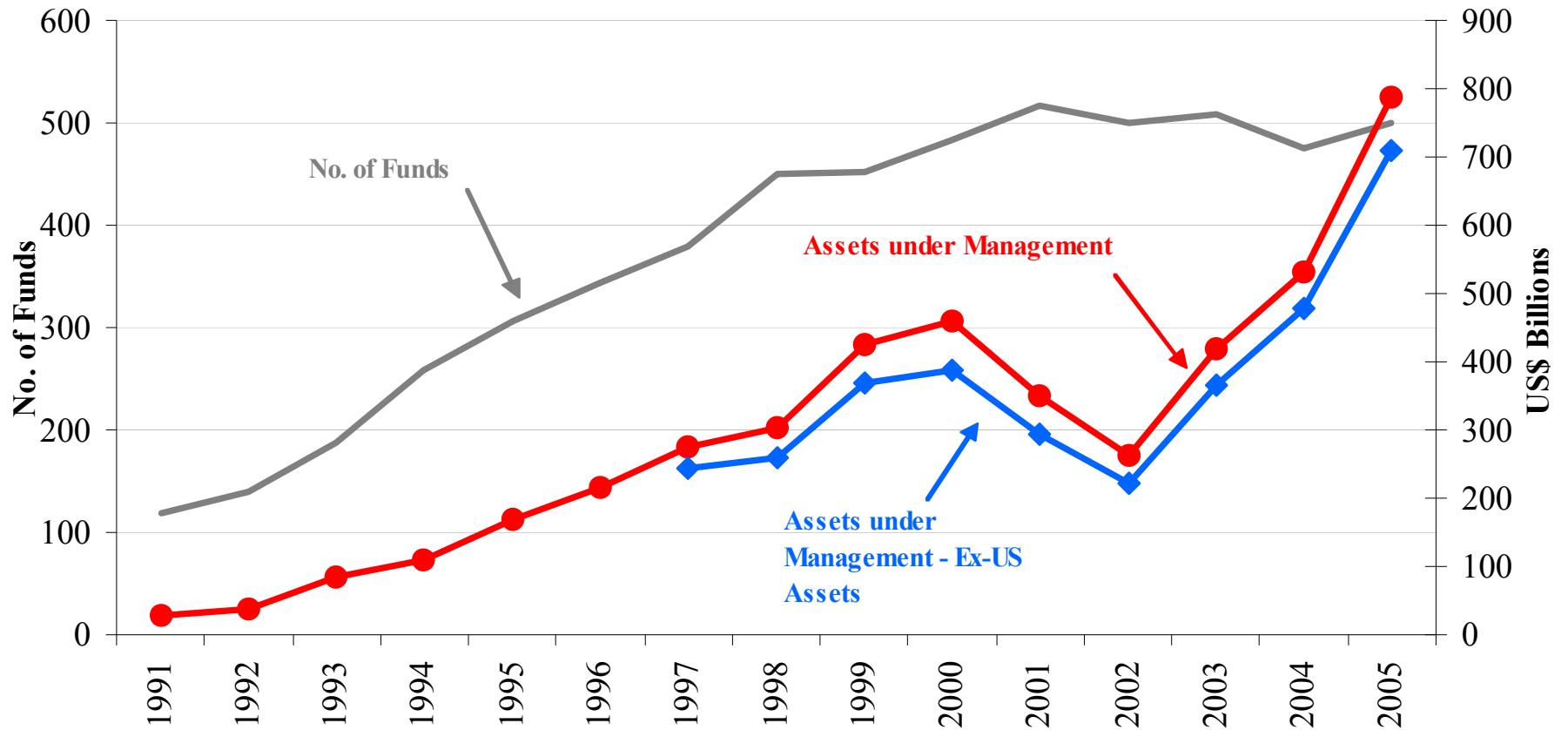|	Average	Median	Std. Dev.
Fund Type:			
Global Funds	155	96	196
World Funds	136	106	131
Excluding U.S. Assets	101	76	100
Foreign Funds	175	105	219
Specialized Funds	116	78	135
Country Funds	126	63	176
Asian Funds	88	64	109
Europe Funds	108	70	155
LAC Funds	57	56	24
Emerging Market Funds	160	121	138
Total	149	95	186

3. MF Holdings

Median Number of Holdings by Fund Type
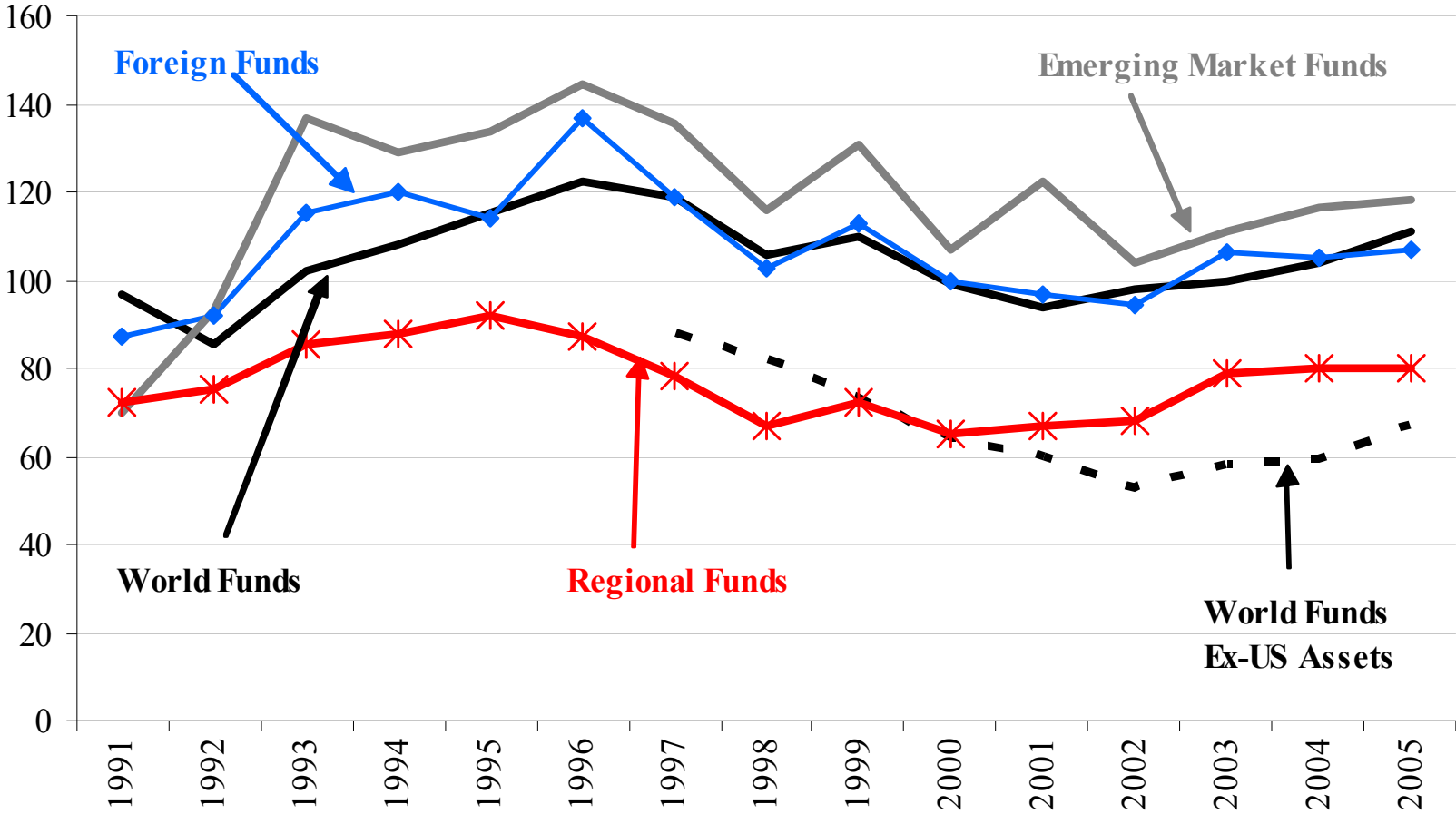
3. MF Holdings: Specialized Funds

Median Number of Holdings by Fund Type
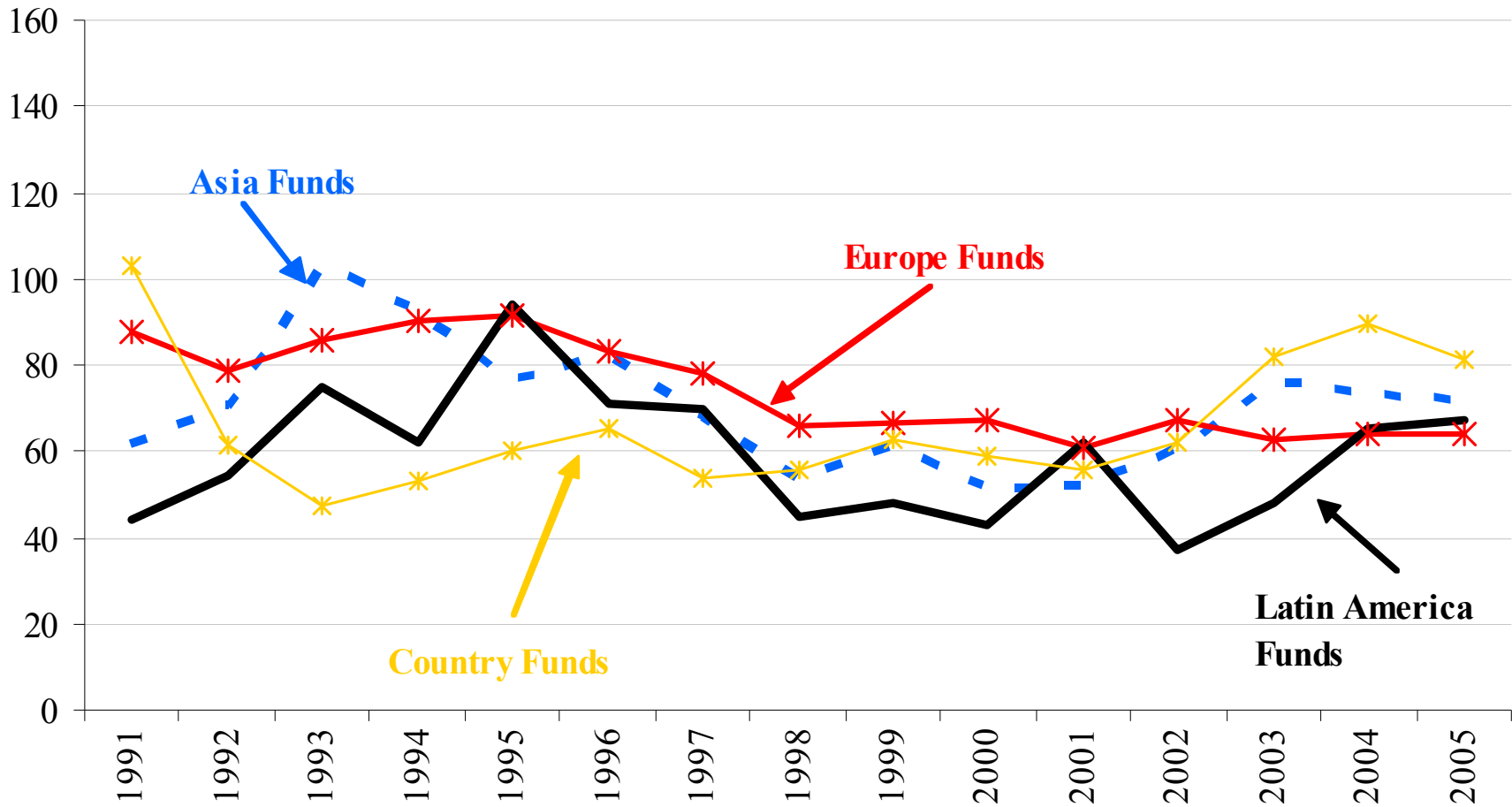
3. Differences in Holdings Within Families

	No. of Assets		
Fund Type	Latin America	Asia	Developed Europe
Regional Funds			
Median No. of Holdings	41	60	62
Changes Relative to:			
Emerging Market Funds	-34%	-33%	-
Foreign Funds	-94%	-42%	-5%
World Funds	-94%	-69%	-49%

3. Differences in Holdings Within Families

No. of Countries

Fund Type	Latin America	Asia	Developed Europe
Regional Funds			
Median No. of Holdings	6	8	11
Changes Relative to:			
Emerging Market Funds	-17%	-10%	-
Foreign Funds	-71%	-31%	0%
World Funds	-75%	-36%	-14%

Presentation

4. Instrument Availability

	No. Listed Companies	All Fund Holdings		Global Fund Holdings	
		No. of Holdings	As a Percentage of All Listed Stocks	No. of Holdings	As a Percentage of All Listed Stocks
			1997		
Total	30,319	9,086	30%	6,267	21%
Developed Countries	12,987	6,815	52%	4,953	38%
Emerging Countries	17,332	2,271	13%	1,314	8%
			2004		
Total	39,061	6,289	16%	5,510	14%
Developed Countries	18,282	5,204	28%	4,799	26%
Emerging Countries	20,779	1,085	5%	711	3%

23

4. Instrument Availability

Mutual Fund Holdings as a Proportion of the Total No. of Listed Stocks

First Quintile

Average: 1.1%
Max: 2.4%

Second Quintile

Average: 7.7%
Max: 13.8%

Third Quintile

Average: 21.1%
Max: 28.2%

Fourth Quintile

Average: 35.2%
Max: 43.6%

Fifth Quintile

Average: 57.8%
Max: 77.3%
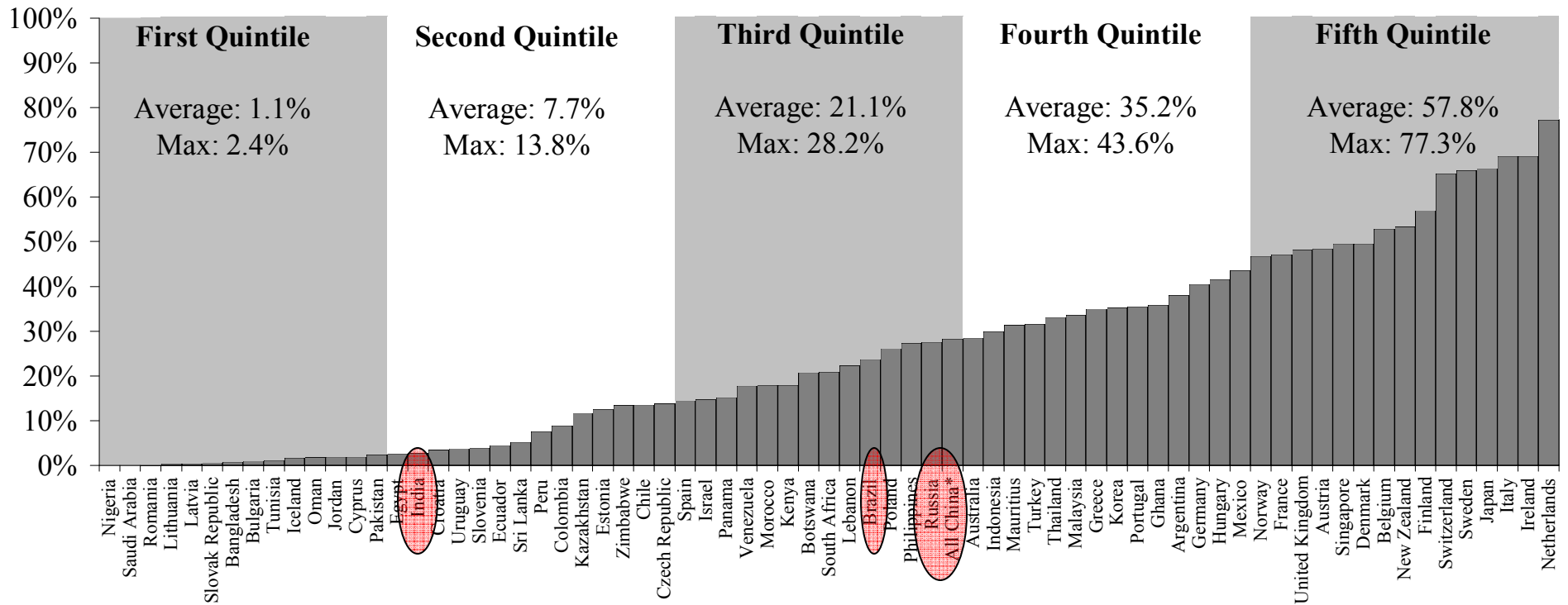
4. Instrument Availability

	Holdings as a Percentage of Firms' Market Capitalization			Average Mutual Fund Size (US$ Million)
	Average	**Median**	**Std. Dev.**	
Fund Type:				
Global Funds	0.12%	0.01%	0.74%	894
World Funds	0.18%	0.01%	0.86%	1,315
Foreign Funds	0.11%	0.01%	0.72%	754
Specialized Funds	0.12%	0.02%	0.59%	272
Emerging Market Funds	0.15%	0.02%	0.70%	367
Asia Funds	0.12%	0.01%	0.53%	131
Europe Funds	0.08%	0.01%	0.35%	332
Latin America Funds	0.09%	0.02%	0.46%	146

4. Holdings Distribution

Histogram

Summary Statistics:

Average: 149 Stocks
Median: 95 Stocks
Std. Dev.: 186 Stocks

74% of obs. are below 150 holdings
88% of obs. are below 250 holdings
82% of obs. are below 350 holdings
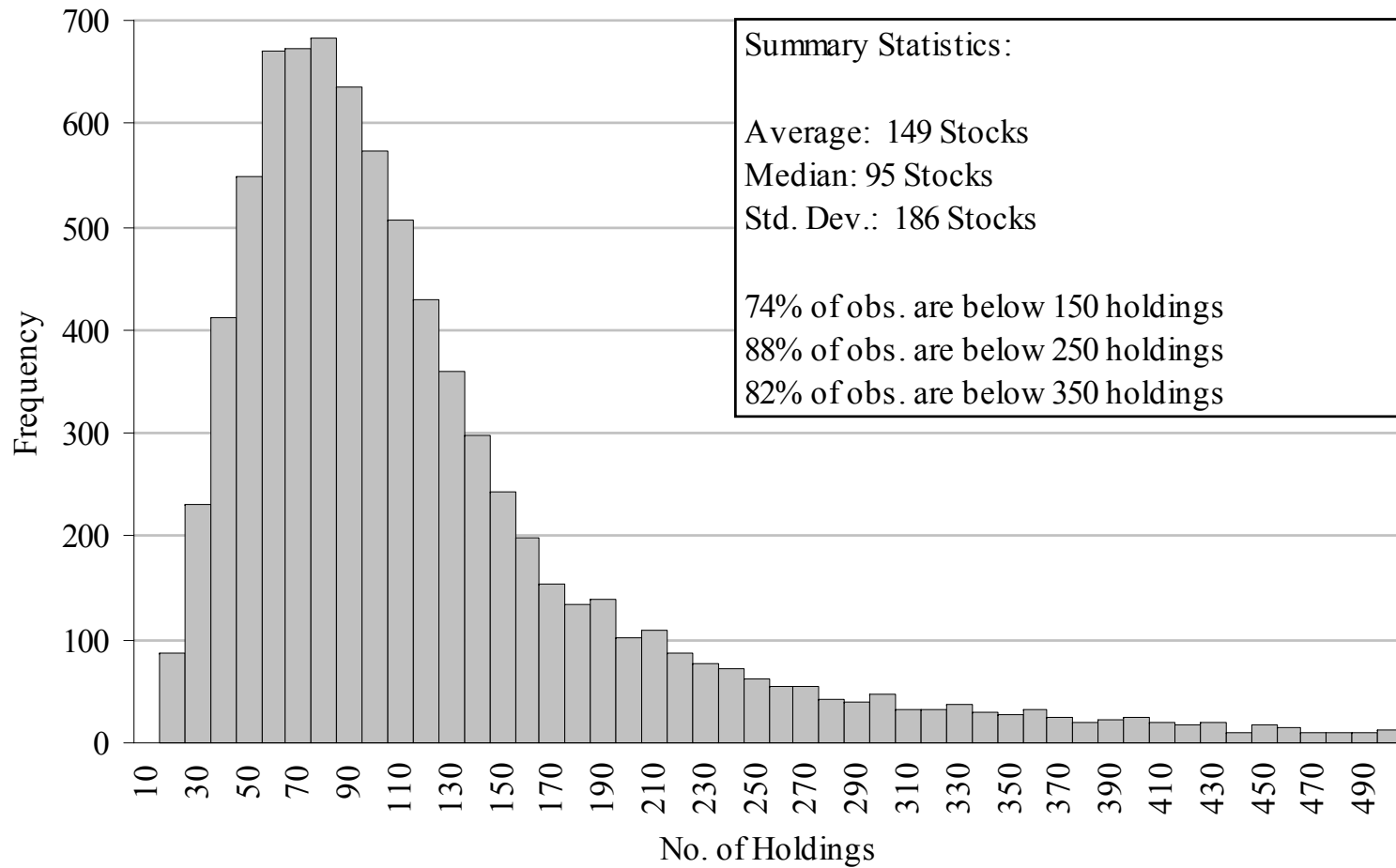
4. Holdings: Family Effects

Averages Across Families
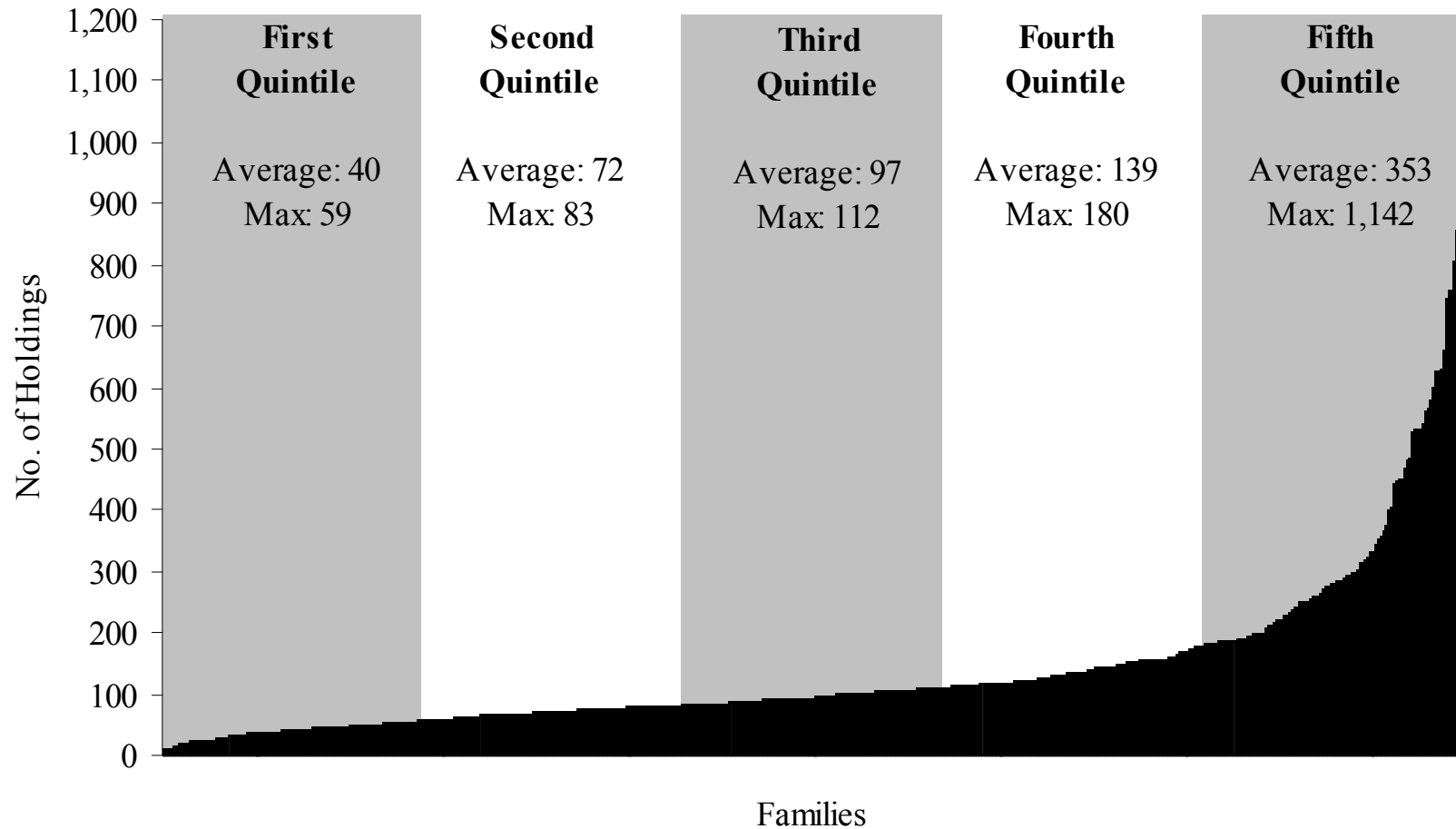
4. Holdings: Family Effects

Regressions: No. of Holdings as Dependent Variable

	(1)	(2)	(3)	(4)	(5)	(6)	(7)
R-squared	0.01	0.03	0.46	0.04	0.47	0.48	0.49
Independent Variables:							
Year Dummies	Yes	No	No	Yes	Yes	No	Yes
Fund Type Dummies	No	Yes	No	Yes	No	Yes	Yes
Family Dummies	No	No	Yes	No	Yes	Yes	Yes
No. of Observations	8,543	8,543	8,543	8,543	8,543	8,543	8,543

4. Information Sharing

Probability of Being Held by a Mutual Fund

		Global Funds Probability of:		Total
		Not Being Held	Being Held	
Specialized Funds Probability of:	Not Being Held	0%	25%	25%
	Being Held	32%	16%	48%
No Specialized Fund		0%	27%	27%
Total		32%	68%	100% [399,281]

4. Information Sharing

Probability of Being Held by a Mutual Fund
Holdings in Emerging Countries Only

		Global Funds Probability of:		Total
		Not Being Held	Being Held	
Specialized Funds Probability of:	Not Being Held	0%	10%	10%
	Being Held	76%	13%	89%
No Specialized Fund		0%	2%	2%
Total		76%	24%	100% [92,355]

4. Information Sharing

- Entropy measure constructed as follows:

$$Entropy_{f,t} = \frac{\displaystyle\sum_{s,i} NAV_{s,i,f,t} + \sum_{s,j} NAV_{s,j,f,t}}{\displaystyle\sum_{i} NAV_{i,f,t} + \sum_{j} NAV_{j,f,t}},$$

4. Information Sharing

Evolution of Entropy Measure
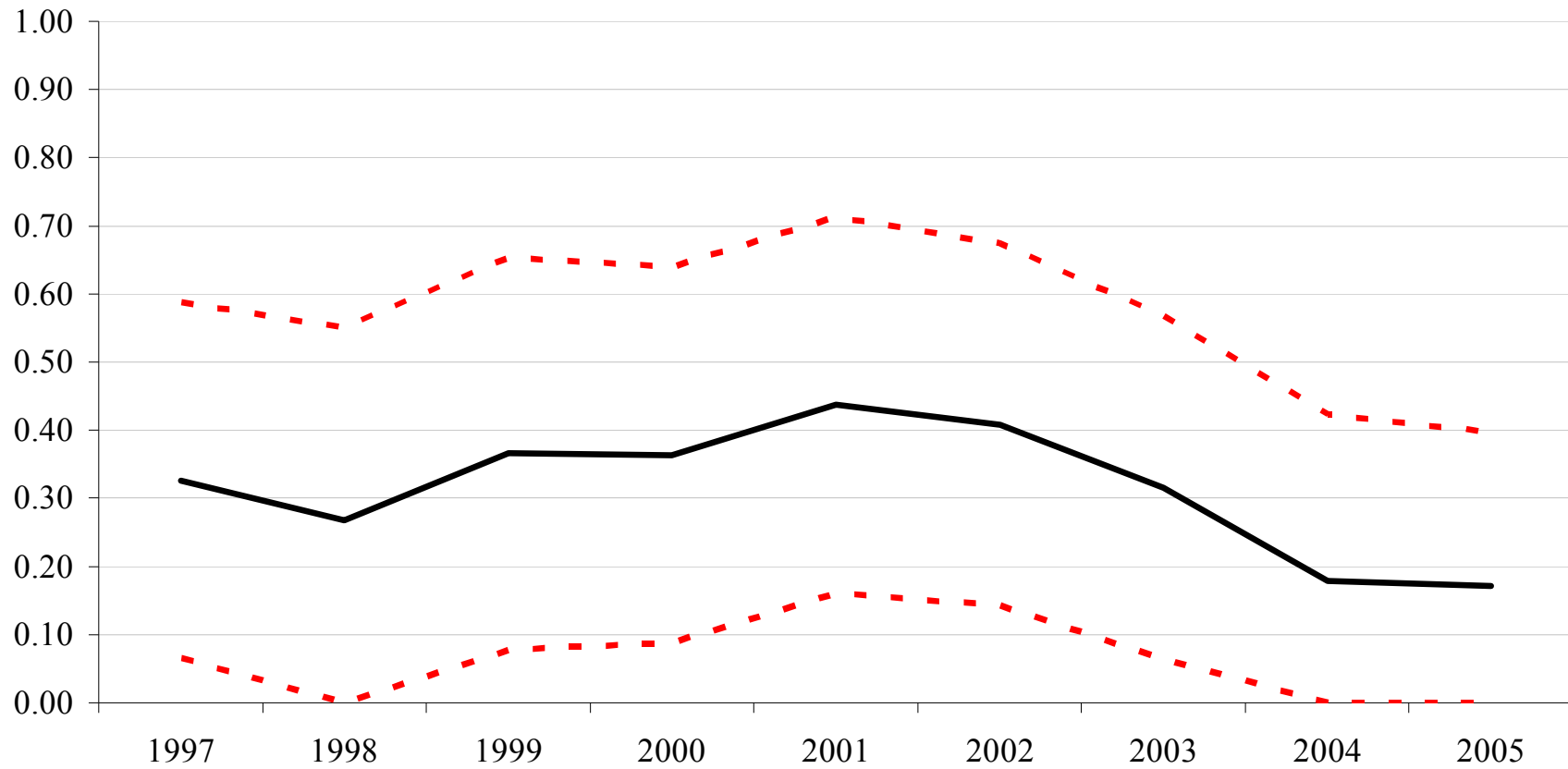
4. Information Sharing

Evolution of Entropy Measure

Holdings in Emerging Countries Only
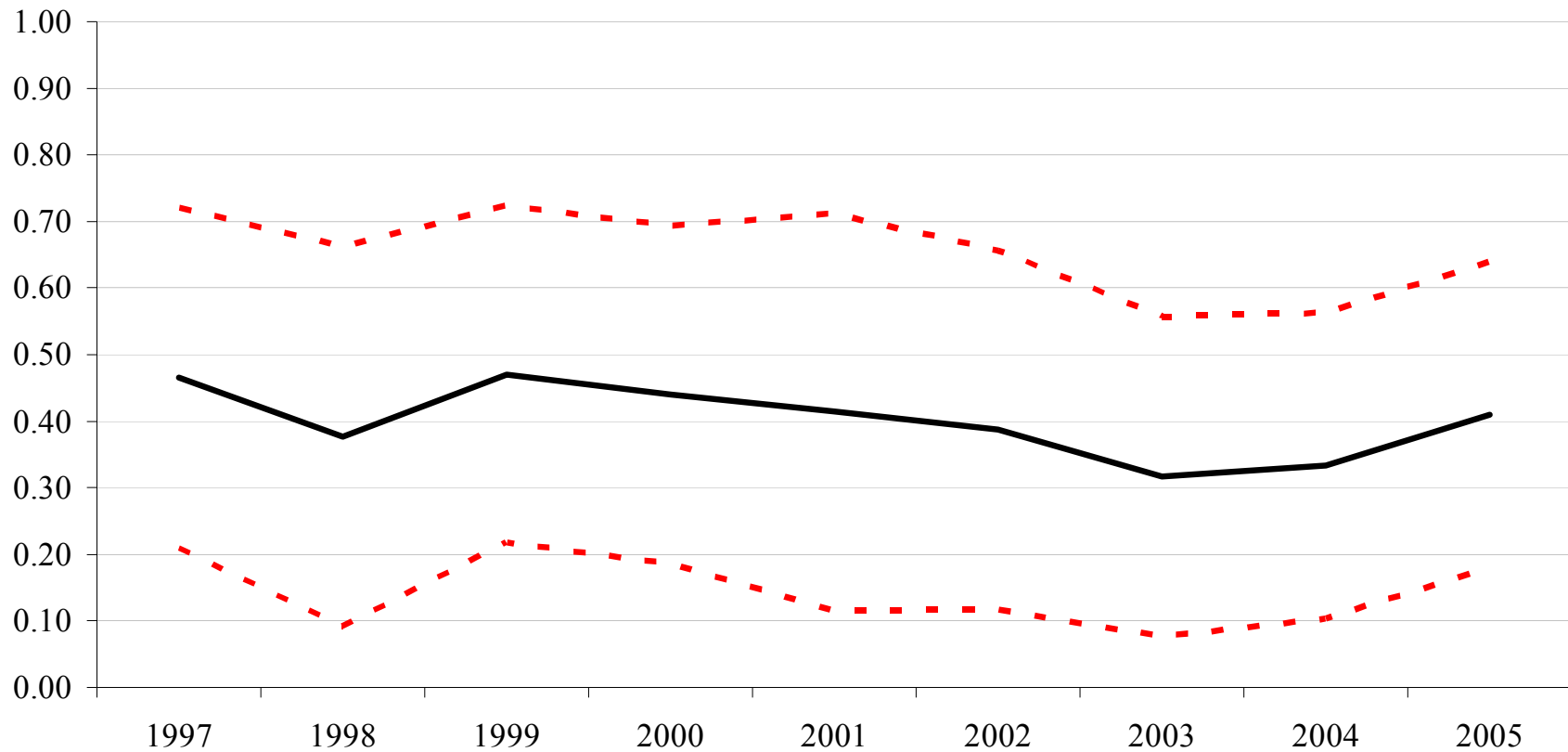
4. Information Processing

No. of Holdings: Importance of No. of Managers

Independent Variables:	
No. of Managers	
1	132.205***
	[3.438]
2	134.980***
	[4.066]
3	153.479***
	[7.867]
4	165.689***
	[8.927]
5	151.307***
	[6.925]
6	196.882***
	[27.129]
7 or More	216.827***
	[9.570]
No. of Observations	6,419
R-squared	0.02

4. Information Processing

No. of Holdings: Importance of No. of Managers and Fees

Independent Variables:	(1)	(2)	(3)	(4)	(5)	(6)	(7)	(8)
No. of Managers	16.814***	15.612***	4.567**				16.075***	4.723**
	[1.681]	[1.653]	[1.886]				[1.774]	[2.024]
Manager Tenure	2.319**	2.776***	2.068**	-1.42	-2.262**	1.505*	1.11	2.138**
	[0.976]	[0.967]	[0.878]	[1.051]	[1.063]	[0.854]	[0.993]	[0.884]
Fund Age	0.999***	0.28	-0.967**	0.45	0.851**	-1.203***	0.22	-1.232***
	[0.357]	[0.369]	[0.443]	[0.368]	[0.388]	[0.404]	[0.362]	[0.403]
Fund Expenses				0.655***	-2.175***	0.23	-2.228***	0.24
				[0.061]	[0.400]	[0.393]	[0.418]	[0.395]
Fund Size					0.028***	0.00	0.026***	0.00
					[0.004]	[0.004]	[0.004]	[0.004]
Year Dummies	No	Yes	Yes	No	No	Yes	Yes	Yes
Fund Type Dummies	No	Yes	Yes	No	No	Yes	Yes	Yes
Family Dummies	No	No	Yes	No	No	Yes	No	Yes
No. of Observations	6,170	6,170	6,170	5,733	5,732	5,732	5,726	5,726
R-squared	0.03	0.05	0.49	0.01	0.02	0.52	0.07	0.52

Presentation

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5. **Are There Implicit Costs?**

6. Conclusions

5. Strategy for Simulations: Minimizing the Variance

- Optimization problem:

$$\underset{x}{Min} \ \mathrm{var}(P) = x' \Sigma x$$

$$\text{such that}:$$

$$E(P) \geq E(G)$$

$$0 \leq x_i \leq 1$$

$$\sum_i x_i < 1$$

$$P = \left(1 - \sum_i x_i\right) * G + \sum_i x_i * S_i.$$

- Portfolio constructed and evaluated out of sample

5. Alternative Portfolios

Minimizing the Variance

	Average Return (p.y.)		Differences in Accumulated Daily Returns	Standard Deviation of Daily Returns		
Type of Global Fund	Global Fund	Port. Spec. Funds	(p.y.)	Global Fund	Port. Spec. Funds	No. of Compar.
World Funds	6.05%	11.08%	5.09%	0.89%	0.80%	60
Foreign Funds	6.40%	10.40%	4.04%	0.96%	0.90%	72
Portfolio of World Funds	22.54%	36.41%	11.59%	0.79%	0.71%	3
Portfolio of Foreign Funds	9.18%	13.22%	3.97%	0.89%	0.83%	21
Total	6.92%	11.49%	4.58%	0.92%	0.85%	156

5. Strategy for Simulations: Maximizing Expected Returns

- Optimization problem:

$$\underset{x}{Max}\ \mathrm{E}(P),$$

$$\text{such that}:$$

$$\mathrm{var}(P) \leq \mathrm{var}(G)$$

$$0 \leq x_i \leq 1$$

$$\sum_i x_i < 1$$

$$P = \left(1 - \sum_i x_i\right) * G + \sum_i x_i * S_i.$$

- Portfolio constructed and evaluated out of sample

5. Alternative Portfolios

Maximizing Expected Return

Type of Global Fund	Average Return (p.y.)		Differences in Accumulated Daily Returns (p.y.)	Standard Deviation of Daily Returns		No. of Compar.
	Global Fund	Port. Spec. Funds		Global Fund	Port. Spec. Funds	
World Funds	6.05%	7.93%	1.91%	0.89%	0.89%	60
Foreign Funds	6.40%	6.85%	0.46%	0.96%	0.96%	73
Portfolio of World Funds	22.54%	34.83%	10.10%	0.79%	0.81%	3
Portfolio of Foreign Funds	9.18%	12.65%	3.46%	0.89%	0.89%	20
Total	6.92%	8.51%	1.61%	0.92%	0.92%	156

5. Strategy for Simulations: Benchmark Minimizing the Variance

- Optimization problem:

$$\underset{x}{Min} \ \text{var}(P - Bench)$$

$$such \ that:$$

$$E(P) \geq E(G)$$

$$0 \leq x_i \leq 1$$

$$\sum_i x_i < 1$$

$$P = \left(1 - \sum_i x_i\right) * G + \sum_i x_i * S_i.$$

- Portfolio constructed and evaluated out of sample

5. Alternative Portfolios: Benchmark Case

Mininmizing the Variance

Type of Global Fund	Average Return (p.y.)		Differences in Accumulated Daily Returns (p.y.)	Standard Deviation of Daily Returns		No. of Compar.
	Global Fund	Port. Spec. Funds		Global Fund	Port. Spec. Funds	
World Funds	8.45%	12.24%	3.75%	0.91%	0.86%	54
Foreign Funds	6.35%	10.36%	3.97%	0.96%	0.94%	72
Portfolio of World Funds	22.54%	31.39%	7.35%	0.79%	0.75%	3
Portfolio of Foreign Funds	9.00%	12.34%	3.34%	0.90%	0.86%	20
Total	7.77%	11.69%	3.87%	0.93%	0.89%	149

5. Strategy for Simulations: Benchmark Maximizing Expected Returns

- Optimization problem:

$$\underset{x}{Max}\ \mathrm{E}(P),$$

such that :

$$\mathrm{var}(P - Bench) \leq \mathrm{var}(G - Bench)$$

$$0 \leq x_i \leq 1$$

$$\sum_i x_i < 1$$

$$P = \left(1 - \sum_i x_i\right) * G + \sum_i x_i * S_i.$$

- Portfolio constructed and evaluated out of sample

5. Alternative Portfolios: Benchmark Case

Maximizing Expected Return

Type of Global Fund	Average Return (p.y.)		Differences in Accumulated Daily Returns (p.y.)	Standard Deviation of Daily Returns		No. of Compar.
	Global Fund	Port. Spec. Funds		Global Fund	Port. Spec. Funds	
World Funds	8.45%	11.60%	3.18%	0.91%	0.85%	54
Foreign Funds	6.35%	8.63%	2.28%	0.96%	0.94%	72
Portfolio of World Funds	22.54%	24.44%	1.59%	0.79%	0.78%	3
Portfolio of Foreign Funds	9.00%	10.74%	1.66%	0.90%	0.88%	20
Total	7.77%	10.29%	2.51%	0.93%	0.89%	149

5. Minimizing Risk

Weekly Data

Minimization of Variance

Global Fund Return:	Average Return		ttest:
	Global Fund	Constructed portfolio	Diff > 0
Between 0% and -1%	-0.47%	-0.35%	11.46
Between -1% and -5%	-2.23%	-1.92%	16.58
Between -5% and -10%	-6.39%	-5.37%	13.35
Smaller than -10%	-13.17%	-11.28%	4.03

Maximization of Return

Global Fund Return:	Average Return		ttest:
	Global Fund	Constructed portfolio	Diff > 0
Between 0% and -1%	-0.47%	-0.45%	1.88
Between -1% and -5%	-2.23%	-2.19%	2.79
Between -5% and -10%	-6.39%	-6.22%	2.67
Smaller than -10%	-13.17%	-13.05%	0.29

5. Minimizing Risk

Weekly Data

Minimization of Variance

	Average Return		ttest:
Return on Constructed Portfolios:	Global Fund	Constructed portfolio	Diff > 0
Between 0% and -1%	-0.52%	-0.47%	4.63
Between -1% and -5%	-2.22%	-2.17%	2.46
Between -5% and -10%	-6.11%	-6.33%	-2.18
Smaller than -10%	-11.98%	-12.81%	-1.68

Maximization of Return

	Average Return		ttest:
Return on Constructed Portfolios:	Global Fund	Constructed portfolio	Diff > 0
Between 0% and -1%	-0.46%	-0.47%	-0.66
Between -1% and -5%	-2.21%	-2.23%	-1.85
Between -5% and -10%	-6.30%	-6.37%	-1.08
Smaller than -10%	-12.77%	-13.31%	-1.23

5. Minimizing Risk

Weekly Data

Minimization of Variance

Return on MSCI Emerging Market Index:	Average Return		ttest:
	Global Fund	Constructed portfolio	Diff > 0
Between 0% and -1%	-0.34%	-0.23%	3.10
Between -1% and -5%	-1.52%	-1.49%	1.44
Between -5% and -10%	-4.12%	-4.47%	-2.19
Smaller than -10%	-3.51%	-3.54%	-0.13

Maximization of Return

Return on MSCI Emerging Market Index:	Average Return		ttest:
	Global Fund	Constructed portfolio	Diff > 0
Between 0% and -1%	-0.34%	-0.32%	0.40
Between -1% and -5%	-1.52%	-1.53%	-0.29
Between -5% and -10%	-4.12%	-4.23%	-0.65
Smaller than -10%	-3.51%	-3.57%	-0.23

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6. **Conclusions**

6. Conclusions: Summary of Main Results

i. Lack of diversification

- MFs, especially global funds, increased substantially

- MFs hold a small number of assets in their portfolios

- Number of holdings independent of investment scope

- Number of holdings does not increase for global funds

- No. of stocks and countries <u>decrease</u> for global funds, for same region regions

    - As going global, stocks and countries drop from portfolios

    - Within family effect

6. Conclusions: Summary of Main Results

ii. Patterns not easily explained by obvious factors

- Not lack of available of instruments
  - As a whole, MFs hold limited fraction of available stocks
  - Fraction decreases over time
  - Each fund holds on average 0.12% of mkt. cap.
- Not information asymmetry or transaction costs
  - Within family comparisons
  - Within families, funds share few stocks (low commonality)
  - No. of stocks not explained by information processing capacity
- Strong family effects

6. Conclusions: Summary of Main Results

iii. Potential diversification gains

- Portfolio of specialized funds yield better returns than global funds

- Robust to series of tests

- Robust to including benchmarks (tracking-error model)

- Global funds not noticeably better at minimizing risk

6. Conclusions: Future research

- New set of stylized facts

- Able to reject potential explanations

- Still need to understand what drives results

- In particular, what is behind family effects?

Thank you!