

Index-based ownership of public firms

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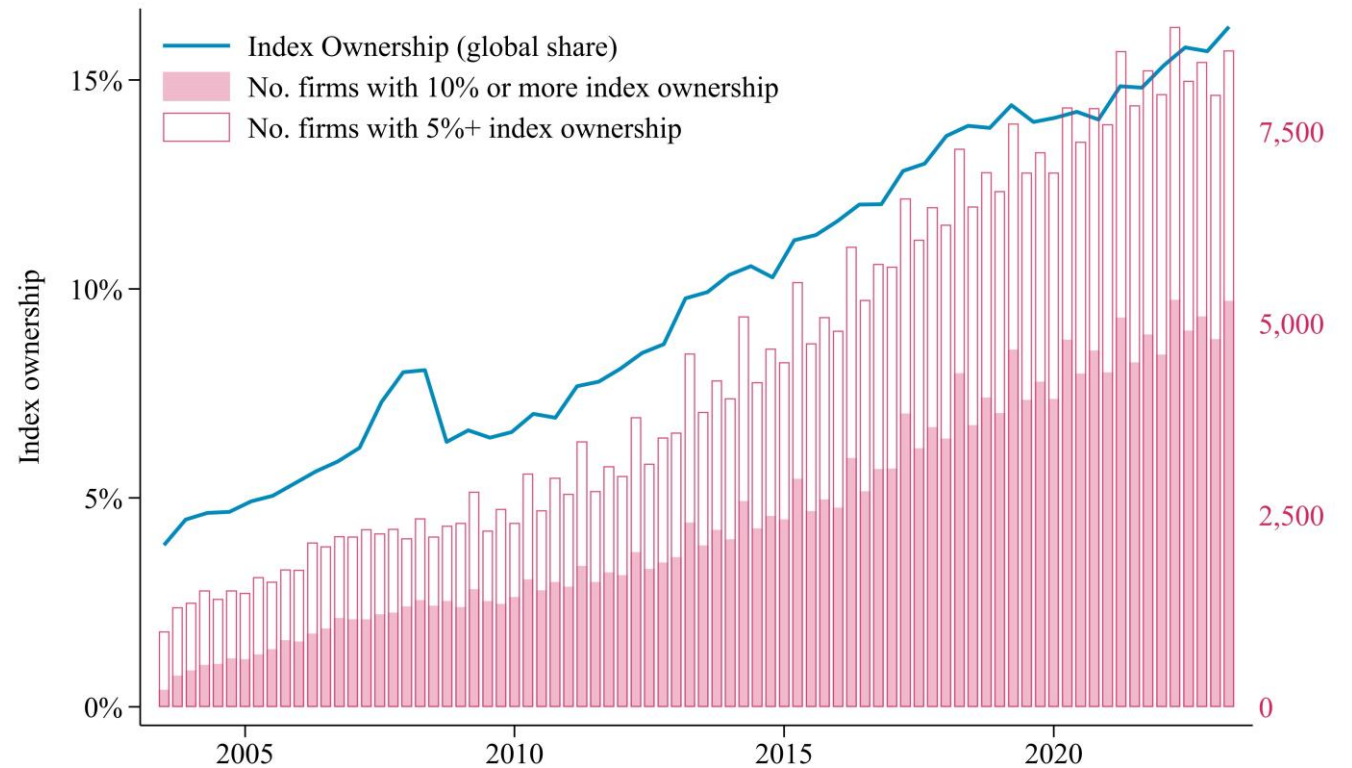


The extent of index-based investing

- 18% of U.S. public firm ownership is domestic index funds (ICI 2024) but 35% may be index-based (Chinco Sammon 2024) – foreigners, hidden indexing etc.
- Index-based investing in mutual fund market rising in many countries (Cremers Ferreira Matos Starks 2016)
- Questions
 - How important is index-based ownership for individual firms, esp. outside the U.S.?
 - Which firms are owned by index funds?

This project: measuring index ownership for all listed firms

- We classify index funds based on quarterly panel data of holdings and names
- Our classification does not require third party classifications, fund mandates or regulatory filings
- Global coverage



Literature

- Index-based ownership for retail investors
 - **Broad diversification, low cost, scale** (Bjerk Sund Døskeland Sjuve Ørpetveit 2025, Chen Hong Huang Kubik 2004, French 2008, Sharpe 1991)
- Effects for publicly listed firms
 - **Stock price levels** (Jain 1987, Chen Noronha Singal 2005, Shahrababaki 2025)
 - **Market efficiency** (Coles Heath Ringgenberg 2022, French 2022, Haddad Huebner Loualiche 2025, Kontz Hanson 2025)
 - **Corporate governance** (Aghion van Reenen Zingales 2013, Appel Gormley Keim 2016/2019, Bebchuk Hirst 2019, Brav Malenko Malenko 2025, Heath Macciocchi Michaely Ringgenberg 2022, Schmidt Fahlenbrach 2017)
 - **Common ownership** (Azar Schmalz Tecu 2018, Anton Ederer Giné Schmalz 2021 etc.)
- Measurement across countries
 - Investor side (Ferreira Matos 2008, Cremers Ferreira Matos Starks 2016)

Data

- S&P Global Market Intelligence: data on mutual funds and ETFs, pension funds, public and private corporations, and other institutions
 - Ownership data for “99.7% of global public and private companies”
 - Based on daily processing of 1,500+ documents
 - Regulatory Filings: SEC (13F, 13D, 13G, Form 3, 4, 5), CSA (SEDAR)
 - Company Reports: Annual reports, proxy statements (DEF 14A), press releases
 - Mutual Fund Reports: Portfolio holdings from ETFs, open-ended and close-ended funds
 - 36,000+ institutional investment firms (300,000 insiders)
 - 2004-2023
 - On average (vw), data covers of 76.2% of shareholdings
- CapitalIQ
 - Firm market capitalization etc.

Information available in the S&P data set

- Shareholder portfolios by quarter (sometimes higher frequency); # shares held, % shares outstanding, trades
- Ownership Categories
 - **Total Institutional Ownership:** Sum of equity holdings in a firm by all public and private investment funds during a given period. Fund type is identified by a fund classification indicator in the dataset (sample vw average: 55.3%)
 - **Public and Private Corporate Holdings:** Sum of equity holdings in a firm by all public (private) corporations during a given period. Corporate type is identified based on firm classification in the dataset (15.4%)
 - **Insiders/Individuals Holdings:** Sum of equity holdings in a public firm by all individual insiders during a given period. Insiders are identified through individual-level ownership records in the dataset (5.5%)
- Free Float = shares available for trading by the public (i.e., excludes shares held by strategic owners)
- Classification of institutional shareholders
 - **Morningstar Index Identifier:** binary variable indicating whether a fund is classified as an index fund or an actively managed fund by Morningstar
 - **Fund Description Index:** Dummy equal to one if fund description explicitly states that the fund tracks an index
 - **Fund Name:** Dummy variable equal to one if the fund name includes the word “index” or index names*

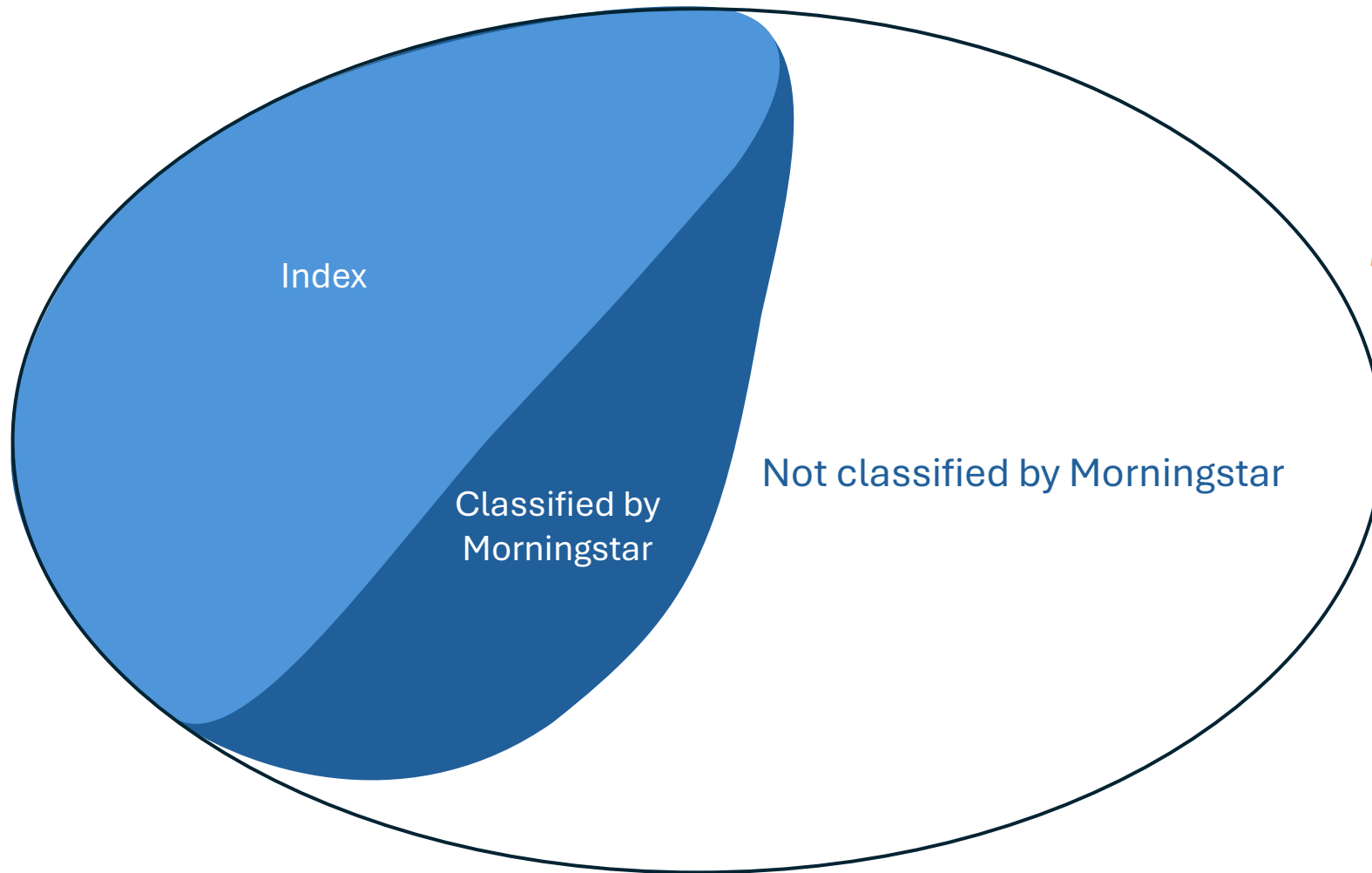
* Terms used: Index, CAC, DAX, OMX, FTSE, S&P, S&P 500, SP500, MSCI, Nasdaq, Russell, Total Market, QQQ, SPY, IVV, VOO, VTI, IWM, Set 50, Jumbo 50, Jumbo 25, Select Sector SPDR, Euro Stoxx, EURO STOXX, Topix, Nikkei, JASDAQ, IBEX, TSX, ASX, Bovespa, KOSPI, Hang Seng, HSI, Lyxor Index, Dow, iShares Core, Vanguard Index, Vanguard 500, Vanguard Total Stock, Xtrackers, Schwab 1000, Fidelity 500

Fund description: Xtrackers - MSCI Europe UCITS ETF

Xtrackers - MSCI Europe UCITS ETF is an exchange traded fund launched by Deutsche Asset & Wealth Management Investment S.A. The fund is managed by State Street Global Advisors Limited. It invests in the public equity markets of **developed countries in Europe**. The fund seeks to invest in the stocks of companies operating across **diversified** sectors. It invests in the stocks of **large-cap and mid-cap companies**. The fund seeks to **replicate the performance of the MSCI Europe Index**, by investing in the stocks of companies as per their weightings in the index. It was formerly known as db x-trackers - MSCI Europe Index UCITS ETF (DR). Xtrackers - MSCI Europe UCITS ETF was formed on January 10, 2007 and is **domiciled in Luxembourg**.

➔ Fund is classified as index fund based on name (“MSCI Europe”) and fund description (“Index”).

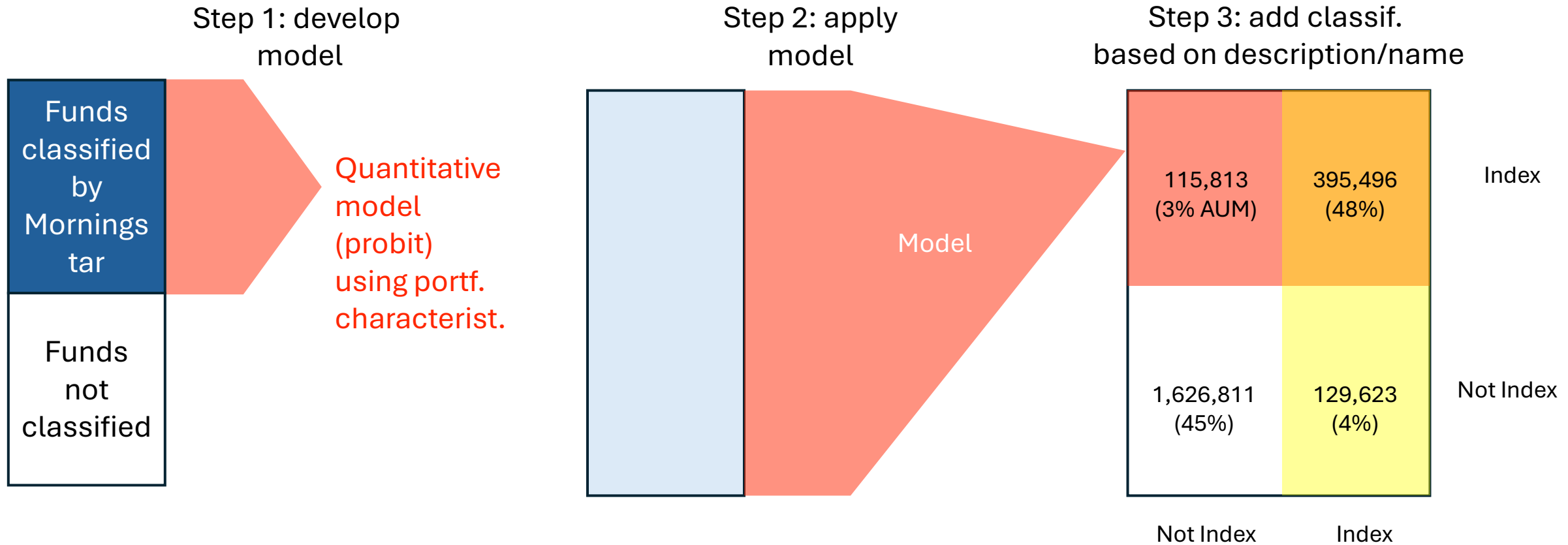
Classifying institutional shareholders



Use fund name
and probit model
to classify



Method for classifying funds



Probit model: independent variables

Positions

Number of securities with non-zero holdings

Holding share Δ

Standard deviation of changes in ownership shares $\left(\frac{\sigma(\Delta p_{i,t}^f)}{\mu(\Delta p_{i,t}^f)}\right)$

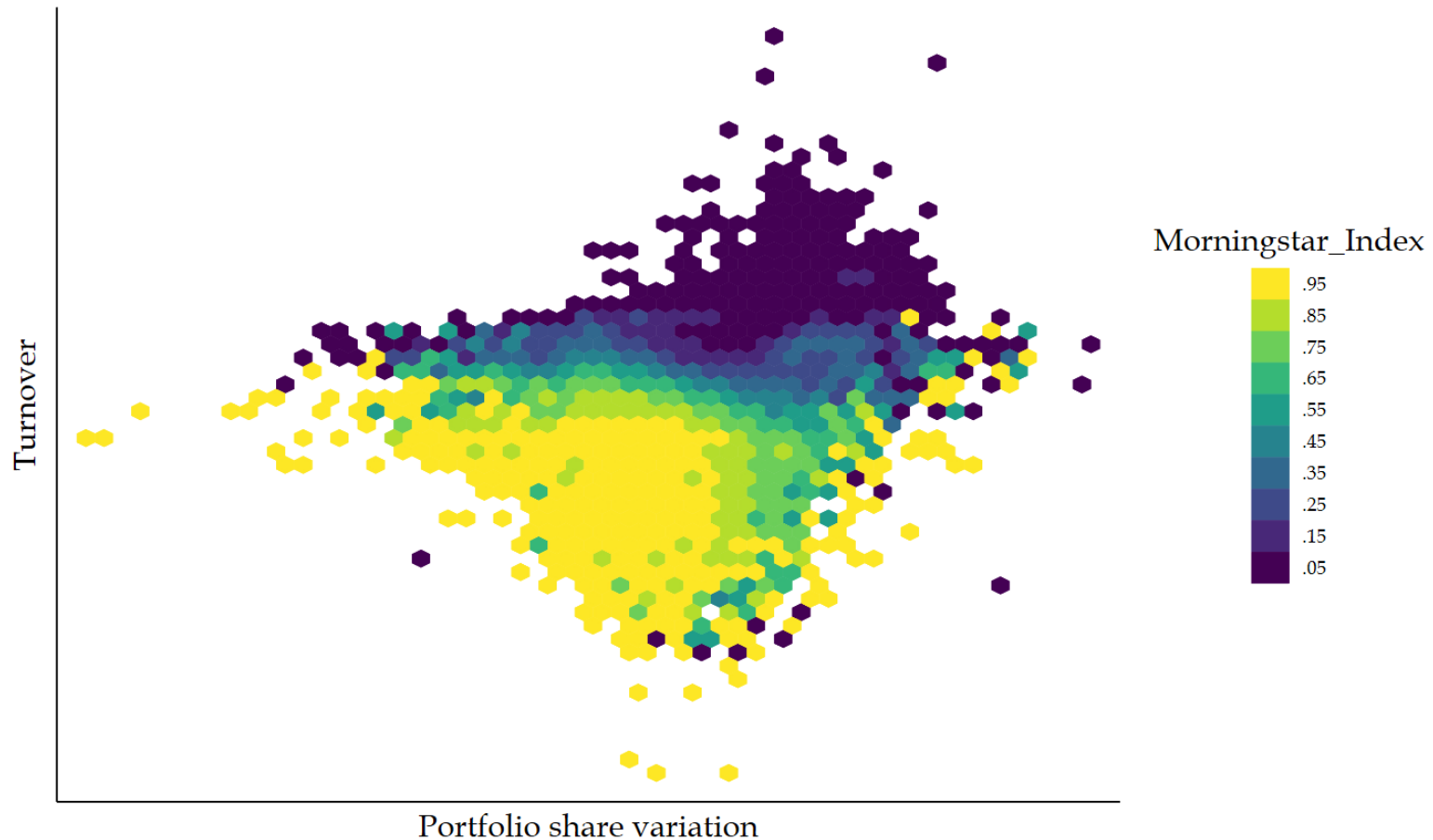
Turnover

Total value of net quarterly buys and sells, relative to portfolio value

Cross-sectional SD of pos.

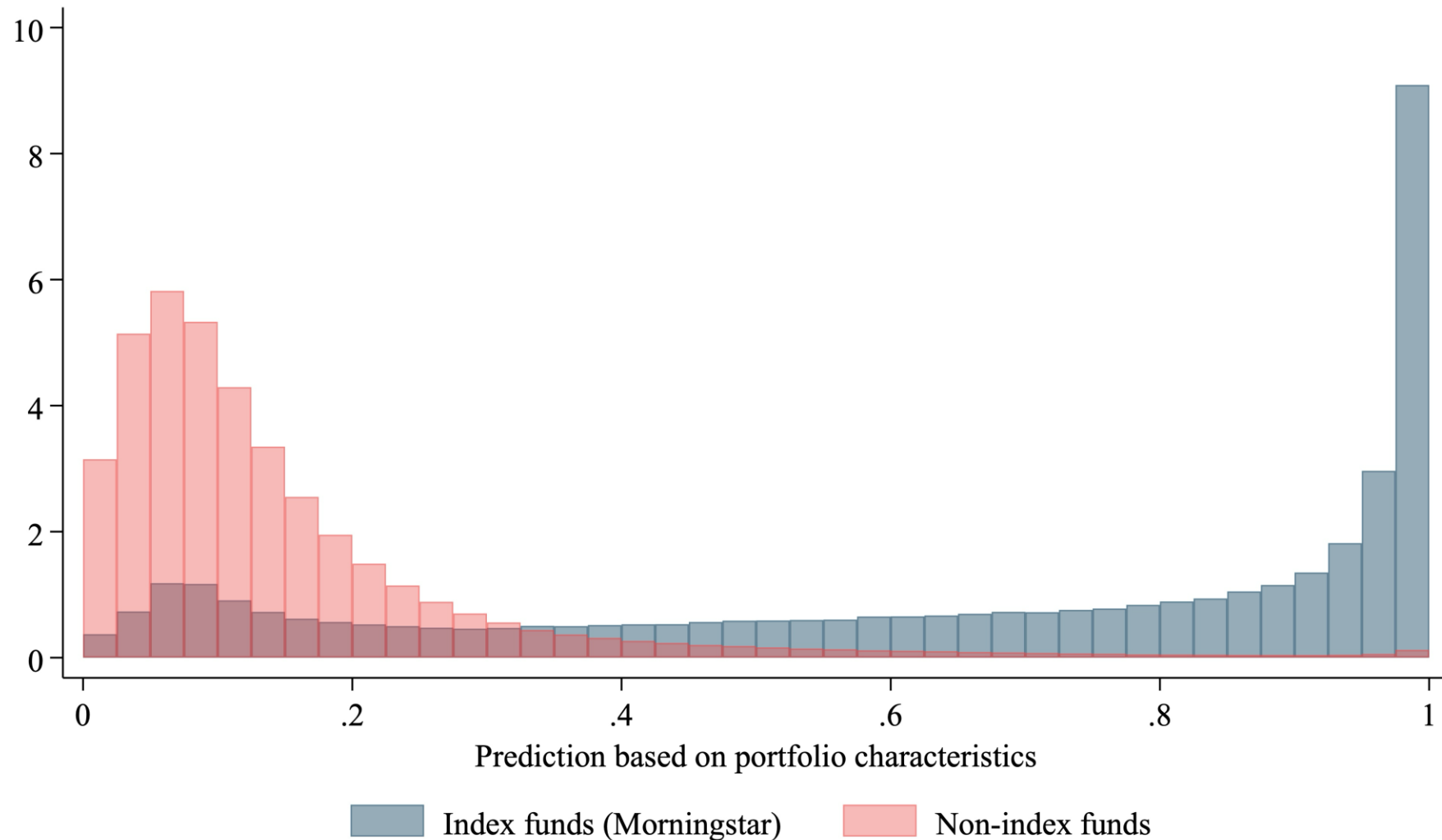
Standard deviation of ownership shares $\left(\frac{\sigma(p_{i,t}^f)}{\mu(p_{i,t}^f)}\right)$

Example: turnover and cross-sectional variation in position size

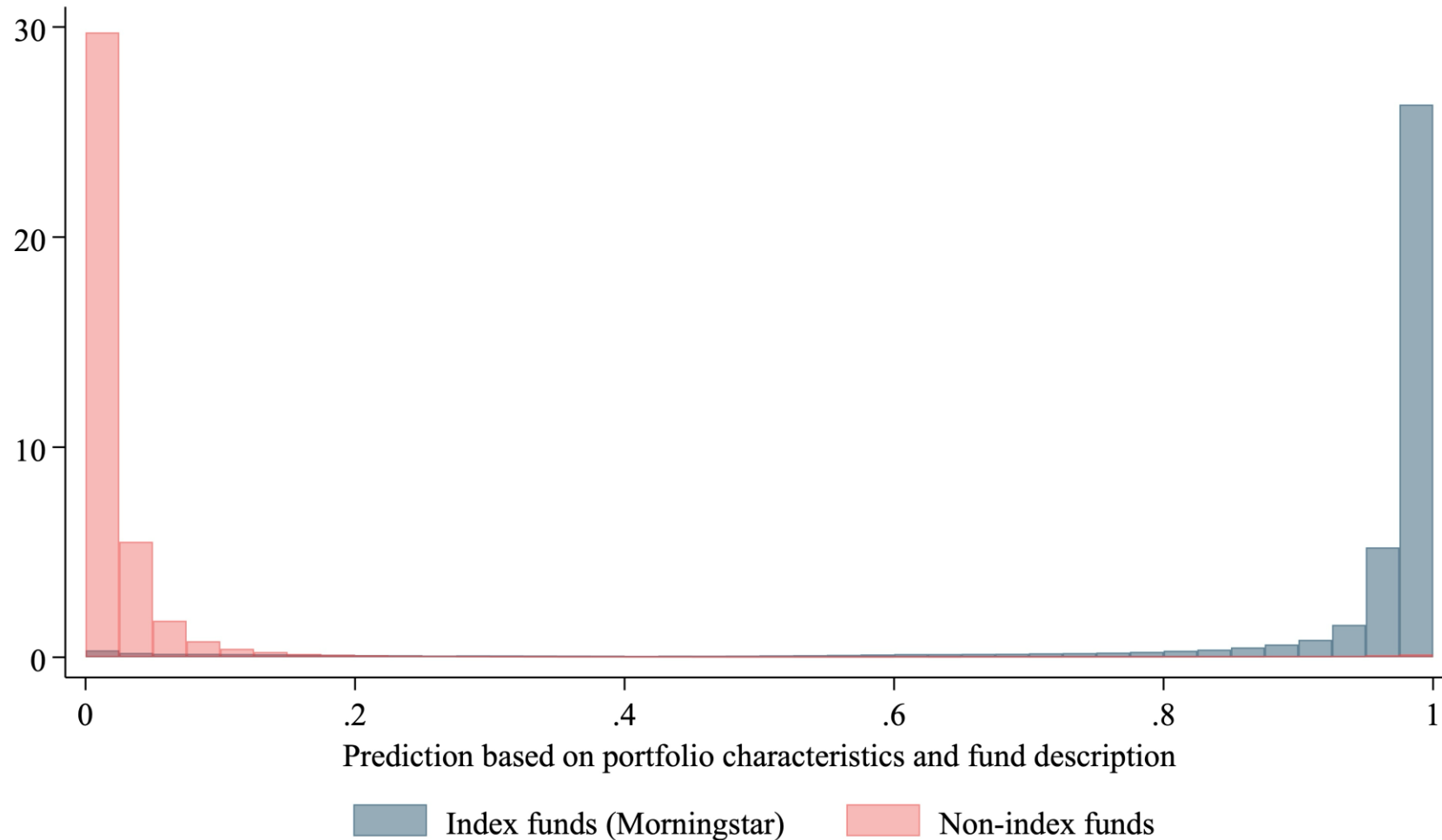


Note: 2023Q4 only

Model fit: portfolio characteristics



Model fit: portfolio characteristics and fund description



Recap classification of index funds

- We use max operator of self-identification and quantitative model

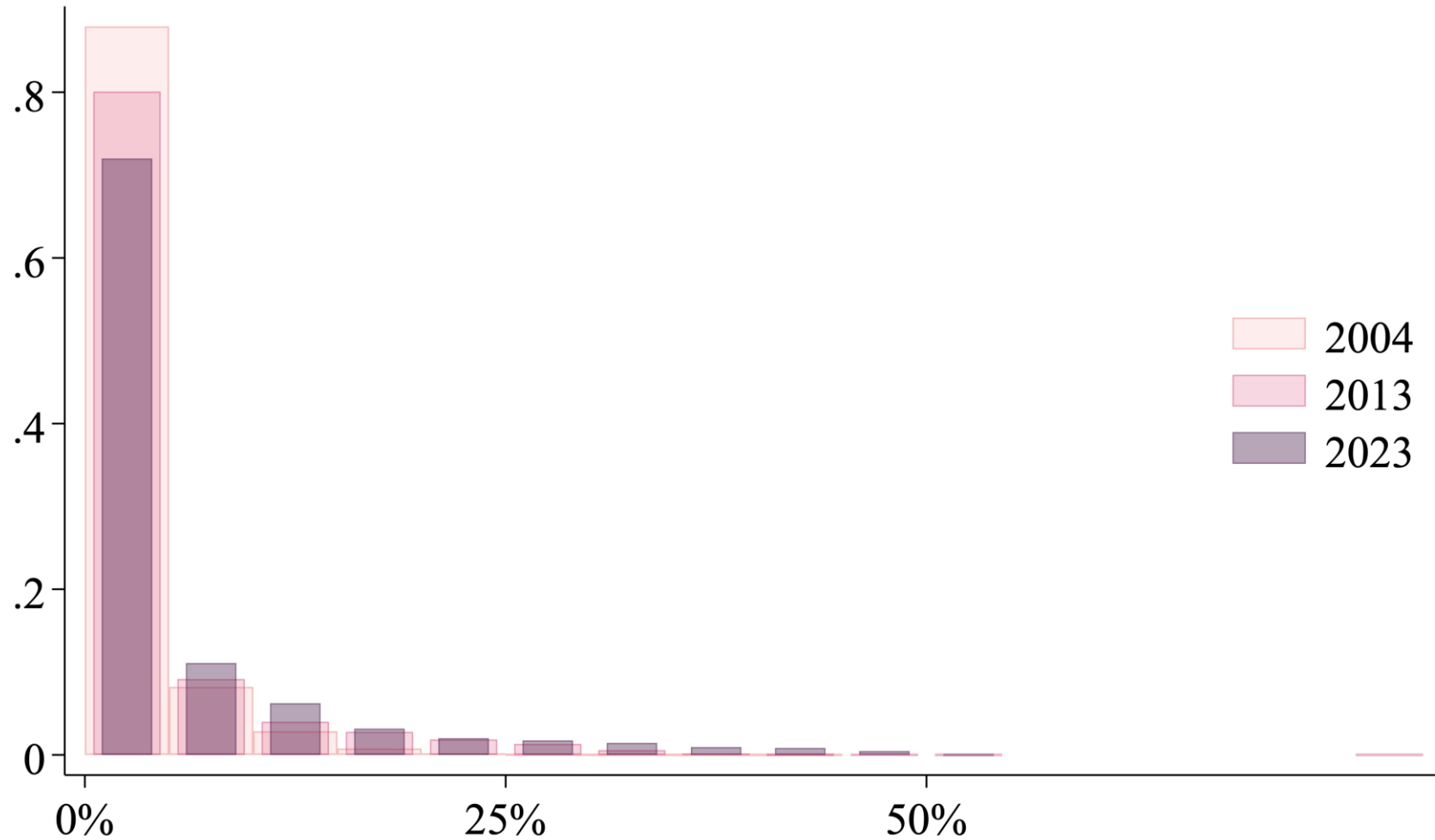
$$I_{it}^{\text{Index Fund, Morningstar}} = \Phi\left(\theta \text{Turnover}_{it} + \gamma \text{Portfolio Holdings}_{it} + \mu \text{Variance}_{it} + \lambda \text{Position Changes}_{it}\right)$$

- Within universe of funds classified by Morningstar, we match 97% with full model

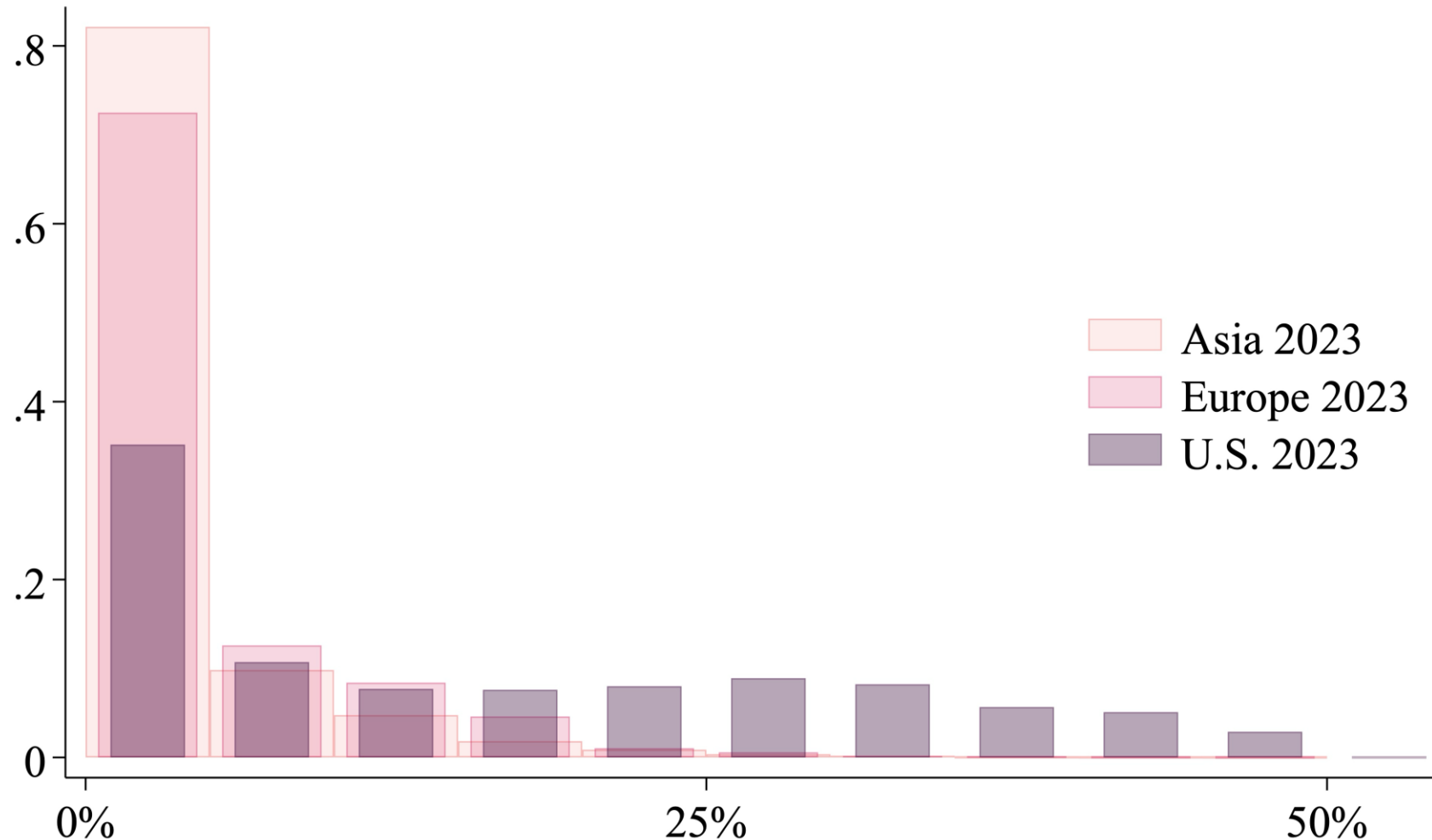
Next step: firm level ownership data

- Calculate index-based ownership by (publicly listed) company
- Questions to explore
 - Comparing levels and time trends across regions, countries
 - Closet vs. explicit indexing
 - Identify indexes used
 - Cross-firm determinants, such as market capitalization, free float

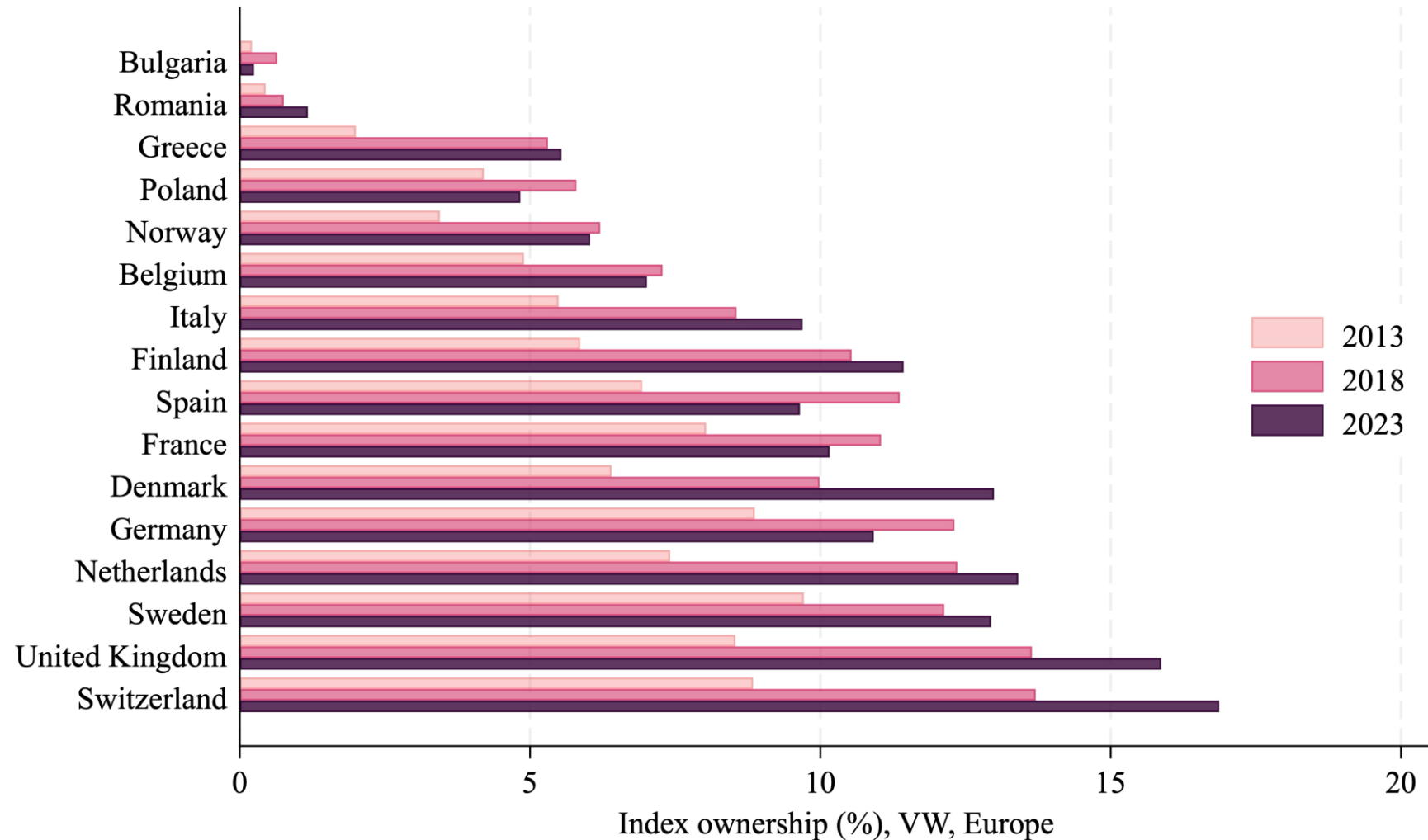
Non-trivial index ownership getting more common



U.S. firms have more index ownership than European, which have more than Asian

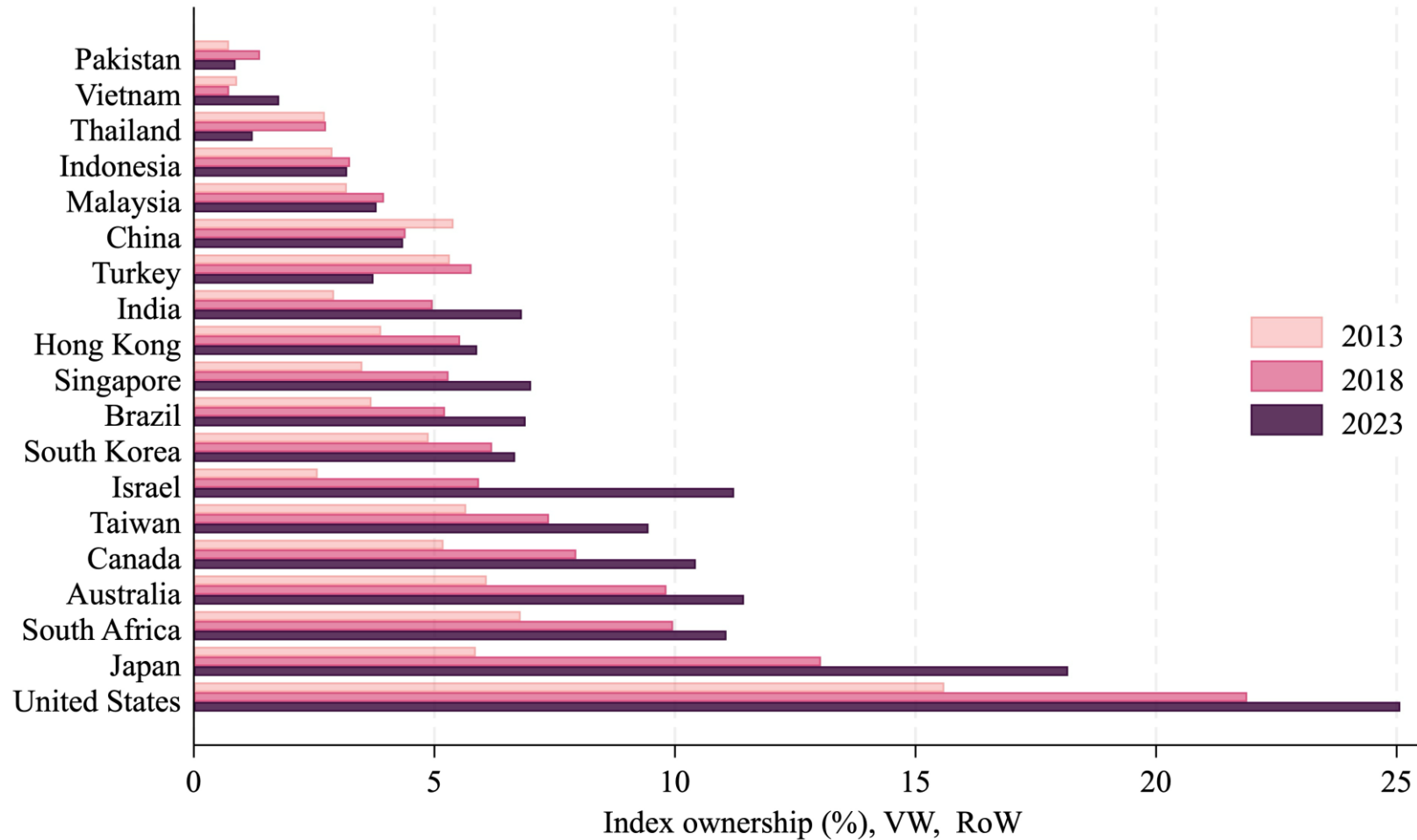


Growth of indexing - Europe



Note: Countries with 5k+ observations

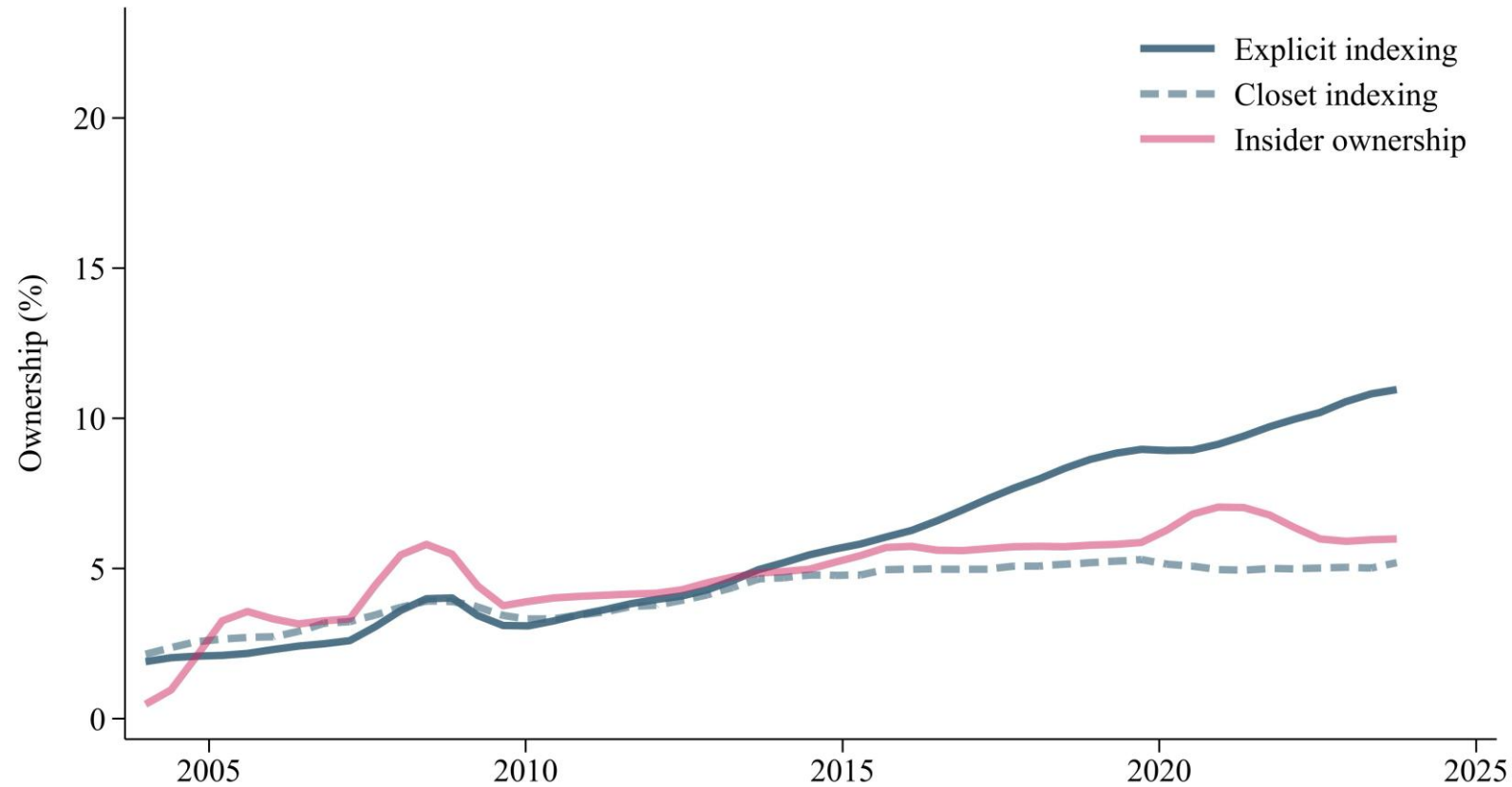
Growth of indexing - RoW



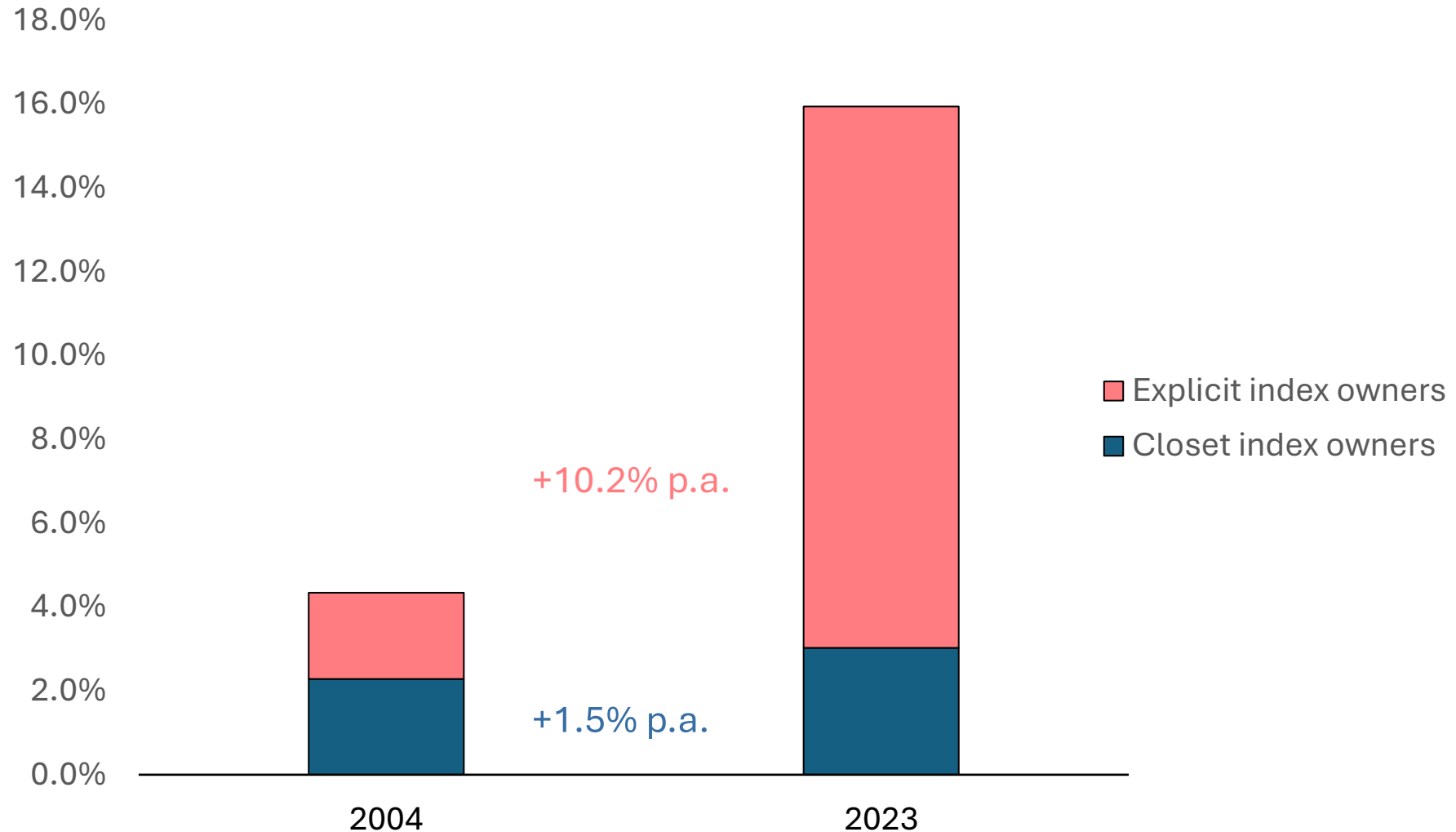
Note: Countries with 10k+ observations

Explicit indexing overtook closet indexing in 2012, insider ownership 2014

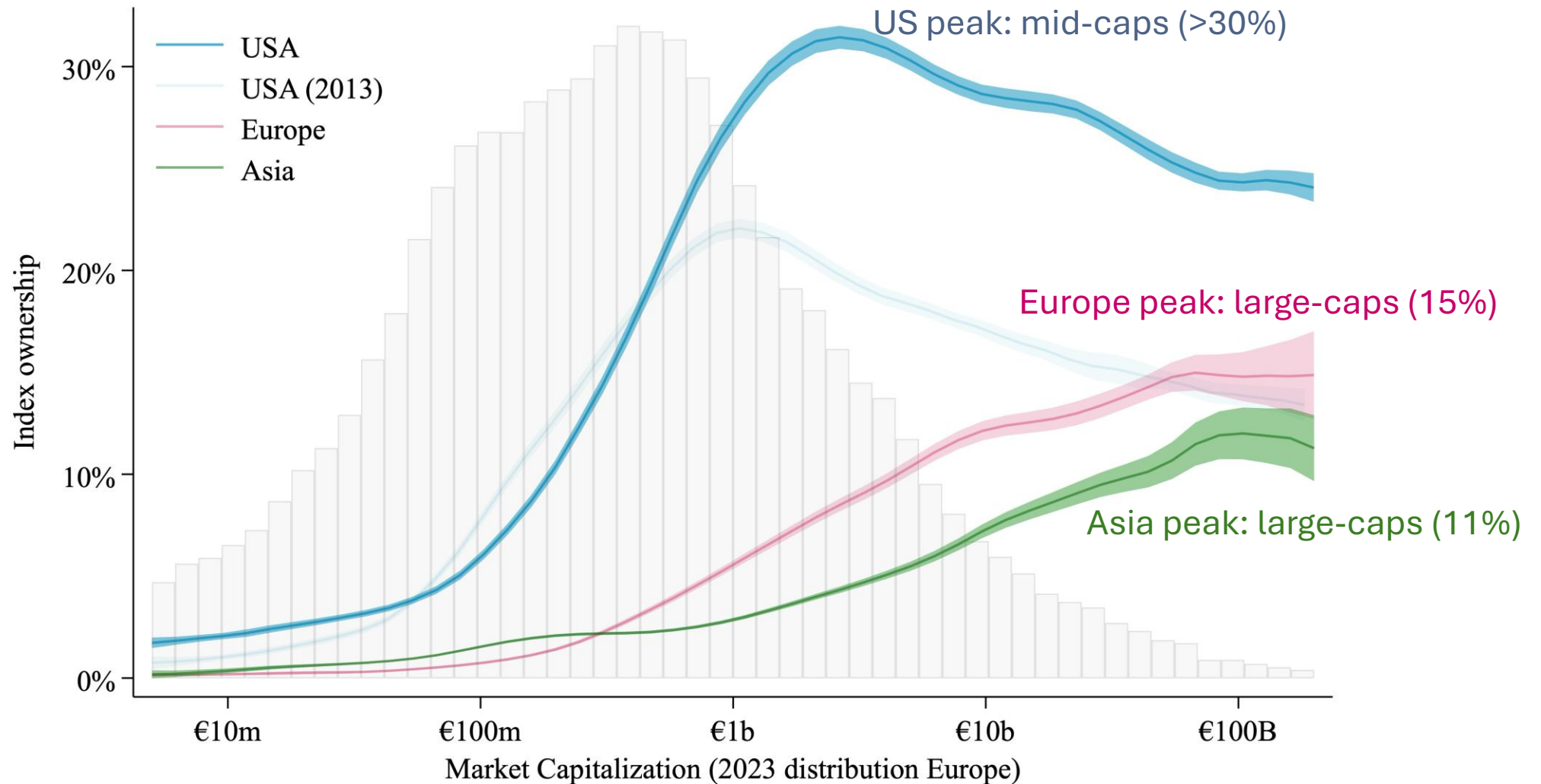
A. Worldwide



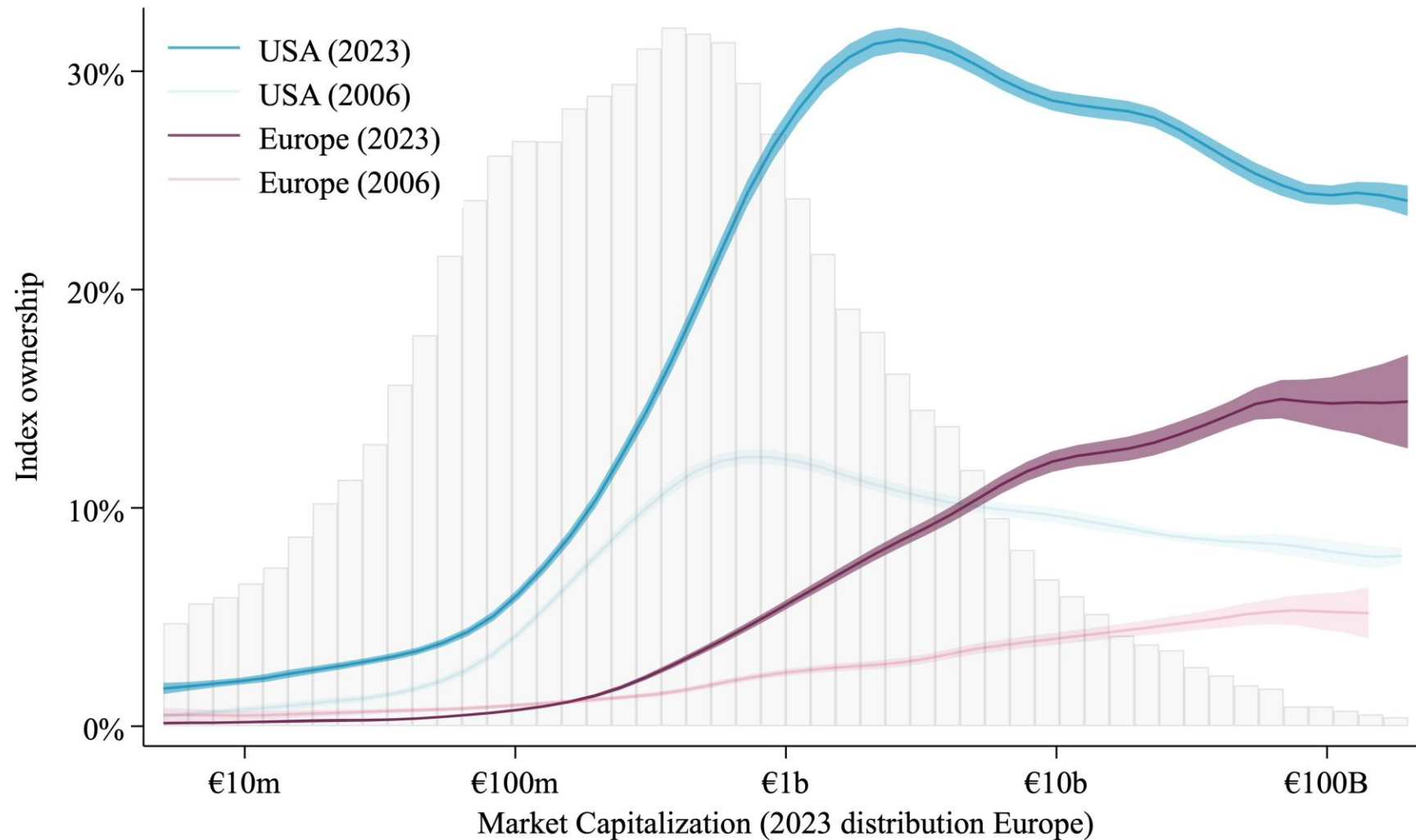
Development of closet and explicit index ownership for European firms



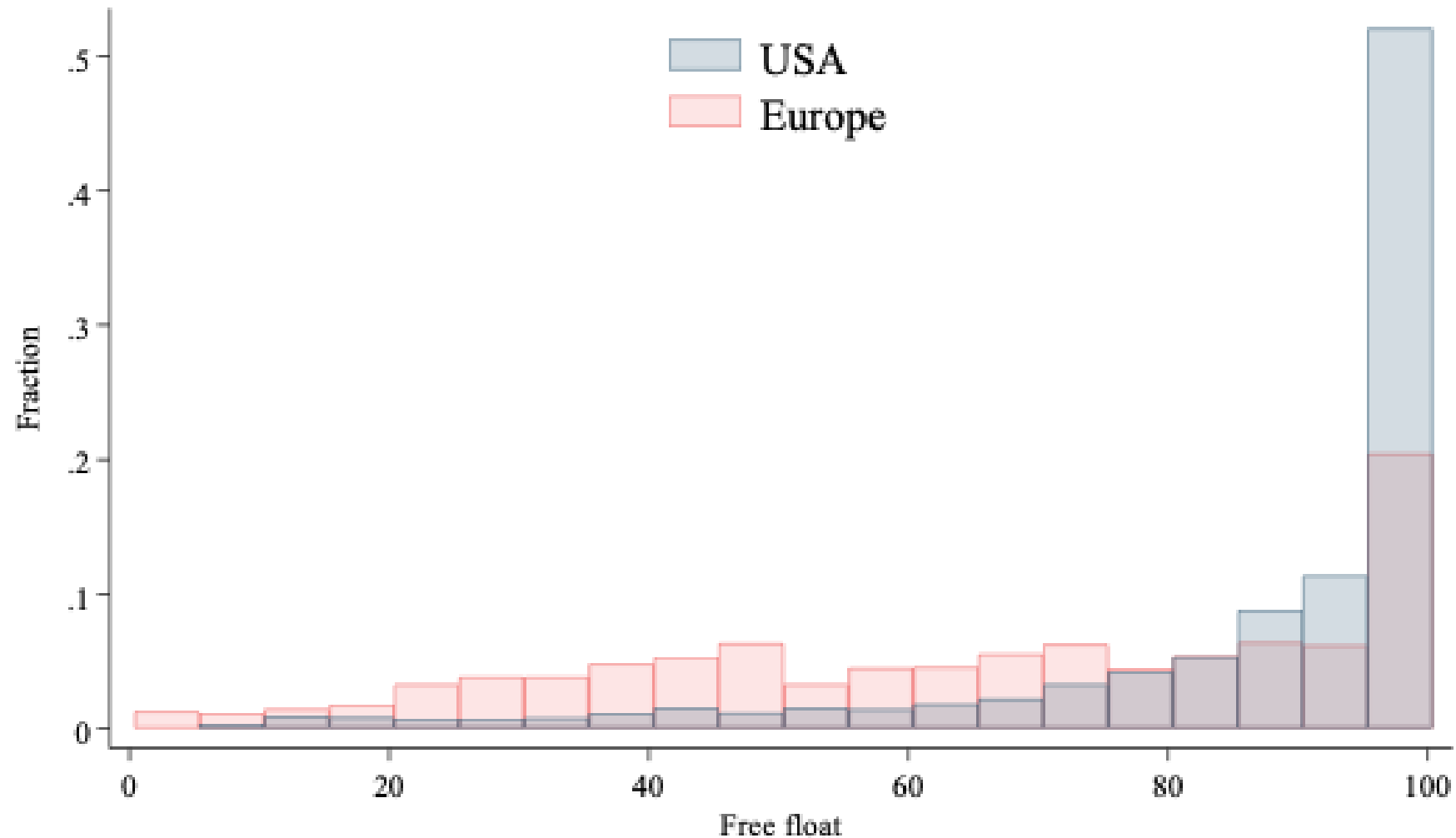
Firm size and index ownership



U.S. 2006 vs. Europe 2023



Free float of large listed firms: Europe vs. USA



Note: 2023Q4, Market Cap \$1B+

Index Ownership and Free Float

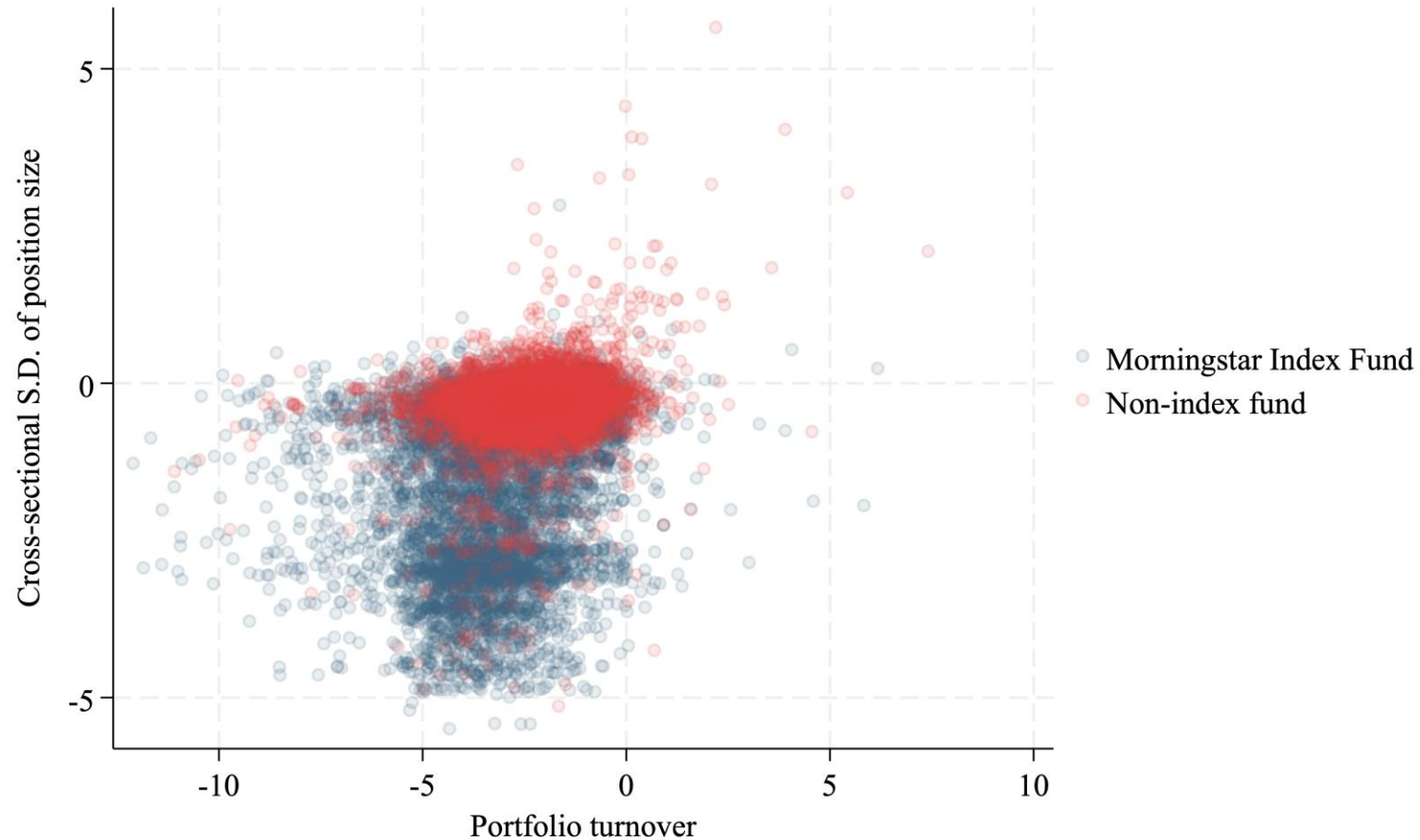
	(1)	(2)	(3)
		Index Ownership	
Free float	0.137** (0.052)	0.101*** (0.035)	0.079*** (0.023)
Market Cap (log)			1.359*** (0.310)
R-squared	0.216	0.444	0.572
Observations	1.47m	1.47m	1.44m
Country FE	No	Yes	Yes
Time FE	No	Yes	Yes
Error clusters	Country, Firm	Country, Firm	Country, Firm

Conclusions

- Model based on portfolio characteristics and name identifies index funds with 97% accuracy; applies globally (cf. Morningstar of CRSP-MF)
- Firm-level determinants of index ownership are (a) country, (b) size, (c) free float
- By 2023: US 26%, Europe 14%, Asia 7%, rising in most markets
- Size works differently outside U.S.
 - US: mid-caps have the most index ownerships, large caps slightly less
 - Asia, Europe: monotonic relationship (liquidity, free float)
- (TBD) Our data will be made available for studying impact on price formation/market efficiency, governance etc.

Back-ups

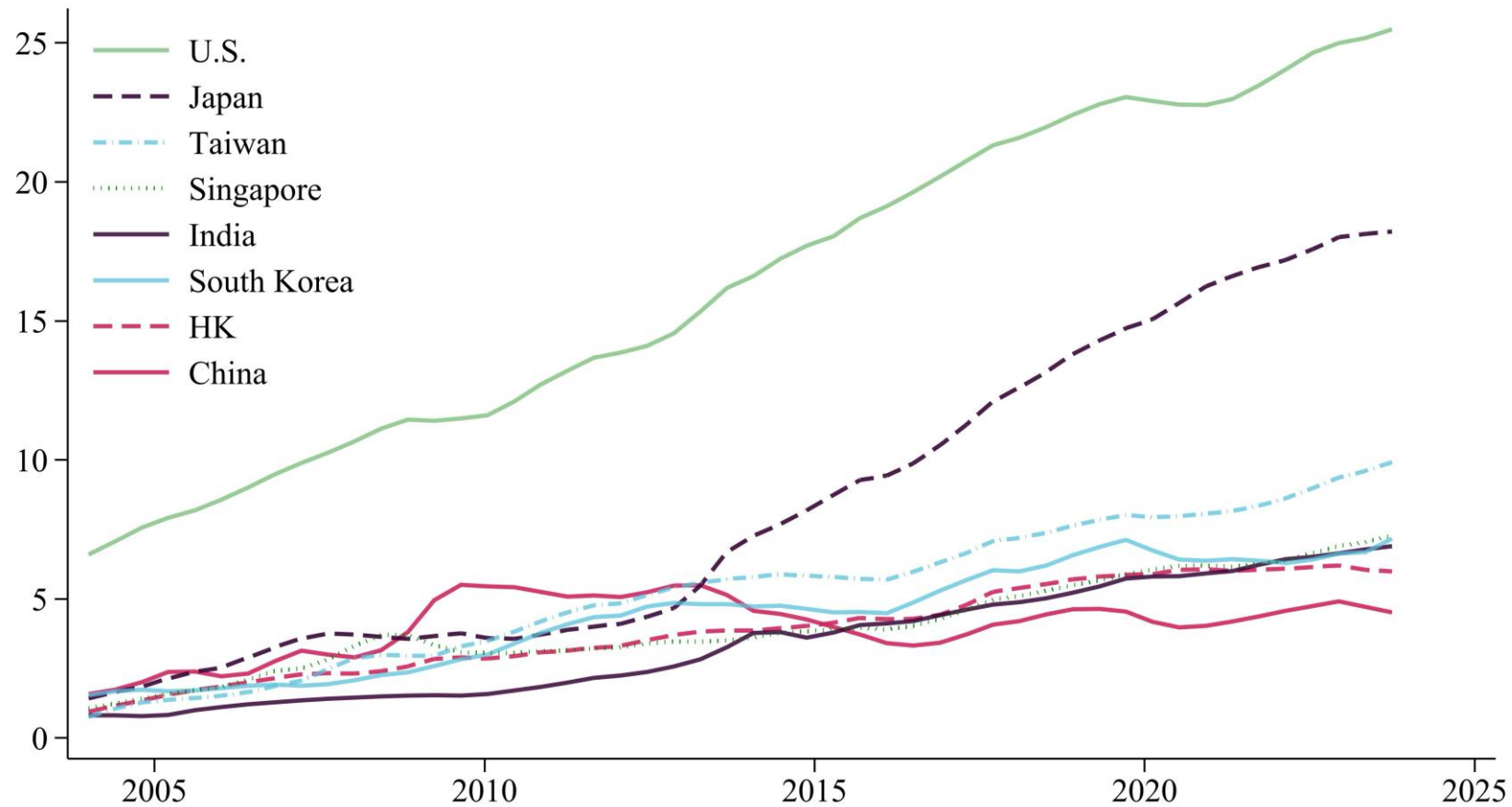
Example: turnover and cross-sectional variation in position size



Note: 2023Q4 only

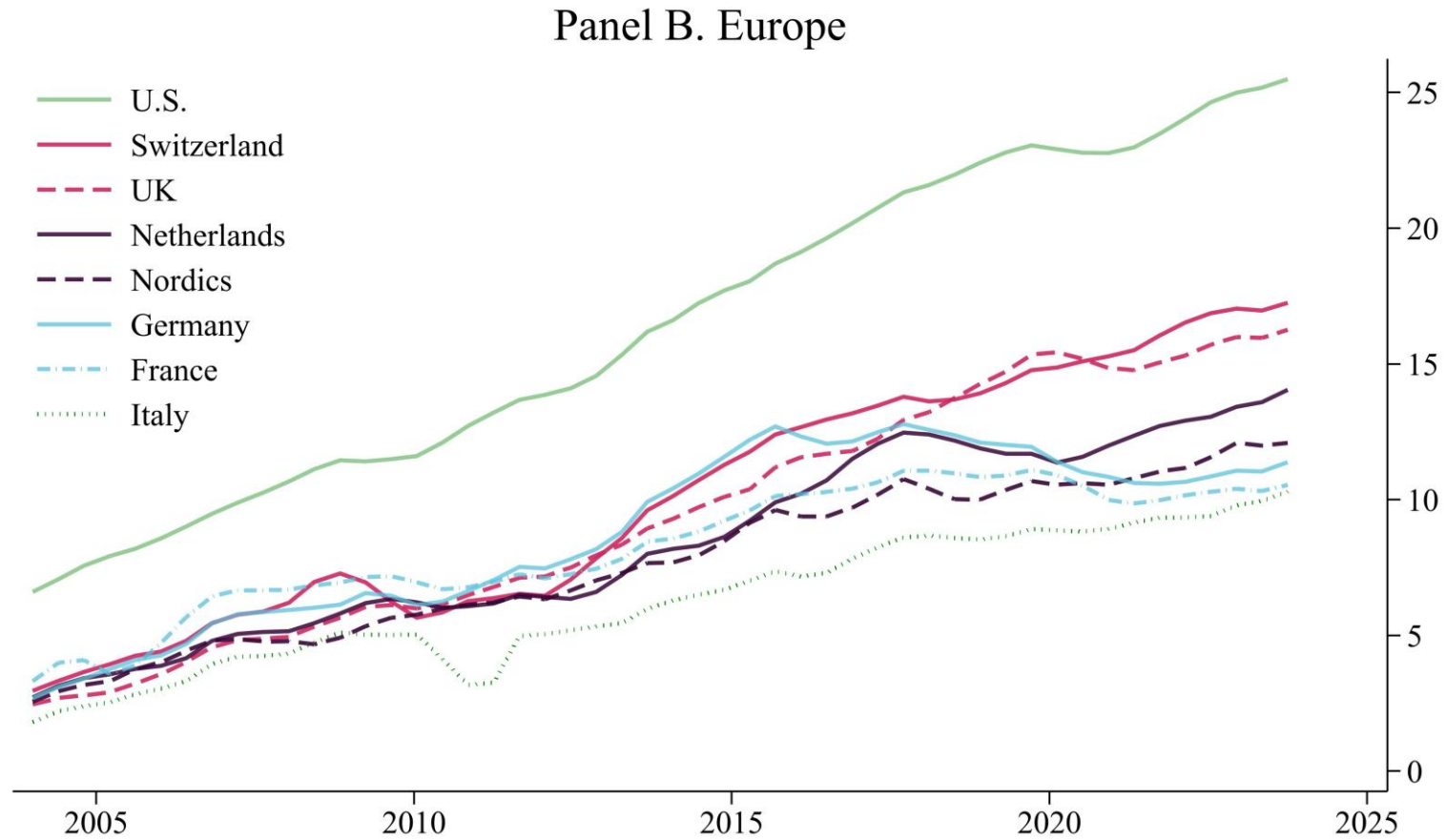
Time trend – selected countries (Asia)

Panel A. Asia



Note: value weighted

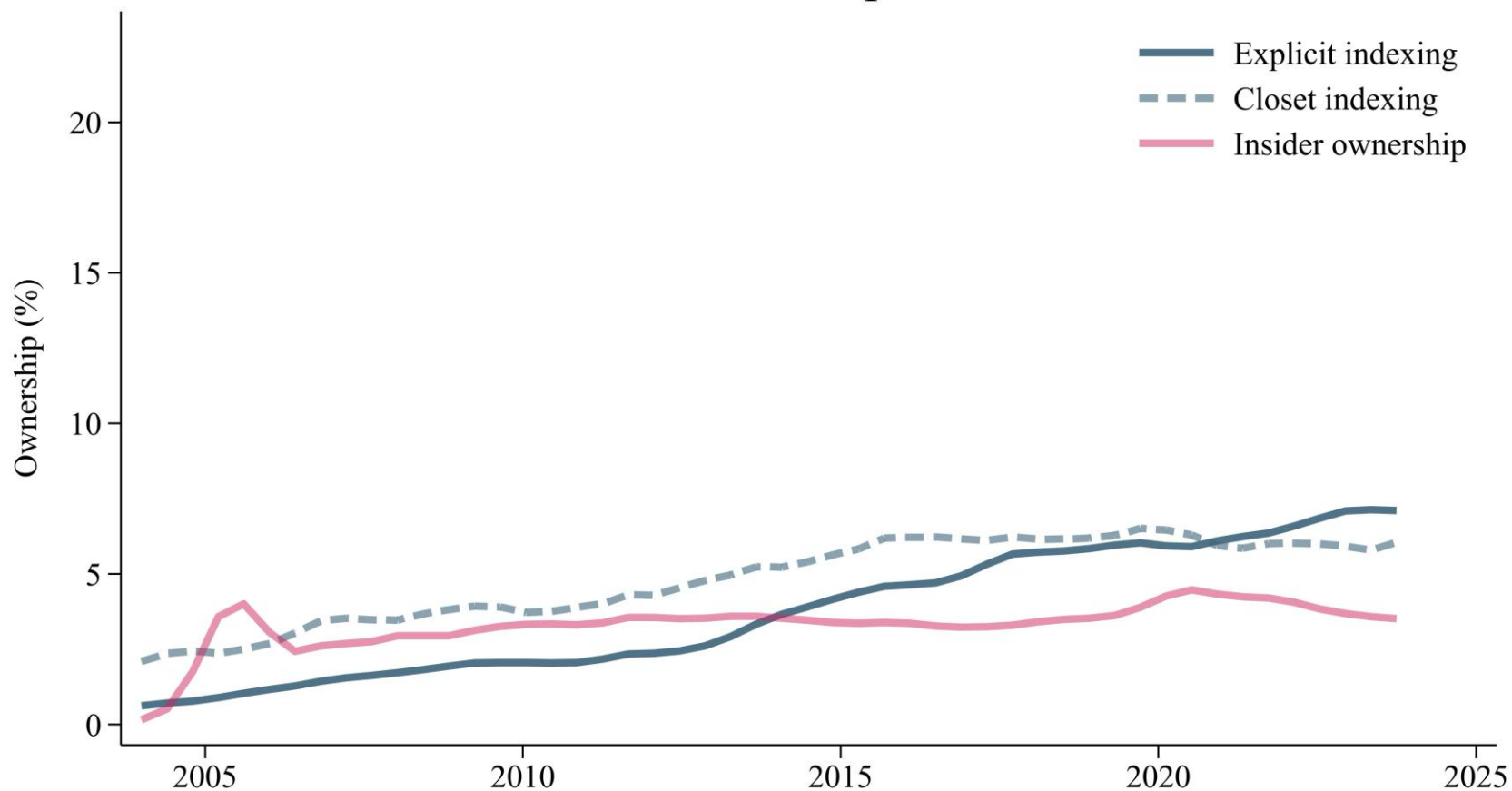
Time trend - selected countries (Europe)



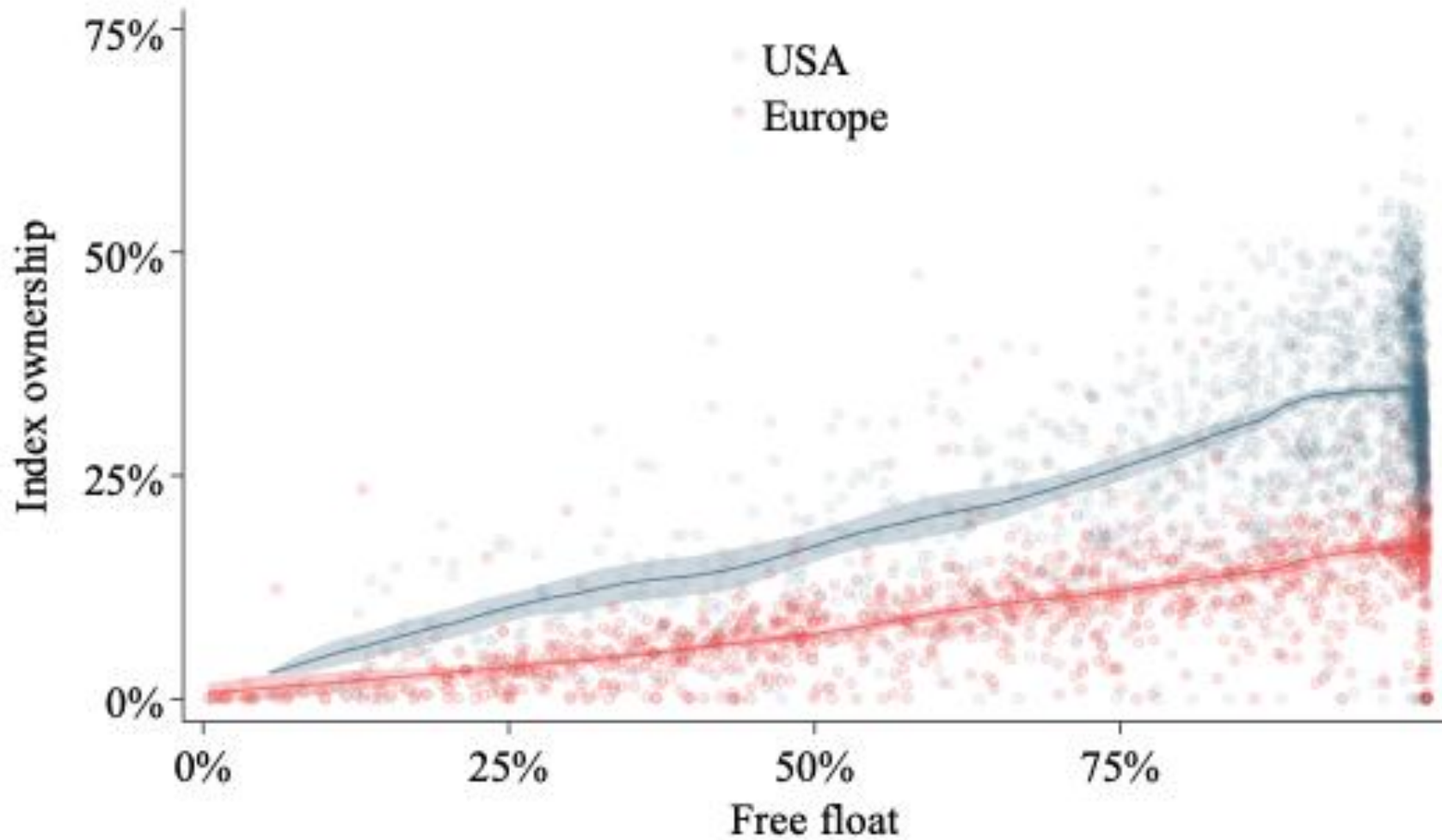
Note: value weighted

Explicit and closet indexing in Europe

C. Europe



Free float and index ownership



Note: 2023Q4, Market Cap \$1B+

Which index?

- We infer index composition from highest AUM-fund whose description suggest following this index
- Match funds to index by holdings (cosine similarity)
- Aggregate AUM by index
- Includes 'closet indexers'

